



CITY of CLOVIS

AGENDA • CITY COUNCIL MEETING

Council Chamber, 1033 Fifth Street, Clovis, CA 93612 (559) 324-2060
www.cityofclovis.com

July 12, 2021

6:00 PM

Council Chamber

In compliance with the Americans with Disabilities Act, if you need special assistance to access the City Council Chamber to participate at this meeting, please contact the City Clerk or General Services Director at (559) 324-2060 (TTY – 711). Notification 48 hours prior to the meeting will enable the City to make reasonable arrangements to ensure accessibility to the Council Chamber.

The Clovis City Council meetings are open to the public at the physical address listed above. There are numerous ways to participate in the City Council meetings: you are able to attend in person; you may submit written comments as described below; you may participate by calling in by phone (see “Verbal Comments” below); and you may view the meeting which is webcast and accessed at www.cityofclovis.com/agendas.

Written Comments

- Members of the public are encouraged to submit written comments at: <https://cityofclovis.com/agendas> at least two (2) hours before the meeting (4:00 p.m.). You will be prompted to provide:

- Council Meeting Date
- Item Number
- Name
- Email
- Comment



- Please submit a separate form for each item you are commenting on.
- A copy of your written comment will be provided to the City Council noting the item number. If you wish to make a verbal comment, please see instructions below.
- Please be aware that any written comments received that do not specify a particular agenda item will be marked for the general public comment portion of the agenda.
- If a written comment is received after 4:00 p.m. on the day of the meeting, efforts will be made to provide the comment to the City Council during the meeting. However, staff cannot guarantee that written comments received after 4:00 p.m. will be provided to City Council during the meeting. All written comments received prior to the end of the meeting will be made part of the record of proceedings.

Verbal Comments

- If you wish to speak to the Council on an item by telephone, you should contact the City Clerk at (559) 324-2060 no later than 4:00 p.m. the day of the meeting.
- You will be asked to provide your name, phone number, and your email. You will be emailed instructions to log into Webex to participate in the meeting. Staff recommends participants log into the Webex at 5:30 p.m. the day of the meeting to perform an audio check.
- All callers will be placed on mute, and at the appropriate time for your comment your microphone will be unmuted.
- You will be able to speak to the Council for up to three (5) minutes.

Webex Participation

- Reasonable efforts will be made to allow written and verbal comment from a participant communicating with the host of the virtual meeting. To do so, a participant will need to chat with the host and request to make a written or verbal comment. The host will make reasonable efforts to make written and verbal comments available to the City Council. Due to the new untested format of these meetings, the City cannot guarantee that these written and verbal comments initiated via chat will occur. Participants desiring to make a verbal comment via chat will need to ensure that they accessed the meeting with audio transmission capabilities.

CALL TO ORDER

FLAG SALUTE - Councilmember Bessinger

ROLL CALL

Public Comments - This is an opportunity for the members of the public to address the City Council on any matter within the City Council's jurisdiction that is not listed on the Agenda. In order for everyone to be heard, please limit your comments to 5 minutes or less, or 10 minutes per topic. Anyone wishing to be placed on the Agenda for a specific topic should contact the City Manager's office and submit correspondence at least 10 days before the desired date of appearance.

ORDINANCES AND RESOLUTIONS - With respect to the approval of resolutions and ordinances, the reading of the title shall be deemed a motion to waive a reading of the complete resolution or ordinance and unless there is a request by a Councilmember that the resolution or ordinance be read in full, further reading of the resolution or ordinance shall be deemed waived by unanimous consent of the Council.

CONSENT CALENDAR - Items considered routine in nature are to be placed upon the Consent Calendar. They will all be considered and voted upon in one vote as one item unless a Councilmember requests individual consideration. A Councilmember's vote in favor of the Consent Calendar is considered and recorded as a separate affirmative vote in favor of each action listed. Motions in favor of adoption of the Consent Calendar are deemed to include a motion to waive the reading of any ordinance or resolution on the Consent Calendar. For adoption of

ordinances, only those that have received a unanimous vote upon introduction are considered Consent items.

- [1.](#) Administration - Approval - Minutes from the June 21, 2021 Council Meeting.
- [2.](#) Administration - Approval – Award the RFP and approve the purchase of Storage Area Network equipment from AMS.net.
- [3.](#) Administration - Approval – Waive Normal Purchasing Process and approve the purchase of replacement desktop computers and servers using competitively bid contracts with purchasing provisions for California State and Local government agencies.
- [4.](#) Finance – Receive and File – Findings & Recommendations from Community Facilities District Citizens Committee.
- [5.](#) Finance - Approval - Res. 21-____, Measure C Extension Local Transportation Pass Through Revenues Certification and Claim Forms for 2021-22.
- [6.](#) Fire - Approval - Waive the City’s formal bidding requirements and authorize the sole source purchase of one Pierce Triple Combination Pumper Fire Apparatus from Golden State Fire Apparatus in Sacramento, CA for a total purchase price of \$748,277.25.
- [7.](#) General Services – Approval – Res. 21-____, Amending the City’s Classification and Compensation Plan by Converting the Assistant City Manager/City Clerk Classification into Separate Assistant City Manager and City Clerk Classifications.
- [8.](#) General Services – Approval – Claim Rejection of the General Liability Claim for Nancy Mendez.
- [9.](#) Planning and Development Services – Approval – Bid Award for CIP 20-06 Shaw Avenue Street Rehabilitation; and Authorize the City Manager to Execute the Contract on behalf of the City.

PUBLIC HEARINGS - A public hearing is an open consideration within a regular or special meeting of the City Council, for which special notice has been given and may be required. When a public hearing is continued, noticing of the adjourned item is required as per Government Code 54955.1.

- [10.](#) Conduct a Public Hearing and Consider Approval - Res. 21-____, A Resolution Declaring the Results of the Property Owner Protest Balloting Proceedings and Approving the Engineer’s Report for Assessment District 95-1 (Blackhorse Estates) Confirming the Assessments for the 2021-22 Fiscal Year.

Staff: Sean Smith, Supervising Civil Engineer

Recommendation: Approve

- [11.](#) Consider Approval – Res. 21-____, A Resolution Adopting the City of Clovis 2020 Urban Water Management Plan and the Water Shortage Contingency Plan.

Staff: Paul Armendariz, Assistant Public Utilities Director

Recommendation: Approve

ADMINISTRATIVE ITEMS- Administrative Items are matters on the regular City Council Agenda other than Public Hearings.

12. Consider – Status update regarding the City’s ongoing efforts to establish procedures for reviewing and analyzing potential Vehicle Miles Traveled (VMT) impacts and policy direction regarding proposed modifications to the Circulation Element of the 2014 Clovis General Plan incorporating VMT-related goals and/or policies.

Staff: Ricky Caperton, Senior Planner & Sean Smith, Supervising Civil Engineer
Recommendation: Provide Policy Direction

CITY MANAGER COMMENTS

COUNCIL COMMENTS

ADJOURNMENT

MEETINGS AND KEY ISSUES

Regular City Council Meetings are held at 6:00 P.M. in the Council Chamber. The following are future meeting dates:

July 19, 2021 (Mon.)
Aug. 2, 2021 (Mon.)
Aug. 3 - Sept. 6, 2021 (Summer Recess)
Sep. 7, 2021 (Tue.)

CLOVIS CITY COUNCIL MEETING

June 21, 2021

6:00 P.M.

Council Chamber

Meeting called to order by Mayor Flores
Flag Salute led by Councilmember Whalen

Roll Call: Present: Councilmembers Ashbeck, Bessinger, Whalen, Mayor Flores
Absent: Councilmember Mouanoutoua

PUBLIC COMMENTS - NONE

CONSENT CALENDAR – 6:06

Motion by Councilmember Ashbeck, seconded by Councilmember Bessinger, that the items on the Consent Calendar be approved. Motion carried 4-0-1 with Councilmember Mouanoutoua absent.

1. Administration - Approved - Minutes from the June 14, 2021 Council Meeting.
2. General Services - Approved – **Res. 21-64**, Adopting the FY2021-2022 Consolidated Transportation Service Agency (CTSA) Operations and Program Budget for Roundup Transit Services.
3. Planning and Development Services - Approved - For the City Council to approve an updated Consultant List from which Professional Consultants shall be selected.
4. Planning and Development Services - Approved – **Res. 21-65**, Final Map Tract 6268, located on the east side of Clovis Avenue, south of Riordan Avenue (Continental Estates Clovis, LLC (Sobaje)).
5. Planning and Development Services - Approved – **Res. 21-66**, Annexation of Proposed Tract 6268, located on the east side of Clovis Avenue, south of Riordan Avenue, to the Landscape Maintenance District No. 1 of the City of Clovis (Continental Estates Clovis, LLC (Sobaje)).
6. Planning and Development Services - Approved – Final Acceptance for Final Map for Tract 6180, located at the southwest corner of North Locan and Teague Avenues (DYP 6180, L.P., De Young Properties)

PUBLIC HEARINGS

6:07 – ITEM 7A - APPROVED - **RES. 21-67**, A RESOLUTION ANNEXING TERRITORY (ANNEXATION #69) (T6339 - NWC LOCAN/TEAGUE, T6332 - NEC LOCAN/TEAGUE, FUTURE PHASE - NEC LOCAN/TEAGUE) TO THE CITY OF CLOVIS COMMUNITY FACILITIES DISTRICT NO. 2004-1 (POLICE AND FIRE SERVICES) AND CALLING A SPECIAL LANDOWNER ELECTION TO ANNEX TERRITORY (ANNEXATION #69) TO CITY OF CLOVIS COMMUNITY FACILITIES DISTRICT NO. 2004-1 (POLICE AND FIRE SERVICES); AND ITEM 7B. APPROVED - **RES. 21-68**, A RESOLUTION OF THE CITY OF CLOVIS DECLARING THE RESULTS OF A SPECIAL LANDOWNER ELECTION AND DIRECTING RECORDING OF THE NOTICE OF SPECIAL TAX LIEN FOR CITY OF CLOVIS COMMUNITY FACILITIES DISTRICT NO. 2004-1 (POLICE AND FIRE SERVICES).

Motion by Councilmember Ashbeck, seconded by Councilmember Bessinger, for the Council to approve Resolution 21-67, a resolution annexing territory (Annexation #69) (T6339 - NWC Locan/Teague, T6332 - NEC Locan/Teague, Future phase - NEC Locan/Teague) to the City of Clovis Community Facilities District No. 2004-1 (Police and Fire Services) and calling a special landowner election to annex territory (Annexation #69) to City of Clovis Community Facilities District No. 2004-1 (Police and Fire Services). Motion carried 4-0-1 with Councilmember Mouanoutoua absent.

Motion by Councilmember Ashbeck, seconded by Councilmember Bessinger, for the Council to approve Resolution 21-68, a resolution of the City of Clovis declaring the results of a special landowner election and directing recording of the Notice of Special Tax Lien for City of Clovis Community Facilities District No. 2004-1 (Police and Fire Services). City Clerk John Holt indicated that he was in receipt of one ballot representing 36 votes all in favor indicating unanimous passage. Motion carried 4-0-1 with Councilmember Mouanoutoua absent.

6:13 – **ITEM 8 - APPROVED – RES. 21-69, AUTHORIZING APPROVAL OF THE APPLICATION AND ADOPTING PERMANENT LOCAL HOUSING ALLOCATION PLAN FOR THE PERMANENT LOCAL HOUSING ALLOCATION PROGRAM; AND APPROVING COMMITMENT OF FUNDS TO THE JEFFERSON AFFORDABLE HOUSING PROJECT LOCATED AT 1703 N. DE WOLF AVENUE.**

Motion by Councilmember Ashbeck, seconded by Councilmember Bessinger, for the Council to approve a resolution authorizing approval of the application and adopting permanent local Housing Allocation Plan for the permanent Local Housing Allocation Program; and approving commitment of funds to the Jefferson Affordable Housing Project located at 1703 N. De Wolf Avenue. Motion carried 4-0-1 with Councilmember Mouanoutoua absent.

6:38 – **ITEM 9A - APPROVED – RES. 21-70, ADOPTING OBJECTIVE SINGLE FAMILY RESIDENTIAL DESIGN AND DEVELOPMENT STANDARDS; AND ITEM 9B – NO ACTION TAKEN - INTRODUCTION – ORD. 21-XX, A REQUEST TO AMEND THE STANDARDS OF THE R-1-MD (SINGLE FAMILY RESIDENTIAL MEDIUM DENSITY) ZONE DISTRICT AND THE GENERAL PROPERTY DEVELOPMENT AND USE STANDARDS RELATED TO PARKING FOR SINGLE FAMILY RESIDENTIAL USES; AND ITEM 9C – APPROVED - TO REMOVE AN EXISTING STANDARD REQUIRING THAT ALL PARK AND LANDSCAPE IMPROVEMENTS BE INSTALLED AND ACCEPTED PRIOR TO ISSUANCE OF 40% OF A SUBDIVISION TRACT’S BUILDING PERMIT.**

Motion by Councilmember Whalen, seconded by Councilmember Bessinger, for the Council to approve a resolution adopting objective single family residential design and development standards and that there be no changes to the city’s current R-1-MD residential standards and further clarifying that the motion note that Council is not approving the recommended changes in the staff report. Motion carried 3-1-1 with Councilmember Ashbeck voting no and Councilmember Mouanoutoua absent.

There was no motion on item 9B due to the fact that Council did not approve any changes to objective single family residential design and development standards in item 9A.

For item 9C, staff indicated that by adopting objective single family residential design and development standards in item 9A, further policy direction to remove an existing standard requiring that all park and landscape improvements be installed and accepted prior to issuance of 40% of a subdivision tract's building permit is unnecessary because this standard was removed in standards that were adopted.

COUNCIL ITEMS

8:00 ITEM 10 - CONSIDERED - FOR THE CITY COUNCIL TO PROVIDE DIRECTION ON HOW CITY COUNCIL MEETINGS WILL BE CONDUCTED GOING FORWARD.

It was the consensus of City Council, with Councilmember Mouanoutoua absent, to direct staff to continue conducting the council meetings in the same manner as has been developed during the pandemic.

WORKSHOP – 8:17

City Manager Luke Serpa indicated that he would be removing this item from the agenda going forward.

CITY MANAGER COMMENTS – 8:20

None.

COUNCIL COMMENTS – 8:20

Mayor Flores adjourned the meeting of the Council to July 6, 2021

Meeting adjourned: 8:27 p.m.

Mayor

City Clerk



CITY *of* CLOVIS

REPORT TO THE CITY COUNCIL

TO: Mayor and City Council

FROM: Administration Department

DATE: July 12, 2021

SUBJECT: Administration - Approval – Award the Request for Proposal and approve the purchase of Storage Area Network equipment from AMS.net.

CONFLICT OF INTEREST

None

RECOMMENDATION

For the City Council to award the Request for Proposal (RFP) and approve the purchase of Storage Area Network equipment from AMS.net in the amount of \$80,167.46.

EXECUTIVE SUMMARY

Over the last several years, staff has implemented a virtualized server infrastructure to consolidate its servers. The system supports approximately 150 servers including the City's financial system, geographic systems and many other applications. It has proven to be an effective replacement model for most servers – instead of purchasing 150 individual servers for all City applications, a virtual infrastructure (consisting of 4 servers and a Storage Area Network (SAN) system) was purchased. This has provided a significant cost savings and a great return on investment.

At the Corporation Yard, the Public Utilities Department's data needs have grown and that data center is in need of a virtualized environment. There are also a number of outdated physical servers running that will be moved to the virtual system. Staff went out with an RFP and received 7 responses. AMS.net provided the most cost effective and responsive proposal.

BACKGROUND

The Information Technology Division supports over 150 virtual servers that provide applications and other information services to all City departments. The current virtual infrastructure in the City Hall data center supports the City's financial system, geographic systems and many other applications. It has proven to be an effective replacement model

for most servers. For example, instead of purchasing individual servers for all the City's applications, only 4 physical servers and the SAN were purchased. This model provides a significant cost savings and has proven to be a great return on investment.

In the last few years, the Public Utilities Department Data Center has continued to grow in its computing and storage needs with systems such as the SCADA systems, the Geography-based applications for streets and signs, the Fleet Asset Management System and other Utility Systems. Staff analyzed the feasibility of adding resources to the City Hall's virtual infrastructure to accommodate this growth; but found that a new virtual environment for the PUD data center would work best in properly securing and segregating that data. This new environment will be the foundation to these core systems and other data needs for Public Utilities Department.

Staff developed and issued an RFP for Storage Area Network equipment and implementation services.

A total of seven (7) proposals were received as follows:

Vendor Name	Device Description	Total
AMS.net	IBM 5200	\$80,167.46
Big Greet IT	Nimble AF20	\$121,412.08
CDW-G	NetApp A200	\$128,688.27
ePlus	Pure Storage X20	\$136,766.09
iKW Solutions	Dell EMC	\$195,600.00
InterVision	NetApp A250	\$124,456.99
Mass Mountain Technologies	Mass Mountain SAN	\$80,700.00

The evaluation criteria used to evaluate the proposals included the cost of the system, the technological specifications of the proposed system (such as design, enterprise grade components, expandability and life expectancy), the firm's project management and technical capabilities, and references from other California Local Government Agencies. The proposal from AMS.net was the lowest cost proposal, it met all of the system requirements and they have an office in the Fresno area. Staff is recommending that Council award the RFP for the Storage Area Network equipment and implementation services to AMS.net for \$80,147.46.

FISCAL IMPACT

The total cost for the SAN, networking equipment and implementation services is \$80,167.46. Funds have been allocated in the IT Division budget.

REASON FOR RECOMMENDATION

There has been significant growth in the Public Utilities Department data center storage and computing needs. The virtualized environment has proven to be an effective and cost efficient model as compared to buying individual servers for each City system/application.

ACTIONS FOLLOWING APPROVAL

Staff will order the storage and network equipment. When it arrives, it will be configured and seamlessly integrated into the City's data center environment at Public Utilities.

Prepared by: Jesse Velez, IT Deputy Director

Reviewed by: City Manager *JH*



CITY *of* CLOVIS

REPORT TO THE CITY COUNCIL

TO: Mayor and City Council

FROM: Administration Department

DATE: July 12, 2021

SUBJECT: Administration - Approval – Waive Normal Purchasing Process and approve the purchase of replacement desktop computers and servers using competitively bid contracts with purchasing provisions for California State and Local government agencies.

ATTACHMENTS: None

CONFLICT OF INTEREST

None

RECOMMENDATION

For the City Council to waive the normal purchasing process and approve the purchase of desktop computers and servers through the use of competitively bid contracts with purchasing provisions for California State and Local government agencies.

EXECUTIVE SUMMARY

Included in the 2021-2022 Budget are funds to purchase computers for all departments and servers for applications. The computers and servers are to provide upgrades and replacement of obsolete, worn out equipment and to equip new employees with computers. The computers are allocated to the various departments based on need. Upgrades are necessary to improve the work performance of clerical and technical positions. A portion of the computers to be purchased are to replace units that have high failure and repair rates, or are unable to run upgraded software. Staff is recommending purchasing the replacement computers using previously competitively bid contracts with purchasing provisions for California State and Local government agencies.

BACKGROUND

As in prior years, the Information Services Division is requesting approval to purchase computers and servers through other competitively bid contracts by other agencies, such as the California Multiple Award Schedule (CMAS). With the proliferation of competitively bid contracts with “piggy-back” provisions, the need to purchase in large quantities at one

time is no longer necessary. These current contracts base their pricing on the ability of multiple State and Local government agencies to purchase equipment on an “as needed” basis, while still passing along quantity discounts. Other examples of these contracts are the Western States Contracting Alliance (WSCA) and the California Communities Purchasing Program (CCPP) sponsored by the League of California Cities.

When purchasing computers on an as needed basis, the City will be able to set up and install the computers more efficiently when staffing is available, eliminating the need to have a large storage area for the computers and risk of potential loss due to theft or disaster. By purchasing when the computer is required, the City can still take advantage of price reductions.

As in the past, the City will continue to use the same evaluation criteria for selecting equipment. This will include certification of the preloaded operating system and software, quality of components, software upgrade policy, price, compliance with the City’s standard specifications, product reliability, vendor reputation, and financial stability of the supplier and the computer manufacturer.

FISCAL IMPACT

There is \$250,000 budgeted to fund the purchase of replacement computers, servers, related software, licensing and peripherals.

REASON FOR RECOMMENDATION

The computers and servers are needed to increase the stability of the computing environment, increase productivity and to replace worn out equipment. Purchasing through current contracts will allow the City the flexibility to install computers and servers on an as needed basis, purchase the most recent configurations offered by the manufacturers, and receive the latest price reductions offered.

ACTIONS FOLLOWING APPROVAL

The City will purchase the budgeted desktop computers and servers from current competitively bid contracts as they are required. As the units arrive, they will be set up and installed to the department users that were designated to receive new computers during the budget process.

Prepared by: Jesse Velez, I.T. Deputy Director

Reviewed by: City Manager *JH*



CITY *of* CLOVIS

REPORT TO THE CITY COUNCIL

TO: Mayor and City Council

FROM: Finance Department

DATE: July 12, 2021

SUBJECT: Finance – Receive and File – Findings & Recommendations from Community Facilities District Citizens Committee.

ATTACHMENTS: 1. Report from CFD Citizens Committee

CONFLICT OF INTEREST

None.

RECOMMENDATION

That the Council receive and file the report presented by the Community Facilities Citizens Oversight Committee following a review of the public safety department budgets and findings relating to the use of the tax proceeds of the CFD for police and fire service.

EXECUTIVE SUMMARY

In March 2004, the Council approved the formation of Community Services District 2004-1, which provides funding for public safety operations in new growth areas generally located north of Herndon and east of Locan Avenues. The Council also established an independent citizen's oversight committee for the purpose of reviewing revenue and expenditures associated with the Community Facilities District. The committee recently met with the Police Chief, Fire Chief, Finance Director, and Assistant Finance Director reviewing the budgets of the Police and Fire Departments, validating allocation methods of CFD costs, and providing findings, if any, related to the use of CFD tax proceeds.

BACKGROUND

As part of the formation of the Community Services District 2004-01, the Council established an independent citizen's oversight committee for the purpose of reviewing revenue and expenditures associated with the Community Facilities District. The committee consists of five members for a term of four (4) years. The committee includes one member of the real estate community, one member of the Building Industry Association, and three members who are landowners of residential properties within the Community Facilities District. The committee will review the expenditures of the tax proceeds and determine that such expenditures are in accordance with the purpose and intent of the Community Facilities District

Resolution of Intention approved by the City Council and to report those findings to the City Council. Committee members are Laura Corey – Real Estate Community Representative; Mike Prandini – Building Industry Association Representative; Dennise Rivera – Property Owner; David Martin Connolly – Property Owner; and Jonathan B. Holt – Property Owner. Jonathan B. Holt is the spokesperson for the committee.

The Purpose and Intent of the Community Facilities District 2004-01 as established by the City Council is:

Police and Fire Services (the “Services”) of the City of Clovis required to sustain the service delivery capability for emergency and non-emergency services to new growth area of the City of Clovis, including related facilities, equipment, vehicles, fire apparatus, services, supplies and personnel; provided however that any increases in special taxes for costs related to employee wages and benefits shall be limited as provided in the Rate and Method of apportionment of the Special Taxes to fund such Services.

The committee recently met with the Police Chief, Fire Chief, Finance Director, and Assistant Finance Director reviewing the actual 2019/20 expenditures and the 2020/21 budgets of the Police and Fire Departments, to validate allocation methods of CFD costs, and provide findings related to the use of CFD tax proceeds. While there were no findings, the committee determined the following:

1. Actual and budgeted expenditures are appropriate and services provided to the Community Facilities District 2004-01 are within the intent of the formation of the district.
2. Revenue and allocation of costs attributable to the Community Facilities District 2004-01 are appropriate.

In conclusion, the committee verified the expenditures are in accordance with the purpose and intent of the enabling legislation found at Government Code Section 53311 and the Resolution of Intention approved by the Clovis City Council.

The committee would also like to express to Council that they, the committee representing the property owners and interested parties, feel the purpose of the Community Facilities District 2004-01 is being fulfilled and recommend that the District and associated tax assessment be continued as currently established.

FISCAL IMPACT

This report provides the findings and recommendations of the Community Facilities District 2004-01 Oversight Committee. The Committee is recommending that the District and associated tax assessments be continued as currently established to meet the funding requirements needed to sustain service levels in the new growth areas.

REASON FOR RECOMMENDATION

The fiscal report is for information only and no action is required.

ACTIONS FOLLOWING APPROVAL

Copies of the report will be made available to any member of the public who requests a copy of the report. The Committee will communicate on an annual basis or as needed to fulfill the role of the committee. Future communications may take place electronically from the committee.

Prepared by: Gina Daniels, Assistant Finance Director

Reviewed by: City Manager *GA*



CITY of CLOVIS

1033 FIFTH STREET • CLOVIS, CA 93612

June 15, 2021

Dear Mayor and Members of the City Council

On behalf of the Community Facilities District 2004-01 Citizens Oversight Committee I would like to present our findings and recommendations following our review of revenues and expenditures associated with the Community Facilities District in Clovis.

Our purpose as we understood it was to review the expenditures of the tax proceeds of the Community Facilities District and to make sure such expenditures were in accordance with the purpose and intent of the enabling legislation and the Resolution of Intention approved by the Clovis City Council; and to report our findings to the City Council.

Our committee recently met with the Police Chief, Fire Chief, Finance Director, and Assistant Finance Director, reviewing the budgets of the Police and Fire Departments, validating allocation methods of CFD costs, and providing findings related to the use of CFD tax proceeds. Below are those findings:

1. Actual and budget expenditures are appropriate and services provided to the Community Facilities District 2004-01 are within the intent of the formation of the District.
2. Revenue and allocation of costs attributable to the Community Facilities District 2004-01 are appropriate.

In conclusion, the committee verified the expenditures are in accordance with the purpose and intent of the enabling legislation found at Government Code Section 53311 and the Resolution of Intention approved by the Clovis City council.

The committee would also like to express to Council that we, the committee representing the property owners and interested parties, feel the Community Facilities District 2004-01 purpose is being fulfilled and recommend the District and associated tax assessment be continued as currently established.

Sincerely,

Jonathan B. Holt
Spokesperson
Clovis Community Facilities District Oversight Committee



CITY of CLOVIS

REPORT TO THE CITY COUNCIL

TO: Mayor and City Council

FROM: Finance Department

DATE: July 12, 2021

SUBJECT: Finance - Approval - Res. 21-____, Measure C Extension Local Transportation Pass Through Revenues Certification and Claim Forms for 2021-22.

ATTACHMENTS: 1. Resolution
2. Certification and Claim Forms

CONFLICT OF INTEREST

None.

RECOMMENDATION

For the City Council to approve Resolution 21-____, Measure C Extension Local Transportation Pass Through Revenues Certification and Claim Forms for 2021-22.

EXECUTIVE SUMMARY

The Fresno County Transportation Authority (FCTA) adopted the apportionment for Local Transportation Purpose Funds (Measure C Extension) for fiscal year 2021-22. The funds are distributed monthly based on the adopted percentages for each city. To receive the funds from FCTA, it is necessary for each city to submit a Certification and Claim Form for each sub program and a resolution of the City Council approving the Certification and Claim Forms. The total estimated amount to be distributed to the City of Clovis is \$4,823,968.

BACKGROUND

Annually the City receives notification from the Fresno County Transportation Authority (FCTA) which adopts the methodology and estimated apportionments of Local Transportation Purpose Funds (Measure C Extension) due each City. The estimated percentage due the City of Clovis for each sub program varies from 1.97% to 17.10% of the total \$116,974,776 to be apportioned. The percentage due each City is based on population and road miles. The FCTA has estimated that the City will receive \$1,351,342 for the Street Maintenance Category, \$47,297 for the ADA Compliance Category, \$1,304,045 for the Flexible Funding Category, \$320,879 for the Pedestrian/Trails-Urban Category, \$81,428 for

the Bicycle Facilities Category, and \$1,718,977 for the Clovis Transit Regional Public Transit Program Category. The total estimate to be disbursed to the City for all sub programs is \$4,823,968 for fiscal year 2021-22.

In order for each city to receive its apportionment, the City must submit a Certification and Claim Form for each sub program and a resolution of the City Council approving the Certification and Claim Forms. These Certification and Claim Forms are for the Measure C Extension (2007-2027) that began July 1, 2007.

FISCAL IMPACT

In order for the City to receive its annual apportionment of Local Transportation Purpose Funds (Measure C Extension), the City must submit a Certification and Claim Form for each sub program and a resolution of the City Council approving the Certification and Claim Forms.

REASON FOR RECOMMENDATION

In order to receive the 2021-22 Measure C funds, the City needs to submit to the FCTA the Certification and Claim Forms and authorizing resolution.

ACTIONS FOLLOWING APPROVAL

After the Council approval, the Certification and Claim Forms and the resolution will be forwarded to the FCTA.

Prepared by: Gina Daniels, Assistant Finance Director

Reviewed by: City Manager *JH*

RESOLUTION 21-____

**RESOLUTION OF THE CITY COUNCIL OF THE CITY OF CLOVIS
APPROVING THE LOCAL TRANSPORTATION PURPOSE FUNDS
CERTIFICATION AND CLAIM FOR 2021-22**

WHEREAS, the City of Clovis is an eligible claimant of funds for Local Transportation Purposes (Measure C Extension) pursuant to California Public Utilities Code Section 142257; and

WHEREAS, the Fresno County Transportation Authority (FCTA) has adopted a Resolution of Apportionment for Fiscal Year 2021-22's estimated revenue setting 10.12% of \$13,350,430 for the Local Transportation Program, Local Allocation – Street Maintenance Category sub program available to the claimant; and

WHEREAS, the FCTA has adopted a Resolution of Apportionment for Fiscal Year 2021-22's estimated revenue setting 10.20% of \$467,266 for the Local Transportation Program, Local Allocation – ADA Compliance Category sub program available to the claimant; and

WHEREAS, the FCTA has adopted a Resolution of Apportionment for Fiscal Year 2021-22's estimated revenue setting 9.78% of \$13,327,988 for the Local Transportation Program, Local Allocation – Flexible Funding Category sub program available to the claimant; and

WHEREAS, the FCTA has adopted a Resolution of Apportionment for Fiscal Year 2021-22's estimated revenue setting 17.10% of \$1,876,041 for the Local Transportation Program, Local Allocation – Pedestrian/Trails-Urban Category sub program available to the claimant; and

WHEREAS, the FCTA has adopted a Resolution of Apportionment for Fiscal Year 2021-22's estimated revenue setting 11.71% of \$695,338 for the Local Transportation Program, Local Allocation – Bicycle Facilities Category sub program available to the claimant; and

WHEREAS, the FCTA has adopted a Resolution of Apportionment for Fiscal Year 2021-22's estimated revenue setting 1.97% of \$87,257,713 for the Regional Public Transit Program, Public Transit Agencies – Clovis Transit sub program available to the claimant.

NOW, THEREFORE, BE IT RESOLVED, by the City Council of the City of Clovis as follows:

1. The Finance Director is hereby authorized to execute the Certification and Claim forms and submit the forms to the FCTA for 2021-22.
2. The City hereby requests the release of funds to the City on a monthly basis, consistent with the adopted percentage and based on actual receipts.
3. The City hereby requests the release of funds to the City in accordance and compliance with Steps 5 and 6 of the Local Agency Handbook – Local Agency Pass-Through Funding Programs.
4. The City Council hereby certifies as follows:

- a. That the sub programs' funds are not being used to substitute for property tax funds which the City had previously used for local transportation purposes. Such substitution of property tax funds is prohibited by California Public Utilities Code Section 142257; and
 - b. That the City has segregated property tax revenues from the City's other General Fund revenues used to support the sub programs' funds so that verification of non-substitution can be proved through audit or that the non-substitution of funds shall apply to the City's entire general fund; and
 - c. That the City shall separately account for the sub program funds received pursuant to Public Utilities Code Section 142257. The City shall maintain records in accordance with generally accepted accounting principles and shall separately record expenditures for each type of eligible purpose. The City shall make such records available to the FCTA for inspection or audit at any time.
5. The City understands that should financial or compliance audit exceptions be found, the FCTA will take immediate steps to resolve the exceptions in accordance with adopted procedures.
6. The City understands they must follow the Reporting Requirements as indicated in the Measure C Extension Local Agency Handbook and the Measure C Extension Local Agency Handbook, Other Revenue Funding and submit the appropriate Reporting Requirements Form for each Program/Project of expenditures for the 2021-22 fiscal year no later than November 15, 2021. The City understands if these Reporting Requirements are not met by the date listed above, the Fresno County Transportation Authority will stop any and all Local Transportation Purposes Pass-Through funds until such Reporting Requirements have been met.

* * * * *

The foregoing resolution was introduced and adopted at a regular meeting of the City Council of the City of Clovis held on July 12, 2021 by the following vote, to wit.

AYES:
NOES:
ABSENT:
ABSTAIN:

DATED: July 12, 2021

Mayor

City Clerk

MEASURE C EXTENSION
LOCAL TRANSPORTATION PASS THROUGH REVENUES
CERTIFICATION AND CLAIM FOR FY2021-22

TO: Fresno County Transportation Authority

FROM: City of Clovis
Local Agency Name

Address: 1033 Fifth Street, Clovis, CA 93612

Telephone: (559) 324-2845 FAX: _____

Contact: Jay Schengel, Finance Director

Email Address: jays@cityofclovis.com

1. Applicable Funding Program: (Check One)

- Regional Public Transit Program: Fresno Area Express, Clovis Transit, FCRTA, PTIS/Transit Consolidation, ADA/Seniors/Paratransit, Farmworker Van Pools, Car/Van Pools, New Technology Reserve
Local Transportation Program: Street Maintenance, ADA Compliance, Flexible Funding, Pedestrian/Trails Urban, Pedestrian/Trails Rural, Bicycle Facilities, Regional Transportation Program, Fresno Airports
Alternative Transportation Program: Rail Consolidation Subprogram, Environmental Enhancement Program, School Bus Replacement, Transit Oriented Infrastructure for In-Fill, Administrative/Planning Program, Fresno COG

2. The City of Clovis ("claimant") is an eligible claimant of funds for local transportation purposes pursuant to California Public Utilities Code Section 142257.

3. The Fresno County Transportation Authority has adopted a Resolution of Apportionment for Fiscal Year 2021-2022 setting 10.12% of \$13,350,430 (or \$1,351,342) for the Subprogram or Category of funds checked above and available to the claimant. On behalf of claimant, I hereby request release of the funds to claimant in accordance with:

- (a) Monthly payments consistent with adopted percentage, based on actual receipts
(b) Compliance with Steps A and B of the Strategic Implementation Plan (SIP) - Local Agency Pass Through Funding programs and Other Implementation Plan Provisions

4. On behalf of claimant, I hereby certify as follows:

- (a) That the Subprogram or Category of funds checked above are not being used to substitute for property tax funds which claimant had previously used for local transportation purposes. Such substitution of property tax funds is prohibited by California Public Utilities Code Section 142257.
(b) That claimant has segregated property tax revenues from claimant's other general fund revenues used to support the Subprogram or Category of funds checked above so that verification of non-substitution can be proved through audit or that the non-substitution of funds shall apply to claimant's entire general fund.
(c) That claimant shall account for Subprogram or Category of funds checked above and received pursuant to Public Utilities Code Section 142257. Claimant shall maintain current records in accordance with generally accepted accounting principles and shall separately record expenditures for each type of eligible purpose. Claimant shall make such records available to the Authority for inspection or audit at any time.

5. Claimant understands that should financial or compliance audit exceptions be found, the Fresno County Transportation Authority will take immediate steps to resolve the exceptions in accordance with its adopted procedures.

Authorized Signature: [Handwritten Signature]
Title: Finance Director
Date: 7/12/21

ATTACHMENT: Evidence of Formal Action for Approval and Submittal
Approved by: Fresno County Transportation Authority Board by Date: _____

**MEASURE C EXTENSION
LOCAL TRANSPORTATION PASS THROUGH REVENUES
CERTIFICATION AND CLAIM FOR FY2021-22**

TO: Fresno County Transportation Authority

FROM: City of Clovis
Local Agency Name

Address: 1033 Fifth Street, Clovis, CA 93612

Contact: Jay Schengel

Telephone: (559) 324-2845 FAX: _____

Email Address: jays@cityofclovis.com


1. Applicable Funding Program: (Check One)

- | | | |
|---|--|--|
| <i>Regional Public Transit Program</i> | <i>Local Transportation Program</i> | <i>Alternative Transportation Program</i> |
| <input type="checkbox"/> Fresno Area Express | <input type="checkbox"/> Street Maintenance | <input type="checkbox"/> Rail Consolidation Subprogram |
| <input type="checkbox"/> Clovis Transit | <input checked="" type="checkbox"/> ADA Compliance | <i>Environmental Enhancement Program</i> |
| <input type="checkbox"/> FCRTA | <input type="checkbox"/> Flexible Funding | <input type="checkbox"/> School Bus Replacement |
| <input type="checkbox"/> PTIS/Transit Consolidation | <input type="checkbox"/> Pedestrian/Trails Urban | <input type="checkbox"/> Transit Oriented Infrastructure for In-Fill |
| <input type="checkbox"/> ADA/Seniors/Paratransit | <input type="checkbox"/> Pedestrian/Trails Rural | <i>Administrative/Planning Program</i> |
| <input type="checkbox"/> Farmworker Van Pools | <input type="checkbox"/> Bicycle Facilities | <input type="checkbox"/> Fresno COG |
| <input type="checkbox"/> Car/Van Pools | <i>Regional Transportation Program</i> | |
| <input type="checkbox"/> New Technology Reserve | <input type="checkbox"/> Fresno Airports | |

2. The City of Clovis ("claimant") is an eligible claimant of funds for local transportation purposes pursuant to *Local Agency Name* California Public Utilities Code Section 142257.

3. The Fresno County Transportation Authority has adopted a Resolution of Apportionment for Fiscal Year 2021-2022 setting **10.2%** of **\$467,266** (or **\$47,297**) for the Subprogram or Category of funds checked above and available to the claimant. On behalf of claimant, I hereby request release of the funds to claimant in accordance with:
(a) Monthly payments consistent with adopted percentage, based on actual receipts
(b) Compliance with Steps A and B of the Strategic Implementation Plan (SIP) – Local Agency Pass Through Funding programs and Other Implementation Plan Provisions

4. On behalf of claimant, I hereby certify as follows:
(a) That the Subprogram or Category of funds checked above are not being used to substitute for property tax funds which claimant had previously used for local transportation purposes. Such substitution of property tax funds is prohibited by California Public Utilities Code Section 142257.
(b) That claimant has segregated property tax revenues from claimant's other general fund revenues used to support the Subprogram or Category of funds checked above so that verification of non-substitution can be proved through audit or that the non-substitution of funds shall apply to claimant's entire general fund.
(c) That claimant shall account for Subprogram or Category of funds checked above and received pursuant to Public Utilities Code Section 142257. Claimant shall maintain current records in accordance with generally accepted accounting principles and shall separately record expenditures for each type of eligible purpose. Claimant shall make such records available to the Authority for inspection or audit at any time.
4. Claimant understands that should financial or compliance audit exceptions be found, the Fresno County Transportation Authority will take immediate steps to resolve the exceptions in accordance with its adopted procedures.

Authorized Signature: 
Title: Emace Director
Date: 7/12/21

ATTACHMENT: Evidence of Formal Action for Approval and Submittal
Approved by: Fresno County Transportation Authority Board by Date: _____

**MEASURE C EXTENSION
LOCAL TRANSPORTATION PASS THROUGH REVENUES
CERTIFICATION AND CLAIM FOR FY2021-22**

TO: Fresno County Transportation Authority

FROM: City of Clovis
Local Agency Name

Address: 1033 Fifth Street, Clovis, CA 93612

Contact: Jay Schengel, Finance Director

Telephone: (559) 324-2845 FAX: _____

Email Address: jays@cityofclovis.com

1. Applicable Funding Program: (Check One)

- | | | |
|---|--|--|
| <i>Regional Public Transit Program</i> | <i>Local Transportation Program</i> | <i>Alternative Transportation Program</i> |
| <input type="checkbox"/> Fresno Area Express | <input type="checkbox"/> Street Maintenance | <input type="checkbox"/> Rail Consolidation Subprogram |
| <input type="checkbox"/> Clovis Transit | <input type="checkbox"/> ADA Compliance | <i>Environmental Enhancement Program</i> |
| <input type="checkbox"/> FCRTA | <input checked="" type="checkbox"/> Flexible Funding | <input type="checkbox"/> School Bus Replacement |
| <input type="checkbox"/> PTIS/Transit Consolidation | <input type="checkbox"/> Pedestrian/Trails Urban | <input type="checkbox"/> Transit Oriented Infrastructure for In-Fill |
| <input type="checkbox"/> ADA/Seniors/Paratransit | <input type="checkbox"/> Pedestrian/Trails Rural | <i>Administrative/Planning Program</i> |
| <input type="checkbox"/> Farmworker Van Pools | <input type="checkbox"/> Bicycle Facilities | <input type="checkbox"/> Fresno COG |
| <input type="checkbox"/> Car/Van Pools | <i>Regional Transportation Program</i> | |
| <input type="checkbox"/> New Technology Reserve | <input type="checkbox"/> Fresno Airports | |

2. The City of Clovis ("claimant") is an eligible claimant of funds for local transportation purposes pursuant to *Local Agency Name* California Public Utilities Code Section 142257.

3. The Fresno County Transportation Authority has adopted a Resolution of Apportionment for Fiscal Year 2021-2022 setting 9.78% of \$13,327,988 (or \$1,304,045) for the Subprogram or Category of funds checked above and available to the claimant. On behalf of claimant, I hereby request release of the funds to claimant in accordance with:
(a) Monthly payments consistent with adopted percentage, based on actual receipts
(b) Compliance with Steps A and B of the Strategic Implementation Plan (SIP) – Local Agency Pass Through Funding programs and Other Implementation Plan Provisions

4. On behalf of claimant, I hereby certify as follows:
(a) That the Subprogram or Category of funds checked above are not being used to substitute for property tax funds which claimant had previously used for local transportation purposes. Such substitution of property tax funds is prohibited by California Public Utilities Code Section 142257.
(b) That claimant has segregated property tax revenues from claimant's other general fund revenues used to support the Subprogram or Category of funds checked above so that verification of non-substitution can be proved through audit or that the non-substitution of funds shall apply to claimant's entire general fund.
(c) That claimant shall account for Subprogram or Category of funds checked above and received pursuant to Public Utilities Code Section 142257. Claimant shall maintain current records in accordance with generally accepted accounting principles and shall separately record expenditures for each type of eligible purpose. Claimant shall make such records available to the Authority for inspection or audit at any time.

5. Claimant understands that should financial or compliance audit exceptions be found, the Fresno County Transportation Authority will take immediate steps to resolve the exceptions in accordance with its adopted procedures.

Authorized Signature: _____
Title: _____
Date: _____
Jay Schengel
Finance Director
7/12/21

ATTACHMENT: Evidence of Formal Action for Approval and Submittal
Approved by: Fresno County Transportation Authority Board by Date: _____

**MEASURE C EXTENSION
LOCAL TRANSPORTATION PASS THROUGH REVENUES
CERTIFICATION AND CLAIM FOR FY2021-22**

TO: Fresno County Transportation Authority

FROM: City of Clovis
Local Agency Name

Address: 1033 Fifth Street, Clovis, CA 93612

Contact: Jay Schengel, Finance Director

Telephone: (559) 324-2845 FAX: _____

Email Address: jays@cityofclovis.com

1. Applicable Funding Program: (Check One)

- | | | |
|---|---|--|
| <i>Regional Public Transit Program</i> | <i>Local Transportation Program</i> | <i>Alternative Transportation Program</i> |
| <input type="checkbox"/> Fresno Area Express | <input type="checkbox"/> Street Maintenance | <input type="checkbox"/> Rail Consolidation Subprogram |
| <input type="checkbox"/> Clovis Transit | <input type="checkbox"/> ADA Compliance | <i>Environmental Enhancement Program</i> |
| <input type="checkbox"/> FCRTA | <input type="checkbox"/> Flexible Funding | <input type="checkbox"/> School Bus Replacement |
| <input type="checkbox"/> PTIS/Transit Consolidation | <input checked="" type="checkbox"/> Pedestrian/Trails Urban | <input type="checkbox"/> Transit Oriented Infrastructure for In-Fill |
| <input type="checkbox"/> ADA/Seniors/Paratransit | <input type="checkbox"/> Pedestrian/Trails Rural | <i>Administrative/Planning Program</i> |
| <input type="checkbox"/> Farmworker Van Pools | <input type="checkbox"/> Bicycle Facilities | <input type="checkbox"/> Fresno COG |
| <input type="checkbox"/> Car/Van Pools | <i>Regional Transportation Program</i> | |
| <input type="checkbox"/> New Technology Reserve | <input type="checkbox"/> Fresno Airports | |

2. The City of Clovis ("claimant") is an eligible claimant of funds for local transportation purposes pursuant to *Local Agency Name* California Public Utilities Code Section 142257.

3. The Fresno County Transportation Authority has adopted a Resolution of Apportionment for Fiscal Year 2021-2022 setting **17.10%** of **\$1,876,041** (or **\$320,879**) for the Subprogram or Category of funds checked above and available to the claimant. On behalf of claimant, I hereby request release of the funds to claimant in accordance with:
(a) Monthly payments consistent with adopted percentage, based on actual receipts
(b) Compliance with Steps A and B of the Strategic Implementation Plan (SIP) – Local Agency Pass Through Funding programs and Other Implementation Plan Provisions

4. On behalf of claimant, I hereby certify as follows:
(a) That the Subprogram or Category of funds checked above are not being used to substitute for property tax funds which claimant had previously used for local transportation purposes. Such substitution of property tax funds is prohibited by California Public Utilities Code Section 142257.
(b) That claimant has segregated property tax revenues from claimant's other general fund revenues used to support the Subprogram or Category of funds checked above so that verification of non-substitution can be proved through audit or that the non-substitution of funds shall apply to claimant's entire general fund.
(c) That claimant shall account for Subprogram or Category of funds checked above and received pursuant to Public Utilities Code Section 142257. Claimant shall maintain current records in accordance with generally accepted accounting principles and shall separately record expenditures for each type of eligible purpose. Claimant shall make such records available to the Authority for inspection or audit at any time.

5. Claimant understands that should financial or compliance audit exceptions be found, the Fresno County Transportation Authority will take immediate steps to resolve the exceptions in accordance with its adopted procedures.

Authorized Signature: _____
Title: Finance Director
Date: 7/12/21

ATTACHMENT: Evidence of Formal Action for Approval and Submittal
Approved by: Fresno County Transportation Authority Board by Date: _____

MEASURE C EXTENSION
LOCAL TRANSPORTATION PASS THROUGH REVENUES
CERTIFICATION AND CLAIM FOR FY2021-22

TO: Fresno County Transportation Authority

FROM: City of Clovis
Local Agency Name

Address: 1033 Fifth Street, Clovis, CA 93612

Telephone: (559) 324-2845 FAX: _____

Contact: Jay Schengel, Finance Director

Email Address: jays@cityofclovis.com

1. Applicable Funding Program: (Check One)

- Regional Public Transit Program
Local Transportation Program
Alternative Transportation Program
Environmental Enhancement Program
Administrative/Planning Program
Regional Transportation Program

2. The City of Clovis ("claimant") is an eligible claimant of funds for local transportation purposes pursuant to California Public Utilities Code Section 142257.

3. The Fresno County Transportation Authority has adopted a Resolution of Apportionment for Fiscal Year 2021-2022 setting 11.71% of \$695,338 (or \$81,428) for the Subprogram or Category of funds checked above and available to the claimant. On behalf of claimant, I hereby request release of the funds to claimant in accordance with:
(a) Monthly payments consistent with adopted percentage, based on actual receipts
(b) Compliance with Steps A and B of the Strategic Implementation Plan (SIP) - Local Agency Pass Through Funding programs and Other Implementation Plan Provisions

4. On behalf of claimant, I hereby certify as follows:
(a) That the Subprogram or Category of funds checked above are not being used to substitute for property tax funds which claimant had previously used for local transportation purposes. Such substitution of property tax funds is prohibited by California Public Utilities Code Section 142257.
(b) That claimant has segregated property tax revenues from claimant's other general fund revenues used to support the Subprogram or Category of funds checked above so that verification of non-substitution can be proved through audit or that the non-substitution of funds shall apply to claimant's entire general fund.
(c) That claimant shall account for Subprogram or Category of funds checked above and received pursuant to Public Utilities Code Section 142257. Claimant shall maintain current records in accordance with generally accepted accounting principles and shall separately record expenditures for each type of eligible purpose. Claimant shall make such records available to the Authority for inspection or audit at any time.

5. Claimant understands that should financial or compliance audit exceptions be found, the Fresno County Transportation Authority will take immediate steps to resolve the exceptions in accordance with its adopted procedures.

Authorized Signature: [Handwritten Signature]
Title: Finance Director
Date: 1/12/21

ATTACHMENT: Evidence of Formal Action for Approval and Submittal

Approved by: Fresno County Transportation Authority Board by Date: _____

**MEASURE C EXTENSION
LOCAL TRANSPORTATION PASS THROUGH REVENUES
CERTIFICATION AND CLAIM FOR FY2021-22**

TO: Fresno County Transportation Authority

FROM: City of Clovis - Clovis Transit Agency
Local Agency Name

Address: 155 N. Sunnyside Avenue, Clovis, CA 93611 Contact: Jay Schengel
Telephone: (559) 324-2768 FAX: _____ Email Address: jays@cityofclovis.com

1. Applicable Funding Program: (Check One)

- | | | |
|---|--|--|
| <i>Regional Public Transit Program</i> | <i>Local Transportation Program</i> | <i>Alternative Transportation Program</i> |
| <input type="checkbox"/> Fresno Area Express | <input type="checkbox"/> Street Maintenance | <input type="checkbox"/> Rail Consolidation Subprogram |
| <input checked="" type="checkbox"/> Clovis Transit | <input type="checkbox"/> ADA Compliance | <i>Environmental Enhancement Program</i> |
| <input type="checkbox"/> FCRTA | <input type="checkbox"/> Flexible Funding | <input type="checkbox"/> School Bus Replacement |
| <input type="checkbox"/> PTIS/Transit Consolidation | <input type="checkbox"/> Pedestrian/Trails Urban | <input type="checkbox"/> Transit Oriented Infrastructure for In-Fill |
| <input type="checkbox"/> ADA/Seniors/Paratransit | <input type="checkbox"/> Pedestrian/Trails Rural | <i>Administrative/Planning Program</i> |
| <input type="checkbox"/> Farmworker Van Pools | <input type="checkbox"/> Bicycle Facilities | <input type="checkbox"/> Fresno COG |
| <input type="checkbox"/> Car/Van Pools | <i>Regional Transportation Program</i> | |
| <input type="checkbox"/> New Technology Reserve | <input type="checkbox"/> Fresno Airports | |

2. The City of Clovis - Clovis Transit Agency ("claimant") is an eligible claimant of funds for local transportation purposes pursuant to California Public Utilities Code Section 142257.
Local Agency Name

3. The Fresno County Transportation Authority has adopted a Resolution of Apportionment for Fiscal Year 2021-2022 setting 1.97% of \$87,257,713 (or \$1,718,977) for the Subprogram or Category of funds checked above and available to the claimant. On behalf of claimant, I hereby request release of the funds to claimant in accordance with:
(a) Monthly payments consistent with adopted percentage, based on actual receipts
(b) Compliance with Steps A and B of the Strategic Implementation Plan (SIP) – Local Agency Pass Through Funding programs and Other Revenue Program Funding

4. On behalf of claimant, I hereby certify as follows:
(a) That the Subprogram or Category of funds checked above are not being used to substitute for property tax funds which claimant had previously used for local transportation purposes. Such substitution of property tax funds is prohibited by California Public Utilities Code Section 142257.
(b) That claimant has segregated property tax revenues from claimant's other general fund revenues used to support the Subprogram or Category of funds checked above so that verification of non-substitution can be proved through audit or that the non-substitution of funds shall apply to claimant's entire general fund.
(c) That claimant shall account for Subprogram or Category of funds checked above and received pursuant to Public Utilities Code Section 142257. Claimant shall maintain current records in accordance with generally accepted accounting principles and shall separately record expenditures for each type of eligible purpose. Claimant shall make such records available to the Authority for inspection or audit at any time.

5. Claimant understands that should financial or compliance audit exceptions be found, the Fresno County Transportation Authority will take immediate steps to resolve the exceptions in accordance with its adopted procedures.

Authorized Signature: _____
Title: _____
Date: _____
Jay Schengel
Finance Director
7/12/21

ATTACHMENT: Evidence of Formal Action for Approval and Submittal

Approved by: Fresno County Transportation Authority Board on: _____



CITY *of* CLOVIS

REPORT TO THE CITY COUNCIL

TO: Mayor and City Council

FROM: Fire Department

DATE: July 12, 2021

SUBJECT: Fire - Approval - Waive the City's formal bidding requirements and authorize the sole source purchase of one Pierce Triple Combination Pumper Fire Apparatus from Golden State Fire Apparatus in Sacramento, CA for a total purchase price of \$748,277.25.

ATTACHMENTS: 1. Quote from Golden State Fire Apparatus

CONFLICT OF INTEREST

None

RECOMMENDATION

Approve the waiving of the City's formal bidding requirements and authorize the sole-source purchase of one Pierce Triple Combination Pumper Fire Apparatus for the amount of \$789,495.53.

EXECUTIVE SUMMARY

Staff requests City Council approve the sole-source purchase of one 2022 Pierce Triple Combination Pumper Fire Apparatus as per the Clovis Fire Department's apparatus specifications. This purchase would place one new fire engine in service at Fire Station 2 located in the Helm Ranch Community of Clovis and funding is in the current fiscal year 2021/22 budget.

BACKGROUND

Clovis Fire Department currently staffs a fleet of fire engines and fire trucks. We have five frontline fire engines and one frontline fire truck; this purchase will replace a 2003 Pierce Quantum Pumper. Each apparatus has a reserve apparatus to serve when the primary apparatus is out-of-service for maintenance or repair. This is in compliance with national standards for fire service fleets.

Our standard for fleet replacement, which was adopted by the City of Clovis in the mid-1990's and incorporated into the Fire Department's accreditation plan approved by the Center for Public Safety Excellence, is to use apparatus for twelve to fourteen years as frontline service

apparatus and then place them in reserve for approximately six to eight years, in order to receive a twenty year total service life.

The manufacturer of this apparatus, Pierce, remains consistent with the standard the Department established in 1996. Since that time we have continued our efforts to standardize all of the new fire apparatus chassis, engines, transmissions, and main fire pumps. This effort and approach have served to increase firefighter safety, reduce training time, and reduce fleet maintenance costs and required parts inventory.

FISCAL IMPACT

Purchase via sole-source is based on the characteristics of the apparatus. This purchase will provide standardization of chassis, which allows for more efficient training and reduces fleet maintenance and inventory costs. This sole-source purchase provides for a single source of warranty work and part ordering.

Base Price Cost Comparison: The Revised Base Price below includes applicable pre-payment discounts and sales tax as shown on price quote, Attachment 1. The total purchase price is \$789,495.53 each, saving the City \$35,694.00 on the vehicle purchase price by using the Fire Rescue GPO bid pricing and \$26,842.29 for the full pre-payment at time of order.

Delivery of the apparatus is typically within 300 to 365 calendar days after execution and acceptance of a contract or purchase order. In total the purchase price for one fire engine from Golden State Fire Apparatus is \$789,495.53 and the required equipment is \$75,504.47, for a total cost of \$865,000.

REASON FOR RECOMMENDATION

The fire engine being purchased will be utilized at Fire Station 2 within the Helm Ranch community of Clovis and replace an aging 2003 Pierce Quantum Pumper.

ACTIONS FOLLOWING APPROVAL

1. Finalize purchase contract with Pierce and order apparatus.
2. Upon delivery conduct an extensive apparatus acceptance test.
3. Order, receive, and mount all equipment on apparatus as needed.

Prepared by: Jim Damico, Battalion Chief

Reviewed by: City Manager *[Signature]*



PROPOSAL PREPARED FOR
City of Clovis Fire Department
Pierce Manufacturing, Inc.
One (1) Velocity PUC Pumper
June 28, 2021

SALES CONSULTANT
Dewayne Young
Golden State Fire Apparatus, Inc.
7400 Reese Road
Sacramento, CA 95828
(209) 777-0650 Cell
dyoung@goldenstatefire.com

PARTS, SERVICE & SUPPORT
Golden State Emergency Vehicle Service, Inc.
7400 Reese Road
Sacramento, CA 95828
916.330.1638 Office
parts@goldenstatefire.com

PROPOSAL PREPARED FOR:

City of Clovis Fire Department
1033 Fifth Street
Clovis, CA 93612

Submitted Date:	June 28, 2021
Proposal Number:	30628-21
Expiration Date:	August 31, 2021
Sales Consultant:	Dewayne Young

We hereby propose and agree to furnish, after your acceptance of this proposal and the proper execution by the CITY OF CLOVIS FIRE DEPARTMENT, hereinafter called "Customer" and an officer of Golden State Fire Apparatus, Inc., hereinafter called "GSFA", the following fire apparatus and equipment, hereinafter called "Product":

#	Description	Unit Price
A	One (1) Pierce Manufacturing, Velocity PUC Pumper	793,690.20
B	Discount for same as HGAC / Fire Rescue GPO Pricing	(35,674.00)
C	Discount For 100% Pre-Payment at Time of Order	(26,842.29)
SUBTOTAL		731,173.91
7.975% State Sales Tax		58,311.12
California Tire Fee		10.50
GRAND TOTAL		789,495.53

PROPOSAL SUMMARY

This proposal includes the following items in accordance with the specifications hereto attached:

- Fire apparatus and equipment
- 100% performance bond
- Pre-delivery inspection/services by GSFA
- Delivery to GSFA service center in Sacramento
- Final delivery from service center to Customer
- Demonstration and familiarization of the Product

PRODUCT COMPLETION

Product shall be built in accordance with the specifications hereto attached, delays due to acts of God, strikes, war, or intentional conflict, failures to obtain chassis, materials, unusual weather conditions or other causes beyond GSFA's control not preventing, within approximately **365 to 395 CALENDAR DAYS** after receipt of this order and the acceptance thereof at our Sacramento, California office. Within thirty (30) calendar days after receipt of this order and acceptance thereof, GSFA shall submit to Customer a production schedule including tentative pre-construction conference, final inspection and final delivery dates.

DELIVERY LOCATION

Product shall be shipped in accordance with the specifications hereto attached and be delivered to you at **CLOVIS, CALIFORNIA**. Proof of insurance must be demonstrated by the Customer to GSFA prior to transferring of the Product(s).

ACCEPTING THIS PROPOSAL

In the event Customer wishes to purchase the Product described in this Proposal and the attached specifications, then, prior to the expiration date listed on page 2 of this Proposal, Customer shall sign and return this Proposal. Thereafter, GSFA and Customer will endeavor to enter into a purchase agreement incorporating this Proposal and including additional terms (a "Purchase Agreement"). If Customer returns a signed copy of this Proposal alone, GSFA will send Customer its form of Purchase Agreement for Customer's review and signature. **If Customer desires to use its standard form of purchase order as the Purchase Agreement, then Customer should return a signed copy of this Proposal along with a copy of such purchase order. All purchase orders shall be made out to GSFA.** GSFA will review such purchase order and contact the Customer regarding any required revisions. Only upon a full execution of a Purchase Agreement shall GSFA and Customer be obligated to purchase and sell the Product set forth in this Proposal.

TERMS AND CONDITIONS

The following Terms and Conditions are hereby made part of this Proposal:

1. Payment Terms, 100% Pre-Payment at Time of Order – Customer shall pay the amount listed on page one of this Proposal, which includes: (i) the total price for the Product (the "Purchase Price"), (ii) the estimated state sales tax on the Product, and (iii) the California tire fee (together with the Purchase Price and estimated state sales tax, the "Grand Total") within fifteen (15) calendar days from the date on which the Purchase Agreement is fully executed. The proposed delivery timeframe for the Product, which is outlined on page one of this Proposal, shall not begin until full payment of the Grand Total is received. In the event Customer does not pay GSFA the Grand Total in the timeframe set forth in this Section 1, GSFA may, in its sole discretion, cancel the Purchase Agreement entered into between the parties.

2. Multiple Unit Purchase – If the Purchase Price includes pricing for multiple units, the price stated on this Proposal shall only be valid if the quantity of Products being proposed are purchased at the same time, pursuant to the same Purchase Agreement.

3. Stock / Demo Units – If applicable, any stock/demo units, including those identified by this Proposal, are available for sale on an as-is, first-come and first served-basis. Regardless of this Proposal, the first Customer to enter into a Purchase Agreement identifying any such stock/demo units shall obtain said units.

4. Order Changes – The Customer may request that GSFA incorporate a change to the Product or the Specifications for the Product by delivering a written change order to GSFA, which shall include a description of the proposed change sufficient to permit GSFA to evaluate the feasibility of such change (a "Change Order"). GSFA will provide Customer a written response (a "Response") stating (i) whether GSFA will accommodate such Change Order (which GSFA may decide in its sole and absolute discretion) and (ii) the terms of the modification to the order, including any increase or decrease in the Purchase Price resulting from such Change Order, and any effect on production scheduling or Delivery resulting from such Change Order. Customer shall have seven (7) days after receipt of the Response to notify GSFA as to whether Customer desires to make the changes GSFA has approved in the Response. In the event Customer counter-signs GSFA's Response, Customer shall pay the increase (or be refunded the decrease) in the Purchase Price prior to final delivery to Customer location.

5. Force Majeure – GSFA shall not be responsible nor deemed to be in default on account of delays in performance due to causes which are beyond GSFA's and manufacturer's control and which make GSFA's performance impracticable, including but not limited to wars, insurrections, strikes, riots, fires, storms, floods, other acts of nature, explosions, earthquakes, accidents, any act of government, delays in transportation, inability to obtain necessary labor supplies or manufacturing facilities, allocation regulations or orders affecting materials, equipment, facilities or completed products, failure to obtain any required license or certificates, acts of God or the public enemy or terrorism, failure of transportation, epidemics, quarantine restrictions, failure of vendors (due to causes similar to those within the scope of this clause) to perform their contracts or labor troubles causing cessation, slowdown, or interruption of work.

6. Cancellation/Termination – In the event Customer and GSFA enter into a Purchase Agreement and Customer thereafter cancels or terminates the Purchase Agreement, GSFA will charge a cancellation fee as follows: (a) 10% of the Purchase Price after order is accepted and entered by GSFA; (b) 20% of the Purchase Price after completion of the pre-construction phase of the order process; and (c) 50% of the Purchase Price after the requisition of any materials or commencement of any manufacturing or assembly of the Product by either GSFA or the manufacturer of the Product. The tier of cancellation fee applicable to any cancellation shall be in the sole and absolute discretion of GSFA.

7. State Sales Tax – Customer shall be responsible for the cost of state sales tax associated with, or attributable to the Product. The taxes owed by Customer for the Product is subject to adjustment for the applicable state sales tax rate in effect when the Product is delivered to the Customer. Therefore, the sales tax will be increased or decreased at the time of delivery if a change in the sales tax rate has occurred, in which case Customer shall pay GSFA (or be refunded by GSFA) the applicable change in sales tax.

8. Proposal Expiration – After the Expiration Date shown on page one of this Proposal, Customer shall require GSFA's written consent to accept this Proposal.

9. Governing Law – This Proposal is to be governed by and under the laws of the state of California.

Thank you for providing Golden State Fire Apparatus, Inc. with the opportunity to provide this proposal. If you have any questions regarding the options presented or need additional options, please contact me.

Sincerely,

I, _____ authorized representative of CITY OF CLOVIS FIRE DEPARTMENT agrees to purchase the proposed Product(s) and agree to the terms and conditions of this proposal and the specifications hereto attached.

Dewayne Young
Golden State Fire Apparatus, Inc.

SIGNATURE: _____

TITLE: _____ DATE: _____



Proposal Details Report

AGENDA ITEM NO. 6.

Customer: CLOVIS FIRE DEPARTMENT **Bid Number:** 877
Representative: Young, Dewayne **Job Number:**
Requirements Manager: **Organization:** Golden State Fire Apparatus, Inc
Description: Clovis Fire Department, Velocity
Chassis: Velocity Chassis, PUC (Big Block), 2010
Body: Pumper, PUC, Aluminum

OptionCode	Type	Option	ProposalText
0766589		Boiler Plates, PUC Pumper	<p>Golden State Fire Apparatus is pleased to submit a proposal to Clovis Fire Department for a Pierce® multi purpose response vehicle per your request for quotation. The following paragraphs will describe in detail the apparatus, construction methods, and equipment proposed. This proposal will indicate size, type, model and make of components parts and equipment, providing proof of compliance with each and every item (except where noted) in the departments advertised specifications.</p> <p>PIERCE MANUFACTURING was founded in 1913. Since then we have been building bodies with one philosophy, "BUILD THE FINEST". Our skilled craftsmen take pride in their work, which is reflected, in the final product. We have been building fire apparatus since the early "forties" giving Pierce Manufacturing over 75 years of experience in the fire apparatus market. Pierce Manufacturing has built and put into service more than 62,500 apparatus, including more than 33,900 on Pierce custom chassis designed and built specifically for fire and emergency applications. Our Appleton, Wisconsin facility has over 870,000 total square feet of floor space situated on approximately 105 acres of land. Our Bradenton, Florida facility has 300,000 square feet of floor space situated on approximately 38 acres of land.</p> <p>Our beliefs in high ethical standards are carried through in all of our commitments and to everyone with whom we do business. Honesty, Integrity, Accountability and Citizenship are global tenets by which we all live and work. Consequently, we neither engage in, nor have we ever been convicted of price fixing, bid rigging, or collusion in any domestic or international fire apparatus market.</p> <p>Pierce has only one brand of fire apparatus "Pierce", ensuring you are receiving top of the line product that meets your specification.</p> <p>In accordance with the current edition of NFPA 1901 standards, this proposal will specify whether the fire department, manufacturer, or apparatus dealership will provide required loose equipment. Images and illustrative material in this proposal are as accurate as known at the time of publication, but are subject to change without notice. Images and illustrative material is for reference only, and may include optional equipment and accessories and may not include all standard equipment.</p> <p>GENERAL DESIGN AND CONSTRUCTION</p> <p>To control quality, ensure compatibility, and provide a single source for service and warranty, the custom cab, chassis, pump module and body will be entirely designed, assembled/welded and painted in Pierce owned manufacturing facilities. This includes, but not limited to the cab weldment, the pumphouse module assembly, the chassis assembly, the body and the electrical system.</p> <p>QUALITY AND WORKMANSHIP</p> <p>Pierce has set the pace for quality and workmanship in the fire apparatus field. Our tradition of building the highest quality units with craftsmen second to none has been the rule right from the beginning and we demonstrate that ongoing commitment by: Ensuring all steel welding follows American Welding Society D1.1-2004 recommendations for structural steel welding. All aluminum welding follows American Welding society and ANSI D1.2-2003 requirements for structural welding of aluminum. All sheet metal welding follows American welding Society B2.1-2000 requirements for structural welding of sheet metal. Our flux core arc welding uses alloy rods, type 7000 and is performed to American Welding Society standards A5.20-E70T1. Furthermore, all employees classified as welders are tested and certified to meet the American welding Society codes upon hire and every three (3) years thereafter. Pierce also employs and American Welding Society certified welding inspector in plant during working hours to monitor weld quality.</p> <p>Pierce Manufacturing operates a Quality Management System under the requirements of ISO 9001. These standards sponsored by the International Organization for Standardization (ISO) specify the quality systems that are established by the manufacturer for design, manufacture, installation and service. A copy of the certificate of compliance is included with this proposal. In addition to the Quality Management system, we also employ a Quality Achievement Supplier program to insure the vendors and suppliers that we utilize meet the high standards we demand. That is just part of our overall "Quality at the Source" program at Pierce.</p> <p>To demonstrate the quality of our products and services, a list of at least two (2) fire departments/municipalities that have purchased vehicles for a second time is provided.</p> <p>DELIVERY</p> <p>The apparatus will be delivered under its own power to insure proper break-in of all components while the apparatus is still under warranty. A qualified delivery representative shall deliver the apparatus and remain for a sufficient length of time to instruct personnel in proper operation, care and maintenance of the equipment delivered.</p> <p>MANUAL AND SERVICE INFORMATION</p> <p>At time of delivery, complete operation and maintenance manuals covering the apparatus will be provided. A permanent plate will be mounted in the driver's compartment specifying the quantity and type of fluids required including engine oil, engine coolant, transmission, pump transmission lubrication, pump primer and drive axle.</p> <p>SAFETY VIDEO</p> <p>At the time of delivery Pierce will also provide one (1) 39-minute, professionally produced apparatus safety video, in DVD format. This video will address key safety considerations for personnel to follow when they are driving, operating, and maintaining the apparatus, including the following: vehicle pre-trip inspection, chassis operation, pump operation, aerial operation, and safety during maintenance.</p> <p>PERFORMANCE TESTS</p> <p>A road test will be conducted with the apparatus fully loaded and a continuous run of no less than ten (10) miles. During that time the apparatus will show no loss of power nor will it overheat.</p>

transmission drive shaft or shafts and the axles will run quietly and be free of abnormal vibration or noise. The apparatus when fully loaded will not have less than 25 percent on the front axle, and not less than 50 percent nor more than 75 percent on the rear axle. The apparatus will meet NFPA 1901 acceleration and braking requirements.

SERVICE AND WARRANTY SUPPORT

Pierce dealership support will be provided by Golden State EVS by operating a Pierce authorized service center. The service center will have factory-trained mechanics on staff versed in Pierce fire apparatus. The service facility will be located within two hundred fifty (250) miles of the fire department.

In addition to the dealership, Pierce has service facilities located in both, Weyauwega, Wisconsin and Bradenton, Florida. Pierce also maintains a dedicated parts facility of over 100,000 square feet in Appleton, Wisconsin. The parts facility stocks in excess of \$5,000,000 in parts dedicated to service and replacement parts. The parts facility employs a staff dedicated solely for the distribution and shipment of service and replacement parts.

Service parts for the apparatus being proposed can be found via Pierceparts.com which, is an interactive online tool that delivers information regarding your specific apparatus as well as the opportunity to register for training classes.

As a Pierce customer you have the ability to view the complete bill of materials for your specific apparatus, including assembly drawings, piece part drawings, and beneficial parts notations. You will also have the ability to search the complete Pierce item master through a parts search function which offers all Pierce SKU's and descriptions offered on all Pierce apparatus. Published component catalogs, which include proprietary systems along with an extensive operators manual library is available for easy reference.

Pierce Manufacturing maintains a dedicated service and warranty staff of over 35 personnel, dedicated to customer support, which also maintains a 24 hour 7 day a week toll free hot line, four (4) on staff EVTs, and offers hands-on repair and maintenance training classes multiple times a year.

LIABILITY

The successful bidder will defend any and all suits and assume all liability for the use of any patented process including any device or article forming a part of the apparatus or any appliance furnished under the contract.

INSURANCE PROVIDED BY BIDDER

COMMERCIAL GENERAL LIABILITY INSURANCE

The successful bidder will, during the performance of the contract and for three (3) years following acceptance of the product, keep in force at least the following minimum limits of commercial general liability insurance:

- Each Occurrence \$1,000,000
- Products/Completed Operations Aggregate \$1,000,000
- Personal and Advertising Injury \$1,000,000
- General Aggregate \$2,000,000

Coverage will be written on a Commercial General Liability form. The policy will be written on an occurrence form and will include Contractual Liability coverage for bodily injury and property damage subject to the terms and conditions of the policy. The policy will include Owner as an additional insured when required by written contract.

COMMERCIAL AUTOMOBILE LIABILITY INSURANCE

The successful bidder will, during the performance of the contract, keep in force at least the following minimum limits of commercial automobile liability insurance and coverage will be written on a Commercial Automobile liability form:

- Each Accident Combined Single Limit: \$1,000,000

UMBRELLA/EXCESS LIABILITY INSURANCE

The successful bidder will, during the performance of the contract and for three (3) years following acceptance of the product, keep in force at least the following minimum limits of umbrella liability insurance:

- Aggregate: \$3,000,000
- Each Occurrence: \$3,000,000

The umbrella policy will be written on an occurrence basis and at a minimum provide excess to the bidder's General Liability and Automobile Liability policies.

The required limits can be provided by one (1) or more policies provided all other insurance requirements are met.

Coverage will be provided by a carrier(s) rated A- or better by A.M. Best.

All policies will provide a 30-day notice of cancellation to the named insured. The Certificate of Insurance will provide the following cancellation clause: Should any of the above described policies be cancelled before the expiration date thereof, notice will be delivered in accordance with the policy provisions.

Bidder agrees to furnish owner with a current Certificate of Insurance with the coverages listed above along with the bid. The certificate will show the purchaser as certificate holder.

INSURANCE PROVIDED BY MANUFACTURER

PRODUCT LIABILITY INSURANCE

The manufacturer will, during the performance of the contract and for three (3) years following acceptance of the product, keep in force at least the following minimum limits of Product Liability insurance:

- Each Occurrence \$1,000,000
- Products/Completed Operations Aggregate \$1,000,000

Coverage will be written on a Commercial General Liability form. The policy will be written on an occurrence form. The manufacturer's policy will include the owner as additional insured when required by written contract between the Owner and a Pierce authorized dealer.

UMBRELLA/EXCESS LIABILITY INSURANCE

The manufacturer will, during the performance of the contract and for three (3) years following acceptance of the product, keep in force at least the following minimum limits of umbrella liability insurance:

- Each Occurrence: \$25,000,000
- Aggregate: \$25,000,000

The umbrella policy will be written on an occurrence basis and provide excess to the manufacturer's General Liability/Products policies.

The required limits can be provided by one (1) or more policies provided all other insurance requirements are met.

Coverage will be provided by a carrier(s) rated A- or better by A.M. Best.

All policies will provide a 30-day notice of cancellation to the named insured. The Certificate of Insurance will provide the following cancellation clause: Should any of the policies be cancelled before the expiration date thereof, notice will be de **AGENDA ITEM NO. 6.** with the policy provisions.

Manufacturer agrees to furnish owner with a current Certificate of Insurance with the coverages listed above along with the bid. The certificate will show the purchaser as the certificate holder.

0661794	Single Source Compliance	<p>SINGLE SOURCE MANUFACTURER Pierce Manufacturing, Inc. provides an integrated approach to the design and manufacture of our products that delivers superior apparatus and a dedicated support team. From our facilities, the chassis, cab weldment, cab, pumphouse (including the sheet metal enclosure, valve controls, piping and operators panel) and body will be entirely designed, tested, and hand assembled to the customer's exact specifications. The electrical system either hardwired or multiplexed, will be both designed and integrated by Pierce Manufacturing. The warranties relative to these major components (excluding component warranties such as engine, transmission, axles, pump, etc.) will be provided by Pierce as a single source manufacturer. Pierce's single source solution adds value by providing a fully engineered product that offers durability, reliability, maintainability, performance, and a high level of quality.</p>
0584456	Manufacture Location, Appleton, Wisconsin	Your apparatus will be manufactured in Appleton, Wisconsin.
0584452	RFP Location: Appleton, Wisconsin	
0588609	Vehicle Destination, US	
0670275	Unit to be Similar in some Aspects, Excluding Pump Panel	<p>SPECIAL INSTRUCTIONS The apparatus being proposed will be designed and built to match the match pump panel as close as possible to 34758. However, some variation may be necessary due to changes in our manufacturing processes or our product offering. Revisions in NFPA guidelines and/or other regulations may also affect our ability to match the previous unit.</p>
0610784	Comply NFPA 1901 Changes Effective Jan 1, 2016, With Exceptions	<p>NFPA 2016 STANDARDS This unit will comply with the NFPA standards effective January 1, 2016, except for fire department directed exceptions. These exceptions will be set forth in the Statement of Exceptions. Certification of slip resistance of all stepping, standing and walking surfaces will be supplied with delivery of the apparatus. All horizontal surfaces designated as a standing or walking surface that are greater than 48.00" above the ground must be defined by a 1.00" wide line along its outside perimeter. Perimeter markings and designated access paths to destination points will be identified on the customer approval print and are shown as approximate. Actual location(s) will be determined based on materials used and actual conditions at final build. Access paths may pass through hose storage areas and opening or removal of covers or restraints may be required. Access paths may require the operation of devices and equipment such as the aerial device or ladder rack. A plate that is highly visible to the driver while seated will be provided. This plate will show the overall height, length, and gross vehicle weight rating. The manufacturer will have programs in place for training, proficiency testing and performance for any staff involved with certifications. An official of the company will designate, in writing, who is qualified to witness and certify test results.</p>
0533347	Pumper/Pumper with Aerial Device Fire Apparatus	
0588611	Vehicle Certification, Pumper	

NFPA COMPLIANCY

Apparatus proposed by the bidder will meet the applicable requirements of the National Fire Protection Association (NFPA) as stated in current edition at time of contract award. Any department's specifications that differ from NFPA specifications will be indicated in the proposal as "non-NFPA".

VEHICLE INSPECTION PROGRAM CERTIFICATION

To assure the vehicle is built to current NFPA standards, the apparatus, in its entirety, will be third-party, audit-certified through Underwriters Laboratory (UL) that it is built and complies to all applicable standards in the current edition of NFPA 1901. The certification will include: all design, production, operational, and performance testing of not only the apparatus, but those components that are installed on the apparatus.

A placard will be affixed in the driver's side area stating the third party agency, the date, the standard and the certificate number of the whole vehicle audit.

PUMP TEST

Underwriters Laboratory (UL) will test, approved, and certify the pump. The test results and the pump manufacturer's certification of hydrostatic test; the engine manufacturer's certified brake horsepower curve; and the pump manufacturer's record of pump construction details will be forwarded to the Fire Department.

GENERATOR TEST

If the unit has a generator, Underwriters Laboratory (UL) will test, approved, and certify the generator. The test results will be provided to the Fire Department at the time of delivery.

BREATHING AIR TEST

If the unit has breathing air, Pierce Manufacturing will draw an air sample from the air system and have the sample certified that the air quality meets the requirements of NFPA 1989, *Standard on Breathing Air Quality for Fire and Emergency Services Respiratory Protection*.

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SCC GSFA, Inspection Trip(s) - Customer Booking & Paying Own Travel

INSPECTION TRIP(S)

The Fire Department will provide one (1) factory inspection trip(s) for to be determined customer representative(s). The inspection trip(s) will be scheduled at times mutually agreed upon between the manufacturer's representative and the customer.

Costs for airfare, lodging, meals and ground transportation while at the manufacturers location will be the responsibility of the Fire Department.

Costs such as Customer ground transportation in California, Customer airport parking, Customer luggage fees and Customer incidentals while traveling to the factory will be the responsibility of the Customer.

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STF Customer Service Website

AFTERMARKET SUPPORT WEBSITE

Pierceparts.com will provide Pierce authorized dealer access to comprehensive information pertaining to the maintenance and service of their customer's apparatus. This tool will provide the Pierce authorized dealer the ability to service and support their customers to the best of their ability with factory support at their fingertips.

Pierceparts.com is also accessible to the end user through the guest login. Limited access is available and vehicle specific parts information accessible by entering a specific VIN number. All end users should see their local authorized Pierce dealer for additional support and service.

The website will consist of the following screens at the dealer level:

My Fleet Screen

The My Fleet screen will provide access to truck detail information on the major components of the vehicle, warranty information, available vehicle photographs, vehicle drawings, sales options, applicable vehicle software downloads, etc.

Parts Screens

The Parts screens will provide parts look-up capability of Pierce Manufacturing sourced items, with the aid of digital photographs, part drawings and assembly drawings. The parts search application will permit the searching of parts by item description or function group (major system category). The parts application will provide the ability to submit electronically a parts order, parts quote, or parts return request directly to Pierce Manufacturing for processing.

Warranty Screen

The Warranty screens will provide dealers the ability to submit electronically warranty claims directly to Pierce Manufacturing for reimbursement.

My Reports Screens

The My Reports screens will provide access to multiple dealer reports to allow the dealership to maintain communication with the customer on the status of orders, claims, and phone contacts.

Technical Support Screens

The Technical Support screens will provide access to all currently published Operation and Maintenance and Service Publications. Access to Pierce Manufacturing Service Bulletins and Work Instructions, containing information on current service topics and recommendations will be provided.

Training

The Training screens will provide access to upcoming training classes offered by Pierce Manufacturing along with interactive electronic learning modules (Operators Guides) covering the operation of major vehicle components will be provided. Access to training manuals used in Pierce Manufacturing training classes will be provided.

About Pierce

Access to customer service articles, corporate news, quarterly newsletters, and key contacts within the Customer Service Department will be provided. The current Customer Service Policy and Procedure Manual, detailing the operation of the Customer Service group will also be accessible.

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STF Weekly Progress Reports, Pumper, GSFA

WEEKLY PROGRESS REPORTS

Golden State Fire Apparatus, Inc. will provide weekly progress reports in the apparatus or the major components as they are being constructed. commence at the start of the manufacturing process and will continue through production by the manufacturer. The reports will show the progress of the apparatus through the course of each week. Special attention will be given to show the unique features and aspects of the apparatus as construction progresses.

AGENDA ITEM NO. 6.

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STF Pre-Delivery Service, GSFA

PRE-DELIVERY SERVICE

After transportation from the factory and prior to delivery, the apparatus will receive a pre-delivery service to confirm proper operation and correction of any issues found as a result of said inspection. The Golden State Fire Apparatus, Inc. pre-delivery service consists of the following:

Engine Compartment and Undercarriage – Check for hoses, electrical and air lines that are unprotected and provide chaffing protection as required. Check for any broken mounting brackets and inspect for correct capacities of the following (if applicable): engine oil, coolant, power steering fluid, washer reservoir fluid, transmission fluid, rear end fluid, pump transmission oil, and primer oil. Lift the apparatus with the with the ARI-HETRA lift system to inspect electrical and air line runs so that they are routed in such a manner as to prevent chaffing, rubbing, etc. The DPF and SCR components will also be inspected along with the U-joints. Interior – Operate all doors, windows and locks for proper adjustment. Check upholstery.

Exterior – Repair reasonable paint scratches or chips. Tighten any loose hardware and inspect tires and wheels for proper pressure and lug torquing. Road Test – With the water tank (if applicable) full, the apparatus will be driven approximately 20 miles which allows the drive train components to get up to operating temperature. Road test will be on both city and highway roads. A DOT compliant brake test will be conducted to ensure the system is holding air. The brake condition and wheel seals will also be inspected.

Electrical - Operate all lights, sirens, and other electrical accessories to verify operation.

Pump - If applicable, vacuum test the pump to hold for 15 minutes. After vacuum test, operate the relief valve, transfer valve and check pump shift. Check water tank for leaks and inspect water level gauge for calibration. With discharge caps loose, rapid test all individual gauges and main gauges for calibration. Lubricate valve rods.

Foam System – If applicable, tighten caps and connect foam lines. Test selector, valves, metering valve and operation of foam system (including flush).

Aerial – If applicable, operate the aerial device to ensure functionality and visually inspect for any damage during delivery to dealership.

Rear Suspension Adjustment – The rear axle suspension will be re-torqued per OEM recommendations at the dealership location prior to final delivery.

Fuel Tank - Fuel tank will be filled at the dealership location prior to final delivery.

DEF Tank - DEF tank will be filled at the dealership location prior to final delivery.

Wash - The apparatus will be thoroughly washed at the dealership location prior to final delivery.

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STF DMV Compliance, Licensing & Registration

LICENSED MANUFACTURER

The State of California Vehicle Code, section 11701 requires “every manufacturer of a vehicle subject to registration shall make application to the Department of Motor Vehicles (DMV) for a license containing a general distinguishing number”. The manufacturer has a current license at time of proposal and shall provide a copy upon request. Temporary licenses are not acceptable.

LICENSED DEALERSHIP

The State of California Vehicle Code, section 11701 requires a “dealer in vehicles of a type subject to registration, shall make application to the Department of Motor Vehicles (DMV) for a license containing a general distinguishing number”. Golden State Fire Apparatus, Inc. has a current license at time of bid as outlined above and is available upon request. Temporary licenses are not acceptable.

LICENSED SALES REPRESENTATIVE

The State of California Vehicle Code, section 11800 requires that it shall be “unlawful for any person to act as a vehicle salesperson without having first procured a license issued by the Department of Motor Vehicles (DMV)”. The representative has a current vehicle salespersons license at time of proposal and shall provide a copy upon request. Temporary licenses are not acceptable.

VEHICLE REGISTRATION

The State of California Vehicle Code section 11739 requires that the “dealer of a new motor vehicle sale is responsible for applying for the title, securing vehicle registration, and obtaining license plates for the Customer” through the Department of Motor Vehicles (DMV). Golden State Fire Apparatus, Inc. is a factory-authorized dealer of the vehicle being sold and is authorized to register with the State of California as a new vehicle manufacturer. The dealer will make all necessary applications and complete all transfer papers, including applying for California Exempt “E” license plates.

0620362 Consortium, HGAC

0537375 Unit of Measure, US Gallons

0529326 Bid Bond, 10%, Pierce Built Chassis **BID BOND**

A bid bond as security for the bid in the form of a 10% bid bond will be provided with the proposal. This bid bond will be issued by a Surety Company who is listed on the U.S. Treasury Departments list of acceptable sureties as published in Department Circular 570. The bid bond will be issued by an authorized representative of the Surety Company and will be accompanied by a certified power of attorney dated on or before the date of bid. The bid bond will include language which assures that the bidder/principal will give a bond or bonds, as may be specified in the bidding or contract documents, with good and sufficient surety for the faithful performance of the contract, including the Basic One (1) Year Limited Warranty, and for the prompt payment of labor and material furnished in the prosecution of the contract. Notwithstanding any document or assertion to the contrary, any surety bond related to the sale of a vehicle will apply only to the Basic One (1) Year Limited Warranty for such vehicle. Any surety bond related to the sale of a vehicle will not apply to any other warranties that are included within this bid (OEM or otherwise) or to the warranties (if any) of any third party of any part, component, attachment or accessory that is incorporated into or attached to the vehicle. In the event of any contradiction or inconsistency between this provision and any other document or assertion, this provision will prevail.

0582697 Performance Bond, 100% with Warranty Bond, 1 Yr, and Payment Bond

PERFORMANCE BOND, 1 YEAR

The successful bidder will furnish a Performance and Payment bond (Bond) equal to 100 percent of the total contract amount within 30 days of the notice of award. Such Bond will be in a form acceptable to the Owner and issued by a surety company included within the Department of Treasury's Listing of Approved Sureties (Department Circular 570) with a minimum A.M. Best Financial Strength Rating of A and Size Category of XV. In the event of a bond issued by a surety of a lesser Size Category, a minimum Financial Strength rating of A+ is required. Bidder and Bidder's surety agree that the Bond issued hereunder, whether expressly stated or not, also includes the surety's guarantee of the vehicle manufacturer's Basic One (1) Year Limited Warranty period included within this proposal. Owner agrees that the penal amount of this bond will be simultaneously amended to 100% percent of the total contract amount upon satisfactory acceptance and delivery of the vehicle(s) included herein. Notwithstanding anything contained within this contract to the contrary, the surety's liability for any warranties of any type will not exceed one (1) year from the date of such satisfactory acceptance and delivery, or the actual Basic One (1) Year Limited Warranty period, whichever is shorter.

0000007 Approval Drawing

APPROVAL DRAWING

A drawing of the proposed apparatus will be prepared and provided to the purchaser for approval before construction begins. The Pierce sales representative will also be provided with a copy of the same drawing. The finalized and approved drawing will become part of the contract documents. This drawing will indicate the chassis make and model, location of the lights, siren, horns, compartments, major components, etc. A "revised" approval drawing of the apparatus will be prepared and submitted by Pierce to the purchaser showing any changes made to the approval drawing.

0781461 SP Electrical Diagrams, Hard, CD or USB Flash Features

ELECTRICAL WIRING DIAGRAMS

There will be electrical wiring diagrams, provided for the model of chassis and body in the following configurations:
one (1) hard copy of the electrical diagrams provided
no CDs of the electrical diagrams provided
one (1) USB flash drive with the electrical diagrams provided

0564230 Velocity Chassis, PUC (Big Block), 2010

VELOCITY CHASSIS

The Pierce Velocity® is the custom chassis developed exclusively for the fire service. Chassis provided will be a new, tilt-type custom fire apparatus. The chassis will be manufactured in the apparatus body builder's facility eliminating any split responsibility. The chassis will be designed and manufactured for heavy-duty service, with adequate strength and capacity for the intended load to be sustained and the type of service required. The chassis will be the manufacturer's first line tilt cab.

0000110 Wheelbase

WHEELBASE

The wheelbase of the vehicle will be 180.50".

0000070 GVW Rating

GVW RATING

The gross vehicle weight rating will be 49,800 pounds.

0000203	Frame Rails, 13.38 x 3.50 x .375, Qtm/AXT/Imp/Vel/DCF	<p>FRAME</p> <p>The chassis frame will be built with two (2) steel channels bolted to five more, depending on other options of the apparatus. The side rails will have the front and mid sections of the chassis, with a continuous smooth taper to the rear axle. Each rail will have a section modulus of 25.992 cubic inches and a resisting bending moment (rbm) of 3,119,040 in-lb over the critical regions of the frame assembly, with a section modulus of 18.96 cubic inches with an rbm of 2,275,200 in-lb over the rear axle. The frame rails will be constructed of 120,000 psi yield strength heat-treated 0.38" thick steel with 3.50" wide flanges.</p>
0020018	Frame Liner Not Req'd	
0508849	Axle, Front, Oshkosh TAK-4, Non Drive, 22,800 lb, Imp/Vel	<p>FRONT NON DRIVE AXLE</p> <p>The Oshkosh TAK-4® front axle will be of the independent suspension design with a ground rating of 22,800 lb.</p> <p>Upper and lower control arms will be used on each side of the axle. Upper control arm castings will be made of 100,000-psi yield strength 8630 steel and the lower control arm casting will be made of 55,000-psi yield ductile iron.</p> <p>The center cross members and side plates will be constructed out of 80,000-psi yield strength steel.</p> <p>Each control arm will be mounted to the center section using elastomer bushings. These rubber bushings will rotate on low friction plain bearings and be lubricated for life. Each bushing will also have a flange end to absorb longitudinal impact loads, reducing noise and vibrations.</p> <p>There will be nine (9) grease fittings supplied, one (1) on each control arm pivot and one (1) on the steering gear extension.</p> <p>The upper control arm will be shorter than the lower arm so that wheel end geometry provides positive camber when deflected below rated load and negative camber above rated load. Camber at load will be 0 degrees for optimum tire life.</p> <p>The ball joint bearing will be of low friction design and be maintenance free.</p> <p>Toe links that are adjustable for alignment of the wheel to the center of the chassis will be provided.</p> <p>The wheel ends will have little to no bump steer when the chassis encounters a hole or obstacle. The steering linkage will provide proper steering angles for the inside and outside wheel, based on the vehicle wheelbase.</p> <p>The axle will have a third party certified turning angle of 45 degrees. Front discharge, front suction, or aluminum wheels will not infringe on this crank angle.</p>
0010427	Suspension, Front TAK-4, 22,800 lb, Qtm/AXT/Imp/Vel/DCF/Enf	<p>FRONT SUSPENSION</p> <p>Front Oshkosh TAK-4™ independent suspension will be provided with a minimum ground rating of 22,800 lb.</p> <p>The independent suspension system will be designed to provide maximum ride comfort. The design will allow the vehicle to travel at highway speeds over improved road surfaces and at moderate speeds over rough terrain with minimal transfer of road shock and vibration to the vehicle's crew compartment.</p> <p>Each wheel will have torsion bar type spring. In addition, each front wheel end will also have energy absorbing jounce bumpers to prevent bottoming of the suspension.</p> <p>The suspension design will be such that there is at least 10.00" of total wheel travel and a minimum of 3.75" before suspension bottoms.</p> <p>The torsion bar anchor lock system allows for simple lean adjustments, without the use of shims. One can adjust for a lean within 15 minutes per side. Anchor adjustment design is such that it allows for ride height adjustment on each side.</p> <p>The independent suspension was put through a durability test that simulated 140,000 miles of inner city driving.</p>
0087572	Shock Absorbers, KONI, TAK-4, Qtm/AXT/Imp/Vel/DCF/Enf	<p>FRONT SHOCK ABSORBERS</p> <p>KONI heavy-duty telescoping shock absorbers will be provided on the front suspension.</p>
0000322	Oil Seals, Front Axle	<p>FRONT OIL SEALS</p> <p>Oil seals with viewing window will be provided on the front axle.</p>
0899288	Tires, Front, Goodyear, Armor MAX MSA, 425/65R22.50, 20 ply, Fire Service Speed	<p>FRONT TIRES</p> <p>Front tires will be Goodyear 425/65R22.50 radials, 20 ply Armor MAX MSA, rated for 22,800 lb maximum axle load and 75 mph maximum speed.</p>
0019611	Wheels, Front, Alcoa, 22.50" x 12.25", Aluminum, Hub Pilot	<p>The tires will be mounted on Alcoa 22.50" x 12.25" polished aluminum disc type wheels with a ten (10)stud, 11.25" bolt circle.</p>
0530465	Axle, Rear, Meritor RS25-160, 27,000 lb, Imp/Vel/Dash CF	<p>REAR AXLE</p> <p>The rear axle will be a Meritor™, Model RS-25-160, with a capacity of 27,000 lb.</p>

AGENDA ITEM NO. 6.

0602744	Top Speed of Vehicle, Non-NFPA 2016 Compliant	<p>TOP SPEED OF VEHICLE NFPA 1901, 2016 edition requires limits on the top speed of vehicles. N AGENDA ITEM NO. 6. the maximum top speed of fire apparatus with a GVWR over 26,000 lb v mph or the manufacturer's maximum fire service speed rating for the tire apparatus, whichever is lower. NFPA 4.15.3 requires that if the combined water tank and foam agent tank on the fire apparatus exceed 1250 gallons or the GVWR of the vehicle is over 50,000 lb, the maximum top speed of the apparatus will not exceed either 60 mph or the manufacturer's maximum fire service speed rating for the tires installed on the apparatus, whichever is lower. It is the intention of the standard to improve safety by limiting the speed of all apparatus to 68 mph, and tankers or heavy apparatus to 60 mph. By requesting an exception to this requirement, the purchasing authority is consciously choosing to operate their apparatus at speeds above the limits designated as safe speeds by the NFPA Technical Committee on Fire Department Apparatus. The top speed of the apparatus as manufactured exceeds the NFPA requirements. Per fire department specification of a top speed that exceeds NFPA requirements, the apparatus will be non-compliant to NFPA 1901 standards at time of contract execution. A rear axle ratio will be furnished to allow the vehicle to reach an approximate top speed of 72 MPH.</p>
0122075	Suspen, Rear, Standens, Spring, 27,000 lb, Imp/Vel/Dash CF	<p>REAR SUSPENSION The rear suspension will be Standens, semi-elliptical, 3.00" wide x 53.00" long, 12-leaf pack with a ground rating of 27,000 lb. The spring hangers will be castings. The two (2) top leaves will wrap the forward spring hanger pin, and the rear of the spring will be a slipper style end that will ride in a rear slipper hanger. To reduce bending stress due to acceleration and braking, the front eye will be a berlin eye that will place the front spring pin in the horizontal plane within the main leaf. A steel encased rubber bushing will be used in the spring eye. The steel encased rubber bushing will be maintenance free and require no lubrication.</p>
0000485	Oil Seals, Rear Axle	<p>REAR OIL SEALS Oil seals will be provided on the rear axle(s).</p>
0791544	SP Spacer Kit, Rear Spring, 1.00" Additional Frame Height	
0782552	Tires, Rear, Goodyear, Endurance RSA, 12R22.50, LRH, Single	<p>REAR TIRES Rear tires will be four (4) Goodyear 12R22.50 radials, load range H, Endurance RSA highway tread, rated for 27,120 lb maximum axle load and 75 mph maximum speed.</p>
0019625	Wheels, Rear, Alcoa, 22.50" x 8.25", Aluminum, Hub Pilot, Single	<p>The tires will be mounted on Alcoa 22.50" x 8.25" polished aluminum disc wheels with a ten (10) stud 11.25" bolt circle.</p>
0568081	Tire Balancing, Counteract Beads	<p>TIRE BALANCE All tires will be balanced with Counteract balancing beads. The beads will be inserted into the tire and eliminate the need for wheel weights.</p>
0602747	No Tire Pressure Indicator, Fire Department Omits, Non-NFPA 2016 Compliant	<p>TIRE PRESSURE INDICATOR NFPA 1901, 2016 edition, section 4.13.4 requires each tire be equipped with a visual indicator or monitoring system that indicates tire pressure. Per Fire Department specification, a tire pressure indicator is not on the apparatus as manufactured. This apparatus will be non-compliant to NFPA 1901 standards effective at time of contract execution.</p>
0003245	Axle Hub Covers w/center hole, S/S, Front Axle	<p>FRONT HUB COVERS Stainless steel hub covers will be provided on the front axle. An oil level viewing window will be provided.</p>
0001960	Axle Hub Covers, Rear, S/S, High Hat (Pair)	<p>REAR HUB COVERS A pair of stainless steel high hat hub covers will be provided on rear axle hubs.</p>
0057936	Covers, Lug Nut, Chrome	<p>CHROME LUG NUT COVERS Chrome lug nut covers will be supplied on front and rear wheels.</p>
0002045	Mud Flap, Front and Rear, Pierce Logo	<p>MUD FLAPS Mud flaps with a Pierce logo will be installed behind the front and rear wheels.</p>

0544802	Chocks, Wheel, SAC-44-E, Folding	WHEEL CHOCKS There will be one (1) pair of folding Ziamatic, Model SAC-44-E, aluminum wheel blocks, with easy-grip handle provided.	AGENDA ITEM NO. 6.
0544806	Mounting Brackets, Chocks, SAC-44-E, Folding, Horizontal	Wheel Chock Brackets There will be one (1) pair of Zico, Model SQCH-44-H, horizontal mounting wheel chock brackets provided for the Ziamatic, Model SAC-44-E, folding wheel chocks. The brackets will be made of aluminum and consist of a quick release spring loaded rod to hold the wheel chocks in place. The brackets will be mounted below the left side rear compartment.	
0010670	ABS Wabco Brake System, Single rear axle	ANTI-LOCK BRAKE SYSTEM The vehicle will be equipped with a Meritor WABCO 4S4M, anti-lock braking system. The ABS will provide a 4-channel anti-lock braking control on both the front and rear wheels. A digitally controlled system that utilizes microprocessor technology will control the anti-lock braking system. Each wheel will be monitored by the system. When any particular wheel begins to lockup, a signal will be sent to the control unit. This control unit then will reduce the braking of that wheel for a fraction of a second and then reapply the brake. This anti-lock brake system will eliminate the lockup of any wheel thus helping to prevent the apparatus from skidding out of control.	
0030185	Brakes, Knorr/Bendix 17", Disc, Front, TAK-4	BRAKES The service brake system will be full air type. The front brakes will be Knorr/Bendix disc type with a 17.00" ventilated rotor for improved stopping distance. The brake system will be certified, third party inspected, for improved stopping distance.	
0000730	Brakes, Meritor, Cam, Rear, 16.50 x 7.00"	The rear brakes will be Meritor™ 16.50" x 7.00" cam operated with automatic slack adjusters. Dust shields will be provided.	
0058463	Air Compressor, Brake, Bendix 15.8 CFM	AIR COMPRESSOR, BRAKE SYSTEM The air compressor will be a Bendix®, Model BA-921, with 15.80 cubic feet per minute output at 1,250 rpm.	
0000785	Brake Reservoirs, Three	BRAKE SYSTEM The brake system will include: Bendix® dual brake treadle valve Heated automatic moisture ejector on air dryer Total air system capacity of 4,362 cubic inches Two (2) air pressure gauges with a red warning light and an audible alarm, that activates when air pressure falls below 60 psi Spring set parking brake system Parking brake operated by a push-pull style control valve A parking "brake on" indicator light on instrument panel Park brake relay/inversion and anti-compounding valve, in conjunction with a double check valve system, with an automatic spring brake application at 40 psi A pressure protection valve to prevent all air operated accessories from drawing air from the air system when the system pressure drops below 80 psi (550 kPa) 1/4 turn drain valve on each air tank The air tank will be primed and painted to meet a minimum 750 hour salt spray test. To reduce the effects of corrosion, the air tank will be mounted with stainless steel brackets.	
0587034	Air Dryer, Bendix, AD-IP w/Heat, 2010	BRAKE SYSTEM AIR DRYER The air dryer will be a Bendix AD-IP, with coalescing filter and heater.	
0000790	Brake Lines, Nylon	BRAKE LINES Color-coded nylon brake lines will be provided. The lines will be wrapped in a heat protective loom in the chassis areas that are subject to excessive heat.	
0617799	Inlet/Outlet, Air, w/Disconnect Fitting, 1/4 Turn Valve, Location	AIR INLET/OUTLET Two (2) air inlets/outlets will be installed with the female coupling located left and right side pump panel. This system will tie into the "wet" tank of the brake system and include a check valve in the inlet line and an 85 psi pressure protection valve in the outlet line. The air outlet will be controlled by a 1/4 turn valve. A mating male fitting will be provided with the loose equipment. The air inlet will allow a shoreline air hose to be connected to the vehicle. This will allow station air to be supplied to the brake system of the vehicle to insure constant air pressure.	

0000845	Air Tank, Additional for Extra Capacity	<p>ADDITIONAL AIR TANK An additional air tank with 1454 cubic inch displacement will be provided of the main air brake system. This tank will be plumbed into the rear half of the main air brake system. The air tank will be primed and painted to meet a minimum 750 hour spray coat to reduce the effects of corrosion, the air tank will be mounted with stainless steel brackets. The output flow of the engine air compressor will vary with engine rpm. Full compressor output will only be achieved at governed engine speed. Engine speed will be limited by generators, pumps and other PTO driven options.</p>
0610846	Engine, DDC DD13, 505 hp, 1750 lb-ft, W/OBD, EPA 2016, REPTO, Velocity	<p>ENGINE The chassis will be powered by an electronically controlled engine as described below: Make: Detroit™ Model: DD13® Power: 505 hp at 1625 rpm Torque: 1750 lb-ft at 1075 rpm Governed Speed: Full Load - 1900 rpm Road/2080 rpm Parked PTO Emissions Certification: EPA 2016 (GHG17) Fuel: Diesel Cylinders: Six (6) Displacement: 781 cubic inches (12.8L) Starter: Delco Remy 39MT™ Fuel Filters: Dual cartridge style with check valve, water separator, and water in fuel sensor The engine will include On-board diagnostics (OBD), which provides self diagnostic and reporting. The system will give the owner or repair technician access to state of health information for various vehicle sub systems. The system will monitor vehicle systems, engine and after treatment. The system will illuminate a malfunction indicator light on the dash console if a problem is detected.</p> <p>REPTO DRIVE A rear engine power take off will be provided to drive the water pump. A vibration dampener will be provided between the REPTO and water pump. Transmission PTO's used to drive the water pump will not be allowed due to their lower torque ratings. The rear engine power take off will be the same as used extensively throughout the construction industry. Rear engine PTO's allow for continuous 240 hp and 480 lb-ft torque ratings needed for large pump applications. The rear engine power take off will have the same warranty as the engine provided by the engine manufacturer.</p>
0001244	High Idle w/Electronic Engine, Custom	<p>HIGH IDLE A high idle switch will be provided, inside the cab, on the instrument panel, that will automatically maintain a preset engine rpm. A switch will be installed, at the cab instrument panel, for activation/deactivation. The high idle will be operational only when the parking brake is on and the truck transmission is in neutral. A green indicator light will be provided, adjacent to the switch. The light will illuminate when the above conditions are met. The light will be labeled "OK to Engage High Idle."</p>
0590300	Engine Brake, Jacobs Compression Brake, DD13	<p>ENGINE BRAKE A Jacobs® engine brake is to be installed with the controls located on the instrument panel within easy reach of the driver. The driver will be able to turn the engine brake system on/off and have a high, medium and low setting. The engine brake will be installed in such a manner that when the engine brake is slowing the vehicle the brake lights are activated. The ABS system will automatically disengage the auxiliary braking device when required.</p>
0552334	Clutch, Fan, Air Actuated, Horton Drive Master	<p>CLUTCH FAN A Horton® fan clutch will be provided. The fan clutch will be automatic when the pump transmission is in "Road" position, and fully engaged in "Pump" position.</p>
0123135	Air Intake, w/Ember separator, Imp/Vel	<p>ENGINE AIR INTAKE An air intake with an ember separator (to prevent road dirt, burning embers, and recirculating hot air from entering the engine) will be mounted at the front of the apparatus, on the passenger side of the engine. The ember separator will be mounted in the air intake with flame retardant, rotomolded polyethylene housing. It will be easily accessible by the hinged access panel at the front of the vehicle.</p>

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0565965	Exhaust System, 5", 2010 DD13, ISX engine, Horizontal, Right Side	<p>EXHAUST SYSTEM</p> <p>The exhaust system will include a diesel particulate filter (DPF) and a selective catalytic reduction (SCR) device to meet current EPA standards. The exhaust system will be routed from the turbo to the inlet of the SCR device and will be 5.00" in diameter. An insulation wrap will be provided on all exhaust pipes between the turbo and SCR to minimize the transfer of heat to the cab. The exhaust will terminate horizontally ahead of the right side rear wheels. A tailpipe diffuser will be provided to reduce the temperature of the exhaust as it exits. Heat deflector shields will be provided to isolate chassis and body components from the heat of the tailpipe diffuser.</p>
0644333	Exhaust, Modified and Flush with Body Side Rub Rail	<p>EXHAUST MODIFICATION</p> <p>The exhaust pipe will be brought out from under the body at a 90 degree angle from the truck. The tail pipe will terminate at the body side and will be flush with the body side.</p>
0787999	Radiator, Impel/Velocity	<p>RADIATOR</p> <p>The radiator and the complete cooling system will meet or exceed NFPA and engine manufacturer cooling system standards.</p> <p>For maximum corrosion resistance and cooling performance, the entire radiator core will be constructed using long life aluminum alloy. The core will be made of aluminum fins, having a serpentine design, brazed to aluminum tubes. The tubes will be brazed to aluminum headers. The radiator core will have a minimum frontal area of 1434 square inches. Supply tank made of glass-reinforced nylon and a return tank of cast aluminum alloy will be crimped on to the core assembly using header tabs and a compression gasket to complete the radiator core assembly. The radiator will be compatible with commercial antifreeze solutions.</p> <p>There will be a full steel frame around the entire radiator core assembly. The radiator core assembly will be isolated within the steel frame by rubber inserts to enhance cooling system durability and reliability. The radiator will be mounted in such a manner as to prevent the development of leaks caused by twisting or straining when the apparatus operates over uneven ground. The radiator assembly will be isolated from the chassis frame rails with rubber isolators. The radiator assembly will include an integral deaeration tank permanently mounted to the top of the radiator framework, with a readily accessible remote-mounted overflow tank. For visual coolant level inspection, the radiator will have a built-in sight glass. The radiator will be equipped with a 15 psi pressure relief cap.</p> <p>A drain port will be located at the lowest point of the cooling system and/or the bottom of the radiator to permit complete flushing of the coolant from the system.</p> <p>A heavy-duty fan will draw in fresh, cool air through the radiator. Shields or baffles will be provided to prevent recirculation of hot air to the inlet side of the radiator.</p>
0511425	Cooling Hoses, Rubber	<p>COOLANT LINES</p> <p>Gates, or Goodyear, rubber hose will be used for all engine coolant lines installed by the chassis manufacturer.</p> <p>Hose clamps will be stainless steel "constant torque type" to prevent coolant leakage. They will react to temperature changes in the cooling system and expand or contract accordingly while maintaining a constant clamping pressure on the hose.</p>
0001125	Fuel Tank, 65 Gallon, Left Side Fill	<p>FUEL TANK</p> <p>A 65 gallon fuel tank will be provided and mounted at the rear of the chassis. The tank will be constructed of 12-gauge, hot rolled steel. It will be equipped with swash partitions and a vent. To eliminate the effects of corrosion, the fuel tank will be mounted with stainless steel straps.</p> <p>A 0.75" drain plug will be located in a low point of the tank for drainage.</p> <p>A fill inlet will be located on the left hand side of the body and is covered with a hinged, spring loaded, stainless steel door that is marked "Ultra Low Sulfur - Diesel Fuel Only."</p> <p>A 0.50" diameter vent will be installed from tank top to just below fuel fill inlet.</p> <p>The fuel tank will meet all FHWA 393.67 requirements including a fill capacity of 95 percent of tank volume.</p>
0001129	Lines, Fuel	<p>All fuel lines will be provided as recommended by the engine manufacturer.</p>
0662965	DEF Tank, 4.5 Gallon, DS Fill, Rear of Axle, Common Air Bottle Door	<p>DIESEL EXHAUST FLUID TANK</p> <p>A 4.5 gallon diesel exhaust fluid (DEF) tank will be provided and mounted in the driver's side body rearward of the rear axle.</p> <p>A 0.50" drain plug will be provided in a low point of the tank for drainage.</p> <p>A fill inlet will be provided and marked "Diesel Exhaust Fluid Only". The fill inlet will be located adjacent to the air bottle storage behind a common door on the driver side of the vehicle.</p> <p>The tank will meet the engine manufacturers requirement for 10 percent expansion space in the event of tank freezing.</p> <p>The tank will include an integrated heater unit that utilizes engine coolant to thaw the DEF in the event of freezing.</p>
0552793	Not Required, Fuel Priming Pump	
0552712	Not Required, Shutoff Valve, Fuel Line	

AGENDA ITEM NO. 6.

0553019	Cooler, Engine Fuel, Imp/Vel, AXT/Qtm/Sab/DCF/SFR/Enf	FUEL COOLER An air to fuel cooler will be installed in the engine fuel return line.	AGENDA ITEM NO. 6.
0690880	No Selection Required From This Category		
0642582	Trans, Allison 5th Gen, 4000 EVS P, w/Prognostics, Imp/Vel/DCF/SFR/Enf	TRANSMISSION An Allison 5th generation, Model EVS 4000P, electronic, torque converting, automatic transmission will be provided. The transmission will be equipped with prognostics to monitor oil life, filter life, and transmission health. A wrench icon on the shift selector's digital display will indicate when service is due. Two (2) PTO openings will be located on left side and top of converter housing (positions 8 o'clock and 1 o'clock). A transmission temperature gauge with red light and buzzer will be installed on the cab instrument panel.	
0625331	Transmission, Shifter, 6-Spd, Push Button, 4000 EVS	TRANSMISSION SHIFTER A six (6)-speed push button shift module will be mounted to right of driver on console. Shift position indicator will be indirectly lit for after dark operation. The transmission ratio will be: 1st 3.51 to 1.00 2nd 1.91 to 1.00 3rd 1.43 to 1.00 4th 1.00 to 1.00 5th 0.75 to 1.00 6th 0.64 to 1.00 R 4.80 to 1.00	
0517604	Transmission Programming, Park to Neutral, PUC	TRANSMISSION PROGRAMMING The transmission will be programmed to automatically shift the transmission to neutral when the parking brake is set to simplify operation and increase operational safety.	
0684459	Transmission Oil Cooler, Modine, External	TRANSMISSION COOLER A Modine plate and fin transmission oil cooler will be provided using engine coolant to control the transmission oil temperature.	
0522824	Mode, Downshift, Aggressive downshift to 3rd, w/engine brake, 6 speed	DOWNSHIFT MODE (w/engine brake) The transmission will be provided with an aggressive downshift mode. This will provide earlier transmission downshifts to 3rd gear from 6th gear, resulting in improved engine braking performance.	
0027844	Fluid, 4000 Series Trans, Allison Approved TES-295 Synthetic, IPOS, Custom	TRANSMISSION FLUID The transmission will be provided with TranSynd, or other Allison approved TES-295 heavy duty synthetic transmission fluid.	
0001375	Driveline, Spicer 1810	DRIVELINE Drivelines will be a heavy-duty metal tube and be equipped with Spicer® 1810 universal joints. The shafts will be dynamically balanced before installation. A splined slip joint will be provided in each driveshaft where the driveline design requires it. The slip joint will be coated with Glidecoat® or equivalent.	
0669988	Steering, Sheppard M110 w/Tilt, TAK-4, Eaton Pump, w/Cooler	STEERING Dual Sheppard, Model M110, steering gears, with integral heavy-duty power steering, will be provided. For reduced system temperatures, the power steering will incorporate an air to oil cooler and an Eaton, Model VN20, hydraulic pump with integral pressure and flow control. All power steering lines will have wire braded lines with crimped fittings. A tilt and telescopic steering column will be provided to improve fit for a broader range of driver configurations.	
0001544	Not Required, Steering Assist Cylinder on Front Axle		

0509230	Steering Wheel, 4 Spoke without Controls	STEERING WHEEL The steering wheel will be 18.00" in diameter, have tilting and telescopic spoke design.	AGENDA ITEM NO. 6.
0690274	Logo/Emblem, on Dash	LOGO AND CUSTOMER DESIGNATION ON DASH The dash panel will have an emblem containing the Pierce logo and customer name. The emblem will have three (3) rows of text for the customer's department name. There will be a maximum of eight (8) characters in the first row, 11 characters in the second row and 11 characters in the third row. The first row of text will be: CLOVIS The second row of text will be: FIRE The third row of text will be: DEPARTMENT	
0123626	Bumper, 22" Extended, Imp/Vel	BUMPER A one (1) piece, ten (10) gauge, 304-2B type polished stainless steel bumper, a minimum of 10.00" high, will be attached to a bolted modular extension frame constructed of 50,000 psi tensile steel "C" channel mounted directly behind it to provide adequate support strength. The bumper will be extended 22.00" from front face of cab. Gravel Pan A gravel pan, constructed of bright aluminum treadplate, will be furnished between the bumper and cab face. The gravel pan will be properly supported from the underside to prevent flexing and vibration of the aluminum treadplate.	
0616489	Tray, Hose, Center, 22" Bumper, Inside Air Horns, 13" Deep, Imp/Vel	CENTER HOSE TRAY A hose tray, constructed of aluminum, will be placed in the center of the bumper extension. The tray will have a capacity of 50' of 5.00" double jacket cotton-polyester hose. Black rubber grating will be provided at the bottom of the tray. Drain holes are also provided.	
0630809	Cover, Aluminum Treadplate, One (1) D-Ring Latch, Hose Tray, Notched	Center Hose Tray Cover A bright aluminum treadplate cover will be provided over the center hose tray. The cover will be "notched" allowing the hose to be pre connected to hose connection. The cover will be attached with a stainless steel hinge. A D-ring latch will secure the cover in the closed position and a pneumatic stay arm will hold the cover in the open position. The arm will be opposite side as the hose notch.	
0637794	Tray, (1) Hose Left Side of Bumper, Special Capacity	LEFT SIDE HOSE TRAY A hose tray will be placed in the left side of the extended bumper. The tray will have a capacity of 100' of 1.5" double jacket with TFT nozzle with the interior fully enclosed but notched for the siren speaker - match 31721 Black rubber grating will be provided at the bottom of the tray. Drain holes will be provided.	
0630808	Cover, Aluminum Treadplate, One (1) D-Ring Latch, Hose Tray, Notched	Left Side Hose Tray Cover A bright aluminum treadplate cover will be provided over the left side hose tray. The cover will be notched to allow the hose to be pre-connected to the hose connection. The cover will be attached with a stainless steel hinge. There will be one (1) D-ring latch provided to secure the cover in the closed position and a pneumatic stay arm will hold the cover in the open position.	
0616677	Notch/Tray, "California" Style Front Inlet, Special Instructions	BUMPER NOTCH AND TRAY The front bumper will be provided with a "U" shaped notch, forward of the passenger side front inlet. The notch will provide smooth transition from the tray located forward of the inlet. Hose for the front inlet shall be carried in the center tray. Black rubber grating will be provided at the bottom of the tray. Drain holes will be provided.	
0625556	Hose Restraint, Not Required, Cover Included with Other Option		
0510226	Lift & Tow Package, Imp/Vel, AXT, Dash CF	LIFT AND TOW MOUNTS Mounted to the frame extension will be lift and tow mounts. The lift and tow mounts will be designed and positioned to adapt to certain tow truck lift systems. The lift and tow mounts with eyes will be painted the same color as the frame.	
0522573	Tow Hooks Not Required, Due to Lift and Tow Package	TOW HOOKS No tow hooks are to be provided. This truck will be equipped with a lift and tow package with integral tow eyes.	
0030312	Trim, Hose Tray, Bumper, S/S Under Front Angle	HOSE TRAY TRIM There will be stainless steel 45 degree shaped trim installed under the front angle(s) of the bumper hose tray(s) to keep hose from catching on the angle for the cover. The trim will be provided on two (2) bumper hose tray(s).	

CAB

The Velocity cab will be designed specifically for the fire service and will be manufactured by Pierce Manufacturing.

AGENDA ITEM NO. 6.

To provide quality at the source and single source customer support, the cab will be built by the apparatus manufacturer in a facility located on the manufacturer's premises.

For reasons of structural integrity and enhanced occupant protection, the cab will be of heavy duty design, constructed to the following minimal standards.

The cab will have 12 main vertical structural members located in the A-pillar (front cab corner posts), B-pillar (side center posts), C-pillar (rear corner posts) and rear wall areas. The A-pillar will be constructed of 0.25" heavy wall extrusions joined by a solid A356-T6 aluminum joint casting. The B-pillar and C-pillar will also be constructed from 0.25" heavy wall extrusions. The rear wall will be constructed of two (2) 4.00" x 2.00" outer aluminum extrusions and two (2) 3.00" x 2.00" inner aluminum extrusions. All main vertical structural members will run from the floor to 7.50" x 3.50" x 0.125" thick roof extrusions to provide a cage-like structure with the A-pillar and roof extrusions being welded into a 0.75" thick corner casting at each of the front corners of the roof assembly.

The front of the cab will be constructed of a 0.25" thick firewall, covered with a 0.125" front skin (for a total thickness of 0.38"), and reinforced with 24.50" wide x 10.00" deep x 0.50" thick supports on each side of the engine tunnel. The cross-cab support will be welded to the A-pillar, 0.25" firewall, and engine tunnel, on the left and right sides.

The cab floors will be constructed of 0.1875" thick aluminum plate and reinforced at the firewall with an additional 0.25" thick cross-floor support providing a total thickness of 0.44" of structural material at the front floor area. The front floor area will also be supported with three (3) 0.50" plates bolted together that also provides the mounting point for the cab lift. This tubing will run from the front of the cab to the 0.1875" thick engine tunnel, creating the structure to support the forces created when lifting the cab.

The cab will be a full-tilt style. A 3-point cab mount system with rubber isolators will improve ride quality by isolating chassis vibrations from the cab.

The crew cab will be a totally enclosed design with the interior area completely open to improve visibility and verbal communication between the occupants.

The forward cab section will have an overall height (from the cab roof to the ground) of approximately 102.00". The crew cab section will have a 10.00" raised roof, with an overall cab height of approximately 112.00". The raised portion will start at the most forward point of the B-pillar and continue rearward to the back of the cab. The overall height listed will be calculated based on a truck configuration with the lowest suspension weight ratings, the smallest diameter tires for the suspension, no water weight, no loose equipment weight, and no personnel weight. Larger tires, wheels, and suspension will increase the overall height listed.

The cab will have an interior width of not less than 93.50". The driver and passenger seating positions will have a minimum 24.00" clear width at knee level.

To reduce injuries to occupants in the seated positions, proper head clearance will be provided. The floor-to-ceiling height inside the forward cab will be no less than 60.25". The floor-to-ceiling height inside the crew cab will be no less than 62.95" in the center position and 68.75" in the outboard positions.

The crew cab will measure a minimum of 57.50" from the rear wall to the backside of the engine tunnel (knee level) for optimal occupant legroom.

CAB PUMP ENCLOSURE

The rear of the cab will be made to house the fire pump below the forward facing crew cab seats. The cab side panels will be notched to accommodate the pump panel.

INTERIOR CAB INSULATION

The cab walls, ceiling and engine tunnel will be insulated in all strategic locations to maximize acoustic absorption and thermal insulation. The cab will be insulated with 2.00" insulation in the rear wall, 3.00" insulation in the side walls, and 1.50" insulation in the ceiling.

FENDER LINERS

Full-circular, aluminum inner fender liners in the wheel wells will be provided.

PANORAMIC WINDSHIELD

A one (1)-piece, safety glass windshield with more than 2,802 square inches of clear viewing area will be provided. The windshield will be full width and will provide the occupants with a panoramic view. The windshield will consist of three (3) layers: the outer light, the middle safety laminate, and the inner light. The 0.114" thick outer light layer will provide superior chip resistance. The middle safety laminate layer will prevent the windshield glass pieces from detaching in the event of breakage. The inner light will provide yet another chip resistant layer. The cab windshield will be bonded to the aluminum windshield frame using a urethane adhesive. A custom frit pattern will be applied on the outside perimeter of the windshield for a finished automotive appearance.

WINDSHIELD WIPERS

Three (3) electric windshield wipers with a washer, in conformance with FMVSS and SAE requirements, will be provided. The wiper blades will be 21.65" long and together will clear a minimum of 1,783 square inches of the windshield for maximum visibility in inclement weather. The windshield washer fluid reservoir will be located at the front of the vehicle and be accessible through the access hood for simple maintenance.

FAST SERVICE ACCESS FRONT TILT HOOD

A full-width access hood will be provided for convenient access to engine coolant, steering fluid, wiper fluid, cab lift controls, headlight power modules, and ember separator. The hood will also provide complete access to the windshield wiper motor and components. The hood will be contoured to provide a sleek, automotive appearance. The hood will be constructed of two (2) fiberglass panels bonded together and will include reinforcing ribs for structural integrity. The hood will include air cylinders to hold the hood in open and closed positions, and a heavy duty latch system that will meet FMVSS 113 (Hood Latch System). The spring-loaded hood latch will be located at the center of the hood with a double-action release lever located behind the Pierce logo. The two (2)-step release requires the lever first be pulled to the driver side until the hood releases from the first latch (primary latch) then to the passenger side to fully release the hood (secondary latch).

0724237	Engine Tunnel, ISL and DD13, Mech Fasteners, Impel/Velocity FR	<p>ENGINE TUNNEL</p> <p>To provide structural strength, the engine tunnel sidewalls will be constructed with a 0.25" fire-rated steel plate that is welded to both the 0.25" firewall and 0.38" heavy wall extrusion. To maximize occupant space, the top edges will be tapered. The back of the engine tunnel will be no higher than 16.25" off the crew cab floor. The engine hood will be insulated for protection from heat and sound. Perforated foil faced insulation will be over a 1.00" thick closed cell foam affixed with pressure sensitive adhesive and further secured with mechanical fasteners. Thermal rating for this insulation will be -40 degrees Fahrenheit to 300 degrees Fahrenheit. The noise insulation keeps the dBA level within the limits stated in the current NFPA 1901 standards.</p>
0677478	Rear Wall, Exterior, Cab, Aluminum Treadplate	<p>CAB REAR WALL EXTERIOR COVERING</p> <p>The exterior surface of the rear wall of the cab will be overlaid with bright aluminum treadplate except for areas that are not typically visible when the cab is lowered.</p>
0122466	Cab Lift, Elec/Hyd, w/Manual Override, Imp/Vel	<p>CAB LIFT</p> <p>A hydraulic cab lift system will be provided, consisting of an electric-powered hydraulic pump, fluid reservoir, dual lift cylinders, remote cab lift controls and all necessary hoses and valves. The hydraulic pump will have a backup manual override, for use in the event of an electrical failure. The cab lift controls will be located at the driver side front of the cab, easily accessible under the full width front access hood. The controls will include a permanently mounted raise/lower switch. For enhanced visibility during cab tilt operations, a remote control tether with on/off switch will be supplied on a coiled cord that will extend from 2.00' (coiled) to 6.00' (extended). The cab will be capable of tilting 42 degrees and 80 degrees with crane assist to accommodate engine maintenance and removal. The cab pivots will be located 46.00" apart to provide stability while tilting the cab. The rear of the cab will be locked down by a two (2)-point, automatic, hydraulic, double hook mechanism that fully engages after the cab has been lowered (self-locking). The dual 2.25" diameter hydraulic cylinders will be equipped with a velocity fuse that protects the cab from accidentally descending when the cab is in the tilt position. For increased safety, a redundant mechanical stay arm will be provided that must be manually put in place on the driver side between the chassis and cab frame when cab is in the raised position. This device will be manually stowed to its original position before the cab can be lowered.</p> <p>Cab Lift Interlock</p> <p>The cab lift safety system will be interlocked to the parking brake. The cab tilt mechanism will be active only when the parking brake is set and the ignition switch is in the on position. If the parking brake is released, the cab tilt mechanism will be disabled.</p>
0123176	Grille, Bright Finished, Front of Cab, Impel/Velocity	<p>GRILLE</p> <p>A bright finished aluminum mesh grille screen, inserted behind a formed bright finished grille surround, will be provided on the front center of the cab, and will serve as an air intake to the radiator.</p>
0002224	Scuffplates, S/S At Cab Door Jambs, 4-Door Cab	<p>DOOR JAMB SCUFFPLATES</p> <p>All cab door jambs will be furnished with a polished stainless steel scuffplate, mounted on the striker side of the jamb.</p>
0527032	Trim, S/S Band, Across Cab Face, Rect Lights, Velocity	<p>FRONT CAB TRIM</p> <p>A band of 22 gauge polished stainless steel trim will be installed across the front of the cab, from door hinge to door hinge. The trim band will be centered on the head lights and applied with two (2)-sided tape. A 0.625" self adhesive trim strip will be applied around the perimeter of the trim band. There will be polished stainless steel corner covers provided over the painted cab corner where the cab turn signals are located.</p>
0015440	No Chrome Molding, On side of cab	
0012188	Mirrors, Velvac, 2025, Heated/Remote, w/Heated Convex	<p>MIRRORS</p> <p>Velvac®, Model 2025, low mount chrome mirrors will be mounted, one (1) on each of the cab doors. The mirror will include a replaceable 62 square inch flat glass and a 30 square inch convex glass. Overall mirror dimensions will be 8.50" wide x 13.75" high. Mirror head will have a highly polished chrome finish. Both flat mirror heads will be adjustable by an electric remote control switch inside the cab within easy reach of the driver. Convex mirror heads will be adjusted manually. The mirror heads will also be heated with the control within easy reach of the driver. The Velvac two (2)-year warranty on material and workmanship and two (2)-year warranty on chrome finish will be provided.</p>

AGENDA ITEM NO. 6.

0667921

Door, Half-Height, Velocity FR 4-Door Cab, Raised Roof

CAB DOORS
 The forward cab and crew cab doors will be the half-height style door. To egress to the cab, the forward cab doors will be a minimum of 43.59" wide. The crew cab doors will measure a minimum of 37.87" wide x 73.75" high.

The forward cab and crew cab doors will be constructed of extruded aluminum with a nominal material thickness of 0.125". The exterior door skins will be constructed from 0.090" aluminum. The forward cab door windows will include a 7.50" high x 10.00" wide drop area at the front to enhance visibility.

A customized, vertical, pull-down type door handle will be provided on the exterior of each cab door. The finish of the door handle will be chrome/black. The exterior handle will be designed specifically for the fire service to prevent accidental activation, and will provide 4.00" wide x 2.00" deep hand clearance for ease of use with heavy gloved hands.

Each door will also be provided with an interior flush, open style paddle handle that will be readily operable from fore and aft positions, and be designed to prevent accidental activation. The interior handles will provide 4.00" wide x 1.25" deep hand clearance for ease of use with heavy gloved hands.

The cab doors will be provided with both interior (rotary knob) and exterior (keyed) locks exceeding FMVSS standards. The keys will be Model 751. The locks will be capable of activating when the doors are open or closed. The doors will remain locked if locks are activated when the doors are opened, then closed.

A full length, heavy duty, stainless steel, piano-type hinge with a 0.38" pin and 11 gauge leaf will be provided on all cab doors. There will be double automotive-type rubber seals around the perimeter of the door framing and door edges to ensure a weather-tight fit.

A chrome grab handle will be provided on the inside of each cab and crew cab door. A red webbed grab handle will be installed on the crew cab door stop strap. The grab handles will be securely mounted.

The cab steps at each cab door location will be located below the cab doors and will be exposed to the exterior of the cab.

AGENDA ITEM NO. 6.

0665511

Door Panel, Brushed Stainless Steel, Impel/Velociry 4-Door Cab

Door Panels
 The inner cab door panels will be constructed out of brushed stainless steel. The cab door panels will be removable.

0671014

Face Plate/s, Blank, Overhead, Imp/Vel, Dash CF

BLANK FACE PLATE
 Blank face plate/s will be provided, in place of standard storage pockets, within the overhead console.

0667902

Controls, Electric Windows, All Cab Doors, Impel/Velociry FR

ELECTRIC WINDOW CONTROLS
 Each cab entry door will be equipped with an electrically operated tempered glass window. A window control panel will be located on the door panel within easy reach of the respective occupant. Each switch will allow intermittent or auto down operation for ease of use. Auto down operation will be actuated by holding the window down switch for approximately 1 second. The driver control panel will contain a control switch for each cab door's window. All other door control panels will contain a single switch to operate the window within that door.

The window switches will be connected directly to the battery power. This allows the windows to be raised and lowered when the battery switch is in the off position.

0662776

Electric Door Locks, Cab Doors, Conceal Switch Feature, Imp/Vel

ELECTRIC CAB DOOR LOCKS
 The front driver and passenger doors will have a door lock master switch (custom designed rotary lock knob) built into the interior door latch that will control all front and rear side exit door locks. Each rear cab door will have its own lock control. Each door will have a keyed exterior lock mechanism built into the door handle assembly.

There will be one (1) concealed switch located under the front hood next to the cab lift remote. The lock system will include two (2) key FOBs that allow for keyless entry into the vehicle. The key FOB system will use code hopping technology for high security and be FCC part 15 compliant.

0512420

Key Pad, Electric Door locks, DS & PS, Imp/Vel

KEY PAD FOR ELECTRIC DOOR LOCKS
 For improved convenience, the cab door locks will include a Trimark keypad entry system to provide complete keyless entry to the cab. There will be two (2) keypads provided, located one each side of the cab behind the front cab doors. The keypads will include visual and audio feedback to confirm activation and acknowledge correct entry code. For enhanced night time use, the keypads will be lighted. For increased security, the system will allow over 3000 possible code combinations.

0799676	Steps, 4-Door Cab, Automatic, Air, Imp/Vel	<p>STEPS, POWER</p> <p>The cab entrance steps will automatically deploy when the door is open and retract when the door is closed. Step motion will be operated by a switch on the cab door. The up and down operation of the steps. Steps will be of a robust aluminum design capable of supporting a 500 lb load when deployed, with minimal deflection. Step surfaces will be covered with aggressive slip resistant material that complies with NFPA requirements. When deployed, each step will provide vertical step spacing of approximately 14.00". Steps will be illuminated for safe entry and egress. Each step will be capable of being manually deployed or stowed in the event of a power failure.</p> <p>The air system will be integrated into the chassis air system. A redundant 12 volt compressor will be provided as a backup air source if needed.</p> <p>The vertical surface of the stowed power step mechanism will be covered with aluminum trim panels painted job color.</p>	AGENDA ITEM NO. 6.
0770194	Handrail, Exterior, Knurled, Alum, 4-Door Cab	<p>CAB EXTERIOR HANDRAILS</p> <p>A 1.25" diameter slip-resistant, knurled aluminum handrail will be provided adjacent to each cab and crew cab door opening to assist during cab ingress and egress.</p>	
0741271	Lights, Cab & Crw Cab Acs Stps, P25, LED, 4Lts, 4-Door Cab	<p>STEP LIGHTS</p> <p>There will be four (4) white LED step lights provided. There will be one (1) light installed at each cab and access crew cab door.</p> <p>In order to ensure exceptional illumination, each light will provide a minimum of 25 foot-candles (fc) covering an entire 15" x 15" square placed ten (10) inches below the light and a minimum of 1.5 fc covering an entire 30" x 30" square at the same ten (10) inch distance below the light. The lights will be activated when the adjacent door is opened.</p>	
0002140	Fenders, S/S on Cab	<p>FENDER CROWNS</p> <p>Stainless steel fender crowns will be installed at the cab wheel openings.</p>	
0592071	No Windows, Side of Crew Cab, Vel/Imp		
0568605	Not Required, Interior Trim, No Cab Side Windows		
0012090	Not Required, Windows, Front/Side of raised roof		
0509286	Not Required, Windows Rear of Crew Cab, Imp/Vel		
0558334	Not Required, Trim, Cab Rear Windows, No Rear Windows		
0786279	Window Tint, Crew Cab Door, Right Side, Privacy Dark Gray	<p>RIGHT SIDE ROLLUP CREW CAB DOOR WINDOW TINT</p> <p>The rollup window in the right side crew cab door will be tinted privacy dark gray.</p>	
0786286	Window Tint, Upper Crew Cab Door, Right Side, Privacy Dark Gray	<p>RIGHT SIDE UPPER CREW CAB DOOR WINDOW TINT</p> <p>The upper window in the right side crew cab door will be tinted privacy dark gray.</p>	
0786290	Window Tint, Crew Cab Door, Left Side, Privacy Dark Gray	<p>LEFT SIDE ROLLUP CREW CAB DOOR WINDOW TINT</p> <p>The rollup window in the left side crew cab door will be tinted privacy dark gray.</p>	
0786294	Window Tint, Upper Crew Cab Door, Left Side, Privacy Dark Gray	<p>LEFT SIDE UPPER CREW CAB DOOR WINDOW TINT</p> <p>The upper window in the left side crew cab door will be tinted privacy dark gray.</p>	
0123731	Roof, Alum 4-way, Impel/Velocity/Velocity SLT	<p>CAB ROOF TREADPLATE</p> <p>The horizontal surface of the cab roof will be covered with bright aluminum embossed treadplate. The aluminum treadplate will be bonded to the cab and cover the full width and length of the cab. Edges will be properly caulked to prevent water from leaking under the aluminum. No front or side warning lights, or any other auxiliary options, will be mounted on top of the treadplate. The treadplate will extend and terminate next to all objects mounted on the roof.</p>	
0123686	Drip Rail, Cab Roof, Impel/Velocity/Velocity SLT	<p>CAB ROOF DRIP RAIL</p> <p>For enhanced protection from inclement weather, a drip rail will be furnished on the sides of the cab. The drip rail will be constructed of bright polished extruded aluminum, and be bonded to the sides of the cab. The drip rail will extend the full length of the cab roof.</p>	

0629017	Work Surface, 3/16" Alum, Full Engine Tunnel, Lower Rear, Rear Lip, Vel/Imp FR	<p>WORK SURFACE</p> <p>There will be a work surface provided on the engine tunnel. The work surface will be constructed of .19" aluminum to allow the entire engine tunnel and will be constructed of .19" aluminum to allow the work surface will be approximately 37.00" wide x 48.00" long, with a cutout for the driver side instrument panel. The work surface will start to the rear of the center instrument panel and continue horizontally to the flat portion at the rear of the engine tunnel. The work surface will drop to the lower flat portion of the engine tunnel and finish at the end of the engine tunnel. The lower portion of the work surface will be provided with a 3.00" lip. The work surface will be painted to match the cab interior.</p>
0748673	Cab Interior, Vinyl, Scuffplate Rear Wall, Velocity FR, CARE	<p>CAB INTERIOR</p> <p>With safety as the primary objective, the wrap-around style cab instrument panel will be designed with unobstructed visibility to instrumentation. The dash layout will provide the driver with a quick reference to gauges that allows more time to focus on the road. The center console will be a high impact ABS polymer and will be easily removable. The passenger side dashboard will be constructed of painted aluminum for durability and low maintenance. For enhanced versatility, the passenger side dash will include a flat working surface.</p> <p>To provide optional (service friendly) control panels, switches and storage modules, a painted aluminum overhead console will also be provided.</p> <p>To complete the cab front interior design, painted aluminum modesty panels will be provided under the dash on both sides of the cab. The driver side modesty panel will provide mounting for the battery switch and diagnostic connectors, while the passenger side modesty panel provides a glove box, and ground access to the main electrical distribution panel via quick quarter turn fasteners.</p> <p>To provide a deluxe automotive interior, the engine tunnel and side walls will be covered by a leather grain vinyl that is resistant to oil, grease, and mildew. The rear wall will be covered with a full width, full height aluminum treadplate scuffplate.</p> <p>The headliner will be installed in both forward and rear cab sections. The headliner panel will be a composition of an aluminum panel covered with a sound barrier and upholstery.</p> <p>The cab structure will include designated raceways for electrical harness routing from the front of the cab to the rear upper portion of the cab. Raceways will be extruded in the forward door frame, floor, walls and overhead in the area where the walls meet the ceiling. The raceways located in the floor will be covered by aluminum extrusion, while the vertical and overhead raceways will be covered by painted aluminum covers. The raceways will improve harness integrity by providing a continuous harness path that eliminates wire chafing and abrasion associated with exposed wiring or routing through drilled metal holes. Harnesses will be laid in place.</p> <p>CAB INTERIOR UPHOLSTERY</p> <p>The cab interior upholstery will be 36 oz dark silver gray vinyl. All cab interior materials will meet FMVSS 302 (flammability of interior materials).</p>
0667943	Cab Interior, Paint Color, Impel/Velocity FR	<p>CAB INTERIOR PAINT</p> <p>The following metal surfaces will be painted black, vinyl textured paint:</p> <ul style="list-style-type: none"> Modesty panel in front of driver Vertical surface of dash in front of the officer (not applicable for recessed dash) Glove box in front of the officer (if applicable) Power distribution in front of the officer Rear heater vent panels <p>The remaining cab interior metal surfaces will be painted fire smoke gray, vinyl texture paint.</p>
0698741	Floor, Alum Cab & Crew Cab - 2010 AXT/Imp/Vel, Wrap Vertical Surfaces, CARE	<p>CAB FLOOR</p> <p>The cab and crew cab flooring will be constructed with bright aluminum treadplate. The vertical surfaces at the top of the step wells and the vertical area where the center floor rises will be covered with aluminum treadplate. The center floor and crew cab flat floor will wrap down the vertical surface with a one (1) piece design floor covering. The front cab floor will stop short of the wire raceway. The side of the raceway will be made of treadplate, down the vertical surface for a one (1) piece design cover. The driver and passenger sides of the crew cab floor will wrap down the vertical surface at the top of the step wells as one (1) piece.</p>

AGENDA ITEM NO. 6.

DEFROST/AIR CONDITIONING SYSTEM

A ceiling mounted combination heater, defroster and air conditioning system will be installed in the cab above the engine tunnel area.

AGENDA ITEM NO. 6.

Cab Defroster

A 54,000 BTU heater-defroster unit with 690 SCFM of air flow will be provided inside the cab. The heater-defrost will be installed in the forward portion of the cab ceiling. Air outlets will be strategically located in the cab header extrusion per the following:

One (1) adjustable will be directed towards the left side cab window

One (1) adjustable will be directed towards the right side cab window

Six (6) fixed outlets will be directed at the windshield

The defroster will be capable of clearing 98 percent of the windshield and side glass when tested under conditions where the cab has been cold soaked at 0 degrees Fahrenheit for 10 hours, and a 2 ounce per square inch layer of frost/ice has been able to build up on the exterior windshield. The defroster system will meet or exceed SAE J382 requirements.

Cab/Crew Auxiliary Heater

There will be one (1) 31,000 BTU auxiliary heater with 560 SCFM of air flow provided in each outboard rear facing seat risers with a dual scroll blower. An aluminum plenum incorporated into the cab structure used to transfer heat to the forward positions.

Air Conditioning

A 19.10 cubic inch compressor will be installed on the engine.

A roof-mounted condenser with a 78,000 BTU output at 2,400 SCFM that meets and exceeds the performance specification will be installed on the cab roof. The condenser cover to be painted to match the cab roof.

The air conditioning system will be capable of cooling the average cab temperature from 100 degrees Fahrenheit to 75 degrees Fahrenheit at 50 percent relative humidity within 30 minutes. The cooling performance test will be run only after the cab has been heat soaked at 100 degrees Fahrenheit for a minimum of 4 hours.

The evaporator unit will be installed in the rear portion of the cab ceiling over the engine tunnel.

The evaporator will include one (1) high performance heating core, one (1) high performance cooling core with (1) plenum directed to the front and one (1) plenum directed to the rear of the cab.

The evaporator unit will have a 52,000 BTU at 690 SCFM rating that meets and exceeds the performance specifications.

Adjustable air outlets will be strategically located on the forward plenum cover per the following:

Four (4) will be directed towards the seating position on the left side of the cab

Four (4) will be directed towards the seating position on the right side of the cab

Adjustable air outlets will be strategically located on the evaporator cover per the following:

Five (5) will be directed towards crew cab area

A high efficiency particulate air (HEPA) filter will be included for the system. Access to the filter cover will be secured with four (4) screws.

The air conditioner refrigerant will be R-134A and will be installed by a certified technician.

Climate Control

An automotive style controller will be provided to control the heat and air conditioning system within the cab. The controller will have three (3) functional knobs for fan speed, temperature, and air flow distribution (front to rear) control.

The system will control the temperature of the cab and crew cab automatically by pushing the center of the fan speed control knob. Rotate the center temperature control knob to set the cab and crew cab temperature.

The AC system will be manually activated by pushing the center of the temperature control knob. Pushing the center of the air flow distribution knob will engage the AC for max defrost, setting the fan speeds to 100 percent and directing all air flow to the overhead forward position.

Gravity Drain Tubes

Two (2) condensate drain tubes will be provided for the air conditioning evaporator. The drip pan will have two (2) drain tubes plumbed separately to allow for the condensate to exit the drip pan. No pumps will be provided.

0789101

Air Conditioning, Coleman-Mach 8, Roughneck, 120V, 15K Cool Only, Cab Roof, White

120 VOLT AIR CONDITIONING

There will be one (1) white, Coleman®-Mach® 8, Roughneck™, 120 volt, low profile air conditioning unit installed on the crew cab roof. The air conditioner will have cooling capacity of 15,000 BTU and include a condensate pump and hose to prevent accumulation of condensate on the roof.

A wall mounted digital thermostat will control the air conditioning unit.

The thermostat will be wired battery direct to operate when the battery switch is off.

This unit will be powered from the shoreline inlet.

INTERIOR CAB INSULATION

The walls and roof will be insulated to aid in cooling.

0639675

Sun Visor, Smoked Lexan, AXT, Dash CF, Imp/Vel, Saber FR/Enforcer

SUN VISORS

Two (2) smoked Lexan™ sun visors will be provided. The sun visors will be located above the windshield with one (1) mounted on each side of the cab.

There will be a black plastic thumb latch provided to help secure each sun visor in the stowed position.

0548173

Grab Handles, Driver and Passenger Door Post, Imp/Vel

GRAB HANDLE

A black rubber covered grab handle will be mounted on the door post of the driver side and passenger side cab door to assist in entering the cab. The grab handle will be securely mounted to the post area between the door and windshield.

0002526	Light, Engine Compt, All Custom Chassis	ENGINE COMPARTMENT LIGHT	An engine compartment light will be installed under the engine hood, of integral part. Light will have a .125" diameter hole in its lens to prevent r	AGENDA ITEM NO. 6.
0122516	Fluid Check Access, Imp/Vel	ACCESS TO ENGINE DIPSTICKS	For access to the engine oil and transmission fluid dipsticks, there will be a door on the engine tunnel, inside the crew cab. The door will be on the rear wall of the engine tunnel, on the vertical surface. The door will be 20.00" wide x 8.25" high and be flush with the wall of the engine tunnel. The engine oil dipstick will allow for checking only. The transmission dipstick will allow for both checking and filling. An additional port will be provided for filling the engine oil. The door will have a rubber seal for thermal and acoustic insulation. One (1) flush latch will be provided on the access door.	
0724066	SP Radio Cover, 14" W x 7" D x 22" H, Map box, 1 bin, Open Top/Btm	MAP BOX	A radio cover with one bin map box will be installed vertically on side of PS rear facing EMS cabinet (match job # 34758). The radio cover will be enclosed on three (3) sides, the bottom will remain open. Louvers will be provided on two (2) sides of the cover. No louvers will be provided on the front. The size will be 14.00" wide x 22.00" high x 4.00" deep. A mounting flange will be provided on three (3) sides of the radio cover to allow for easy access to the mounting hardware. A map box will be welded to the front of the radio cover. The map box will be 14.00" wide x 12.00" high x 3.00" deep. There will be no top or bottom only sides of this box. It will be constructed of .125" aluminum and will be painted to match the cab interior.	
0002508	Map Box, 3 Bin/30 deg Slant, Custom Chassis	MAP BOX	There will be one (1) map box(es) with three (3) bins, open at top. The map box(es) will be installed at final inspection. The map box(es) will be divided into three (3) bins, each being 12.50" wide x 3.00" high x 12.00" deep. Each bin will slant 30 degrees from horizontal. The map box(es) will be constructed of 0.125" aluminum and will be painted to match the cab interior.	
0583040	Frontal Impact Protection	FRONTAL IMPACT PROTECTION	The cab will be provided with a frontal impact protection system and will include the following: A supplemental restraint system (SRS) sensor will be installed on a structural cab member behind the instrument panel. The SRS sensor will perform real time diagnostics of all critical subsystems and will record sensory inputs immediately before and during a frontal impact event. A fault-indicating light will be provided on the vehicle's instrument panel allowing the driver to monitor the operational status of the SRS system. A driver side front air bag will be mounted in the steering wheel and will be designed to protect the head and upper torso of the occupant, when used in combination with the three (3)-point seat belt. A passenger side knee bolster air bag will be mounted in the modesty panel below the dash panel and will be designed to protect the legs of the occupant, when used in combination with the three (3)-point seat belt. Driver and front passenger suspension seats will be provided with devices to retract them to the lowest travel position during a frontal impact event. Driver and front passenger seat belts will be provided with pre-tensioners to remove slack from the seat belt during frontal impact event. The SRS system will provide protection during a frontal or oblique impact event. The system will activate when the vehicle decelerates at a predetermined G force known to cause injury to the occupants. The cab and chassis will have been subjected, via third party test facility, to a crash impact during frontal and oblique impact testing. Testing included all major chassis and cab components such as mounting straps for fuel and air tanks, suspension mounts, front suspension components, rear suspensions components, frame rail cross members, engine and transmission and their mounts, pump house and mounts, frame extensions and body mounts. The testing provided configuration specific information used to optimize the timing for firing the safety restraint system. The sensor will activate the pyrotechnic devices when the correct crash algorithm, wave form, is detected. The SRS system will deploy the following components in the event of a frontal or oblique impact event: Driver side front air bag. Passenger side knee bolster air bag. Driver and front passenger suspension seats will be retracted to the lowest travel position. Driver and front passenger seat belts will be pre-tensioned to firmly hold the occupant in place.	
0622618	Seating Capacity, 5 Seats	SEATING CAPACITY	The seating capacity in the cab will be five (5).	

0697006

Seat, Driver, Pierce PS6, Premium, Air Ride, High Back, Frontal Impact

DRIVER SEAT

A Pierce PS6® seat will be provided in the cab for the driver. The seat will be a cam action type, with air suspension. For increased convenience, the seat will include a manual control to adjust the rake (15 degrees), height (1.75" travel) and horizontal (7.00" travel) position. Electronic controls will be located below the forward part of the seat cushion. To provide flexibility for multiple driver configurations, the seat will have a reclining back, adjustable from 20 degrees back to 45 degrees forward. Providing for maximum comfort, the seat back will be a high back style with manual lumbar adjustment lever, for lower back support, and will include minimum 7.50" deep side bolster pads for maximum support. The lumbar adjustment lever will be easily located at the lower outboard position of the seat cushion. For optimal comfort, the seat will be provided with 17.00" deep dual density foam cushions designed with EVC (elastomeric vibration control).

AGENDA ITEM NO. 6.

The seat will include the following features incorporated into the frontal impact protection system: A suspension seat safety system will be included. When activated in the event of a frontal impact, this system will pretension the seat belt and retract the seat to its lowest travel position.

The seat will be furnished with a 3-point, shoulder type seat belt. The seat belt will be furnished with dual automatic retractors that will provide ease of operation in the normal seating position.

0696993

Seat, Officer, Pierce PS6, Premium, Air Ride, High Back, Frontal Impact

OFFICER SEAT

A Pierce PS6® seat will be provided in the cab for the passenger. The seat will be a cam action type with air suspension. For increased convenience, the seat will include a manual control to adjust the horizontal position (6.00" travel). The manual horizontal control will be a towel-bar style located below the forward part of the seat cushion. To provide flexibility for multiple passenger configurations, the seat will have a reclining back adjustable from 20 degrees back to 0 degrees forward. The seat back will be a high back style with manual lumbar adjustment lever and will include minimum 7.50" deep side bolster pads for maximum support. For optimal comfort, the seat will be provided with 17.00" deep dual density foam cushions designed with EVC (elastomeric vibration control). To ensure safe operation, the seat will be equipped with seat belt sensors in the seat cushion and belt receptacle that will activate an alarm indicating a seat is occupied but not buckled.

The seat will include the following feature incorporated into the frontal impact protection system: A suspension seat safety system will be included. When activated, this system will pretension the seat belt and retract the seat to its lowest travel position.

The seat will be furnished with a 3-point, shoulder type seat belt. The seat belt will be furnished with dual automatic retractors that will provide ease of operation in the normal seating position.

0002517

Not Required, Radio Compartment

0761642

SP

Cabinet, Rear Facing, LS, 24 W x 32 H x 30.5 D, Radius, Ext Acc, Imp/Vel

REAR FACING LEFT SIDE CABINET

A rear facing cabinet will be provided in the crew cab at the left side outboard position with interior and exterior access.

The cabinet will be 24.00" wide x 32.00" high x 30.50" deep with one (1) Amdor rollup door with anodized finish, non-locking, radius track style. That is, it will travel over the top and down the back of the cabinet. Front top corners of the cabinet will be radiused. This will allow access through the front and top section of the cabinet. A shield will be installed to keep items in this cabinet from falling into the door tracking area and jamming the door. The frame to frame opening will be 18.50" wide x 31.75" high. The minimum clear door opening will be 15.75" wide x 29.00" high.

The cabinet will include one (1) infinitely adjustable shelf with a 0.75" flanged down lippainted to match the cab interior.

The cabinet will include no louvers.

The cabinet will also provide exterior access with one (1) double pan door painted to match the cab exterior with a locking D-ring latch with #751 key. A pneumatic stay arm will be provided as a door stop. The clear door opening will 19.75" wide x 28.00" high.

The exterior access will be provided with a polished stainless steel scuffplate on the lower door frame.

The cabinet will be constructed of smooth aluminum and painted to match the cab interior.

Cabinet Light

There will be one (1) white Amdor LED strip light installed on the left side of the exterior cabinet door opening. The lights will be controlled by an automatic door switch.

0102783

Not Required, Seat, Rr Facing C/C, Center

0723976	SP	Cabinet, Rear Facing, RS, 21.5 W x 32 H x 30.5 D, Radius, Ext Acc, Imp/Vel	<p>REAR FACING RIGHT SIDE CABINET</p> <p>A rear facing cabinet will be provided in the crew cab at the right side of the cab. The cabinet will be 21.50" wide x 32.00" high x 30.50" deep with one (1) anodized finish, non-locking, radius track style. That is, it will travel over the top and down the back of the compartment. Front top corners of the compartment will be radiused. This will allow access through the front and top section of the compartment. A shield will be installed to keep items in this cabinet from falling into the door tracking area and jamming the door. The frame to frame opening will be 16.50" wide x 31.75" high. The minimum clear door opening of the cabinet will be 13.75" wide x 29.25" high.</p> <p>The cabinet will include one (1) infinitely adjustable shelf with a 0.75" flanged down lippainted to match the cab interior.</p> <p>The cabinet will include no louvers.</p> <p>The cabinet will also provide access from outside the cab with one (1) double pan door painted to match the cab exterior with a locking D-ring latch with #751 key. A pneumatic stay arm will be provided as a door stop. The exterior clear door opening will be 14.50" wide x 28.00" high. The door will be located on the side of the cab over the wheelwell.</p> <p>The exterior access will be provided with a polished stainless steel scuffplate on the lower door frame.</p> <p>The cabinet will be constructed of smooth aluminum and painted to match the cab interior.</p> <p>Cabinet Light</p> <p>There will be one (1) white Amdor LED strip light installed on the right side of the exterior cabinet door opening. The lighting will be controlled by an automatic door switch.</p>	AGENDA ITEM NO. 6.
0199330		Seat, Forward Facing C/C, DS Outboard, Pierce PS6, Base, SCBA, Foldup	<p>FORWARD FACING DRIVER SIDE OUTBOARD SEAT</p> <p>There will be one (1) forward facing, Pierce PS6® foldup seat provided at the driver side outboard position in the crew cab. To provide improved ride comfort, and maximize accessibility to the crew cab, the seat will be a minimum of 15.00" from the front of the cushion to the face of the seat back and the seat back will be provided with 0 degree fixed recline angle. To ensure safe operation, the seat will be equipped with seat belt sensors in the seat cushion and belt receptacle, that will activate an alarm indicating a seat is occupied but not buckled.</p> <p>The seat back will be an SCBA back style. The SCBA cavity will be adjustable from front to rear in 1.00" increments, to accommodate different sized SCBA cylinders. Moving the SCBA cavity will be accomplished by unbolting, relocating, and re-bolting it in the desired location.</p> <p>The seat will be furnished with a 3-point, shoulder type seat belt. The seat belt will be furnished with dual automatic retractors that will provide ease of operation in the normal seating position.</p>	
0123166		Seat, Forward Facing C/C, Center, (1) Pierce PS6, Premium, Hi-Back	<p>FORWARD FACING CENTER SEAT</p> <p>There will be one (1) forward facing, Pierce PS6® seat provided at the center position in the crew cab. The seat back will be a high back style with 7.5 degree fixed recline angle, and will include minimum 7.50" deep side bolster pads for maximum support. For optimal comfort, the seat will be provided with 17.00" deep dual density foam cushions designed with EVC (elastomeric vibration control). To ensure safe operation, the seat will be equipped with seat belt sensors in the seat cushion and belt receptacle that will activate an alarm indicating a seat is occupied but not buckled.</p> <p>The seat will be furnished with a 3-point, shoulder type seat belt. The seat belt will be furnished with dual automatic retractors that will provide ease of operation in the normal seating position.</p>	
0199329		Seat, Forward Facing C/C, PS Outboard, Pierce PS6, Base, SCBA, Foldup	<p>FORWARD FACING PASSENGER SIDE OUTBOARD SEAT</p> <p>There will be one (1) forward facing, foldup, Pierce PS6® seat provided at the passenger side outboard position in the crew cab. To provide improved ride comfort, and maximize accessibility to the crew cab, the seat will be a minimum of 15.00" from the front of the cushion to the face of the seat back and the seat back will be provided with 0 degree fixed recline angle. To ensure safe operation, the seat will be equipped with seat belt sensors in the seat cushion and belt receptacle, that will activate an alarm indicating a seat is occupied but not buckled.</p> <p>The seat back will be an SCBA back style. The SCBA cavity will be adjustable from front to rear in 1.00" increments, to accommodate different sized SCBA cylinders. Moving the SCBA cavity will be accomplished by unbolting, relocating, and re-bolting it in the desired location.</p> <p>The seat will be furnished with a 3-point, shoulder type seat belt. The seat belt will be furnished with dual automatic retractors that will provide ease of operation in the normal seating position.</p>	
0726634	SP	Guard, Radius Door Curve, EMS Cabinet	<p>GUARD</p> <p>There will be one (1) guard, designed to protect the curve of a radius roll-up door from damage while retracting. The guard will be provided above the standard guard in each EMS compartment located One (1) DS EMS Cabinet One (1) PS EMS Cabinet. There will be a total of two (2) guard (s) provided.</p> <p>The guard will be painted to match the cabinet interior.</p>	
0723980	SP	Location, Cabinet Light	<p>LIGHT MOUNTING LOCATION</p> <p>There will be two (2) light(s) mounted One (1) DS EMS Cabinet One (1) PS EMS Cabinet in DS EMS Cabinet - LS of cabinet (from the exterior door looking into the cabinet) Mounted between the shelf track and roll-up door track, light facing rearward towards back of cab. PS EMS Cabinet - RS of cabinet (from the exterior door looking into the ca compartment(s)).</p>	

0644702	Compt, Storage, (2) Rear Facing, Overhead, 22 W x 10 H x 20 D, Imp/Vel FR	<p>REAR FACING OVERHEAD STORAGE COMPARTMENT</p> <p>There will be two (2) overhead rear facing storage compartments installed within the crew cab, on each side of the air conditioner. The compartments will be 22.00" wide x 10.00" high x 20.00" deep at the bottom. Each compartment will include one (1) lift up compartment door. Non-locking latch, paddle handle, and gas operated stay arms will be provided. The compartment will be constructed of smooth aluminum and painted to match the cab interior.</p> <p>COMPARTMENT LIGHT</p> <p>The storage compartment lighting will consist of one (1) white LED strip light installed horizontally above each compartment door opening.</p>
0766467	Upholstery, Seats In Cab, All Vinyl, Seats Inc, CARE	<p>SEAT UPHOLSTERY</p> <p>All seat upholstery will be leather grain 36 oz dark silver gray vinyl resistant to oil, grease and mildew. The cab will have five (5) seating positions.</p>
0543991	Bracket, Air Bottle, Hands-Free II, Cab Seats	<p>AIR BOTTLE HOLDERS</p> <p>All SCBA type seats in the cab will have a "Hands-Free" auto clamp style bracket in its backrest. For efficiency and convenience, the bracket will include an automatic spring clamp that allows the occupant to store the SCBA bottle by simply pushing it into the seat back. For protection of all occupants in the cab, in the event of an accident, the inertial components within the clamp will constrain the SCBA bottle in the seat and will exceed the NFPA standard of 9G. There will be a quantity of two (2) SCBA brackets.</p>
0603221	Seat Belt, ReadyReach, Extended Shoulder Belt Length	<p>SEAT BELTS</p> <p>All seating positions in the cab, crew cab and tiller cab (if applicable) will have red seat belts. To provide quick, easy use for occupants wearing bunker gear, the female buckle and seat belt webbing length will meet or exceed the current edition of NFPA 1901 and CAN/ULC - S515 standards. The shoulder belt web length will be 120.00". The 3-point shoulder type seat belts will also include the ReadyReach D-loop assembly to the shoulder belt system. The ReadyReach feature adds an extender arm to the D-loop location placing the D-loop in a closer, easier to reach location. Any flip up seats will include a 3-point shoulder type belts only.</p>
0604864	Seat Belt Height Adjustment, 5 Seats, Imp/Vel, Dash CF	<p>SHOULDER HARNESS HEIGHT ADJUSTMENT</p> <p>All seating positions furnished with 3-point shoulder type seat belts will include a height adjustment. This adjustment will optimize the belts effectiveness and comfort for the seated firefighter. A total of five (5) seating positions will have the adjustable shoulder harness.</p>
0602464	Helmet Storage, Provided by Fire Department, NFPA 2016	<p>HELMET STORAGE PROVIDED BY FIRE DEPARTMENT</p> <p>NFPA 1901, 2016 edition, section 14.1.7.4.1 requires a location for helmet storage be provided. There is no helmet storage on the apparatus as manufactured. The fire department will provide a location for storage of helmets.</p>
0647647	Lights, Dome, FRP Dual LED 4 Lts	<p>CAB DOME LIGHTS</p> <p>There will be four (4) dual LED dome lights with black bezels provided. Two (2) lights will be mounted above the inside shoulder of the driver and officer and two (2) lights will be installed and located, one (1) on each side of the crew cab. The color of the LED's will be red and white. The white LED's will be controlled by the door switches and the lens switch. The color LED's will be controlled by the lens switch. In order to ensure exceptional illumination, each white LED dome light will provide a minimum of 10.1 foot-candles (fc) covering an entire 20.00" x 20.00" square seating position when mounted 40.00" above the seat.</p>
0628472	Light, Map, Overhead, Peterson M371S LED, Rectangular w/Switch 2lts	<p>OVERHEAD MAP LIGHTS</p> <p>There will be two (2) Peterson, Model M371S, rectangular LED adjustable map lights installed in the cab: One (1) overhead in front of the driving position. One (1) overhead in front of the passenger's position. Each light will include a switch on the light housing. The light switches will be connected directly to the battery switched power.</p>
0602637	Portable Hand Light, Provided by Fire Dept, Pumper NFPA 2016 Classification	<p>PORTABLE HAND LIGHTS, PROVIDED BY FIRE DEPARTMENT</p> <p>NFPA 1901, 2016 edition, section 5.9.4 requires two portable hand lights mounted in brackets fastened to the apparatus. The hand lights are not on the apparatus as manufactured. The fire department will provide and mount these hand lights.</p>
0568369	Cab Instruments, Ivory Gauges, Chrome Bezels, Impel/Velocity 2010, Dash CF	<p>CAB INSTRUMENTATION</p> <p>The cab instrument panel will consist of gauges, an LCD display, telltale indicator lights, alarms, control switches, and a diagnostic panel. The function of instrument panel controls and switches will be identified by a label adjacent to each item. Actuation of the headlight switch will illuminate</p>

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the labels in low light conditions. Telltale indicator lamps will not be illuminated unless necessary. The cab instruments and controls will be conveniently located within the directly forward of the driver. Gauge and switch panels will be designed of service and low cost of ownership.

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Gauges

The gauge panel will include the following ten (10) ivory gauges with chrome bezels to monitor vehicle performance:

Voltmeter gauge (Volts)

Low volts (11.8 VDC)

Amber indicator on gauge assembly with alarm

High volts (15 VDC)

Amber indicator on gauge assembly with alarm

Very low volts (11.3 VDC)

Amber indicator on gauge assembly with alarm

Very high volts (16 VDC)

Amber indicator on gauge assembly with alarm

Tachometer (RPM)

Speedometer (Primary (outside) MPH, Secondary (inside) Km/H)

Fuel level gauge (Empty - Full in fractions)

Low fuel (1/8 full)

Amber indicator on gauge assembly with alarm

Very low fuel (1/32) fuel

Amber indicator on gauge assembly with alarm

Engine oil pressure gauge (PSI)

Low oil pressure to activate engine warning lights and alarms

Red indicator on gauge assembly with alarm

Front air pressure gauge (PSI)

Low air pressure to activate warning lights and alarm

Red indicator on gauge assembly with alarm

Rear air pressure gauge (PSI)

Low air pressure to activate warning lights and alarm

Red indicator on gauge assembly with alarm

Transmission oil temperature gauge (Fahrenheit)

High transmission oil temperature activates warning lights and alarm

Amber indicator on gauge assembly with alarm

Engine coolant temperature gauge (Fahrenheit)

High engine temperature activates an engine warning light and alarm

Red indicator on gauge assembly with alarm

Diesel Exhaust Fluid Level Gauge (Empty - Full in fractions)

Low fluid (1/8 full)

Amber indicator on gauge assembly with alarm

All gauges and gauge indicators will perform prove out at initial power-up to ensure proper performance.

Indicator Lamps

To promote safety, the following telltale indicator lamps will be integral to the gauge assembly and are located above and below the center gauges. The indicator lamps will be "dead-front" design that is only visible when active. The colored indicator lights will have descriptive text or symbols.

The following amber telltale lamps will be present:

Low coolant

Trac cntl (traction control) (where applicable)

Check engine

Check trans (check transmission)

Aux brake overheat (Auxiliary brake overheat)

Air rest (air restriction)

Caution (triangle symbol)

Water in fuel

DPF (engine diesel particulate filter regeneration)

Trailer ABS (where applicable)

Wait to start (where applicable)

HET (engine high exhaust temperature) (where applicable)

ABS (antilock brake system)

MIL (engine emissions system malfunction indicator lamp) (where applicable)

SRS (supplemental restraint system) fault (where applicable)

DEF (low diesel exhaust fluid level)

The following red telltale lamps will be present:

Warning (stop sign symbol)

Seat belt

Parking brake

Stop engine

Rack down

The following green telltale lamps will be provided:

Left turn

Right turn

Battery on

The following blue telltale lamp will be provided:

High beam

Alarms

Audible steady tone warning alarm: A steady audible tone alarm will be provided whenever a warning message is present.

Audible pulsing tone caution alarm: A pulsing audible tone alarm (chime/chirp) will be provided whenever a caution message is present without a warning message being present.

Alarm silence: Any active audible alarm will be able to be silenced by holding the ignition switch at the top position for 3 to 5 seconds. For improved safety, silenced audible alarms will intermittently chirp every 30 seconds until the alarm condition no longer exists. The intermittent chirp will act as a reminder to the operator that a caution or warning condition still exists. Any new warning or caution condition will enable the steady or pulsing tone

respectively.

Indicator Lamp and Alarm Prove-Out

Telltale indicators and alarms will perform prove-out at initial power performance.

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Control Switches

For ease of use, the following controls will be provided immediately adjacent to the cab instrument panel within easy reach of the driver.

Emergency master switch: A molded plastic push button switch with integral indicator lamp will be provided. Pressing the switch will activate emergency response lights and siren control. A green lamp on the switch provides indication that the emergency master mode is active. Pressing the switch again disables the emergency master mode.

Headlight / Parking light switch: A three (3)-position maintained rocker switch will be provided. The first switch position will deactivate all parking lights and the headlights. The second switch position will activate the parking lights. The third switch position will activate the headlights.

Panel backlighting intensity control switch: A three (3)-position momentary rocker switch will be provided. The first switch position decreases the panel backlighting intensity to a minimum level as the switch is held. The second switch position is the default position that does not affect the backlighting intensity. The third switch position increases the panel backlighting intensity to a maximum level as the switch is held.

The following standard controls will be integral to the gauge assembly and are located below the right hand gauges. All switches have backlit labels for low light applications.

High idle engagement switch: A two (2)-position momentary rocker switch with integral indicator lamp will be provided. The first switch position is the default switch position. The second switch position will activate and deactivate the high idle function when pressed and released. The "Ok To Engage High Idle" indicator lamp must be active for the high idle function to engage. A green indicator lamp integral to the high idle engagement switch will indicate when the high idle function is engaged.

"Ok To Engage High Idle" indicator lamp: A green indicator light will be provided next to the high idle activation switch to indicate that the interlocks have been met to allow high idle engagement.

The following standard controls will be provided adjacent to the cab gauge assembly within easy reach of the driver. All switches will have backlit labels for low light applications.

Ignition switch: A three (3)-position maintained/momentary rocker switch will be provided. The first switch position will deactivate vehicle ignition. The second switch position will activate vehicle ignition. The third momentary position will disable the Command Zone audible alarm if held for 3 to 5 seconds. A green indicator lamp will be activated with vehicle ignition.

Engine start switch: A two (2)-position momentary rocker switch will be provided. The first switch position is the default switch position. The second switch position will activate the vehicle's engine. The switch actuator is designed to prevent accidental activation.

4-way hazard switch: A two (2)-position maintained rocker switch will be provided. The first switch position will deactivate the 4-way hazard switch function. The second switch position will activate the 4-way hazard function. The switch actuator will be red and includes the international 4-way hazard symbol.

Heater, defroster, and air conditioning control panel.

Turn signal arm: A self-canceling turn signal with high beam headlight and windshield wiper/washer controls will be provided. The windshield wiper control will have high, low, and intermittent modes.

Parking brake control: An air actuated push/pull park brake control valve will be provided.

Chassis horn control: Activation of the chassis horn control will be provided through the center of the steering wheel.

Custom Switch Panels

The design of cab instrumentation will allow for emergency lighting and other switches to be placed within easy reach of the operator thus improving safety. There will be positions for up to four (4) switch panels in the overhead console on the driver's side, up to four (4) switch panels in the engine tunnel console facing the driver, up to four (4) switch panels in the overhead console on the officer's side and up to two (2) switch panels in the engine tunnel console facing the officer. All switches will have backlit labels for low light applications.

Diagnostic Panel

A diagnostic panel will be accessible while standing on the ground and located inside the driver's side door left of the steering column. The diagnostic panel will allow diagnostic tools such as computers to connect to various vehicle systems for improved troubleshooting providing a lower cost of ownership. Diagnostic switches will allow ABS systems to provide blink codes should a problem exist.

The diagnostic panel will include the following:

Engine diagnostic port

Transmission diagnostic port

ABS diagnostic port

SRS diagnostic port (where applicable)

Command Zone USB diagnostic port

ABS diagnostic switch (blink codes flashed on ABS telltale indicator)

Diesel particulate filter regeneration switch (where applicable)

Diesel particulate filter regeneration inhibit switch (where applicable)

Cab LCD Display

A digital four (4)-row by 20-character dot matrix display will be integral to the gauge panel. The display will be capable of showing simple graphical images as well as text. The display will be split into three (3) sections. Each section will have a dedicated function.

The upper left section will display the outside ambient temperature.

The upper right section will display, along with other configuration specific information:

Odometer

Trip mileage

PTO hours

Fuel consumption

Engine hours

The bottom section will display INFO, CAUTION, and WARNING messages. Text messa

will automatically activate to describe the cause of an audible caution or warning alarm. The LCD will be capable of displaying multiple text messages should a caution or warning condition exist.

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0509511	Air Restriction Indicator, Imp/Vel, AXT, Dash CF, Enf MUX	AIR RESTRICTION INDICATOR A high air restriction warning indicator light LCD message with amber warning indicator and audible alarm will be provided.
0543751	Light, Do Not Move Apparatus	"DO NOT MOVE APPARATUS" INDICATOR A flashing red indicator light, located in the driving compartment, will be illuminated automatically per the current NFPA requirements. The light will be labeled "Do Not Move Apparatus If Light Is On." The same circuit that activates the Do Not Move Apparatus indicator will activate a steady tone alarm when the parking brake is released.
0509042	Messages, Open Dr/DNMT, Color Dsply,	DO NOT MOVE TRUCK MESSAGES Messages will be displayed on the Command Zone™, color display located within sight of the driver whenever the Do Not Move Truck light is active. The messages will designate the item or items not in the stowed for vehicle travel position (parking brake disengaged). The following messages will be displayed (where applicable): Do Not Move Truck DS Cab Door Open (Driver Side Cab Door Open) PS Cab Door Open (Passenger's Side Cab Door Open) DS Crew Cab Door Open (Driver Side Crew Cab Door Open) PS Crew Cab Door Open (Passenger's Side Crew Cab Door Open) DS Body Door Open (Driver Side Body Door Open) PS Body Door Open (Passenger's Side Body Door Open) Rear Body Door Open DS Ladder Rack Down (Driver Side Ladder Rack Down) PS Ladder Rack Down (Passenger Side Ladder Rack Down) Deck Gun Not Stowed Lt Tower Not Stowed (Light Tower Not Stowed) Fold Tank Not Stowed (Fold-A-Tank Not Stowed) Aerial Not Stowed (Aerial Device Not Stowed) Stabilizer Not Stowed Steps Not Stowed Handrail Not Stowed Any other device that is opened, extended, or deployed that creates a hazard or is likely to cause major damage to the apparatus if the apparatus is moved will be displayed as a caution message after the parking brake is disengaged.
0611681	Switching, Cab, Membrane, Impel/Velocity/Quantum, Dash CF, AXT WiFi MUX	SWITCH PANELS The emergency light switch panel will have a master switch for ease of use plus individual switches for selective control. Each switch panel will contain eight (8) membrane-type switches each rated for one million (1,000,000) cycles. Panels containing less than eight (8) switch assignments will include non-functioning black appliques. Documentation will be provided by the manufacturer indicating the rated cycle life of the switches. The switch panel(s) will be located in the overhead position above the windshield on the driver side overhead to allow for easy access. Additional switch panel(s) will be located in the overhead position(s) above the windshield or in designated locations on the lower instrument panel layout. The switches will be membrane-type and also act as an integral indicator light. For quick, visual indication the entire surface of the switch will be illuminated white whenever back lighting is activated and illuminated green whenever the switch is active. An active illuminated switch will flash when interlock requirements are not met or device is actively being load managed. For ease of use, a two (2)-ply, scratch resistant laser engraved Gravoply label indicating the use of each switch will be placed in the center of the switch. The label will allow light to pass through the letters for ease of use in low light conditions.
0555915	Wiper Control, 2-Speed with Intermittent, MUX, Impel/Velocity	WIPER CONTROL For simple operation and easy reach, the windshield wiper control will be an integral part of the directional light lever located on the steering column. The wiper control will include high and low wiper speed settings, a one (1)-speed intermittent wiper control and windshield washer switch. The control will have a "return to park" provision, which allows the wipers to return to the stored position when the wipers are not in use.
0547505	Wiring, Spare, 10 A 12V DC 1st	SPARE CIRCUIT There will be one (1) pair of wires, including a positive and a negative, installed on the apparatus. The above wires will have the following features: The positive wire will be connected directly to the ignition switched power. The negative wire will be connected to ground. Wires will be protected to 10 amps at 12 volts DC. Power and ground will terminate coiled behind panel position B overhead and labeled "Mobile Radio Repeater". Termination will be with heat shrinkable butt splicing. Wires will be sized to 125 percent of the protection. This circuit(s) may be load managed when the parking brake is applied.

0548004	Wiring, Spare, 15 A 12V DC 1st	<p>SPARE CIRCUIT There will be two (2) pair of wires, including a positive and a negative, in The above wires will have the following features: The positive wire will be connected directly to the battery power The negative wire will be connected to ground Wires will be protected to 15 amps at 12 volts DC Power and ground will terminate officer side dash area and on the officer's side of the engine tunnel Termination will be with 15 amp, power point plug with rubber cover Wires will be sized to 125 percent of the protection The circuit(s) may be load managed when the parking brake is set.</p>
0548006	Wiring, Spare, 15 A 12V DC 2nd	<p>SPARE CIRCUIT There will be four (4) pair of wires, including a positive and a negative, installed on the apparatus. The above wires will have the following features: The positive wire will be connected directly to the battery power. The negative wire will be connected to ground. Wires will be protected to 15 amps at 12 volts DC. Power and ground will terminate (1) each side of forward facing crew cab seat base, one (1) behind the officer's seat and one (1) behind the driver's seat. Termination will be with heat shrinkable butt splicing. Wires will be sized to 125 percent of the protection. This circuit(s) may be load managed when the parking brake is set.</p>
0548007	Wiring, Spare, 15 A 12V DC 3rd	<p>SPARE CIRCUIT There will be one (1) pair of wires, including a positive and a negative, installed on the apparatus. The above wires will have the following features: The positive wire will be connected directly to the battery power. The negative wire will be connected to ground. Wires will be protected to 15 amps at 12 volts DC. Power and ground will terminate behind the officer's seat (this will be for the TIC and handheld charger). Termination will be with heat shrinkable butt splicing. Wires will be sized to 125 percent of the protection. This circuit(s) may be load managed when the parking brake is set.</p>
0548009	Wiring, Spare, 20 A 12V DC 1st	<p>SPARE CIRCUIT There will be one (1) pair of wires, including a positive and a negative, installed on the apparatus. The above wires will have the following features: The positive wire will be connected directly to the battery power The negative wire will be connected to ground Wires will be protected to 20 amps at 12 volts DC Power and ground will terminate Officers side dash, coiled behind dash near power point for customer installed MDT Termination will be with heat shrinkable butt splicing Wires will be sized to 125% of the protection This circuit(s) may be load managed when the parking brake is set.</p>
0598394	Wiring, Spare, 30 A 12V DC, 6 Circuit Fuse Block, Blue Sea 5025 1st	<p>SPARE CIRCUIT There will be one (1) pair of wires, including a positive and a negative, installed on the apparatus. The above wires will have the following features: The positive wire will be connected directly to the battery power. The negative wire will be connected to ground. Wires will be protected to 30 amps at 12 volts DC. Power and ground will terminate Under Radio Compartment/map box cover on RS RF EMS located forward and as high as possible (need room under this for Pierce installed radio transceiver and CTF mobile repeater). Termination will be to a Blue Sea System, Model 5025, 6 circuit with negative bus bar. The terminal block will include a cover with circuit labels. Wires will be sized to 125% of the protection. This circuit(s) may be load managed when the parking brake is set.</p>
0628991	Wiring, Spare, 30 A 12V DC, 12 Circuit Fuse Block, Blue Sea 5026 1st	<p>SPARE CIRCUIT There will be one (1) pair of wires, including a positive and a negative, installed on the apparatus. The above wires will have the following features: The positive wire will be connected directly to the battery power. The negative wire will be connected to ground. Wires will be protected to 30 amps at 12 volts DC. Power and ground will terminate in RS1 on left wall inboard of 120 volt inverter receptacle (side by side with receptacle if possible). Termination will be to a Blue Sea System, Model 5026, 12 circuit with negative bus bar. The terminal block will include a cover with circuit labels. Wires will be sized to 125% of the protection. This circuit(s) may be load managed when the parking brake is set.</p>

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0797189

Wiring, Spare, 4.8 A 12V DC, USB Termination Blue Sea 1045 1st

SPARE CIRCUIT

There will be one (1) dual USB fast charge socket mounts installed on the
The above wires will have the following features:
The positive wire will be connected directly to the battery power.
The negative wire will be connected to ground.
Wires will be protected to 4.8 amps at 12 volts DC.
The USB socket mount will be Mounted flush on the vertical surface of the three (3) inch down turned lip of the upper engine tunnel work surface. On the drivers side as far back towards the rear corner as possible facing outboard towards the EMS cabinet. (see ref. photo provided).
Termination will be a Blue Sea Systems part number 1045 dual USB charger socket.
Wires will be sized to 125% of the protection.
This circuit(s) may be load managed when the parking brake is applied.

AGENDA ITEM NO. 6.

0566101

Recess, Dash Panel, Officer Side, Vel/Imp

DASH PANEL RECESS

The dash panel across from the officer will be recessed to accommodate the mounting of miscellaneous items. The recess will be 7.25" down x 7.81" back and 20.88" wide.

0643196

Radio, AM/FM/CD/WB, Jensen, Front Aux In / USB / Bluetooth

STEREO RADIO

A Jensen, heavy duty AM/FM/CD/Weatherband stereo radio, with front auxiliary input will be installed within reach of the officer . There will be 5.25" speakers installed one (1) pair of 5.25" speakers in the cab and one (1) pair of 5.25" speakers in the crew cab. The antenna will be a roof-mounted rubber antenna located in an open space, on the cab roof .
The following features will be included:
CD Player with Electronic Skip Protection (ESP)
Full 7-Channel NOAA Weatherband Tuner with SAME technology
Built-in Clock
Audio CD, CD-R, R/W, MP3 CD compatible
Radio Broadcast Data System Text Display
Front panel USB input
Front and Rear Auxiliary Audio Input
Receives audio (A2DP/AVRCP) from Bluetooth enabled device
Supports Bluetooth HFP to receive phone calls from BT-enabled phones
Low battery alert (<10.8Vdc)
Heavy Duty design with Conformal Coated Circuit Boards for maximum durability under all conditions

0679284

Switch, 12V (Inst Pnl), AM/FM Radio, Off Switch, Auto On

SWITCH, MASTER, AM/FM RADIO

There will be a remote switch provided inside the cab to control the AM/FM radio. The switch will be installed Switch Panel 8, top row, far right switch.. The radio will automatically turn on when the battery switch is turned on.

0615386

Vehicle Information Center, 7" Color Display, Touchscreen, MUX

INFORMATION CENTER

An information center employing a 7.00" diagonal touch screen color LCD display will be encased in an ABS plastic housing.
The information center will have the following specifications:
Operate in temperatures from -40 to 185 degrees Fahrenheit
An Optical Gel will be placed between the LCD and protective lens
Five weather resistant user interface switches
Grey with black accents
Sunlight Readable
Linux operating system
Minimum of 1000nits rated display
Display can be changed to an available foreign language
A LCD display integral to the cab gauge panel will be included as outlined in the cab instrumentation area.
Programmed to read US Customary

General Screen Design

Where possible, background colors will be used to provide "At a Glance" vehicle information. If information provided on a screen is within acceptable limits, a green background will be used. If a caution or warning situation arises the following will occur:
An amber background/text color will indicate a caution condition
A red background/text color will indicate a warning condition
The information center will utilize an "Alert Center" to display text messages for audible alarm tones. The text messages will be written to identify the item(s) causing the audible alarm to sound. If more than one (1) text message occurs, the messages will cycle every second until the problem(s) have been resolved. The background color for the "Alert Center" will change to indicate the severity of the "warning" message. If a warning and a caution condition occur simultaneously, the red background color will be shown for all alert center messages.
A label for each button will exist. The label will indicate the function for each active button for each screen. Buttons that are not utilized on specific screens will have a button label with no text or symbol.

Home/Transit Screen

This screen will display the following:
Vehicle Mitigation (if equipped)
Water Level (if the water level system includes compatible communications to the information center)
Foam Level (if the foam level system includes compatible communications to the information center)
Seat Belt Monitoring Screen
Tire Pressure Monitoring (if equipped)
Digital Speedometer

Active Alarms

On Scene Screen

This screen will display the following and will be auto activated with purp

- Battery Voltage
- Fuel
- Oil Pressure
- Coolant Temperature
- RPM
- Water Level (if equipped)
- Foam Level (if equipped)
- Foam Concentration (if equipped)
- Water Flow Rate (if equipped)
- Water Used (if equipped)
- Active Alarms

Virtual Buttons

There will be four (4) virtual switch panel screens that match the overhead and lower lighting and HVAC switch panels.

Page Screen

The page screen will display the following and allow the user to progress into other screens for further functionality:

- Diagnostics
- Faults
- Listed by order of occurrence
- Allows to sort by system
- Interlock
- Throttle Interlocks
- Pump Interlocks (if equipped)
- Aerial Interlocks (if equipped)
- PTO Interlocks (if equipped)
- Load Manager

A list of items to be load managed will be provided. The list will provide a description of the load. The lower the priority numbers the earlier the device will be shed should a low voltage condition occur.

The screen will indicate if a load has been shed (disabled) or not shed.

"At a glance" color features are utilized on this screen.

Systems

- Command Zone
- Module type and ID number
- Module Version
- Input or output number
- Circuit number connected to that input or output
- Status of the input or output
- Power and Constant Current module diagnostic information
- Foam (if equipped)
- Pressure Controller (if equipped)
- Generator Frequency (if equipped)

Live Data

- General Truck Data
- Maintenance
- Engine oil and filter
- Transmission oil and filter
- Pump oil (if equipped)
- Foam (if equipped)
- Aerial (if equipped)

Setup

- Clock Setup
- Date & Time
- 12 or 24 hour format
- Set time and date
- Backlight
- Daytime
- Night time
- Sensitivity
- Unit Selection
- Home Screen
- Virtual Button Setup
- On Scene Screen Setup
- Configure Video Mode
- Set Video Contrast
- Set Video Color
- Set Video Tint
- Do Not Move

The screen will indicate the approximate location and type of item that is open or is not stowed for travel. The actual status of the following devices will be indicated

- Driver Side Cab Door
- Passenger's Side Cab Door
- Driver Side Crew Cab Door
- Passenger's Side Crew Cab Door
- Driver Side Body Doors
- Passenger's Side Body Doors
- Rear Body Door(s)
- Ladder Rack (if applicable)
- Deck Gun (if applicable)
- Light Tower (if applicable)
- Hatch Door (if applicable)
- Stabilizers (if applicable)
- Steps (if applicable)
- Notifications

View Active Alarms
Shows a list of all active alarms including date and time of the occurrence
alarm
Silence Alarms - All alarms are silenced
Timer Screen
HVAC (if equipped)
Tire Information (if equipped)
Ascendant Set Up Confirmation (if equipped)
Button functions and button labels may change with each screen.

0734857 Collision Mitigation, HAAS Alert (R2V), HA5

COLLISION MITIGATION

There will be a HAAS Alert®, Model HA5 Responder-to-Vehicle (R2V) collision avoidance system provided on the apparatus. The HA5 cellular transponder module will be installed behind the cab windshield, as high and near to the center as practical, to allow clear visibility to the sky. The module dimensions are 5.40" long x 2.70" wide x 1.30" high, and operating temperature range is -40 degree C to 85 degree C. The transponder will be connected to the vehicle's emergency master circuit and battery direct power and ground. While responding with emergency lights on, the HA5 transponder sends alert messages via cellular network to motorists in the vicinity of the responding truck that are equipped with the WAZE app. While on scene with emergency lights on, the HA5 transponder sends road hazard alerts to motorists in the vicinity of the truck that are equipped with the WAZE app. The HA5 Responder-to-Vehicle (R2V) collision avoidance system will include the transponder and a 5 year cellular plan subscription. Activation of the HAAS Alert system requires a representative of the customer to accept the End User License Agreement (EULA) via an on-line portal.

0606248 Vehicle Data Recorder w/CZ Display Seat Belt Monitor, Unique Alarm

VEHICLE DATA RECORDER

There will be a vehicle data recorder (VDR) capable of reading and storing vehicle information provided. The information stored on the VDR can be downloaded through a USB port mounted in a convenient location determined by cab model. A USB cable can be used to connect the VDR to a laptop to retrieve required information. The program to download the information from the VDR will be available to download on-line. The vehicle data recorder will be capable of recording the following data via hardwired and/or CAN inputs:
Vehicle Speed - MPH
Acceleration - MPH/sec
Deceleration - MPH/sec
Engine Speed - RPM
Engine Throttle Position - % of Full Throttle
ABS Event - On/Off
Seat Occupied Status - Yes/No by Position
Seat Belt Buckled Status - Yes/No by Position
Master Optical Warning Device Switch - On/Off
Time - 24 Hour Time
Date - Year/Month/Day

Seat Belt Monitoring System

A seat belt monitoring system (SBMS) will be provided on the Command Zone™ color display. The SBMS will be capable of monitoring up to 10 seating positions indicating the status of each seat position per the following:
Seat Occupied & Buckled = Green LED indicator illuminated
Seat Occupied & Unbuckled = Red LED indicator with audible alarm
No Occupant & Buckled = Red LED indicator with audible alarm
No Occupant & Unbuckled = No indicator and no alarm
The seat belt monitoring screen will become active on the Command Zone color display when:
The home screen is active:
and there is any occupant seated but not buckled or any belt buckled with an occupant.
and there are no other Do Not Move Apparatus conditions present. As soon as all Do Not Move Apparatus conditions are cleared, the SBMS will be activated. The SBMS will include an audible alarm that will warn that an unbuckled occupant condition exists and the parking brake is released, or the transmission is not in park. The alarm will have a unique sound that shall be different than all other alarm sounds on the vehicle. A "Seat Belt Alarm" label will be provided above this buzzer.

0596662 Intercom, Sigtronics US-67S, 6-Pos, 3-Radio, D,O,3C,P

INTERCOM SYSTEM

A six (6) position Sigtronics, Model US-67S, intercom with single radio transmit capability for the driver, officer, and pump operator will be provided. Three (3) crew cab, at three (3) forward facing seats will have radio listen / intercom only capability. System includes:
One (1) US-67S Intercom master station
Five (5) Headset jacks in blue boxes (Driver, Officer, 3 Crew)
One (1) Headset jack in blue box w/splash cover (Pump Panel)
Three (3) Push-To-Transmit buttons in blue boxes (Driver, Officer, Pump Panel)
All necessary cabling

0006288	Cable, Radio to Intercom Interface, Sigtronics, 1 Radio	RADIO / INTERCOM INTERFACE CABLE The apparatus manufacturer will supply and install one (1) radio interface the vehicle. The radio equipment to be used by the customer will be: Bendix King , Model number KNG M150 .	AGENDA ITEM NO. 6.
0568105	Headset, Sigtronics, SE-8 Under Helmet, Flex Mic, Standard	HEADSET, UNDER HELMET There will be four (4) Sigtronics, Model SE-8, under helmet, standard headset(s) provided Driver, Officer, DS outboard and PS outboard seats. Each headset will feature: Coiled cord with single nickel coated plug Noise cancelling electret microphone with wind muff Flexible microphone boom rotates 180 degrees for left or right dress Gel filled earseals Volume control 24 dB noise reduction	
0681408	Hangers For Headsets, NFPA, Each	HEADSET HANGERS There will be four (4) headset hanger(s) installed driver's seat, officer's seat, driver's side outboard forward facing seat and passenger's side outboard forward facing seat. The hanger(s) will meet NFPA 1901, Section 14.1.11, requirement for equipment mounting.	
0559156	Install Customer Provided Two-Way Radio(s)	TWO WAY RADIO INSTALLATION There will be one (1) customer supplied two way radio(s) sent to the apparatus manufacturers preferred radio installer to be installed remote head in panel position #5 with transceiver on EMS cabinet wall behind officer seat as low as possible (match 33607) per the shipping document. No antenna mount or whip will be included in this option. Specific radio shipping requirements will be followed.	
0736417	Install Customer Provided Two-Way Radio(s), Single Remote Head	TWO WAY RADIO INSTALLATION There will be one (1) customer supplied two way radio(s) with a single remote head sent to the apparatus manufacturers preferred radio installer to be installed mounted on RS RF EMS cabinet, inside radio/map cover as low and rearward as possible (under this cover is also a Pierce provided blue Sea fuse panel and a CTF radio repeater.) per the shipping document. The remote radio head will be located Remote Head at switch panel Position B . No antenna mount or whip will be included in this option. Specific shipping requirements will be followed.	
0003757	Antenna, Std and Add'l Mts Only, 2-way Radio,Cust,Spl Cable Routing	RADIO ANTENNA MOUNT There will be four (4) standard antenna-mounting base(s), Model MATM, with 17 feet of coax cable and weatherproof cap provided for a two (2)-way radio installation. The standard mount will be located on the cab roof, just to the rear of the officer seat and the additional mount(s) will be located on the cab roof, please maintain 18" behind the lightbar and 18" in between mounts. The cable(s) will be routed (1) connected to BK transceiver, (2) routed behind officer seat for CTF Kenwood radio and (1) spare antenna routed behind officer seat. .	
0540118	Camera, Safety Vision, Driver Mux, Rear Camera Only	VEHICLE CAMERA SYSTEM There will be a color vehicle camera system provided with the following: One (1) camera located at the rear of the apparatus, pointing rearward, displayed automatically with the vehicle in reverse The camera images will be displayed on the driver's vehicle information center display. Audio from the microphone on the active camera will be via an amplified speaker with volume control located behind the driver seat. The following components will be included: One (1) Safety Vision, Model 620 camera One (1) Amplified speaker (if applicable) All necessary cables	
0637350	SP Recess, Rear Vision Camera, Painted	RECESS REAR CAMERA The rear camera located above B1 same as 31721 will be recessed. The recess will be painted job color.	
0640009	SP Camera Activation Switch, Mux, Rear Camera	CAMERA SWITCH There will be one (1) manual activation multiplexed switch located in the cab Per Instrument Panel Layout for activation of the rear camera on the driver's vehicle information center display.	
0615100	Pierce Command Zone, Advanced Electronics & Control System, Diag LEDs, Vel, WiFi	ELECTRICAL POWER CONTROL SYSTEM The primary power distribution will be located forward of the officer's seating position and be easily accessible while standing on the ground for simplified maintenance and troubleshooting. Additional electrical distribution centers will be provided throughout the vehicle to house the vehicle's electrical power, circuit protection, and control components. The electrical distribution centers will be located strategically throughout the vehicle to minimize wire length. For ease of maintenance, all electrical distribution centers will be easily accessible. All distribution centers containing fuses, circuit breakers and/or relays will be easily accessible.	

Distribution centers located throughout the vehicle will contain battery powered studs for supplying customer installed equipment thus providing a lower cost of ownership. Circuit protection devices, which conform to SAE standards, will be utilized. All circuit protection devices will be rated per NFPA requirements to prevent component damage when subjected to extreme current overload. General protection circuit breakers will be Type-I automatic reset (continuously resetting). When required, automotive type fuses will be utilized to protect electronic equipment. Control relays and solenoid will have a direct current rating of 125 percent of the maximum current for which the circuit is protected per NFPA.

Solid-State Control System

A solid-state electronics based control system will be utilized to achieve advanced operation and control of the vehicle components. A fully computerized vehicle network will consist of electronic modules located near their point of use to reduce harness lengths and improve reliability. The control system will comply with SAE J1939-11 recommended practices.

The control system will operate as a master-slave system whereas the main control module instructs all other system components. The system will contain patented Mission Critical software that maintains critical vehicle operations in the unlikely event of a main controller error. The system will utilize a Real Time Operating System (RTOS) fully compliant with OSEK/VDX™ specifications providing a lower cost of ownership.

For increased reliability and simplified use the control system modules will include the following attributes:

Green LED indicator light for module power

Red LED indicator light for network communication stability status

Control system self test at activation and continually throughout vehicle operation

No moving parts due to transistor logic

Software logic control for NFPA mandated safety interlocks and indicators

Integrated electrical system load management without additional components

Integrated electrical load sequencing system without additional components

Customized control software to the vehicle's configuration

Factory and field re programmable to accommodate changes to the vehicle's operating parameters

Complete operating and troubleshooting manuals

USB connection to the main control module for advanced troubleshooting

To assure long life and operation in a broad range of environmental conditions, the solid-state control system modules will meet the following specifications:

Module circuit board will meet SAE J771 specifications

Operating temperature from -40C to +70C

Storage temperature from -40C to +70C

Vibration to 50g

IP67 rated enclosure (Totally protected against dust and also protected against the effect of temporary immersion between 15 centimeters and one (1) meter)

Operating voltage from eight (8) volts to 16 volts DC

The main controller will activate status indicators and audible alarms designed to provide warning of problems before they become critical.

Circuit Protection and Control Diagram

Copies of all job-specific, computer network input and output (I/O) connections will be provided with each chassis. The sheets will indicate the function of each module connection point, circuit protection information (where applicable), wire numbers, wire colors and load management information.

On-Board Advanced/Visual Electrical System Diagnostics

The on-board information center will include the following diagnostic information:

Text description of active warning or caution alarms

Simplified warning indicators

Amber caution indication with intermittent alarm

Red warning indication with steady tone alarm

All control system modules, with the exception of the main control module, will contain on-board visual diagnostic LEDs that assist in troubleshooting. The LEDs will be enclosed within the sealed, transparent module housing near the face of the module. One LED for each input or output will be provided and will illuminate whenever the respective input or output is active. Color-coded labels within the modules will encompass the LEDs for ease of identification. The LED indicator lights will provide point of use information for reduced troubleshooting time without the need for an additional computer.

Tech Module with WiFi

An in cab module will provide WiFi wireless interface and data logging capability. The WiFi interface will comply with IEEE 802.11 b/g/n capabilities while communicating at 2.4 Gigahertz.

The module will provide an external antenna connection allowing a line of site communication range of up to 300 feet with a roof mounted antenna.

The module will transmit a password protected web page to a WiFi enabled device (i.e. most smart phones, tablets or laptops) allowing two levels of user interaction. The firefighter level will allow vehicle monitoring of the vehicle and firefighting systems on the apparatus. The technician level will allow diagnostic access to inputs and outputs installed on the Command Zone™, control and information system.

The data logging capability will record faults from the engine, transmission, ABS and Command Zone™, control and information systems as they occur. No other data will be recorded at the time the fault occurs. The data logger will provide up to 2 Gigabytes of data storage.

A USB connection will be provided on the Tech Module. It will provide a means to download data logger information and update software in the device.

Prognostics

A software based vehicle tool will be provided to predict remaining life of the vehicles critical fluid and events.

The system will send automatic indications to the Command Zone, color display and/or wireless enabled device to proactively alert of upcoming service intervals.

Prognostics will include:

Engine oil and filter

Transmission oil and filter

Pump oil (if equipped)

Foam oil (if equipped)

Aerial oil and filter (if equipped)

Advanced Diagnostics

An advanced, Windows-based, diagnostic software program will be provided for the vehicle's electrical system. The software will provide troubleshooting tools to service technicians on a Windows-based computer or wireless enabled device. The service and maintenance software will be easy to understand and use and have the ability to view system input/output (I/O) information.

AGENDA ITEM NO. 6.

Indicator Light and Alarm Prove-Out System

A system will be provided which automatically tests basic indicator lights and alarms located on the cab instrument panel.

Voltage Monitor System

A voltage monitoring system will be provided to indicate the status of the battery system connected to the vehicle's electrical load. The system will provide visual and audible warning when the system voltage is below or above optimum levels.

The alarm will activate if the system falls below 11.8 volts DC for more than two (2) minutes.

Dedicated Radio Equipment Connection Points

There will be three (3) studs provided in the primary power distribution center located in front of the officer for two-way radio equipment.

The studs will consist of the following:
12-volt 40-amp battery switched power
12-volt 60-amp ignition switched power
12-volt 60-amp direct battery power

There will also be a 12-volt 100-amp ground stud located in or adjacent to the power distribution center.

Enhanced Software

The solid-state control system will include the following software enhancements:

All perimeter lights and scene lights (where applicable) will be deactivated when the parking brake is released.

Cab and crew cab dome lights will remain on for 10 seconds for improved visibility after the doors close. The dome lights will dim after 10 seconds or immediately if the vehicle is put into gear.

Cab and crew cab perimeter lights will remain on for 10 seconds for improved visibility after the doors close. The dome lights will dim after 10 seconds or immediately if the vehicle is put into gear.

EMI/RFI Protection

To prevent erroneous signals from crosstalk contamination and interference, the electrical system will meet, at a minimum, SAE J551/2, thus reducing undesired electromagnetic and radio frequency emissions. An advanced electrical system will be used to ensure radiated and conducted electromagnetic interference (EMI) or radio frequency interference (RFI) emissions are suppressed at their source.

The apparatus will have the ability to operate in the electromagnetic environment typically found in fire ground operations to ensure clean operations. The electrical system will meet, without exceptions, electromagnetic susceptibility conforming to SAE J1113/25 Region 1, Class C EMR for 10KHz-1GHz to 100 Volts/Meter. The vehicle OEM, upon request, will provide EMC testing reports from testing conducted on an entire apparatus and will certify that the vehicle meets SAE J551/2 and SAE J1113/25 Region 1, Class C EMR for 10KHz-1GHz to 100 Volts/Meter requirements.

EMI/RFI susceptibility will be controlled by applying appropriate circuit designs and shielding. The electrical system will be designed for full compatibility with low-level control signals and high-powered two-way radio communication systems. Harness and cable routing will be given careful attention to minimize the potential for conducting and radiated EMI/RFI susceptibility.

0624254

Electrical System, Velocity

ELECTRICAL

All 12-volt electrical equipment installed by the apparatus manufacturer will conform to modern automotive practices. All wiring will be high temperature crosslink type. Wiring will be run, in loom or conduit, where exposed and have grommets where wire passes through sheet metal.

Automatic reset circuit breakers will be provided which conform to SAE Standards. Wiring will be color, function and number coded. Function and number codes will be continuously imprinted on all wiring harness conductors at 2.00" intervals. Exterior exposed wire connectors will be positive locking, and environmentally sealed to withstand elements such as temperature extremes, moisture and automotive fluids.

Electrical wiring and equipment will be installed utilizing the following guidelines:

All holes made in the roof will be caulked with silicon. Large fender washers, liberally caulked, will be used when fastening equipment to the underside of the cab roof.

Any electrical component that is installed in an exposed area will be mounted in a manner that will not allow moisture to accumulate in it. Exposed area will be defined as any location outside of the cab or body.

Electrical components designed to be removed for maintenance will not be fastened with nuts and bolts. Metal screws will be used in mounting these devices. Also a coil of wire will be provided behind the appliance to allow them to be pulled away from mounting area for inspection and service work.

Corrosion preventative compound will be applied to all terminal plugs located outside of the cab or body. All non-waterproof connections will require this compound in the plug to prevent corrosion and for easy separation (of the plug).

All lights that have their sockets in a weather exposed area will have corrosion preventative compound added to the socket terminal area.

All electrical terminals in exposed areas will have silicon (1890) applied completely over the metal portion of the terminal.

All lights and reflectors, required to comply with Federal Motor Vehicle Safety Standard #108, will be furnished. Rear identification lights will be recessed mounted for protection. Lights and wiring mounted in the rear bulkheads will be protected from damage by installing a false bulkhead inside the rear compartments.

An operational test will be conducted to ensure that any equipment that is permanently attached to the electrical system is properly connected and in working order.

The results of the tests will be recorded and provided to the purchaser at time of delivery.

0098841	Batteries, (6) Deka Grp 31, 1000 CCA each, Threaded Stud	<p>BATTERY SYSTEM Six (6) 12 volt, Deka, Model 1231MF, maintenance free group 31 batteries following features, each, will be provided: 1000 CCA (cold cranking amps) 185 reserve capacity High cycle Ref. CA of 1190 at 0 degrees Fahrenheit 185 reserve capacity Threaded studs</p>	AGENDA ITEM NO. 6.
0008621	Battery System, Single Start, All Custom Chassis	<p>BATTERY SYSTEM There will be a single starting system with an ignition switch and starter button provided and located on the cab instrument panel. MASTER BATTERY SWITCH There will be a master battery switch provided within the cab within easy reach of the driver to activate the battery system. An indicator light will be provided on the instrument panel to notify the driver of the status of the battery system.</p>	
0123174	Battery Compartment, Imp/Vel	<p>BATTERY COMPARTMENTS The batteries will be stored in well-ventilated compartments that are located under the cab and bolted directly to the chassis frame. The battery compartments will be constructed of 3/16" steel plate and be designed to accommodate a maximum of three (3) group 31 batteries in each compartment. The compartments will include formed fit heavy-duty roto-molded polyethylene battery tray inserts with drains on each side of the frame rails. The batteries will be mounted inside of the roto-molded trays. JUMPER STUDS One (1) set of battery jumper studs with plastic color-coded covers will be installed on the battery box on the driver's side. This will allow enough room for easy jumper cable access.</p>	
0528020	Not Required at Battery, Receptacle, Battery Charging, w/Inverter & Charger		
0012778	No Pick Required, Battery Charger Location		
0530960	Not Required, Remote Battery Charger Indicator		
0782026	Shoreline, 20A 120V, Blue Sea Sure Eject 7851	<p>SHORELINE INLET There will be one (1) Blue Sea Sure Eject™ part number 7851, 20 amp 120 volt AC shoreline inlet provided to operate the dedicated 120 volt AC circuits on the apparatus. The shoreline will be connected to inverter. The shoreline inlet cover color to be red. The connector body will be released from the inlet when the apparatus engine start button is activated. There will be a mating connector body supplied with the loose equipment. There will be a label installed near the inlet(s) that state the following: Line Voltage Current Rating (amps) Phase Frequency</p>	
0026800	Shoreline Location	The shoreline receptacle will be located on the driver side of cab, to the front of cab door.	
0760950	SP Shoreline Inlet, 20A 120V Blue Sea Sure Eject 7851	<p>SHORELINE INLET There will be one (1) Blue Sea Sure Eject™ part number 7851, 20 amp 120 volt AC shoreline inlet provided to operate the dedicated 120 volt AC circuits on the apparatus. The shoreline will be left front cab corner below primary shoreline, see signed AD . The shoreline will be connected to the RV style crew cab air conditioner on the blue shoreline exclusively and no auto transfer switch required. The shoreline inlet cover color to be blue. The connector body will be released from the inlet when the apparatus engine start button is activated. There will be a mating connector body supplied with the loose equipment. There will be a label installed near the inlet(s) that state the following: Line Voltage Current Rating (amps) Phase Frequency</p>	

0647728	Alternator, 430 amp, Delco Remy 55SI	<p>ALTERNATOR A Delco Remy®, Model 55SI, alternator will be provided. It will have a rated output of 430 amps, as measured by SAE method J56. The alternator will feature an internal rectifier system that has been tested and qualified to an ambient temperature of 201 degrees Fahrenheit (125 degrees Celsius). The alternator will be connected to the power and ground distribution system with heavy-duty cables sized to carry the full rated alternator output.</p>
AGENDA ITEM NO. 6.		
0604586	SP Relocate, Rear Command Zone Power Distribution, Vert, Behind Fuel Tank, High	<p>RELOCATE, REAR COMMAND ZONE POWER DISTRIBUTION The command zone modules at the rear of the truck will be relocated to behind the fuel tank. The module will be mounted vertical and as high as possible.</p>
0686615	Set Command Zone Clock To Pacific Standard Time	
0092582	Load Manager/Sequencer, MUX	<p>ELECTRONIC LOAD MANAGER An electronic load management (ELM) system will be provided that monitors the vehicles 12-volt electrical system, automatically reducing the electrical load in the event of a low voltage condition, and automatically restoring the shed electrical loads when a low voltage condition expires. This ensures the integrity of the electrical system. For improved reliability and ease of use, the load manager system will be an integral part of the vehicle's solid state control system requiring no additional components to perform load management tasks. Load management systems which require additional components will not be allowed. The system will include the following features: System voltage monitoring. A shed load will remain inactive for a minimum of five minutes to prevent the load from cycling on and off. Sixteen available electronic load shedding levels. Priority levels can be set for individual outputs. High Idle to activate before any electric loads are shed and deactivate with the service brake. If enabled: "Load Man Hi-Idle On" will display on the information center. Hi-Idle will not activate until 30 seconds after engine start up. Individual switch "on" indicator to flash when the particular load has been shed. The information center indicates system voltage. The information center, where applicable, includes a "Load Manager" screen indicating the following: Load managed items list, with priority levels and item condition. Individual load managed item condition: ON = not shed SHED = shed</p> <p>SEQUENCER A sequencer will be provided that automatically activates and deactivates vehicle loads in a preset sequence thereby protecting the alternator from power surges. This sequencer operation will allow a gradual increase or decrease in alternator output, rather than loading or dumping the entire 12 volt load to prolong the life of the alternator. For improved reliability and ease of use, the load sequencing system will be an integral part of the vehicle's solid state control system requiring no additional components to perform load sequencing tasks. Load sequencing systems which require additional components will not be allowed. Emergency light sequencing will operate in conjunction with the emergency master light switch. When the emergency master switch is activated, the emergency lights will be activated one by one at half-second intervals. Sequenced emergency light switch indicators will flash while waiting for activation. When the emergency master switch is deactivated, the sequencer will deactivate the warning light loads in the reverse order. Sequencing of the following items will also occur, in conjunction with the ignition switch, at half-second intervals: Cab Heater and Air Conditioning Crew Cab Heater (if applicable) Crew Cab Air Conditioning (if applicable) Exhaust Fans (if applicable) Third Evaporator (if applicable)</p>
0783153	Headlights, Rect LED, JW Spkr Evo 2, AXT/DCF/Enf/Imp/Sab/Vel	<p>HEADLIGHTS There will be four (4) JW Speaker®, Model 8800, 4" x 6" rectangular LED lights mounted in the front quad style, chrome housing on each side of the cab grille: the outside light on each side will contain a part number 055***1 low beam module the inside light on each side will contain a part number 055***1 high beam module the headlights to include chrome bezels The low beam lights will be activated when the headlight switch is on. The high beam and low beam lights will be activated when the headlight switch and the high beam switch is activated.</p>
0648425	Light, Directional, Wln 600 Cmb, Cab Crn, Imp/Vel/AXT/Qtm/DCF	<p>DIRECTIONAL LIGHTS There will be two (2) Whelen 600® series, LED combination directional/marker lights provided. The lights will be located on the outside cab corners, next to the headlights. The color of the lenses will be the same color as the LED's.</p>

0620054	Light, Directional/Marker, Intermediate, Weldon 9186-8580-29 LED 2lts	INTERMEDIATE LIGHT There will be two (2) Weldon, Model 9186-8580-29, amber LED turn signal furnished, one (1) each side, in the rear fender panel. The light will double as a marker light.	AGENDA ITEM NO. 6.
0648074	Lights, Clearance/Marker/ID, Front, P25 LED 7 Lts	CAB CLEARANCE/MARKER/ID LIGHTS There will be seven (7) amber LED lights provided to indicate the presence and overall width of the vehicle in the following locations: Three (3) amber LED identification lights will be installed in the center of the cab above the windshield. Two (2) amber LED clearance lights will be installed, one (1) on each outboard side of the cab above the windshield. Two (2) amber LED marker lights will be installed, one (1) on each side above the cab doors.	
0796870	SP Lights, Clearance/Marker/ID, Rear, FRP LED Bar & Truck-Lite 33050R LED 4Lts, PUC	REAR CLEARANCE/MARKER/ID LIGHTING There will be a three (3) LED light bar used as identification lights located at the rear of the apparatus per the following: As close as practical to the vertical centerline Centers spaced not less than 6.00" or more than 12.00" apart Red in color All at the same height There will be two (2) Truck-Lite®, Model 33050R, LED lights installed at the rear of the apparatus used as clearance lights located at the rear of the apparatus per the following: To indicate the overall width of the vehicle One (1) each side of the vertical centerline As near the top as practical Red in color To be visible from the rear All at the same height There will be two (2) Truck-Lite, Model 33050R, LED lights installed on the side of the apparatus used as marker lights located as close to the rear as practical per the following: To indicate the overall length of the vehicle One (1) each side of the vertical centerline As near the top as practical Red in color To be visible from the side All at the same height Two (2) red reflectors located on the rear of the truck facing to the rear. One (1) each side, as far to the outside as practical, at a minimum of 15.00", but no more than 60.00", above the ground. Two (2) red reflectors located on the side of the truck facing to the side. One (1) each side, as far to the rear as practical, at a minimum of 15.00", but no more than 60.00", above the ground. Per FMVSS 108 and CMVSS 108 requirements.	
0517025	Lights, Tail, Wrap-around, Stop/Tail, Turn & Backup LED, Tri-Cluster	REAR FMVSS LIGHTING There will be two (2) wrap around tri-cluster LED modules provided on the face of the rear body compartments. Each tri-cluster will include the following: One (1) LED stop/tail light One (1) LED directional light One (1) LED backup light	
0085910	Lights, Backup Included in Signal Cluster		
0664481	Bracket, License Plate & Light, P25 LED	LICENSE PLATE BRACKET There will be one (1) license plate bracket mounted on the rear of the body. A white LED light will illuminate the license plate. A stainless steel light shield will be provided over the light that will direct illumination downward, preventing white light to the rear.	
0589905	Alarm, Back-up Warning, PRECO 1040	BACK-UP ALARM A PRECO, Model 1040, solid-state electronic audible back-up alarm that actuates when the truck is shifted into reverse will be provided. The device will sound at 60 pulses per minute and automatically adjust its volume to maintain a minimum ten (10) dBA above surrounding environmental noise levels.	
0768459	Lights, Perimeter Cab, Amdor AY-LB-12HW012 LED 4Dr, Pwr Step, Vel/Imp	CAB PERIMETER SCENE LIGHTS There will be four (4) Amdor Model AY-LB-12HW012, 190 lumen, 12.00" long, white LED lights provided under the cab and crew cab access areas: One (1) for the driver's access. One (1) for the passenger's side front cab access door. One (1) for the passenger's side crew cab access door. One (1) for the driver's side crew cab access door. These lights will be activated automatically when the battery switch is on and the exit doors are opened or by the same means as the body perimeter scene lights.	

0769559	Lights, Perimeter Pump House, Amdor AY-LB-12HW012 LED 2lts	PUMP HOUSE PERIMETER LIGHTS There will be two (2) Amdor, Model AY-LB-12HW012, 190 lumens each weatherproof strip lights with brackets provided under the pump panel front to rear as much as possible, one (1) each side. The lights will be activated when the battery switch is on, and controlled by the same means as the body perimeter lights.
0769560	Lights, Perimeter Body, Amdor AY-LB-12HW012 LED 2lts, Rear Step	BODY PERIMETER SCENE LIGHTS There will be two (2) Amdor, Model AY-LB-12HW012, 190 lumens each, 12.00" 12 volt DC LED strip lights provided at the rear step area of the body, one (1) each side shining to the rear. The perimeter scene lights will be activated when a switch within reach of the driver is activated and the parking brake is applied.
0557322	Lights, Step, P25 at Rear Tailboard, PUC, 4lts Perm Lts	STEP LIGHTS There will be four (4) white LED step lights provided at the rear to illuminate the tailboard/step area. In order to ensure exceptional illumination, each light will provide a minimum of 25 foot-candles (fc) covering an entire 15" x 15" square placed ten (10) inches below the light and a minimum of 1.5 fc covering an entire 30" x 30" square at the same ten (10) inch distance below the light. These step lights will be actuated with the perimeter scene lights. All other steps on the apparatus will be illuminated per the current edition of NFPA 1901.
0674004	Lights, Side Scene, WIn M9LZC Gradient LED, 4th	SCENE LIGHTS There will be one (1) Whelen, Model M9LZC, LED scene light(s) with chrome flange(s) installed on the side of the apparatus, on the officer's side of the cab above the "Billy Bronco" emblem. A control for the light(s) selected above will be the following: from the passenger's side body scene light option control opening the passenger's side cab or crew cab doors no additional switch location no additional switch location These lights may be load managed when the parking brake is set.
0698584	Lights, Side Scene, WIn M9LZC Gradient LED, 3rd	SCENE LIGHTS There will be one (1) Whelen, Model M9LZC LED scene light(s) with chrome flange(s) installed on the side of the apparatus, on the driver's side of the cab above the "Billy Bronco" emblem. A control for the light(s) selected above will be the following: from the driver's side body scene light option control opening the driver's side cab or crew cab doors no additional switch location no additional switch location These lights may be load managed when the parking brake is set.
0698585	Lights, Side Scene, WIn M9LZC Gradient LED, 2nd,	SCENE LIGHTS There will be two (2) Whelen, Model M9LZC LED scene light(s) with chrome flange(s) installed on the side of the apparatus, on the passenger side at both upper corners of the body. A control for the light(s) selected above will be the following: a switch at the pump operator's panel a switch at the driver's side switch panel no additional switch location no additional switch location These lights may be load managed when the parking brake is set.
0698589	Lights, Side Scene, WIn M9LZC Gradient LED, 1st	SIDE SCENE LIGHTS There will be two (2) Whelen®, Model M9LZC, LED scene light(s) with Model M9FC, chrome flange(s) installed on the side of the apparatus, one (1) high and forward on driver's side body and one (1) high and rearward on driver's side body. A control for the light(s) selected above will be the following: a switch at the pump operator's panel a switch at the driver's side switch panel no additional switch location no additional switch location These lights may be load managed when the parking brake is applied.
0776357	Light, Visor, WIn, 12V P*H2* Pioneer, Cnt Feature, 1st	12 VOLT LIGHTING There will be one (1) Whelen® Model P*H2*, 17,750 lumens 12 volt DC light(s) with a combination of flood and spot optics provided on the front visor, centered. The housing(s) painted parts of this light assembly to be white. The light(s) will be controlled by a switch at the driver's side switch panel and by a switch at the driver's side pump panel. These light(s) may be load managed when the parking brake is applied.
0532358	Not Required, Deck Lights, Other Hose Bed & Rear Lighting	

AGENDA ITEM NO. 6.

0645873	Lights, Hose Bed, Sides, Dual LED Light Strips, Amdor XX9951 4lts	<p>HOSE BED LIGHTS</p> <p>There will be four (4) Amdor LumaBar SuperBright, Model XX9951, 20.0 LED light strips provided to light the hose bed area. These lights will be length stainless steel shield to protect the lights and wiring.</p> <p>One (1) will be installed on the driver's side, side of the hose bed three (3) feet from the front of the hose bed.</p> <p>One (1) will be installed on the driver's side, side of the hose bed three (3) feet from the rear of the hose bed.</p> <p>One (1) will be installed on the passenger's side, side of the hose bed three feet from the rear of the hose bed.</p> <p>One (1) will be installed on the passenger's side, side of the hose bed three (3) feet from the front of the hose bed.</p> <p>The lights will be controlled when the hosebed cover is raised.</p>
0645677	Lights, Not Required, Rear Work, Alt. 12 Volt Lights At Rear Body	
0709438	Light, Walking Surf, FRP Flood, LED	<p>WALKING SURFACE LIGHT</p> <p>There will be Model FRP, 4" round black 12 volt DC LED floodlight(s) with bolt mount provided to illuminate the entire designated walking surface on top of the body.</p> <p>The light(s) will be activated when the body step lights are on.</p>
0518282	Pumper, PUC, Aluminum	
0554271	Body Skirt Height, 20"	
0619844	SP Tank, Water, 525 Gallon, Poly, Rectangle, PUC	<p>WATER TANK</p> <p>Booster tank will have a capacity of 525 gallons and be constructed of UV stabilized ultra high impact polypropylene plastic by a manufacturer with a minimum of 20 years experience building tanks, is ISO 9001:2000 certified in all its manufacturing facilities, and has over 50,000 tanks in service.</p> <p>The tank will be no wider than 39.00" at the base to allow for greater compartment depth and no wider than 53.00" at the top.</p> <p>Tank joints and seams will be nitrogen welded inside and out.</p> <p>Tank will be baffled in accordance with NFPA Bulletin 1901 requirements.</p> <p>Baffles will have vent openings at both the top and bottom to permit movement of air and water between compartments.</p> <p>Longitudinal partitions will be constructed of .38" polypropylene plastic and will extend from the bottom of the tank through the top cover to allow for positive welding.</p> <p>Transverse partitions will extend from 4.00" off the bottom of the tank to the underside of the top cover.</p> <p>All partitions will interlock and will be welded to the tank bottom and sides.</p> <p>Tank top will be constructed of .50" polypropylene. It will be recessed .38" and will be welded to the tank sides and the longitudinal partitions.</p> <p>Tank top will be sufficiently supported to keep it rigid during fast filling conditions.</p> <p>Construction will include 2.00" polypropylene dowels spaced no more than 30.00" apart and welded to the transverse partitions. Two (2) of the dowels will be drilled and tapped (.50" diameter, 13.00" deep) to accommodate lifting eyes.</p> <p>A sump that will be sized dependent on the tank to pump plumbing will be provided at the bottom of the water tank.</p> <p>Sump will include a drain plug and the tank outlet.</p> <p>Tank will be installed in a fabricated cradle assembly constructed of structural steel.</p> <p>Sufficient crossmembers will be provided to properly support bottom of tank. Crossmembers will be constructed of steel bar channel or rectangular tubing.</p> <p>Tank will "float" in cradle to avoid torsional stress caused by chassis frame flexing. Rubber cushions, .50" thick x 3.00" wide, will be placed on all horizontal surfaces that the tank rests on.</p> <p>Stops or other provision will be provided to prevent an empty tank from bouncing excessively while moving vehicle.</p> <p>Mounting system will be approved by the tank manufacturer.</p>
0003405	Overflow, 4.00" Water Tank, Poly	<p>Fill tower will be constructed of .50" polypropylene and will be a minimum of 8.00" wide x 14.00" long.</p> <p>Fill tower will be furnished with a .25" thick polypropylene screen and a hinged cover.</p> <p>An overflow pipe, constructed of 4.00" schedule 40 polypropylene, will be installed approximately halfway down the fill tower and extend through the water tank and exit to the rear of the rear axle.</p>
0028104	Foam Cell Required	
0010129	Drain, Tank - 2.50"	<p>TANK DRAIN</p> <p>A 2.50" tank drain will be installed with a 2.50" ball valve located underneath the left front compartment that is properly labeled.</p>

AGENDA ITEM NO. 6.

0633066	Sleeve, Through Tank	SLEEVE, PLUMBING, THROUGH TANK One (1) sleeve will be provided in the water tank for a 3.00" pipe and a	AGENDA ITEM NO. 6.
0553729	Not Required, Restraint, Water Tank, Heavy Duty		
0003429	Not Required, Direct Tank Fill		
0003424	Not Required, Dump Valve		
0048710	Not Required, Jet Assist		
0030007	Not Required, Dump Valve Chute		
0514778	Not Required, Switch, Tank Dump Master		
0597043	Body Height, PUC/HDRP	BODY HEIGHT The height of the body will be 92.00" from the bottom of the body to the top of the body.	
0199241	Hose Bed, Aluminum, Pumper, PUC	HOSE BED The hose bed will be fabricated of .125"-5052 aluminum with a nominal 38,000 psi tensile strength. Flooring of the hose bed will be removable aluminum grating with the top surface corrugated to aid in hose aeration. The grating slats will be a minimum of 0.50" x 4.50" with spacing between slats for hose ventilation.	
0003481	Hose Bed Capacity, Special	Hose bed will accommodate (DS to PS): Bed #1 600' x 2.50" DJ / Bed #2 600' x 2.50" DJ / Bed #3 750' x 5.00" LDH using 50' lengths.	
0003488	Divider, Hose Bed, Unpainted	HOSE BED DIVIDER Two (2) adjustable hosebed dividers will be furnished for separating hose. Each divider will be constructed of a .125" brushed aluminum sheet fitted and fastened into a slotted, 1.50" diameter radiused extrusion along the top, bottom, and rear edge. Divider will be fully adjustable by sliding in tracks, located at the front and rear of the hose bed. Divider will be held in place by tightening bolts, at each end. Acorn nuts will be installed on all bolts in the hose bed which have exposed threads.	
0761929	SP Cross-Divider, Hose Bed, Additional, Painted, PUC	An additional cross-divider will be provided at the front hose bed area rear of the foam and water tank fill domes (per signed AD drawing) . The divider will be bolted to the side sheet and painted.	
0530804	Cover, Hose Bed, Alum Treadplate	HOSE BED COVER A two (2) section hose bed cover, constructed of .125" bright aluminum treadplate will be furnished. The cover will be hinged with full length stainless steel piano hinge. The sides will be slanted down. The cover will be reinforced so that it can support the weight of a man walking on the cover. The cover is designed with the left cover opening first. If access to the water tank fill tower is blocked by the hose bed cover, then a hinged door will be provided in it so that the tank may be filled without raising cover doors. Chrome grab handles and four (4) gas filled cylinders will be provided to assist in opening and closing the cover. A handrail is to be provided at the rear, in the center of the support, to assist in opening the cover.	
0587696	Hose Restraint, Hose Bed, One Piece Vinyl Flap, Strap Fastener, Hose Bed Frame, Rear	HOSEBED RESTRAINT REAR There will be a black vinyl flap installed at the rear of the hosebed. The flap will be attached to the top hosebed frame with quarter turn fasteners. The flap will have straps that loop through footman loops at the bottom of the hosebed and fasten with spring clip and hook fasteners and chain.	

0611509

Running Boards, Flip Out, PUC

RUNNING BOARDS

A running board will be provided on each side of the front body to allow backboard/crosslay storage area. The running boards will be designed and punched into .125" bright aluminum treadplate material providing support, slip resistance, and drainage.

AGENDA ITEM NO. 6.

The runningboard will have a flip out section design that allows easier access to the full width equipment area above. The flip out section will be tied to the "do not move truck indicator" with a sensor when it is flipped out. There will be a latch provided that secures the flip out section when not in use.

0683043

Tailboard, 12" Deep, Full Width, Angled Corners, PUC/HDRP

TAILBOARD

The tailboard will be constructed of .125" bright aluminum treadplate and spaced .50" from the body, as well as supported by a structural steel assembly.

The tailboard area will be 12.00" deep and full width of the body. The outboard sides of the tailboard will be angled at 45 degrees beginning at the point where the body meets the tailboard at the outboard edge angling rearward to the rear edge of the tailboard.

The exterior side will be flanged down and in for increased rigidity of tailboard structure.

0690029

Wall, Rear, Body Material, PUC, PUC Tanker, PRM, HDRP

REAR WALL, BODY MATERIAL, PUC

The rear wall will be smooth and the same material as the body.

The rear wall body material will be painted. Unpainted aluminum overlays will be provided to allow for chevron application and to provide continuously smooth rear wall panels.

The outboard edges of the rear wall will be trimmed in polished stainless steel.

0003531

Tow Bar, Under Tailboard

TOW BAR

A tow bar will be installed under the tailboard at center of truck.

Tow bar will be fabricated of 1.00" CRS bar rolled into a 3.00" radius.

Tow bar assembly will be constructed of .38" structural angle. When force is applied to the bar, it will be transmitted to the frame rail.

Tow bar assembly will be designed and positioned to allow up to a 30-degree upward angled pull of 17,000 lb, or a 20,000 lb straight horizontal pull in line with the centerline of the vehicle.

Tow bar design will have been fully tested and evaluated using strain gauge testing and finite element analysis techniques.

COMPARTMENTATION

The apparatus body will be built of aluminum construction using a minimum of H32 aluminum.

AGENDA ITEM NO. 6.

The body panel assembly will be constructed in a fixture and consist of formed sheet metal for the front and rear bulkheads, door frames, floors, ceilings, and back walls. These parts will be welded together to ensure greatest longevity with no visible welds in compartment interior. Welded construction will consist of 1.00" x 0.38" engineered plug weld holes that control the size, location, and the amount of weld required. The bodies will be assembled and welded from engineered prints that call out the size, location, and type of weld required.

In structural areas the sheet metal components will have flanges for welding. No butt joints will be allowed. Gussets and support posts will be provided for additional strength where needed.

The fender panel will be an integral part of the complete welded body assembly. All light and compartment holes are pre punched prior to construction to provide accuracy and rounded corners to prevent stress risers in the material.

Circular fender liners will be provided. For prevention of paint chips and ease of suspension maintenance the fender liners will be formed from brush finished 304L stainless steel, be unpainted, and removable for suspension maintenance.

Side compartment flooring will be of the sweep out design with the floor minimum of 1.00" higher than the compartment door lip.

Drip protection will be provided above the doors by means of aluminum extrusion, or formed bright aluminum treadplate.

The top of the compartment will be sheet metal and covered with bright aluminum treadplate rolled over the edges on the front, and rear. These covers will have the corners welded.

The aluminum treadplate covers will not make up the ceiling of the compartment.

All screws and bolts, which are not Grade 8, will be stainless steel and where they protrude into a compartment will have acorn nuts on the ends to prevent injury.

UNDERBODY SUPPORT SYSTEM

Due to the severe loading requirements of this pumper a method of body and compartment support suitable for the intended load will be provided.

The backbone of the body support system will begin with the chassis frame rails which is the strongest component of the chassis and is designed for sustaining maximum loads. The support system will include lateral frame rail extensions that are formed from 0.375" 80k high strength steel and bolted to the chassis frame rails with 0.625" diameter Grade 8 bolts.

The vertical and horizontal members of the frame rail extensions are to be reinforced with welded gussets and extend to the outside edge of the body. The lateral frame extensions will be electro-coated for superior corrosion resistance.

The floating substructure will be separated from the lateral frame extensions with neoprene elastomer isolators. These isolators will reduce the natural flex stress of the chassis from being transmitted to the body, and absorb road shock and vibration.

The isolators will have a broad load range, proven viability in vehicular applications, be of a fail safe design and allow for all necessary movement in three (3) transitional and rotational modes.

The neoprene isolators will be installed in a modified V three (3)-point mounting pattern to reduce the natural flex of the chassis being transmitted to the body. Two (2) 3.50" diameter isolators are provided at the front of the body near the centerline of the vehicle above the chassis frame. A minimum of eight (8) - 2.55" diameter isolators will be provided, two (2) under each front compartment and two (2) under each rear side compartment. A minimum of four (4) 3.50" diameter isolators will be provided under the rear compartment.

AGGRESSIVE WALKING SURFACE

All exterior surfaces designated as stepping, standing, and walking areas will comply with the required average slip resistance of the current NFPA standards. Documentation of the material meeting the standard will be provided at time of delivery.

LOUVERS

All body compartments will have a minimum of one (1) set of automotive style, dust resistant louvers pressed into a wall. The louvers will incorporate a one (1)-way rubber valve that provides airflow out of the compartment and prevents water and dirt from gaining access to the compartment. Compartments over the wheel will not have louvers.

TESTING OF BODY DESIGN

Body structural analysis will be fully tested. Proven engineering and test techniques such as finite element analysis and strain gauging have been performed with special attention given to fatigue life and structural integrity of the body and substructure.

The body will be tested while loaded to its greatest in-service weight.

The criteria used during the testing procedure will include:

Raising opposite corners of the vehicle tires 9.00" to simulate the twisting a truck may experience when driving over a curb.

Making a 90 degree turn, while driving at 20 mph to simulate aggressive driving conditions.

Driving the vehicle on at 35 mph on a washboard road.

Driving the vehicle at 55 mph on a smooth road.

Accelerating the vehicle fully, until reaching the approximate speed of 45 mph on rough pavement.

Evidence of the actual testing techniques will be made available upon request.

FEA will have been performed on all substructure components.

0518345

LS 177" Rollup, (1) 50" Fwd, (1) 52" Rr, FH/FD Frt&Rr, PUC

LEFT SIDE COMPARTMENTATION

The left side compartmentation will consist of three rollup door compartments. A full height, rollup door compartment ahead of the rear wheels will be provided. The interior dimensions of this compartment will be 50.00" wide x 54.50" high x 25.88" deep. The area behind the roll up door spool will be notched for exterior storage or larger capacity water tank tee. The depth of the compartment will be calculated with the compartment door closed. The compartment interior will be fully open from the compartment ceiling to the compartment floor and designed so that no permanent dividers are required between the upper and lower sections. The clear door opening of this compartment will be 47.00" wide x 54.50" high.

A roll-up door compartment over the rear wheels will be provided. The interior dimensions of this compartment will be 60.00" wide x 23.00" high x 25.88" deep. The area behind the roll up door spool will be notched for exterior storage or larger capacity water tank tee. The depth of the compartment will be calculated with the compartment door closed. The clear door opening of this compartment will be 57.00" wide x 23.00" high.

A full height, roll-up door compartment behind the rear wheels will be provided. **The interior dimensions of this compartment will be 51.75" wide x 54.63" high x 26.00" deep. The clear door opening will be a minimum of 49.25" wide x 54.63" high.**

The roll up door spool will be installed in a recess above the compartment ceiling. All compartments will include a drip pan below the roll of the door. The drip pan will be installed level with the compartment ceiling. The interior height of the compartments will be measured from the compartment floor to the ceiling. The depth of the compartments will be measured from the back wall to the inside of the door frame.

Closing of the doors will not require releasing, unlocking, or unlatching any mechanism and will easily be accomplished with one hand.

AGENDA ITEM NO. 6.

0518346

RS 177" Rollup, (1) 50" Fwd, (1) 52" Rr, FH/FD Frt&Rr, PUC

RIGHT SIDE COMPARTMENTATION

The right side compartmentation will consist of three rollup door compartments. A full height, rollup door compartment ahead of the rear wheels will be provided. The interior dimensions of this compartment will be 50.00" wide x 54.50" high x 25.88" deep. The area behind the roll up door spool will be notched for exterior storage or larger capacity water tank tee. The depth of the compartment will be calculated with the compartment door closed. The compartment interior will be fully open from the compartment ceiling to the compartment floor and designed so that no permanent dividers are required between the upper and lower sections. The clear door opening of this compartment will be 47.00" wide x 54.50" high.

A roll-up door compartment over the rear wheels will be provided. The interior dimensions of this compartment will be 60.00" wide x 23.00" high x 25.88" deep. The area behind the roll up door spool will be notched for exterior storage or larger capacity water tank tee. The depth of the compartment will be calculated with the compartment door closed. The clear door opening of this compartment will be 57.00" wide x 23.00" high.

A full height, roll-up door compartment behind the rear wheels will be provided. **The interior dimensions of this compartment will be 52.00" wide x 54.50" high x 25.88" deep. The area behind the roll up door spool will be notched for exterior storage or larger capacity water tank tee. The depth of the compartment will be calculated with the compartment door closed. The compartment interior will be fully open from the compartment ceiling to the compartment floor and designed so that no permanent dividers are required between the upper and lower sections. The clear door opening of this compartment will be 49.00" wide x 54.50" high.**

The roll up door spool will be installed in a recess above the compartment ceiling. All compartments will include a drip pan below the roll of the door. The drip pan will be installed level with the compartment ceiling. The interior height of the compartments will be measured from the compartment floor to the ceiling. The depth of the compartments will be measured from the back wall to the inside of the door frame.

Closing of the doors will not require releasing, unlocking, or unlatching any mechanism and will easily be accomplished with one hand.

0594005

Doors, Rollup, Amdor, Side Compartments

SIDE COMPARTMENT ROLLUP DOOR(S)

There will be six (6) compartment doors installed on the side compartments, double faced, aluminum construction, painted one (1) color to match the lower portion of the body and manufactured by AMDOR™ brand rollup doors.

Door(s) will be constructed using 1.00" extruded double wall aluminum slats which will feature a flat smooth interior surface to provide maximum protection against equipment hang-up. The slats will be connected with a structural driven ball and socket hinge designed to provide maximum curtain diaphragm strength. Mounting and adjusting the curtain will be done with a clip system that connects the curtain to the balancer drum allowing for easy tension adjustment without tools. The slats will be mounted in reusable slat shoes with positive snap-lock securement. Each slat will incorporate weather tight recessed dual durometer seals. One (1) fin will be designed to locate the seal within the extrusion. The second will serve as a wiping seal which will also allow for compression to prevent water ingress.

The doors will be mounted in a one (1)-piece aluminum side frame with recessed side seals to minimize seal damage during equipment deployment. All seals including side frames, top gutters and bottom panel are to be manufactured utilizing non-marring materials.

Bottom panel flange of rollup door will be equipped with two (2) cut-outs to allow for easier access with gloved hands.

A polished stainless steel lift bar with locking key latches to be provided for each roll-up door. The keys to be Model 751 to match all compartment and cab doors. The lift bar will be located at the bottom of door with striker latches installed at the base of the side frames. Side frame mounted door strikers will include support beneath the stainless steel lift bar to prevent door curtain bounce, improve bottom seal life expectancy and to avoid false door ajar signals.

All injection molded rollup door wear components will be constructed of Type 6 nylon.

Each rollup door will have a 3.00 inch diameter balancer/tensioner drum to assist in lifting the door.

The header for the rollup door assembly will not exceed 4.00".

A heavy-duty magnetic switch will be used for control of open compartment door warning lights.

0599445	Compt, Rear, Rollup, 33.50" FF, w/Tailboard, PUC/HDRP	<p>REAR COMPARTMENTATION</p> <p>A roll-up door compartment above the rear tailboard will be provided. The interior dimensions of this compartment will be 37.00" wide x 36.50" lower 27.00" of the compartment and 15.00" deep in the remaining upper portion. The clear door opening will be a minimum of 33.88" wide x 26.63" high.</p> <p>A removable access panel will be furnished on the back wall of the compartment. The rear compartment will be open into the rear side compartments. The transverse opening will be a minimum of 22.00" wide x 27.50" high.</p> <p>A drip pan will be installed below the roll of the door. A guard will be installed behind the roll of the door. The interior height of the compartment will be measured from the floor to the ceiling. The depth of the compartment will be measured from the back wall to the inside of the door frame. Closing of the door will not require releasing, unlocking, or unlatching any mechanism and will easily be accomplished with one hand.</p>
0593958	Door, Amdor, Rollup, Rear Compartment, PUC	<p>ROLL-UP REAR COMPARTMENT DOOR</p> <p>The rear compartment will have a roll-up door. The door will be double faced, aluminum construction, satin aluminum and manufactured by AMDOR™ brand roll-up doors.</p> <p>The door will be constructed using 1.00" extruded double wall aluminum slats which will feature a flat smooth interior surface to provide maximum protection against equipment hang-up. The slats will be connected with a structural driven ball and socket hinge designed to provide maximum curtain diaphragm strength. Mounting and adjusting the curtain will be done with a clip system that connects the curtain to the balancer drum allowing for easy tension adjustment without tools. The slats will be mounted in reusable slat shoes with positive snap-lock securement.</p> <p>Each slat will incorporate weather tight recessed dual durometer seals. One (1) fin will be designed to locate the seal within the extrusion. The second will serve as a wiping seal which will also allow for compression to prevent water ingress.</p> <p>The door will be mounted in a one (1)-piece aluminum side frame with recessed side seals to minimize seal damage during equipment deployment. All seals including side frames, top gutters and bottom panel are to be manufactured utilizing non-marring materials.</p> <p>Bottom panel flange of roll-up door will be equipped with two (2) cut-outs to allow for easier access with gloved hands.</p> <p>A polished stainless steel lift bar with locking key latches to be provided for each roll-up door. The keys to be Model 751 to match all compartment and cab doors. The lift bar will be located at the bottom of door with striker latches installed at the base of the side frames. Side frame mounted door strikers will include support beneath the stainless steel lift bar to prevent door curtain bounce, improve bottom seal life expectancy and to avoid false door ajar signals.</p> <p>All injection molded roll-up door wear components will be constructed of Type 6 nylon. The door will have a 3.00 inch diameter balancer/tensioner drum to assist in lifting the door. The header for the roll-up door assembly will not exceed 4.00".</p> <p>A heavy-duty magnetic switch will be used for control of open compartment door warning lights.</p>
0505888	Keyed Locks for Latches, Lap Doors (#751 Lock)	<p>KEYED LOCK(S)</p> <p>There will be two (2) compartment doors that require a keyed lock. The compartments to have a keyed lock will be hard suction and ladder compartments.</p>
0608489	SP Keyed Locks for Latches, Hatch Compartment Doors (#751 Lock)	<p>KEYED LOCK(S)</p> <p>There will be a keyed lock provided on the hatch compartment door(s). There will be four (4) compartment doors that require a keyed lock. The hatch compartment door(s) to have a keyed lock will be all hatch compartment doors.</p>
0732709	Pull Strap for Rollup Doors	<p>ROLLUP DOOR PULL STRAPS</p> <p>two (2) compartment doors will be provided with pull straps. The pull straps will be 22.00" long and black in color.</p> <p>The straps will be installed directly to the inside of the rollup door.</p> <p>The rollup door compartments to have these straps will be both crosslay roll up doors.</p>
0659353	Lights, Compt, Amdor AY-9220 LED, Dual Lt Strip	<p>COMPARTMENT LIGHTING</p> <p>There will be six (6) compartments with Amdor, Model AY-9220, white 12 volt DC LED compartment light strips. The lights will be mounted with mechanical fasteners.</p> <p>There will be two (2) strip lights installed vertically in each compartment opening per the latest NFPA requirements.</p> <p>The lights will be activated when the battery switch is on and the respective compartment door is opened.</p>

AGENDA ITEM NO. 6.

0520221

177" Hatch, (2) Lift-up, 21" Wide, Both Sides, PUC/HDRP

HATCH COMPARTMENTS

Hatch compartments with two (2) lift-up, top opening hatch doors will be provided on the left and right side body compartments. Each hatch compartment will extend the full length of the side body compartmentation except for a 20.00" recessed step area at the rear of the compartment on the access ladder side.

Sides of the compartments will be constructed of the same material as the body and painted job color on the outside panels. A 2.00" tall formed painted aluminum trim will be provided to cover the seam between the top of the body panel and the bottom of the hatch compartment. The vertical outboard seam at the center of the compartment will have a painted smooth weld. Top of the compartments will be constructed of bright aluminum treadplate.

Two (2) lift-up, bright aluminum treadplate doors will be provided on the top of each hatch compartment. Each door will have a lever handle with a slam style latch to hold the doors in the closed position.

These double pan doors will have lipped edges with a rubber seal for weather resistance. Doors will be hinged on the outboard side and will be held open with pneumatic stay arms. The compartments will have a 3/4" drain that extends to below the body.

Ribbed rubber matting will be provided on the compartment floor to stop wet equipment from sitting in water pools.

AGENDA ITEM NO. 6.

0733406

Handrails, Hatch Step Area, (1) Curved & (1) Straight

Handrails will be provided at the step area to the rear of the hatch compartment. One (1) curved handrail will be mounted on the outboard side of the step area at the rear and curve over the top. One (1) straight handrail will be mounted vertically along the inboard side of the step area.

0659814

Lights, Hatch Compt, Amdor AY-9220 LED Strip Light, 177", Both Sides

HATCH COMPARTMENT LIGHTING

There will be Amdor LumaBar, Model AY-9220-0**, LED strip lights mounted the full length on the interior, hinged side of each compartment. The lights will be mounted with mechanical fasteners. The hatch compartment lights will be activated when the battery switch is on and the respective door is opened.

0687145

Shelf Tracks, Recessed, PUC/3rd Generation

MOUNTING TRACKS

There will be recessed tracks installed vertically to support the adjustable shelf(s). Tracks will not protrude into any compartment in order to provide the greatest compartment space and widest shelves possible. The tracks will be provided in each compartment except for the one that contains the pump operator's panel.

0600350

Shelves, Adj, 500 lb Capacity, Full Width/Depth, Predefined Locations

ADJUSTABLE SHELVES

There will be eight (8) shelves with a capacity of 500 lb provided. The shelf construction will consist of .188" aluminum painted spatter gray with 2.00" sides. Each shelf will be infinitely adjustable by means of a threaded fastener, which slides in a track. The shelves will be held in place by .12" thick stamped plated brackets and bolts. The location(s) will be in RS2 centered between the floor and the ceiling, in RS1 in the upper third, in RS1 in the upper third, in RS3 in the lower third to the left of the partition, in RS3 in the lower third to the right of the partition, in RS3 in the upper third to the right of the partition, in RS3 in the upper third to the left of the partition and in LS2 centered between the floor and ceiling.

0647042

Tray, Floor Mounted, Slide-Out, w/ Side Slides, 200lb, 2.00" Sides, 3G

SLIDE-OUT FLOOR MOUNTED TRAY

There will be one (1) floor mounted slide-out tray(s) with 2.00" sides provided. Each tray will be rated for up to 200lb in the extended position. The tray(s) will be constructed of .19" aluminum with non-welded corners. The finish will be painted to match compartment interior. Slides will be equipped with ball bearings for ease of operation and years of dependable service. The slides will be located on the sides of the tray so that the tray can be located as close to the compartment floor as possible. Automatic locks will be provided for both the "in" and "out" positions. The trip mechanism for the locks will be located at the front of the tray for ease of use with a gloved hand.

0647467

Tray, Floor Mounted, Slide-Out, 500lb, Special Side Height, 3G

SLIDE-OUT FLOOR MOUNTED TRAY

There will be one (1) floor mounted slide-out tray(s) provided in compartment LS3, on the permanent horizontal partition. Each tray will be rated for up to 500lb in the extended position. The tray(s) will be constructed of .19" aluminum with non-welded corners. The finish will be painted to match compartment interior. The side height of the tray(s) will be as follows:
Front: 2.00" high
Rear: 2.00" high
Left and Right Sides: 2.00" high

There will be two undermount-roller bearing type slides rated at 250lb each provided. The pair of slides will have a safety factor rating of 2.

To ensure years of dependable service, the slides will be coated with a finish that is tested to withstand a minimum of 1,000 hours of salt spray per ASTM B117.

To ensure years of easy operation, the slides will require no more than a 50lb force for push-in or pull-out movement when fully loaded after having been subjected to a 40 hour vibration (shaker) test under full load. The vibration drive file will have been generated from accelerometer data collected from a heavy truck chassis driven over rough gravel roads in an unloaded condition. Proof of compliance will be provided upon request.

Automatic locks will be provided for both the "in" and "out" positions. The trip mechanism for the locks will be located at the front of the tray for ease of use with a gloved hand.

Item ID	Description	Details	AGENDA ITEM NO. 6.
0725648	Drawer Assembly, CTECH, Two Drawers, Up To 24" Wide	<p>DRAWER ASSEMBLY A slide-out drawer assembly will be installed LS3, Match Job # 35938. The clear dimensions of the first drawer starting at the top will be 6.00" 7.00" high x 21.00" deep. The clear dimensions of the second drawer will be 5.75" with a face plate that is 6.00" high x 21.00" deep. Each drawer will be the same width and not exceed 24.00". The drawers will have a capacity of 250 pounds. The drawers will be mounted in a cabinet housing constructed of light gray powder coated aluminum with anodized aluminum frames. The housing will be 24.00" deep, and completely enclose the drawer. A full-length aluminum extruded rail will be provided at the top edge of each drawer. This rail will act as the latching mechanism as well as the handle for each drawer. There will be a total of one (1) provided.</p>	AGENDA ITEM NO. 6.
0590939	Toolboard, Alum, .188", Peg Board, Added to Slide-Out Tray	<p>TOOL BOARD An aluminum tool board will be provided. It will be a minimum of .188" thick with .203" diameter diameter holes in a pegboard pattern with 1.00" centers between holes. A 1.00" x 1.00" aluminum tube frame will be welded to the edge of the board. The board will be installed on adjustable tracks on a slide out tray. The tracks will allow side to side adjustment. The board will be as high as space permits and full length of the tray. The tray is not included in this option. There will be One (1) toolboard(s) provided. The toolboard(s) will be spatter gray painted and installed LS3, adjusted with minimum of 9" clear mountable space on pump panel side of tool board..</p>	
0726428	Partition, Horizontal, In Compt	<p>HORIZONTAL PARTITION One (1) partition, horizontally mounted and bolted or welded in place, will be installed Compartment LS3, on top of the CTECH drawer assembly. Match Job # 35938.</p>	
0726423	Partition, Trans Rear Compt, PUC/HDRP, Sealed	<p>PARTITION, TRANSVERSE REAR COMPARTMENT Two (2) partitions will be bolted in place to separate the left and right side rear compartments from the rear tailboard compartment. The partition will be body material painted spatter gray. Each partition will be permanently sealed with caulk to ensure no water will leak to or from the adjoining compartments.</p>	
0726457	Partition, Vertical Compt, Predefined Locations	<p>VERTICAL COMPARTMENT PARTITION One (1) partition will be provided. The partition construction will consist of body material painted spatter gray. Each partition will be the full vertical height of the compartment. The location(s) will be in LS1, 12.00" from the forward door frame.</p>	
0625280	Trim, Body/Crosslay Seams, Painted Aluminum, PUC	<p>BODY TRIM PIECE Painted aluminum trim will be provided on the horizontal body/crosslay seams. The trim piece will be bonded to the painted surface with a high viscosity adhesive.</p>	
0762913	Divider, Vertical	<p>VERTICAL DIVIDER A .12" thick aluminum vertical compartment divider will be provided compartment RS3, floor to ceiling, tight to floor tray. The divider will be secured in place with #10 self tapping screws. A total of one (1) will be provided.</p>	
0725524	SP Recess, Blister, Partition, Transverse Rear Compt	<p>RECESS, BLISTER, PARTITION A quantity of one (1) blister(s) will be provided in the transverse rear compartment partition(s) B1 compartment, right side partition. blister to accommodate hose reel motor. Match Job # 35938.</p>	
0063064	Rub Rail, Aluminum Extruded, Side of Body, 3rd Gen Body	<p>RUB RAIL Bottom edge of the side compartments will be trimmed with a bright aluminum extruded rub rail. Trim will be 3.12" high with 1.50" flanges turned outward for rigidity. The rub rails will not be an integral part of the body construction, which allows replacement in the event of damage. Rub rails will be attached with bolts and spaced from the body with isolators that will help to absorb any moderate impact without damaging the body.</p>	
0515441	Fender Crowns, Rear, S/S, W/Removable Fender Liner, Pumper, 3rd Gen	<p>BODY FENDER CROWNS Polished stainless steel fender crowns will be provided around the rear wheel openings. A fender liner constructed of painted body material will be provided to avoid paint chipping. The liners will be removable to aid in the maintenance of rear suspension components. A dielectric barrier will be provided between the fender crown fasteners (screws) and the fender sheet metal to prevent corrosion. The fender crowns will be held in place with stainless steel screws that thread directly into a composite nut and not directly into the parent body sheet metal to eliminate dissimilar metals contact and greatly reduce the chance for corrosion.</p>	

0602222		Hose, Hard Suction, 6.0", 10.0', Clear Corrugated, Kocheck	<p>HARD SUCTION HOSE</p> <p>Two (2) lengths of 6.00" Kocheck Fire Grade clear corrugated hard suction hose with black spiral helix, 10' in length, will be provided. The hose will be equipped with female coupling on one (1) end and a rocker lug male coupling on the other end. Couplings will be black anodized hard coated aluminum.</p>	AGENDA ITEM NO. 6.
0747678	SP	Troughs, Hard Suction, In 21" Hatch Compartment, Spcl Length, PUC	<p>HOSE TROUGHS</p> <p>Two (2) stainless steel hard suction hose troughs will be provided. The troughs will be installed in the hatch compartment located on the right side. one (1) troughs will be of adequate length to store the hose with a Kocheck BS60 strainer attached.</p> <p>The troughs will be installed with a smooth aluminum door at the rear. The door will have a D-handle latch.</p> <p>A floor will be provided above the hard suction hose inside the hatch compartment to allow storage of addition equipment in the compartment.</p>	
0527021		Handrails Located @ Front Body	<p>HANDRAILS</p> <p>The handrails will be 1.25" diameter knurled aluminum to provide a positive gripping surface. Chrome plated end stanchions will support the handrail. Plastic gaskets will be used between end stanchions and any painted surfaces.</p> <p>Drain holes will be provided in the bottom of all vertically mounted handrails.</p> <p>Handrails will be located on the front of the body in positions needed to meet NFPA requirements.</p>	
0664688		Handrails, Rear, PUC/HDRP	Two (2) vertical handrails will be located at the rear, one on each side of the rear compartment .	
0014138	SP	Handrail, Rear, Below Hose Bed, Extra Stanchions	One (1) full width horizontal handrail will be provided below the hose bed at the rear of the apparatus. This handrail will be mounted with two additional stanchions for extra support.	
0622393		Compt, Air Pack in Fender Panel	<p>AIR PACK STORAGE</p> <p>A total of two (2) air pack compartment(s) will be provided and located DS froward of axle and PS forward of axle. The air pack compartment(s) will be tapered to match the profile of the space available in the fender. The compartment(s) will be approximately 15.50" wide at the top and 5.00" wide at the bottom for the wheel cutout. The compartment(s) will be 15.50" tall at the body side compartment and 6.00" tall at the wheel cutout. The compartment(s) will be 26.00" deep and have a drain hole.</p> <p>Inside the compartment, black Dura-Surf friction reducing material will be provided.</p> <p>A polished stainless steel hinged door with a chrome plated flush lift & turn latch will be provided to contain the air pack. A dielectric barrier will be provided between the door hinge, hinge fasteners and the body sheet metal.</p>	
0657522		Compt, Air Bottle, Triple, Fender Panel	<p>AIR BOTTLE STORAGE (Triple)</p> <p>A quantity of one (1) air bottle compartment designed to hold (3) air bottles up to 7.25" in diameter x 26.00" deep will be provided on the right side rearward of the rear wheels. A polished stainless steel door with a chrome plated flush lift & turn latch will be provided to contain the air bottle. A dielectric barrier will be provided between the door hinge, hinge fasteners and the body sheet metal.</p> <p>Inside the compartment, black rubber matting will be provided.</p> <p>AIR BOTTLE COMPARTMENT STRAP</p> <p>A strap will be provided in the air bottle compartment(s) to help contain the air bottles when the vehicle is parked on an incline. The strap will wrap around the neck and attach to the wall of the compartment.</p>	
0654143		Compt, Air Bottle, Single, Common Triple Door (DEF/Fuel), Fender Panel	<p>AIR BOTTLE STORAGE (Single)</p> <p>A quantity of one air bottle compartment, approximately 7.50" wide x 7.50" tall x 26.00" deep, will be provided on the driver side rearward of the rear wheels. The triangular door will cover the air bottle opening, the DEF tank access, and fuel fill. The compartment will be square with angled corners. A polished stainless steel door with a chrome plated flush lift & turn latch will be provided to contain the air bottle. A dielectric barrier will be provided between the door hinge, hinge fasteners and the body sheet metal.</p> <p>Inside the compartment, black rubber matting will be provided.</p> <p>AIR BOTTLE COMPARTMENT STRAP</p> <p>A strap will be provided in the air bottle compartment to help contain the air bottle when the vehicle is parked on an incline. The strap will wrap around the neck and attach to the wall of the compartment.</p>	
0750915	SP	Restraint, Air Bottle Compartment Door(s), Seatbelt Material Strap	<p>AIR BOTTLE COMPARTMENT DOOR RESTRAINT</p> <p>The Air Bottle and Air pack storages at fenders front and rear of rear axleair bottle compartment doors will include a seatbelt material style strap to prevent the door from hitting other items. There will be four (4) straps installed.</p>	

0602940	Ladder, Extension, Provided by Fire Dept, Pumper/Pumper w/Aerial, NFPA 2016	EXTENSION LADDERS PROVIDED BY FIRE DEPARTMENT NFPA 1901, 2016 edition, section 5.8.1.2 requires an extension ladder. The extension ladder is not on the apparatus as manufactured. There will be one (1) extension ladder(s) provided and installed by the fire department. The ladder(s) will be a 21' Duo-Safety 900-A, two (2)-section. <div style="border: 1px solid black; padding: 2px; float: right; margin-top: 10px;">AGENDA ITEM NO. 6.</div>
0602718	Ladder, Roof, Provided by Fire Department, Pumper/Pumper w/Aerial Device, NFPA 2016	ROOF LADDER PROVIDED BY FIRE DEPARTMENT NFPA 1901, 2016 edition, section 5.8.1.2 requires a minimum of one (1) roof ladder. The roof ladder is not on the apparatus as manufactured. There will be one (1) roof ladder(s) provided and installed by the fire department. The ladder(s) will be a 14' Duo-Safety 775-A.
0638384	Rack, Ladders, RS Full Depth Body, PUC/HDRP	LADDER STORAGE The ladders will be stored inside the upper section of the right side compartments. This ladder rack will reduce the depth of the upper section in the side compartments. A partition will be installed inside the compartment on the side of the rack to allow for equipment storage and to conceal the ladders. The ladders will be banked in separate storage troughs. The ladder storage assembly will be fabricated of stainless steel track channels to aid in loading and removal of ladders. Rear of the ladder storage area will have a vertically hinged smooth aluminum door with a D-handle latch to contain the ladders.
0602903	Ladder, 10' Duo-Safety 585A, Provided by Fire Dept, Pumper NFPA 2016	FOLDING LADDER PROVIDED BY FIRE DEPARTMENT NFPA 1901, 2016 edition, section 5.8.1.2 requires a folding ladder. The folding ladder is not on the apparatus as manufactured. There will be one (1) 10' aluminum Series 585-A Duo-Safety folding ladder provided by the fire department.
0733004	Compt w/Trough, Folding Ladder, In Upper Body, RS	FOLDING LADDER/LONG TOOL COMPARTMENT A compartment will be provided, recessed in the upper, inside part of body compartment on the right side. The compartment will be equipped with a stainless steel trough for the folding ladder and storage for long handle tools. A door constructed of smooth aluminum and hinged along the outboard edge will be provided at the rear with a flush lift and turn latch.
0793652	Ladder, Little Giant, Velocity - Model 13, 15413-001	ADDITIONAL FOLDING LADDER One (1) aluminum Little Giant Velocity - Model 13 folding ladder will be provided. The stored dimensions will be 42.00" high x 24.00" wide x 8.00" deep. The weight will be 25 lb. The ladder will be located stored in LS1 between the left wall and the vertical partition
0602877	Pike Pole, Pumper, Provided by Fire Department, NFPA 2016	PIKE POLE PROVIDED BY FIRE DEPARTMENT NFPA 1901, 2016 edition, Section 5.9.4 requires one (1) 8 ft or longer pike pole mounted in a bracket fastened to the apparatus. The pike pole is not on the apparatus as manufactured. The fire department will provide and mount the pike pole. The pike pole(s) will be a Nupla 8' pike pole.
0732982	Tube, Pike Pole 8' or Longer, In Upper Body Long Tool Storage Compt	PIKE POLE STORAGE A aluminum tube with a .75" notch for an 8' or longer pike pole will be provided in the upper body compartment on the right side.
0602875	Pike Pole, 6', Pumper, Provided by Fire Department, NFPA 2016	6' PIKE POLE PROVIDED BY FIRE DEPARTMENT NFPA 1901, 2016 edition, Section 5.9.4 requires one (1) 6' pike pole or plaster hook mounted in a bracket fastened to the apparatus. The pike pole is not on the apparatus as manufactured. The fire department will provide and mount the pike pole. The pike pole(s) will be a Nupla 6' pike pole.
0732992	Tube, Pike Pole 6', In Upper Body Long Tool Storage Compt	PIKE POLE STORAGE A aluminum tube for a 6' pike pole with .75" notch will be provided in the upper body compartment on the right side.
0740068	Compt, Long Tool Storage Compt, In Upper Body (1) LS, PUC/HDRP	LONG ITEM STORAGE COMPARTMENT One (1) compartment will be provided, recessed in the upper, inside part of body compartment on the left side for storage of long handle tools. The door will be made of smooth aluminum and have a flush lift and turn latch. The door will be hinged along the outboard edge.

0724173	SP Trough for D-Handled Trash Hook, w/Bracket Supports	<p>TRASH HOOK STORAGE</p> <p>There will be one (1) stainless steel U-shaped trough(s) provided for storage of trash hook(s). The trough(s) will be installed in crosslay area accessible above dead lay tray attached to backboard compartment with trough that is 18" long. There will be shelf type bracket supports provided to help support the trash hook ends.</p>
0058193	Tubes, Alum, Pike Pole Storage, Spcl Notch, NY PP Head	<p>PIKE POLE STORAGE</p> <p>Aluminum tubing will be used for the storage of two (2) pike poles and will be located (2) tubes forward of lower crosslays attached to front wall (removable for service) with (1) tube accessible from left side and (1) accessible from right side.. If the head of a pike pole can come in contact with a painted surface, a stainless steel scuffplate will be provided. The pike pole tube will be notched to allow a New York style pike pole to fit into the tube.</p>
0521734	No Steps Required, Front Of Body, PUC	
0657023	SP Ladder, Top Access, Alum, LH Rear, Spaced to meet NFPA, PUC	<p>LADDER, TOP ACCESS</p> <p>A wide easy climbing access ladder, constructed of aluminum rungs and extruded aluminum rails, will be provided on the left side at the rear of the apparatus. The inside climbing area of the ladder will be 13.75" wide</p> <p>The lower section of the ladder will be retractable into the upper section to eliminate interference with the rear FMVSS lights. When lowered the bottom rung will be lower than the body, approximately 16.00" to 20.00" from the ground to allow a lower first step height.</p> <p>The ladder will be slanted when in use for easy access, and fold against the body for storage to reduce the overall length. Corrosion resistant, stainless steel spring-loaded locks will hold the ladder in place.</p> <p>The ladder mounting brackets will be built so the rear bulkhead lighting does not have to be recessed mounted. Lights will be flush mounted.</p> <p>There will be a "do not move truck" indicator activated in the cab if the ladder is not in the stowed position when the parking brake is disengaged.</p>
0650261	I Zone Bracket, Pair, Folding Style	<p>I-ZONE BRACKETS</p> <p>Two (2) flip-out I-Zone brackets will be provided and mounted at the rear of the apparatus, (1) each side so hose hung from a single bracket will not block the taillights. The brackets will be designed with adequate reinforcement to eliminate flexing of the body (oil canning).</p>

AGENDA ITEM NO. 6.

Pump, Pierce, 1500 GPM, Single Stage, PUC

AGENDA ITEM NO. 6.

PUMP

Pump will be a Pierce, low profile, 1500 gpm single stage midship mounted below the cab. The pump will have a 15 percent reserve capacity time between pump rebuild. To ensure efficient pump/vehicle design the capacity to weight ratio will not be less than 1.5:1.

The pump casing will consist of three (3) discharge outlets, one (1) to each side in line with the impeller and one (1) to the rear. The pump casing will incorporate two (2) water strippers to maintain radial balance.

Pump will be the Class A type.

Pump will be certified to deliver the percentage of rated discharge from draft at pressure indicated below:

- 100 percent of rated capacity at 150 psi net pump pressure
- 70 percent of rated capacity at 200 psi net pump pressure
- 50 percent of rated capacity at 250 psi net pump pressure

The pump will have the capacity to deliver the percentage of rated discharge from a pressurized source as indicated below:

- 135 percent of rated capacity at 100 psi net pump pressure from a 5 psi source

Pump body will be fine-grained gray iron. Pump will incorporate a heater/cooling jacket integral to the pump housing.

The impeller will be high strength vacuum cast bronze alloy accurately machine balanced and splined to a 10 spline stainless steel pump shaft for precision fit, exceptional durability, and efficiency. Double replaceable reverse flow labyrinth type bronze wear ring design will help to minimize end thrust. The impeller will be a twisted vane design to create higher lift.

The pump will include o-ring gaskets throughout the pump.

Deep groove radial type oversize ball bearings will be provided. The bearings will be protected at the openings from road dirt and water with an oil seal and a water slinger.

The pump will have a flat, patterned area on the top of the pump intake wye to allow standing for plumbing maintenance. The main inlet manifold will be 6.00" in diameter and will have a low profile design to facilitate low crosslays and high flows.

For ease of service, the pump housing, intake wye, impeller, mechanical seal, and gear case will be accessible from above the chassis frame by tilting the cab. The intake wyes will be removable without having to remove the main intake casting. Removal of the main inlet wyes will provide access to the impeller, mechanical seal, and wear ring.

The tank to pump line and the primary discharge line will be the only piping required to be removed for overhaul.

For ease of service and overhaul there will be no piping or manifolding located directly over the pump.

PUMP MOUNTING

Pump will be mounted to the chassis frame rails directly below the crew cab, to minimize wheelbase and facilitate service, using rubber isolators in a modified V pattern that include two (2) central mounted isolators located between the frame rails, and one (1) on each side outside the frame rails. The mounting will allow chassis frame rails to flex independently without damage to the fire pump. Each isolator will be 2.55" in total outside diameter and will be rated at 490 lb. The pump will be completely accessible by tilting the cab with no piping located directly above the pump.

Seal, Mechanical, Silicon Carbide, PUC Pump

MECHANICAL SEALS

Silicon carbide mechanical seals will be provided. The seals will be spring loaded and self-adjusting. The seals will have a minimum thermal conductivity of 126 W/m*K to run cooler. Seals will have a minimum hardness of 2800 kg/mm2 to be more resistant to wear, and have thermal expansion characteristics of no more than 4.0 X106mm/mm*K to be more resistant to thermal shock.

Gear Case, Pierce Pump, REPTO-Clutch Drive

PUMP GEAR CASE

The pump gear case will be a pressure-lubricated to cool, lubricate, and filter the oil. The gear case will include an auxiliary PTO opening. The gear case will be constructed of lightweight aluminum, and impregnated with resin in accordance to MIL Spec MIL-I-17563. A dipstick, accessible by tilting the cab, will be provided for easy fluid level checks. A filter screen will be provided for long life.

The gear case will consist of two (2) gears to drive the pump impeller and one (1) for the auxiliary PTO.

The auxiliary PTO opening will provide for the addition of PTO driven accessories.

The pump will be driven through the rear engine power take-off and clutch. The rear engine power take-off drive will be live at all times to allow for pump and roll applications. Rear engine power take-off's allow for high horsepower and torque ratings needed for large pump applications, and is a proven drive system throughout the rugged construction industry.

CLUTCH

There will be a heavy-duty electric clutch mounted directly to the front of the pump to engage and disengage the pump without gear clash. The clutch will be a multiple disc design for maximum torque. The clutch will be fully self-adjusting to provide automatic wear compensation, and consistent torque throughout the life of the clutch. Positive engagement and disengagement will be provided through a high efficient and dependable magnetic system to assure superior performance. The clutch will have a 500 lb-ft rating. Clutch will be of a time-tested design used in critical military applications.

0721196

Pumping Mode, Pump and Roll/Stationary, Basic, MUX, PUC

PUMPING MODE

Pump will provide for both pump and roll mode and stationary pumping. Stationary pumping mode will be accomplished by stopping the vehicle, and engaging the water pump switch on the cab switch panel. The transmission will shift to "Neutral" range automatically when the parking brake is set. The "OK to Stationary Pump" indicator will also illuminate when the parking brake is set. If the vehicle is equipped with a suitable Husky foam system or Hercules CAFS system, these systems will be engaged from the cab switch panel as well. Pump and roll mode will be accomplished by the use of the main pump and will not require the use of a secondary pump. Pump and roll mode will use the same operation sequence as stationary pumping mode with a few additional steps. After the vehicle is setup for stationary pumping, the operator will leave the cab and setup the pump panel to discharge at the desired outlet(s). Upon returning to the cab, the operator will disengage the parking brake. An "OK to Pump & Roll" indicator will illuminate on the cab switch panel. First gear on the transmission gear selector will be selected by the operator for pump and roll operations. The operator as needed will apply the foot throttle. Pump and roll mode will be maintained unless the transmission shifts out of first gear. Stopping either stationary pumping mode or pump and roll mode will be accomplished by pressing the "Water Pump" switch down to disengage the pump. A pump pressure reading will be displayed on the drivers multiplex information center, in view of the driver.

AGENDA ITEM NO. 6.

0515829

Pump Shift, Sure-Shift

PUMP SHIFT

Pump will be engaged in not more than two steps, by simply setting the parking brake, which will automatically put the transmission into neutral, and activating a rocker switch in the cab. Switches in the cab will also allow for water, foam, or CAFS if equipped, and activate the appropriate system to preset parameters. The engagement will provide simple two-step operation, enhance reliability, and completely eliminate gear clash. The shift will include the indicator lights as mandated by NFPA. A direct override switch will be located behind a door in the lower pump operator's panel. The switch will automatically disengage when the door is closed. As the parking brake is applied, the pump panel throttle will be activated and deactivate the chassis foot throttle for stationary operation.

0515833

Transmission Lock-up, Not Req'd, Park to Neutral, Pump, PUC

TRANSMISSION LOCK UP

Transmission lock up is not required as transmission will automatically shift to neutral as soon as the parking brake is set.

0515835

Auxiliary Cooling System, PUC

AUXILIARY COOLING SYSTEM

A supplementary heat exchange cooling system will be provided to allow the use of water from the discharge side of the pump for cooling the engine water. A water-to-coolant heat exchanger will be used.

0014486

Not Required, Transfer Valve, Stage Pump

0746508

Valve(s), Relief Intake, Trident Air Max, Control Location

INTAKE RELIEF VALVE

One (1) Trident Air Max intake relief valve(s) will be installed on the suction side of the pump preset at 200 psig. The relief valve will have a working range of 50 PSI to 350 PSI. The outlet will terminate below the frame rails with a 2.50" National Standard hose thread adapter and will have a "do not cap" warning tag. One (1) adjustable air regulator and pressure indicating gauge will be located on a common bezel on the left side pump panel to control the intake valve(s).

PIERCE PRESSURE CONTROLLER

A Pierce electronic pressure controller will be provided.

A pressure transducer will be installed in the discharge side of the water line. The controller continuously monitors pump pressure sending a signal to the electronic control panel.

The pressure controller can be used in two (2) modes of operation, RPM mode and pressure modes. The controller will be programmed to turn on/default to RPM Setting mode.

In the RPM mode, the controller can be activated after vehicle parking brake has been set. When in this mode, the controller will maintain the set engine speed, regardless of engine load (within engine operation capabilities).

In the pressure mode, the controller can be activated after vehicle parking brake has been set. When in this mode, the controller will automatically maintain the discharge pressure set by the operator (within the discharge capabilities of the pump and water supply) regardless of flow.

A 2.00" diameter throttle control knob with no mechanical stops, a serrated grip, and a red idle push button in the center will be a integrated/part of the pressure controller. The throttle control knob will be programmed for Clockwise rotation to increase engine speed.

Individual LED indicators for ok to pump, throttle ready, pressure mode and rpm mode will be located on the pressure controller for easy viewing.

A pump cavitation protection feature will also provided which will return the engine to idle should the pump cavitate. Cavitation is sensed by the combination of pump pressure below 30 psi and engine speed above 2000 rpm for more than five (5) seconds.

Other safety features include recognition of low water and no water conditions with an automatic programmed response and a push button to return the engine to idle.

The pressure controller LCD screen will be 4.20" in size with a minimum brightness of 750 nits.

The LCD screen and LED intensity will be automatically adjust for day and nighttime operation. The LCD screen intensity can also be manually adjusted if needed.

The following information will be provided/displayed on the LCD screen -

Engine RPM

Check engine and stop engine warning indicators

Engine oil pressure

Engine coolant temperature

Water pump temperature

Fuel Level

Water tank level

Battery voltage

Operating mode (RPM or pressure)

Pressure or RPM setting

On screen messaging show diagnostic and warning messages as they occur. It will show apparatus information, stored data, and program options when selected by the operator. It will monitor inputs outputs and support audible and visual warning alarms for the following conditions -

High battery voltage

Low battery voltage/engine off

Low battery voltage/engine running

High water pump temperature

Low fuel

Low engine oil pressure

High engine coolant temperature

Water tank out of water (visual alarm only)

No engine response (visual alarm only)

The pressure controller will store the accumulated operating hours for the pump and engine.

These items are to be displayed within the pressure controller menu.

The pressure controller will include a USB port on the back of the controller for easy software upgrades if needed.

AGENDA ITEM NO. 6.

0072153

Primer, Trident, Air Prime, Air Operated

PRIMING PUMP

The priming pump will be a Trident Emergency Products compressed air powered, high efficiency, multistage venturi based AirPrime System, conforming to standards outlined in the current edition of NFPA 1901.

All wetted metallic parts of the priming system are to be of brass and stainless steel construction.

One (1) priming control will open the priming valve and start the pump primer.

0044552

Line, 0.50" Recirculating w/Check Valve

RECIRCULATING LINE WITH CHECK VALVE

A 0.50" diameter recirculating line, from the pump to the water tank, will be furnished with a control installed at the pump operator's control panel. A check valve will be provided in this line to prevent the back flow of water from the tank to the pump if the valve is left in the open position.

0658266

Thermal Relief Valve, w/Amber Warning Light and Alarm, PUC Pump

THERMAL RELIEF VALVE

A Pierce thermal relief valve will be included on the pump that monitors pump water temperature and opens to relieve water to cool the pump when the temperature of the pump water exceeds 120 Degrees F (49 C).

The thermal protection system will include a amber warning light and audible alarm mounted on the pump operator panel.

The discharge line will be 3/8 inch diameter tubing plumbed to ground.

0780359

Manuals, Pump, (2) Total, Electronic Copies, Pierce PUC Pump

PUMP MANUALS

There will be a total of two (2) pump manuals provided by the pump manufacturer and furnished with the apparatus. The manuals will be provided by the pump manufacturer in the form of two (2) electronic copies. Each manual will cover pump operation, maintenance, and parts.

0602496	Plumbing, Stainless Steel and Hose, Single Stage Pump, PUC	<p>PLUMBING, STAINLESS STEEL AND HOSE All inlet and outlet lines will be plumbed with either stainless steel pipe, tubing or synthetic rubber hose reinforced with hi-tensile polyester braid equipped with brass or stainless steel couplings. All stainless steel hard plumbing will be a minimum of a schedule 10 wall thickness. Where vibration or chassis flexing may damage or loosen piping or where a coupling is required for servicing, the piping will be equipped with victaulic or rubber couplings. Plumbing manifold bodies will be ductile cast iron or stainless steel. All piping lines are to be drained through a master drain valve or will be equipped with individual drain valves. All drain lines will be extended with a hose to drain below the chassis frame. All water carrying gauge lines will be of flexible polypropylene tubing. All piping, hose and fittings will have a minimum of a 500 PSI hydrodynamic pressure rating.</p>
0795135	Plumbing, Stainless Steel, w/Foam System	<p>FOAM SYSTEM PLUMBING All piping that is in contact with the foam concentrate or foam/water solution will be stainless steel. The fittings will be stainless steel or brass. Cast iron pump manifolds will be allowed.</p>
0517852	Inlets, 6.00" - 1500 GPM, Pierce PUC Pump	<p>MAIN PUMP INLETS A 6.00" pump manifold inlet will be provided on each side of the vehicle. The suction inlets will include removable die cast zinc screens that are designed to provide cathodic protection for the pump, thus reducing corrosion in the pump. Main pump inlets will not be located on the main operator's panel and will maintain a low connection height by terminating below the top of the chassis frame rail.</p>
0004646	Cap, Main Pump Inlet, Long Handle, NST, VLH	<p>MAIN PUMP INLET CAP The main pump inlets will have National Standard Threads with a long handle chrome cap. The cap will be the Pierce VLH, which incorporates an exclusive thread design to automatically relieve stored pressure in the line when disconnected.</p>
0767402	Valve, w/Relief, Left Inlet, 6", Akron 9333 Elec Controller, Manual Override,PUC	<p>INLET BUTTERFLY VALVE There shall be one (1) butterfly valve provided on the left side main pump inlet. The 6.00" inlet valve shall be recessed behind the pump panel. A built-in, adjustable pressure relief valve and a 3/4" bleeder valve shall be provided on the inlet side of the valve. The bleeder valve controls shall be located at the threaded connection and at the pump operator's panel. There shall be an Akron 9333 electric valve controller provided on the pump operators panel. The electric control must be of a true position feedback design, requiring no clutches in the motor or current limiting. The unit must be completely sealed with momentary open, close as well and an optional one touch full open feature to operate the valve actuator. The controller shall provide position indication on a full color, backlit LCD display. It shall have manual adjustment of the brightness as well as an auto dimming option. The electric actuator will be furnished with a manual override, extended to the pump panel. A manual override wrench will be provide to manually open or close the valve.</p>
0084610	Valves, Akron 8000 series- All	<p>VALVES All ball valves will be Akron® Brass. The Akron valves will be the 8000 series heavy-duty style with a stainless steel ball and a simple two-seat design. No lubrication or regular maintenance is required on the valve. Valves will have a ten (10) year warranty.</p>
0004660	Inlet (1), Left Side, 2.50"	<p>LEFT SIDE INLET There will be one (1) auxiliary inlet with a 2.50" valve at the left side pump panel, terminating with a 2.50" (F) National Standard hose thread adapter. The auxiliary inlet will be provided with a strainer, chrome swivel and plug.</p>
0004680	Inlet, Right Side, 2.50"	<p>RIGHT SIDE INLET There will be one (1) auxiliary inlet with a 2.50" valve at the right side pump panel, terminating with a 2.50" (F) National Standard hose thread adapter. The auxiliary inlet will be provided with a strainer, chrome swivel and plug.</p>
0520002	Valve, Inlet(s) Recessed, Side Cntrl, PUC	<p>The location of the valve for the two (2) inlets will be recessed behind the pump panel.</p>
0521137	Anode, Zinc, Pair, Pump Inlets, PUC	<p>ANODE, INLET A pair of sacrificial zinc anodes will be provided in the water pump inlets to protect the pump from corrosion.</p>
0004700	Control, Inlet, at Valve	<p>INLET CONTROL The side auxiliary inlet(s) will incorporate a quarter-turn ball valve with the control located at the inlet valve. The valve operating mechanism will indicate the position of the valve.</p>

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0672141	Inlet, 4" to 6" Front, 5" S/S Plumbing, w/Bleeder Valve, California Style	<p>FRONT INLET A 4.50" inlet front inlet with die cast zinc screens will be provided using 5.00" elbows and a 5.00" butterfly valve. Only radiused elbows will be used in the piping. Drains are furnished in all the low points of piping and have .75" valves with push panel controls. A bleeder valve will be located at the threaded connection. The front inlet will terminate at the right side of the bumper extension with a "California" style installation.</p>
AGENDA ITEM NO. 6.		
0767497	Control, Front Inlet, Akron 9333 Elec Controller, w/Override, PUC	<p>FRONT INLET CONTROL The front inlet will be gated and controlled with an Akron 9333 electric valve controller provided on the pump operators panel. The electric control must be of a true position feedback design, requiring no clutches in the motor or current limiting. The unit must be completely sealed with momentary open, close as well and an optional one touch full open feature to operate the valve actuator. The controller will provide position indication on a full color, backlit LCD display. It will have manual adjustment of the brightness as well as an auto dimming option. A manual override hex nut will be provided directly on the valve. Access to the manual override hex nut will be between the lower pump panel and the rearward area of the cab on the right side of the truck. A maintain switch will be provided on the lower right PUC pump panel near the manual override hex nut to disconnect the power to the electric actuator motor to allow the manual override to be utilized. An instruction placard will be supplied with directions to operate the manual override. A manual override speed wrench with swivel sockets will be provided in loose equipment to override the front inlet valve.</p>
0737985	Valve, Relief Intake,Front Inlet,Trident Air Max,Cntrl w/Main Pump Intake Relief	<p>INTAKE RELIEF VALVE, FRONT INLET A Trident Air Max intake relief valve will be installed on the inlet side of the front inlet valve. The relief valve will have a working range of 50 PSI to 350 PSI. The outlet will terminate below the frame rails with a 2.50" National Standard hose thread adapter and will have a "do not cap" warning tag. The control for this front inlet intake relief valve will be operated with the main pump Trident Air Max intake relief valve controls.</p>
0521688	Not Required, Cap, Long Handle, Front Inlet, Pre-connected Hose	
0769000	Piping to Terminate in Hose Tray, As Short As Possible	<p>FRONT INLET PIPING The piping for the front inlet will terminate with a chrome plated National Standard hose thread adapter, within the front hose tray so that the adapter threads protrude just far enough to allow a hose coupling to be installed.</p>
0092569	No Rear Inlet (Large Dia) Requested	
0092696	Not Required, Cap, Rear Inlet	
0064116	No Rear Inlet Actuation Required	
0009648	No Rear Intake Relief Valve Required on Rear Inlet	
0092568	No Rear Auxiliary Inlet Requested	
0563738	Valve, .75" Bleeder, Aux. Side Inlet, Swing Handle	<p>INLET BLEEDER VALVE A 0.75" bleeder valve will be provided for each side gated inlet. The valves will be located behind the panel with a swing style handle control extended to the outside of the panel. The handles will be chrome plated and provide a visual indication of valve position. The swing handle will provide an ergonomic position for operating the valve without twisting the wrist and provides excellent leverage. The water discharged by the bleeders will be routed below the chassis frame rails.</p>
0520277	Tank to Pump, (1) 3.00" Valve, 4.00" Plumbing, PUC	<p>TANK TO PUMP The booster tank will be connected to the intake side of the pump with heavy duty 4.00" piping and a quarter turn 3.00" full flow line valve with the control located at the operator's panel. A rubber coupling will be included in this line to prevent damage from vibration or chassis flexing. A check valve will be provided in the tank to pump supply line to prevent the possibility of "back filling" the water tank.</p>
0595508	Outlet, Tank Fill, 1.50", PUC	<p>TANK REFILL A 1.50" combination tank refill and pump re-circulation line will be provided, using a quarter-turn full flow ball valve controlled from the pump operator's panel.</p>

0516755	Outlet, Left Side, 2.50" (2), PUC	<p>LEFT SIDE DISCHARGE OUTLETS</p> <p>There will be two (2) discharges with a 2.50" valves on the left side of the apparatus with a 2.50" (M) National Standard hose thread adapter. Discharges will be no higher than the top of the chassis frame rail. Discharges will not be located on the pump operator's panel. Lever controls will be provided at the valve.</p>
0766761	Outlet, Right Side, 2.50", (1), Electric Akron 9335 Controller, PUC	<p>RIGHT SIDE DISCHARGE OUTLETS</p> <p>There will be One (1) discharge outlet with a 2.50" valve on the right side of the apparatus, terminating with a 2.50" MNST adapter. The discharge(s) will be located below the crew cab and will be no higher than the top of the chassis frame rail.</p> <p>There will be Akron 9335 electric valve controller(s) provided on the pump operators panel. The electric control(s) must be of a true position feedback design, requiring no clutches in the motor or current limiting. The unit(s) must be completely sealed with momentary open, close as well and an optional one touch full open feature to operate the valve actuator. The controller(s) will provide position indication on a full color, backlit LCD display. They will have manual adjustment of the brightness as well as an auto dimming option.</p> <p>In addition to valve position, each controller will include a pressure display.</p>
0766992	Outlet, Right Side, 4" w/4" Valve, Akron 9335 Elec Controller, PUC	<p>LARGE DIAMETER DISCHARGE OUTLET</p> <p>There will be a 4.00" discharge outlet with a 4.00" valve installed on the right side of the apparatus, terminating with 4.00" MNST threads. The discharge will be located below the crew cab and will be no higher than the top of the chassis frame rail.</p> <p>There will be an Akron 9335 electric valve controller provided on the pump operators panel. The electric control must be of a true position feedback design, requiring no clutches in the motor or current limiting. The unit must be completely sealed with momentary open, close as well and an optional one touch full open feature to operate the valve actuator. The controller will provide position indication on a full color, backlit LCD display. It will have manual adjustment of the brightness as well as an auto dimming option.</p> <p>In addition to valve position, the controller will include a pressure display.</p>
0649939	Outlet, Front, 1.50" w/2" Plumbing	<p>FRONT DISCHARGE OUTLET</p> <p>There will be one (1) 1.50" discharge outlet piped to the front of the apparatus and located on the top of the left side of the front bumper.</p> <p>Plumbing will consist of 2.00" piping and flexible hose with a 2.00" ball valve with control at the pump operator's panel. A fabricated weldment made of stainless steel pipe will be used in the plumbing where appropriate. The piping will terminate with a 1.50" NST with 90 degree stainless steel swivel.</p> <p>There will be Elkhart push pull drains provided at all low points of the piping.</p>
0516777	Outlet, Rear, 2.50", (1), Thru Tank, PUC	<p>REAR DISCHARGE OUTLET</p> <p>There will be One (1) discharge outlet piped to the rear of the hose bed on left side, installed so proper clearance is provided for spanner wrenches or adapters. Plumbing will consist of 2.50" piping along with a 2.50" full flow ball valve with the control from the pump operator's panel. Discharge will terminate with 2.50" NST thread. Discharge piping will be schedule 10 304L welded or formed stainless steel and routed through the water tank.</p>
0537394	Not Required, Outlet, Rear, Additional, PUC	
0752078	Caps/Plugs for 1.00" to 3.00" Discharges/Inlets, S/S Cable	<p>DISCHARGE CAPS/ INLET PLUGS</p> <p>Chrome plated, rocker lug, caps with S/S cables will be furnished for all discharge outlets 1.00" thru 3.00" in size, besides the pre-connected hose outlets.</p> <p>Chrome plated, rocker lug, plugs with S/S cables will be furnished for all auxiliary inlets 1.00" thru 3.00" in size.</p> <p>The caps and plugs will incorporate a thread design to automatically relieve stored pressure in the line when disconnected.</p>
0563739	Valve, 0.75" Bleeder, Discharges, Swing Handle	<p>OUTLET BLEEDER VALVE</p> <p>A 0.75" bleeder valve will be provided for each outlet 1.50" or larger. Automatic drain valves are acceptable with some outlets if deemed appropriate with the application.</p> <p>The valves will be located behind the panel with a swing style handle control extended to the outside of the side pump panel. The handles will be chrome plated and provide a visual indication of valve position. The swing handle will provide an ergonomic position for operating the valve without twisting the wrist and provides excellent leverage. Bleeders will be located at the bottom of the pump panel. They will be properly labeled identifying the discharge they are plumbed in to. The water discharged by the bleeders will be routed below the chassis frame rails.</p>
0055095	Not Required, Elbow, Left Side Outlets, 2.50"	
0021134	Not Required, Elbow, Right Side Outlets	

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0045091		Elbow, Rear Outlets, 45 Degree, 2.50" FNST x 2.50" MNST, VLH	<p>REAR OUTLET ELBOWS</p> <p>The 2.50" discharge outlets located at the rear of the apparatus will be for National Standard hose thread x 2.50" (M) National Standard hose thread degree elbow.</p> <p>The elbow will be Pierce VLH, which incorporates an exclusive thread design to automatically relieve stored pressure in the line when disconnected.</p>	AGENDA ITEM NO. 6.
0537395		Not Required, Elbow, Rear Outlets, Additional		
0602443		Elbow and Cap, Large Dia Outlet, Provided by Fire Department, NFPA 2016	<p>ELBOW AND CAP, LARGE DIAMETER OUTLET PROVIDED BY FIRE DEPT</p> <p>NFPA 1901, 2016 edition, section 16.7.7 requires any 2.00" or larger discharge outlet that is located more than 42.00" off the ground and to which hose is to be connected and that is not in a hose storage area will be supplied with a sweep elbow of at least 30 degrees downward. NFPA 1901, 2016 edition, section 16.7.4 requires all discharge outlet connections, except connections to which a hose will be pre-connected, will be equipped with caps or closures capable of withstanding a hydrostatic gauge pressure of 100 psi over the maximum pump close-off pressure or 500 psi, whichever is greater.</p> <p>The elbow(s) and cap are not on the apparatus as manufactured. The fire department will provide the elbow(s) and cap.</p>	
0638829		Adapter, Thread - 4.00" FNST X 4.50" MNST, w/Cap	<p>ADAPTER</p> <p>There will be one (1) adapter with 4.00" FNST x 4.50" MNST, chrome, with cap. These adapters will be installed on right side.</p>	
0005080		Reducer, 2.50" FNST x 1.50" MNST, w/Cap	<p>REDUCER</p> <p>There will be one (1) adapter with 2.50" FNST x 1.50" MNST threads and a 1.50" chrome plated cap installed on rear 2.5" discharge.</p>	
0601697	SP	Outlet, 3.00" Deluge w/3.00" Valve, w/TFT Extend-a-Gun XG18 riser, PUC	<p>DELUGE RISER</p> <p>A 3.00" deluge riser will be installed above the pump in such a manner that a monitor can be mounted and used effectively. Piping will be installed securely so no movement develops when the line is charged. The riser will be gated and controlled at the pump operator's panel. A 3.00" valve will be provided. The deluge riser will allow flow for 1250 GPM.</p> <p>Any 3.00 inch or larger discharge valve will be a slow-operating valve in accordance with NFPA 16.7.5.3.</p> <p>TELESCOPIC PIPING</p> <p>The deluge riser piping will include a 18.00" Task Force Model XG18 Extend-A-Gun extension. This extension will be telescopic to allow the deluge gun to be raised 18.00" increasing the range of operation.</p> <p>A triangular bracing structure will be installed to support the piping. Aluminum tread plate will be placed on the forward side of the bracing structure.</p> <p>A position sensor will be provided on the telescopic piping that will activate the "do not move vehicle" light inside the cab when the monitor is in the raised position.</p>	
0766952		Control, Outlets,Elec Right Outlet,Akron 9335 Press Disp,Add'l Outlets 9335,PUC	<p>DISCHARGE OUTLET CONTROLS</p> <p>The discharge outlets will incorporate a quarter-turn ball valve with the control located at the pump operator's panel. The valve operating mechanism will indicate the position of the valve or an indicator will be provided to show when the valve is closed.</p> <p>The right side discharges will be controlled by an Akron 9335 electric valve controller provided on the pump operators panel. The electric control must be of a true position feedback design, requiring no clutches in the motor or current limiting. The unit must be completely sealed with momentary open, close as well and an optional one touch full open feature to operate the valve actuator. The controller will provide position indication on a full color, backlit LCD display. It will have manual adjustment of the brightness as well as an auto dimming option. In addition to the valve controls, the electric valve controller will include a pressure display</p> <p>Additional One (1) discharge outlet will have Akron 9335 electric valve controllers provided on the pump operator's panel. The outlet(s) will be located Deluge. The electric control(s) must be of a true position feedback design, requiring no clutches in the motor or current limiting. The unit(s) must be completely sealed with momentary open, close as well and an optional one touch full open feature to operate the valve actuator. The controller(s) will provide position indication on a full color, backlit LCD display. They will have manual adjustment of the brightness as well as an auto dimming option. In addition to the valve controls, the electric valve controller will include a pressure display</p> <p>All other outlets will have manual swing handles that operate in a vertical up and down motion. These handles will be able to lock in place to prevent valve creep under pressure.</p>	
0746542	SP	4.50" Quicloc Mount, RMP49, 4.5 NST	<p>There will be one (1) RMP4912AC 4.5"NST quicloc mounting plate, for the deluge monitor portable base, installed in the cargo area.</p> <p>The mounting plate will be installed at customer inspection.</p>	
0747173	SP	2.50" Quicloc Mount	<p>There will be one (1) QL48Z25C quicloc mounting plate, for the deluge monitor stacked tips, installed in the cargo area.</p> <p>The mounting plate will be installed at customer inspection.</p>	

0770359	No Monitor Requested, Customer/Dealer Furnished and Installed	MONITOR A customer/dealer supplied and installed make and model Apollo Model properly installed on the deluge riser.	AGENDA ITEM NO. 6.
0029304	No Nozzle Req'd		
0005070	Deluge Mount, NPT	The deluge riser will have male National Pipe Threads for mounting the monitor.	
0750982	Crosslay Module, Full Width, Roll Up Doors, PUC	CROSSLAY MODULE The crosslay module will be full width of the rear body. The forward, upper corners of the module will have full body corners. The crosslay module will be manufactured for installation of roll up doors on each side.	
0750897	Doors, Crosslay, Roll-up Amdor, Each End, Full Height, PUC	ROLL-UP DOOR, CROSSLAY ENDS, PUC All compartment doors will be roll-up style double faced, aluminum construction, painted one (1) color to match the lower portion of the body and manufactured by AMDOR™. The crosslay enclosure will be full width of the body. The track will be the flanged track with the screws installed to the rear of the track guide. The slats will be double wall box frame extrusion. The exterior surface will be flat and the interior surface will be concave to help loose equipment fall to the ground and prevent it from jamming the door. Between each slat will be a PVC inner seal to prevent metal to metal contact and prevent dirt or moisture from entering the compartments. Each door will have a 4.00" counter balance to assist in lifting. A polished stainless steel lift bar with locking key latches to be provided for each roll-up door. The keys to be Model 751 to match all compartment and cab doors. The lift bar will be located at the bottom of door with striker latches installed at the base of the side frames. Side frame mounted door strikers will include support beneath the stainless steel lift bar to prevent door curtain bounce, improve bottom seal life expectancy and to avoid false door ajar signals. The crosslays will have a drip pan below the roll of the door.	
0747660	Lights, Crosslay Compt, Forward LED, 2Lts	CROSSLAY COMPARTMENT LIGHTING There will be two (2) 12 volt DC light strips with white LEDs and mechanical fasteners, provide behind the front door frame on the crosslay compartments per the following: One (1) strip light for the left side crosslay compartment door One (1) strip light for the right side crosslay compartment door The lights will be activated when the battery switch is on and the respective door is opened.	
0750916	Crosslays, (2) 1.50", W/Poly Trays, PUC	CROSSLAY(S), LOWER There will be two (2) lower crosslays provided. 1.50" Crosslays There will be two (2) 1.50" crosslays plumbed with 2.00" welded or formed schedule 10 304L stainless steel pipe. The crosslays will be low mounted with the bottom of both crosslay trays no more than 11.00" above the frame rails for simple, safe reloading and deployment. There will be a 1.50" National Standard hose thread 90-degree swivel provided in each hose bed, so that the hose may be removed from either side of apparatus. The swivel will be as far outbound as possible for ease of changing hose. Each crosslay will be gated with a 2.00" quarter turn ball valve with the controls located at the pump operator's panel. Each hose bed will be capable of carrying 200' of 1.75" double jacket hose . Crosslay Hose Trays A removable tray will be provided for each crosslay hose bed. The crosslay tray will be constructed of black poly to provide a lightweight sturdy tray. Two (2) hand holes will be in the floor and additional hand holes will be provided in the sides for easy removal and installation from the compartment. The floor of the trays will be perforated to allow for drainage and hose drying. Trays will be held in place by a mechanical spring-loaded stainless-steel latch that automatically deploys upon loading the trays to hold the trays in place during transit.	

0744954		Crosslay, (1) 1.50", Deadlay (1), W/Poly Trays, PUC	<p>CROSSLAY(S)/DEADLAY(S) UPPER There will be one (1) upper crosslay and one (1) upper deadlay provided.</p> <p>1.50" Crosslay There will be one (1) 1.50" crosslay plumbed with 2.00" welded or formed stainless steel pipe.</p> <p>There will be a 1.50" National Standard hose thread 90-degree swivel provided in each hose bed, so that hose may be removed from either side of apparatus. The swivel will be as far outboard as possible for ease of changing hose.</p> <p>Each crosslay will be gated with a 2.00" quarter turn ball valve with the controls located at the pump operator's panel.</p> <p>Each hose bed will be capable of carrying 200' of 1.75" double jacket hose .</p> <p>Deadlay There will be one (1) deadlay, without plumbing provided. The hose bed will be capable of carrying 200' of 1.75" double jacket hose .</p> <p>Crosslay Hose Trays A removable tray will be provided for each crosslay hose bed. The crosslay tray will be constructed of black poly to provide a lightweight sturdy tray. Two (2) hand holes will be in the floor and additional hand holes will be provided in the sides for easy removal and installation from the compartment. The floor of the trays will be perforated to allow for drainage and hose drying. Trays will be held in place by a mechanical spring-loaded stainless-steel latch that automatically deploys upon loading the trays to hold the trays in place during transit.</p>
0724032	SP	Mounting, Backboard, Upper Crosslay Module, Strap, Special, PUC	<p>BACKBOARD STORAGE Mounting will be provide for One (1) backboard(s) located in the upper crosslay module. The backboard(s) will be enclosed and removable from either side of the truck. A 2" Velcro® strap with a tri-glide buckle will be provided on each end of the storage. A footman's loop will be used on the forward wall. The rearward wall will have a slot cut into it to weave the restraint strap through.</p> <p>The backboard(s) to be stored will be 1.5" T x 18"W x 71.75" L.</p>
0791268		MODIFICATION, Increase Wheelbase 1.00"	
0724070	SP	Reel, Booster, Steel, Rr Tailboard Comp,High,Platform Mt w/Stg, Spl Roll Assy,PUC	<p>BOOSTER HOSE REEL A Hannay electric rewind booster hose will be installed as high as practical in the rear compartment on an elevated platform supported off the floor of the compartment. The platform will be mounted to allow storage of miscellaneous items below, to be accessed from the rear. The exterior finish of the reel will be painted #269 gray from the reel manufacturer. Roll-up door for this compartment will not interfere with the hose reel.</p> <p>A stainless steel roller assembly will be provided on the rear of the reel so the booster hose does not rub against a painted surface. The roller assembly will be provided as close to the door as practical. One (1) horizontal roller will be provided at the bottom for the width of the drum. One (1) horizontal roller will be provided at the top for the width of the drum. Two (2) vertical rollers shall be provided, one (1) each side, for the height of the drum.</p> <p>Discharge control will be provided at the pump operator's panel. Plumbing to the reel will consist of 1.50" or larger Aeroquip hose, stainless steel pipe and a 2.00" valve.</p> <p>HOSE REEL BLOWOUT A hose reel blowout will be furnished to blow out any remaining water from the hose reel. The blowout will be piped from the wet tank of the brake system to the hose reel and will be controlled at the pump operator's panel.</p>
0007666		Switch, Reel Rewind - One at Reel, Location	<p>REEL REWIND SWITCH Reel motor will be protected from overload with a circuit breaker rated to match the motor. Electric rewind control will be a rubber covered button will be located on the driver side in B1(match 34758).</p>
0045300		Hose, Booster - 200' of 1.00"/800 PSI	<p>Booster hose, 1.00" diameter and 200 feet, with chrome plated Barway, or equal couplings will be provided. Working pressure of the booster hose will be a minimum of 800 psi.</p>
0005244		Capacity, Hose Reel 200' of 1"	<p>Capacity of the hose reel will be 200 feet of 1.00" booster hose.</p>
0007428		Nozzle for Booster Reel Not Req'd	

AGENDA ITEM NO. 6.

HUSKY 3 FOAM PROPORTIONER

A Pierce Husky® 3 foam proportioning system will be provided. The Husky 3 is an automatic proportioning, single point, direct injection system suitable for Class A foam concentrates, including the high viscosity (6000 cps), alcohol resistant Class B foams. Operation will be based on direct measurement of water flow, and remain consistent within the specified flows and pressures. The system will automatically proportion foam solution at rates from 0.1 percent to 3 percent regardless of variations in water pressure and flow, up to the maximum rated capacity of the foam concentrate pump.

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The design of the system will allow operation from draft, hydrant, or relay operation.

System Capacity

The system will have the ability to deliver the following minimum foam solution flow rates at accuracies that meet or exceed NFPA requirements at a pump rating of 150 psi.

100 gpm @ 3 percent
300 gpm @ 1 percent
600 gpm @ 0.5 percent

Class A foam setting in 0.1 percent increments from 0.1 percent to 1 percent. Typical settings of 1 percent, 0.5 percent and 0.3 percent (maximum capacity will be limited to the plumbing and water pump capacity).

Control System

The system will be equipped with a digital electronic control display located on the pump operators panel. Push button controls will be integrated into the panel to turn the system on/off, control the foam percentage, and to set the operation modes.

The percent of injection will have a preset. This preset can be changed at the fire department as desired. The percent of injection will be able to be easily changed at the scene to adjust to changing demands.

Three (3) 0.50" high LEDs will display the foam percentage in numeric characters. Three (3) indicator LEDs will also be included: one (1) green, one (1) red, and one (1) yellow. The LEDs will indicate various system operation or error states.

The indications will be:

Solid Green - System On
Solid Red - Valve Position Error
Solid Yellow - Priming System
Flashing Green - Injecting Foam
Flashing Red - Low Tank Level
Flashing Yellow - Refilling Tank

The control display will house a microprocessor, which receives input from the systems water flow meter while also monitoring the position of the foam concentrate pump. The microprocessor will compare the values of the water flow versus the position/rate of the foam pump, to ensure the proportion rate is accurate. One (1) check valve will be installed in the plumbing to prevent foam from contaminating the water pump.

Hydraulic Drive System

The foam concentrate pump will be powered by an electric over hydraulic drive system. The hydraulic system and motor will be integrated into one unit.

Foam Concentrate Pump

The foam concentrate pump will be of positive displacement, self-priming; linear actuated design, driven by the hydraulic system. The pump will be constructed of brass body; chrome plated stainless steel shaft, with a stainless steel piston. In order to increase longevity of the pump, no aluminum will be present in its construction.

A relief system will be provided which is designed to protect the drive system components and prevent over pressuring the foam concentrate pump.

The foam concentrate pump will have minimum capacity for 3 gpm with all types of foam concentrates with a viscosity at or below 6000 cps including protein, fluoroprotein, AFFF, FFFP, or AR-AFFF. The system will deliver only the amount of foam concentrate flow required, without recirculating foam back to the storage tank. Recirculating foam concentrate back to the storage tank can cause agitation and premature foaming of the concentrate, which can result in system failure. The foam concentrate pump will be self-priming and have the ability to draw foam concentrate from external supplies such as drums or pails.

External Foam Concentrate Connection

An external foam pick-up will be provided to enable use of a foam agent that is not stored on the vehicle. The external foam pick-up will be designed to allow continued operation after the on-board foam tank is empty, or the use of foam different than the foam in the foam tank.

Panel Mounted External Pick-Up Connection / Valve

A bronze three (3)-way valve will be provided. The unit will be mounted to the pump panel. The valve unit will function as the foam system tank to pump valve and external suction valve. The external foam pick-up will be one (1) 0.75" male connection GHT (garden hose thread) with a cap.

Pick-Up Hose

A 0.75" flexible hose with an end for insertion into foam containers will be provided. The hose will be supplied with a 0.75" female swivel GHT (garden hose thread) swivel connector. The hose will be shipped loose.

Discharges

The foam system will be plumbed to the lower rear crosslay, lower front crosslay, upper rear crosslay, left side of front bumper, hose reel in the rear compartment and left rear outlet.

System Electrical Load

The maximum current draw of the electric motor and system will be no more than 55 amperes at 12 VDC.

0592527

Refill, Foam Tank, Integral, Husky 3

SINGLE FOAM TANK REFILL

The foam system's proportioning pump will be used to fill the foam tank. auxiliary foam pick-up to pump the foam from pails or a drum on the ground. A foam shut-off switch will be installed in the fill dome of the tank to shut the system down when the tank is full. The fill operation will be controlled by a mode in the foam system controller. While the proportioner pump is filling the tank, the controller will display a flashing yellow LED to indicate that the tank is filling. When the tank is full, as determined by the float switch in the tank dome, the pump will stop and the controller will shut the yellow LED off. If it attempted to use tank fill and the refill valve and suction valve are in the wrong position(s), then a red LED will illuminate to indicate the improper valve position(s). When the valves are positioned properly, then filling will commence.

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0031896

Demonstration, Foam System, Dealer Provided

0530519

Foam Cell, 30 Gallon, Not Reducing, PUC

FOAM CELL

The foam cell will be an integral portion of the polypropylene water tank. The cell will have a capacity of 30 gallons of foam with the intended use of Class A foam. The brand of foam stored in this tank will be Silvex. The foam cell will not reduce the capacity of the water tank. The foam cell will have a screen in the fill dome and a breather in the lid.

0697589

Drain, 1.00", Foam Tank #1, Husky 3 Foam System, Quarter Turn

FOAM TANK DRAIN

The foam tank drain will be a 1.00" quarter turn drain valve located inside the pump/plumbing compartment.

0091079

Not Required, Foam Tank #2

0091112

Not Required, Foam Tank #2 Drain

0515692

Pump Operators Panel, 31", Control Zone, PUC

PUMP CONTROL PANELS (Left Side Control)

Pump controls and gauges will be located midship at the left side of the apparatus and properly identified.

The main pump operator's control panel will be completely enclosed and located in the forward section of the body compartment, to protect against road debris and weather elements. The pump operator's panels will be no more than 31.00" wide, and made in four (4) sections with the center section easily removable with simple hand tools. For the safety of the pump operator, there will be no discharge outlets or pump inlets located on the main pump operators panel. Layout of the pump control panel will be ergonomically efficient and systematically organized.

The upper section will contain the master gauges. This section will be angled down for easy visibility. The center section will contain the pump controls aligned in two horizontal rows. The pressure control device, engine monitoring gauges, electrical switches, and foam controls (if applicable) will be located on or adjacent to the center panel, on the side walls for easy operation and visibility. The lower section will contain the outlet drains.

Manual controls will be easy moving 8" long lever style controls that operate in a vertical, up and down swing motion. These handles will have a 2.25" diameter knob and be able to lock in place to prevent valve creep under any pressure. Bright finish bezels will encompass the opening, be securely mounted to the pump operator's panel, and will incorporate the discharge gauge bezel. Bezels will be bolted to the panel for easy removal and gauge service. The left side discharges will be controlled directly at the valve. There will be no push-pull style control handles.

Identification tags for the discharge controls will be recessed within the same bezel. The discharge identification tags will be color coded, with each discharge having its own unique color. All remaining identification tags will be mounted on the pump panel in chrome-plated bezels. All discharge outlets will be color coded and labeled to correspond with the discharge identification tag.

The pump panels for the midship discharge and intake ports will be located ahead of the body compartments with no side discharge or intake higher than the frame rail. The pump panels will be easily removable with simple hand tools.

A recessed cargo area will be provided at the front of the body, ahead of the water tank above the plumbing.

Approval Dwg, All Pump Panel(s), Includes Color And Label Tags

The following drawing(s) will be provided for approval by the customer. The drawing(s) will be made for up 34758 apparatus and/or similar Pierce job number.

AGENDA ITEM NO. 6.

PUMP OPERATOR'S PANEL DRAWING

A detailed drawing to scale of the pump operator's panel will be provided for the customer to review. The drawing will include all of the gauges, controls, switching, etc., located on the pump operator's panel. The customer will be allowed to make changes and/or mark-ups to this approval drawing. The fire apparatus manufacturer will make revisions (If needed) to the drawing per the customer changes and/or mark-ups as long as the changes are physically possible within a specific product line.

The finalized and signed customer approved pump operator's panel drawing will become part of the contract documents.

Due to the way drain(s), bleeder(s), operational/maintenance tag(s) and NFPA required warning tag(s) are placed on pump panel(s), these items will NOT be shown on any pump panel approval drawing(s). These item(s) will be placed on pump panel(s) at the fire apparatus manufacturer discretion.

REMAINING PUMP PANEL(S)

Detailed drawing(s) to scale of the remaining pump panel(s) will be provided for the customer to review. The drawing(s) will include all of the gauges, controls, switching, etc., located on the pump panel(s). The customer will be allowed to make changes and/or mark-ups to these approval drawing(s). The fire apparatus manufacturer will make revisions (If needed) to the drawing(s) per the customer changes and/or mark-ups as long as the changes are physically possible within a specific product line.

The finalized and signed customer approved pump panel drawing(s) will become part of the contract documents.

Due to the way drain(s), bleeder(s), operational/maintenance tag(s) and NFPA required warning tag(s) are placed on pump panel(s), these items will NOT be shown on any pump panel approval drawing(s). These item(s) will be placed on pump panel(s) at the fire apparatus manufacturer discretion.

COLOR CODED TAGS

A detailed drawing/chart of the colors used on all of the inlet(s) and outlet(s) will be provided for the customer to review. The customer will be allowed to make changes and/or mark-ups to this approval drawing/chart. The fire apparatus manufacturer will make revisions (If needed) to the drawing per the customer changes and/or mark-ups as long as the changes are physically possible within a specific product line.

The finalized and signed customer approved drawing/chart of the colors will become part of the contract documents.

SPECIAL TEXT/VERBIAGE TAGS

A detailed drawing/chart of the text/verbiage used on all of the inlet(s) and outlet(s) will be provided for the customer to review. The customer will be allowed to make changes and/or mark-ups to this approval drawing/chart. The fire apparatus manufacturer will make revisions (If needed) to the drawing per the customer changes and/or mark-ups as long as the changes are physically possible within a specific product line.

The finalized and signed customer approved drawing/chart of the text/verbiage will become part of the contract documents.

0032479

Pump Panel Configuration, Control Zone

PUMP PANEL CONFIGURATION

The pump panel configuration will be arranged and installed in an organized manner that will provide user-friendly operation.

0516975

Material, Pump Panels, Operators Brushed Stainless, Sides Brushed Stainless, PUC

PUMP AND GAUGE PANEL

The pump operator's panel and gauge panels will be constructed of stainless steel with a brushed finish.

The side control panels will be constructed of stainless steel with a brushed finish for durability and ease of maintenance.

0516978

Pump and Plumbing Access, Simple Tilt Service, PUC

PUMP AND PLUMBING ACCESS

Simple access to the plumbing will be provided through the front of the body area by raising the cab for complete plumbing service and valve maintenance. Access to valves will not require removal of operator panels or pump panels. Access for rebuilding of the pump will not require removal of more than the tank to pump line and a single discharge line. This access will allow for fast, easy valve or pump rebuilding, making for reduced out of service times. Steps will be provided for access to the top of the pump.

Access to the pump will be provided by raising the cab. The pump will be positioned such that all maintenance and overhaul work can be performed above the frame and under the tilted cab. The service and overhaul work on the pump will not require the removal of operator panels or pump panels. Complete pump casing and gear case removal will require no more than removal of the intake and discharge manifolds, driveline, coolers and a single discharge line. The pump case and gear case will be able to be removed by lifting upward without interference from piping and be removable in less than 3 hours.

0520016

Not Required, Pumphouse Structure, PUC

0618458

Light, Pump Compt, WIn 3SC0CDCR LED White, PUC

PUMP COMPARTMENT LIGHT

There will be one (1) Whelen®, Model 3SC0CDCR, 3.00" white 12 volt DC LED light(s) with Whelen, Model 3FLANGEC, flange(s) installed in the plumbing area.

The light(s) will be activated by a toggle switch located in the pump compartment area.

0516983		Gauges, Engine, Included With Pierce Pressure Controller, PUC	Engine monitoring graduated LED indicators will be incorporated with the pressure controller.	AGENDA ITEM NO. 6.
0005601		Throttle, Engine, Incl'd w/Press Controller		
0739224		Indicator Light @ Pump Panel, Throttle Ready, Incl w/Pressure Gov/Throttle,Green	THROTTLE READY GREEN INDICATOR LIGHT There will be a green indicator light integrated with the pressure governor and/or engine throttle installed on the pump operators panel that is activated when the pump is in throttle ready mode.	
0549333		Indicators, Engine, Included with Pressure Controller		
0005780		Control, Air Horn At Pmp Pnl, Button	AIR HORN BUTTON An air horn control button will be provided at the pump operator's control panel. This button will be properly labeled and put within easy reach of the operator.	
0585446	SP	Guards, Half Moon, S/S For Switches at the Pump Panel.	GUARD, SWITCH There will be a stainless steel half moon guard provided over one (1) switches on the pump panel to prevent accidental activation. The guard will be provided on the Main inlet override switch on RS pump panel switches.	
0005690		Gauges, 6.00" Master, Class 1, 30"-0-600psi	VACUUM AND PRESSURE GAUGES The pump vacuum and pressure gauges will be liquid filled and manufactured by Class 1 Incorporated ©. The gauges will be a minimum of 6.00" in diameter and will have white faces with black lettering, with a pressure range of 30.00"-0-600#. The pump pressure and vacuum gauges will be installed adjacent to each other at the pump operator's control panel. Test port connections will be provided at the pump operator's panel. One will be connected to the intake side of the pump, and the other to the discharge manifold of the pump. They will have 0.25 in. standard pipe thread connections and polished stainless steel plugs. They will be marked with a label.	
0038070		Gauge, 2.50" Pressure, Class 1, 30"-0-400psi	PRESSURE GAUGES The individual "line" pressure gauges for the discharges will be intertube filled and manufactured by Class 1©. They will be a minimum of 2.50" in diameter and will have white faces with black lettering. Gauges will be compound type with a vacuum/pressure range of 30.00"-0-400#. The individual pressure gauge will be installed as close to the outlet control as practical.	
0764676	SP	Gauge, Flowmeter / Pressure, Akron 9335 Controller, PUC	FLOWMETER / PRESSURE DISPLAY There will be one (1) Akron© 9335 Navigator Pro display(s) provided for Deluge. The Akron 9335 Navigator Pro will include a flowmeter and pressure display. The controller unit will be of true position feedback design, requiring no clutches in the motor or current limiting. The controller will be completely sealed with two (2) button open and close valve position capability and a full color LCD display with backlight.	
0539612		Gauge, Master Pump Flowmeter, FRC , PUC	MASTER FLOWMETER A master pump flowmeter display will be provided the operator's panel. The flowmeter will contain solid state electronics with LED readout of total flow of the pump. An FRC X-FLC flow conditioner will be installed in the plumbing for better flow readings.	
0898945	SP	Gauge, Flowmeter, Right Side Outlet Manifold, FRC , PUC	FLOWMETER A flowmeter display will be provided at the operator's panel. The flowmeter will read the flow of the right side outlets manifold. The flowmeter will contain solid state electronics with LED readout of total flow of the pump. An FRC X-FLC flow conditioner will be installed in the plumbing for better flow readings.	

0756688	Gauge, Water Level, Pierce, In pressure Controller, w/Mini Slave, PUC, Lt Driver	<p>WATER LEVEL GAUGE An electric water level gauge will be incorporated in the pressure controller level by means of nine (9) LEDs. They will be at 1/8 level increments with LEDs will be a bright type that is readable in sunlight, and have a full 180-degree of clear viewing. To further alert the pump operator, the gauge will have a warning flash when the tank volume is less than 25 percent. The gauge will have down chasing LEDs when the tank is almost empty. The level measurement will be ascertained by sensing the head pressure of the fluid in the tank or cell.</p> <p>MINI SLAVE UNIT An electric water level gauge will be provided in the cab that registers water level by means of five (5) LEDs. They will be at 1/4 level increments with a tank empty LED. The LEDs will be a bright type that are readable in sunlight and have a full 180-degree of clear viewing. The water level gauge in the cab will be activated when the parking brake is applied.</p>
0750438	Water Level Gauge, WIn PSTANK2, LED 1-Light, 4-Level	<p>WATER LEVEL GAUGE There will be two (2) additional water level indicator(s), Whelen®, Model PSTANK2, LED module with chrome trim, installed one (1) each side rearward of crew cab doors. This light module(s) will include four (4) colored levels, and function similar to the water level indicator located at the operators panel: First green module indicates a full water level Second blue module indicates a water level above 3/4 full Third amber module indicates a water level above 1/2 full Last red module indicates a water level above 1/4 full and empty Above 1/4 this light will be steady burning At empty this light will be flashing The flash rate will be determined by the main water level tank sensor. This module will be activated when the pump is in gear.</p>
0604268	Gauge, Foam Level, FRC, Tank Vision Pro, WLA 360-A00, Class "A" w/(1) Mini Slave	<p>CLASS "A" FOAM LEVEL GAUGE A Fire Research TankVision Pro model WLA360-A00 cell/tank level indicator kit shall be installed on the pump operators panel. The kit will include an electronic indicator module, a pressure sensor, a 10' sensor cable and a tank vent. The indicator will show the volume of Class "A" foam concentrate in the cell/tank on nine (9) easy to see super bright RGB LEDs. A wide view lens over the LEDs will provide for a viewing angle of 180 degrees. The indicator case will be waterproof, manufactured of Polycarbonate/Nylon material and have a distinctive green label. The program features will be accessed from the front of the indicator module. The program will support self-diagnostics capabilities, self-calibration, six (6) programmable colored light patterns to display cell/tank volume, adjustable brightness control levels and a data link to connect remote indicators. Low foam level warnings will include flashing LEDs at 1/4 cell/tank and down chasing LEDs when the cell/tank is almost empty. The indicator will receive an input signal from an electronic pressure sensor. The sensor will be mounted from the outside of the foam cell/tank near the bottom. No probe will be placed on the interior of the cell/tank. Wiring will be weather resistant and have automotive type plug-in connectors.</p> <p>CLASS "A" MINI SLAVE UNIT Fire Research TankVision model WLA265-A00 miniature cell/tank indicator will be installed in the cab. The indicator will show the volume of Class "B" foam concentrate in the cell/tank on five (5) easy to see super bright LEDs. A wide view lens over the LEDs will provide for a viewing angle of 180 degrees. The indicator case will be manufactured of Polycarbonate material with an integrated lens and have a distinctive green label.</p>
0738037	SP Light, Pump Op & Panel, Side Ctrl, PUC, AY-LB-12HW020-0 Und Crosslay, OH Chr Cvr	<p>SIDE CONTROL PUMP OPERATOR'S/PUMP PANEL LIGHTING Illumination will be provided for controls, switches, essential instructions, gauges, and instruments necessary for the operation of the apparatus and the equipment provided on it. External illumination will be a minimum of five (5) foot-candles on the face of the device. Internal illumination will be a minimum of four (4) footlamberts. The pump panels will be illuminated by two (2) Amdor Model AY-LB-12HW020-0, 350 lumens 20.00" weather resistant strip lights with white LED lights, one (1) on the driver's side and one (1) on the passenger's side. These light strips will be mounted under the speedlay/crosslay compartment. The pump operator's panel will utilize the same LED strip lighting at the forward doorframe as all other compartment lighting. There will be a small white LED pump engaged indicator light installed overhead.</p>
0606696	Air Horns, (2) Grover, Stutter Tone, In Bumper	<p>AIR HORN SYSTEM Two (2) Grover, Stutter Tone, air horns will be recessed in the front bumper. The horn system will be piped to the air brake system wet tank utilizing 0.38" tubing. A pressure protection valve will be installed in-line to prevent loss of air in the air brake system.</p>
0606833	Location, Air Horns, Bumper, Each Side, Inside Frame (Pos #3 & #5)	<p>Air Horn Location The air horns will be located on each side of the bumper, inside of the frame rails.</p>
0016065	Control, Air Horn, Horn Ring, PS Chrome Push Button	<p>Air Horn Control The air horns will be actuated by a chrome push button located on the officer's side of the engine tunnel and by the horn button in the steering wheel. The driver will have the option to control the air horns or the chassis horns from the horn button by means of a selector switch located on the instrument panel.</p>

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0688049	Siren, Federal EQ2B-200, 200 Watt	<p>ELECTRONIC SIREN There will be a Federal, Model EQ2B-200, electronic siren with noise call microphone provided. This siren to be active when the battery switch is on and that emergency master switch is on.</p>
0510206	Location, Elect Siren, Recessed Overhead In Console	Electronic siren head will be recessed in the driver side inside switch panel.
0006148	Control, Elec Siren, DS Foot Sw	Siren will be actuated by one (1) foot switch located on the driver's side.
0550216	Speaker, (1) Federal, BP200-EF, 200 watt, Stainless Steel	<p>SPEAKER A Federal, Model BP200-EF, 200 watt speaker will be provided. A chrome-plated "EF" flat grille will be installed in front of the speaker.</p>
0601556	Location, Speaker, Frt Bumper, Recessed, Left Side, Outside Frame, Inbrd (Pos 6)	The speaker will be recessed in the left side of the front bumper, just outside of the frame rail.
0736164	Sw, Siren Brake, Momentary, LS Overhead Sw Pnl	A momentary switch will be included in the left side overhead switch panel to activate the siren brake.
0746353	Not Required, Warning Lights Intensity	
0799394	SP Lightbar, WIn, Freedom IV-Q, 81", RRRRRWRROptRRWRRRRR	<p>FRONT ZONE UPPER WARNING LIGHTS There will be one (1) 81.00" Whelen Freedom IV LED lightbar mounted on the cab roof. The lightbar will include the following: One (1) red flashing LED module in the driver's side end position. One (1) red flashing LED module in the driver's side front corner position. One (1) red flashing LED module in the driver's side first front position. One (1) red flashing LED module in the driver's side second front position. One (1) red flashing LED module in the driver's side third front position. One (1) white flashing LED module in the driver's side fourth front position. One (1) red flashing LED module in the driver's side fifth front position. One (1) red flashing LED module in the driver's side sixth front position. One (1) 795 LED traffic light controller set to national standard high priority in the center positions.</p> <p>One (1) red flashing LED module in the passenger's side sixth front position. One (1) red flashing LED module in the passenger's side fifth front position. One (1) white flashing LED module in the passenger's side fourth front position. One (1) red flashing LED module in the passenger's side third front position. One (1) red flashing LED module in the passenger's side second front position. One (1) red flashing LED module in the passenger's side first front position. One (1) red flashing LED module in the passenger's side front corner position. One (1) red flashing LED module in the passenger's side end position. There will be clear lenses included on the lightbar. The following switches may be installed in the cab on the switch panel to control the lightbar: a switch to control the flashing LED modules. the traffic light controller by a cab switch with emergency master control and another cab switch without emergency master control. no momentary switch to activate the traffic light controller. The white lights and the traffic light controller will be disabled when the parking brake is applied. The 12 red flashing LED modules in the front positions may be load managed when the parking brake is applied.</p>
0768172	SP Light, Front Zone, WIn C6L**, C6L** Sdy Burn LED, 4lts Q Bezel	<p>CAB FACE WARNING LIGHTS There will be four (4) Whelen®, Model C6L**, 5.12" high x 7.56" wide x 1.56" deep LED lights installed on the cab face above the headlights, mounted in two (2) bezels similar to the headlights. The driver's side outside warning light to include red LEDs. The default flash pattern of this light will remain unchanged. .The driver's side front inside warning light to include red LEDs. The flash pattern of this light to be set a to steady burning. The passenger's side front inside warning light to include red LEDs. The flash pattern of this light to be set to steady burning. The passenger's side front outside warning light to include red LEDs. The default flash pattern of this light will remain unchanged. The clear. There will be a switch in the cab on the switch panel to control the lights. The inside lights will be controlled per the following: white LEDs will be deactivated when the parking brake is applied amber LEDs will be deactivated when the parking brake is released</p>

0653937	Flasher, Headlight Alternating	HEADLIGHT FLASHER The high beam headlights will flash alternately between the left and right. There will be a switch installed in the cab on the switch panel to control the flashing. The flashing will automatically cancel when the hi-beam headlight switch is activated or when the parking brake is set.	AGENDA ITEM NO. 6.
0788934	SP Lights, Side Zone Lower, WIn M7* LED, Front Split Color , Clr/Color Lens, 3pr	SIDE ZONE LOWER LIGHTING Six (6) Whelen Model M7* LED flashing warning lights with bezels will be located in the following positions: Two (2) lights, one (1) each side on the bumper extension. The side front lights to be red to the front and white to the rear. Two (2) lights, rear of crew cab door and matching job 31721. The side middle lights to be red. Two (2) lights, over the rear axle. The side rear lights to be red. The two (2) forward lights will include a clear lens. The four (4) lights to the rear will include a colored lens. There will be one (1) switch located in the cab on the switch panel to control the lights. Any white warning lights will be disabled when the parking brake is set.	
0540777	Lights, Rear Zone Lower, WIn M6* LED, Colored Lens	REAR ZONE LOWER LIGHTING Two (2) Whelen, Model M6* LED flashing warning lights with chrome bezels will be located at the rear of the apparatus. The driver's side rear light to be red. The passenger's side rear light to be red. Both lights will include a lens that is the same color as the LED's. There will be a switch located in the cab on the switch panel to control the lights.	
0601891	SP Lights, Rear/Side Up Zone, WIn M9** Side, M9V2** Rear 4lts	WARNING LIGHTS (Rear and Side upper zones) There will be four (4) Whelen LED lights with chrome flange(s) provided at the rear of the apparatus. One (1) Model M9**, 6.50" high x 10.37" long x 1.37" deep flashing LED warning light installed on the driver's side, side of the apparatus as high and close to the rear as practical. The side rear upper light(s) on the driver's side to be red. One (1) Model M9V2**, 6.50" high x 10.38" long x 2.63" deep flashing LED warning light with white scene LEDs installed on the driver's side, rear of the apparatus as high and close to the outside as practical. The rear upper light(s) on the driver's side to be red. One (1) Model M9V2**, 6.50" high x 10.38" long x 2.63" deep flashing LED warning light with white scene LEDs installed on the passenger's side, rear of the apparatus as high and close to the outside as practical. The rear upper light(s) on the passenger's side to be red. One (1) Model M9**, 6.50" high x 10.37" long x 1.37" deep flashing LED warning light installed on the passenger's side, side of the apparatus as high and close to the rear as practical. The side rear upper light(s) on the passenger's side to be red. The flashing warning lights will include a lens that is the same color as the LED's. The scene lights will include a clear lens. There will be a switch in the cab on the switch panel to control the flashing warning lights. The scene LEDs will be controlled by a switch at the driver's side switch panel and by a switch at the driver's side pump panel. The scene LEDs may be load managed when the parking brake is applied.	
0006551	Not Required, Lights, Rear Upper Zone Blocking		
0590000	No Hose Bed Warn Light Brackets Req'd, Lights Mtd on Hatch/Body Compts, PUC		
0791463	Light, Traffic Directing, WIn TANF65, 34" Long LED	TRAFFIC DIRECTING LIGHT There will be one (1) Whelen® Model TANF65, 34.00" long x 2.37" high x 2.37" deep, amber LED traffic directing light installed at the rear of the apparatus. The Whelen Model TACTL5 control head will be included with this installation. The control head will be powered when the battery switch is on. The auxiliary flash to be activated when the emergency master switch is on.	
0637356	SP Location, Traf Dir Lt, Recessed with S/S Trim, with Camera	This traffic directing light will be recessed with a stainless steel trim plate at the rear of the apparatus as high as practical. The trim plate will be part of a common bezel around the rear camera.	
0530281	Location, Traf Dir Lt Controller, Center Console in Sw Pnl	The traffic directing light controller will be located within the switch panel on the center console. The controller will be within easy reach of the driver.	

0732820	SP Inverter/Bat Charger, Xantrex Freedom 817-2080 Rated at 1,500 Watts, GFCI	<p>INVERTER / BATTERY CHARGER</p> <p>There will be a Xantrex part number 817-2080, inverter/battery charger include the following: GFCI duplex receptacle This inverter will be rated at 1,500 watts to meet NFPA requirements. The inverter will be connected to the batteries through proper fusing and also to shoreline AC power. The inverter/battery charger will be mounted in the RS3 on the back wall, 1" above lip of floor tray and centered to floor tray with adequate ventilation.</p>	AGENDA ITEM NO. 6.
0781579	Receptacle, 15/20A 120V 3-Pr 3-Wr, NEMA 5-20R SB Dup, 1st, Interior Cab	<p>120 VOLT RECEPTACLE</p> <p>There will be one (1), 15/20 amp 120 volt AC three (3) wire straight blade duplex receptacle(s) with interior stainless steel wall plate(s), installed Mounted to the back of the DS EMS cabinet with the receptacle facing inboard towards the engine tunnel. The box should be mounted as low as possible but still allow access for items to be plugged into receptacle without interference. (see ref. photo). The NEMA configuration for the receptacle(s) will be 5-20R. The receptacle(s) will be powered from the on board 12 volt DC to 120 volt AC power inverter. There will be a label installed near the receptacle(s) that state the following: Line Voltage Current Rating (amps) Phase Frequency</p>	
0779722	Receptacle, 15/20A 120V 3-Pr 3-Wr, NEMA 5-20R SB Dup, 1st, Interior Body	<p>120 VOLT RECEPTACLE</p> <p>There will be one (1), 15/20 amp 120 volt AC three (3) wire straight blade duplex receptacle(s) with interior stainless steel wall plate(s), installed in RS1 recessed in left wall just below roll up door. The NEMA configuration for the receptacle(s) will be 5-20R. The receptacle(s) will be powered from the on board 12 volt DC to 120 volt AC power inverter. There will be a label installed near the receptacle(s) that state the following: Line Voltage Current Rating (amps) Phase Frequency</p>	
0778560	Receptacle, 15A 120V 3-Pr 3-Wr TL, Wtrproof	<p>120 VOLT RECEPTACLE</p> <p>There will be one (1), 15 amp 120 volt AC three (3) wire twist lock receptacle(s) with flip up cover (s) installed at the rear of the body on the right side rear bulkhead above the taillights. The NEMA configuration for the receptacles will be L5-15R. The receptacle(s) will be powered from the on board 12 volt DC to 120 volt AC power inverter. There will be a label installed near the receptacle(s) that state the following: Line Voltage Current Rating (amps) Phase Frequency</p>	
0519934	Not Required, Brand, Hydraulic Tool System		
0649753	Not Required, PTO Driven Hydraulic Tool System		
0007150	Bag of Nuts and Bolts	<p>LOOSE EQUIPMENT</p> <p>The following equipment will be furnished with the completed unit: One (1) bag of chrome, stainless steel, or cadmium plated screws, nuts, bolts and washers, as used in the construction of the unit.</p>	
0766730	Speed Wrench, Electric Valve Override	<p>SPEED WRECH, ELECTRIC VALVE OVERRIDE</p> <p>A one piece speed wrench will be provided in loose equipment for manually overriding the electric valve(s) on the truck. The speed wrench will have sockets welded on each end for overriding the valve(s).</p>	

NFPA Required Loose Equipment, Pumper, NFPA 2016, Provided by Fire Department

NFPA REQUIRED LOOSE EQUIPMENT PROVIDED BY FIRE DEPARTMENT

AGENDA ITEM NO. 6.

The following loose equipment as outlined in NFPA 1901, 2016 edition, will be provided by the fire department.

800 ft (60 m) of 2.50" (65 mm) or larger fire hose.

400 ft (120 m) of 1.50" (38 mm), 1.75" (45 mm), or 2.00" (52 mm) fire hose.

One (1) handline nozzle, 200 gpm (750 L/min) minimum.

Two (2) handline nozzles, 95 gpm (360 L/min) minimum.

One (1) smoothbore of combination nozzle with 2.50" shutoff that flows a minimum of 250 gpm.

One (1) SCBA complying with NFPA 1981 for each assigned seating position, but not fewer than four (4), mounted in brackets fastened to the apparatus or stored in containers supplied by the SCBA manufacturer.

One (1) spare SCBA cylinder for each SCBA carried, each mounted in a bracket fastened to the apparatus or stored in a specially designed storage space(s).

One (1) first aid kit.

Four (4) combination spanner wrenches.

Two (2) hydrant wrenches.

One (1) double female 2.50" (65 mm) adapter with National Hose threads.

One (1) double male 2.50" (65 mm) adapter with National Hose threads.

One (1) rubber mallet, for use on suction hose connections.

Two (2) salvage covers each a minimum size of 12 ft x 14 ft (3.7 m x 4.3 m).

One (1) traffic vest for each seating position, each vest to comply with ANSI/ISEA 207, *Standard for High Visibility Public Safety Vests*, and have a five-point breakaway feature that includes two (2) at the shoulders, two (2) at the sides, and one (1) at the front.

Five (5) fluorescent orange traffic cones not less than 28.00" (711 mm) in height, each equipped with a 6.00" (152 mm) retro-reflective white band no more than 4.00" (102 mm) from the top of the cone, and an additional 4.00" (102 mm) retro-reflective white band 2.00" (51 mm) below the 6.00" (152 mm) band.

Five (5) illuminated warning devices such as highway flares, unless the five (5) fluorescent orange traffic cones have illuminating capabilities.

One (1) automatic external defibrillator (AED).

Four (4) ladder belts meeting the requirements of NFPA 1983, *Standard on Fire Service Life Safety Rope and System Components* (if equipped with an aerial device).

If the supply hose carried does not use sexless couplings, an additional double female adapter and double male adapter, sized to fit the supply hose carried, will be carried mounted in brackets fastened to the apparatus.

If none of the pump intakes are valved, a hose appliance that is equipped with one or more gated intakes with female swivel connection(s) compatible with the supply hose used on one side and a swivel connection with pump intake threads on the other side will be carried. Any intake connection larger than 3.00" (75 mm) will include a pressure relief device that meets the requirements of 16.6.6.

If the apparatus does not have a 2.50" National Hose (NH) intake, an adapter from 2.50" NH female to a pump intake will be carried, mounted in a bracket fastened to the apparatus if not already mounted directly to the intake.

If the supply hose carried has other than 2.50" National Hose (NH) threads, adapters will be carried to allow feeding the supply hose from a 2.50" NH thread male discharge and to allow the hose to connect to a 2.50" NH female intake, mounted in brackets fastened to the apparatus if not already mounted directly to the discharge or intake.

0602407

Soft Suction Hose, Provided by Fire Department, Pumper NFPA 2016 Classification

SOFT SUCTION HOSE PROVIDED BY FIRE DEPARTMENT

NFPA 1901, 2016 edition, section 5.8.2.1 requires a minimum of 20' of suction hose or 15' of supply hose will be carried.

Hose is not on the apparatus as manufactured. The fire department will provide suction or supply hose.

0602390

Strainer, Provided by Fire Department, Pumper NFPA 2016 Classification

STRAINER PROVIDED BY FIRE DEPARTMENT

NFPA 1901, 2016 edition, section 5.8.2.1.1 requires a suction strainer when suction hose is provided.

The strainer is not on the apparatus as manufactured. The fire department will provide the suction strainer.

0602538

Extinguisher, Dry Chemical, Pumper NFPA 2016 Class, Provided by Fire Department

DRY CHEMICAL EXTINGUISHER PROVIDED BY FIRE DEPARTMENT

NFPA 1901, 2016 edition, section 5.9.4 requires one (1) approved dry chemical portable fire extinguisher with a minimum 80-B:C rating mounted in a bracket fastened to the apparatus.

The extinguisher is not on the apparatus as manufactured. The fire department will provide and mount the extinguisher.

0602360

Extinguisher, 2.5 Gal. Pressurized Water, Pumper NFPA 2016, Provided by Fire Dept

WATER EXTINGUISHER PROVIDED BY FIRE DEPARTMENT

NFPA 1901, 2016 edition, section 5.9.4 requires one (1) 2.5 gallon or larger water extinguisher mounted in a bracket fastened to the apparatus.

The extinguisher is not on the apparatus as manufactured. The fire department will provide and mount the extinguisher.

0602679

Axe, Flathead, Pumper NFPA 2016 Classification, Provided by Fire Department

FLATHEAD AXE PROVIDED BY FIRE DEPARTMENT

NFPA 1901, 2016 edition, Section 5.9.4 requires one (1) flathead axe mounted in a bracket fastened to the apparatus.

The axe is not on the apparatus as manufactured. The fire department will provide and mount the axe.

0602667

Axe, Pickhead, Pumper NFPA 2016 Classification, Provided by Fire Department

PICKHEAD AXE PROVIDED BY FIRE DEPARTMENT

NFPA 1901, 2016 edition, Section 5.9.4 requires one (1) pickhead axe r fastened to the apparatus. The axe is not on the apparatus as manufactured. The fire department will provide and mount the axe.

AGENDA ITEM NO. 6.

0741569

Paint Process / Environmental Requirements, Appleton

PAINT

The exterior custom cab and body painting procedure will consist of a seven (7) step finishing process as follows:

Manual Surface Preparation - All exposed metal surfaces on the custom cab and body will be thoroughly cleaned and prepared for painting. Imperfections on the exterior surfaces will be removed and sanded to a smooth finish. Exterior seams will be sealed before painting. Exterior surfaces that will not be painted include; chrome plating, polished stainless steel, anodized aluminum and bright aluminum treadplate.

Chemical Cleaning and Pretreatment - All surfaces will be chemically cleaned to remove dirt, oil, grease, and metal oxides to ensure the subsequent coatings bond well. The aluminum surfaces will be properly cleaned and treated using a high pressure, high temperature 4 step Acid Etch process. The steel and stainless surfaces will be properly cleaned and treated using a high temperature 3 step process specifically designed for steel or stainless. The chemical treatment converts the metal surface to a passive condition to help prevent corrosion.

Surfacer Primer - The Surfacer Primer will be applied to a chemically treated metal surface to provide a strong corrosion protective basecoat. A minimum thickness of 2 mils of Surfacer Primer is applied to surfaces that require a Critical aesthetic finish. The Surfacer Primer is a two-component high solids urethane that has excellent sanding properties and an extra smooth finish when sanded.

Finish Sanding - The Surfacer Primer will be sanded with a fine grit abrasive to achieve an ultra-smooth finish. This sanding process is critical to produce the smooth mirror like finish in the topcoat.

Sealer Primer - The Sealer Primer is applied prior to the Basecoat in all areas that have not been previously primed with the Surfacer Primer. The Sealer Primer is a two-component high solids urethane that goes on smooth and provides excellent gloss hold out when topcoated.

Basecoat Paint - Two coats of a high performance, two component high solids polyurethane basecoat will be applied. The Basecoat will be applied to a thickness that will achieve the proper color match. The Basecoat will be used in conjunction with a urethane clear coat to provide protection from the environment.

Clear Coat - Two (2) coats of Clear Coat will be applied over the Basecoat color. The Clear Coat is a two-component high solids urethane that provides superior gloss and durability to the exterior surfaces. Lap style and roll-up doors will be Clear Coated to match the body. Paint warranty for the roll-up doors will be provided by the roll-up door manufacturer.

After the cab and body are painted, the color will be verified to make sure that it matches the color standard. Electronic color measuring equipment will be used to compare the color sample to the color standard entered into the computer. Color specifications will be used to determine the color match. A Delta E reading will be used to determine a good color match within each family color.

All removable items such as brackets, compartment doors, door hinges, and trim will be removed and painted separately if required, to ensure paint behind all mounted items. Body assemblies that cannot be finish painted after assembly will be finish painted before assembly.

The paint finish quality levels for critical areas of the apparatus (cab front and sides, body sides and doors, and boom lettering panels) are to meet or exceed Cadillac/General Motors GMW15777 global paint requirements. Orange peel levels are to meet or exceed the #6 A.C.T. standard in critical areas. These requirements must be met in order for the exterior paint finish to be considered acceptable. The manufacture's written paint standards will be available upon request.

PAINT - ENVIRONMENTAL IMPACT

Contractor will meet or exceed all current state regulations concerning paint operations. Pollution control will include measures to protect the atmosphere, water and soil. Controls will include the following conditions:

Topcoats and primers will be chrome and lead free.

Metal treatment chemicals will be chrome free. The wastewater generated in the metal treatment process will be treated on-site to remove any other heavy metals.

Particulate emission collection from sanding operations will have a 99.99% efficiency factor.

Particulate emissions from painting operations will be collected by a dry filter or water wash process. If the dry filter is used, it will have an efficiency rating of 98.00%. Water wash systems will be 99.97% efficient

Water from water wash booths will be reused. Solids will be removed on a continual basis to keep the water clean.

Paint wastes are disposed of in an environmentally safe manner.

Empty metal paint containers will be recycled to recover the metal.

Solvents used in clean-up operations will be recycled on-site or sent off-site for distillation and returned for reuse.

Additionally, the finished apparatus will not be manufactured with or contain products that have ozone depleting substances. Contractor will, upon demand, present evidence that the manufacturing facility meets the above conditions and that it is in compliance with his state EPA rules and regulations.

0709846

Paint, Two-Tone Color, Velocity/Impel

CAB TWO-TONE PAINT

The cab will be painted two-tone, with the upper section painted #10 white and the lower section painted #90 red. There will be a standard two-tone cab paint break provided. There will be a standard cab shield provided.

0709845

Paint, Single Color, Body

BODY PAINT

The body will be painted to match the lower section of the cab.

			AGENDA ITEM NO. 6.
0646897	Paint Chassis Frame Assy, E-Coat, Standard	<p>PAINT CHASSIS FRAME ASSEMBLY</p> <p>The chassis frame assembly will be finished with a single system black installation of the cab and body, and before installation of the engine and air brake lines, electrical wire harnesses, etc.</p> <p>Components treated with epoxy E-coat protection prior to paint:</p> <p>Two (2) C-channel frame rails</p> <p>Components that are included with the chassis frame assembly that will be painted not e-coated are:</p> <ul style="list-style-type: none"> Cross members Axles Suspensions Steering gear Battery boxes Bumper extension weldment Frame extensions Body mounting angles Rear Body support substructure (front and rear) Pump house substructure Air tanks Steel fuel tank Castings <p>Individual piece parts used in chassis and body assembly</p> <p>The E-coat process will meet the technical properties shown.</p>	
0693797	No Paint Required, Aluminum Front Wheels		
0693792	No Paint Required, Aluminum Rear Wheels		
0733739	Paint, Axle Hubs	<p>AXLE HUB PAINT</p> <p>All axle hubs will be painted to match lower job color.</p>	
0620095	Paint, Drip Rail, Cab	<p>PAINTED RAIN DRIP</p> <p>The cab roof rain drip will be painted to match the cab roof paint color.</p>	
0581434	Transit Coating, Carwell, Corrosion Protection, Including Underside	<p>TRANSIT COATING</p> <p>All non-painted metal surfaces on the exterior of the vehicle will be sprayed with a corrosion protective coating provided by Carwell. The coating can be removed with soap and water. The coating is made of a linseed oil base and is biodegradable.</p> <p>The underside non-painted metal surfaces will also be coated with a corrosion protective coating.</p>	
0007230	Compartment, Painted, Spatter Gray	<p>COMPARTMENT INTERIOR PAINT</p> <p>The interior of all compartments will be painted with a gray spatter finish for ease of cleaning and to make it easier to touch up scratches and nicks.</p>	
0544087	Reflective Band, 6"	<p>REFLECTIVE BAND</p> <p>A 6.00" white reflective band will be provided across the front of the vehicle and along the sides of the body.</p>	
0510041	Reflective across Cab Face, Imp/Vel	<p>The reflective band provided on the cab face will be below the headlights on the fiberglass.</p>	
0593732	Stripe, Chevron, Rear, Diamond Grade, Pumper, PUC	<p>REAR CHEVRON STRIPING</p> <p>There will be alternating chevron striping located on the rear-facing vertical surface of the apparatus. The rear surface, excluding the rear roll up door, will be covered. The colors will be red and fluorescent yellow diamond grade. Each stripe will be 6.00" in width. This will meet the requirements of the current edition of NFPA 1901, which states that 50% of the rear surface will be covered with chevron striping.</p>	
0011949	"S" Ribbon, Shaded in Reflective Stripe, Pair	<p>STRIPE, REFLECTIVE, "S" RIBBON</p> <p>"S" type ribbon(s) will be added to the reflective stripe match job 31721 where possible. Areas adjacent to the "S" portion of the stripe will be shaded and highlighted with an air brush to give it a ribbon affect. There will be one (1) pair on the vehicle.</p>	
0065687	Stripe, Reflective, Cab Doors Interior	<p>CAB DOOR REFLECTIVE STRIPE</p> <p>A 6.00" x 16.00" black reflective stripe will be provided across the interior of each cab door. The stripe will be located approximately 1.00" up from the bottom, on the door panel. This stripe will meet the NFPA 1901 requirement.</p>	

0067290	Stripe, Gold Leaf, Side of Body, High	BODY STRIPE There will be a genuine gold leaf stripe provided on each side of the body of the side compartmentation.	AGENDA ITEM NO. 6.
0679788	Stripe, Vinyl, Cab Sides, IPO Chrome Molding	CAB STRIPE There will be a vinyl stripe provided on both sides of the cab in place of the chrome molding.	
0027372	Lettering Specifications, (GOLD STAR Process)	LETTERING The lettering will be totally encapsulated between two (2) layers of clear vinyl.	
0686391	Lettering, Gold Leaf, 4.00", (21-40)	LETTERING Twenty-one (21) to forty (40) genuine gold leaf lettering, 4.00" high, with outline and shade will be provided.	
0683996	Lettering, Vinyl, 20.00", Each	LETTERING There will be non-reflective vinyl lettering, 20.00" high, with no outline or shade provided. There will be three (3) letters provided.	
0686018	Lettering, Reflective, 5.00", Each	LETTERING There will be reflective lettering, 5.00" high, with outline and shade provided. There will be six (6) letters provided.	
0686081	Lettering, Reflective, 3.00", (21-40)	LETTERING Twenty-one (21) to forty (40) reflective lettering, 3.00" high, with outline and shade will be provided.	
0686194	Lettering, Gold Leaf, 12.00", Each	LETTERING There will be genuine gold leaf lettering, 12.00" high, with outline and shade provided. There will be four (4) letters provided.	
0686215	Lettering, Gold Leaf, 8.00", Each	LETTERING There will be genuine gold leaf lettering, 8.00" high, with outline and shade provided. There will be 12 letters provided.	
0686236	Lettering, Gold Leaf, 5.00", Each	LETTERING There will be genuine gold leaf lettering, 5.00" high, with outline and shade provided. There will be 12 letters provided.	
0012612	Plate, Alum for Reflective Letters	REFLECTIVE PLATE/S FOR LETTERING There will be two (2) aluminum plate/s provided for department lettering. The plates will be covered with ruby red reflective material and will be mounted (1) 26"H x 54"W brushed aluminum plate & (1) 6.5"H x 15"W brushed aluminum plate at rear of truck.. They will be Roof plate letter size 20" & rear plate letter size approx. 6" in size.	
0017279	Emblem, Corner Scroll, Gold leaf, Each	CORNER SCROLL four (4) corner scrolls, comprised of genuine gold leaf, will be provided upper body corners.	
0594393	SP Emblem, "Waiving American Flag With Pole, Pair (mirror images)	"AMERICAN FLAG" EMBLEMS There will be one (1) pair of color imaged emblems, 10.00" wide, featuring a "Waiving American Flag" with pole and 9-11-01, installed Located behind the crew cab window on cab sides.. The pair will be mirror images of each other.	
0654570	Emblem, Vinyl, Per Dept. Submittal, Each	EMBLEM There will be two (2) vinyl emblem(s), approximately 10.00"-12.00" in size, installed located between the cab door windows. Ref LP print.. the emblem will be modeled after the department submitted information (art, patch, etc).	

0796973	Manual, Fire Apparatus Parts, (2) Hard Copy, (1) USB Flash Drive, Custom	<p>MANUAL, FIRE APPARATUS PARTS Two (2) custom parts manuals for the complete fire apparatus will be provided with the completed unit. One (1) USB flash drive will also be provided that will include all of the information from the above manual. The manual will contain the following: Job number Part numbers with full descriptions Table of contents Parts section sorted in functional groups reflecting a major system, component, or assembly Parts section sorted in Alphabetical order Instructions on how to locate parts The manual will be specifically written for the chassis and body model being purchased. It will not be a generic manual for a multitude of different chassis and bodies.</p> <p>SERVICE PARTS INTERNET SITE The service parts information included in this manual is also available on the Pierce website. The website offers additional functions and features not contained in this manual, such as digital photographs and line drawings of select items. The website also features electronic search tools to assist in locating parts quickly.</p>
0623664	Manual, Chassis Service, (2) Hard Copy, (1) USB Flash Drive, Custom	<p>CHASSIS SERVICE MANUALS There will be three (3) chassis service manuals containing parts and service information on major components provided. There will be two (2) hard copies and one (1) USB flash drive copy provided with the completed unit. The manual will contain the following sections: Job number Table of contents Troubleshooting Front Axle/Suspension Brakes Engine Tires Wheels Cab Electrical, DC Air Systems Plumbing Appendix The manual will be specifically written for the chassis model being purchased. It will not be a generic manual for a multitude of different chassis and bodies.</p>
0605803	Manual, Chassis Operation, (2) Hard Copy, (1) USB Flash Drive, Custom	<p>CHASSIS OPERATION MANUALS There will be two (2) hard copies and one (1) USB flash drive provided that will include all of the same information.</p>
0047891	Manual/s, Maint/Service, Allison EVS 4000 Series Transmission, Add'l	<p>MANUAL/S, (transmission) There will be one (1) additional maintenance/service manual(s) for an Allison 4000 series transmission provided.</p>
0688223	Manual/s, Maint/Service, For Detroit Diesel DD13 Engine	<p>ENGINE MANUALS There will be one (1) set(s) of maintenance/service manuals for a Detroit Diesel DD13 engine provided.</p>
0030008	Warranty, Basic, 1 Year, Apparatus, WA0008	<p>ONE (1) YEAR MATERIAL AND WORKMANSHIP A Pierce basic apparatus limited warranty certificate, WA0008, is included with this proposal.</p>
0611136	Warranty, Chassis, 3 Year, Velocity/Impel, WA0284	<p>THREE (3) YEAR MATERIAL AND WORKMANSHIP The Pierce custom chassis limited warranty certificate, WA0284, is included with this proposal.</p>
0696696	Warranty, Engine, Detroit DD13, 5 Year, WA0180	<p>ENGINE WARRANTY A Detroit Diesel five (5) year limited engine warranty will be provided. A limited warranty certificate, WA0180, is included with this proposal.</p>
0684953	Warranty, Steering Gear, Sheppard M110, 3 Year WA0201	<p>STEERING GEAR WARRANTY A Sheppard three (3) year limited steering gear warranty will be provided. A copy of the warranty certificate will be submitted with the bid package.</p>
0595767	Warranty, Frame, 50 Year, Velocity/Impel, Dash CF, WA0038	<p>FIFTY (50) YEAR STRUCTURAL INTEGRITY The Pierce custom chassis frame and crossmembers limited warranty certificate, WA0038, is included with this proposal.</p>

AGENDA ITEM NO. 6.

0595698	Warranty, Axle, 3 Year, TAK-4, WA0050	FRONT AXLE THREE (3) YEAR MATERIAL AND WORKMANSHIP WARRANTY The Pierce TAK-4 suspension limited warranty certificate, WA0050, is included with this proposal.	AGENDA ITEM NO. 6.
0733306	Warranty, Single Axle, 5 Year, Meritor, General Service, WA0384	SINGLE REAR AXLE FIVE (5) YEAR MATERIAL AND WORKMANSHIP WARRANTY A Meritor™ Axle 5 year limited warranty will be provided.	
0652758	Warranty, ABS Brake System, 3 Year, Meritor Wabco, WA0232	ABS BRAKE SYSTEM THREE (3) YEAR MATERIAL AND WORKMANSHIP WARRANTY A Meritor Wabco™ ABS brake system limited warranty certificate, WA0232, is included with this proposal.	
0019914	Warranty, Structure, 10 Year, Custom Cab, WA0012	TEN (10) YEAR STRUCTURAL INTEGRITY The Pierce custom cab limited warranty certificate, WA0012, is included with this proposal.	
0744240	Warranty, Paint, 10 Year, Cab, Pro-Rate, WA0055	TEN (10) YEAR PRO-RATED PAINT AND CORROSION A Pierce cab limited pro-rated paint warranty certificate, WA0055, is included with this proposal.	
0595770	Warranty, Power Step, 2 Year, WA0031	TWO (2) YEAR MATERIAL AND WORKMANSHIP The Pierce power step limited warranty certificate, WA0031, is included with this proposal.	
0524627	Warranty, Electronics, 5 Year, MUX, WA0014	FIVE (5) YEAR MATERIAL AND WORKMANSHIP The Pierce Command Zone electronics limited warranty certificate, WA0014, is included with this proposal.	
0708760	Warranty, Not Applicable, LED Strip Lights	COMPARTMENT LIGHT WARRANTY The compartment lights will not offer an extended warranty.	
0046369	Warranty, 5-year EVS Transmission, Standard Custom, WA0187	TRANSMISSION WARRANTY The transmission will have a five (5) year/unlimited mileage warranty covering 100 percent parts and labor. The warranty will be provided by Allison Transmission. Note: The transmission cooler is not covered under any extended warranty you may be getting on your Allison Transmission. Please review your Allison Transmission warranty for coverage limitations.	
0685945	Warranty, Transmission Cooler, WA0216	TRANSMISSION COOLER WARRANTY The transmission cooler will carry a five (5) year parts and labor warranty (exclusive to the transmission cooler). In addition, a collateral damage warranty will also be in effect for the first three (3) years of the warranty coverage and will not exceed \$10,000 per occurrence. A copy of the warranty certificate will be submitted with the bid package.	
0688798	Warranty, Water Tank, Lifetime, UPF, Poly Tank, WA0195	WATER TANK WARRANTY A UPF poly water tank limited warranty certificate, WA0195, is included with this proposal.	
0596025	Warranty, Structure, 10 Year, Body, WA0009	TEN (10) YEAR STRUCTURAL INTEGRITY The Pierce apparatus body limited warranty certificate, WA0009, is included with this proposal.	
0693126	Warranty, AMDOR, Roll-up Door, 10 Year/5 Year Painted, WA0185	ROLL UP DOOR MATERIAL AND WORKMANSHIP WARRANTY An AMDOR roll-up door limited warranty will be provided. The roll-up door will be warranted against manufacturing defects for a period of ten (10) years . A five (5) year limited warranty will be provided on painted roll up doors. The limited warranty certificate, WA0185, is included with this proposal.	
0516693	Warranty, Pump, Pierce, PUC, 6 Year Parts, 1 Year Labor, WA0039	SIX (6) YEAR PARTS, ONE (1) YEAR LABOR The pump and its components will be provided with a six (6) year parts and one (1) year labor limited warranty. The manufacturer's warranty will provide that the pump and its components will be free from failures caused by defects in material and workmanship that would arise under normal use and service. A copy of the warranty certificate will be submitted with the bid package.	
0648675	Warranty, 10 Year S/S Pumping, WA0035	TEN (10) YEAR PUMP PLUMBING WARRANTY The Pierce apparatus plumbing limited warranty certificate, WA0035, is included with this proposal.	

0657990	Warranty, Foam System, Husky 3, WA0231	<p>FOAM SYSTEM WARRANTY The Husky 3 foam system limited warranty certificate, WA0231, is included with this proposal.</p>	AGENDA ITEM NO. 6.
0595820	Warranty, Paint, 10 Year, Body, Pro-Rate, WA0057	<p>TEN (10) YEAR PRO-RATED PAINT AND CORROSION A Pierce body limited pro-rated paint warranty certificate, WA0057, is included with this proposal.</p>	
0595421	Warranty, Goldstar, 3 Year, Apparatus, WA0018	<p>THREE (3) YEAR MATERIAL AND WORKMANSHIP The Pierce Goldstar gold leaf lamination limited warranty certificate, WA0018, is included with this proposal.</p>	
0683627	Certification, Vehicle Stability, CD0156	<p>VEHICLE STABILITY CERTIFICATION The fire apparatus manufacturer will provide a certification stating the apparatus complies with NFPA 1901, current edition, section 4.13, Vehicle Stability. The certification will be provided at the time of bid.</p>	
0610837	Certification, Engine Installation, Velocity, Detroit DD13, 2016, CD0148	<p>ENGINE INSTALLATION CERTIFICATION The fire apparatus manufacturer will provide a certification, along with a letter from the engine manufacturer stating they approve of the engine installation in the bidder's chassis. The certification will be provided at the time of bid.</p>	
0686786	Certification, Power Steering, CD0098	<p>POWER STEERING CERTIFICATION The fire apparatus manufacturer will provide a certification stating the power steering system as installed meets the requirements of the component supplier. The certification will be provided at the time of bid.</p>	
0667417	Certification, Cab Integrity, Velocity FR, CD0009	<p>CAB INTEGRITY CERTIFICATION The fire apparatus manufacturer will provide a cab integrity certification with this proposal. The certification will state that the cab has been tested and certified by an independent third-party test facility. Testing events will be documented with photographs, real-time and high-speed video, vehicle accelerometers, cart accelerometers, and a laser speed trap. The fire apparatus manufacturer will provide a state-licensed professional engineer to witness and certify all testing events. Testing will meet or exceed the requirements below: European Occupant Protection Standard ECE Regulation No.29. SAE J2422 Cab Roof Strength Evaluation - Quasi-Static Loading Heavy Trucks. SAE J2420 COE Frontal Strength Evaluation - Dynamic Loading Heavy Trucks.</p> <p>Roof Crush The cab will be subjected to a roof crush force of 22,050 lb. This value meets the ECE 29 criteria and is equivalent to the front axle rating up to a maximum of 10 metric tons.</p> <p>Additional Roof Crush The same cab will be subjected to a roof crush force of 100,000 lbs. This value exceeds the ECE 29 criteria by nearly 4.5 times.</p> <p>Side Impact The same cab will be subjected to dynamic preload where a 13,275 lb moving barrier slams into the side of the cab at 5.5 mph at a force of 13,000 ft-lbs. This test is part of the SAE J2422 test procedure and more closely represents the forces a cab will see in a rollover incident.</p> <p>Frontal Impact The same cab will withstand a frontal impact of 32,600 ft-lbs of force using a moving barrier in accordance with SAE J2420.</p> <p>Additional Frontal Impact The same cab will withstand a frontal impact of 65,200 ft-lbs of force using a moving barrier, (twice the force required by SAE J2420). The same cab will withstand all tests without any measurable intrusion into the survival space of the occupant area.</p>	
0548950	Certification, Cab Door Durability, Velocity/Impel, CD0001	<p>CAB DOOR DURABILITY CERTIFICATION Robust cab doors help protect occupants. Cab doors will survive a 200,000 cycle door slam test where the slamming force exceeds 20 G's of deceleration. The bidder will certify that the sample doors similar to those provided on the apparatus have been tested and have met these criteria without structural damage, latch malfunction, or significant component wear.</p>	
0548967	Certification, Windshield Wiper Durability, Impel/Velocidy, CD0005	<p>WINDSHIELD WIPER DURABILITY CERTIFICATION Visibility during inclement weather is essential to safe apparatus performance. Windshield wipers will survive a 3 million cycle durability test in accordance with section 6.2 of SAE J198 <i>Windshield Wiper Systems - Trucks, Buses and Multipurpose Vehicles</i>. The bidder will certify that the wiper system design has been tested and that the wiper system has met these criteria.</p>	
0667411	Certification, Electric Window Durability, Velocity/Impel FR, CD0004	<p>ELECTRIC WINDOW DURABILITY CERTIFICATION Cab window roll-up systems can cause maintenance problems if not designed for long service life. The window regulator design will complete 30,000 complete up-down cycles and still function normally when finished. The bidder will certify that sample doors and windows similar to those provided on the apparatus have been tested and have met these criteria without malfunction or significant component wear.</p>	

0549273

Certification, Seat Belt Anchors and Mounting, Imp/Vel/Vel SLT, CD0018

SEAT BELT ANCHOR STRENGTH

Seat belt attachment strength is regulated by Federal Motor Vehicle Safety Standards and should be validated through testing. Each seat belt anchor design will withstand the lap and shoulder belt in accordance with FMVSS 571.210 Seat Belt Assembly Anchorages. The bidder will certify that each anchor design was pull tested to the required force and met the appropriate criteria.

AGENDA ITEM NO. 6.

SEAT MOUNTING STRENGTH

Seat attachment strength is regulated by Federal Motor Vehicle Safety Standards and should be validated through testing. Each seat mounting design will be tested to withstand 20 G's of force in accordance with FMVSS 571.207 Seating Systems. The bidder will certify that each seat mount and cab structure design was pull tested to the required force and met the appropriate criteria.

0735950

Certification, Cab HVAC System Performance, Imp FR, CD0166/CD0168/CD0176/CD0177

PERFORMANCE CERTIFICATIONS

Cab Air Conditioning

Good cab air conditioning temperature and air flow performance keeps occupants comfortable, reduces humidity, and provides a climate for recuperation while at the scene. The cab air conditioning system will cool the cab from a heat-soaked condition at 100 degrees Fahrenheit to an average of 78 degrees Fahrenheit in 30 minutes. The bidder will certify that a substantially similar cab has been tested and has met these criteria.

Cab Defroster

Visibility during inclement weather is essential to safe apparatus performance. The defroster system will clear the required windshield zones in accordance with SAE J381 Windshield Defrosting Systems Test Procedure And Performance Requirements - Trucks, Buses, And Multipurpose Vehicles. *The bidder will certify that the defrost system design has been tested in a cold chamber and passes the SAE J381 criteria.*

Cab Auxiliary Heater

Good cab heat performance and regulation provides a more effective working environment for personnel, whether in-transit, or at a scene. An auxiliary cab heater will warm the cab 77 degrees Fahrenheit from a cold-soak, within 30 minutes when tested using the coolant supply methods found in SAE J381. The bidder will certify, at time of delivery, that a substantially similar cab has been tested and has met these criteria.

0545073

Amp Draw Report, NFPA Current Edition

AMP DRAW REPORT

The bidder will provide, at the time of bid and delivery, an itemized print out of the expected amp draw of the entire vehicle's electrical system.

The manufacturer of the apparatus will provide the following:

Documentation of the electrical system performance tests.

A written load analysis, which will include the following:

The nameplate rating of the alternator.

The alternator rating under the conditions specified per:

Applicable NFPA 1901 or 1906 (Current Edition).

The minimum continuous load of each component that is specified per:

Applicable NFPA 1901 or 1906 (Current Edition).

Additional loads that, when added to the minimum continuous load, determine the total connected load.

Each individual intermittent load.

All of the above listed items will be provided by the bidder per the applicable NFPA 1901 or 1906 (Current Edition).

0002758

Amp Draw, NFPA/ULC Radio Allowance

0799248

Appleton/Florida BTO

0000048

PUMPER/TANKER, 3rd Gen

0000012

PIERCE CHASSIS

0562778

DD13 ENGINE

0046396

EVS 4000 Series TRANSMISSION

0520324

PIERCE PUMP, PUC

0020009

POLY TANK

0028048

FOAM SYSTEM

0020006 SIDE CONTROL

0020007 AKRON VALVES

0020014 FRONT SUCTION

0020015 ABS SYSTEM

0658751 PUMPER BASE

AGENDA ITEM NO. 6.



Fire and Rescue Apparatus One (1) Year Material and Workmanship Basic Apparatus Limited Warranty

1. LIMITED WARRANTY

Subject to the limitations and exclusions set forth below, Pierce Manufacturing provides the following warranty to the Buyer:

Coverage:	Portions of the apparatus manufactured by Pierce shall be free from defects in material and workmanship
Warranty Begins:	The date the apparatus is placed in service, or 60 days from the original buyer invoice date, whichever comes first.
Warranty Period Ends After:	Twelve (12) months.
Conditions and Exclusions: See Also Paragraphs 2 thru 4	No specific exclusions apply

This limited warranty shall apply only if the product is properly maintained in accordance with Pierce's maintenance instructions and manuals and is used in service which is normal to the particular model. Normal service means service which does not subject the product to stresses or impacts greater than normally result from careful use. If the Buyer discovers a defect or nonconformity, it must notify Pierce in writing within thirty (30) days after the date of discovery, but in any event prior to the expiration of the warranty period. THIS LIMITED WARRANTY MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED BY THE BUYER TO ANY SUBSEQUENT USER OR PURCHASER OR TO ANY OTHER PERSON OR ENTITY.

Notwithstanding anything to the contrary herein, Pierce makes no warranty whatsoever as to:

(a) any integral parts, components, attachments or trade accessories of or to the product that are not manufactured by Pierce, including but not limited to engines, transmissions, drivelines, axles, water pumps and generators; with respect to all such parts, components, attachments and accessories, Pierce shall assign to Buyer the applicable warranties, if any, made by the respective manufacturers thereof;

(b) any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect, fire, exposure to severe environmental or chemical conditions, acidic environment, improper maintenance, accident, crash, or force majeure such as natural disaster, lightning, earthquake, windstorm, hail, flood, war or riot;

(c) any vehicle, chassis or component, part, attachment or accessory that has been repaired, altered or assembled in any way by any person or entity other than Pierce which, in the sole judgment of Pierce, adversely affects the performance, stability or purpose for which it was manufactured; or

(d) products or parts which may in the ordinary course wear out and have to be replaced during the warranty period, including, but not limited to, tires, fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or subassemblies into finishing products or vehicles unless the assembly is performed by Pierce.

The original purchaser may void this warranty in part or in its entirety if the product is repaired or replaced (a) without prior written approval of the Pierce Customer Service Department; or (b) at a facility which has not been approved by Pierce as to technical capability. Any repairs, modifications, alterations or aftermarket parts added after manufacture without the authorization of Pierce may void this warranty.

2. DISCLAIMERS OF WARRANTIES

THE WARRANTY SET FORTH IN PARAGRAPH 1 IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S EXCLUSIVE REMEDY

If the product fails to conform to the warranty set forth in paragraph 1 during the warranty period, and such nonconformity is not due to misuse, neglect, accident or improper maintenance, Buyer must notify Pierce within the time period specified in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce, any allegedly defective product shall be returned to Pierce by Buyer for examination and/or repair. Buyer shall be responsible for the cost of such transportation, and for risk of loss of or damage to the product during transportation. Within a reasonable time, Pierce shall repair or replace (at Pierce's option and expense) any nonconforming or defective parts. Repair or replacement shall be made only by a facility approved in advance in writing by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES

Notwithstanding anything to the contrary herein or in any agreement between Pierce and Buyer, IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES WHATSOEVER, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORY OF LAW OR EQUITY, WITH RESPECT TO VEHICLES OR OTHER PRODUCTS SOLD BY PIERCE, OR THEIR OPERATION OR FAILURE TO OPERATE, OR ANY DEFECTS THEREIN, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATED THERETO, REGARDLESS OF WHETHER PIERCE HAS BEEN INFORMED OF THE POSSIBILITY OF ANY SUCH DAMAGES. Without limiting the generality of the foregoing, Pierce specifically disclaims any liability for property or personal injury damages, penalties, damages for lost profits or revenues, loss of vehicles or products or any associated equipment, cost of substitute vehicles or products, down-time, delay damages, any other types of economic loss, or for any claims by any third party for any such damages.

Note: Any Surety Bond, if a part of the sale of the vehicle as to which this limited warranty is provided, applies only to this Pierce Basic One Year Limited Warranty for such vehicle, and not to other warranties made by Pierce in a separate document (if any) or to the warranties (if any) made by any manufacturer (other than Pierce) of any part, component, attachment or accessory that is incorporated into or attached to the vehicle.



Fire and Rescue Apparatus

Three (3) Year Material and Workmanship Velocity and Impel Custom Chassis

Limited Warranty

1. LIMITED WARRANTY

Subject to the limitations and exclusions set forth below, Pierce Manufacturing provides the following warranty to the Buyer:

Coverage:	Portions of the apparatus manufactured by Pierce shall be free from defects in material and workmanship
Warranty Begins:	The date the apparatus is placed in service, or 60 days from the original buyer invoice date, whichever comes first.
Warranty Period Ends After:	Three (3) Years, or 30,000 Miles, or 5000 Engine Hours
Conditions and Exclusions: See Also Paragraphs 2 thru 4	This limited warranty applies, where applicable, to Goldstar lamination, defroster heater coil and motor blower assembly (excluding the FET PWM module), heater, air conditioning condenser coil and fan/motor assembly, air conditioning evaporator coil and motor blower assembly (excluding the drain pan pump and thermostat), under seat heaters coil and motor blower assembly (excluding the FET PWM module), HVAC electronic switches, HVAC hoses and hard lines, heater water valve, Pierce PS6 seat frames and hardware, Pierce One-Eleven mirrors, Pierce hands-free scba holder, cracking or color loss of roto-molded components, Meritor rear axle, Wabco ABS system, cab door handles, Standen spring suspension components, and the gauge instrument cluster.

This limited warranty shall apply only if the product is properly maintained in accordance with Pierce's maintenance instructions and manuals and is used in service which is normal to the particular model. Normal service means service which does not subject the product to stresses or impacts greater than normally result from careful use. If the Buyer discovers a defect or nonconformity, it must notify Pierce in writing within thirty (30) days after the date of discovery, but in any event prior to the expiration of the warranty period. THIS LIMITED WARRANTY MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED BY THE BUYER TO ANY SUBSEQUENT USER OR PURCHASER OR TO ANY OTHER PERSON OR ENTITY.

Notwithstanding anything to the contrary herein, Pierce makes no warranty whatsoever as to:

- (a) any integral parts, components, attachments or trade accessories of or to the product that are not manufactured by Pierce, including but not limited to engines, transmissions, drivelines, axles, water pumps and generators; with respect to all such parts, components, attachments and accessories, Pierce shall assign to Buyer the applicable warranties, if any, made by the respective manufacturers thereof;
- (b) any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect, fire, exposure to severe environmental or chemical conditions, acidic environment, improper maintenance, accident, crash, or force majeure such as natural disaster, lightning, earthquake, windstorm, hail, flood, war or riot;
- (c) any vehicle, chassis or component, part, attachment or accessory that has been repaired, altered or assembled in any way by any person or entity other than Pierce which, in the sole judgment of Pierce, adversely affects the performance, stability or purpose for which it was manufactured; or
- (d) products or parts which may in the ordinary course wear out and have to be replaced during the warranty period, including, but not limited to, tires, fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or subassemblies into finishing products or vehicles unless the assembly is performed by Pierce.

The original purchaser may void this warranty in part or in its entirety if the product is repaired or replaced (a) without prior written approval of the Pierce Customer Service Department; or (b) at a facility which has not been approved by Pierce as to technical capability. Any repairs, modifications, alterations or aftermarket parts added after manufacture without the authorization of Pierce may void this warranty.

2. DISCLAIMERS OF WARRANTIES

THE WARRANTY SET FORTH IN PARAGRAPH 1 IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S EXCLUSIVE REMEDY.

If the product fails to conform to the warranty set forth in paragraph 1 during the warranty period, and such nonconformity is not due to misuse, neglect, accident or improper maintenance, Buyer must notify Pierce within the time period specified in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce, any allegedly defective product shall be returned to Pierce by Buyer for examination and/or repair. Buyer shall be responsible for the cost of such transportation, and for risk of loss of or damage to the product during transportation. Within a reasonable time, Pierce shall repair or replace (at Pierce's option and expense) any nonconforming or defective parts. Repair or replacement shall be made only by a facility approved in advance in writing by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES.

Notwithstanding anything to the contrary herein or in any agreement between Pierce and Buyer, IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES WHATSOEVER, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORY OF LAW OR EQUITY, WITH RESPECT TO VEHICLES OR OTHER PRODUCTS SOLD BY PIERCE, OR THEIR OPERATION OR FAILURE TO OPERATE, OR ANY DEFECTS THEREIN, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATED THERETO, REGARDLESS OF WHETHER PIERCE HAS BEEN INFORMED OF THE POSSIBILITY OF ANY SUCH DAMAGES. Without limiting the generality of the foregoing, Pierce specifically disclaims any liability for property or personal injury damages, penalties, damages for lost profits or revenues, loss of vehicles or products or any associated equipment, cost of substitute vehicles or products, down-time, delay damages, any other types of economic loss, or for any claims by any third party for any such damages.

Note: Any Surety Bond, if a part of the sale of the vehicle as to which this limited warranty is provided, applies only to this Pierce Basic One Year Limited Warranty for such vehicle, and not to other warranties made by Pierce in a separate document (if any) or to the warranties (if any) made by any manufacturer (other than Pierce) of any part, component, attachment or accessory that is incorporated into or attached to the vehicle.

Limited Warranty on New Detroit Diesel

DD13 Engines

Used In Fire Truck or Crash Vehicle Applications



Terms of Coverage:

Uses

This warranty applies to the first retail purchaser and subsequent owners during the WARRANTY PERIOD of new DD13 Engines (referred to as Engine) manufactured by Detroit Diesel and/or supplied by Detroit Diesel or Detroit Diesel of Canada Limited (which are collectively referred to as Detroit Diesel) for use in fire truck or crash vehicle applications.

Defects

This warranty covers Engine REPAIRS to correct any malfunction occurring during the WARRANTY PERIOD resulting from defects in material or workmanship.

Repairs

To obtain warranty repairs, you must request the needed repairs within the WARRANTY PERIOD from an authorized Detroit Diesel service outlet. Only new genuine parts, remanufactured parts or components supplied or approved by Detroit Diesel will be used. Detroit Diesel may, at its discretion, replace rather than repair components. A reasonable time must be allowed to perform the warranty repair after taking the engine to the authorized service outlet. Repairs will be performed during normal business hours.

Warranty Period

The WARRANTY PERIOD begins on the date the Engine is delivered to the first retail purchaser or put in use prior to sale at retail, whichever date occurs first, and ends at the time or mileage/kilometer limits shown below:

WARRANTY PERIOD				
Item	Warranty Limitations (Whichever Occurs First)		Repair Charge To Be Paid By Owner	
	MONTHS	MILES/KM	PARTS	LABOR
Engine	0-60	0-100,000 mi 0-160,000 km	No Charge	No Charge
Accessories*	0-24	0-100,000 mi 0-160,000 km	No Charge	No Charge
* Fire Commander warranty is two year/unlimited mileage.				

Service Supplies

The cost of service supplies such as coolant, oil and filters which are not reusable due to needed repairs is covered by this warranty.

Like Replacement Engine

Engine(s) supplied by Detroit Diesel as a replacement for an Engine still under warranty will assume the identity of the Engine being replaced and be entitled to the remaining warranty coverage.

Engine Removal and Reinstallation

Reasonable labor costs for engine removal and reinstallation, when necessary to make a warranty repair, are covered by this warranty.

Towing

During the base warranty period reasonable towing costs to the nearest authorized service outlet are covered by the warranty when due to warrantable failure and the engine is either inoperable, cannot be safely operated or continued operation would cause further damage to the Product.

This Warranty Does Not Cover:

Repairs Due To Accidents, Misuse, Alteration, Storage Damage, Negligence Or Certain Modifications

Repairs due to an accident, misuse, alteration, misapplication, storage damage, negligence or modification exceeding Detroit Diesel specifications, are not covered by this warranty.

Maintenance

Detroit Diesel is not responsible for the cost of maintenance or repairs due to lack of performance of required maintenance services or the failure to use fuel, oil, lubricants and coolant meeting Detroit Diesel-recommended specifications. Performance of the required maintenance and use of proper fuel, oil, lubricants and coolant are the responsibility of the owner. See the Engine Operator's Guide for full details.

Incidental or Consequential Damages

Detroit Diesel is not responsible for incidental or consequential costs or expenses which the owner may incur as a result of a malfunction or failure covered by this warranty, such as communication expenses, meals, lodging, overtime, loss of use of the Engine or vehicle ("downtime"), loss of time, inconvenience, cargo loss or damage, and other similar costs and expenses.

Other Limitations

The performance of REPAIRS is the exclusive Owner's remedy under this warranty. Detroit Diesel does not authorize any person to assume or create for it any other obligation or liability in connection with the Engine or the Accessories.

THIS LIMITED WARRANTY AND THE EMISSIONS CONTROL WARRANTY ARE THE ONLY WARRANTIES APPLICABLE TO THE ENGINE AND ACCESSORIES AS USED IN FIRE TRUCK OR CRASH VEHICLE APPLICATIONS. DETROIT DIESEL MAKES NO OTHER WARRANTIES EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. DETROIT DIESEL SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES AS DESCRIBED ABOVE.

Some states do not allow the limitation of how long this warranty may last or the limitation or exclusion of incidental or consequential damages, so the above may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which may vary from state to state.

DETROIT DIESEL 
DEMAND PERFORMANCE™
 13400 Outer Drive, West / Detroit, Michigan 48239-4001
 Telephone: 313-592-5000
 www.detroitdiesel.com

R. H. SHEPPARD CO., INC.
101 Philadelphia St.
Hanover, PA 17331
Pierce Manufacturing Inc.
2600 American Drive
Appleton, WI 54912

LIMITED WARRANTY: The R. H. Sheppard Co. Inc., (“Sheppard”) warrants all M110PKG1 and M110SAU1 steering gears manufactured and sold to Pierce Manufacturing Inc. (“Pierce”) for application on Pierce TAK-4 equipped vehicles to be free from defects of workmanship and material under normal use and service for a period of thirty six months from the in service date of the vehicle to its original owner.

Vehicle applications where Sheppard product is used require an application approval before production build. If Pierce uses Sheppard product for any purpose or application which has not been approved by Sheppard in advance, including aftermarket devices (defined as a device added to the steering system directly or indirectly affecting the performance or operation of the Sheppard product in its approved application) not tested and approved by Sheppard this limited warranty **SHALL NOT APPLY AND SHALL BE VOID. SHEPPARD MAKES NO OTHER WARRANTY, EITHER EXPRESS OR IMPLIED. SHEPPARD EXPRESSLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR USE OR PURPOSE WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.**

SHEPPARD SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL OR INDIRECT DAMAGES OR FOR LOSS OR DAMAGE DIRECTLY OR INDIRECTLY ARISING FROM THE USE OF A PRODUCT. Pierce expressly acknowledges its obligation to inform all users (customers) of the above disclaimer.

CONDITIONS: Claims under this Limited Warranty may only be made by Pierce. In no event shall Sheppard be held liable for warranty charges by unauthorized persons. No allowance will be made for repairs or alterations, unless made with the written consent of Sheppard. Authorized Pierce dealers shall be the only authorized repair facility for Sheppard products applied to Pierce vehicles. Any warrantable repair made under this Limited Warranty must be made on or before 36 months of the in-service date for the Product to which the claim relates. Sheppard shall not be liable for claims made after such date. Sheppard product fitted to Pierce vehicles that are repaired at a repair facility other than an authorized Pierce dealer within the warranty period will be considered for payment under the guidelines of this agreement only by joint written consideration of Sheppard and Pierce warranty departments. It shall be the responsibility of the Pierce warranty department to notify Sheppard if and when this situation occurs. Sheppard will not be held responsible for damage to other steering components such as but not limited to pumps and reservoirs due to improper adjustment of steering gear relief plungers. Vehicle downtime and towing will not be considered under warranty.

REMEDIES: The sole and exclusive remedy of Pierce for Sheppard’s breach of the foregoing warranty is limited to the return and repair or reimbursement as follows:

R. H. SHEPPARD CO., INC. WARRANTY
Pierce Manufacturing Inc.
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Warranty Support: In support of the Pierce dealer network, Sheppard will provide a toll-free “Hotline” service to assist in the diagnosis and troubleshooting of steering problems. The R. H. Sheppard Co., Inc. Field Service Department can be reached at 1-800-274-7437 for assistance. Sheppard will require that Pierce dealers contact this toll-free “Hotline” for approval before product is removed from a vehicle in a warranty situation. When contacted regarding a warranty situation, the Sheppard representative will provide an authorization number for removal of the product. This Returned Goods Authorization (RGA) number must be included in all warranty correspondence and attached to all returned goods.

Procedure: In the event of a warranty situation, the servicing dealer shall contact the Sheppard Hotline and receive an RGA number before replacing any steering gear. For M110PKG1 and M110SAU1 steering gear models, the dealer will first obtain an RGA number from Sheppard, and then order the replacement gear from Pierce. Replacement M110PKG1 and M110SAU1 steering gears shall be shipped from Pierce once those models are in full production. A warranty claim for both parts and labor will then be generated by the dealer and sent to Pierce. After reviewing the claim, Pierce will submit it to Sheppard for reimbursement.

Parts Reimbursement: Sheppard agrees to reimburse Pierce at Pierce’s purchase price plus 30% mark-up for parts found to be defective within the warranty period. Parts being returned for warranty consideration shall be sent to the R. H. Sheppard Company, 447 E. Middle St., Hanover, PA 17331 ATTN: Warranty Dept. Sheppard’s determination as to whether the part is covered by the foregoing warranty is final and conclusive. Sheppard requires the return of complete steering gears only. Individual seals replaced under warranty **should not** be returned unless specifically requested by Sheppard. All parts being returned for warranty consideration must be clearly tagged with all pertinent warranty information including, but not limited to (1) Returned Goods Authorization number (RGA); (2) claim number; (3) date in service; (4) date of failure; (5) mileage; (6) part number; (7) labor hours; (8) dealer labor rate and; (9) dollar amount claimed. Claims submitted without prior authorization are subject to rejection under this agreement.

Labor: Labor to repair Sheppard product found to be defective within the warranty period will be reimbursed at not more than 10 hours per vehicle. Labor shall be reimbursed at the rate of \$85.00 USD per hour for M110PGK1 and M110SAU1 steering gears.

Freight: Pierce will collect M110PGK1 and M110SAU1 warranty material at a designated collection point. Inbound freight to the Pierce collection point will be the responsibility of Pierce. All warranty material should be returned from the Pierce collection point to R. H. Sheppard Co. Freight Collect by a Sheppard-specified common carrier based on location of the Pierce collection point. Sheppard does not require the return of failed seals. Any freight charges incurred for the return of seals will be the responsibility of Pierce. Parts returned for warranty consideration without prior authorization are subject to rejection under this agreement and may be subject to a charge back of inbound freight charges. Parts rejected under this warranty will be returned to Pierce Freight Collect or scrapped by Sheppard at Pierce’s discretion.

R. H. SHEPPARD CO., INC. WARRANTY
Pierce Manufacturing Inc.
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Outside Purchases: Pierce authorized dealers shall be the only outlet for repair, warranty service and parts for Sheppard products applied to Pierce vehicles. Sheppard will not be responsible for consumables such as hoses, belts, fluids, fittings or miscellaneous shop material that may be required for the repair of the product.

Warranty Documentation: Warranty credit memos will be issued monthly to the Pierce Warranty Department. Monthly credit memos will include (1) claim number; (2) part number; (3) parts reimbursement; (4) labor reimbursement; (5) any applicable Pierce reference number and; (6) reason for rejection or acceptance of the claim. Credit memos will be issued in U.S. funds. Debits for warranty claims will not be accepted under this agreement. Claim disposition will constitute the final and conclusive resolution of warranty claims.

Parts Retention: Sheppard will retain parts submitted for warranty consideration for a period of sixty (60) days for any material found to be rejected for warranty. Sheppard will notify Pierce within sixty (60) days of receipt of Sheppard's determination as to whether any such part is covered by this warranty. Warranty reimbursement will be issued within thirty days of receipt of material at Sheppard.

Good-Will Requests: Good-Will requests will be considered jointly between Sheppard and Pierce for equitable compensation.

RECALLS: Sheppard retains the right to review information regarding federal motor vehicle recall and /or product repair programs if Sheppard products fitted to Pierce vehicles are alleged to be non-compliant with federal motor vehicle safety standards. Sheppard retains the right to review any claims of product defect or non-compliance before participating in reimbursement of expenses incurred as a result of alleged non-compliance or defect of its products. Sheppard agrees to negotiate in good faith for the reimbursement of expenses incurred by Pierce for all administrative, material and labor cost and expense associated with any recall where Sheppard product is found to be defective or non-compliant with federal motor vehicle standards.

MISCELLANEOUS: This writing constitutes the full complete and final statement of Sheppard's limited warranty for M110PKG1 and M110SAU1 products sold to Pierce. All prior oral or written correspondence, test data, negotiations, representations, understandings and the like regarding products are merged in this writing and extinguished by it. This limited warranty may not be altered, amended extended or modified except by a writing signed by the President or Vice President of Sheppard. No employee, vendor, dealer, distributor or other representative of Sheppard has authority to make statements to extend, expand, alter or amend the terms of this Limited Warranty. Sheppard expressly disclaims any statements contrary to the Limited Warranty. Sheppard's failure at any time to enforce any of the terms and conditions stated herein shall not constitute a waiver of any provisions herein. This Limited Warranty shall be governed by and construed in accordance with the laws of the Commonwealth of Pennsylvania.

R. H. SHEPPARD CO., INC. WARRANTY
Pierce Manufacturing Inc.
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Any legal actions which may arise as a result of disputes, controversies or claims arising out of or related to this limited warranty shall be in such forum as Sheppard and Pierce shall agree, or, in the absence of agreement, in a court of appropriate jurisdiction other than in the county in which either party is located. This Limited Warranty shall not be assigned by Pierce.

COOPERATIVE EFFORT: Sheppard and Pierce agree to work cooperatively toward expanding this warranty coverage to a period of sixty months from the in service date. These cooperative efforts shall focus on examining the effects of increased heat generated by 2007 model engines and its impact on the entire power steering system.

AGREEMENT: This agreement is effective April 3, 2006 and may be modified by mutual agreement between Sheppard and Pierce of a signed amendment to be attached to the original Limited Warranty. There are no third party beneficiaries to this Limited Warranty. This warranty agreement applies to Pierce authorized dealers only. It does not encompass any special arrangements that Pierce may now have or that Pierce may enter into, with any other segments of the trucking industry. This warranty agreement does not apply to non-conforming product removed at Pierce assembly plants.

This Limited Warranty agreement between the R. H. Sheppard Co., Inc and Pierce Manufacturing Inc. may be terminated by either party with thirty days written notice prior to termination.

Signed at Pierce Manufacturing Inc., Appleton, WI this _____ day of _____, 2006.

R. H. SHEPPARD CO., INC.

PIERCE MANUFACTURING INC.

Authorized Signature

Authorized Signature

Title

Title



Fire and Rescue Apparatus Lifetime Fifty (50) Year Structural Integrity Chassis Frame & Crossmembers

Limited Warranty

1. LIMITED WARRANTY

Subject to the limitations and exclusions set forth below, Pierce Manufacturing provides the following warranty to the Buyer:

Coverage:	Custom chassis frame rail and cross members manufactured by Pierce shall be free from defects in material and workmanship
Warranty Begins:	The date of the original purchase invoice (issued when the product ships from the factory).
Warranty Period Ends After:	Fifty (50) Years (Expected Life of Apparatus)
Conditions and Exclusions: See Also Paragraphs 2 thru 4	This warranty does not apply to damage caused by corrosion.

This limited warranty shall apply only if the product is properly maintained in accordance with Pierce's maintenance instructions and manuals and is used in service which is normal to the particular model. Normal service means service which does not subject the product to stresses or impacts greater than normally result from careful use. If the Buyer discovers a defect or nonconformity, it must notify Pierce in writing within thirty (30) days after the date of discovery, but in any event prior to the expiration of the warranty period. THIS LIMITED WARRANTY MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED BY THE BUYER TO ANY SUBSEQUENT USER OR PURCHASER OR TO ANY OTHER PERSON OR ENTITY.

Notwithstanding anything to the contrary herein, Pierce makes no warranty whatsoever as to:

(a) any integral parts, components, attachments or trade accessories of or to the product that are not manufactured by Pierce, including but not limited to engines, transmissions, drivelines, axles, water pumps and generators; with respect to all such parts, components, attachments and accessories, Pierce shall assign to Buyer the applicable warranties, if any, made by the respective manufacturers thereof;

(b) any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect, fire, exposure to severe environmental or chemical conditions, acidic environment, improper maintenance, accident, crash, or force majeure such as natural disaster, lightning, earthquake, windstorm, hail, flood, war or riot;

(c) any vehicle, chassis or component, part, attachment or accessory that has been repaired, altered or assembled in any way by any person or entity other than Pierce which, in the sole judgment of Pierce, adversely affects the performance, stability or purpose for which it was manufactured; or

(d) products or parts which may in the ordinary course wear out and have to be replaced during the warranty period, including, but not limited to, tires, fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or subassemblies into finishing products or vehicles unless the assembly is performed by Pierce.

The original purchaser may void this warranty in part or in its entirety if the product is repaired or replaced (a) without prior written approval of the Pierce Customer Service Department; or (b) at a facility which has not been approved by Pierce as to technical capability. Any repairs, modifications, alterations or aftermarket parts added after manufacture without the authorization of Pierce may void this warranty.

2. DISCLAIMERS OF WARRANTIES

THE WARRANTY SET FORTH IN PARAGRAPH 1 IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S EXCLUSIVE REMEDY.

If the product fails to conform to the warranty set forth in paragraph 1 during the warranty period, and such nonconformity is not due to misuse, neglect, accident or improper maintenance, Buyer must notify Pierce within the time period specified in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce, any allegedly defective product shall be returned to Pierce by Buyer for examination and/or repair. Buyer shall be responsible for the cost of such transportation, and for risk of loss of or damage to the product during transportation. Within a reasonable time, Pierce shall repair or replace (at Pierce's option and expense) any nonconforming or defective parts. Repair or replacement shall be made only by a facility approved in advance in writing by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES.

Notwithstanding anything to the contrary herein or in any agreement between Pierce and Buyer, IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES WHATSOEVER, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORY OF LAW OR EQUITY, WITH RESPECT TO VEHICLES OR OTHER PRODUCTS SOLD BY PIERCE, OR THEIR OPERATION OR FAILURE TO OPERATE, OR ANY DEFECTS THEREIN, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATED THERETO, REGARDLESS OF WHETHER PIERCE HAS BEEN INFORMED OF THE POSSIBILITY OF ANY SUCH DAMAGES. Without limiting the generality of the foregoing, Pierce specifically disclaims any liability for property or personal injury damages, penalties, damages for lost profits or revenues, loss of vehicles or products or any associated equipment, cost of substitute vehicles or products, down-time, delay damages, any other types of economic loss, or for any claims by any third party for any such damages.

Note: Any Surety Bond, if a part of the sale of the vehicle as to which this limited warranty is provided, applies only to this Pierce Basic One Year Limited Warranty for such vehicle, and not to other warranties made by Pierce in a separate document (if any) or to the warranties (if any) made by any manufacturer (other than Pierce) of any part, component, attachment or accessory that is incorporated into or attached to the vehicle.



Fire and Rescue Apparatus

Three (3) Year Material and Workmanship TAK-4 Independent Front Suspension

Limited Warranty

1. LIMITED WARRANTY

Subject to the limitations and exclusions set forth below, Pierce Manufacturing provides the following warranty to the Buyer:

Coverage:	The TAK-4 Front Independent Suspension and Steering Gears shall be free from defects in material and workmanship.
Warranty Begins:	The date of the original purchase invoice (issued when the product ships from the factory).
Warranty Period Ends After:	Three (3) Years -or- 30,000 Miles
Conditions and Exclusions: See Also Paragraphs 2 thru 4	This limited warranty excludes brake pads, brake rotors, seal boots and shock absorbers.

Notwithstanding anything to the contrary herein, Pierce makes no warranty whatsoever as to:

(a) any integral parts, components, attachments or trade accessories of or to the product that are not manufactured by Pierce, including but not limited to engines, transmissions, drivelines, axles, water pumps and generators; with respect to all such parts, components, attachments and accessories, Pierce shall assign to Buyer the applicable warranties, if any, made by the respective manufacturers thereof;

(b) any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect, fire, exposure to severe environmental or chemical conditions, acidic environment, improper maintenance, accident, crash, or force majeure such as natural disaster, lightning, earthquake, windstorm, hail, flood, war or riot;

(c) any vehicle, chassis or component, part, attachment or accessory that has been repaired, altered or assembled in any way by any person or entity other than Pierce which, in the sole judgment of Pierce, adversely affects the performance, stability or purpose for which it was manufactured; or

(d) products or parts which may in the ordinary course wear out and have to be replaced during the warranty period, including, but not limited to, tires, fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or subassemblies into finishing products or vehicles unless the assembly is performed by Pierce.

The original purchaser may void this warranty in part or in its entirety if the product is repaired or replaced (a) without prior written approval of the Pierce Customer Service Department; or (b) at a facility which has not been approved by Pierce as to technical capability. Any repairs, modifications, alterations or aftermarket parts added after manufacture without the authorization of Pierce may void this warranty.

2. DISCLAIMERS OF WARRANTIES

THE WARRANTY SET FORTH IN PARAGRAPH 1 IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S EXCLUSIVE REMEDY.

If the product fails to conform to the warranty set forth in paragraph 1 during the warranty period, and such nonconformity is not due to misuse, neglect, accident or improper maintenance, Buyer must notify Pierce within the time period specified in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce, any allegedly defective product shall be returned to Pierce by Buyer for examination and/or repair. Buyer shall be responsible for the cost of such transportation, and for risk of loss of or damage to the product during transportation. Within a reasonable time, Pierce shall repair or replace (at Pierce's option and expense) any nonconforming or defective parts. Repair or replacement shall be made only by a facility approved in advance in writing by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES.

Notwithstanding anything to the contrary herein or in any agreement between Pierce and Buyer, IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES WHATSOEVER, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORY OF LAW OR EQUITY, WITH RESPECT TO VEHICLES OR OTHER PRODUCTS SOLD BY PIERCE, OR THEIR OPERATION OR FAILURE TO OPERATE, OR ANY DEFECTS THEREIN, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATED THERETO, REGARDLESS OF WHETHER PIERCE HAS BEEN INFORMED OF THE POSSIBILITY OF ANY SUCH DAMAGES. Without limiting the generality of the foregoing, Pierce specifically disclaims any liability for property or personal injury damages, penalties, damages for lost profits or revenues, loss of vehicles or products or any associated equipment, cost of substitute vehicles or products, down-time, delay damages, any other types of economic loss, or for any claims by any third party for any such damages.

Note: Any Surety Bond, if a part of the sale of the vehicle as to which this limited warranty is provided, applies only to this Pierce Basic One Year Limited Warranty for such vehicle, and not to other warranties made by Pierce in a separate document (if any) or to the warranties (if any) made by any manufacturer (other than Pierce) of any part, component, attachment or accessory that is incorporated into or attached to the vehicle.

This limited warranty shall apply only if the product is properly maintained in accordance with Pierce's maintenance instructions and manuals and is used in service which is normal to the particular model. Normal service means service which does not subject the product to stresses or impacts greater than normally result from careful use. If the Buyer discovers a defect or nonconformity, it must notify Pierce in writing within thirty (30) days after the date of discovery, but in any event prior to the expiration of the warranty period. THIS LIMITED WARRANTY MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED BY THE BUYER TO ANY SUBSEQUENT USER OR PURCHASER OR TO ANY OTHER PERSON OR ENTITY.



Fire and Rescue Apparatus



SUPPLIER

Limited Warranty

1. LIMITED WARRANTY

Subject to the limitations and exclusions set forth below, Pierce Manufacturing provides the following warranty to the purchaser who first puts the product in service ("Buyer"):

Coverage:	The Meritor axle shall be covered by Meritor as indicated in the attached Meritor warranty coverage description
Warranty Begins:	The date of the original purchase invoice (issued when the product ships from the factory).
Warranty Period Ends After:	Five (5) Years
Conditions and Exclusions: See Also Paragraphs 2 thru 4	The exclusions listed in the attached Meritor warranty description shall apply.

Notwithstanding anything to the contrary herein, Pierce makes no warranty whatsoever as to:

(a) any integral parts, components, attachments or trade accessories of or to the product that are not manufactured by Pierce, including but not limited to engines, transmissions, drivelines, axles, water pumps and generators; with respect to all such parts, components, attachments and accessories, Pierce shall assign to Buyer the applicable warranties, if any, made by the respective manufacturers thereof;

(b) any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect, fire, exposure to severe environmental or chemical conditions, acidic environment, improper maintenance, accident, crash, or force majeure such as natural disaster, lightning, earthquake, windstorm, hail, flood, war or riot;

(c) any vehicle, chassis or component, part, attachment or accessory that has been repaired, altered or assembled in any way by any person or entity other than Pierce which, in the sole judgment of Pierce, adversely affects the performance, stability or purpose for which it was manufactured; or

(d) products or parts which may in the ordinary course wear out and have to be replaced during the warranty period, including, but not limited to, tires, fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or subassemblies into finishing products or vehicles unless the assembly is performed by Pierce.

The original purchaser may void this warranty in part or in its entirety if the product is repaired or replaced (a) without prior written approval of the Pierce Customer Service Department; or (b) at a facility which has not been approved by Pierce as to technical capability. Any repairs, modifications, alterations or aftermarket parts added after manufacture without the authorization of Pierce may void this warranty.

2. DISCLAIMERS OF WARRANTIES

THE WARRANTY SET FORTH IN PARAGRAPH 1 IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S EXCLUSIVE REMEDY.

If the product fails to conform to the warranty set forth in paragraph 1 during the warranty period, and such nonconformity is not due to misuse, neglect, accident or improper maintenance, Buyer must notify Pierce within the time period specified in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce, any allegedly defective product shall be returned to Pierce by Buyer for examination and/or repair. Buyer shall be responsible for the cost of such transportation, and for risk of loss of or damage to the product during transportation. Within a reasonable time, Pierce shall repair or replace (at Pierce's option and expense) any nonconforming or defective parts. Repair or replacement shall be made only by a facility approved in advance in writing by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES.

Notwithstanding anything to the contrary herein or in any agreement between Pierce and Buyer, IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES WHATSOEVER, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORY OF LAW OR EQUITY, WITH RESPECT TO VEHICLES OR OTHER PRODUCTS SOLD BY PIERCE, OR THEIR OPERATION OR FAILURE TO OPERATE, OR ANY DEFECTS THEREIN, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATED THERETO, REGARDLESS OF WHETHER PIERCE HAS BEEN INFORMED OF THE POSSIBILITY OF ANY SUCH DAMAGES. Without limiting the generality of the foregoing, Pierce specifically disclaims any liability for property or personal injury damages, penalties, damages for lost profits or revenues, loss of vehicles or products or any associated equipment, cost of substitute vehicles or products, down-time, delay damages, any other types of economic loss, or for any claims by any third party for any such damages.

Note: Any Surety Bond, if a part of the sale of the vehicle as to which this limited warranty is provided, applies only to this Pierce Basic One Year Limited Warranty for such vehicle, and not to other warranties made by Pierce in a separate document (if any) or to the warranties (if any) made by any manufacturer (other than Pierce) of any part, component, attachment or accessory that is incorporated into or attached to the vehicle.

This limited warranty shall apply only if the product is properly maintained in accordance with Pierce's maintenance instructions and manuals and is used in service which is normal to the particular model. Normal service means service which does not subject the product to stresses or impacts greater than normally result from careful use. If the Buyer discovers a defect or nonconformity, it must notify Pierce in writing within thirty (30) days after the date of discovery, but in any event prior to the expiration of the warranty period. THIS LIMITED WARRANTY MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED BY THE BUYER TO ANY SUBSEQUENT USER OR PURCHASER OR TO ANY OTHER PERSON OR ENTITY.

6/29/2020 WA0384

**MERITOR® COMMERCIAL
VEHICLE SYSTEMS
WARRANTY/MODEL YEAR 2020 VEHICLES**

AGENDA ITEM NO. 6.



MERITOR



WARRANTY INFORMATION CONTENTS

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How to Read Warranty Coverage

Number of Years	Mileage (in thousands) Unl=Unlimited	P=Parts Only P&L=Parts & Labor
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Notice:

Models or components that are approved for use by Meritor’s vocational guidelines contained in Meritor Publication TP-9441 for axles, SP-8320 for trailer axles, TP-12126 for drivelines, which are not specifically listed, are warranted for one year, unlimited miles, parts only (1/Unl/P).

Products purchased on an incomplete vehicle (glider) are limited to one year, unlimited miles parts only (1/Unl/P).

Advantage Program

Purchasing additional coverage on select components will continue to safeguard your investment against major repair costs after the initial base coverage expires. You can find out more about the Advantage Program by visiting www.meritor.com or by contacting Meritor at 866-OnTrac1 (866-668-7221).

LINEHAUL WARRANTY INFORMATION

Linehaul Vehicles

- Bulk Hauler
- Chip Hauler (Truck)*
- Doubles
- Flatbed
- General Freight
- Grain Hauler
- Livestock Hauler
- Moving Van
- Pipe Hauler
- Refrigerated Freight
- Tanker
- Triples

* Chip Hauler vehicles require specific axle models listed below and Linehaul condition to be eligible for Linehaul warranty consideration.

Linehaul Typically Is

- High mileage operation (over 60,000 miles/year)
- Well maintained major highways of concrete or asphalt construction
- Greater than 30 miles between starting and stopping

Coverage under Meritor's warranty require that the application of products be properly approved pursuant to OEM and Meritor approvals. Refer to TP-9441 for axles, SP-8320 for trailer axles, TP-12126 for drivelines, and/or contact Meritor regarding specific application approval questions on any product line.

Front Non-Drive Steer Axles – 5/750/P&L

FD-965	FF-967	MFS-12-122B-N	MFS-12-132C-N	MFS-13-122B-N	MFS-13B-122C-N
FF-941	FG-941	MFS-12-122C-N	MFS-12E-132B-N	MFS-13-122C-N	MFS-13B-132B-N
FF-942	FG-943	MFS-12E-122A-N	MFS-12E-132C-N	MFS-13-132B-N	MFS-13B-132C-N
FF-943	MFS-10-122A	MFS-12E-122B-N	MFS-12-143A-N	MFS-13-132C-N	MFS-14-122A-N
FF-944	MFS-10-143A-N	MFS-12E-122C-N	MFS-12E-143A-N	MFS-13-143A-N	MFS-14-124A-N
FF-961	MFS-10-144A-N	MFS-12-124A-N	MFS-12-144A-N	MFS-13-144A-N	MFS-14-143A-N
FF-966	MFS-12-122A-N	MFS-12-132B-N	MFS-13-122A-N	MFS-13B-122B-N	MFS-14-144A-N

Rear Drive Single Axles – 5/750/P&L

RS-19-144/145/A	RS-21-145	RS-23-160
MS-19-14X	RS-21-160	RS-23-161
MS-21-144	MS-23-17X	RS-23-186

Rear Drive Tandem/Tridem Axles – 5/750/P&L

RT-34-144/P/A	MA-40-165	MT-40-14XHE
RT-40-145/A	MA-40-175	MT-40-144/P
RT-40-160/P ^{1,2}	MT-34-14X/P	MT-40-943
RT-46-160/P ^{1,2}	MT-40-14T/P	MT-40-943-SP
RT-46-164EH/P ^{1,2}	MT-40-14X/P	RZ-166 ²
RT-50-160/P ^{1,2}	MT-40-14X/P	RZ-188

Drivelines

RPL	5/500/P, 1/Unl/P&L
MXL	3/350/P, 1/Unl/P&L
155N	1/Unl/P
92N	1/Unl/P

¹ These models required for Chip Hauler and Linehaul warranty consideration.
² Each vehicle must have a Request for Application Recommendation (RAR) approved by Meritor prior to vehicle build. All RARs must identify the chassis number or VIN. Refer to Product Information Letter #303 and #396 for further details.

LINEHAUL WARRANTY INFORMATION

Brake Components

Cam Q Series Trailer Brakes	5/500/P, 1/100/L
Q+ Drum Brake™	5/500/P, 1/Unl/P&L
ASA	5/500/P, 1/Unl/P&L
Hubs/Cast Drums and Other Wheel-end Components	1/Unl/P
Hydraulic Disc Brakes	1/Unl/P
All Other Brakes	1/Unl/P
STEELite X30 Drum Brake™ ²	12-Years or Wearable Life/P
EX+ Air Disc Brake™	5/500/P, 1/Unl/L
EX+ Air Disc Brake Extended Standard Warranty ³	5/500/P&L

¹ Includes: bushing, seal, cam, ASA lubrication and wear coverage of 3/500/P&L.

² Based on stamped wear diameter max.

³ Applies only to MA761 friction material code CD brake assembly i.e. EX225LXXXCDXXX

Trailer Axles

Beam and Brackets	5/500/P, 1/100/L
Wheel End Systems ¹	
Standard System ²	1/100/P&L
PreSet by Meritor ³	5/500/P&L
AxlePak ⁴	5P/L
AxlePak ⁵	7P/L

¹ Includes hub, wheel seals and wheel bearings—all systems require annual inspections and proper documentation to ensure full coverage.

² When installed by Meritor.

³ Requires approved hubcap stating PreSet by Meritor on hubcap face.

⁴ When specified with AxlePak5 wheel end system, coverage on MTIS thru-tee and stator is 5/Unl/P, 1/Unl/L.

⁵ When specified with AxlePak7 wheel end system, coverage on MTIS thru-tee and stator is 7/Unl/P, 1/Unl/L.

(For brake components and ABS coverage, refer to appropriate product warranties.)

TAG/Pusher Axles¹

TQ, TQD, TR, TRD Beam and Brackets	5/750/P&L
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¹ For brake components and ABS Coverage, refer to appropriate product warranties.

Meritor Tire Inflation System

MTIS Components	5/Unl/P, 1/Unl/L
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Trailer Air Suspension Systems

MPA38/40 (Tandem Axle Parallelogram) ¹	
Major Structural Components	5/500/P, 1/100/L
Curbing Damage Warranty ²	5/500/P, 1/100/L
Height Control Valve	1/100/P&L
Shock Absorbers	2/200/P&L
Air Springs	2/200/P, 1/100/L
Bushings	5/P, 3/L
PinLoc Air Controls	1/100/P&L
PinLoc Actuator	3/300/P&L
MPA20 (Single Axle Parallelogram)	
Major Structural Components	5/500/P, 1/100/L
Height Control Valve	1/100/P&L
Shock Absorbers	2/200/P&L
Air Springs	2/200/P, 1/100/L
Bushings	5/P, 3/L
MTA (Trailing Arm)	
Major Structural Components	5/500/P, 1/100/L
Height Control Valve	1/100/P&L
Shock Absorbers	2/200/P&L
Air Springs & Rebound Straps	2/200/P, 1/100/L
Bushings	5/500/P, 3/300/L

¹ Fastener torque coverage is limited to 2/Unl/P&L when torqued by Meritor (For axle and ABS coverage, refer to appropriate product warranties.)

² “Curbing damage” is defined as deformation (bending, buckling, or breakage), caused by sudden impact with a curb or similar fixed object. Damage to the RideSentry slider box (the suspension sliding subframe, consisting of the frame rails, crossmembers, and central A-frame assembly), caused by accidental trailer impact with a curb or similar fixed object, is eligible for warranty coverage. Damage to other components or damage resulting from collision with another vehicle, rollover or fire is not covered under this provision. Warranty is not transferrable to another trailer VIN, and coverage does not apply if the trailer is deemed to be a total loss, scrapped, or otherwise not salvageable.

GENERAL SERVICE WARRANTY INFORMATION

General Service Vehicles

- Auto Hauler
- Beverage Truck
- Chip Hauler
- Cross Country Coach
- Flatbed
- Front Engine Commercial Chassis
- Front Engine Integral Coach
- General Freight
- Intercity Coach
- Intermodal Chassis
- Livestock Hauler
- Meat Packer
- Moving Van
- Municipal Truck
- Newspaper Delivery
- Pick-Up and Delivery
- Pipe Hauler
- Platform Auto Hauler
- Rear Engine Integral Coach
- Recreational Vehicles
- Refrigerated Freight
- School Bus
- Stake Truck
- Tanker
- Tanker Trailer
- Tour Bus
- Wrecker

General Service Typically Is

- Lower mileage operations (less than 60,000 miles/year)
- Generally, on-road service (less than 10% off-road)
- An average of three (3) miles between starting and stopping

Coverage under Meritor's warranty require that the application of products be properly approved pursuant to OEM and Meritor approvals. Refer to TP-9441 for axles, SP-8320 for trailer axles, TP-12126 for drivelines, and/or contact Meritor regarding specific application approval questions on any product line.

Front Non-Drive Steer Axles – 2/Uni/P&L

FD-965	FL-943	MFS-8-163B-N	MFS-12E-132B-N	MFS-13-132C-N	MFS-16-143A-N
FF-941	MFS-6-151A-N	MFS-10-122A	MFS-12-132C-N	MFS-13B-132B-N	MFS-18-133A-N
FF-942	MFS-6-153B-N	MFS-10-143A-N	MFS-12E-132C-N	MFS-13B-132C-N	MFS-18-135A-N
FF-943	MFS-6-162B-N	MFS-10-144A-N	MFS-12-143A-N	MFS-13-143A-N	MFS-18-193A-N
FF-944	MFS-6-153C-N	MFS-12-122A-N	MFS-12-144A-N	MFS-13-144A-N	MFS-20-133A-N
FF-946	MFS-6-162C-N	MFS-12E-122A-N	MFS-12E-143A-N	MFS-14-122A-N	MFS-20-135A-N
FF-961	MFS-7-113C-N	MFS-12-122B-N	MFS-13-122A-N	MFS-14-124A-N	MFS-20-192A-N
FF-966	MFS-7-153C-N	MFS-12E-122B-N	MFS-13-122B-N	MFS-14-143A-N	MFS-20-193A-N
FG-967	MFS-7-163C-N	MFS-12-122C-N	MFS-13B-122B-N	MFS-14-144A-N	MFS-22-135A-N
FG-941	MFS-8-113B-N	MFS-12E-122C-N	MFS-13-122C-N	MFS-16-122A-N	MFS-22H-135A-N
FH-941	MFS-8-143A-N	MFS-12-124A-N	MFS-13B-122C-N	MFS-16-133A-N	MFS-22-193A-N
FH-946 ¹	MFS-8-153B-N	MFS-12-132B-N	MFS-13-132B-N	MFS-16-135A-N	MFS-22H-193A-N
FL-941					

¹ Can also be used with reduced steer angles in tag position in Coach Applications.

Front Drive/Non-Drive Steer Axles – 1/Uni/P&L

MX-08-130-FV (FSD-08A)	MX-16-130-FV (FSD-16A)	MX-21-130-SD (SDA-2100)
MX-10-130-FV (FSD-10A)	MX-18-130-FV (FSD-18A)	MX-23-130-FV (FSD-23A)
MX-12-130-FV (FSD-12A)	MX-18-130-SD (SDA-1800)	MX-23-130-SD (SDA-2300)
MX-13-130-FV (FSD-13A)	MX-20-130-FV (FSD-20A)	MX-29-130-FV (FSD-29A)
MX-14-130-FV (FSD-14A)	MX-21-130-FV (FSD-21A)	

Rear Drive Tandem/Tridem - 3/Uni/P&L

RT-40-160/P	RT-50-160/P
RT-46-160/P	RZ-166
RT-46-164EH/P	

Rear Drive Axles – 1/Uni/P&L

11170	RND-14H
523	RND-16A

Drivelines

RPL	4/400/P, 1/Uni/P&L
MXL	3/350/P, 1/Uni/P&L
155N	1/Uni/P
92N	1/Uni/P

Rear Drive Single Axles – 2/Uni/P&L

MS-17-13X	MS-21-14X	RC-23-160	RS-24-160	MS-30-616-SP
MS-17-14X	MS-21-144	RC-23-161	RC-25-160	RS-35-380
MS-19-13X	MS-23-17X	RC-23-162 ¹	RS-26-185	71162
MS-19-14X	RS-21-145/A	RC-23-165 ¹	MS-26-616	71163
RS-17-144/145/A	RS-21-160	RS-23-160	MS-26-616-SP	79163
RS-19-144/145/A	RC-22-145	RS-23-161	RS-30-185	
MS-21-13X	RC-22-145/A	RS-23-186	MS-30-616	

¹ 3/Uni/P&L if PreSet by Meritor.

Rear Drive Tandem/Tridem Axles – 2/Uni/P&L

MT-34-14X/P	MT-40-14XHE	RT-44-145/P	MT-58-616
RT-34-144/P/A	MT-40-144/P	RT-46-169	RT-58-185 ¹
MT-40-14T/P	RT-40-145/A	MT-52-616	MT-70-380
MT-40-14X/P	MT-44-14X/P	RT-52-185 ¹	RZ-188

Transmission – 1/Uni/P&L

516	FAT 30
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PTO – 1/Uni/P&L

MPT-318	MPT-526	MPT-1702
MPT-500	MPT-531	MPT-175
MPT-510	MPT-543	MPT-185
MPT-518	MPT-170	MPT-190

¹ Each vehicle must have a Request for Application Recommendation (RAR) approved by Meritor prior to vehicle build. All RARs must identify the chassis number or VIN. Refer to Product Information Letter #303 and #396 for further details.

GENERAL SERVICE WARRANTY INFORMATION

Brake Components

Cam Q Series Trailer Brakes	3/Unl/P, 1/Unl/L
Cam P ³	2/200/P
Cam	3/Unl/P
Q+ Drum Brake™	3/Unl/P&L
Q+ Drum Brake™ ³	2/200/P&L
ASA	3/Unl/P
ASA ³	2/200/P
Hubs/Cast Drums and Other Wheel-end Components	1/Unl/P
Hydraulic Disc Brakes	1/Unl/P
All Other Brakes	1/Unl/P
STEELite X30 Drum Brake™ ²	12-Years or Wearable Life/P
EX+ Air Disc Brake™	2/Unl/P&L

¹ Includes: bushing, seal, cam, ASA lubrication and wear coverage of 1/Unl/P.

² Based on stamped wear diameter max.

³ Applies to Tour Bus and Cross Country Coach only.

Trailer Axles

Beam and Brackets ¹	5/Unl/P, 1/Unl/L
Wheel End Systems ²	
Standard System ³	1/Unl/P&L
AxlePak ⁴	5/P&L
AxlePak ⁵	7/P&L

¹ 9000 Series is 3/Unl/P, 1/Unl/L

² Includes hub, wheel seals and wheel bearings—all systems require annual inspections and proper documentation to ensure full coverage.

³ When installed by Meritor.

⁴ When specified with AxlePak5 wheel end system, coverage on MTIS thru-tee and stator is 5/Unl/P, 1/Unl/L.

⁵ When specified with AxlePak7 wheel end system, coverage on MTIS thru-tee and stator is 7/Unl/P, 1/Unl/L.

(For brake components and ABS coverage, refer to appropriate product warranties.)

Chassis Axles (2000 Series/ChassiPak)

Beam & Brackets	6/Unl/P, 1/Unl/L
Wheel End Systems ¹	
Standard System	1/Unl/P&L
AxlePak7	7/P&L
Beam and Brackets	7/P, 1/L

¹ Includes hub, wheel seals and wheel bearings—all systems require annual inspections and proper documentation to ensure full coverage.

Trailer Air Suspension Systems

MPA38/40 (Tandem Axle Parallelogram) ¹	
Major Structural Components	5/Unl/P, 1/Unl/L
Curbing Damage Warranty ²	5/500/P, 1/100/L
Height Control Valve	1/Unl/P&L
Shock Absorbers	2/Unl/P&L
Air Springs	2/Unl/P, 1/Unl/L
Bushings	5/P, 3/L
PinLoc Air Controls	1/Unl/P&L
PinLoc Air Actuator	3/Unl/P&L
MPA20 (Single Axle Parallelogram)	
Major Structural Components	5/Unl/P, 1/Unl/L
Height Control Valve	1/Unl/P&L
Shock Absorbers	2/Unl/P&L
Air Springs	2/Unl/P, 1/Unl/L
Bushings	5/P, 3/L
MTA (Trailing Arm)	
Major Structural Components	5/Unl/P, 1/Unl/L
Height Control Valve	1/Unl/P&L
Shock Absorbers	2/Unl/P&L
Air Springs and Rebound Straps	2/Unl/P, 1/Unl/L
Bushings ³	5/Unl/P, 3/Unl/L

(For axle and ABS coverage, refer to appropriate product warranties.)

¹ Fastener torque coverage is limited to 2/Unl/P&L when torqued by Meritor

² "Curbing damage" is defined as deformation (bending, buckling, or breakage), caused by sudden impact with a curb or similar fixed object. Damage to the RideSentry slider box (the suspension sliding subframe, consisting of the frame rails, crossmembers, and central A-frame assembly), caused by accidental trailer impact with a curb or similar fixed object, is eligible for warranty coverage. Damage to other components or damage resulting from collision with another vehicle, rollover or fire is not covered under this provision. Warranty is not transferrable to another trailer VIN, and coverage does not apply if the trailer is deemed to be a total loss, scrapped, or otherwise not salvageable.

³ Raw wood applications 3/Unl/P, 1/Unl/L

TAG/Pusher Axles

TQ, TQD, TR, TRD Beam and Brackets ¹	3/Unl/P, 1/Unl/L
MC14002, MC16003, FH946	2/Unl/P&L

(For brake components and ABS coverage, refer to appropriate product warranties.)

¹ 3/Unl/P&L if sold with PreSet by Meritor.

Meritor® Tire Inflation System

MTIS Components	5/Unl/P, 1/Unl/L
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HEAVY SERVICE/SPECIALTY VEHICLE WARRANTY INFORMATION

Heavy Service/Specialty Vehicle

- Airport Rescue Fire Fighting (ARFF)
- Airport Shuttle*
- Asphalt Truck
- Block Truck
- Bottom Dump Trailer Combination
- Cementing Vehicle
- Commercial Pick-Up
- Concrete Pumper
- Construction Material Hauler
- Mixer
- Demolition
- Drill Rig
- Dump
- Equipment Hauling
- Flatbed Trailer Hauler
- Flatbed Truck
- Fracturing Truck
- Front Loader
- Geophysical Exploration
- Hopper Trailer Combinations
- Landscaping Truck
- Liquid Waste Hauler
- Log Hauling
- Lowboy
- Michigan Special Gravel Trains
- Michigan Special Log Hauler
- Michigan Special Steel Hauler
- Michigan Special Waste Vehicle
- Municipal Dump
- Rear Loader (Refuse)
- Recycling Truck
- Residential Pick-Up (Refuse)
- Rigging Truck
- Roll-Off
- Scrap Truck
- Semi-End Dump
- Sewer/Septic Vacuum
- Shuttle Bus*
- Side Loader
- Snowplow/Snowblower
- Steel Hauling
- Tanker
- Tank Truck
- Tractors with Pole Trailers
- Tractor/Trailer with Jeeps
- Transfer Dump
- Transfer Vehicle
- Utility Truck
- Winch Truck

*Commercial chassis only

Heavy Service/Specialty Vehicle Typically Is

- Moderate mileage operation (less than 60,000 miles per year)
- On/Off road vocations (10% or more off-road)
- Moderate to frequent stops/starts (up to 10 stops per mile)

Coverage under Meritor's warranty require that the application of products be properly approved pursuant to OEM and Meritor approvals. Refer to TP-9441 for axles, SP-8320 for trailer axles, TP-12126 for drivelines, and/or contact Meritor regarding specific application approval questions on any product line.

Front Drive/Non-Drive Steer Axles – 2/Unl/P&L

FD-965	FL-941	MFS-10-143A-N	MFS-12-143A-N	MFS-13-144A-N	MFS-18-193A-N	MX-12-120
FF-941	FL-943	MFS-10-144A-N	MFS-12-144A-N	MFS-13-155	MFS-20-133A-N	MX-12-120 EVO
FF-942	MFS-6-151A-N	MFS-12-122	MFS-12-155	MFS-14-122	MFS-20-135A-N	MX-14-120
FF-943	MFS-6-153B	MFS-12E-122	MFS-13-122	MFS-14-124A-N	MFS-20-192A-N	MX-16-120
FF-944	MFS-6-162B	MFS-12-122B-N	MFS-13-122B-N	MFS-14-143A-N	MFS-20-193A-N	MX-18-120
FF-946	MFS-6-162C	MFS-12E-122B-N	MFS-13B-122B-N	MFS-14-144A-N	MFS-22-135A-N	MX-17-140
FF-961	MFS-7-113C-N	MFS-12-122C-N	MFS-13-122C-N	MFS-16-122A-N	MFS-22H-135A-N	MX-19-140
FF-966	MFS-7-153C-N	MFS-12E-122C-N	MFS-13B-122C-N	MFS-16-133A-N	MFS-22-193A-N	MX-21-140
FF-967	MFS-7-163C-N	MFS-12-124A-N	MFS-13-132B-N	MFS-16-135A-N	MFS-22H-193A-N	MX-21-160
FG-941	MFS-8-113B-N	MFS-12-132B-N	MFS-13B-132B-N	MFS-16-143A-N	RF-16-145	MX-23-160
FG-943	MFS-8-153B-N	MFS-12E-132B-N	MFS-13-132C-N	MFS-18-133A-N	RF-21-160	MX-810
FH-941	MFS-8-163B-N	MFS-12-132C-N	MFS-13B-132C-N	MFS-18-135A-N	MX-10-120	
FH-946	MFS-10-122A	MFS-12E-132C-N	MFS-13-143A-N	MFS-18-192A-N	MX-10-120 EVO	

Front Drive/Non-Drive Steer Axles – 1/Unl/P&L

MX-08-130-FV (FSD-08A)	MX-16-130-FV (FSD-16A)	MX-21-130-SD (SDA-2100)
MX-10-130-FV (FSD-10A)	MX-18-130-FV (FSD-18A)	MX-23-130-FV (FSD-23A)
MX-12-130-FV (FSD-12A)	MX-18-130-SD (SDA-1800)	MX-23-130-SD (SDA-2300)
MX-13-130-FV (FSD-13A)	MX-20-130-FV (FSD-20A)	MX-29-130-FV (FSD-29A)
MX-14-130-FV (FSD-14A)	MX-21-130-FV (FSD-21A)	

Rear Drive Axles – 1/Unl/P&L

11170	RND-14H
523	RND-16A

Drivelines

RPL	3/Unl/P, 1/Unl/P&L
92N	1/Unl/P&L
MXL	1/Unl/P&L

Rear Drive Single Axles – 2/Unl/P&L

MS-17-14X	RS-21-160	RS-24-160	MS-35-380
RS-17-144/145/A	RC-22-145	RS-25-160	RS-38-380
MS-19-14X	RC-23-160	MS-26-616	RC-25-160
RS-19-144	RH-23-160	MS-26-616-SP	RC-26-633
MS-21-114	RS-23-160	RS-26-185/380	MT-58-616
MS-21-14X	RC-23-161	MS-30-616	MT-58-616-SP
RS-21-145	RS-23-161	MS-30-616-SP	
RS-21-145/A	RS-23-186/380	RS-30-185/380	

Transmission – 1/Unl/P&L

516
FAT 30

PTO – 1/Unl/P&L

MPT-318	MPT-526	MPT-1702
MPT-500	MPT-531	MPT-175
MPT-510	MPT-543	MPT-185
MPT-518	MPT-170	MPT-195

HEAVY SERVICE/SPECIALTY VEHICLE WARRANTY INFORMATION

Rear Drive Tandem/Tridem Axles – 2/Unl/P&L

MT-34-14X/P	RT-44-145/P	RT-52-185/380 ^{1,2}	MT-70-380
RT-34-144/P/A	RT-46-169	MT-58-616	RZ-188
MT-40-14X/P	RT-58-160	MT-58-616-SP	
RT-40-145/A	MT-52-616	RT-58-185/380 ^{1,2}	
MT-44-14X/P	MT-52-616-SP	RT-70-380	

¹ Axle model designated will vary according to options and variations specified on these axles. Contact Meritor Axle Applications Engineering for details.

² Each vehicle must have a Request for Application Recommendation (RAR) approved by Meritor prior to vehicle build. All RARs must identify the chassis number or VIN. Refer to Product Information Letter #303 and #396 for further details.

Brake Components

Cam P	3/Unl/P
Cam P ³	2/100/P
Cam Cast Plus™	2/100/P&L
Q+ Drum Brake™	3/Unl/P&L
Q+ Drum Brake™ ²	2/100/P&L
ASA	3/Unl/P
ASA ²	2/100/P
Hubs/Cast Drums and Other Wheel-end Components	1/Unl/P
Hydraulic Disc Brakes	1/Unl/P
All Other Brakes	1/Unl/P
EX+ Air Disc Brake	2/100/P&L

¹ Based on stamped wear diameter max.

² Applies to City Bus, Trolley, Shuttle Bus and Airport Shuttle only.

³ Warranty for all non-Meritor ASAs supplied by Meritor for all Heavy Service vocations is 1/100/P.

Rear Drive Tandem/Tridem - 3/Unl/P&L

RT-40-160/P/A ³
RT-46-160/P/A ^{1,3}
RT-46-164EH/P/A ^{2,3}
RT-50-160/P/A ³
RZ-166

¹ U.S. only. Canadian warranty = 1/Unl/P for combination vehicles only.

² Axle model designated will vary according to options and variations specified on these axles. Contact Meritor Axle Applications Engineering for details.

³ Each vehicle must have a Request for Application Recommendation (RAR) approved by Meritor prior to vehicle build. All RARs must identify the chassis number or VIN. Refer to Product Information Letter #303 and #396 for further details.

Meritor Tire Inflation System

MTIS Components	5/Unl/P, 1/Unl/L
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Trailer Air Suspension Systems

MTA (Trailing Arm)	
Major Structural Components ¹	5/Unl/P, 1/Unl/L
Height Control Valve	1/Unl/P&L
Shock Absorbers	2/Unl/P&L
Air Springs	2/Unl/P, 1/Unl/L
Bushings ¹	5/Unl/P, 3/Unl/L

¹ Raw wood applications 3/Unl/P, 1/Unl/L

(For axle and ABS coverage, refer to appropriate product warranties.)

Trailer Axles

Beam and Brackets ¹	5/Unl/P, 1/Unl/L
Wheel End Systems ²	
Standard System ³	1/Unl/P&L

¹ 9000 Series is 3/Unl/P, 1/Unl/L.

² Includes hub, wheel seals and wheel bearings—all systems require annual inspections and proper documentation to ensure full coverage.

³ When installed by Meritor.

(For brake components and ABS coverage, refer to appropriate product warranties.)

Gearboxes – 1/Unl/P&L

MGX-240	MGX-376	MGX-448	MGX-506	MGX-528	MGX-546
MGX-279	MGX-377	MGX-456	MGX-514	MGX-533	MGX-550
MGX-279D	MGX-378	MGX-478	MGX-519	MGX-534	
MGX-280	MGX-380	MGX-480	MGX-520	MGX-536	
MGX-285	MGX-384	MGX-487	MGX-522	MGX-537	
MGX-292	MGX-402	MGX-488	MGX-524	MGX-541	
MGX-314	MGX-413	MGX-505	MGX-527	MGX-545	

Transfer Cases – 1/Unl/P

MTC-4213	MTC-3118-CV (358)	MTC-3209-GV (RTC-60/420)
MTC-4210	MTC-3120-FV (TC-143)	MTC-3209-GV (RTC-60/380)
MTC-4208	MTC-3124 (T-2119)	MTC-3209-GV (MTC-60/420)
MTC-4206-FV (TC-38)	MTC-3205-GV (MTC-25/247)	MTC-3209-GV (MTC-60/380)
MTC-3106-FV (TC-137)	MTC-3205-GV (MTC-25/350)	MTC-3212-CV (315 & 548B)
MTC-3111 (T-2111)	MTC-3205-GV (RTC-25/350)	MTC-3312-FV (TC-270)
MTC-3112-CV (529 & 548C)	MTC-3206-FV (TC-237)	MTC-3220-FC (TC-142)
MTC-3116 (T-2111)	MTC-3206-CS (544)	MTC-2212-CV (306)
MTC-3118-FV (TC-180 & TC-180-23)	MTC-3208-GV (RTC-50)	



FIRE AND EMERGENCY WARRANTY INFORMATION

Fire and Emergency Vehicles

- Aerial Ladder Truck
- Aerial Platform
- Ambulance
- Command Vehicle
- Crash Fire Rescue (CFR)
- Pumper
- Rapid Intervention Vehicle (RIV)
- Tanker

Fire and Emergency Typically Is

- Lower mileage operations (less than 20,000 miles/year)
- Generally, on-road service (less than 10% off-road)
- An average of three (3) miles between starting and stopping

Coverage under Meritor's warranty require that the application of products be properly approved pursuant to OEM and Meritor approvals. Refer to TP-9441 for axles, TP-12126 for drivelines, and/or contact Meritor regarding specific application approval questions on any product line.

Front Non-Drive Steer Axles – 5/Unl/P&L

FL-941	MFS-18-193A-N	MFS-22-135A-N
FL-943	MFS-20-133A-N	MFS-22H-135A-N
MFS-18-133A-N	MFS-20-135A-N	MFS-22-193A-N
MFS-18-135A-N	MFS-20-193A-N	MFS-22H-193A-N

Front Drive Steer Axles – 2/Unl/P&L

MX-19140	MX-21160	MX-23810
MX-21140	MX-23160	

Rear Drive Single Axles – 5/Unl/P&L

RC-23-160	RS-23-186	RS-26-185	RS-25-160
RS-23-160	RS-24-160	RS-30-185	
RS-23-161	RC-25-160	RS-35-380	

¹ 3/Unl/P&L if PreSet by Meritor.

Rear Drive Tandem/Tridem Axles – 5/Unl/P&L

MT-40-14X/P	RT-44-145/P	MT-52-616
MT-40-144/P	RT-46-160/P	RT-52-185 ¹
RT-40-145/A	RT-46-164EH/P	MT-58-616
RT-40-160/P	RT-46-169	RT-58-185 ¹
MT-44-14X/P	RT-50-160/P	MT-70-380

¹ Each vehicle must have a Request for Application Recommendation (RAR) approved by Meritor prior to vehicle build. All RARs must identify the chassis number or VIN. Refer to Product Information Letter #303 and #396 for further details.

Brake Components

Cam	3/Unl/P
Q+ Drum Brake™	3/Unl/P&L
ASA	3/Unl/P
Hubs/Cast Drums and Other Wheel-end Components	1/Unl/P
Hydraulic Disc Brakes	1/Unl/P
All Other Brakes	1/Unl/P
EX+ Air Disc Brake™	2/Unl/P&L

¹ Includes: bushing, seal, cam, ASA lubrication and wear coverage of 1/Unl/P.

Drivelines

RPL	4/400/P, 1/Unl/L
MXL	3/350/P, 1/Unl/L
155N	1/Unl/P
92N	1/Unl/P

Transfer Cases – 1/Unl/P

MTC-4208	MTC-3111 (T-2111)
MTC-4210	MTC-3116 (T-2111)
MTC-4213	MTC-3124 (T-2119)

TRANSIT BUS WARRANTY INFORMATION

Transit Bus Vehicles

- Airport Shuttle
- City Bus
- Commuter Coach
- Shuttle Bus
- Transit Bus
- Trolley

Transit Bus Typically Is

- Moderate mileage operation (less than 50,000 miles per year)
- Moderate to frequent stops/starts (up to 10 stops per mile)

Coverage under Meritor's warranty require that the application of products be properly approved pursuant to OEM and Meritor approvals. Refer to TP-9441 for axles, TP-12126 for drivelines, and/or contact Meritor regarding specific application approval questions on any product line.

Front Drive/Non-Drive Steer Axles – 5/300/P&L

FH-946 MFS-12-155
 FH-941¹ MFS-13-155

¹ Commuter coach only – 2/Unl/P&L

Drivelines

RPL 3/Unl/P, 1/Unl/L
 92N 1/Unl/P&L
 MXL 1/Unl/P&L

Rear Drive Single Axles – 5/300/P&L

RS-23-160 79163 RS-21-160
 RC-23-161 RC-23-162¹
 71163 RC-23-165¹

¹ Commuter coach only – 2/Unl/P&L

Tag Axles – 2/Unl/P&L

MC-14002
 MC-16003
 FH-946

Brake Components

Cam Cast Plus™ 2/100/P&L
 Q+ Drum Brake™¹ 2/100/P&L
 ASA¹ 2/100/P
 Hubs/Cast Drums and
 Other Wheel-end
 Components 1/Unl/P
 All Other Brakes 1/Unl/P
 EX+ Air Disc Brake 2/100/P&L

¹ Applies to City Bus, Trolley, Shuttle Bus and Airport Shuttle only.

Center Non-drive Axles – 5/300/P&L

MC-26000
 71063
 79063

TERMS AND CONDITIONS

Coverage Exclusions

Product Description

All

The cost of any repairs, replacements or adjustments to a covered component (1) associated with noise; (2) resulting from the use or installation of non-genuine Meritor components or materials; (3) due to vibration associated with improper operation or misapplication of drivetrain components; and (4) damage resulting from corrosion.

For axle assemblies supplied by Meritor with suspension and interface brackets designed and/or attached by non-Meritor parties, Meritor warranty coverage does not apply to the brackets, bracket attachment methods, and field issues caused by brackets or bracket attachments to any covered component unless specified in a separate OEM agreement.

Front Axles

King Pin Bushings.

Rear Axles

Self-contained traction equalizers and oil filters. The use of NoSPIN differentials will result in the exclusion of axle shafts from warranty considerations. NoSPIN is a product of Eaton.

ASA

Boot and bushing. Bent, broken, over-torqued, missing or otherwise damaged pawl assemblies.

Cam Brake

Brake lining wear and brake shoe "rust-jacking."

Disc Brake

Pad wear, rotor wear.

Coverage Limitations

Product Description

All

Any claim beyond 60 days from date of repair will not be accepted or honored under this warranty program. Products purchased on an incomplete vehicle (glider) are limited to one year, unlimited miles parts only (1/Unl/P).

Front Axles

Tie rod and tie rod ends limited to 3-year/300,000-mile or published vocational coverage, whichever is less. Wheel seals, gaskets and wheel bearings are covered for 1 year/unlimited miles if the wheel end equipment is supplied and assembled by Meritor.

Rear Axles

Pinion and through shaft seals limited to 3-year/300,000-mile or published vocational coverage, whichever is less, if yoke is installed by Meritor. If yoke is not installed by Meritor, then Meritor does not warrant pinion seals. Wheel seals, gaskets and wheel bearings are covered for 1 year/unlimited miles if the wheel end equipment is supplied and assembled by Meritor.

Rear Axles

The Meritor® breather part number A-2297-C-8765 with A-3196-J-1336 hose must be used for eligibility of any potential warranty consideration relating to contamination and/or loss of lube in axles.

Cam Brake

Limited to bracket, brake spider and camshaft structural integrity.

STEELite X30

Wearable life is up to the discard diameter of the drum.

Disc Brake

Warranty coverage for boots, seals, bushings and pins is 2/200/P. Warranty coverage for pads is 1/100/P.

Warranty coverage on vehicles with 1,850 lb-ft engine torque and over may be reduced on individual drivetrain components. Contact your Meritor representative for specific details.

TERMS AND CONDITIONS

(1) What is Covered by this Commercial Warranty?

Meritor Heavy Vehicle Systems, LLC warrants to the owner ("Owner") that the components listed in this publication, which have been installed by an Original Equipment Manufacturer ("OEM") as original equipment in vehicles licensed for on-highway use, will be free from defects in material and workmanship. This warranty coverage begins only after the expiration of the OEM's vehicle warranty for the applicable covered components. Warranty coverage ends at the expiration of the applicable time period from the date of vehicle purchase by the first Owner, or, the applicable mileage limitation, whichever occurs first. Duration of coverage varies by component and vocation as detailed elsewhere in this warranty statement.

Some components are warranted for parts only and the Owner must pay any labor costs associated with the repair or replacement of the component. Other components are warranted for both parts and reasonable labor to repair or replace the subject component. Components (whether new, used or remanufactured) installed as replacements under this warranty are warranted only for the remainder of the original period of time or mileage under the original warranty.

For certain components, coverage requires the use of specific extended drain interval or synthetic lubricants. For further information about lubrication and maintenance, see Meritor publication Maintenance Manual Number 1 and the applicable Meritor maintenance manual for the product in question. Other conditions and limitations applicable to this warranty are detailed below.

(2) Designation of Vocational Use Required.

To obtain warranty coverage, each Owner must notify Meritor through the OEM new truck and/or trailer dealer of the intended vocational use of the vehicle into which the Meritor components have been incorporated prior to the vehicle in-service date. This notification may be accomplished by registering the vehicle through your OEM new truck and/or trailer dealer or with Meritor directly. Failure to notify Meritor of (I) the intended vocational use of the vehicle or (II) a change in vocational use from that which was originally designated, will result in the application of a one year, unlimited mileage, parts only warranty (1/Unl/P) from the initial in-service date.

A second Owner and each subsequent Owner must also notify Meritor as to the intended vocational use of the vehicle. This notification can be sent directly to Meritor or through the OEM new truck and/or trailer dealer. The duration and mileage coverage of this warranty cannot exceed the coverage extended to the first Owner after his or her initial designation of vocational use.

Coverage under Meritor's warranty requires that the application of products be properly approved pursuant to OEM and Meritor approvals. Refer to TP-9441 for axles, SP-8320 for trailer axles, TP-12126 for drivelines, and/or contact Meritor regarding specific application approval questions on any product line.

(3) What is the Cost of this Warranty?

There is no charge to the Owner for this warranty.

(4) What is not Covered by this Warranty?

This warranty does not cover normal wear and tear; nor does it cover a component that fails, malfunctions or is damaged as a result of (I) improper installation, adjustment, repair or modification (including the use of unauthorized attachments or changes or modification in the vehicle's configuration, usage, or vocation from that which was originally approved by Meritor), (II) accident, natural disaster, abuse, or improper use (including loading beyond the specified maximum vehicle weight or altering engine power settings to exceed the axle and/or driveline capacity), or (III) improper or insufficient maintenance (including deviation from approved lubricants, change intervals, or lube levels). This warranty does not cover any component or part that is not branded by Meritor. For vehicles that operate full or part time outside of the United States and Canada, a one year, unlimited mileage, parts only warranty (1/Unl/P) will apply.

(5) Remedy.

The exclusive remedy under this warranty shall be the repair or replacement of the defective component at Meritor's option. Meritor reserves the right to require that all applicable failed materials are available and/or returned to Meritor for review and evaluation.

(6) Disclaimer of Warranty.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES OR CONDITIONS, EXPRESSED, IMPLIED OR STATUTORY INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE.

(7) Limitation of Remedies.

In no event shall Meritor be liable for special, incidental, indirect, or consequential damages of any kind or under any legal theory, including, but not limited to, towing, downtime, lost productivity, cargo damage, taxes, or any other losses or costs resulting from a defective covered component.

(8) To Obtain Service.

If the Owner discovers within the applicable coverage period a defect in material or workmanship, the Owner must promptly give notice to either Meritor or the dealer from which the vehicle was purchased. To obtain service, the vehicle must be taken to any participating OEM new truck and/or trailer dealer or authorized Meritor service location. The dealer will inspect the vehicle and contact Meritor for an evaluation of the claim. When authorized by Meritor, the dealer will repair or replace during the term of this warranty any defective Meritor component covered by this warranty.

(9) Entire Agreement.

This is the entire agreement between Meritor and the Owner about warranty and no Meritor employee or dealer is authorized to make any additional warranty on behalf of Meritor. This agreement allocates the responsibilities for component failure between Meritor and the Owner.

Product models, brands, names and trademarks depicted herein are the property of their respective owners and, except where otherwise indicated, are not in any way associated with Meritor Heavy Vehicle Systems, LLC, or any parent or affiliate, thereof.



Meritor Heavy Vehicle Systems, LLC
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Troy, Michigan 48084 USA

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or visit meritor.com

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Fire and Rescue Apparatus

Three (3) Year Material and Workmanship Meritor Wabco ABS Brake System Limited Warranty

1. LIMITED WARRANTY

Subject to the limitations and exclusions set forth below, Pierce Manufacturing provides the following warranty to the Buyer:

Coverage:	The Meritor Wabco ABS brake system shall be covered by Meritor Wabco as indicated in the attached Meritor Wabco warranty coverage description
Warranty Begins:	The date of the original purchase invoice (issued when the product ships from the factory).
Warranty Period Ends After:	Three (3) Year
Conditions and Exclusions: See Also Paragraphs 2 thru 4	The exclusions listed in the attached Meritor Wabco warranty description shall apply.

Notwithstanding anything to the contrary herein, Pierce makes no warranty whatsoever as to:

(a) any integral parts, components, attachments or trade accessories of or to the product that are not manufactured by Pierce, including but not limited to engines, transmissions, drivelines, axles, water pumps and generators; with respect to all such parts, components, attachments and accessories, Pierce shall assign to Buyer the applicable warranties, if any, made by the respective manufacturers thereof;

(b) any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect, fire, exposure to severe environmental or chemical conditions, acidic environment, improper maintenance, accident, crash, or force majeure such as natural disaster, lightning, earthquake, windstorm, hail, flood, war or riot;

(c) any vehicle, chassis or component, part, attachment or accessory that has been repaired, altered or assembled in any way by any person or entity other than Pierce which, in the sole judgment of Pierce, adversely affects the performance, stability or purpose for which it was manufactured; or

(d) products or parts which may in the ordinary course wear out and have to be replaced during the warranty period, including, but not limited to, tires, fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or subassemblies into finishing products or vehicles unless the assembly is performed by Pierce.

The original purchaser may void this warranty in part or in its entirety if the product is repaired or replaced (a) without prior written approval of the Pierce Customer Service Department; or (b) at a facility which has not been approved by Pierce as to technical capability. Any repairs, modifications, alterations or aftermarket parts added after manufacture without the authorization of Pierce may void this warranty.

2. DISCLAIMERS OF WARRANTIES

THE WARRANTY SET FORTH IN PARAGRAPH 1 IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S EXCLUSIVE REMEDY.

If the product fails to conform to the warranty set forth in paragraph 1 during the warranty period, and such nonconformity is not due to misuse, neglect, accident or improper maintenance, Buyer must notify Pierce within the time period specified in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce, any allegedly defective product shall be returned to Pierce by Buyer for examination and/or repair. Buyer shall be responsible for the cost of such transportation, and for risk of loss of or damage to the product during transportation. Within a reasonable time, Pierce shall repair or replace (at Pierce's option and expense) any nonconforming or defective parts. Repair or replacement shall be made only by a facility approved in advance in writing by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES.

Notwithstanding anything to the contrary herein or in any agreement between Pierce and Buyer, IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES WHATSOEVER, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORY OF LAW OR EQUITY, WITH RESPECT TO VEHICLES OR OTHER PRODUCTS SOLD BY PIERCE, OR THEIR OPERATION OR FAILURE TO OPERATE, OR ANY DEFECTS THEREIN, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATED THERETO, REGARDLESS OF WHETHER PIERCE HAS BEEN INFORMED OF THE POSSIBILITY OF ANY SUCH DAMAGES. Without limiting the generality of the foregoing, Pierce specifically disclaims any liability for property or personal injury damages, penalties, damages for lost profits or revenues, loss of vehicles or products or any associated equipment, cost of substitute vehicles or products, down-time, delay damages, any other types of economic loss, or for any claims by any third party for any such damages.

Note: Any Surety Bond, if a part of the sale of the vehicle as to which this limited warranty is provided, applies only to this Pierce Basic One Year Limited Warranty for such vehicle, and not to other warranties made by Pierce in a separate document (if any) or to the warranties (if any) made by any manufacturer (other than Pierce) of any part, component, attachment or accessory that is incorporated into or attached to the vehicle.

This limited warranty shall apply only if the product is properly maintained in accordance with Pierce's maintenance instructions and manuals and is used in service which is normal to the particular model. Normal service means service which does not subject the product to stresses or impacts greater than normally result from careful use. If the Buyer discovers a defect or nonconformity, it must notify Pierce in writing within thirty (30) days after the date of discovery, but in any event prior to the expiration of the warranty period. THIS LIMITED WARRANTY MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED BY THE BUYER TO ANY SUBSEQUENT USER OR PURCHASER OR TO ANY OTHER PERSON OR ENTITY.



MERITOR WABCO

Safety Strong. Efficiency Smart.

**Warranty
Model Year 2018 Vehicles**

SIMPLER IS BETTER

Warranty coverage is essential to protecting your investment. But understanding the full details of your coverage can be challenging. This straightforward approach allows you, our valued customer, to better understand how your specific vehicle applications will be covered in your region. Our component warranty coverage is provided according to vocation/usage categories listed below.

- Linehaul covers high mileage operation (over 60,000 miles/year) on well maintained major highways of concrete or asphalt construction.
- General Service covers moderate mileage operations (less than 60,000 miles/year) on well maintained public roads (less than 10 percent off-road) typically with less than three (3) stops per mile.
- Heavy Service (Vocational) covers vehicles with more than 10 percent off-road OR moderate to frequent starts/stops typically with more than three (3) stops per mile.
- Off-Highway Service covers lower mileage operations. Vehicles are not typically licensed for highway use.

CONTENTS

- Linehaul Service..... 4
- General Service..... 4
- Heavy Service 5
- Industrial/Off-Highway Service 6
- Terms and Conditions 7

How to Read Warranty Coverage (Example)

Number of Years	Mileage (in thousands) Unl=Unlimited	P=Parts Only P&L=Parts & Labor
3	300	P

HEAVY SERVICE (VOCATIONAL) WARRANTY INFORMATION

Heavy Service Vehicles

- Airport Rescue Fire (ARF)
- Airport Shuttle
- Asphalt Truck
- Block Truck
- Bottom Dump Trailer Combination
- Cementing Vehicle
- City Bus
- Commercial Pick-Up
- Concrete Pumper
- Construction Material Hauler
- Crash Fire Rescue (CFR)
- Mixer
- Demolition
- Drill Rig
- Dump
- Emergency Service
- Equipment Hauling
- Flatbed Trailer Hauler
- Flatbed Truck
- Fracturing Truck
- Front Loader
- Geophysical Exploration
- Hopper Trailer Combinations
- Landscaping Truck
- Liquid Waste Hauler
- Log Hauling
- Lowboy
- Michigan Special Gravel Trains
- Michigan Special Log Hauler
- Michigan Special Steel Hauler
- Michigan Special Waste Vehicle
- Municipal Dump
- Newspaper Delivery
- Package Delivery
- Pick-up and Delivery
- Rapid Intervention Vehicle (RIV)
- Rear Loader
- Recycling Truck
- Residential Pick-Up/Waste
- Rigging Truck
- Roll-Off
- Scrap Truck
- Semi-End Dump
- Sewer/Septic Vacuum
- Shuttle Bus
- Side Loader
- Snowplow/Snowblower
- Steel Hauling
- Tanker
- Tank Truck
- Tractors with Pole Trailers
- Tractor/Trailer with Jeeps
- Transfer Dump
- Transfer Vehicle
- Transit Bus
- Trolley
- Utility Truck
- Winch Truck

Heavy Service Typically Is

- On/Off road vocations (10% or more off-road) OR
- Moderate to frequent starts/stops typically more than three (3) stops per mile

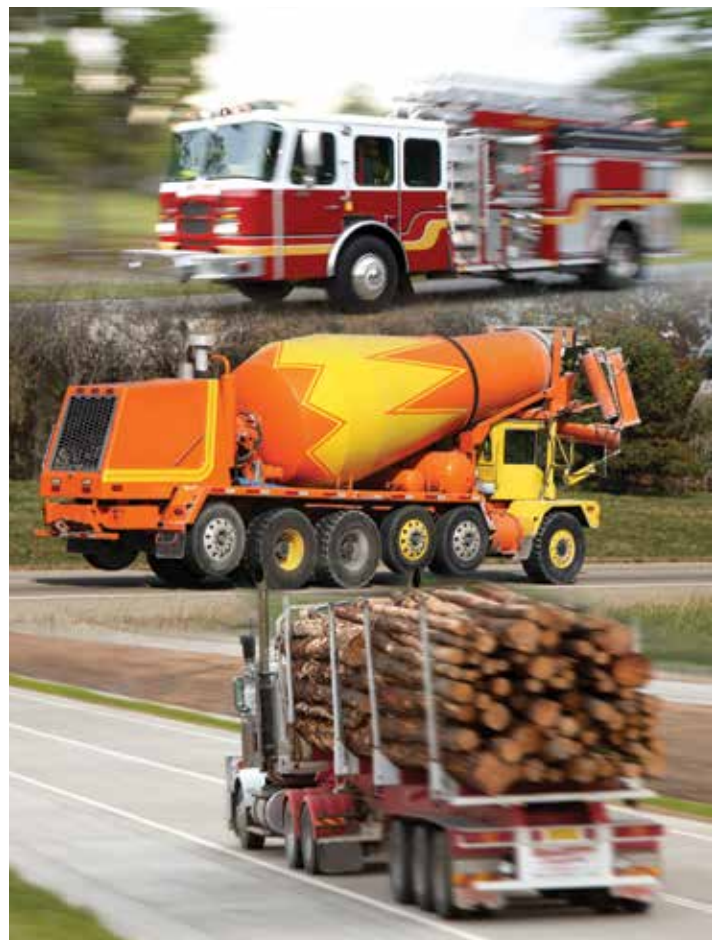
Meritor WABCO Components¹

ABS (Anti-Lock Braking System) Air	3/300/P&L
ABS (Anti-Lock Braking System) Hydraulic	2/200/P&L
Electronic Braking System (EBS)	3/300/P&L
Electronic Stability Control (ESC)	3/300/P&L
Roll Stability Control (RSC)	3/300/P&L
Air Dryers (ALL)	1/100/P&L
Leveling Valves	1/100/P&L
Air Brake Valves	1/100/P&L
Emission Valves (SCR)	2/200/P&L
Clutch Controls	2/200/P&L
Air Compressors (ALL) ²	1/100/P&L
OnGuard™	3/300/P&L
OnGuardACTIVE™	3/300/P&L
OnLane™ Lane Departure Warning	3/300/P&L
Blind Spot Detection	3/300/P&L
OptiRide™	2/200/P&L
Trailer Roll Stability Support (RSS)	3/300/P&L
Trailer Control Line Filter ³	1/100/P&L
Trailer ABS Valve ³	3/300/P&L

¹ WABCO and Meritor WABCO branded components.

² WABCO compressors installed on Cummins, Mercedes, and DDC engines are not warranted or serviced by Meritor WABCO. Please contact your respective dealer/distributor of those engines for warranty and servicing.

³ An extended warranty of 4/400/P will be applied when a Meritor WABCO Trailer Control Line Filter is used in combination with a Meritor WABCO Trailer ABS valve.



TERMS AND CONDITIONS

Coverage Exclusions

Product Description

All

The cost of any repairs, replacements or adjustments to a covered product due to the following: (1) damage to the product or its component parts caused by incorrect use, installation, maintenance or repair, including without limitation (a) improper fit of mating components or brackets, (b) damaged threads, (c) cut, broken, chafed, pinched or otherwise damaged wiring (sensors, harnesses and connectors), (d) damaged sensors from removal when seized in block, or associated with sensor adjustments/alignments, and (e) damage resulting from the use or installation of non-genuine Meritor WABCO components or materials; (2) damage to the product, its component parts, or diminished product or component part performance due to incorrect operation, deviation from approved conditions or misapplication; (3) any unauthorized disassembly of the product or its component parts including without limitation (a) obliterated, defaced or missing WABCO or Meritor WABCO name plate, serial numbers or label identifying the device as a Meritor WABCO product or WABCO component, (b) changes to sealed adjusting screws, and (c) opening or attempted repair of non-serviceable components; (4) malfunction of the component due to internal contamination out of the vehicle system including without limitation (a) water and other contamination damage that is due to the use of a non-genuine air dryer cartridge or (b) valve failures due to contamination in air system, (5) complaints associated with noise, (6) damage resulting from corrosion (including oxidation of electrical devices and connections).

Air Dryers

Mounting brackets (see vehicle OEM). Desiccant cartridge housing only.

Air System Components

Normal wear items; Gladhand seals, dash valve knobs, valve actuation handles, treadles, pedals.

ABS, Electronic Stability Control (ESC), Roll Stability Control (RSC), OptiRide™, OnGuard™ and OnLane™, collectively “Electronics”

Failure of electronic components due to overvoltage condition, improper grounding, electrostatic discharge (ESD), improper shielding, electromagnetic interference (EMI), or other wiring or installation issues.

Malfunctions and failure codes caused by other electronic subsystem failures (data bus, engine, transmission, dashboard, etc.)

Hydraulic Components

For certain components, brake fluid DOT3 or DOT4 is used as the operating medium. Use of any other fluid will void all warranties associated with that component. For hydraulic braking applications the brake fluid is considered a maintenance item. Maintenance intervals are listed in TB-1367.

Coverage Limitations

Product Description

All

Any claim beyond 60 days from date of repair will not be accepted or honored under this warranty program.

Products purchased on an incomplete vehicle (glider) are limited to one year, 1/Unl/P.

For vehicles that operate full- or part-time outside of the United States and Canada, a 1-Year/Unlimited Miles parts only (1/Unl/P) will apply.

TOOLBOX™ Software

Proper diagnostics of Meritor WABCO Electronics may require the latest version of TOOLBOX™. Additional labor due to use of an outdated version of TOOLBOX™. TOOLBOX™ software, and/or the time to purchase or install latest version of TOOLBOX™ are not covered under product warranty.

TERMS AND CONDITIONS

(1) What is Covered by this Commercial Warranty?

Meritor WABCO Vehicle Control Systems warrants to the owner ("Owner") that the components listed in this publication, which have been installed by an Original Equipment Manufacturer ("OEM") as original equipment will be free from defects in material and workmanship. This warranty coverage begins from the original in-service date to the limits provided and runs concurrently with any warranties provided by OEMs and/or any service contracts that cover the components listed in this publication, if any. If the components listed in this publication are covered by an OEM warranty and/or service contract, then the OEM's warranty and/or service contract shall supersede Meritor WABCO's warranty and Owner shall comply with all OEM's warranty and/or service contract requirements for claims under such OEM's warranty and/or service contract until those agreements expire. Once those agreements expire and provided the Meritor WABCO warranty has not expired under the terms stated above, the Meritor WABCO warranty would be in effect until its expiration date.

Warranty coverage ends at the expiration of the applicable time period from the date of vehicle purchase by the first Owner, or, the applicable mileage limitation, whichever occurs first. Duration of coverage varies by component and vocation as detailed previously in this publication. Some components are warranted for parts only and the Owner must pay any labor costs associated with the repair or replacement of the component. Other components are warranted for both parts and reasonable labor to repair or replace the subject component. Additional diagnostic time due to use of an outdated version of TOOLBOX™, time to purchase or install latest version of TOOLBOX™ are the responsibility of the authorized Meritor WABCO service location and are not covered under product warranty. Components installed as replacements under this warranty are warranted only for the remainder of the original period of time or mileage under the original warranty.

(2) Designation of Vocational Use Required.

To obtain warranty coverage, each Owner must notify Meritor WABCO through the OEM new truck and/or trailer dealer of the intended vocational use of the vehicle into which the Meritor WABCO components have been incorporated prior to the vehicle in-service date. This notification may be accomplished by registering the vehicle through your OEM new truck and/or trailer dealer or with Meritor WABCO directly. Failure to notify Meritor WABCO of (I) the intended vocational use of the vehicle or (II) a change in vocational use from that which was originally designated, will result in the application of a one year, unlimited mileage, parts only warranty (1/Unl/P) from the initial in-service date.

A second Owner and each subsequent Owner must also notify Meritor WABCO as to the intended vocational use of the vehicle. This notification can be sent directly to Meritor WABCO or through the OEM new truck and/or trailer dealer. The duration and mileage coverage of this warranty cannot exceed the coverage extended to the first Owner after his or her initial designation of vocational use.

Coverage under Meritor WABCO's warranty requires that the application of products be properly approved pursuant to OEM and Meritor WABCO, approvals.

(3) What is the Cost of this Warranty?

There is no charge to the Owner for this warranty.

(4) What is not Covered by this Warranty?

In addition to the items listed on page 7, this warranty does not cover normal wear and tear, or service items; nor does it cover a component that fails, malfunctions or is damaged as a result of

(a) improper handling, storage, installation, adjustment, repair or modification including the use of unauthorized attachments or changes or modification in the vehicle's configuration, usage, or vocation from that which was originally approved by Meritor WABCO, (b) accident, fire or other casualty, natural disaster, road debris, negligence, misuse, abuse, or improper use (including loading beyond the specified maximum vehicle weight or altering engine power settings to exceed the brake system capacity), or (c) improper or insufficient maintenance (including deviation from maintenance intervals, approved lubricants, or lube levels). This warranty does not cover any component or part that is not sold by Meritor WABCO.

(5) Remedy.

The exclusive remedy under this warranty shall be the repair or replacement of the defective component at Meritor WABCO's option. Meritor WABCO reserves the right to require that all applicable covered components are available and/or returned to Meritor WABCO for review and evaluation.

(6) DISCLAIMER OF WARRANTY.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS, IMPLIED OR STATUTORY INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE. SOME STATES LIMIT OR DO NOT ALLOW THE DISCLAIMER OF IMPLIED OR OTHER WARRANTIES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO THE EXTENT SUCH STATE'S LAW IS APPLICABLE TO THESE TERMS.

(7) LIMITATION OF REMEDIES.

IN NO EVENT SHALL MERITOR WABCO BE LIABLE FOR SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES OF ANY KIND OR UNDER ANY LEGAL THEORY, INCLUDING, BUT NOT LIMITED TO, TOWING, DOWNTIME, LOST PRODUCTIVITY, CARGO DAMAGE, TAXES, LOST PROFITS, COSTS OF PROCUREMENT OF A SUBSTITUTE COMPONENT OR ANY OTHER LOSSES OR COSTS RESULTING FROM A COVERED COMPONENT. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO THE EXTENT SUCH STATE'S LAW IS APPLICABLE TO THESE TERMS.

(8) TIME LIMIT ON COMMENCING LEGAL ACTION.

ANY LEGAL ACTION OR CLAIM ARISING FROM OR RELATED TO THIS WARRANTY, IN CONTRACT OR OTHERWISE, MUST BE COMMENCED WITHIN ONE YEAR FROM THE ACCRUAL OF THAT CAUSE OF ACTION, OR BE BARRED FOREVER.

(9) To Obtain Service.

If the Owner discovers within the applicable coverage period a defect in material or workmanship, the Owner must promptly give notice to either Meritor WABCO or the dealer from which the vehicle was purchased. To obtain service, the vehicle must be taken to any participating OEM new truck and/or trailer dealer or authorized Meritor WABCO service location. The dealer will inspect the vehicle and contact Meritor WABCO for an evaluation of the claim. When authorized by Meritor WABCO, the dealer will repair or replace during the term of this warranty any defective Meritor WABCO component covered by this warranty.

(10) Entire Agreement.

This is the entire agreement between Meritor WABCO and the Owner about warranty and no Meritor, Meritor WABCO employee, or dealer is authorized to make any additional warranty on behalf of Meritor WABCO unless in writing and signed by an authorized representative of Meritor WABCO.

For more information on Meritor WABCO Warranty, call our OnTrac Customer Service team at 866-OnTrac1 (866-668-7221) or visit meritorwabco.com.



Fire and Rescue Apparatus Ten (10) Year Structural Integrity Custom Cab Limited Warranty

1. LIMITED WARRANTY

Subject to the limitations and exclusions set forth below, Pierce Manufacturing provides the following warranty to the Buyer:

Coverage:	The Pierce Custom Cab shall be free from structural failures caused by defects in material and workmanship
Warranty Begins:	The date of the original purchase invoice (issued when the product ships from the factory).
Warranty Period Ends After:	Ten (10) Years - or - 100,000 Miles
Conditions and Exclusions: See Also Paragraphs 2 thru 4	This warranty applies only to the cab tubular support and mounting structures and other structural components of the cab of the vehicle model, as identified in the Pierce specifications for the Fire and Rescue Apparatus. This warranty does not apply to damage caused by corrosion.

This limited warranty shall apply only if the product is properly maintained in accordance with Pierce's maintenance instructions and manuals and is used in service which is normal to the particular model. Normal service means service which does not subject the product to stresses or impacts greater than normally result from careful use. If the Buyer discovers a defect or nonconformity, it must notify Pierce in writing within thirty (30) days after the date of discovery, but in any event prior to the expiration of the warranty period. THIS LIMITED WARRANTY MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED BY THE BUYER TO ANY SUBSEQUENT USER OR PURCHASER OR TO ANY OTHER PERSON OR ENTITY.

Notwithstanding anything to the contrary herein, Pierce makes no warranty whatsoever as to:

(a) any integral parts, components, attachments or trade accessories of or to the product that are not manufactured by Pierce, including but not limited to engines, transmissions, drivelines, axles, water pumps and generators; with respect to all such parts, components, attachments and accessories, Pierce shall assign to Buyer the applicable warranties, if any, made by the respective manufacturers thereof;

(b) any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect, fire, exposure to severe environmental or chemical conditions, acidic environment, improper maintenance, accident, crash, or force majeure such as natural disaster, lightning, earthquake, windstorm, hail, flood, war or riot;

(c) any vehicle, chassis or component, part, attachment or accessory that has been repaired, altered or assembled in any way by any person or entity other than Pierce which, in the sole judgment of Pierce, adversely affects the performance, stability or purpose for which it was manufactured; or

(d) products or parts which may in the ordinary course wear out and have to be replaced during the warranty period, including, but not limited to, tires, fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or subassemblies into finishing products or vehicles unless the assembly is performed by Pierce.

The original purchaser may void this warranty in part or in its entirety if the product is repaired or replaced (a) without prior written approval of the Pierce Customer Service Department; or (b) at a facility which has not been approved by Pierce as to technical capability. Any repairs, modifications, alterations or aftermarket parts added after manufacture without the authorization of Pierce may void this warranty.

2. DISCLAIMERS OF WARRANTIES

THE WARRANTY SET FORTH IN PARAGRAPH 1 IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S EXCLUSIVE REMEDY

If the product fails to conform to the warranty set forth in paragraph 1 during the warranty period, and such nonconformity is not due to misuse, neglect, accident or improper maintenance, Buyer must notify Pierce within the time period specified in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce, any allegedly defective product shall be returned to Pierce by Buyer for examination and/or repair. Buyer shall be responsible for the cost of such transportation, and for risk of loss of or damage to the product during transportation. Within a reasonable time, Pierce shall repair or replace (at Pierce's option and expense) any nonconforming or defective parts. Repair or replacement shall be made only by a facility approved in advance in writing by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES

Notwithstanding anything to the contrary herein or in any agreement between Pierce and Buyer, IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES WHATSOEVER, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORY OF LAW OR EQUITY, WITH RESPECT TO VEHICLES OR OTHER PRODUCTS SOLD BY PIERCE, OR THEIR OPERATION OR FAILURE TO OPERATE, OR ANY DEFECTS THEREIN, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATED THERETO, REGARDLESS OF WHETHER PIERCE HAS BEEN INFORMED OF THE POSSIBILITY OF ANY SUCH DAMAGES. Without limiting the generality of the foregoing, Pierce specifically disclaims any liability for property or personal injury damages, penalties, damages for lost profits or revenues, loss of vehicles or products or any associated equipment, cost of substitute vehicles or products, down-time, delay damages, any other types of economic loss, or for any claims by any third party for any such damages.

Note: Any Surety Bond, if a part of the sale of the vehicle as to which this limited warranty is provided, applies only to this Pierce Basic One Year Limited Warranty for such vehicle, and not to other warranties made by Pierce in a separate document (if any) or to the warranties (if any) made by any manufacturer (other than Pierce) of any part, component, attachment or accessory that is incorporated into or attached to the vehicle.



Fire and Rescue Apparatus

Ten (10) Year Pro-Rated Paint and Corrosion

Cab

Limited Warranty

1. LIMITED WARRANTY

Subject to the limitations and exclusions set forth below, Pierce Manufacturing provides the following warranty to the Buyer:

Coverage:	Exterior surfaces of the cab painted by Pierce shall be free from blistering, peeling, corrosion or any other adhesion defect caused by defective manufacturing methods or paint material selection.
Warranty Begins:	The date of the original purchase invoice (issued when the product ships from the factory).
Warranty Period Ends After:	Ten (10) Years
Conditions and Exclusions: See Also Paragraphs 2 thru 4	<p>This limited warranty is applicable to the vehicle in the following percentage costs of warranty repair, if any:</p> <p>Topcoat Durability & Appearance: Gloss, Color Retention & Cracking 0-72 months 100% 73-96 months 50% 97-120 months 25%</p> <p>Integrity of Coating System: Adhesion, Blistering/Bubbling 0-36 months 100% 37-84 months 50% 85-120 months 25%</p> <p>Corrosion: Dissimilar Metal and Crevice 0-36 months 100% 37-48 months 50% 49-72 months 25% 73-120 months 10%</p> <p>Corrosion Perforation 0-120 months 100%</p> <p>This limited warranty applies only to exterior paint. Paint on the vehicle's interior is warranted only under the Pierce Basic One Year Limited Warranty.</p> <p>Items not covered by this warranty include: (a) Damage from lack of maintenance and cleaning (proper cleaning and maintenance procedures are detailed in the Pierce operation and maintenance manual). (b) UV paint fade. (c) Any cab not manufactured by Pierce.</p>

This limited warranty shall apply only if the product is properly maintained in accordance with Pierce's maintenance instructions and manuals and is used in service which is normal to the particular model. Normal service means service which does not subject the product to stresses or impacts greater than normally result from careful use. If the Buyer discovers a defect or nonconformity, it must notify Pierce in writing within thirty (30) days after the date of discovery, but in any event prior to the expiration of the warranty period. THIS LIMITED WARRANTY MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED BY THE BUYER TO ANY SUBSEQUENT USER OR PURCHASER OR TO ANY OTHER PERSON OR ENTITY.

Notwithstanding anything to the contrary herein, Pierce makes no warranty whatsoever as to:

- (a) any integral parts, components, attachments or trade accessories of or to the product that are not manufactured by Pierce, including but not limited to engines, transmissions, drivelines, axles, water pumps and generators; with respect to all such parts, components, attachments and accessories, Pierce shall assign to Buyer the applicable warranties, if any, made by the respective manufacturers thereof;
- (b) any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect, fire, exposure to severe environmental or chemical conditions, acidic environment, improper maintenance, accident, crash, or force majeure such as natural disaster, lightning, earthquake, windstorm, hail, flood, war or riot;
- (c) any vehicle, chassis or component, part, attachment or accessory that has been repaired, altered or assembled in any way by any person or entity other than Pierce which, in the sole judgment of Pierce, adversely affects the performance, stability or purpose for which it was manufactured; or
- (d) products or parts which may in the ordinary course wear out and have to be replaced during the warranty period, including, but not limited to, tires, fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or subassemblies into finishing products or vehicles unless the assembly is performed by Pierce.

The original purchaser may void this warranty in part or in its entirety if the product is repaired or replaced (a) without prior written approval of the Pierce Customer Service Department; or (b) at a facility which has not been approved by Pierce as to technical capability. Any repairs, modifications, alterations or aftermarket parts added after manufacture without the authorization of Pierce may void this warranty.

2. DISCLAIMERS OF WARRANTIES

THE WARRANTY SET FORTH IN PARAGRAPH 1 IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S EXCLUSIVE REMEDY

If the product fails to conform to the warranty set forth in paragraph 1 during the warranty period, and such nonconformity is not due to misuse, neglect, accident or improper maintenance, Buyer must notify Pierce within the time period specified in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce, any allegedly defective product shall be returned to Pierce by Buyer for examination and/or repair. Buyer shall be responsible for the cost of such transportation, and for risk of loss of or damage to the product during transportation. Within a reasonable time, Pierce shall repair or replace (at Pierce's option and expense) any nonconforming or defective parts. Repair or replacement shall be made only by a facility approved in advance in writing by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES

Notwithstanding anything to the contrary herein or in any agreement between Pierce and Buyer, IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES WHATSOEVER, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORY OF LAW OR EQUITY, WITH RESPECT TO VEHICLES OR OTHER PRODUCTS SOLD BY PIERCE, OR THEIR OPERATION OR FAILURE TO OPERATE, OR ANY DEFECTS THEREIN, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATED THERETO, REGARDLESS OF WHETHER PIERCE HAS BEEN INFORMED OF THE POSSIBILITY OF ANY SUCH DAMAGES. Without limiting the generality of the foregoing, Pierce specifically disclaims any liability for property or personal injury damages, penalties, damages for lost profits or revenues, loss of vehicles or products or any associated equipment, cost of substitute vehicles or products, down-time, delay damages, any other types of economic loss, or for any claims by any third party for any such damages.

Note: Any Surety Bond, if a part of the sale of the vehicle as to which this limited warranty is provided, applies only to this Pierce Basic One Year Limited Warranty for such vehicle, and not to other warranties made by Pierce in a separate document (if any) or to the warranties (if any) made by any manufacturer (other than Pierce) of any part, component, attachment or accessory that is incorporated into or attached to the vehicle.



Fire and Rescue Apparatus

Two (2) Year Material and Workmanship Power Step

Limited Warranty

1. LIMITED WARRANTY

Subject to the limitations and exclusions set forth below, Pierce Manufacturing provides the following warranty to the Buyer:

Coverage:	Each power step shall be free from defects in material and workmanship
Warranty Begins:	The date of the original purchase invoice (issued when the product ships from the factory).
Warranty Period Ends After:	Two (2) Years
Conditions and Exclusions: See Also Paragraphs 2 thru 4	No specific exclusions apply

This limited warranty shall apply only if the product is properly maintained in accordance with Pierce's maintenance instructions and manuals and is used in service which is normal to the particular model. Normal service means service which does not subject the product to stresses or impacts greater than normally result from careful use. If the Buyer discovers a defect or nonconformity, it must notify Pierce in writing within thirty (30) days after the date of discovery, but in any event prior to the expiration of the warranty period. THIS LIMITED WARRANTY MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED BY THE BUYER TO ANY SUBSEQUENT USER OR PURCHASER OR TO ANY OTHER PERSON OR ENTITY.

Notwithstanding anything to the contrary herein, Pierce makes no warranty whatsoever as to:

(a) any integral parts, components, attachments or trade accessories of or to the product that are not manufactured by Pierce, including but not limited to engines, transmissions, drivelines, axles, water pumps and generators; with respect to all such parts, components, attachments and accessories, Pierce shall assign to Buyer the applicable warranties, if any, made by the respective manufacturers thereof;

(b) any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect, fire, exposure to severe environmental or chemical conditions, acidic environment, improper maintenance, accident, crash, or force majeure such as natural disaster, lightning, earthquake, windstorm, hail, flood, war or riot;

(c) any vehicle, chassis or component, part, attachment or accessory that has been repaired, altered or assembled in any way by any person or entity other than Pierce which, in the sole judgment of Pierce, adversely affects the performance, stability or purpose for which it was manufactured; or

(d) products or parts which may in the ordinary course wear out and have to be replaced during the warranty period, including, but not limited to, tires, fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or subassemblies into finishing products or vehicles unless the assembly is performed by Pierce.

The original purchaser may void this warranty in part or in its entirety if the product is repaired or replaced (a) without prior written approval of the Pierce Customer Service Department; or (b) at a facility which has not been approved by Pierce as to technical capability. Any repairs, modifications, alterations or aftermarket parts added after manufacture without the authorization of Pierce may void this warranty.

2. DISCLAIMERS OF WARRANTIES

THE WARRANTY SET FORTH IN PARAGRAPH 1 IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S EXCLUSIVE REMEDY

If the product fails to conform to the warranty set forth in paragraph 1 during the warranty period, and such nonconformity is not due to misuse, neglect, accident or improper maintenance, Buyer must notify Pierce within the time period specified in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce, any allegedly defective product shall be returned to Pierce by Buyer for examination and/or repair. Buyer shall be responsible for the cost of such transportation, and for risk of loss of or damage to the product during transportation. Within a reasonable time, Pierce shall repair or replace (at Pierce's option and expense) any nonconforming or defective parts. Repair or replacement shall be made only by a facility approved in advance in writing by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES

Notwithstanding anything to the contrary herein or in any agreement between Pierce and Buyer, IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES WHATSOEVER, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORY OF LAW OR EQUITY, WITH RESPECT TO VEHICLES OR OTHER PRODUCTS SOLD BY PIERCE, OR THEIR OPERATION OR FAILURE TO OPERATE, OR ANY DEFECTS THEREIN, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATED THERETO, REGARDLESS OF WHETHER PIERCE HAS BEEN INFORMED OF THE POSSIBILITY OF ANY SUCH DAMAGES. Without limiting the generality of the foregoing, Pierce specifically disclaims any liability for property or personal injury damages, penalties, damages for lost profits or revenues, loss of vehicles or products or any associated equipment, cost of substitute vehicles or products, down-time, delay damages, any other types of economic loss, or for any claims by any third party for any such damages.

Note: Any Surety Bond, if a part of the sale of the vehicle as to which this limited warranty is provided, applies only to this Pierce Basic One Year Limited Warranty for such vehicle, and not to other warranties made by Pierce in a separate document (if any) or to the warranties (if any) made by any manufacturer (other than Pierce) of any part, component, attachment or accessory that is incorporated into or attached to the vehicle.



Fire and Rescue Apparatus Five (5) Year Material and Workmanship Command Zone Electronics Limited Warranty

1. LIMITED WARRANTY

Subject to the limitations and exclusions set forth below, Pierce Manufacturing provides the following warranty to the Buyer:

Coverage:	Command Zone control modules shall be free from failures caused by defects in material and workmanship
Warranty Begins:	The date of the original purchase invoice (issued when the product ships from the factory).
Warranty Period Ends After:	Five (5) Years
Conditions and Exclusions: See Also Paragraphs 2 thru 4	This limited warranty applies to all of the control modules for the Command Zone system, including the full color graphic displays. Related wire harnesses, cables and connectors are not covered under this limited warranty and are instead covered under the Pierce One Year Basic Apparatus Limited Warranty.

This limited warranty shall apply only if the product is properly maintained in accordance with Pierce's maintenance instructions and manuals and is used in service which is normal to the particular model. Normal service means service which does not subject the product to stresses or impacts greater than normally result from careful use. If the Buyer discovers a defect or nonconformity, it must notify Pierce in writing within thirty (30) days after the date of discovery, but in any event prior to the expiration of the warranty period. THIS LIMITED WARRANTY MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED BY THE BUYER TO ANY SUBSEQUENT USER OR PURCHASER OR TO ANY OTHER PERSON OR ENTITY.

Notwithstanding anything to the contrary herein, Pierce makes no warranty whatsoever as to:

(a) any integral parts, components, attachments or trade accessories of or to the product that are not manufactured by Pierce, including but not limited to engines, transmissions, drivelines, axles, water pumps and generators; with respect to all such parts, components, attachments and accessories, Pierce shall assign to Buyer the applicable warranties, if any, made by the respective manufacturers thereof;

(b) any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect, fire, exposure to severe environmental or chemical conditions, acidic environment, improper maintenance, accident, crash, or force majeure such as natural disaster, lightning, earthquake, windstorm, hail, flood, war or riot;

(c) any vehicle, chassis or component, part, attachment or accessory that has been repaired, altered or assembled in any way by any person or entity other than Pierce which, in the sole judgment of Pierce, adversely affects the performance, stability or purpose for which it was manufactured; or

(d) products or parts which may in the ordinary course wear out and have to be replaced during the warranty period, including, but not limited to, tires, fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or subassemblies into finishing products or vehicles unless the assembly is performed by Pierce.

The original purchaser may void this warranty in part or in its entirety if the product is repaired or replaced (a) without prior written approval of the Pierce Customer Service Department; or (b) at a facility which has not been approved by Pierce as to technical capability. Any repairs, modifications, alterations or aftermarket parts added after manufacture without the authorization of Pierce may void this warranty.

2. DISCLAIMERS OF WARRANTIES

THE WARRANTY SET FORTH IN PARAGRAPH 1 IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S EXCLUSIVE REMEDY

If the product fails to conform to the warranty set forth in paragraph 1 during the warranty period, and such nonconformity is not due to misuse, neglect, accident or improper maintenance, Buyer must notify Pierce within the time period specified in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce, any allegedly defective product shall be returned to Pierce by Buyer for examination and/or repair. Buyer shall be responsible for the cost of such transportation, and for risk of loss of or damage to the product during transportation. Within a reasonable time, Pierce shall repair or replace (at Pierce's option and expense) any nonconforming or defective parts. Repair or replacement shall be made only by a facility approved in advance in writing by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES

Notwithstanding anything to the contrary herein or in any agreement between Pierce and Buyer, IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES WHATSOEVER, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORY OF LAW OR EQUITY, WITH RESPECT TO VEHICLES OR OTHER PRODUCTS SOLD BY PIERCE, OR THEIR OPERATION OR FAILURE TO OPERATE, OR ANY DEFECTS THEREIN, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATED THERETO, REGARDLESS OF WHETHER PIERCE HAS BEEN INFORMED OF THE POSSIBILITY OF ANY SUCH DAMAGES. Without limiting the generality of the foregoing, Pierce specifically disclaims any liability for property or personal injury damages, penalties, damages for lost profits or revenues, loss of vehicles or products or any associated equipment, cost of substitute vehicles or products, down-time, delay damages, any other types of economic loss, or for any claims by any third party for any such damages.

Note: Any Surety Bond, if a part of the sale of the vehicle as to which this limited warranty is provided, applies only to this Pierce Basic One Year Limited Warranty for such vehicle, and not to other warranties made by Pierce in a separate document (if any) or to the warranties (if any) made by any manufacturer (other than Pierce) of any part, component, attachment or accessory that is incorporated into or attached to the vehicle.

NEW PRODUCT WARRANTY



**PARTICIPATING OEM SALES
DISTRIBUTOR SALES**

**LIMITED WARRANTY ON NEW ALLISON AUTOMATIC TRANSMISSIONS
USED IN EMERGENCY VEHICLE APPLICATIONS**

Allison Transmission will provide for repairs or replacement, at its option, during the warranty period of each new Allison transmission listed below that is installed in an Emergency Vehicle in accordance with the following terms, conditions, and limitations.

WHAT IS COVERED

- **WARRANTY APPLIES** — This warranty is for new Allison transmission models listed below installed in an Emergency Vehicle and is provided to the original and any subsequent owner(s) of the vehicle during the warranty period.
- **REPAIRS COVERED** — The warranty covers repairs or replacement, at Allison Transmission’s option, to correct any transmission malfunction resulting from defects in material or workmanship occurring during the warranty period. Needed repairs or replacements will be performed using the method Allison Transmission determines most appropriate under the circumstances.
- **TOWING** — Towing is covered to the nearest Allison Transmission Distributor or authorized Dealer only when necessary to prevent further damage to your transmission.
- **PAYMENT TERMS** — Warranty repairs, including parts and labor, will be covered per the schedule shown in the chart contained in section “APPLICABLE MODELS, WARRANTY LIMITATIONS, AND ADJUSTMENT SCHEDULE.”
- **OBTAINING REPAIRS** — To obtain warranty repairs, take the vehicle to any Allison Transmission Distributor or authorized Dealer within a reasonable amount of time and request the needed repairs. A reasonable amount of time must be allowed for the Distributor or Dealer to perform necessary repairs.
- **TRANSMISSION REMOVAL AND REINSTALLATION** — Labor costs for the removal and re-installation of the transmission, when necessary to make a warranty repair, are covered by this warranty.
- **WARRANTY PERIOD** — The warranty period for all coverages shall begin on the date the transmission is delivered to the first retail purchaser, with the following exception:

Demonstration Service - A transmission in a new truck or bus may be demonstrated to a total of 5000 miles (8000 kilometers). If the vehicle is within this limit when sold to a retail purchaser, the warranty start date is the date of purchase. Normal warranty services are applicable to the demonstrating Dealer. Should the truck or bus be sold to a retail purchaser after these limits are reached, the warranty period will begin on the date the vehicle was first placed in demonstration service and the purchaser will be entitled to the remaining warranty.

APPLICABLE MODELS, WARRANTY LIMITATIONS, AND ADJUSTMENT SCHEDULE

APPLICABLE MODELS	WARRANTY LIMITATIONS (Whichever occurs first)		ADJUSTMENT CHARGE TO BE PAID BY THE CUSTOMER	
	Months	Transmission Miles Or Kilometers	Parts	Labor
MT, MD 3000, 3200, 3500, 3700	0-24	No Limit	No Charge	No Charge
HT with Hydraulic Controls	0-24	No Limit	No Charge	No Charge
AT, 1000 Series™, 2000 Series™, 2400 Series™	0-36	No Limit	No Charge	No Charge
HT with Electronic Controls	0-60	No Limit	No Charge	No Charge
HD 1000 EVS, 2100 EVS, 2200 EVS 2350 EVS, 2500 EVS, 2550 EVS, 3000 EVS, 3500 EVS, 4000, 4000 EVS, 4500, 4500 EVS, 4700, 4700 EVS, 4800, 4800 EVS	0-60	No Limit	No Charge	No Charge

WHAT IS NOT COVERED

- **DAMAGE DUE TO ACCIDENT, MISUSE, or ALTERATION** — Defects and damage caused as the result of any of the following are not covered:
 - Flood, collision, fire, theft, freezing, vandalism, riot, explosion, or objects striking the vehicle;
 - Misuse of the vehicle;
 - Installation into unapproved applications and installations;
 - Alterations or modification of the transmission or the vehicle, and
 - Damage resulting from improper storage (refer to long-term storage procedure outlined in the applicable Allison Service Manual)
 - Anything other than defects in Allison Transmission material or workmanship

NOTE: This warranty is void on transmissions used in vehicles currently or previously titled as salvaged, scrapped, junked, or totaled.

- **CHASSIS, BODY, and COMPONENTS** — The chassis and body company (assemblers) and other component and equipment manufacturers are solely responsible for warranties on the chassis, body, component(s), and equipment they provide. Any transmission repair caused by an alteration(s) made to the Allison transmission or the vehicle which allows the transmission to be installed or operated outside of the limits defined in the appropriate Allison Installation Guideline is solely the responsibility of the entity making the alteration(s).
- **DAMAGE CAUSED by LACK of MAINTENANCE or by the USE of TRANSMISSION FLUIDS NOT RECOMMENDED in the OPERATOR'S MANUAL** — Defects and damage caused by any of the following are not covered:
 - Failure to follow the recommendations of the maintenance schedule intervals applicable to the transmission;
 - Failure to use transmission fluids or maintain transmission fluid levels recommended in the Operator's Manual.
- **MAINTENANCE** — Normal maintenance (such as replacement of filters, screens, and transmission fluid) is not covered and is the owner's responsibility.
- **REPAIRS by UNAUTHORIZED DEALERS** — Defects and damage caused by a service outlet that is not an authorized Allison Transmission Distributor or Dealer are not covered.
- **USE of OTHER THAN GENUINE ALLISON TRANSMISSION PARTS** — Defects and damage caused by the use of parts that are not genuine Allison Transmission parts are not covered.
- **EXTRA EXPENSES** — Economic loss and extra expenses are not covered. Examples include but are not limited to: loss of vehicle use; inconvenience; storage; payment for loss of time or pay; vehicle rental expense; lodging; meals; or other travel costs.
- **"DENIED PARTY" OWNERSHIP** — Warranty repair parts and labor costs are not reimbursed to any participating or non-participating OEMs, dealers or distributors who perform warranty work for, or on behalf of, end users identified by the United States as being a "denied party" or who are citizens of sanctioned or embargoed countries as defined by the U.S. Department of Treasury Office of Foreign Assets Control. Furthermore, warranty reimbursements are not guaranteed if the reimbursement would be contrary to any United States export control laws or regulations as defined by the U.S. Department of Commerce, the U.S. Department of State, or the U.S. Department of Treasury.

OTHER TERMS APPLICABLE TO CONSUMERS AS DEFINED by the MAGNUSON-MOSS WARRANTY ACT

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

Allison Transmission does not authorize any person to create for it any other obligation or liability in connection with these transmissions.

ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE APPLICABLE TO THESE TRANSMISSIONS IS LIMITED IN DURATION TO THE DURATION OF THIS WRITTEN WARRANTY. PERFORMANCE OF REPAIRS AND NEEDED ADJUSTMENTS IS THE EXCLUSIVE REMEDY UNDER THIS WRITTEN WARRANTY OR ANY IMPLIED WARRANTY. ALLISON TRANSMISSION SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES (SUCH AS, BUT NOT LIMITED TO, LOST WAGES OR VEHICLE RENTAL EXPENSES) RESULTING FROM BREACH OF THIS WRITTEN WARRANTY OR ANY IMPLIED WARRANTY.**

** Some states do not allow limitations on how long an implied warranty will last or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

OTHER TERMS APPLICABLE TO OTHER END-USERS

THIS WARRANTY IS THE ONLY WARRANTY APPLICABLE TO THE ALLISON TRANSMISSION MODELS LISTED ABOVE AND IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ALLISON TRANSMISSION DOES NOT AUTHORIZE ANY PERSON TO CREATE FOR IT ANY OTHER OBLIGATION OR LIABILITY IN CONNECTION WITH SUCH TRANSMISSIONS. ALLISON TRANSMISSION SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM BREACH OF THIS WARRANTY OR ANY IMPLIED WARRANTY.

QUESTIONS

If you have any questions regarding this warranty or the performance of warranty obligations, you may contact any Allison Transmission Distributor or Dealer or write to:

Allison Transmission, Inc.
P.O. Box 894
Indianapolis, IN 46206-0894
Attention: Warranty Administration PF-9



Fire and Rescue Apparatus

Five (5) Year Material and Workmanship - Transmission Oil Cooler Three (3) Year Collateral Damage Coverage

Limited Warranty

1. LIMITED WARRANTY

Subject to the limitations and exclusions set forth below, Pierce Manufacturing provides the following warranty to the Buyer:

Coverage:	The transmission cooler shall be free from component or structural failures caused by defects in material and/or workmanship. Collateral damage up to \$10,000 per occurrence is available for the first three (3) years.
Warranty Begins:	The date of delivery to the first retail purchaser.
Warranty Period Ends After:	Five (5) Years on Oil Cooler and three (3) years on collateral damage coverage
Conditions and Exclusions: See Also Paragraphs 2 thru 4	<p>This warranty does not cover repair due to accidents, misuse, and excessive vibration, flying debris, storage damage (freezing), negligence or modification. This warranty is void if any modification or repairs are performed without authorization. This also voids any future warranty.</p> <p>This warranty does not cover cost of maintenance or repairs due to lack of required maintenance services as recommended. Performance of the required maintenance and use of proper fluids are the responsibility of the owner.</p> <p>Towing is covered to the nearest distributor or authorized dealer only when necessary to prevent further damage to your transmission.</p> <p>Labor costs for the removal and reinstallation of goods may be covered when necessary to make repairs. Please contact your OEM for authorization.</p> <p>Replacement of cooler during the warranty period is limited to 100% of reasonable labor costs up to a maximum of \$700 to remove, replace, or repair the oil cooler.</p>

Notwithstanding anything to the contrary herein, Pierce makes no warranty whatsoever as to:

- (a) any integral parts, components, attachments or trade accessories of or to the product that are not manufactured by Pierce, including but not limited to engines, transmissions, drivelines, axles, water pumps and generators; with respect to all such parts, components, attachments and accessories, Pierce shall assign to Buyer the applicable warranties, if any, made by the respective manufacturers thereof;
- (b) any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect, fire, exposure to severe environmental or chemical conditions, acidic environment, improper maintenance, accident, crash, or force majeure such as natural disaster, lightning, earthquake, windstorm, hail, flood, war or riot;
- (c) any vehicle, chassis or component, part, attachment or accessory that has been repaired, altered or assembled in any way by any person or entity other than Pierce which, in the sole judgment of Pierce, adversely affects the performance, stability or purpose for which it was manufactured; or
- (d) products or parts which may in the ordinary course wear out and have to be replaced during the warranty period, including, but not limited to, tires, fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or subassemblies into finishing products or vehicles unless the assembly is performed by Pierce.

The original purchaser may void this warranty in part or in its entirety if the product is repaired or replaced (a) without prior written approval of the Pierce Customer Service Department; or (b) at a facility which has not been approved by Pierce as to technical capability. Any repairs, modifications, alterations or aftermarket parts added after manufacture without the authorization of Pierce may void this warranty.

2. DISCLAIMERS OF WARRANTIES

THE WARRANTY SET FORTH IN PARAGRAPH 1 IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S EXCLUSIVE REMEDY.

If the product fails to conform to the warranty set forth in paragraph 1 during the warranty period, and such nonconformity is not due to misuse, neglect, accident or improper maintenance, Buyer must notify Pierce within the time period specified in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce, any allegedly defective product shall be returned to Pierce by Buyer for examination and/or repair. Buyer shall be responsible for the cost of such transportation, and for risk of loss of or damage to the product during transportation. Within a reasonable time, Pierce shall repair or replace (at Pierce's option and expense) any nonconforming or defective parts. Repair or replacement shall be made only by a facility approved in advance in writing by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES.

Notwithstanding anything to the contrary herein or in any agreement between Pierce and Buyer, IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES WHATSOEVER, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORY OF LAW OR EQUITY, WITH RESPECT TO VEHICLES OR OTHER PRODUCTS SOLD BY PIERCE, OR THEIR OPERATION OR FAILURE TO OPERATE, OR ANY DEFECTS THEREIN, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATED THERETO, REGARDLESS OF WHETHER PIERCE HAS BEEN INFORMED OF THE POSSIBILITY OF ANY SUCH DAMAGES. Without limiting the generality of the foregoing, Pierce specifically disclaims any liability for property or personal injury damages, penalties, damages for lost profits or revenues, loss of vehicles or products or any associated equipment, cost of substitute vehicles or products, down-time, delay damages, any other types of economic loss, or for any claims by any third party for any such damages.

Note: Any Surety Bond, if a part of the sale of the vehicle as to which this limited warranty is provided, applies only to this Pierce Basic One Year Limited Warranty for such vehicle, and not to other warranties made by Pierce in a separate document (if any) or to the warranties (if any) made by any manufacturer (other than Pierce) of any part, component, attachment or accessory that is incorporated into or attached to the vehicle.

This limited warranty shall apply only if the product is properly maintained in accordance with Pierce's maintenance instructions and manuals and is used in service which is normal to the particular model. Normal service means service which does not subject the product to stresses or impacts greater than normally result from careful use. If the Buyer discovers a defect or nonconformity, it must notify Pierce in writing within thirty (30) days after the date of discovery, but in any event prior to the expiration of the warranty period. THIS LIMITED WARRANTY MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED BY THE BUYER TO ANY SUBSEQUENT USER OR PURCHASER OR TO ANY OTHER PERSON OR ENTITY.

UPF
UNITED PLASTIC FABRICATING, INC.
WARRANTY
FOR: POLY-TANK®, POLYSIDE®, INTEGRATOR™, ELLIPSE™, ELLIP-T-TANK™ & DEFENDER™

LIFETIME SERVICE WARRANTY

United Plastic Fabricating, Inc. (hereinafter called "UPF") warrants each POLY-TANK®, Booster/Foam Tank POLYSIDE® Wetside Tank, Integrator Tank/Body, ELLIPSE™ Elliptical Tank, Ellip-T-Tank Tank and DEFENDER™ Skid Tank to be free from defects in material and workmanship for the service life of the original vehicle (vehicle must be actively used in an emergency response for fire suppression). All UPF Tanks must be installed and operated in accordance with the UPF Installation and Operating Guidelines. Failure to do so can void the warranty.

Every UPF Tank is inspected and tested before leaving our facility. Should your UPF Tank require service, please notify UPF via email, fax, in writing or by calling UPF at 1-978-975-4520. Please provide the serial number, a description of the service request, the location along with the phone number and name of the contact person. Our goal is to have scheduled work completed within a reasonable time period.

Under a valid warranty claim, UPF will cover the cost to repair the UPF Tank including the customary and reasonable costs to make the tank accessible such as the removal and reinstallation of the tank if authorized in advance (pre-approved) by UPF. The warranty will not cover tanks that have been improperly installed, operated, misused, abused, or modified from its intended or designed use. Serial number must not have been altered, defaced or removed. Tanks that are not stored or installed properly which results in the tank suffering UV damage will not be covered by this agreement.

Should UPF determine that the service claim is valid under this warranty for a tank located outside of the United States and Canada, UPF will assume the costs for labor and material for the warranty repair as described above plus all travel costs to the U.S. port of embarkation. Costs for airline travel outside of the U.S. and Canada will not be the responsibility of UPF.

In the event the tank shall become stationed in an area of the world that is considered to be a war zone or where unsafe conditions exist for the safe passage of United States Nationals, as reported by the United States Department of State, (<http://www.state.gov>), and a request to perform service or warranty repairs, UPF reserves the right to refuse to honor such requests. It is the purchaser's responsibility to relocate the tank to an area where such repairs can be performed without undue risk to UPF employees or their designee. UPF will make every reasonable effort to support our products through alternative means.

For Ellipse™ elliptical tanks, a separate five year warranty provided by the subcontractor is applied to the sub-frames, chute linings (rubber isolation strips) and metal components. The stainless steel wrap provided by UPF shall be warranted by the subcontractor performing the wrap installation in accordance with their warranty in place at the time of the installation. UPF will not be liable for any warranty costs associated with the wrap, sub-frames, chute linings (rubber isolation strips) and metal components but will assist with all claims on behalf of its customer.

For PolySide® wetsided tanks and Integrator™ Tank/Body units, all polypropylene components related to the tank shall carry the standard UPF



UNITED PLASTIC FABRICATING, INC.

WARRANTY

FOR: POLY-TANK®, POLYSIDE®, INTEGRATOR™, ELLIPSE™, ELLIP-T-TANK™ & DEFENDER™

service warranty. Other polypropylene components, including but not limited to compartments, wheel wells, fenders and other body related components shall be warranted by UPF for a period of ten years. The warranty for the PolySide® and Integrator™ units excludes paint or hardware, which shall be covered by the manufacturer of the paint/hardware.

All UPF tanks 50 gallons or less utilized for non-fire applications and installed on specialty vehicles such as ATVs, trailers, boats, etc. are covered under a separate warranty policy available from UPF. Further, UPF Protector™ foam and water trailers are warranted under a separate warranty policy available from UPF.

This UPF warranty is transferable within the United States only with prior written approval by UPF (except an original apparatus manufacturer may assign this warranty to the first titled owner/lessee of the apparatus).

UPF will NOT reimburse any unnecessary work and/or work that has not been pre-approved. Any and all third party charges must be pre-authorized and approved in writing by UPF prior to commencing the work. Any unauthorized third party repairs, alterations, actions or modifications will not be covered and can void the warranty. UPF will be the sole determining authority as to whether a service claim will be valid and covered under this warranty.

In no event will UPF be liable for an amount in excess of the purchase price of the booster/foam tank at the time of manufacture or for any loss or damage, whether direct, indirect, incidental, consequential, or otherwise arising out of failure of its product. Loss of contents (water, foam, etc.) shall not be the responsibility of UPF. Further, UPF is not responsible for costs associated with service repairs to chassis, sub-frames, bodies, valves, dumps, hoses, pressure vacuum vents, and other components (i.e. liquid level transducers, etc.). Further, UPF will not cover the cost for travel of the vehicle to and from a repair facility.

This warranty contains the entire warranty. It is the sole warranty and price agreements or representation, whether oral or written, are either merged herein or expressly cancelled. UPF neither assumes, nor authorizes any person supposing to act on its behalf to change, nor assume for it, any warranty or liability concerning its product.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. Some states do not allow exclusion or limitation or incidental or consequential damage, so the above limitation or exclusion may not apply to you. Since some states do not allow limitations on the length of an implied warranty, the above limitation may not apply to you.

THERE ARE NO WARRANTIES, EXPRESSED OR IMPLIED, WHICH EXTEND BEYOND THE DESCRIPTION OF THE FACE HEREOF. THERE IS NO EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR A WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. ADDITIONALLY, THIS WARRANTY IS IN LIEU OF ALL OTHER OBLIGATION OR LIABILITIES ON THE PART OF UPF.



BULLETIN

TO: All Dealer Service Representatives

From: Kevin Hanegraaf

DATE: January 4, 2010

RE: UPF Tank Warranty Policy – Truck in Accident

Service Topic #292



To keep the UPF tank warranty valid on trucks that have been involved in a vehicular accident, it is UPF's policy that the customer must remove the tank from the truck and send it back to one of UPF's facilities for inspection. In the event that this does not take place, the warranty will be considered null and void.

The customer must remove and send the tank back to UPF for inspection in order to maintain the original warranty coverage, at which time it will be:

- Filled with water
- Visually inspected
- Ultraviolet spark tested on articulating test stand in the dark
- Recommendation for repairs if necessary provided by UPF
- Fully evaluated and repaired by UPF

If your customer chooses to leave the tank on the truck and wants a technician to inspect and/or repair the tank in the field, then **the warranty is no longer in effect.** This direction is upheld by UPF because the technician cannot inspect the entire tank when it is still installed on the truck.

Note: This memo is intended to relay the information Pierce has received on UPF's tank warranty for trucks that are in a vehicular accident. In the event of an actual claim, we direct you to consult with UPF's service Manager Maura Watts (800-638-8265 x253)



Fire and Rescue Apparatus Ten (10) Year Structural Integrity Apparatus Body Limited Warranty

1. LIMITED WARRANTY

Subject to the limitations and exclusions set forth below, Pierce Manufacturing provides the following warranty to the Buyer:

Coverage:	The apparatus body shall be free from structural failures caused by defects in material and workmanship
Warranty Begins:	The date of the original purchase invoice (issued when the product ships from the factory).
Warranty Period Ends After:	Ten (10) Years - or - 100,000 Miles
Conditions and Exclusions: See Also Paragraphs 2 thru 4	This warranty applies only to the body tubular support and mounting structures and other structural components of the body of the vehicle model, as identified in the Pierce specifications for the Fire and Rescue Apparatus. This warranty does not apply to damage caused by corrosion.

This limited warranty shall apply only if the product is properly maintained in accordance with Pierce's maintenance instructions and manuals and is used in service which is normal to the particular model. Normal service means service which does not subject the product to stresses or impacts greater than normally result from careful use. If the Buyer discovers a defect or nonconformity, it must notify Pierce in writing within thirty (30) days after the date of discovery, but in any event prior to the expiration of the warranty period. THIS LIMITED WARRANTY MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED BY THE BUYER TO ANY SUBSEQUENT USER OR PURCHASER OR TO ANY OTHER PERSON OR ENTITY.

Notwithstanding anything to the contrary herein, Pierce makes no warranty whatsoever as to:

(a) any integral parts, components, attachments or trade accessories of or to the product that are not manufactured by Pierce, including but not limited to engines, transmissions, drivelines, axles, water pumps and generators; with respect to all such parts, components, attachments and accessories, Pierce shall assign to Buyer the applicable warranties, if any, made by the respective manufacturers thereof;

(b) any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect, fire, exposure to severe environmental or chemical conditions, acidic environment, improper maintenance, accident, crash, or force majeure such as natural disaster, lightning, earthquake, windstorm, hail, flood, war or riot;

(c) any vehicle, chassis or component, part, attachment or accessory that has been repaired, altered or assembled in any way by any person or entity other than Pierce which, in the sole judgment of Pierce, adversely affects the performance, stability or purpose for which it was manufactured; or

(d) products or parts which may in the ordinary course wear out and have to be replaced during the warranty period, including, but not limited to, tires, fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or subassemblies into finishing products or vehicles unless the assembly is performed by Pierce.

The original purchaser may void this warranty in part or in its entirety if the product is repaired or replaced (a) without prior written approval of the Pierce Customer Service Department; or (b) at a facility which has not been approved by Pierce as to technical capability. Any repairs, modifications, alterations or aftermarket parts added after manufacture without the authorization of Pierce may void this warranty.

2. DISCLAIMERS OF WARRANTIES

THE WARRANTY SET FORTH IN PARAGRAPH 1 IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S EXCLUSIVE REMEDY

If the product fails to conform to the warranty set forth in paragraph 1 during the warranty period, and such nonconformity is not due to misuse, neglect, accident or improper maintenance, Buyer must notify Pierce within the time period specified in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce, any allegedly defective product shall be returned to Pierce by Buyer for examination and/or repair. Buyer shall be responsible for the cost of such transportation, and for risk of loss of or damage to the product during transportation. Within a reasonable time, Pierce shall repair or replace (at Pierce's option and expense) any nonconforming or defective parts. Repair or replacement shall be made only by a facility approved in advance in writing by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES

Notwithstanding anything to the contrary herein or in any agreement between Pierce and Buyer, IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES WHATSOEVER, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORY OF LAW OR EQUITY, WITH RESPECT TO VEHICLES OR OTHER PRODUCTS SOLD BY PIERCE, OR THEIR OPERATION OR FAILURE TO OPERATE, OR ANY DEFECTS THEREIN, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATED THERETO, REGARDLESS OF WHETHER PIERCE HAS BEEN INFORMED OF THE POSSIBILITY OF ANY SUCH DAMAGES. Without limiting the generality of the foregoing, Pierce specifically disclaims any liability for property or personal injury damages, penalties, damages for lost profits or revenues, loss of vehicles or products or any associated equipment, cost of substitute vehicles or products, down-time, delay damages, any other types of economic loss, or for any claims by any third party for any such damages.

Note: Any Surety Bond, if a part of the sale of the vehicle as to which this limited warranty is provided, applies only to this Pierce Basic One Year Limited Warranty for such vehicle, and not to other warranties made by Pierce in a separate document (if any) or to the warranties (if any) made by any manufacturer (other than Pierce) of any part, component, attachment or accessory that is incorporated into or attached to the vehicle.



AMDOR Inc. TERMS OF BUSINESS AND GENERAL INFORMATION

Warranty:

All AMDOR Inc. roll-up door products are warranted for a period of 10 years from the date of delivery (with the exception of wet paint adhesion - please see below). AMDOR Inc. liability covers the replacement or repair of any component that fails due to defects in material and / or workmanship during the coverage period. We accept no liability for claims made for damages to any part (or parts) of a vehicle and / or machine (of any type) or injury claims by a person or persons assumed or alleged to have been brought about by the use or misuse of any product supplied by AMDOR Inc. Warranty coverage does not extend to door attachments including (but not limited to) decals, emblems, stripes and adhesives.

In order to initiate the claims process please contact your authorized representative of AMDOR Inc. Warranty claims must be accompanied by a written description providing full and reasonable details as to the nature of the defect. Upon receipt of your claim arrangements will be made to inspect the defective product (if necessary). Justified warranty claims will be repaired, exchanged, or credited to the customer's account at AMDOR Inc.'s discretion. All warranty claims must be approved in writing by the Customer Service Manager for AMDOR Inc. There are no exceptions to this clause.

Limited warranty coverage includes the labor associated with the disassembly and assembly of products deemed to be defective by AMDOR Inc. Labor allowances are based on a set time schedule as determined by AMDOR Inc. The maximum allowable hourly labor rate is \$ 50. All warranty labor claims must be approved in writing by an authorized representative of AMDOR Inc. prior to commencement of work. Allowances for removal and installation:

Curtain replacement:	3/4 hour
Balancer replacement:	1 hour
Door ajar switch	3/4 hour
Bottom Panel Assembly:	1/2 hour
Slat replacement:	3/4 hour
Door removal and replacement	1 1/2 hours

Items authorized for return must be accompanied by a Return Goods Authorization (RGA) number. We will accept collect shipments of items deemed to be defective provided that they are returned via the most economical carrier. Should items be

returned by means other than the most economical carrier the difference will be back to the sender.

AMDOR Inc. reserves the right to reject any claim when a product has been opened, interfered with or modified. Claims may also be rejected when damage to the product (or any sub-assembly) has been brought about by accident, misuse, abuse, vandalism, incorrect installation, temperature extremes, chemical exposure or any factor other than regular operating conditions.

Limited Wet Paint Match Adhesion Warranty

AMDOR Inc. warrants wet paint finishes applied by AMDOR utilizing our approved factory paint specification. All wet paint match colors must be approved in writing by an authorized OEM representative. AMDOR Inc. will provide a color spray out for this purpose. The time required for shipping and consideration of initial color spray outs will be considered over and above stated lead times. Warranty coverage will extend for a period of not less than 5 years from the date of delivery as determined by AMDOR Inc.'s Packing Slip. AMDOR reserves the right to determine whether individual units will be replaced and / or repaired by an AMDOR approved vendor. An allowance will be made for labor associated with the disassembly and assembly of individual units at the prescribed hourly rate of \$ 50 per hour. Compensation for labor will not exceed the maximum time allowance permitted for door removal and replacement. Written approval including specified allowance for time must be obtained from AMDOR prior to initiating work. Warranty coverage will extend to the following visible paint system defects:

- 1./ Loss of mechanical adhesion as evidenced by peeling, cracking or blistering which exposes the substrate material.
- 2./ Corrosion of the substrate due to paint system failure.
- 3./ Fading which results in a substantial departure from the primary AMDOR approved body color.

Wet paint adhesion limited warranty coverage will be excluded when damages to the system are determined by AMDOR Inc. to be a result of the following:

- 1./ Damage caused through the use of attachments including (but not limited to) decals, labels, adhesives, non factory approved coatings.
- 2./ Loss of gloss, discoloration or damage due to improper maintenance (including but not limited to) mechanical wash systems, pressure washers, steam cleaners, non approved wash or polishing agents.
- 3./ Abuse, acts of nature, excessive heat / cold, chemical exposure, vandalism and / or accidents.
- 4./ Scratches, chips, abrasions, or dents from any source.

This document supercedes all previous written and / or verbal warranties provided by AMDOR Inc. and / or it's affiliates.



Fire and Rescue Apparatus Six (6) Year Material and Workmanship PUC Pump

Limited Warranty

1. LIMITED WARRANTY

Subject to the limitations and exclusions set forth below, Pierce Manufacturing provides the following warranty to the Buyer:

Coverage:	The PUC Pump and its components manufactured under the Pierce brand in its Fire and Rescue Apparatus vehicle shall be free from failures caused by defects in material and workmanship
Warranty Begins:	The date of the original purchase invoice (issued when the product ships from the factory).
Warranty Period Ends After:	Six (6) Years - or - 3000 Pump Hours
Conditions and Exclusions: See Also Paragraphs 2 thru 4	This limited warranty applies to the PUC Pump and all its components manufactured under the Pierce brand. Items not manufactured under the Pierce brand such as valves, relief valves or wear items such as wear rings, seals, bearings or costs of removal, transporting, storing, or reinstallation are not covered by this six-year limited warranty and are instead covered under the Pierce Basic One Year Limited Warranty.

This limited warranty shall apply only if the product is properly maintained in accordance with Pierce's maintenance instructions and manuals and is used in service which is normal to the particular model. Normal service means service which does not subject the product to stresses or impacts greater than normally result from careful use. If the Buyer discovers a defect or nonconformity, it must notify Pierce in writing within thirty (30) days after the date of discovery, but in any event prior to the expiration of the warranty period. THIS LIMITED WARRANTY MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED BY THE BUYER TO ANY SUBSEQUENT USER OR PURCHASER OR TO ANY OTHER PERSON OR ENTITY.

Notwithstanding anything to the contrary herein, Pierce makes no warranty whatsoever as to:

(a) any integral parts, components, attachments or trade accessories of or to the product that are not manufactured by Pierce, including but not limited to engines, transmissions, drivelines, axles, water pumps and generators; with respect to all such parts, components, attachments and accessories, Pierce shall assign to Buyer the applicable warranties, if any, made by the respective manufacturers thereof;

(b) any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect, fire, exposure to severe environmental or chemical conditions, acidic environment, improper maintenance, accident, crash, or force majeure such as natural disaster, lightning, earthquake, windstorm, hail, flood, war or riot;

(c) any vehicle, chassis or component, part, attachment or accessory that has been repaired, altered or assembled in any way by any person or entity other than Pierce which, in the sole judgment of Pierce, adversely affects the performance, stability or purpose for which it was manufactured; or

(d) products or parts which may in the ordinary course wear out and have to be replaced during the warranty period, including, but not limited to, tires, fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or subassemblies into finishing products or vehicles unless the assembly is performed by Pierce.

The original purchaser may void this warranty in part or in its entirety if the product is repaired or replaced (a) without prior written approval of the Pierce Customer Service Department; or (b) at a facility which has not been approved by Pierce as to technical capability. Any repairs, modifications, alterations or aftermarket parts added after manufacture without the authorization of Pierce may void this warranty.

2. DISCLAIMERS OF WARRANTIES

THE WARRANTY SET FORTH IN PARAGRAPH 1 IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S EXCLUSIVE REMEDY.

If the product fails to conform to the warranty set forth in paragraph 1 during the warranty period, and such nonconformity is not due to misuse, neglect, accident or improper maintenance, Buyer must notify Pierce within the time period specified in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce, any allegedly defective product shall be returned to Pierce by Buyer for examination and/or repair. Buyer shall be responsible for the cost of such transportation, and for risk of loss of or damage to the product during transportation. Within a reasonable time, Pierce shall repair or replace (at Pierce's option and expense) any nonconforming or defective parts. Repair or replacement shall be made only by a facility approved in advance in writing by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES.

Notwithstanding anything to the contrary herein or in any agreement between Pierce and Buyer, IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES WHATSOEVER, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORY OF LAW OR EQUITY, WITH RESPECT TO VEHICLES OR OTHER PRODUCTS SOLD BY PIERCE, OR THEIR OPERATION OR FAILURE TO OPERATE, OR ANY DEFECTS THEREIN, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATED THERETO, REGARDLESS OF WHETHER PIERCE HAS BEEN INFORMED OF THE POSSIBILITY OF ANY SUCH DAMAGES. Without limiting the generality of the foregoing, Pierce specifically disclaims any liability for property or personal injury damages, penalties, damages for lost profits or revenues, loss of vehicles or products or any associated equipment, cost of substitute vehicles or products, down-time, delay damages, any other types of economic loss, or for any claims by any third party for any such damages.

Note: Any Surety Bond, if a part of the sale of the vehicle as to which this limited warranty is provided, applies only to this Pierce Basic One Year Limited Warranty for such vehicle, and not to other warranties made by Pierce in a separate document (if any) or to the warranties (if any) made by any manufacturer (other than Pierce) of any part, component, attachment or accessory that is incorporated into or attached to the vehicle.



Fire and Rescue Apparatus

Ten (10) Year Material and Workmanship Stainless Steel Piping Limited Warranty

1. LIMITED WARRANTY

Subject to the limitations and exclusions set forth below, Pierce Manufacturing provides the following warranty to the Buyer:

Coverage:	Stainless steel piping shall be free from structural failures caused by defects in material and workmanship, or perforation caused by corrosion.
Warranty Begins:	The date of the original purchase invoice (issued when the product ships from the factory).
Warranty Period Ends After:	Ten (10) Years - or - 100,000 Miles
Conditions and Exclusions: See Also Paragraphs 2 thru 4	Pierce's obligation under this warranty is limited to repairing or replacing without charge, as Pierce may elect, the stainless steel piping or components which Pierce determines to have failed due to defective material and workmanship, or perforation caused by corrosion. This warranty does not cover the use of fluoroprotein (FP) type foam. The sodium chloride within FP foam can cause long-term damage to system components if not thoroughly flushed immediately after use.

This limited warranty shall apply only if the product is properly maintained in accordance with Pierce's maintenance instructions and manuals and is used in service which is normal to the particular model. Normal service means service which does not subject the product to stresses or impacts greater than normally result from careful use. If the Buyer discovers a defect or nonconformity, it must notify Pierce in writing within thirty (30) days after the date of discovery, but in any event prior to the expiration of the warranty period. THIS LIMITED WARRANTY MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED BY THE BUYER TO ANY SUBSEQUENT USER OR PURCHASER OR TO ANY OTHER PERSON OR ENTITY.

Notwithstanding anything to the contrary herein, Pierce makes no warranty whatsoever as to:

(a) any integral parts, components, attachments or trade accessories of or to the product that are not manufactured by Pierce, including but not limited to engines, transmissions, drivelines, axles, water pumps and generators; with respect to all such parts, components, attachments and accessories, Pierce shall assign to Buyer the applicable warranties, if any, made by the respective manufacturers thereof;

(b) any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect, fire, exposure to severe environmental or chemical conditions, acidic environment, improper maintenance, accident, crash, or force majeure such as natural disaster, lightning, earthquake, windstorm, hail, flood, war or riot;

(c) any vehicle, chassis or component, part, attachment or accessory that has been repaired, altered or assembled in any way by any person or entity other than Pierce which, in the sole judgment of Pierce, adversely affects the performance, stability or purpose for which it was manufactured; or

(d) products or parts which may in the ordinary course wear out and have to be replaced during the warranty period, including, but not limited to, tires, fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or subassemblies into finishing products or vehicles unless the assembly is performed by Pierce.

The original purchaser may void this warranty in part or in its entirety if the product is repaired or replaced (a) without prior written approval of the Pierce Customer Service Department; or (b) at a facility which has not been approved by Pierce as to technical capability. Any repairs, modifications, alterations or aftermarket parts added after manufacture without the authorization of Pierce may void this warranty.

2. DISCLAIMERS OF WARRANTIES

THE WARRANTY SET FORTH IN PARAGRAPH 1 IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S EXCLUSIVE REMEDY.

If the product fails to conform to the warranty set forth in paragraph 1 during the warranty period, and such nonconformity is not due to misuse, neglect, accident or improper maintenance, Buyer must notify Pierce within the time period specified in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce, any allegedly defective product shall be returned to Pierce by Buyer for examination and/or repair. Buyer shall be responsible for the cost of such transportation, and for risk of loss of or damage to the product during transportation. Within a reasonable time, Pierce shall repair or replace (at Pierce's option and expense) any nonconforming or defective parts. Repair or replacement shall be made only by a facility approved in advance in writing by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES.

Notwithstanding anything to the contrary herein or in any agreement between Pierce and Buyer, IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES WHATSOEVER, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORY OF LAW OR EQUITY, WITH RESPECT TO VEHICLES OR OTHER PRODUCTS SOLD BY PIERCE, OR THEIR OPERATION OR FAILURE TO OPERATE, OR ANY DEFECTS THEREIN, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATED THERETO, REGARDLESS OF WHETHER PIERCE HAS BEEN INFORMED OF THE POSSIBILITY OF ANY SUCH DAMAGES. Without limiting the generality of the foregoing, Pierce specifically disclaims any liability for property or personal injury damages, penalties, damages for lost profits or revenues, loss of vehicles or products or any associated equipment, cost of substitute vehicles or products, down-time, delay damages, any other types of economic loss, or for any claims by any third party for any such damages.

Note: Any Surety Bond, if a part of the sale of the vehicle as to which this limited warranty is provided, applies only to this Pierce Basic One Year Limited Warranty for such vehicle, and not to other warranties made by Pierce in a separate document (if any) or to the warranties (if any) made by any manufacturer (other than Pierce) of any part, component, attachment or accessory that is incorporated into or attached to the vehicle.



Fire and Rescue Apparatus

One (1) Year Material and Workmanship Foam System & Five (5) Year Material and Workmanship Control Head

Limited Warranty

1. LIMITED WARRANTY

Subject to the limitations and exclusions set forth below, Pierce Manufacturing provides the following warranty to the Buyer:

Coverage:	Limited warranty 1 year parts and labor for the foam system and 5 years parts and labor for the control head.
Warranty Begins:	The date of the original purchase invoice (issued when the product ships from the factory).
Warranty Period Ends After:	One (1) Year & Five (5) Year
Conditions and Exclusions: See Also Paragraphs 2 thru 4	<p>This warranty does not cover repair due to accidents, misuse, and excessive vibration, flying debris, storage damage (freezing), negligence or modification. This warranty is void if any modification or repairs are performed without authorization. This also voids any future warranty.</p> <p>This warranty does not cover cost of maintenance or repairs due to lack of required maintenance services as recommended. Performance of the required maintenance and use of proper fluids are the responsibility of the owner.</p>

Notwithstanding anything to the contrary herein, Pierce makes no warranty whatsoever as to:

(a) any integral parts, components, attachments or trade accessories of or to the product that are not manufactured by Pierce, including but not limited to engines, transmissions, drivelines, axles, water pumps and generators; with respect to all such parts, components, attachments and accessories, Pierce shall assign to Buyer the applicable warranties, if any, made by the respective manufacturers thereof;

(b) any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect, fire, exposure to severe environmental or chemical conditions, acidic environment, improper maintenance, accident, crash, or force majeure such as natural disaster, lightning, earthquake, windstorm, hail, flood, war or riot;

(c) any vehicle, chassis or component, part, attachment or accessory that has been repaired, altered or assembled in any way by any person or entity other than Pierce which, in the sole judgment of Pierce, adversely affects the performance, stability or purpose for which it was manufactured; or

(d) products or parts which may in the ordinary course wear out and have to be replaced during the warranty period, including, but not limited to, tires, fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or subassemblies into finishing products or vehicles unless the assembly is performed by Pierce.

The original purchaser may void this warranty in part or in its entirety if the product is repaired or replaced (a) without prior written approval of the Pierce Customer Service Department; or (b) at a facility which has not been approved by Pierce as to technical capability. Any repairs, modifications, alterations or aftermarket parts added after manufacture without the authorization of Pierce may void this warranty.

2. DISCLAIMERS OF WARRANTIES

THE WARRANTY SET FORTH IN PARAGRAPH 1 IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S EXCLUSIVE REMEDY.

If the product fails to conform to the warranty set forth in paragraph 1 during the warranty period, and such nonconformity is not due to misuse, neglect, accident or improper maintenance, Buyer must notify Pierce within the time period specified in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce, any allegedly defective product shall be returned to Pierce by Buyer for examination and/or repair. Buyer shall be responsible for the cost of such transportation, and for risk of loss of or damage to the product during transportation. Within a reasonable time, Pierce shall repair or replace (at Pierce's option and expense) any nonconforming or defective parts. Repair or replacement shall be made only by a facility approved in advance in writing by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES.

Notwithstanding anything to the contrary herein or in any agreement between Pierce and Buyer, IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES WHATSOEVER, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORY OF LAW OR EQUITY, WITH RESPECT TO VEHICLES OR OTHER PRODUCTS SOLD BY PIERCE, OR THEIR OPERATION OR FAILURE TO OPERATE, OR ANY DEFECTS THEREIN, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATED THERETO, REGARDLESS OF WHETHER PIERCE HAS BEEN INFORMED OF THE POSSIBILITY OF ANY SUCH DAMAGES. Without limiting the generality of the foregoing, Pierce specifically disclaims any liability for property or personal injury damages, penalties, damages for lost profits or revenues, loss of vehicles or products or any associated equipment, cost of substitute vehicles or products, down-time, delay damages, any other types of economic loss, or for any claims by any third party for any such damages.

Note: Any Surety Bond, if a part of the sale of the vehicle as to which this limited warranty is provided, applies only to this Pierce Basic One Year Limited Warranty for such vehicle, and not to other warranties made by Pierce in a separate document (if any) or to the warranties (if any) made by any manufacturer (other than Pierce) of any part, component, attachment or accessory that is incorporated into or attached to the vehicle.

This limited warranty shall apply only if the product is properly maintained in accordance with Pierce's maintenance instructions and manuals and is used in service which is normal to the particular model. Normal service means service which does not subject the product to stresses or impacts greater than normally result from careful use. If the Buyer discovers a defect or nonconformity, it must notify Pierce in writing within thirty (30) days after the date of discovery, but in any event prior to the expiration of the warranty period. THIS LIMITED WARRANTY MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED BY THE BUYER TO ANY SUBSEQUENT USER OR PURCHASER OR TO ANY OTHER PERSON OR ENTITY.



Fire and Rescue Apparatus

Ten (10) Year Pro-Rated Paint and Corrosion

Custom Body

Limited Warranty

1. LIMITED WARRANTY

Subject to the limitations and exclusions set forth below, Pierce Manufacturing provides the following warranty to the Buyer:

Coverage:	Exterior surfaces of the body shall be free from blistering, peeling, corrosion or any other adhesion defect caused by defective manufacturing methods or paint material selection.
Warranty Begins:	The date of the original purchase invoice (issued when the product ships from the factory).
Warranty Period Ends After:	Ten (10) Years
Conditions and Exclusions: See Also Paragraphs 2 thru 4	<p>This limited warranty is applicable to the vehicle in the following percentage costs of warranty repair, if any:</p> <p>Topcoat Durability & Appearance: Gloss, Color Retention & Cracking 0-72 months 100% 73-96 months 50% 97-120 months 25%</p> <p>Integrity of Coating System: Adhesion, Blistering/Bubbling 0-36 months 100% 37-84 months 50% 85-120 months 25%</p> <p>Corrosion: Dissimilar Metal and Crevice 0-36 months 100% 37-48 months 50% 49-72 months 25% 73-120 months 10%</p> <p>Corrosion Perforation 0-120 months 100%</p> <p>This limited warranty applies only to exterior paint. Paint on the vehicle's interior is warranted only under the Pierce Basic One Year Limited Warranty.</p> <p>Items not covered by this warranty include: (a) Damage from lack of maintenance and cleaning (proper cleaning and maintenance procedures are detailed in the Pierce operation and maintenance manual). (b) UV paint fade. (c) Any cab not manufactured by Pierce.</p>

This limited warranty shall apply only if the product is properly maintained in accordance with Pierce's maintenance instructions and manuals and is used in service which is normal to the particular model. Normal service means service which does not subject the product to stresses or impacts greater than normally result from careful use. If the Buyer discovers a defect or nonconformity, it must notify Pierce in writing within thirty (30) days after the date of discovery, but in any event prior to the expiration of the warranty period. THIS LIMITED WARRANTY MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED BY THE BUYER TO ANY SUBSEQUENT USER OR PURCHASER OR TO ANY OTHER PERSON OR ENTITY.

Notwithstanding anything to the contrary herein, Pierce makes no warranty whatsoever as to:

(a) any integral parts, components, attachments or trade accessories of or to the product that are not manufactured by Pierce, including but not limited to engines, transmissions, drivelines, axles, water pumps and generators; with respect to all such parts, components, attachments and accessories, Pierce shall assign to Buyer the applicable warranties, if any, made by the respective manufacturers thereof;

(b) any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect, fire, exposure to severe environmental or chemical conditions, acidic environment, improper maintenance, accident, crash, or force majeure such as natural disaster, lightning, earthquake, windstorm, hail, flood, war or riot;

(c) any vehicle, chassis or component, part, attachment or accessory that has been repaired, altered or assembled in any way by any person or entity other than Pierce which, in the sole judgment of Pierce, adversely affects the performance, stability or purpose for which it was manufactured; or

(d) products or parts which may in the ordinary course wear out and have to be replaced during the warranty period, including, but not limited to, tires, fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or subassemblies into finishing products or vehicles unless the assembly is performed by Pierce.

The original purchaser may void this warranty in part or in its entirety if the product is repaired or replaced (a) without prior written approval of the Pierce Customer Service Department; or (b) at a facility which has not been approved by Pierce as to technical capability. Any repairs, modifications, alterations or aftermarket parts added after manufacture without the authorization of Pierce may void this warranty.

2. DISCLAIMERS OF WARRANTIES

THE WARRANTY SET FORTH IN PARAGRAPH 1 IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S EXCLUSIVE REMEDY

If the product fails to conform to the warranty set forth in paragraph 1 during the warranty period, and such nonconformity is not due to misuse, neglect, accident or improper maintenance, Buyer must notify Pierce within the time period specified in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce, any allegedly defective product shall be returned to Pierce by Buyer for examination and/or repair. Buyer shall be responsible for the cost of such transportation, and for risk of loss of or damage to the product during transportation. Within a reasonable time, Pierce shall repair or replace (at Pierce's option and expense) any nonconforming or defective parts. Repair or replacement shall be made only by a facility approved in advance in writing by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES

Notwithstanding anything to the contrary herein or in any agreement between Pierce and Buyer, IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES WHATSOEVER, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORY OF LAW OR EQUITY, WITH RESPECT TO VEHICLES OR OTHER PRODUCTS SOLD BY PIERCE, OR THEIR OPERATION OR FAILURE TO OPERATE, OR ANY DEFECTS THEREIN, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATED THERETO, REGARDLESS OF WHETHER PIERCE HAS BEEN INFORMED OF THE POSSIBILITY OF ANY SUCH DAMAGES. Without limiting the generality of the foregoing, Pierce specifically disclaims any liability for property or personal injury damages, penalties, damages for lost profits or revenues, loss of vehicles or products or any associated equipment, cost of substitute vehicles or products, down-time, delay damages, any other types of economic loss, or for any claims by any third party for any such damages.

Note: Any Surety Bond, if a part of the sale of the vehicle as to which this limited warranty is provided, applies only to this Pierce Basic One Year Limited Warranty for such vehicle, and not to other warranties made by Pierce in a separate document (if any) or to the warranties (if any) made by any manufacturer (other than Pierce) of any part, component, attachment or accessory that is incorporated into or attached to the vehicle.



Fire and Rescue Apparatus

Three (3) Year Material and Workmanship

Goldstar® Gold Leaf Lamination

Limited Warranty

1. LIMITED WARRANTY

Subject to the limitations and exclusions set forth below, Pierce Manufacturing provides the following warranty to the Buyer:

Coverage:	Each Goldstar® gold leaf lamination shall be free from defects in material and workmanship.
Warranty Begins:	The date of the original purchase invoice (issued when the product ships from the factory).
Warranty Period Ends After:	Three (3) Years
Conditions and Exclusions: See Also Paragraphs 2 thru 4	This warranty does not cover damage from lack of maintenance and cleaning (proper cleaning and maintenance procedures are detailed in the Pierce operation and maintenance manual).

This limited warranty shall apply only if the product is properly maintained in accordance with Pierce's maintenance instructions and manuals and is used in service which is normal to the particular model. Normal service means service which does not subject the product to stresses or impacts greater than normally result from careful use. If the Buyer discovers a defect or nonconformity, it must notify Pierce in writing within thirty (30) days after the date of discovery, but in any event prior to the expiration of the warranty period. THIS LIMITED WARRANTY MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED BY THE BUYER TO ANY SUBSEQUENT USER OR PURCHASER OR TO ANY OTHER PERSON OR ENTITY.

Notwithstanding anything to the contrary herein, Pierce makes no warranty whatsoever as to:

(a) any integral parts, components, attachments or trade accessories of or to the product that are not manufactured by Pierce, including but not limited to engines, transmissions, drivelines, axles, water pumps and generators; with respect to all such parts, components, attachments and accessories, Pierce shall assign to Buyer the applicable warranties, if any, made by the respective manufacturers thereof;

(b) any vehicle, chassis, or component, part, attachment or accessory damaged by misuse, neglect, fire, exposure to severe environmental or chemical conditions, acidic environment, improper maintenance, accident, crash, or force majeure such as natural disaster, lightning, earthquake, windstorm, hail, flood, war or riot;

(c) any vehicle, chassis or component, part, attachment or accessory that has been repaired, altered or assembled in any way by any person or entity other than Pierce which, in the sole judgment of Pierce, adversely affects the performance, stability or purpose for which it was manufactured; or

(d) products or parts which may in the ordinary course wear out and have to be replaced during the warranty period, including, but not limited to, tires, fluids, gaskets and light bulbs. Pierce assumes no responsibility for the assembly of its parts or subassemblies into finishing products or vehicles unless the assembly is performed by Pierce.

The original purchaser may void this warranty in part or in its entirety if the product is repaired or replaced (a) without prior written approval of the Pierce Customer Service Department; or (b) at a facility which has not been approved by Pierce as to technical capability. Any repairs, modifications, alterations or aftermarket parts added after manufacture without the authorization of Pierce may void this warranty.

2. DISCLAIMERS OF WARRANTIES

THE WARRANTY SET FORTH IN PARAGRAPH 1 IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY PIERCE. PIERCE HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

3. BUYER'S EXCLUSIVE REMEDY

If the product fails to conform to the warranty set forth in paragraph 1 during the warranty period, and such nonconformity is not due to misuse, neglect, accident or improper maintenance, Buyer must notify Pierce within the time period specified in paragraph 1, and shall make the product available for inspection by Pierce or its designated agent. At the request of Pierce, any allegedly defective product shall be returned to Pierce by Buyer for examination and/or repair. Buyer shall be responsible for the cost of such transportation, and for risk of loss of or damage to the product during transportation. Within a reasonable time, Pierce shall repair or replace (at Pierce's option and expense) any nonconforming or defective parts. Repair or replacement shall be made only by a facility approved in advance in writing by Pierce. THIS REMEDY SHALL BE THE EXCLUSIVE AND SOLE REMEDY FOR ANY BREACH OF WARRANTY.

4. EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES

Notwithstanding anything to the contrary herein or in any agreement between Pierce and Buyer, IN NO EVENT SHALL PIERCE BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES WHATSOEVER, WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORY OF LAW OR EQUITY, WITH RESPECT TO VEHICLES OR OTHER PRODUCTS SOLD BY PIERCE, OR THEIR OPERATION OR FAILURE TO OPERATE, OR ANY DEFECTS THEREIN, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATED THERETO, REGARDLESS OF WHETHER PIERCE HAS BEEN INFORMED OF THE POSSIBILITY OF ANY SUCH DAMAGES. Without limiting the generality of the foregoing, Pierce specifically disclaims any liability for property or personal injury damages, penalties, damages for lost profits or revenues, loss of vehicles or products or any associated equipment, cost of substitute vehicles or products, down-time, delay damages, any other types of economic loss, or for any claims by any third party for any such damages.

Note: Any Surety Bond, if a part of the sale of the vehicle as to which this limited warranty is provided, applies only to this Pierce Basic One Year Limited Warranty for such vehicle, and not to other warranties made by Pierce in a separate document (if any) or to the warranties (if any) made by any manufacturer (other than Pierce) of any part, component, attachment or accessory that is incorporated into or attached to the vehicle.



CITY *of* CLOVIS

REPORT TO THE CITY COUNCIL

TO: Mayor and City Council

FROM: General Services Department

DATE: July 12, 2021

SUBJECT: General Services – Approval – Res. 21-___, Amending the City's Classification and Compensation Plan by Converting the Assistant City Manager/City Clerk Classification into Separate Assistant City Manager and City Clerk Classifications.

ATTACHMENTS: 1. Resolution Classification Revisions

CONFLICT OF INTEREST

None.

RECOMMENDATION

For City Council to approve Resolution 21-___, amending the City's Classification and Compensation Plan by converting the Assistant City Manager/City Clerk Classification into separate Assistant City Manager and City Clerk Classifications.

EXECUTIVE SUMMARY

It is necessary to update the Assistant City Manager/City Clerk classification into two separate classifications. The proposed revisions include both the Assistant City Manager and the City Clerk classifications. The work assignments were evaluated within the department and it was determined that the Administration Department has a need for both classifications. Modification of the City's Classification and Compensation Plan requires the City Council's approval.

BACKGROUND

The Administration Department has recently evaluated the work assignments within the department and has determined that one (1) Assistant City Manager and one (1) City Clerk position will more effectively serve the needs of the department than the current combined single position. Both positions have previously been added to the Administration Department's FY 21-22 Position Allocation Plan.

In 2009, the City Clerk and the Assistant City Manager classifications were combined into one position during the recession. This position was renamed to the Assistant City

Manager/City Clerk classification. Staff is proposing that this classification be revised into two separate positions to better reflect the responsibilities and job duties that are required in the Administration Department. The two positions would include the Assistant City Manager and the City Clerk.

The recommended salary range for the City Clerk will be \$7,128 to \$8,664. The City Council recently approved changes to the Municipal Code to remove the requirement that the City Clerk be appointed as a Department Head level. The City Clerk will be assigned to the Management Employee Group for employee benefits. It is also recommended that the salary range for the Assistant City Manager remain the same as the current Assistant City Manager/City Clerk classification with a salary range of \$13,899 to \$16,895. The Assistant City Manager will continue to stay in the Executive Management Employee Group for employee benefit coverage.

Staff is recommending that the City Council approve these revisions to the City's Classification and Compensation Plan. The desired changes will result in the need to modify the City's Classification and Compensation Plan.

FISCAL IMPACT

The salary and related benefit costs of the proposed change for the remainder of the fiscal year would be approximately an additional \$65,000. The additional costs were budgeted in the FY 21-22 Administration Department budget allocation.

REASON FOR RECOMMENDATION

The recommended changes to the City's Classification and Compensation Plan better suits the staffing needs of the Administration Department. Modification of the City's Classification and Compensation Plan requires the City Council's approval.

ACTIONS FOLLOWING APPROVAL

The City's Classification and Compensation Plan will be updated to reflect the changes. The classification plan will be modified as noted in Attachment A of Attachment 1.

Prepared by: Lori Shively, Personnel/Risk Manager

Reviewed by: City Manager LS

RESOLUTION 21____

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF CLOVIS APPROVING AMENDMENTS TO THE CITY’S CLASSIFICATION PLAN AND COMPENSATION PLAN FOR THE ASSISTANT CITY MANAGER AND CITY CLERK CLASSIFICATIONS

The City Council of the City of Clovis resolves as follows:

WHEREAS, it has been determined that amendments to the classifications, and updates to the definition, class characteristics, and the education and experience sections of the Assistant City Manager and City Clerk classifications are necessary in order to accurately depict the requirements of each position; and

WHEREAS, it has been determined that the appropriate salary range for the Assistant City Manager classification is \$13,899 to \$16,895 and the appropriate salary range for the City Clerk is \$7,128 to \$8,664; and

WHEREAS, modification of the City’s Classification and Compensation Plan requires authorization by the City Council.

NOW THEREFORE, BE IT RESOLVED by the City Council of the City of Clovis that the City’s Classification and Compensation Plan shall be modified to include the revised classification specifications with the salary ranges of \$13,899 to \$16,895 for the Assistant City Manager and a salary range of \$7,128 to \$8,664 for the City Clerk as noted in Attachment A.

* * * * *

The foregoing Resolution was introduced and adopted at a regular meeting of the City Council of the City of Clovis held on July 12, 2021, by the following vote to wit:

AYES:

NOES:

ABSENT:

ABSTAIN:

Dated: July 12, 2021

Mayor

City Clerk

Attachment 1

City of Clovis
ASSISTANT CITY MANAGER/CITY CLERK

SALARY RANGE
\$13,899 - \$16,895 Monthly

DEFINITION

Under ~~Administrative direction,~~ to act as the assistant executive officer for the City; to plan, organize and direct the overall administrative activities and operations of the City; to maintain the City's official records; coordinates the conduct of City Council and Special Measure/Initiative elections; coordinates legislative analysis activities and performs related work as required. to assist with the day-to-day management of the City and to serve as the acting City Manager in the City Manager's absence. Responsible for working with the City Council, department heads, the Community, and assigned staff members on high priority projects and initiatives as directed by the City Manager, and performs related work as required.

CLASS CHARACTERISTICS

This single-position classification is ~~recognized as a Department Head. The incumbent is responsible to the City Council for all City Clerk functions and to the City Manager for all other functions. The incumbent exercises considerable judgment and discretion in the administration and execution of various assignments and operations including but not limited to the Office of the City Clerk with those of other elected and appointed officials and providing assistance to the City Manager. When designated by the City Manager, the incumbent will serve as the Acting City Manager. The incumbent is responsible for preparing performance evaluations, processing bargaining unit grievances, recommending employment, and for taking and recommending disciplinary action. Positions in this class act with a high degree of independence of action in the assigned area of responsibility. Direction received consists of the assignment of the responsibility to attain objectives according to policy guidelines. The incumbent is expected to develop methods and procedures to solve problems encountered. Except where a deviation in policy is involved, most work is not reviewed directly by the supervisor and when work is reviewed, the review is directed toward final outcomes and results. This is an exempt classification in which the incumbent serves in an at will capacity.~~ exercises delegated supervision over a group of City departments, relieves the City Manager of a wide variety of administrative duties, and facilitates managerial communication with and among City departments. The incumbent reports to and receives direction from the City Manager on matters of policy and new assignments consisting only of desired objectives and exercises considerable independent judgment in overseeing assigned departments. This is an unclassified position in which the incumbent serves at the will of the City Manager.

EXAMPLES OF DUTIES

~~Confers with the City Manager, concerning overall City and Department or function specific programs; assists the City Manager with complex, confidential negotiations with various private parties and governmental agencies; assists the City Manager in directing the development and administration of the Council and Administration budgets; monitors and approves expenditures; directs and participates in the formulation of the City's policies, strategic plan, and Mission, Vision, and Values; identifies future trends/issues and develops/implements proposals for action in coordination with operating Departments; directs, plans, and organizes the activities of the Office of the City Clerk, updates the City's Municipal Code ensuring proper ordinance codification; co~~

ATTACHMENT A OF ATTACHMENT 1

~~ordinates legislative analysis activities with other staff to track pending legislation that may impact the City and develops impact projections as well as position statement recommendations for the City Manager and City Council; serves as the City's Election Official, directs and coordinates all aspects of the City's General and Special Elections; administers the City's Conflict of Interest Code, Municipal Code; serves as a filing officer for required disclosure under the Political Reform Act; directs, oversees, and participates in a variety of activities within the City Manager's Office; represents the City Manager at various meetings and serves as the City representative in a number of forums; directs the implementation of cable television franchise agreements; directs, prepares and conducts training; directs and supervises assigned staff; and performs other duties as assigned.~~

Direct the activities of City departments as assigned, and oversee the operations thereof; perform all duties and assume all responsibilities of the City Manager when appointed by the City Council as the Acting City Manager to serve during the City Manager's absence from the City, his or her inability to perform duties, or during any vacancy in the position; confer with department heads to convey information concerning established policies and practices and solicit information needed as a basis for action; confer with the City Manager on matters concerning major departmental activities and community problems and recommend course of action; direct the preparation of reports, agreements, contracts, resolutions, and ordinances, and attend City Council meetings; monitor implementation of agreements; devise solutions to problems; if necessary, assign to appropriate City staff for further research and action; may attend committee meetings, civic gatherings or other official functions; direct and coordinate special projects and programs; participate in the preparation of the annual City budget and the administration thereof; overall coordination of the City's Code Enforcement Division. Act as the American's with Disabilities Act (ADA) Coordinator, and perform related duties as required.

TYPICAL QUALIFICATIONS

LICENSE REQUIRED

- Possession of, ~~or ability to obtain,~~ a valid California ~~d~~Driver's License with and a good driving record.

EDUCATION AND EXPERIENCE

~~Any combination of education and experience that would likely provide the required knowledge and skills is qualifying. A typical way to obtain the knowledge and skills would be:~~

Education:

- ~~Graduation~~ Bachelor' degree from an accredited college or university with a Bachelor's degree in Public or Business Administration or a closely related field major work in public administration, planning, business administration, public finance or law.
- A Master's degree in public administration or related area is highly desirable.

AND

Experience:

- Five (5) years of increasingly responsible municipal administrative experience including significant administrative and personnel management responsibilities in the planning, coordination and financing of varied activities, preferable in a municipality, at progressively responsible levels.

QUALIFICATIONS

Knowledge of:

- Modern principles and practices of municipal government administration;
- Economic development functions and services;
- Public relations practices and techniques;
- Principles and practices of personnel administration, supervision and training;
- Principles and practices of municipal budget preparation and administration;
- Pertinent federal, state and local laws, codes and regulations;
- Principles and techniques of project management;
- Functions, authority, responsibilities and limitations of an elected City Council;
- Functions, services and funding sources of a municipal government;
- Records maintenance practices and procedures; and
- Computer applications related to the work.
- Principles, practices and methods of public administration including municipal and government codes;
- Principles and practices of budget preparation, administration and management;
- Principles and methods of administrative analysis;
- Principles of fiscal analysis and long range financial planning;
- Pertinent State, Federal and local laws and regulations;
- Principles and practices of organization, administration and personnel management;
- Personnel rules and administrative policies;
- Capital improvement plan
- Economic development and general plan;
- California Environmental Quality Act;
- Legal, ethical and professional rules of conduct for public sector employees;
- Operation of a personal computer and all other documents related to municipal government.

Ability to:

- Select, supervise, train and evaluate assigned staff;
- Interpret applicable laws, rules and regulations;
- Prepare and analyze fiscal and organizational reports, statements and correspondence; Analyze interpret, summarize and present administrative and technical information
- Develop, prepare and administer municipal budget;
- Communicate clearly and concisely, both orally and in writing;
- Establish and maintain effective working relationships;
- Direct, plan, organize and coordinate the activities of assigned staff;
- Take and transcribe accurate minutes;
- Drafting resolutions and ordinances;

- ~~Interpret codes and laws related to City records; and~~
- ~~Use computers and related software applications.~~
- Plan, organize, and direct the activities of assigned department;
- Develop comprehensive plans to satisfy present and future needs for City services;
- Deal effectively with representatives from public and private agencies and the general public in coordinating activities and resolving problems;
- Establish and maintain effective working relationships with staff, representatives, and other departments, the public and outside agencies.
- Analyze a variety of administrative problems and make sound policy and procedural recommendations;
- Analyze budget and technical reports;
- Properly interpret and make decisions in accordance with laws, regulations and policies;
- Supervise, evaluate and train staff;
- Communicate effectively, verbally and in writing.

SUPPLEMENTAL INFORMATION

PHYSICAL DEMANDS AND WORKING CONDITIONS

- ~~Must possess mobility to work in a standard office setting and to use standard office equipment, including a computer, and to attend meetings at various sites within and away from the City; strength to lift and carry materials weighing up to 25 pounds; vision to read printed materials and a computer screen; and hearing and speech to communicate in person and over the telephone.~~
- Incumbent is required to attend frequent evening meetings.
- Incumbent is required to travel within and out of City to attend meetings.
- The position is designated as confidential under the Meyers-Millas Brown Act and is an exempt employee under the Fair Labor Standards Act.
- Work is primarily sedentary.

**CITY OF CLOVIS
ASSISTANT CITY MANAGER/CITY CLERK**

**SALARY RANGE
\$7,128 - \$8,664 Monthly**

DEFINITION

~~Under administrative direction to act as the assistant executive officer for the City; to plan, organize and direct the overall administrative activities and operations of the City; to maintain the City's official records; coordinates the conduct of City Council and Special Measure/Initiative elections; coordinates legislative analysis activities and performs related work as required.~~ Under administrative direction, to plan, organize, direct and participate in all City Clerk functions, including retaining custody of and maintaining the City's official records; coordinating the conduct of City Council and Special Measure/Initiative elections; coordinate legislative analysis activities and perform related work as required. The incumbent will be working out of the Administration Department and may be tasked with special projects as assigned in all of the Divisions within the department.

CLASS CHARACTERISTICS

~~This single-position classification is recognized as a Department Head. The incumbent is responsible to the City Council for all City Clerk functions and to the City Manager for all other functions. The incumbent exercises considerable judgment and discretion in the administration and execution of various assignments and operations including but not limited to the Office of the City Clerk with those of other elected and appointed officials and providing assistance to the City Manager. When designated by the City Manager, the incumbent will serve as the Acting City Manager. The incumbent is responsible for preparing performance evaluations, processing bargaining unit grievances, recommending employment, and for taking and recommending disciplinary action. Positions in this class act with a high degree of independence of action in the assigned area of responsibility. Direction received consists of the assignment of the responsibility to attain objectives according to policy guidelines. The incumbent is expected to develop methods and procedures to solve problems encountered. Except where a deviation in policy is involved, most work is not reviewed directly by the supervisor and when work is reviewed, the review is directed toward final outcomes and results. This is an exempt classification in which the incumbent serves in an at will capacity.~~ This single-position is recognized as a Management Position. The City Clerk is the local official for elections, local legislation, the Public Records Act, the Political Reform Act, and the Brown Act (open meeting laws). The City Clerk is a position operating out of the Administration Department upon which the City Council, all City departments, and the general public rely for information regarding the operations and legislative history of the City. The City Clerk serves as the liaison between the public and City Council and provides related municipal services. This is an exempt position in which the incumbent serves in an at will capacity.

EXAMPLES OF DUTIES

~~Confers with the City Manager, concerning overall City and Department or function specific programs; assists the City Manager with complex, confidential negotiations with various private parties and governmental agencies; assists the City Manager in directing the development and administration of the Council and Administration budgets; monitors and~~

~~approves expenditures; directs and participates in the formulation of the City's policies, strategic plan, and Mission, Vision, and Values; identifies future trends/issues and develops/implements proposals for action in coordination with operating Departments; directs, plans, and organizes the activities of the Office of the City Clerk, updates the City's Municipal Code ensuring proper ordinance codification; coordinates legislative analysis activities with other staff to track pending legislation that may impact the City and develops impact projections as well as position statement recommendations for the City Manager and City Council; serves as the City's Election Official, directs and coordinates all aspects of the City's General and Special Elections; administers the City's Conflict of Interest Code, Municipal Code; serves as a filing officer for required disclosure under the Political Reform Act; directs, oversees, and participates in a variety of activities within the City Manager's Office; represents the City Manager at various meetings and serves as the City representative in a number of forums; directs the implementation of cable television franchise agreements; directs, prepares and conducts training; directs and supervises assigned staff; and performs other duties as assigned.~~ Direct and participate in the preparation of the City Council agenda packets, including coordinating and reviewing agenda material, finalizing agendas and overseeing distribution of the packets; ensure legal notification of various Council, commission and committee meetings consistent with the Brown Act; perform follow-up activities resulting from Council meetings, including transcribing and distributing minutes, ensuring that resolutions and ordinances are in proper format and notarized, tracking committee and commission actions and preparing letters of acceptance or rejection; direct the maintenance of official City records ensuring that documents are recorded and filed properly; direct the archiving and destruction of documents; update the City's Municipal Code ensuring proper ordinance codification; coordinate legislative analysis activities with other staff to track pending legislation that may impact the City and develop impact projections as well as position statement recommendations for the City Manager and City Council; monitor contracts and other agreements ensuring they are signed, recorded in a timely manner; serve as the City's Election Official, coordinate all aspects of the City's General and Special Elections; administer oath of office for City Council and Commissioners and maintain custody of official City seal; administer the City's Conflict of Interest Code and Municipal Code; update and maintain the Records Retention and Storage Policy; receive and coordinate responses to all subpoenas for records served on the City; receive bids, officiate at bid openings, return unsuccessful bid bonds and archive bid documents; direct and supervise assigned staff; direct and participate in the preparation and administration of the Department budget and perform related duties as required.

TYPICAL QUALIFICATIONS

LICENSE REQUIRED

- Possession of, ~~or ability to obtain,~~ a valid California ~~d~~Driver's License with a good driving record.
- Ability to obtain certification as a Certified Municipal Clerk (CMC) after three (3) years and certification as a Master Municipal Clerk (MMC) after six (6) subsequent years is highly desirable.

EDUCATION AND EXPERIENCE

~~Any combination of education and experience that would likely provide the required knowledge and skills is qualifying. A typical way to obtain the knowledge and skills would be:~~

Education:

- Graduation from an accredited college or university with a Bachelor's degree in Public or Business Administration, **Economics**, or a closely related field. ~~A Master's degree in public administration is highly desirable.~~

AND

Experience:

- ~~Five~~ **Three (3)** years of increasingly responsible municipal administrative experience, ~~including significant years administrative and personnel management responsibilities~~ **preferably in municipal government.**

QUALIFICATIONS

Knowledge of:

- ~~Modern principles and practices of municipal government administration;~~
- ~~Economic development functions and services;~~
- ~~Public relations practices and techniques;~~
- ~~Principles and practices of personnel administration, supervision and training;~~
- ~~Principles and practices of municipal budget preparation and administration;~~
- ~~Pertinent federal, state and local laws, codes and regulations;~~
- ~~Principles and techniques of project management;~~
- ~~Functions, authority, responsibilities and limitations of an elected City Council;~~
- ~~Functions, services and funding sources of a municipal government;~~
- ~~Records maintenance practices and procedures; and~~
- ~~Computer applications related to the work.~~
- Principles, practices and procedures related to public agency record keeping, municipal elections, administrative procedures, budgeting and information technology;
- Functions, authority, responsibilities and limitations of an elected City Council;
- Functions, services and funding sources of a municipal government;
- Laws, codes and statutes related to City records, elections and public meetings;
- Applicable policies, procedures, laws and regulations pertaining to assigned programs, including the Brown Act, Freedom of Information Act, Public Records Act, Maddy Act and FPPC procedures and regulations;
- Records maintenance practices and procedures;
- Computer applications related to the work;
- Basic supervisory principles and practices;
- Applicable federal and state laws, codes, ordinances and regulations;
- Techniques for effectively representing the City in contacts with governmental agencies, community groups, individuals and various professional, educational, regulatory and legislative organizations;
- Principles and practices of supervision, training and performance evaluation.

Ability to:

- ~~Select, supervise, train and evaluate assigned staff;~~
- ~~Interpret applicable laws, rules and regulations;~~
- ~~Prepare and analyze fiscal and organizational reports, statements and correspondence; Analyze interpret, summarize and present administrative and technical information~~

- ~~Develop, prepare and administer municipal budget;~~
- ~~Communicate clearly and concisely, both orally and in writing;~~
- ~~Establish and maintain effective working relationships;~~
- ~~Direct, plan, organize and coordinate the activities of assigned staff;~~
- ~~Take and transcribe accurate minutes;~~
- ~~Drafting resolutions and ordinances;~~
- ~~Interpret codes and laws related to City records; and~~
- ~~Use computers and related software applications.~~
- Direct, plan, organize and coordinate the activities of professional, technical and clerical staff;
- Take accurate minutes;
- Draft reports, resolutions and ordinances;
- Interpret codes and laws related to City records;
- Serve as City Clerk to the City Council and ensure proper conduct of meetings;
- Coordinate, oversee and participate in the preparation and maintenance of public records for the City;
- Coordinate the preparation of agenda packets for legislative and administrative meetings;
- Oversee and administer an efficient records management system;
- Assist in the development and implementation of policies, procedures and internal controls;
- Select, supervise, train and evaluate staff;
- Establish and maintain effective working relationships with staff, representatives, other departments and outside agencies;
- Use computers and related software applications;
- Communicating effectively verbally and in writing.

SUPPLEMENTAL INFORMATION

PHYSICAL DEMANDS AND WORKING CONDITIONS

- ~~Must possess mobility to work in a standard office setting and to use standard office equipment, including a computer, and to attend meetings at various sites within and away from the City; strength to lift and carry materials weighing up to 25 pounds; vision to read printed materials and a computer screen; and hearing and speech to communicate in person and over the telephone.~~
- Work is primarily sedentary and performed in an office environment.
- Positions in this classification are designated as confidential under the Meyers-Millas Brown Act and are exempt employees under the Fair Labor Standards Act.
- Incumbent is required to attend frequent evening meetings.
- Incumbent is required to travel within and out of City to attend meetings.



CITY *of* CLOVIS

REPORT TO THE CITY COUNCIL

TO: Mayor and City Council

FROM: General Services Department

DATE: July 12, 2021

SUBJECT: General Services – Approval – Claim Rejection of the General Liability Claim for Nancy Mendez.

ATTACHMENTS: None

CONFLICT OF INTEREST

None

RECOMMENDATION

Reject the General Liability Claim filed by Nancy Mendez.

EXECUTIVE SUMMARY

Nancy Mendez (claimant) filed a General Liability Claim against the City of Clovis on June 22, 2021, for defamation, intentional infliction of emotional distress, and harassment. Ms. Mendez claims that the unfair biased treatment caused by officers within Clovis Police Department created tremendous emotional distress for her and family. The claim amount identified on the claim form is \$2,000,000.00. It is recommended that the claim is rejected at this time.

BACKGROUND

On June 22, 2021, a General Liability Claim was filed against the City of Clovis by Nancy Mendez. The claim was considered legally sufficient and timely. Ms. Mendez alleged that during the period of December 6, 2020 through December 14, 2020, the Clovis Police Department responded to her residence due to a trash pick-up complaint, which subsequently lead officers to document the matter unfairly with bias, and negative behavior towards her and family caused emotional distress and defamed their reputation.

Ms. Mendez seeks compensation for defamation, intentional infliction of emotional distress, escalation, and harassment. The claim has been filed for the amount of \$2,000,000.00.

FISCAL IMPACT

Rejection of the claim does not result in any fiscal impact.

REASON FOR RECOMMENDATION

It is recommended that the claim be rejected. The City is not liable for this claim. In addition, by rejecting this claim, the time in which lawsuits may be filed against the City will begin to run.

ACTIONS FOLLOWING APPROVAL

A letter will be sent to the claimant informing her that the claim has been rejected.

Prepared by: Charles W. Johnson, Management Analyst

Reviewed by: City Manager *JH*



CITY *of* CLOVIS

REPORT TO THE CITY COUNCIL

TO: Mayor and City Council

FROM: Planning and Development Services Department

DATE: July 12, 2021

SUBJECT: Planning and Development Services – Approval – Bid Award for CIP 20-06 Shaw Avenue Street Rehabilitation; and Authorize the City Manager to Execute the Contract on behalf of the City.

ATTACHMENTS: 1. Vicinity Map

CONFLICT OF INTEREST

None

RECOMMENDATION

1. For the City Council to pre-authorize the City Manager to award the subject project to the lowest responsible bidder; and
2. For the City Council to authorize the City Manager to execute the contract on behalf of the City.

EXECUTIVE SUMMARY

Staff is recommending that City Council pre-authorize the City Manager to award and execute the contract to the lowest responsible bidder so the contractor may start and complete construction in a timely manner.

The project involves 0.5-mile of street rehabilitation on Shaw Avenue from Sunnyside to Fowler including grinding and replacing asphalt concrete pavement, replacements of concrete curb returns, sidewalks and minor median island, adjustments of existing utility boxes, manholes, and utility valve boxes to finish grades, replacements of traffic striping, markings and signage, traffic signal modification, and reinstallation of traffic loop detectors. This project also involves rehabilitation of asphalt concrete sections in full depth at the Shaw-Sunnyside Intersection and Shaw-Fowler Intersection for the Shaw Avenue Street Rehabilitation (“Project”).

This action by City Council will allow the City Manager to move forward with award and execution of the contract in the most expedient manner, allowing construction to begin as soon as possible in a construction window that will affect the operations of the adjacent school, Jefferson Elementary, as little as possible.

BACKGROUND

The project plans and specifications have been made available to prospective bidders. The bid opening is scheduled for July 13, 2021. The construction cost is estimated at \$1,081,074.50. The apparent low bidder will be determined following the bid opening process, and project award will take place after staff has validated bidder's license status through the California State Contractor's Board and has submitted all the required federal paperwork.

FISCAL IMPACT

This project was budgeted in the 2020-2021 Community Investment Program. The project is supported by Surface Transportation Block Grant Program (STBG) through the City Community Investment Program. The construction cost has been estimated as noted above and funding is available and allocated at this amount. Staff will evaluate the lowest responsible bids in comparison with the estimated construction costs and will execute the contracts only if the lowest bid is financially responsive to the allocated funding.

REASON FOR RECOMMENDATION

Staff is requesting that the City Council pre-authorize the City Manager to award and execute the contract for the project to the lowest responsible bidder that meets the contract requirements. Staff is requesting this expedited process for maintaining the current project requirements and schedule commitments. Pre-authorization for awarding of this project will allow the Engineering Division to continue timely delivery of the project and limit disruption to the adjacent school operations at Jefferson Elementary.

ACTIONS FOLLOWING APPROVAL

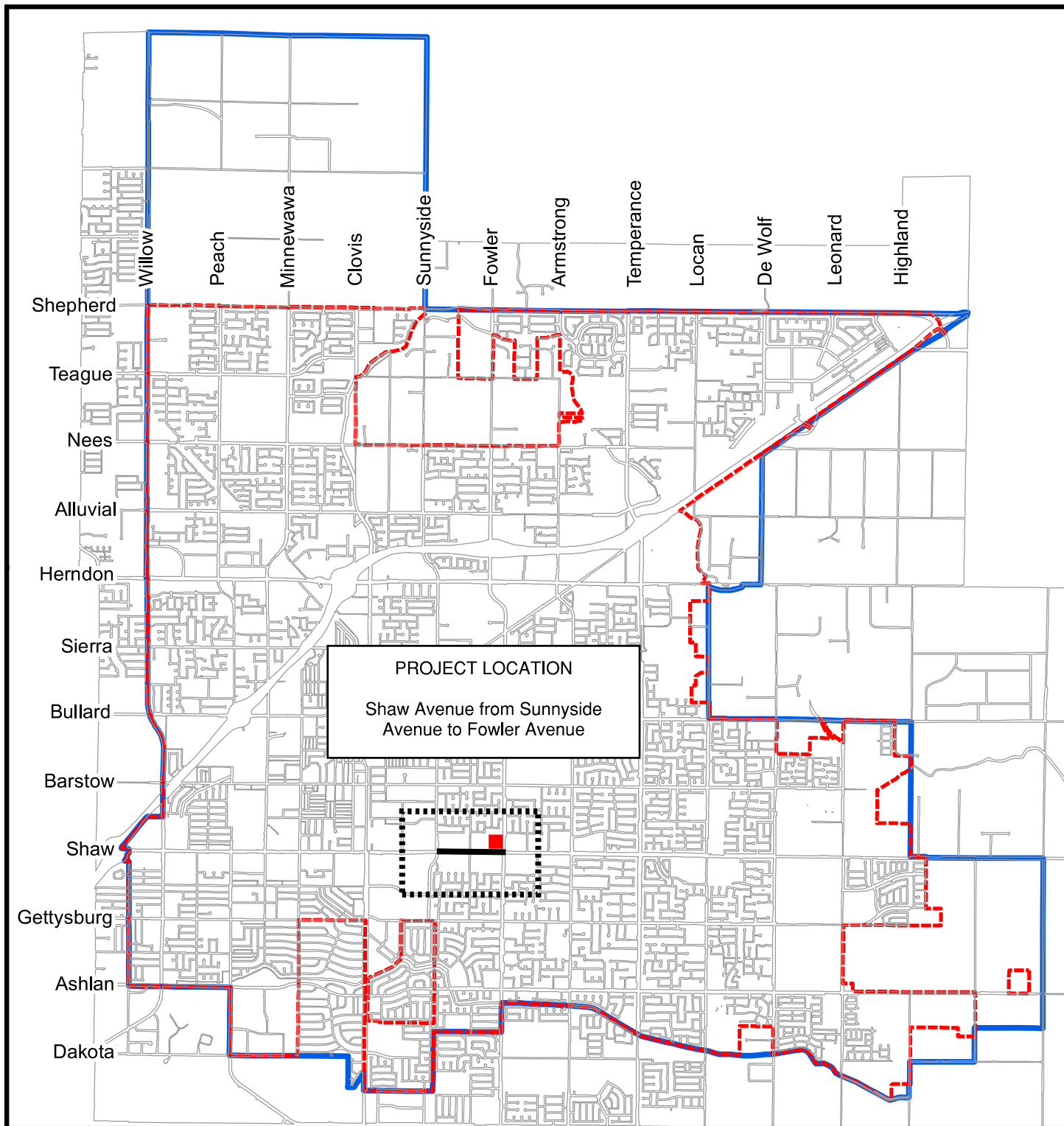
1. Staff will open bids and determine the lowest responsible bidder for the project, and City Council will receive a report of the bid award.
2. The contract will be prepared and executed, subject to the Contractor providing performance security that is satisfactory to the City.
3. Construction will begin approximately one (1) week after contract execution and be completed in thirty (30) working days thereafter.

Prepared by: Thomas K. Cheng, Project Civil Engineer

Reviewed by: City Manager *JH*

VICINITY MAP

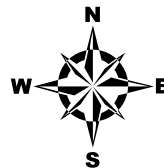
CIP 20-06 Shaw Avenue Street Rehabilitation



PROJECT LOCATION
 Shaw Avenue from Sunnyside Avenue to Fowler Avenue



ATTACHMENT 1



- JEFFERSON ELEMENTARY SCHOOL
- CITY LIMITS
- SPHERE OF INFLUENCE



CITY *of* CLOVIS

REPORT TO THE CITY COUNCIL

TO: Mayor and City Council

FROM: Planning and Development Services

DATE: July 12, 2021

SUBJECT: Conduct a Public Hearing and Consider Approval - Res. 21-____, A Resolution Declaring the Results of the Property Owner Protest Balloting Proceedings and Approving the Engineer's Report for Assessment District 95-1 (Blackhorse Estates) Confirming the Assessments for the 2021-22 Fiscal Year.

Staff: Sean Smith, Supervising Civil Engineer

Recommendation: Approve

ATTACHMENTS:

1. Resolution 21-____
2. Vicinity Map
3. FY 2021-22 Engineer's Report

CONFLICT OF INTEREST

None.

RECOMMENDATION

1. Conduct a Public Hearing regarding the proposed assessment increase in the maximum assessment for Benefit Area 1 (Renaissance Neighborhood) and Benefit Area II (Country View Neighborhood) beginning with Fiscal Year (FY) 2021-22 for the City of Clovis Benefit Assessment District 95-1 (Blackhorse Estates) pursuant to Proposition 218; and
2. At the conclusion of the public testimony, request any remaining property owner ballots be delivered to the City Clerk, declare the balloting period closed, and any ballots received after that time shall be invalid and not counted; and
3. Declare the assessment ballots will be tabulated; and
4. Approve the Resolution declaring the results of the property owner protest balloting proceedings pursuant to Proposition 218 and approving the FY 2021-22 Engineer's report for Assessment District 95-1 confirming the assessments for FY 2021-22.

EXECUTIVE SUMMARY

On May 1, 1995, the City Council of the City of Clovis approved Resolution No. 95-42 forming the maintenance Assessment District (AD) 95-1 (the "District") within Tract 4299A comprised of the Blackhorse Estates development. Blackhorse Estates is divided into two areas, Area 1 has 45 homes and is known as the Renaissance neighborhood and Area 2 has 81 homes and is known as the Country View neighborhood, for a total of 126 homes. Each Area is a gated community where each home is assessed an annual amount to pay for maintenance of the street and landscaping facilities, including sidewalks, curbs and gutters, pavement, valley gutters, entrance control gates, median island landscaping, drainage inlets and street lights benefitting the homes within the District.

The City has contracted with Regency Property Management to manage maintenance for AD 95-1. In 2020, Regency Property Management worked with residents in both areas to identify projects that were desired by the community. The property owners in the District identified a few beautification projects in Area 1 as well as a Slurry Seal for the neighborhood streets and in Area 2 no projects beyond a Slurry Seal were identified. The City, Regency Property Management, and the District's consultant have evaluated the fund balance for both areas and have determined that in order to fund a costly project like a Slurry Seal, an annual assessment increase needs to be approved by the property owners to help recover from the costs, prepare for any future large capital projects, and keep up with significant increases in maintenance costs due to inflation.

At the May 3, 2021 City Council Meeting, Council approved a Resolution of Intent that allowed staff to proceed with a Proposition 218 proceeding with the property owners to receive approval to increase assessments in both areas. The recommended increase for Area 1 (Renaissance) is \$90.00 annually from \$557.00 to \$647.00 per parcel per year and for Area 2 (Country View) is \$84.00 annually from \$461.00 to \$545.00 per parcel per year.

BACKGROUND

AD 95-1, Blackhorse Estates, is a gated community located at the southeast corner of Alluvial and Minnewawa Avenues (Attachment 2) and was created under the provisions of the Benefit Assessment Act of 1982, to provide for the maintenance of sidewalks, curbs and gutters, pavement, valley gutters, entrance control gates, median islands and median island landscaping, drainage inlets and street lights within the District. The maintenance activities are managed through a contract with Regency Property Management, a real estate management firm.

Since the District is a gated community with privately owned streets, no public funds for City crews may be used for street maintenance or to fund improvement projects, such as a slurry seal. Prior to the adoption of the Engineer's Report for fiscal year 2020-2021, City staff heard from the homeowners in Area 1 that they had a few desired landscape improvements and nothing was brought to the City's attention for Area 2. City staff evaluated that both areas were in need of a slurry seal since one has not been done since the District's formation back in 1995. After the approval from the City Council of the 2020-21 Engineer's Report, City reevaluated the assessment rates in both areas and confirmed that, though there is enough in the fund to do the street resurfacing projects, the revenue stream from the annual

assessments is sufficient only to cover routine maintenance items such as gate repairs and operation, landscape maintenance, etc. Any large capital project would deplete the fund to the point that any future capital needs, such as the next street resurfacing project, or any increases in the cost of services could not be funded. This is due to rising operational and maintenance costs combined with no rate increases since 2008.

City staff worked with the District consultant, Francisco and Associates, to determine an appropriate proposed assessment rate increase. The proposed increases for each area as well as the intent to conduct a formal Proposition 218 proceeding was presented to City Council on May 3, 2021. From that meeting City Council directed staff to hold another meeting with the homeowners in the District and to provide additional financial information to answer any lingering questions that Renaissance or Country View residents may have about the District finances and the assessment rate increase before sending out the ballots for the vote.

A meeting was held on Thursday, May 20, 2021 for the purpose of explaining to interested residents where the District stands financially, the maintenance projects that are needed, and why assessments need to be increased. The meeting was very contentious with the homeowners focused on the management of the funds collected through the assessments. Staff provided financial data presented in a table and chart format at the meeting. Some homeowners requested that the information be provided in a format that is more standard within the financial sector.

Staff has provided an in-depth breakdown of the District's financial records from the past 10 years by posting this information to the Blackhorse page on the City's website. Staff notified the homeowners that were interested in the updated financial formatting and that had provided contact information. In addition to these requests, City staff made themselves available for any in-person meetings requested by the homeowners. One homeowner took advantage of this and met with staff from the finance department and engineering department on May 24. Staff was able to provide the financial information to him on a format that was more in line with what he was accustomed to. One concern from the homeowners was the ability to compare the budgeted expenses to actual expenses. Staff has worked with Regency so that their financial information will use this formatting going forward, which will include a comparison of budgeted and actual expenses. This information will all be posted to the City's website on a continual basis. The same homeowner also proposed a Citizen Advisory Committee at the May 3, 2021 Council meeting, to which Council directed staff to work on. Staff has discussed this with him and indicated a willingness to work with a sub-group of property owners.

There has been no confirmation that the committee has been formed as of the date of the writing of this report. Some property owners also expressed dissatisfaction with the performance of Regency Property Management, who is under contract with the City for the management services and was also in attendance at the meeting. Each of the items brought up at the meeting have since been addressed by Regency, including revising gate codes, redirecting the landscape maintenance contractor, and fixing deficiencies in the landscaping.

In general, Regency has been very responsive to City staff inquiries and requests for service staff receives from residents.

Ballots were mailed to all the residents the day after the meeting (May 27, 2021) together with concise and detailed information about the district and why the increase is needed and how the voting works. Per Proposition 218 provisions, ballots may be received up until the close of the public input portion of the public hearing. The vote, per area, requires a simple majority to pass. If the assessment rate increase passes in both areas, the fund will be immediately depleted with the slurry seal of the streets within the district, but will be built up to a level that another slurry seal can be applied in about 10 years. The slurry seal will be scheduled for Fall 2021. If the vote does not pass, City staff is recommending that the Regency still move forward with a slurry seal due to the current condition of the streets within the District. However, without the additional revenue, there would not be any funding being built up for any future projects. In this event, staff would meet with the District consultant as well as the property management firm to assess current costs to determine if, or for how long, the District can continue and possibly establish a plan for disbanding or doing another 218 election. If the District is to continue, the level of service and maintenance provided is likely to be reduced in the future in order to stay within the budget.

FISCAL IMPACT

There is no fiscal impact to the City.

Should the Proposition 218 vote pass, assessment rates will increase by \$90.00 per home per year in Benefit Area 1 (Renaissance neighborhood) and by \$84.00 per home per year in Benefit Area 2 (Country View neighborhood).

If the Proposition 218 proceeding does not pass in one or both areas, the current assessment rates will be levied for FY 2021-22 upon City Council approval. The current assessment rates provide funding sufficient only for routine maintenance items with no ability to fund and recover the costs of large capital projects. Examples of large capital projects include, but are not limited to, street maintenance, gate equipment replacement, and sidewalk replacement. Future increases in maintenance and overhead costs without an increase in assessment rates will lead to providing diminished services over time. In the worst case scenario, insufficient funding could lead to dissolution of the Assessment District, removal of the gates, conversion of the streets from private back to public streets, and the City assuming future maintenance similar to other subdivisions in the City with public streets.

REASON FOR RECOMMENDATION

The current fund balance for each area will be depleted with the planned street maintenance project. An increase in funding is needed in order to sustain continued maintenance at the current level and also provide for future planned maintenance as well as unforeseen maintenance and repairs that come up from time to time.

ACTIONS FOLLOWING APPROVAL

If the assessment rate increase passes, the City will work with the District consultant to get the attached Engineer's Report signed and recorded with the County Tax Auditor to levy the increased AD 95-1 assessments for FY 2021-22.

If the assessment rate increase does not pass in one or both of the areas, the City will work with the District consultant to update the attached Engineer's Report with the proper assessment rates before getting it signed and recorded with the County Tax Auditor to levy the AD 95-1 assessments for FY 2021-22.

Prepared by: Sean Smith, Supervising Civil Engineer / Tatiana Partain, Principal Office Assistant

Reviewed by: City Manager JS

RESOLUTION 21-____**A RESOLUTION OF THE COUNCIL OF THE CITY OF CLOVIS, CALIFORNIA,
DECLARING THE RESULTS OF THE PROPERTY OWNER PROTEST BALLOTING
PROCEEDINGS AND APPROVING THE ENGINEER'S REPORT FOR BENEFIT
ASSESSMENT DISTRICT 95-1 (BLACKHORSE ESTATES) CONFIRMING THE
ASSESSMENTS FOR FISCAL YEAR 2021-2022**

WHEREAS, on May 1, 1995, the City Council approved Resolution 95-42 creating Assessment District 95-1 in Tract 4299A; and

WHEREAS, an Engineer's Report, a copy of which is on file with the City Clerk, has been prepared evaluating the costs of maintenance in Assessment District 95-1 for the 2021-2022 fiscal year; and

WHEREAS, Benefit Area I of Assessment District 95-1 consists of the Renaissance neighborhood which accesses Minnewawa Avenue as shown on the attached Attachment 2; and

WHEREAS, Benefit Area II of Assessment District 95-1 consists of the Country View neighborhood which accesses Alluvial Avenue as shown on the attached Attachment 2; and

WHEREAS, the Engineer's Report sets forth the proposed 2021-2022 fiscal year assessments for each benefit area within Assessment District 95-1; and

WHEREAS, City staff is proposing increases to the assessments for Benefit Area I and Benefit Area II commencing with FY 2021-22; and

WHEREAS, City staff has reviewed and concurs with the Engineer's Report; and

WHEREAS, a notice of the proposed assessment increases, including an assessment ballot was provided to the record owners in Assessment District 95-1 as required by Government Code section 53753; and

WHEREAS, the Clovis City Council conducted a public hearing on July 12, 2021 in accordance with law and the notice provided the property owners in Assessment District 95-1, and all objections or protests, if any, and all written and oral testimony submitted by interested persons, if any, to the proposed assessment having been duly considered; and

WHEREAS, the City Clerk has tabulated all assessment ballots submitted in favor of and in opposition to the proposed assessment increases for each benefit area within Assessment District 95-1, and certified the following results: ___ in favor and ___ opposed to the proposed assessment increase for Benefit Area I and ___ in favor and ___ opposed to the proposed assessment increase in Benefit Area II.

ATTACHMENT 1

NOW, THEREFORE, IT IS RESOLVED AND ORDERED, as follows:

1. The recitals above are true and made a substantive part of this resolution; and
2. The Engineer's Report, in the form on file with the City Clerk or as amended per the results of the property owner protest balloting proceedings, is hereby accepted and approved; and
3. City staff is hereby directed to provide the County Auditor with the assessments to be collected on behalf of Assessment District 95-1 for FY 2021-22.

* * * * *

The foregoing resolution is hereby adopted at a regular meeting of the City Council of the City of Clovis held on July 12, 2021, by the following vote, to wit:

AYES:
 NOES:
 ABSENT:
 ABSTAIN:

DATED: July 12, 2021

Mayor

City Clerk





CITY OF CLOVIS BENEFIT ASSESSMENT DISTRICT NO. 95-1



Fiscal Year 2021-22
Preliminary Engineer's Report

May 3, 2021

Prepared by:

Francisco & Associates, Inc.
231 Market Place, Suite 543
San Ramon, CA 94583
(925) 867-3400



ATTACHMENT 3

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CITY OF CLOVIS
CITY COUNCIL MEMBERS AND CITY STAFF

FISCAL YEAR 2021-22

City Council Members

Jose Flores
Mayor

Lynne Ashbeck
Mayor Pro-Tem

Drew Bessinger
Council Member

Bob Whalen
Council Member

Vong Mouanoutoua
Council Member

City Staff Members

Luke Serpa
City Manager

Scott Cross
City Attorney

John Holt
Assistant City Manager/
City Clerk

Jay Schengel
Finance Director

Mike Harrison
City Engineer


Sean Smith
Supervising Civil Engineer

Francisco & Associates, Inc.
Assessment Engineer

ENGINEER'S REPORT
CITY OF CLOVIS
ENGINEER'S REPORT FOR THE CITY'S
BENEFIT ASSESSMENT DISTRICT NO. 95-1

Fiscal Year 2021-22

The undersigned, acting on behalf of Francisco & Associates, Inc. respectfully submits the enclosed Engineer's Report as directed by the Clovis City Council pursuant to the provisions of the Benefit Assessment Act of 1982, Article XIII C and XIII D of the California Constitution and pursuant to the Charter and Municipal Code of the City of Clovis. The undersigned certifies that he is a Professional Engineer, registered in the State of California.

Dated: April 1, 2021 By: 
Eduardo Espinoza, P.E.
RCE # 83709

I HEREBY CERTIFY that the enclosed Engineer's Report, together with Assessment Roll and Assessment Diagram, thereto attached, was filed with me on the _____ day of _____, 2021

John Holt, City Clerk
City of Clovis
Fresno County, California

By: _____

I HEREBY CERTIFY that the enclosed Engineer's Report, together with Assessment Roll and Assessment Diagram, thereto attached, was approved and confirmed by the Council of the City of Clovis, Fresno County, California, on the _____ day of _____, 2021, by adoption of Resolution No. _____.

John Holt, City Clerk
City of Clovis
Fresno County, California

By: _____

I HEREBY CERTIFY that the enclosed Engineer's Report, together with Assessment Roll and Assessment Diagram, thereto attached, was filed in my office in the County of Fresno, on the _____ day of _____, 2021.

Oscar J. Garcia, CPA, Auditor
Fresno County, California

By: _____

SECTION I

INTRODUCTION
ENGINEER'S REPORT

CITY OF CLOVIS
ENGINEER'S REPORT FOR THE CITY'S
BENEFIT ASSESSMENT DISTRICT NO. 95-1

Fiscal Year 2021-22

Background Information

To insure the proper flow of funds for the ongoing operation, maintenance and servicing of specific improvements within the boundaries of the Benefit Assessment District No. 95-1 ("District"), the City Council, through the Benefit Assessment Act of 1982 ("1982 Act"), previously approved the formation of the District which includes two (2) benefit areas as described in this Engineer's Report ("Report"). Benefit Area I is comprised of the Renaissance development and Benefit Area II is comprised of the Country View development. Improvements, which may be constructed, operated, maintained and serviced by the District, include, but are not limited to:

Sidewalks, curbs and gutters, pavement, valley gutters, entrance control gates, medians islands and median island landscaping, drainage inlets and street lights.

Generally, Developers as a part of their development conditions, are required to construct the improvements listed above which benefit their development. However, the ongoing operation, maintenance, servicing and capital replacement of these improvements are financed through the levy of assessments on parcels within the District. As new developments occur, benefit areas may be created within the District to ensure that the operation, maintenance, servicing and capital replacement of the improvements are specifically paid for by those property owners who directly benefit from those improvements.

Current Annual Administration

As required by the Benefit Assessment Act of 1982, this Report includes for the ensuing fiscal year: (1) a general description of the improvements to be constructed, operated, maintained and serviced by the District, (2) an estimated budget to construct, operate, maintain and service the improvements, (3) the method used to distribute the costs to the benefiting property owners within the District, (4) a diagram of the District and associated benefit areas, and (5) listing of the proposed Fiscal Year 2021-22 assessments to be levied upon each assessable lot or parcel within the District.

For FY 2021-22, the City Council is proposing an increase to the current maximum annual assessment rate for parcels located within Benefit Area I (Renaissance) and Benefit Area II (Country View). The purpose of these proposed assessment rate increases is to provide funding for the City to conduct slurry seal work for the streets associated with Benefit Area I (Renaissance) and Benefit Area II (Country View) every 10 years to preserve and protect the

underlying pavement structure and avoid much more costly street replacement work in the future.

The proposed increases in the assessment rates will require the City to conduct a Proposition 218 election. As a result, the City will mail notices and ballots to the affected property owners a minimum of 45 days prior to the Public Hearing set for June 21, 2021 when the proposed increase in assessments are to be discussed. At the Public Hearing the City will provide an opportunity for any interested person to provide testimony. After the public hearing input portion, the City Council will ask if there are any remaining ballots to be turned in or if anyone would like to change their vote. The ballots will then be tabulated, and the results of the ballot tabulation will be presented to the City Council. If a majority of the ballots received within each benefit area are in favor of the assessment increase, then the assessment increase may be imposed by the City Council for that benefit area. At the conclusion of the Public Hearing, the City Council may adopt a resolution confirming the Fiscal Year 2021-22 levy and collection of assessments for all benefit areas as originally proposed or as modified.

Payment of these annual assessments for each parcel will be made in the same manner and at the same time as payments are made for their annual property taxes. All funds collected through the assessments must be placed in a special fund and can only be used for the purposes stated within this Report.

SECTION II

**ENGINEER'S REPORT PREPARED PURSUANT TO THE PROVISIONS OF THE
BENEFIT ASSESSMENT ACT OF 1982
SECTION 54703 THROUGH 54720
OF THE CALIFORNIA GOVERNMENT CODE**

Pursuant to the Benefit Assessment Act of 1982 (Part 1 of Division 2 of Title 5 of the Government Code of the State of California), and in accordance with Resolution No. 21-__ initiating proceedings for the levy and collection of assessments and ordering the preparation of the annual Engineer's Report and Resolution No. 21-__ approving the Preliminary Engineer's Report and Declaring the Intention for Levy and Collection of Assessments, adopted by the City Council of the City of Clovis, on May 3, 2021, and in connection with the proceedings for:

**CITY OF CLOVIS
BENEFIT ASSESSMENT DISTRICT NO. 95-1**

Herein after referred to as the "District", I, Eduardo Espinoza, the duly appointed ENGINEER OF WORK, submit herewith the "Report" consisting of five (5) parts as follows:

PART A: PLANS AND SPECIFICATIONS

This part describes the improvements to be financed by the District. Plans and specifications for the improvements are as set forth on the lists thereof, attached hereto, and are on file in the Office of the City Clerk of the City of Clovis and are incorporated herein by reference.

PART B: ESTIMATE OF COST

This part contains an estimate of the cost of the proposed improvements, including incidental costs and expenses in connection therewith.

PART C: ASSESSMENT DISTRICT DIAGRAM

This part incorporates by reference a diagram of the District showing the boundaries of any benefit areas within the District and the lines and dimensions of each lot or parcel of land within the District. The lines and dimensions of each lot or parcel within the District are those lines and dimensions shown on the maps of the Fresno County Assessor for the year when this Report was prepared. The Assessor's maps and records are incorporated by reference and made part of this Report.

PART D: METHOD OF APPORTIONMENT OF ASSESSMENT

This part contains the method of apportionment of assessments, based upon parcel classification of land within the District, in proportion to the estimated benefits to be received.

PART E: PROPERTY LIST AND ASSESSMENT ROLL

This part contains a list of the Fresno County Assessor's parcel numbers, and the amount to be assessed upon the benefited lands within the District. The Assessment Roll is filed in the Office of the Clovis City Clerk and is incorporated in this Report by reference. The list is keyed to the records of the Fresno County Assessor, which are incorporated herein by reference.

PART A

PLANS AND SPECIFICATIONS

The facilities, which have been constructed within the City of Clovis, and those which may be subsequently constructed, operated, maintained and serviced are generally described as follows:

Street and Landscaping Facilities

Street and Landscaping facilities consist of, but are not limited to: operation, maintenance and servicing of sidewalks parallel to and within 27 feet of the center line of the streets, curbs and gutters, paved sections, valley gutters, four entrance control gates located on Birch Avenue, Chennault Avenue, Oxford Avenue and Dartmouth Avenue, median islands and landscaping in the median islands, drainage inlet structures, and street lights located within the boundaries of the District.

PART B

ESTIMATE OF COST

The 1982 Act requires that a special fund be set up for the collection of revenues and expenditures for the District. The 1982 Act provides that the total cost for the construction, operation, maintenance and servicing of the street facilities can be recovered by the District. Incidental expenses including administration of the District, engineering fees, legal fees and all other costs associated with the District can also be included.

Revenues collected from the assessments within each benefit area shall be used only for the expenditures associated with each benefit area as authorized under the 1982 Act. Any balance remaining at the end of the fiscal year must be carried over to the next fiscal year.

Tables 1 and 2 below provide a summary of the total Fiscal Year 2021-22 estimated revenues and expenditures for each benefit area.

For a detailed breakdown on the revenues and expenditures for each benefit area within the District please refer to Appendix "A" and Appendix "B" in this report.

TABLE NO. 1: COST ESTIMATE FY 2021-22 Benefit Area I (Renaissance)	
	Proposed FY 2021-22
Projected Beginning Balance as of July 1, 2021:	\$37,915
Revenue	
Annual Assessments	\$29,096
Total Revenue:	\$67,011
Annual Expenditures⁽¹⁾	
Office Supplies and Miscellaneous Maintenance	(\$400)
Electronic Gate Maintenance	(\$2,000)
Telephone	(\$700)
Street Sweeping	(\$900)
Landscape Maintenance	(\$4,600)
Electrical Power for Gate and Streetlights	(\$3,500)
City Administration Costs	(\$1,409)
County Collection Fees	(\$8)
District Administrator	(\$8,940)
Assessment Engineering	(\$1,339)
Insurance	(\$1,300)
Annual Expenditures Subtotal:	(\$25,096)
Capital Improvement Projects	
Slurry Seal	(\$28,799)
Sidewalk Repairs & Gate Replacement	(\$0)
Capital Improvement Projects Subtotal:	(\$28,799)
Total Expenses:	(\$53,895)
Projected Ending Balance as of June 30, 2022:	\$13,116
Reserve Detail as of June 30, 2022	
Required Operating Reserves ⁽²⁾	\$12,548
Available Operating Reserves	\$12,548
Available Capital Reserves ⁽³⁾	\$568
Assessment Rate (45 Parcels)	\$646.58
Notes:	
(1) See Appendix "A" for a detailed description of expenses.	
(2) Operating reserves are needed because the City does not receive assessment revenue from the County until the end of December of each year, therefore it is necessary to have an operating reserve to fund 6 months of the estimated annual expenditures from July 1 through December 31 of each fiscal year.	
(3) Capital reserve funds will be used for Capital Improvement Projects or to replace existing improvements once they have reached the end of their useful life.	

TABLE NO. 2: COST ESTIMATE FY 2021-22 Benefit Area II (Country View)	
	Proposed FY 2021-22
Projected Beginning Balance as of July 1, 2021	\$69,625
Revenue	
Annual Assessments	\$44,101
Total Revenue:	\$113,726
Annual Expenditures⁽¹⁾	
Office Supplies and Miscellaneous Maintenance	(\$800)
Electronic Gate Maintenance	(\$2,000)
Telephone	(\$900)
Street Sweeping	(\$1,700)
Landscape Maintenance	(\$8,000)
Electrical Power for Gate and Streetlights	(\$5,500)
City Administration Costs	(\$2,616)
County Collection Fees	(\$14)
District Administrator	(\$13,860)
Assessment Engineering	(\$2,411)
Insurance	(\$1,300)
Annual Expenditures Subtotal:	(\$39,101)
Capital Improvement Projects	
Slurry Seal	(\$48,773)
Sidewalk Repairs & Gate Replacement	(\$5,000)
Capital Improvement Projects Subtotal:	(\$53,773)
Total Expenses:	(\$92,874)
Projected Ending Balance as of June 30, 2022:	\$20,852
Reserve Detail as of June 30, 2022	
Required Operating Reserves ⁽²⁾	\$19,551
Available Operating Reserves	\$19,551
Available Capital Reserves ⁽³⁾	\$1,301
Assessment Rate (81 Parcels)	\$544.46/parcel
<p>Notes:</p> <p>(1) See Appendix "A" for a detailed description of expenses.</p> <p>(2) Operating reserves are needed because the City does not receive assessment revenue from the County until the end of December of each year, therefore it is necessary to have an operating reserve to fund 6 months of the estimated annual expenditures from July 1 through December 31 of each fiscal year.</p> <p>(3) Capital reserve funds will be used for Capital Improvement Projects or to replace existing improvements once they have reached the end of their useful life.</p>	

PART C

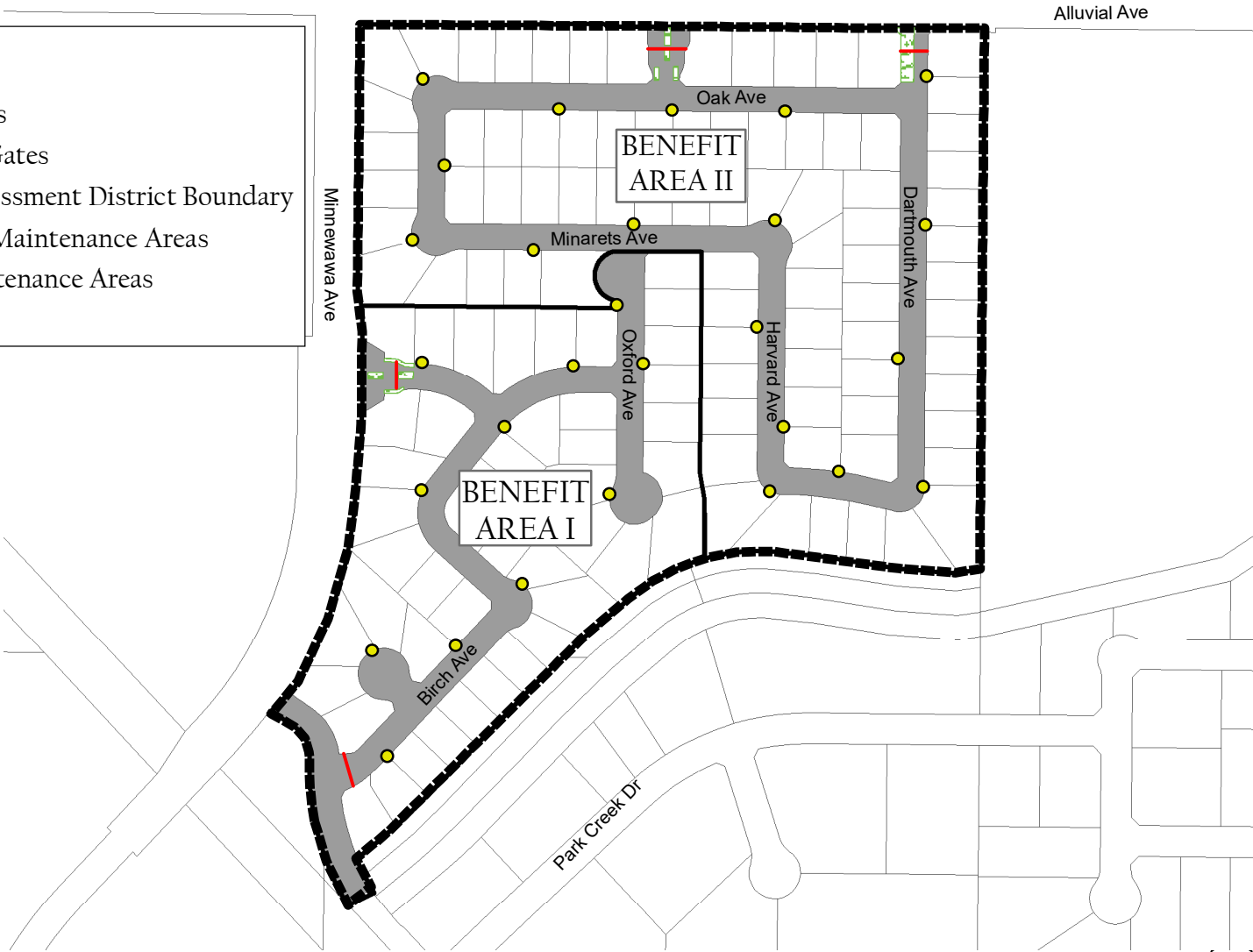
ASSESSMENT DISTRICT DIAGRAM

The boundary of the District is completely within the boundaries of the City of Clovis. The Assessment Diagram for the two benefit areas is on file in the Office of the City Clerk of the City of Clovis and is shown on the following page of this Report. The lines and dimensions of each lot or parcel within the District are those lines and dimensions shown on the maps of the Fresno County Assessor, for the year when this Report was prepared, and are incorporated by reference herein and made part of this Report.

City of Clovis Benefit Assessment District No. 95-1 Blackhorse Estates Maintenance Improvement Diagram

Legend

- Street Lights
- Electronic Gates
- ▬ Benefit Assessment District Boundary
- ▨ Landscape Maintenance Areas
- Street Maintenance Areas
- Parcel Lines



Prepared by Francisco & Associates, Inc.



PART D

METHOD OF APPORTIONMENT OF ASSESSMENT

This section explains the benefits to be derived from the street and landscaping improvements and the methodology used to apportion the costs to the benefitting properties within the District.

Discussion of Special Benefit

Part 1 of Division 2 of Title 5 of the Government Code, the Benefit Assessment Act of 1982, permits the establishment of assessment districts by Agencies for the purpose of providing certain public improvements and services which include the construction, operation, maintenance and servicing of street facilities.

Section 54711 of the Benefit Assessment Act of 1982 requires that maintenance assessments must be levied according to benefit rather than according to assessed value. This Section states:

“The amount of the assessment imposed on any parcel of property shall be related to the benefit to the parcel which will be derived from the provision of the service.”

In addition, the 1982 Act permits the designation of zones or areas of benefit within any individual assessment district.

Article XIIIID, Section 4(a) of the California Constitution (also known as Proposition 218) limits the amount of any assessment to the proportional special benefit conferred on the property.

“No assessment shall be imposed on any parcel which exceeds the reasonable cost of the proportional special benefit conferred on that parcel.”

Article XIIIID provides that publicly owned properties must be assessed unless there is clear and convincing evidence that those properties receive no special benefit from the assessment. Exempted from the assessment would be the areas of public streets, public avenues, public lanes, public roads, public drives, public courts, public alleys, public easements and rights-of-ways, public greenbelts and public parkways, and that portion of public property that is not developed and used for business purposes similar to private residential, commercial, industrial and institutional activities.

Special versus General Benefit

In the absence of an annual assessment, the street and landscaping maintenance activities within each benefit area of the District would not be provided. All the assessment proceeds derived from each benefit area will be utilized to fund the cost of providing a level of tangible “special benefits” in the form of property related services which benefit individual properties to which the services are provided. The assessments are also structured to provide specific improvements within each benefit area, further ensuring that the improvements funded by the assessments are of specific and special benefit to property within each benefit area.

The street and landscaping facilities in each benefit area of the District were specifically designed, located and created to provide vehicular access to residences for the direct benefit of property inside the benefit area, and not the public at large. The boundaries of the benefit area have been drawn to include only those parcels that receive a direct benefit from the improvements. Other properties that are outside a benefit area do not benefit from the property related improvements.

It is therefore concluded that all the street and landscaping maintenance activities funded by the Assessments are of special benefit to the identified benefiting properties located within the benefit areas and that the value of the special benefits from such Improvements to property in the benefit areas reasonably exceeds the cost of the assessments for every assessed parcel in the benefit areas. (In other words, as required by Proposition 218: the reasonable cost of the proportional special benefit conferred on each parcel does not exceed the cost of the assessments.)

ASSESSMENT METHODOLOGY

The 1982 Act requires that assessments must be based on the benefit that the subject properties receive from the improvements being maintained. The improvements to be maintained by the District relate to the vehicular access from the public streets, adjacent to the District, and to the residences within the District.

Each year, the Engineer for the District shall evaluate the conditions of the improvements to be maintained by the District and shall estimate the required costs of the maintenance and incidental costs and spread the assessments to the benefitting properties. A portion of the estimated costs may be set aside for significant maintenance items, such as seal coats and street surface overlays. If necessary, revised amounts for the assessments will be determined by the Engineer for the District then considered by the City Council of the City of Clovis to revise the amounts of the assessments as they deem appropriate.

Since the assessments are levied on the owners of properties as shown on the secured property tax rolls, the final charges must be assigned by Assessor's Parcel Number.

The single-family residential parcel has been selected as the basic unit for the calculation of assessments since it represents all the parcels within the District. Therefore, the single-family residential parcel has been determined to have equal vehicular access from the public streets, adjacent to the District, and to the residential parcels. For the spread of the assessments, there are 45 residential parcels in Benefit Area I (Renaissance) and 81 residential parcels in Benefit Area II (Country View) that will be assessed for the maintenance of the improvements. Therefore, the maintenance and incidental costs for Benefit Area I (Renaissance) will be equally spread to each of the residential parcels within Benefit Area I (Renaissance) and the maintenance and incidental costs for Benefit Area II (Country View) will be equally spread to each of the residential parcels within Benefit Area II (Country View).

Below is a listing of each of the benefit areas, their corresponding number and type of parcels within each benefit area and the method of apportioning the costs of the improvements to the benefiting parcels.

Benefit Area I (Renaissance)

Benefit Area I (Renaissance) is comprised of 45 single-family residential parcels. In Fiscal Year 2021-22, there are 45 assessable parcels, and the total assessment revenue needed to operate and maintain the facilities within Benefit Area I (Renaissance) is \$29,096. This results in the following proposed assessment that will be levied upon approval of the property owners within Benefit Area I (Renaissance):

Fiscal Year 2021-22 Rate: \$646.58/parcel

Benefit Area II (Country View)

Benefit Area II (Country View) is comprised of 81 single-family residential parcels. In Fiscal Year 2021-22, there are 81 assessable parcels, and the total assessment revenue needed to operate and maintain the facilities within Benefit Area II (Country View) is \$44,101. This results in the following proposed assessment that will be levied upon approval of the property owners within Benefit Area II (Country View):

Fiscal Year 2021-22 Rate: \$544.46/parcel

PART E

PROPERTY LIST AND ASSESSMENT ROLL

A list of the addresses of all parcels, and the description of each lot or parcel within each of the City of Clovis's Benefit Assessment District No. 95-1 is shown on the last equalized Property Tax Roll of the Fresno County Assessor, which by reference is hereby made a part of this Report.

This list is keyed to the Assessor's Parcel Numbers as shown on the Assessment Roll, which includes the maximum proposed amount of assessments apportioned to each lot or parcel. The Assessment Roll is on file in the Office of the City Clerk of the City of Clovis and is shown in this Report as Appendix "C".

APPENDIX A

DETAILED STATEMENT OF COSTS FOR
BENEFIT AREA I (RENAISSANCE)

BENEFIT AREA I (RENAISSANCE)

DETAILED STATEMENT OF COSTS

The detailed description of costs for each of the improvements to be operated, maintained and serviced in Benefit Area I (Renaissance), and those which may be subsequently operated, maintained and serviced are generally described as follows:

Office Supplies and Miscellaneous Maintenance

This item is to cover unexpected costs that may arise in any given fiscal year that is generally associated with the following improvements:

1. Street pavement and surface maintenance
2. Curb, gutter and sidewalk
3. Street or traffic signs
4. Storm drain inlets
5. Concrete valley gutters

Based on historical data, repairs to the above-mentioned improvements are not needed each fiscal year. The estimated cost for miscellaneous/contingency repairs in Fiscal Year 2021-22 is \$400. If major repairs are needed during the fiscal year, funds will be utilized from the capital reserve fund.

Electronic Gate Maintenance

There are two electronic gates that will be maintained by the District. The estimated cost for electronic gate maintenance in Fiscal Year 2021-22 is \$2,000.

Telephone Costs

Telephone costs are for maintaining the telephone located at the entrance gate which will be used by people at the gate to communicate with the residents of the District.

There are two gates. One gate is an "Enter Only" gate and the other is an "Exit Only" gate. There will only be one telephone to be maintained at the "Enter Only" gate.

The telephone system is a private system and the cost for repair and replacement of the telephone equipment, when needed, will be paid for from the capital reserve fund. The estimated cost to fund telephone equipment repairs and local calls through AT&T is \$700 for Fiscal Year 2021-22.

Street Sweeping

These costs are based on a firm bid obtained by the District Administrator.

The streets will be swept once every two months within Benefit Area I (Renaissance) for an estimated cost of \$900/year.

Landscape Maintenance

The areas where landscaping is scheduled to be maintained by the District are in the median island planters constructed at the gates. The total area of landscaping to be maintained is approximately 500 square feet.

Historically, the residents within Benefit Area I (Renaissance) have routinely requested a higher level of landscape installation and maintenance than was originally planned, including the planting of annual flowers that has resulted in increased maintenance costs.

The total cost of landscape maintenance including City of Clovis water charges for Fiscal Year 2021-22 will be \$4,600 as estimated by the District Administrator.

Electrical Power for Gate and Streetlights

The total estimated cost for electrical power charges for gate operations and street lights for Fiscal Year 2021-22 is \$3,500.

City Administration Costs

The City of Clovis will have many responsibilities for the administration of the District. Included in these costs are:

- a. City Council Costs related to notices, hearings, etc.
- b. Attorney fees for the City Attorney to prepare the legal documents as are required for the operation of the District.
- c. Staff time for the preparation of documents necessary for the on-going operation of the District.
- d. Staff time for the review of documents prepared by District Consultants as necessary for the on-going operations of the District.
- e. Staff time related to the timely application of necessary maintenance and repairs as required.

Historically, the City of Clovis has assessed minimal charges to the District for their services. The estimated annual cost for City Administration in Fiscal Year 2021-22 is \$1,409.

County Collection Fees

The costs from the County of Fresno related to the collection of assessments and transfer of funds to the City are \$0.17 per parcel.

The total estimated cost for the County of Fresno collection fees in Fiscal Year 2021-22 is \$8 (45 parcels x \$0.17/parcel).

District Administrator

The District Administrator will manage the maintenance of the improvements for the District for an estimated cost of \$8,940 for Fiscal Year 2021-22.

Assessment Engineering

The District Assessment Engineer is Francisco & Associates, Inc. They have a contract with the District to perform the assessment engineering services for the sum of \$1,339 for Fiscal Year 2021-22.

Insurance Costs

The District will carry property damage insurance for damage to the gates caused by an accident or vandalism and Comprehensive General Liability Insurance with Excess Coverage.

The property insurance is issued by State Farm Insurance Company. It provides for a maximum of \$80,000 per occurrence for damage to the electronic gates with a \$1,000 deductible.

The Comprehensive Liability Insurance is issued by State Farm Insurance Company, which has the following coverage:

\$3,000,000	General Aggregate
\$3,000,000	Each Occurrence
\$3,000,000	Personal Injury
\$ 50,000	Fire Damage Legal Liability

The total estimated insurance cost for Fiscal Year 2021-22 is \$1,300.

Capital Reserve

On the recommendation of the District Administrator and the City of Clovis Finance Department, the Capital Reserve was established to provide funding for future expenses that do not occur on an annual basis.

Included in the Capital Reserve are funds set aside for items including but not limited to roadway slurry seal maintenance, sidewalk repairs, gate replacement, gate operator replacement, gate support columns and track replacement, gate phone/phone board replacement, and landscape upgrades.

For Fiscal Year 2021-22, the City of Clovis intends on completing the capital improvement projects shown below.

Capital Improvement Projects

After the evaluation of current improvements and their remaining useful life, the City of Clovis and District Administrator assessed a need to utilize Capital Reserve to fund capital improvement projects.

In FY 2020-21, the following capital improvement projects were performed:

- a. Gate Maintenance/Painting
- b. Additional Landscape Maintenance at front and back gate

In FY 2021-22, the City of Clovis and District Administrator anticipate the following capital improvement projects:

- a. Perform Roadway Slurry Seal
- b. Sidewalk Repairs and Gate Replacement (as necessary)

The total estimated cost for the Capital Improvement Projects is \$28,799.

APPENDIX B

DETAILED STATEMENT OF COSTS FOR
BENEFIT AREA II (COUNTRY VIEW)

BENEFIT AREA II (COUNTRY VIEW)

DETAILED STATEMENT OF COSTS

The detailed description of costs for each of the improvements to be operated, maintained and serviced in Benefit Area II (Country View), and those which may be subsequently operated, maintained and serviced are generally described as follows:

Office Supplies and Miscellaneous Maintenance

This item is to cover unexpected costs that may arise in any given fiscal year that is generally associated with the following improvements:

1. Street pavement and surface maintenance
2. Curb, gutter and sidewalk
3. Street or traffic signs
4. Storm drain inlets
5. Concrete valley gutters

Based on historical data, repairs to the above-mentioned improvements are not needed each fiscal year. The amount to be assessed for miscellaneous/contingency repairs in Fiscal Year 2021-22 is \$800. If major repairs are needed during the fiscal year, funds will be utilized from the capital reserve fund.

Electronic Gate Maintenance

There are two electronic gates that will be maintained by the District. The estimated cost for electronic gate maintenance in Fiscal Year 2021-22 is \$2,000.

Telephone Costs

Telephone costs are for maintaining the telephone located at the entrance gate which will be used by people at the gate to communicate with the residents of the District.

There are two gates. One gate is an "Enter Only" gate and the other is an "Exit Only" gate. There will only be one telephone to be maintained at the "Enter Only" gate.

The telephone system is a private system and the cost for repair and replacement of the telephone equipment, when needed, will be paid for from the capital reserve fund. The estimated cost to fund telephone equipment repairs and local calls through AT&T is \$900 for Fiscal Year 2021-22.

Street Sweeping

These costs are based on a firm bid obtained by the District Administrator.

The streets will be swept once every month within Benefit Area II (Country View) for an estimated cost of \$1,700/year.

Landscape Maintenance

The areas where landscaping is scheduled to be maintained by the District are in the median island planters constructed at the gates and a 2,800-sf grass area located on Dartmouth Avenue.

The total cost of landscape maintenance including City of Clovis water charges for Fiscal Year 2021-22 will be \$8,000 as estimated by the District Administrator.

Electrical Power for Gate and Streetlights

The total estimated cost for electrical power charges for gate operations and street lights for Fiscal Year 2021-22 is \$5,500.

City Administration Costs

The City of Clovis will have many responsibilities for the administration of the District. Included in these costs are:

- a. City Council Costs related to notices, hearings, etc.
- b. Attorney fees for the City Attorney to prepare the legal documents as are required for the operation of the District.
- c. Staff time for the preparation of documents necessary for the on-going operation of the District.
- d. Staff time for the review of documents prepared by District Consultants as necessary for the on-going operations of the District.
- e. Staff time related to the timely application of necessary maintenance and repairs as required.

Historically, the City of Clovis has assessed minimal charges to the District for their services. The estimated annual cost for City Administration in Fiscal Year 2021-22 is \$2,616.

County Collection Fees

The costs from the County of Fresno related to the collection of assessments and transfer of funds to the City are \$0.17 per parcel.

The total estimated cost for the County of Fresno collection fees in Fiscal Year 2021-22 is \$14 (81 parcels x \$0.17/parcel).

District Administrator

The District Administrator will manage the maintenance of the improvements for the District for an estimated cost of \$13,860 for Fiscal Year 2021-22.

Assessment Engineering

The District Assessment Engineer is Francisco & Associates, Inc. They have a contract with the District to perform the assessment engineering services for the sum of \$2,411 for Fiscal Year 2021-22.

Insurance Costs

The District will carry property damage insurance for damage to the gates caused by an accident or vandalism and Comprehensive General Liability Insurance with Excess Coverage.

The property insurance is issued by State Farm Insurance Company. It provides for a maximum of \$80,000 per occurrence for damage to the electronic gates with a \$1,000 deductible.

The Comprehensive Liability Insurance is issued by State Farm Insurance Company, which has the following coverage:

\$3,000,000	General Aggregate
\$3,000,000	Each Occurrence
\$3,000,000	Personal Injury
\$ 50,000	Fire Damage Legal Liability

The total estimated insurance cost for Fiscal Year 2021-22 is \$1,300.

Capital Reserve

On the recommendation of the District Administrator and the City of Clovis Finance Department, the Capital Reserve was established to provide funding for future expenses that do not occur on an annual basis.

Included in the Capital Reserve are funds set aside for items including but not limited to the roadway slurry seal maintenance, sidewalk repairs, gate replacement, gate operator replacement, gate support columns and track replacement, and gate phone/phone board replacement, and landscape upgrades.

For Fiscal Year 2021-22, the City of Clovis intends on completing the capital improvement projects shown below.

Capital Improvement Projects

After the evaluation of current improvements and their remaining useful life, the City of Clovis and District Administrator assessed a need to utilize Capital Reserve to fund capital improvement projects.

In FY 2021-22, the City of Clovis and District Administrator anticipate the following capital improvement projects:

- a. Perform Roadway Slurry Seal
- b. Sidewalk Repairs and Gate Replacement (as necessary)

The total estimated cost for the Capital Improvement Projects is \$53,773.

APPENDIX C
ASSESSMENT ROLL

CITY OF CLOVIS
ASSESSMENT DISTRICT NO. 1995-1
(Blackhorse Estates)
Assessment Roll
Fiscal Year 2021-22
Benefit Area 1

AGENDA ITEM NO. 10.

Assessor's Parcel Number	Benefit Area	Assessment Amount	Property Owner	Property Address	Tract and Lot
562-151-08	1	\$646.58	NISHIMURA GAREY	25 CHENNAULT AVE	TR 4299 Lot 1
562-151-09	1	\$646.58	REED SAMUEL H	45 CHENNAULT AVE	TR 4299 Lot 2
562-151-10	1	\$646.58	ANTARAMIAN PETER	65 CHENNAULT AVE	TR 4299 Lot 3
562-151-11	1	\$646.58	TWEDT BRIAN D & VICKIE L	85 CHENNAULT AVE	TR 4299 Lot 4
562-151-12	1	\$646.58	SYVERTSEN WILLIAM & CHERYLE L FAM TRUST	105 CHENNAULT AVE	TR 4299 Lot 5
562-151-13	1	\$646.58	PINERO MARIA JULIA & JESUS SACRAMENTADO	125 CHENNAULT AVE	TR 4299 Lot 6
562-152-04	1	\$646.58	NIMERI ABDELRAHMAN & SHAIMA	650 N CHERRY LN	TR 4299 Lot 41
562-152-05	1	\$646.58	SRA FAMILY	640 N CHERRY LN	TR 4299 Lot 40
562-152-06	1	\$646.58	DUNMORE JAMES L JR & TRACEE L	42 CHENNAULT AVE	TR 4299 Lot 43
562-152-07	1	\$646.58	HSIAO PAUL S	62 CHENNAULT AVE	TR 4299 Lot 42
562-153-03	1	\$646.58	TAKEDA VICTOR K & ANNE M TRUSTEES	665 N CHERRY LN	TR 4299 Lot 18
562-153-04	1	\$646.58	SIRIMARCO JAMES V III & DONNA M	655 N CHERRY LN	TR 4299 Lot 19
562-153-05	1	\$646.58	ROBERTSON STEPHEN W JR & AUTUMN N	635 N CHERRY LN	TR 4299 Lot 20
562-153-06	1	\$646.58	STAFFORD FRANKLIN H	611 N CHERRY LN	TR 4299 Lot 21
562-153-07	1	\$646.58	BIGLIERI JULIE M	601 N CHERRY LN	TR 4299 Lot 22
562-153-13	1	\$646.58	ICE JACOB M	624 N OXFORD AVE	TR 4299 Lot 12
562-153-14	1	\$646.58	CHAVEZ MANUEL A & ROSSANNE C TRS	634 N OXFORD AVE	TR 4299 Lot 13
562-153-15	1	\$646.58	BURRI ROBERT	644 N OXFORD AVE	TR 4299 Lot 14
562-153-16	1	\$646.58	SHIDIYWAH SAIF & HUDA	664 N OXFORD AVE	TR 4299 Lot 15
562-153-17	1	\$646.58	STAWARSKI DOUGLAS P & KAKELLY	684 N OXFORD AVE	TR 4299 Lot 16
562-153-18	1	\$646.58	HASSAN WAQAR	102 CHENNAULT AVE	TR 4299 Lot 17
562-153-19	1	\$646.58	CLARK JASON K RAY	614 N OXFORD AVE	TR 4299 Lot 11
562-153-20	1	\$646.58	MCLAUGHLIN KIMBERLY	651 N OXFORD AVE	TR 4299 Lot 10
562-153-21	1	\$646.58	TILLEY SHARRON F TRUSTEE	671 N OXFORD AVE	TR 4299 Lot 9
562-153-22	1	\$646.58	MEIKLE DIANE L TRUSTEE	691 N OXFORD AVE	TR 4299 Lot 8
562-153-23	1	\$646.58	BROBST JAMES H & M ARLENE TRUSTEES	711 N OXFORD AVE	TR 4299 Lot 7
562-153-24	1	\$646.58	GILL SHERAZ	731 N OXFORD AVE	Por of Lot 6 Clovis Colony
562-161-01	1	\$646.58	GANDY ANN TRUSTEE	610 N CHERRY LN	TR 4299 Lot 37
562-161-02	1	\$646.58	HEMMAN RONALD D & STEPHANIE J	620 N CHERRY LN	TR 4299 Lot 38
562-161-03	1	\$646.58	LARSON DAVID	630 N CHERRY LN	TR 4299 Lot 39
562-161-04	1	\$646.58	GATES GINGER G	57 BIRCH AVE	TR 4299 Lot 36
562-161-05	1	\$646.58	O HARA MICHAEL & CYNTHIA	55 BIRCH AVE	TR 4299 Lot 35
562-161-06	1	\$646.58	DER HAROUTUNIAN VASKEN & LINDA	51 BIRCH AVE	TR 4299 Lot 34
562-161-07	1	\$646.58	YANG YIA	47 BIRCH AVE	TR 4299 Lot 33
562-161-08	1	\$646.58	HAMILTON BRENDA S	37 BIRCH AVE	TR 4299 Lot 32
562-162-01	1	\$646.58	ECKEL DENNIS D & MARIA R TRS	94 BIRCH AVE	TR 4299 Lot 23
562-162-02	1	\$646.58	KHAN SAMIA	84 BIRCH AVE	TR 4299 Lot 24
562-162-03	1	\$646.58	CARUSO HILDA M	74 BIRCH AVE	TR 4299 Lot 25

CITY OF CLOVIS
ASSESSMENT DISTRICT NO. 1995-1
(Blackhorse Estates)
Assessment Roll
Fiscal Year 2021-22
Benefit Area 1

<i>AGENDA ITEM NO. 10.</i>

Assessor's Parcel Number	Benefit Area	Assessment Amount	Property Owner	Property Address	Tract and Lot
562-162-04	1	\$646.58	BRONSON JAMES C & MICHELLE L	64 BIRCH AVE	TR 4299 Lot 26
562-162-05	1	\$646.58	HARDIN TAYLOR J & TETYANA S	54 BIRCH AVE	TR 4299 Lot 27
562-162-06	1	\$646.58	WEBER DAVID & MICHELLE	44 BIRCH AVE	TR 4299 Lot 28
562-162-07	1	\$646.58	THACKER BARBARA J TRUSTEE	34 BIRCH AVE	TR 4299 Lot 29
562-162-08	1	\$646.58	DOUGHERTY STEPHEN P & MONICA	24 BIRCH AVE	TR 4299 Lot 30
562-162-09	1	\$646.58	ROSENTHAL STEVE ANDREW	14 BIRCH AVE	TR 4299 Lot 31
562-180-45	1	\$646.58	GOTTLIEB DAVID ANDREW & VIRGINIA TRS	741 N OXFORD AVE	TR 4668 Lot 18
<hr/>					
TOTAL:	45	\$29,096.10			

CITY OF CLOVIS
ASSESSMENT DISTRICT NO. 1995-1
(Blackhorse Estates)
Assessment Roll
Fiscal Year 2021-22
Benefit Area 2

AGENDA ITEM NO. 10.

Assessor's Parcel Number	Benefit Area	Assessment Amount	Property Owner	Property Address	Tract and Lot
562-153-25	2	\$544.46	KUHL MICHAEL B	732 N HARVARD AVE	TR 4661 Lot 28
562-153-26	2	\$544.46	KEMP TIMOTHY F & SAUNDRA D	722 N HARVARD AVE	TR 4661 Lot 27
562-153-27	2	\$544.46	KONSTANZER KEVIN C & PAMELA S TRUSTEES	712 N HARVARD AVE	TR 4661 Lot 26
562-153-28	2	\$544.46	WEAVER JAMES & LISA TRUSTEES	692 N HARVARD AVE	TR 4661 Lot 25
562-153-29	2	\$544.46	PORTFOLIO MANAGEMENT SERVICES LLC	672 N HARVARD AVE	TR 4661 Lot 24
562-153-30	2	\$544.46	MAKEL JOHN T & RAQUEL	204 BIRCH AVE	TR 4661 Lot 23
562-153-31	2	\$544.46	HIRATA RYEN J & ERICA R JOHNSON TRS	214 BIRCH AVE	TR 4661 Lot 22
562-153-32	2	\$544.46	TURNBULL BRENT L & PATRICIA K TRS	234 BIRCH AVE	TR 4661 Lot 21
562-153-33	2	\$544.46	BASHERIAN ALEX & GENEVIEVE	264 BIRCH AVE	TR 4661 Lot 20
562-153-34	2	\$544.46	AYDINYAN ARA	284 BIRCH AVE	TR 4661 Lot 19
562-153-35	2	\$544.46	KEISER ROBERT & TONI	647 N DARTMOUTH AVE	TR 4661 Lot 18
562-153-36	2	\$544.46	RODRIGUEZ LOUIS JR	667 N DARTMOUTH AVE	TR 4661 Lot 17
562-153-37	2	\$544.46	BICKEL BRUCE D TRUSTEE	687 N DARTMOUTH AVE	TR 4661 Lot 16
562-153-38	2	\$544.46	HOLGUIN GIL & KIM A	707 N DARTMOUTH AVE	TR 4661 Lot 15
562-153-39	2	\$544.46	MARTIN DARRELL B TRUSTEE	717 N DARTMOUTH AVE	TR 4661 Lot 14
562-153-40	2	\$544.46	ANALLA BRYAN G & MOLLY BLISS	727 N DARTMOUTH AVE	TR 4661 Lot 13
562-153-41	2	\$544.46	GUISTO NANCY A	737 N DARTMOUTH AVE	TR 4661 Lot 12
562-155-01	2	\$544.46	GATTIE BRAD H & KIRSTEN	673 N HARVARD AVE	TR 4661 Lot 29
562-155-02	2	\$544.46	GRAY LAURIE J & RANDALL M	676 N DARTMOUTH AVE	TR 4661 Lot 30
562-155-03	2	\$544.46	BREWER ADRIANNE M PETRUTIS & SCOTT M	696 N DARTMOUTH AVE	TR 4661 Lot 31
562-155-04	2	\$544.46	WADE GARY N & DANELLE	716 N DARTMOUTH AVE	TR 4661 Lot 32
562-155-05	2	\$544.46	HUDSON KIMBERLY SUE	726 N DARTMOUTH AVE	TR 4661 Lot 33
562-155-06	2	\$544.46	LEACH RONALD P & TRACY A	736 N DARTMOUTH AVE	TR 4661 Lot 34
562-180-01	2	\$544.46	SCOTT ANDREW L	149 OAK AVE	TR 4668 Lot 1
562-180-02	2	\$544.46	MAINOCK RALPH H TRS	129 OAK AVE	TR 4668 Lot 2
562-180-03	2	\$544.46	ALCONCHER RONALD B & ANNA C TRS	99 OAK AVE	TR 4668 Lot 3
562-180-04	2	\$544.46	LOYD WILLIAM D & CYNTHIA L	89 OAK AVE	TR 4668 Lot 4
562-180-05	2	\$544.46	HUBBARD STEVEN & KATHLEEN TRUSTEES	69 OAK AVE	TR 4668 Lot 5
562-180-06	2	\$544.46	NOEL MIKE & TIFFANY	49 OAK AVE	TR 4668 Lot 6
562-180-07	2	\$544.46	DINATA ANTONIUS J & VERONICA M	790 N CHERRY LN	TR 4668 Lot 7
562-180-08	2	\$544.46	THOMPSON CRAIG	780 N CHERRY LN	TR 4668 Lot 8
562-180-09	2	\$544.46	RATZLAFF CHRISTOPHER	770 N CHERRY LN	TR 4668 Lot 9
562-180-10	2	\$544.46	SILVA ANNA	760 N CHERRY LN	TR 4668 Lot 10
562-180-11	2	\$544.46	KATEIAN JANICE L TRS	750 N CHERRY LN	TR 4668 Lot 11
562-180-12	2	\$544.46	WESSON VINCENT F & SANDRA C TRUSTEES	26 MINARETS AVE	TR 4668 Lot 12
562-180-13	2	\$544.46	SAKAGUCHI PAUL K & CATHERINE KAZU TRS	46 MINARETS AVE	TR 4668 Lot 13
562-180-14	2	\$544.46	KEITH DIANA	66 MINARETS AVE	TR 4668 Lot 14
562-180-15	2	\$544.46	STONECIPHER KAREN TRUSTEE	86 MINARETS AVE	TR 4668 Lot 15

CITY OF CLOVIS
ASSESSMENT DISTRICT NO. 1995-1
(Blackhorse Estates)
Assessment Roll
Fiscal Year 2021-22
Benefit Area 2

AGENDA ITEM NO. 10.

Assessor's Parcel Number	Benefit Area	Assessment Amount	Property Owner	Property Address	Tract and Lot
562-180-19	2	\$544.46	HOLTERMANN DARRIN & JENNIFER	742 N HARVARD AVE	TR 4668 Lot 19
562-180-20	2	\$544.46	KARST DENNIS S & KATHERINE TRUSTEES	693 N HARVARD AVE	TR 4668 Lot 20
562-180-21	2	\$544.46	REY STEVEN F & JULIE L TRUSTEES	713 N HARVARD AVE	TR 4668 Lot 21
562-180-22	2	\$544.46	RAMOS STEPHEN A & JACQUELINE R	723 N HARVARD AVE	TR 4668 Lot 22
562-180-23	2	\$544.46	CLARK MICHAEL & CYNTHIA TRUSTEES	733 N HARVARD AVE	TR 4668 Lot 23
562-180-24	2	\$544.46	DU BOIS DIANE D	743 N HARVARD AVE	TR 4668 Lot 24
562-180-25	2	\$544.46	MORRIS ROGER GARY & ZENAIDA MAPANAO TRS	753 N HARVARD AVE	TR 4668 Lot 25
562-180-26	2	\$544.46	WYATT VIRGINIA V TRUSTEE	197 MINARETS AVE	TR 4668 Lot 26
562-180-27	2	\$544.46	MORROW JOELENE ANN	187 MINARETS AVE	TR 4668 Lot 27
562-180-28	2	\$544.46	STANLEY MATTHEW	177 MINARETS AVE	TR 4668 Lot 28
562-180-29	2	\$544.46	CINO JOHN C & MICHELLE MARQUEZ	157 MINARETS AVE	TR 4668 Lot 29
562-180-30	2	\$544.46	FRANK JOHN BRETT	137 MINARETS AVE	TR 4668 Lot 30
562-180-31	2	\$544.46	OPIE SARA JOAN TRUSTEE	117 MINARETS AVE	TR 4668 Lot 31
562-180-32	2	\$544.46	RALEY EVELYN	97 MINARETS AVE	TR 4668 Lot 32
562-180-33	2	\$544.46	SCHARF DONALD R & DOROTHY D SPENCER TRS	77 MINARETS AVE	TR 4668 Lot 33
562-180-34	2	\$544.46	BESTON LAURENCE O & MARYBETH TRS	57 MINARETS AVE	TR 4668 Lot 34
562-180-35	2	\$544.46	DUCAR FRANK LEROY & GINNIE ILENE TRS	58 OAK AVE	TR 4668 Lot 35
562-180-36	2	\$544.46	HOFER FERDINAND & ANTJE TRUSTEES	78 OAK AVE	TR 4668 Lot 36
562-180-37	2	\$544.46	JACKSON LEANNE R TRUSTEE	98 OAK AVE	TR 4668 Lot 37
562-180-38	2	\$544.46	BELLOW CHERYL	118 OAK AVE	TR 4668 Lot 38
562-180-39	2	\$544.46	DANSBY PAUL	138 OAK AVE	TR 4668 Lot 39
562-180-40	2	\$544.46	CENTRAL PACIFIC INVESTMENT CORPORATION	158 OAK AVE	TR 4668 Lot 40
562-180-41	2	\$544.46	KRUEGER TIMOTHY K	178 OAK AVE	TR 4668 Lot 41
562-180-42	2	\$544.46	HULL HARLAN & ROBIN	188 OAK AVE	TR 4668 Lot 42
562-180-43	2	\$544.46	DEWEY CARL C	198 OAK AVE	TR 4668 Lot 43
562-180-44	2	\$544.46	HAMES KENT L TRUSTEE	106 MINARETS AVE	TR 4668 Lots 16 & 17
562-180-46	2	\$544.46	MANALANSAN EDUARDO L & ROSEMARIE M	179 OAK AVE	TR 4661 Lot 1
562-180-47	2	\$544.46	AULT PHILIP H & COLLEEN K	189 OAK AVE	TR 4661 Lot 2
562-180-48	2	\$544.46	HAUS SPENCER N & CATHLEEN J	219 OAK AVE	TR 4661 Lot 3
562-180-49	2	\$544.46	BREWER RANDALL C & CHERI L TRUSTEES	249 OAK AVE	TR 4661 Lot 4
562-180-50	2	\$544.46	FOSTER STEPHEN & JOANNE	269 OAK AVE	TR 4661 Lot 5
562-180-51	2	\$544.46	KUYPER JASON J	797 N DARTMOUTH AVE	TR 4661 Lot 6
562-180-52	2	\$544.46	LANIK PETR & AIMEE	787 N DARTMOUTH AVE	TR 4661 Lot 7
562-180-53	2	\$544.46	STEADMON MARK S & AMY	777 N DARTMOUTH AVE	TR 4661 Lot 8
562-180-54	2	\$544.46	WILLIAMS RICHARD E & LOLA T TRS	767 N DARTMOUTH AVE	TR 4661 Lot 9
562-180-55	2	\$544.46	STUEBNER KRIS & PRISCILLA	757 N DARTMOUTH AVE	TR 4661 Lot 10
562-180-56	2	\$544.46	CRUZ RAMIRO	747 N DARTMOUTH AVE	TR 4661 Lot 11
562-180-57	2	\$544.46	HOODE SUMANGALI	746 N DARTMOUTH AVE	TR 4661 Lot 12

CITY OF CLOVIS
ASSESSMENT DISTRICT NO. 1995-1
(Blackhorse Estates)
Assessment Roll
Fiscal Year 2021-22
Benefit Area 2

<i>AGENDA ITEM NO. 10.</i>

Assessor's Parcel Number	Benefit Area	Assessment Amount	Property Owner	Property Address	Tract and Lot
562-180-58	2	\$544.46	SIRMAN JAMES A & SHIRLEY A	756 N DARTMOUTH AVE	TR 4661 Lot 36
562-180-59	2	\$544.46	VAN PROYEN DARYL TRS	766 N DARTMOUTH AVE	TR 4661 Lot 37
562-180-60	2	\$544.46	BYRD JAMES L & DOROTHY J TRUSTEES	268 OAK AVE	TR 4661 Lot 38
562-180-61	2	\$544.46	GUTHRIE ALICE EVELYN TRUSTEE	248 OAK AVE	TR 4661 Lot 39
562-180-62	2	\$544.46	JOHNSON BENJAMIN M & KIM	228 OAK AVE	TR 4661 Lot 40
<hr/>					
TOTAL:	81	\$44,101.26			



CITY *of* CLOVIS

REPORT TO THE CITY COUNCIL

TO: Mayor and City Council

FROM: Public Utilities Department

DATE: July 12, 2021

SUBJECT: Consider Approval – Res. 21-____, A Resolution Adopting the City of Clovis 2020 Urban Water Management Plan and the Water Shortage Contingency Plan.

Staff: Paul Armendariz, Assistant Public Utilities Director

Recommendation: Approve

ATTACHMENTS:

1. Resolution
2. Executive Summary - Urban Water Management Plan
3. Urban Water Management Plan
4. Water Shortage Contingency Plan

CONFLICT OF INTEREST

None

RECOMMENDATION

1. For the City Council to hold a public hearing for the 2020 Urban Water Management Plan and the Water Shortage Contingency Plan;
2. Consider Approval – Res. 21 - ____, a resolution adopting the City of Clovis 2020 Urban Water Management Plan Update and the Water Shortage Contingency Plan.

EXECUTIVE SUMMARY

The City's Urban Water Management Plan (UWMP) and Water Shortage Contingency Plan (WSCP) have been prepared pursuant to the requirements of the California Water Code, §10610-10656 and §10608. The UWMP is a State-mandated report required to be updated and submitted to the Department of Water Resources (DWR) every five years. Within UWMPs, urban water suppliers must assess the reliability of water sources over a 20-year planning horizon, describe demand management measures and water shortage contingency plans, report progress toward meeting a targeted 20 percent reduction in per capita urban

water consumption by the year 2020 in accordance with the Water Conservation Act of 2009 (SB X7-7), and discuss the use and planned use of recycled water.

The UWMP and WSCP have been prepared, notice has been given to the public to review and comment, and the plans have been submitted to the Council for approval and adoption.

BACKGROUND

California Water Code, §10610-10656 and §10608, requires every urban water supplier that either provides over 3,000 acre-feet of water annually or serves more than 3,000 service connections to prepare and adopt a UWMP every five years. The City currently serves over 25,000 acre-feet of water annually to over 37,000 services and is thereby required to comply with preparing and adopting by resolution a UWMP and WSCP.

A UWMP is considered to be a source of information for Water Supply Assessments (Senate Bill 610) and Written Verifications of Water Supply (SB 221). In addition, a UWMP may serve as a long-range planning document for water supply, a source of data for development of a regional water plan, and a source document for cities and counties as they prepare planning documents. Submission of an updated Plan is necessary for financial assistance from the Department of Water Resources.

The purpose of the UWMP is to provide for the conservation and efficient use of urban water supplies and to plan for that use and its implementation. This Plan spells out how the City intends to manage its water resources through both conservation and source development. Most of the management programs are ongoing and the City will continue those. These measures include a water waste prevention ordinance, metering, conservation pricing, public education, plumbing retrofits, customer water surveys, washing machine rebates, toilet replacements, conservation programs, and school education programs.

Some of the main topics required in the UWMP include:

- Water supply reliability – Assessment of water source reliability over a 20-year planning period, in five-year increments, considering future demands, growth, and population to ensure that adequate water supplies are available to meet existing and future water needs.
- Water service reliability and drought risk assessment – Conduct a dry year water reliability assessment for a single dry and multiple dry (up to five consecutive) years.
- Water shortage contingency plan – A WSCP consisting of six drought stages (up to 10 percent, up to 20 percent, up to 30 percent, up to 40 percent, up to 50 percent, and greater than 50 percent reductions).

In 2009, the State approved SB X7-7, which amended the California Water Code to require water suppliers to set goals for water use reductions of 10% by December 31, 2015, and 20% by December 31, 2020. If a supplier does not meet the goals, they will not be eligible for State water grants or loans. A baseline per capita water use was determined based on a ten-year period between December 31, 2004 and December 31, 2010. Clovis' baseline usage was determined to be 249 gallons per capita per day (gpcd). The 2015 interim target was 224 gpcd and the 2020 target was 199 gpcd. The 2015 target was easily met due to the

mandatory State-required reductions in 2015. In 2020, the City achieved a per capita water use of 181 gpcd, thereby meeting the 2020 target by 18 gpcd, or approximately 9% additional water use reduction.

The Water Shortage Contingency Plan (WSCP) is a detailed plan for how the City intends to respond to foreseeable and unforeseeable water shortages. A water shortage occurs when the water supply is reduced to a level that cannot support typical demand at any given time. The WSCP is used to provide guidance to the City's elected officials, staff, and the public by identifying response actions to allow for efficient management of any water shortage with predictability and accountability. The WSCP provides the tools to maintain reliable supplies and reduce the impacts of supply interruptions due to extended drought or catastrophic supply interruptions. The 2021 WSCP is a standalone document included as Appendix E in the UWMP and can be modified as needed.

Changes from the 2015 WSCP include requirements to address a five-year drought instead of a three-year drought, the inclusion of six standard water shortage stages instead of four, and making the WSCP a standalone plan instead of an analysis included as a section in the 2015 UWMP.

Prior to adopting the UWMP and WSCP, the law requires the plans be made available for public inspection and a public hearing be held. This hearing was noticed in the Fresno Bee on June 14 and June 21, 2021. No public comment was received by staff as of the preparation date of this report. The Plan was also circulated to public agencies in the vicinity that might be affected by the Plan, and there have been no comments received as of the preparation date of this report.

FISCAL IMPACT

The cost to prepare the UWMP and WSCP was included in the 2020-21 Water Enterprise budget. The plans do not propose any significant new demand reduction measures so there are no expected fiscal impacts.

REASON FOR RECOMMENDATION

The City is required by State law to update its UWMP every five years. It has been five years since the City's last plan update. The updated UWMP and WSCP will allow the City to increase its commitment to water resource management.

ACTIONS FOLLOWING APPROVAL

Staff will modify the plans as directed by Council if required, and will submit copies of the UWMP and WSCP to the State Department of Water Resources, the California State Library, the City of Fresno, and Fresno County within 30 days of adoption.

Prepared by: Paul Armendariz, Assistant Public Utilities Director

Reviewed by: City Manager 

RESOLUTION 21-____**A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF CLOVIS ADOPTING THE 2020 URBAN WATER MANAGEMENT PLAN AND THE WATER SHORTAGE CONTINGENCY PLAN**

WHEREAS, the Urban Water Management Planning Act (Water Code Sections 10610–10656 and 10608) requires every urban water supplier to prepare an Urban Water Management Plan (UWMP), the primary function of which is to support the suppliers' long-term resource planning to ensure that adequate water supplies are available to meet existing and future water needs; and

WHEREAS, the City of Clovis (City) is an urban supplier of water providing water to over 37,000 customers; and

WHEREAS, the UWMP shall be periodically reviewed at least once every five years, and the City shall make any amendments or changes to its plan which are indicated by the review; and

WHEREAS, the Water Shortage Contingency Plan (WSCP) is included as an appendix in the UWMP and provides an action plan for a drought or catastrophic water supply; and

WHEREAS, the City has prepared and circulated a draft Urban Water Management Plan and Water Shortage Contingency Plan for public review, and properly noticed a public hearing regarding said plan held by the City Council on July 12, 2021; and

WHEREAS, the Clovis City Council considered the Urban Water Management Plan and Water Shortage Contingency Plan, staff report, and all public testimony on July 12, 2021.

NOW, THEREFORE, BE IT RESOLVED as follows:

1. The Clovis City Council does hereby adopt the 2020 Urban Water Management Plan and Water Shortage Contingency Plan as presented to this Council on July 12, 2021;
2. That copies of said plans be forwarded to the State of California, Department of Water Resources, City of Fresno, Fresno County, and the California State Library for filing within 30 days of this date;
3. The Public Utilities Director is hereby authorized and directed to implement the demand management measures as set forth in the 2020 Urban Water Management Plan and Water Shortage Contingency Plan, which includes water shortage contingency analysis and recommendations to the City Council regarding necessary procedures,

rules, and regulations to carry out effective and equitable water conservation and water recycling programs;

4. In a water shortage, the Public Utilities Director is hereby authorized to declare a Water Shortage Emergency according to the Stages of Action indicated in the Plan and implement necessary elements of the plans;

5. The Public Utilities Director shall recommend to the City Council additional procedures, rules, and regulations to carry out effective and equitable allocation of water resources.

* * * * *

The foregoing resolution was adopted at a regular meeting of the City Council of the City of Clovis held on July 12, 2021, by the following vote, to wit:

AYES:
NOES:
ABSENT:
ABSTAIN:

DATED:

Mayor

City Clerk

Executive Summary (Lay Description)

Legal Requirements:

CWC §10630.5 Each plan shall include a simple lay description of how much water the agency has on a reliable basis, how much it needs for the foreseeable future, what the agency’s strategy is for meeting its water needs, the challenges facing the agency, and any other information necessary to provide a general understanding of the agency’s plan.

The 2020 UWMP has been prepared in compliance with the UWMPA and the Water Conservation Act of 2009 (Senate Bill [SB] X7-7) by Provost & Pritchard Consulting Group and the City of Clovis.

The purpose of the UWMP is to maintain efficient use of urban water supplies, continue to promote conservation programs and policies, ensure that sufficient water supplies are available for future beneficial use, and provide a mechanism for response during water drought conditions. This report, which was prepared in compliance with the California Water Code and as set forth in the 2020 Urban Water Management Plan Guidebook for Urban Water Suppliers (DWR, 2021) established by the DWR (UWMP Guidebook), constitutes the City of Clovis (City) 2020 UWMP.

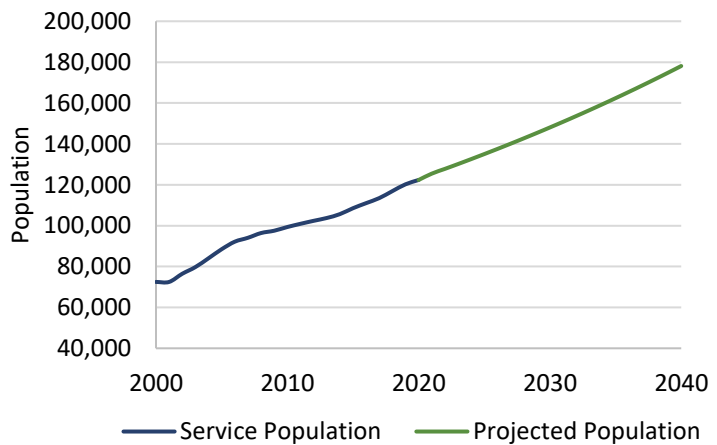
The UWMP is organized into ten Sections, including: Section 1 – Introduction and Overview, Section 2 – Plan Preparation, Section 3 – System Description, Section 4 – System Demands, Section 5 – SB X-7 Baselines, Targets, and Compliance, Section 6 – System Supplies, Section 7 – Water Service Reliability, Section 8 – Water Shortage Contingency Planning, Section 9 – Demand Management Measures, and Section 10 – Plan Adoption, Submittal, and Implementation.

This UWMP has been prepared for the City of Clovis and is not a regional or joint plan, but instead an individual plan for the City. The plan is based on the calendar year and is reported in units of acre-feet (one acre-foot is equivalent to approximately 325,851 gallons).

System Description

The City’s water system provides water supplies to approximately 122,350 people throughout the City of Clovis and the county island of Tarpey Village. The population of the City is anticipated to grow by almost two percent per year, while that of Tarpey Village is anticipated to remain stable. The figure (shown at right) illustrates the population growth anticipated in the planning horizon of this plan.

Figure ES-1: Water Users by Sectors

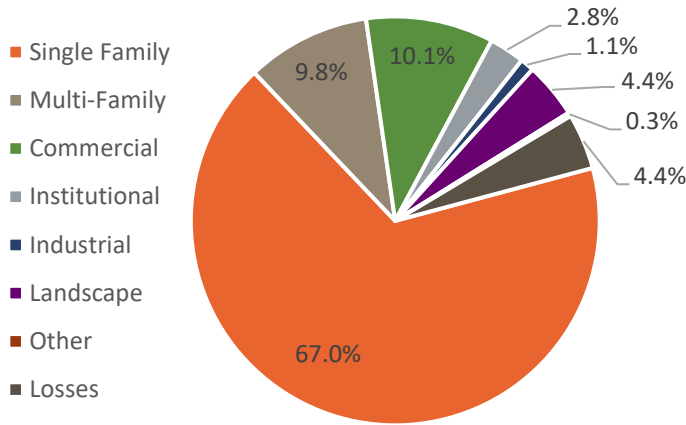


The City Limits currently encompasses 25.9 square miles. The City’s Sphere of Influence (SOI) covers 34.9 square miles, while the City’s General Plan encompasses approximately 74.3 square miles.

System Demands

The City’s water demands are tracked by water use sectors, such as single-family residential, commercial, or industrial, to name a few; the composition of the City’s customers is shown below.

Figure ES-2: Water Users by Sectors



The overall system demands have been increasing in the past five years due to population growth. However, the water use per person, saw a sharp decline in 2015 in response to mandatory drought restrictions, followed by a slight increase as the 2012-2016 drought ended. Usage has remained well below pre-drought levels since 2016, as shown in the following table.

Table ES-1: Past Water Production

Year	Total Annual Production (AF)	Population	Per Capita Consumption (gpcd)
2010	24,735	99,335	222
2011	23,931	100,895	212
2012	26,110	102,362	228
2013	27,120	103,739	233
2014	25,067	105,640	212
2015	20,031	108,532	165
2016	20,623	111,015	166
2017	22,470	113,477	177
2018	23,123	116,891	177
2019	22,951	120,218	170
2020	24,828	122,350	181

The water supply sources include groundwater, surface water and recycled water supplies, which are the basis for the City’s water supply portfolio.

The City’s current and projected water use is shown below, in acre-feet, separated by customer type. The last row illustrates the City’s commitment to intentional groundwater recharge. Per the DWR guidebook, this table does not include recycled water uses, as those are reported in [Section 6, System Supplies](#).

Table ES-2: Current and Projected Water Use

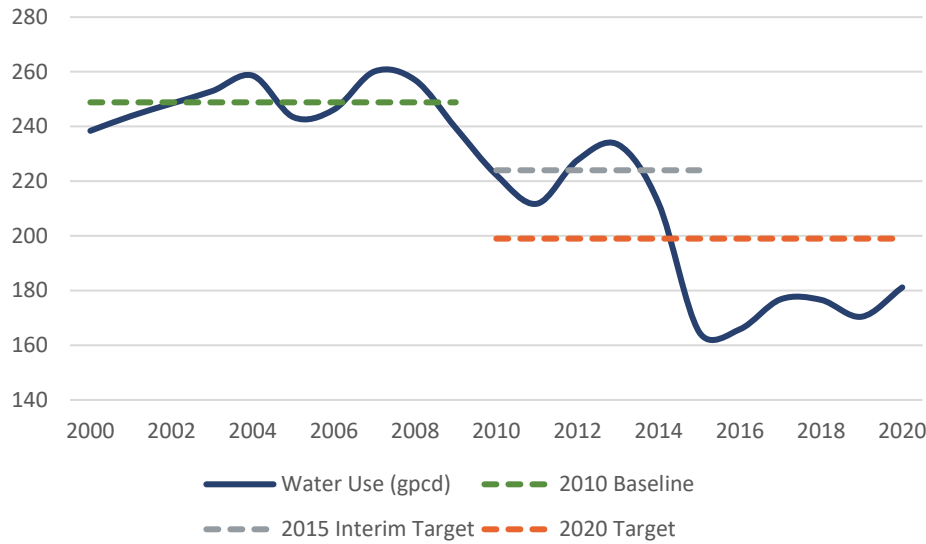
Use Type	2020	2025	2030	2035	2040
Single Family	16,638	18,546	18,106	19,901	21,874
Multi-Family	2,434	2,713	2,715	2,978	3,266
Commercial	2,518	3,052	3,346	3,670	4,026
Institutional	703	852	934	1,025	1,124
Industrial	267	324	355	389	427
Landscape	1,102	1,336	1,465	1,607	1,763
Other	76	93	101	111	122
Water Loss	1,090	1,321	1,449	1,589	1,743
Subtotal	24,828	28,237	28,472	31,270	34,345
Recycled Water Use	710	3,100	5,500	6,300	9,400
Groundwater Recharge	5,316	8,400	8,400	8,400	8,400
Total	30,854	39,737	42,372	45,970	52,145

The residential water uses reflect the anticipated indoor residential water use standards discussed in AB 1668 and SB 606 of 55 gpcd until January 2025 and 50 gpcd until January 2030. The projected water use demands also reflect low-income house water demands. The total of the “Subtotal” and “Recycled Water Use” equals the total water into the system. Groundwater recharge does not enter the system, in terms of a per capita demand and the remaining supplies produced at the City’s Water Reuse Facility were not used in the system in 2020 but instead discharged to Fancher Creek.

SB X7-7 Compliance

The City’s 2020 per capita water use goal was set in the 2015 UWMP as 199 gallons per capita per day (gpcd). As discussed in the 2020 UWMP Guidebook, the City does not meet any criteria which would necessitate updating the target; therefore, 199 gpcd remains the 2020 water use target. With a water use of 181 gpcd, the City has met the target and achieved SB X7-7 compliance. As shown in the following figure, the City’s per capita water use remains well below the 199 gpcd target.

Figure ES-3: Historic Per Capita Water Use



System Supplies

The City has three main water supply sources: groundwater, surface water, and recycled water. As the City continues to grow, it intends to expand its surface water supply use, recycled water use, and to continue intentional groundwater recharge efforts to relieve pressure on the groundwater aquifer.

Groundwater

The City extracts groundwater from the Kings Subbasin, an unadjudicated basin, with a status of critically overdrafted. The City worked cooperatively with several other agencies in the subbasin to prepare the North Kings Groundwater Sustainability Plan (NKGSP), as required by the Sustainable Groundwater Management Act (SGMA). The NKGSP explains the subbasin characteristics in detail and provides direction for compliance with SGMA, namely sustainable management of the aquifer by 2040.

The City’s system contains more than 30 wells with a total capacity of approximately 37,690 gallons per minute with another 4,750 gpm of additional capacity planned in the next few years. In 2020, the City extracted 12,105 AF and conducted 5,316 AF of intentional recharge activities. It is presently understood that 9,400 AF per year can be sustainably used from the aquifer. The net impact to the subbasin in 2020 was positive and should aid in slowing or reversing the groundwater level declines. The City continues to remain dedicated to recharge, as shown in the projected intentional groundwater recharge numbers above.

Surface Water

In addition to the groundwater supplies, the City also has access to surface water through several different contracts, all of which are delivered to the City by the Fresno Irrigation District (FID). The various surface water supplies are from the Kings River and Central Valley Project.

The City has access to a proportional share of the FID entitlement depending on the water deliveries in a particular year. The average delivery the City has received of its total allocation is just over 17,000 AF per year, with the smallest delivery being 9,452 AF in 2015 and the largest of 24,958 in 2017.

The City, through FID, also has access to Central Valley Project, Class II water supplies, when available (Class II supplies are much less reliable than other surface water supplies).

The City executed a new, firm water supply, agreement with FID in 2019 that provides a surface water supply that does not fluctuate with the FID entitlement or allocation and will be available to the City on a consistent basis. This agreement provides for up to 7,000 AF per year by 2045, beginning at 1,000 AF in 2020.

Finally, as the City grows and annexes portions of the Garfield and International Water Districts, those CVP, Class I water rights will be transferred to the City and added to the overall water supply portfolio.

Recycled Water

The City’s Water Reuse Facility produces tertiary treated effluent that can be used for a variety of applications but is primarily used either as agriculture or landscape irrigation, with the remaining being discharged to nearby creeks. The City intends to continue to expand the beneficial users of the recycled water supply and show the volumes in the water supply portfolio. Use of recycled water in this manner will continue to offset the City’s use of potable sources for non-potable demands, such as irrigation.

Water Supply Reliability

Section 7 shows comparison of the City’s supplies and projected demands, to gauge the systems water supply reliability. This comparison is completed for ‘normal’ years when no drought conditions are present and water supplies are available in their expected quantities. All quantities are shown in acre-feet.

Table ES-3: Normal Year Supply and Demand Comparison

	2025	2030	2035	2040
Supply Totals	50,739	58,937	65,034	74,650
Demand Totals	39,737	42,824	46,422	52,598
Difference	11,002	16,113	18,611	22,052

The comparison is also completed for a single-dry year scenario and a five-year, multiple dry year scenario.

The single-dry year scenario used the 2015 drought as a model, with a significant reduction in surface water supplies. The only demand reduction employed in this scenario was to reduce intentional groundwater recharge; all customer demands were assumed to continue without mandatory conservation strategies. There are sufficient supplies to meet the demands for the single-dry year.

Table ES-4: Single Dry Year Supply and Demand Comparison

	2025	2030	2035	2040
Supply Totals	37,839	43,587	47,233	53,109
Demand Totals	34,272	37,359	40,957	47,133
Difference	3,567	6,228	6,276	5,976

The multiple-dry year scenario used the 2012-2016 drought as a model, utilizing the reductions in surface water supplies of those years for the projected supply totals. The demand reductions fluctuated from 5 percent in the first and fifth year, up to 20 percent in the fourth year. Intentional groundwater recharge was also reduced during this scenario, but not eliminated entirely. Without demand conservation, the City would still have sufficient supply to meet demands in all years except the fourth, but the redundancy or supply buffer is significantly reduced, therefore conservation strategies would be employed during a multiple year drought.

Table ES-5: Multiple Dry Year Supply and Demand Comparison

		2025	2030	2035	2040
First Year	Supply Totals	46,784	54,607	60,330	68,999
	Demand Totals	36,489	39,422	42,840	48,707
	Difference	10,294	15,185	17,489	20,292
Second Year	Supply Totals	45,093	52,576	57,958	66,095
	Demand Totals	34,183	36,962	40,200	45,758
	Difference	10,910	15,614	17,758	20,337
Third Year	Supply Totals	41,895	48,310	52,625	59,717
	Demand Totals	31,346	33,969	37,028	42,277
	Difference	10,550	14,341	15,597	17,440
Fourth Year	Supply Totals	37,839	43,587	47,233	53,109
	Demand Totals	28,005	30,474	33,353	38,293
	Difference	9,834	13,112	13,881	14,815
Fifth Year	Supply Totals	49,743	57,992	64,141	73,716
	Demand Totals	37,825	40,758	44,176	50,043
	Difference	11,918	17,235	19,965	23,674

Finally, the City prepared a Drought Risk Assessment, evaluating the preparedness of the City to contend with a drought immediately, in the next five years. This assessment draws upon the action detailed in the Water Shortage Contingency Plan. Again, in all years, except the fourth, the City is able to meet demands without significant reduction measures, but the redundancy of the system is not as robust, so action from the Water Shortage Contingency Plan would be anticipated.

Table ES-6: Five-Year Drought Risk Assessment

Year	Without WSCP Actions			Planned WSCP Actions			
	Total Water Use	Total Supplies	Surplus/Shortfall w/o WSCP Action	WSCP - supply augmentation benefit	WSCP - use reduction savings benefit	Revised Surplus/ (shortfall)	Resulting % Use Reduction from WSCP action
2021	31,443	41,809	10,366	0	1,275	11,642	4%
2022	32,741	40,513	7,772	0	2,619	10,391	8%
2023	34,040	38,068	4,028	0	4,031	8,059	12%
2024	35,339	34,537	(801)	0	5,511	4,710	16%
2025	36,637	45,893	9,256	0	1,412	10,668	4%

Demand Management Measures

The last portion of the UWMP is documentation of the City’s efforts to educate the public and manage the water system demands proactively. The City utilizes many measures to help manage demand including: Water Waste Prevention Ordinance, Metering, Conservation Pricing, Public Education, Distribution System Loss assistance, Water Conservation Program Coordinator, plumbing retrofits, water surveys, washing machine rebates, toilet replacements, conservation programs, and school education programs.

The City has implemented a water waste ordinance and utilizes the steps listed therein to remind customers that water wasting is not allowed. Additionally, customers can request assistance with their water consumption through these varied programs in an effort to reduce consumption. With a volumetric billing rate and an additional charge during times of drought, the City’s programs are helpful for all types of water customers throughout the system.

Urban Water Management Plan 2020 Update



July 2021



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Abbreviations

AB State Assembly Bill

AF acre-feet

AFY acre-feet per year

AWWA.....American Water Works Association

BGBF.....Boswell Groundwater Banking Facility

CIMIS California Irrigation Management Information System

City City of Clovis

CSAcounty service area

CVP Central Valley Project

CVWAC Central Valley Water Awareness Committee

CWC..... California Water Code

DBCP.....Dibromochloropropane

DMM Demand Management Measures

DOF.....Department of Finance

DRA..... Drought Risk Assessment

DWRDepartment of Water Resources

ENSO El Niño Southern Oscillation

ETo evapotranspiration

Fe..... Iron

FIDFresno Irrigation District

FMFCD..... Fresno Metropolitan Flood Control District

ft..... feet

gpcd..... gallons per capita per day

gpf gallons per flush

gpdgallons per day

gpmgallons per minute

GSP Groundwater Sustainability Plan

GWD.....Garfield Water District

IWD International Water District

IWF..... integrated water factor

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kWh	kilowatt hours
MG	million gallons
mgd	million gallons per day
Mn	Manganese
MTBE	.....	Methyl tert-butyl ether
MWELO	.....	Model Water Efficient Landscape Ordinance
NKGSA	.....	North Kings Groundwater Sustainability Agency
NOAA	.....	National Oceanic and Atmospheric Administration
O&M	.....	Operations and Maintenance
PFAS	.....	Perfluoroalkyl Substances
PG&E	.....	Pacific Gas and Electric Company
RUWMP	.....	Regional Urban Water Management Plan
RWRF	.....	Fresno-Clovis Regional Wastewater Reclamation Facility
RWMP	.....	Recycled Water Master Plan
SB	.....	State Senate Bill
SB X7-7	.....	Water Conservation Act of 2009
SGMA	.....	Sustainable Groundwater Management Act of 2014
SOI	.....	Sphere of Influence
SWTP	.....	Surface Water Treatment Plant
TCP	.....	1,2,3 Trichloropropane
TDS	.....	total dissolved solids
ULFT	.....	ultra-low flush toilet
UWMP	.....	Urban Water Management Plan
UWMP Guidebook	.....	2020 Urban Water Management Plan Guidebook for Urban Water Suppliers
UWMPA	.....	Urban Water Management Plan Act
WBF	.....	Waldron Banking Facilities
WMP	.....	Water Master Plan
WRF	.....	Water Reuse Facility
WSCP	Water Shortage Contingency Plan
WUE	Water Use Efficiency
WWD	waterworks district

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Executive Summary (Lay Description)

Legal Requirements:

CWC §10630.5 Each plan shall include a simple lay description of how much water the agency has on a reliable basis, how much it needs for the foreseeable future, what the agency’s strategy is for meeting its water needs, the challenges facing the agency, and any other information necessary to provide a general understanding of the agency’s plan.

The 2020 UWMP has been prepared in compliance with the UWMPA and the Water Conservation Act of 2009 (Senate Bill [SB] X7-7) by Provost & Pritchard Consulting Group and the City of Clovis.

The purpose of the UWMP is to maintain efficient use of urban water supplies, continue to promote conservation programs and policies, ensure that sufficient water supplies are available for future beneficial use, and provide a mechanism for response during water drought conditions. This report, which was prepared in compliance with the California Water Code and as set forth in the 2020 Urban Water Management Plan Guidebook for Urban Water Suppliers (DWR, 2021) established by the DWR (UWMP Guidebook), constitutes the City of Clovis (City) 2020 UWMP.

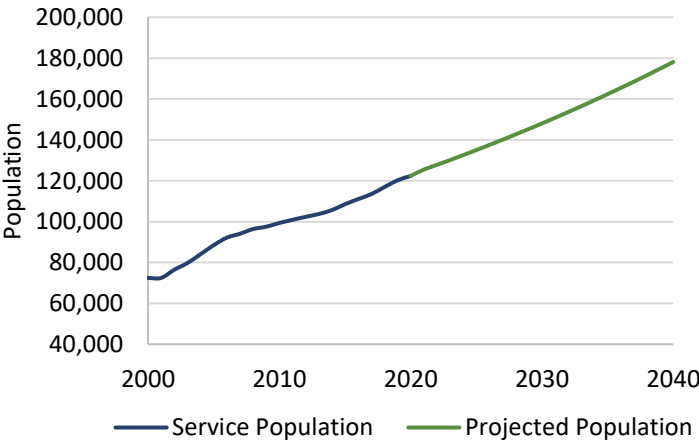
The UWMP is organized into ten Sections, including: Section 1 – Introduction and Overview, Section 2 – Plan Preparation, Section 3 – System Description, Section 4 – System Demands, Section 5 – SB X-7 Baselines, Targets, and Compliance, Section 6 – System Supplies, Section 7 – Water Service Reliability, Section 8 – Water Shortage Contingency Planning, Section 9 – Demand Management Measures, and Section 10 – Plan Adoption, Submittal, and Implementation.

This UWMP has been prepared for the City of Clovis and is not a regional or joint plan, but instead an individual plan for the City. The plan is based on the calendar year and is reported in units of acre-feet (one acre-foot is equivalent to approximately 325,851 gallons).

System Description

The City’s water system provides water supplies to approximately 122,350 people throughout the City of Clovis and the county island of Tarpey Village. The population of the City is anticipated to grow by almost two percent per year, while that of Tarpey Village is anticipated to remain stable. The figure (shown at right) illustrates the population growth anticipated in the planning horizon of this plan.

Figure ES-1: Water Users by Sectors

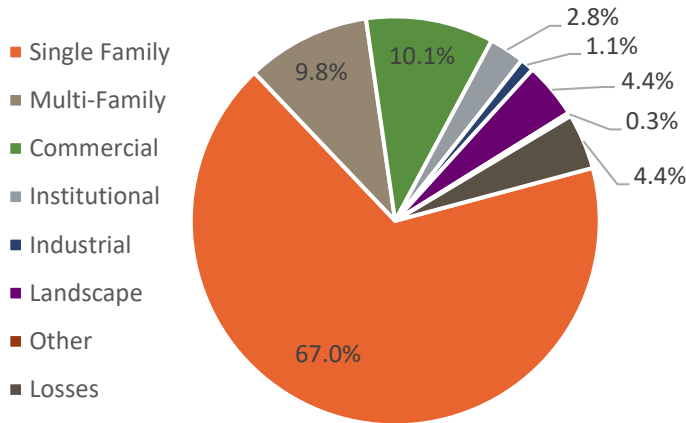


The City Limits currently encompasses 25.9 square miles. The City’s Sphere of Influence (SOI) covers 34.9 square miles, while the City’s General Plan encompasses approximately 74.3 square miles.

System Demands

The City’s water demands are tracked by water use sectors, such as single-family residential, commercial, or industrial, to name a few; the composition of the City’s customers is shown below.

Figure ES-2: Water Users by Sectors



The overall system demands have been increasing in the past five years due to population growth. However, the water use per person, saw a sharp decline in 2015 in response to mandatory drought restrictions, followed by a slight increase as the 2012-2016 drought ended. Usage has remained well below pre-drought levels since 2016, as shown in the following table.

Table ES-1: Past Water Production

Year	Total Annual Production (AF)	Population	Per Capita Consumption (gpcd)
2010	24,735	99,335	222
2011	23,931	100,895	212
2012	26,110	102,362	228
2013	27,120	103,739	233
2014	25,067	105,640	212
2015	20,031	108,532	165
2016	20,623	111,015	166
2017	22,470	113,477	177
2018	23,123	116,891	177
2019	22,951	120,218	170
2020	24,828	122,350	181

The water supply sources include groundwater, surface water and recycled water supplies, which are the basis for the City’s water supply portfolio.

The City’s current and projected water use is shown below, in acre-feet, separated by customer type. The last row illustrates the City’s commitment to intentional groundwater recharge. Per the DWR guidebook, this table does not include recycled water uses, as those are reported in Section 6, System Supplies.

Table ES-2: Current and Projected Water Use

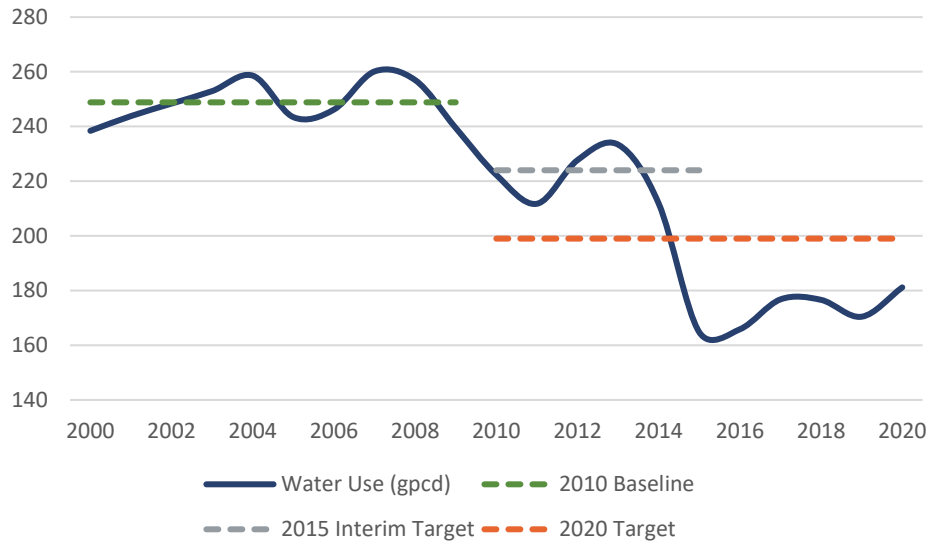
Use Type	2020	2025	2030	2035	2040
Single Family	16,638	18,546	18,106	19,901	21,874
Multi-Family	2,434	2,713	2,715	2,978	3,266
Commercial	2,518	3,052	3,346	3,670	4,026
Institutional	703	852	934	1,025	1,124
Industrial	267	324	355	389	427
Landscape	1,102	1,336	1,465	1,607	1,763
Other	76	93	101	111	122
Water Loss	1,090	1,321	1,449	1,589	1,743
Subtotal	24,828	28,237	28,472	31,270	34,345
Recycled Water Use	710	3,100	5,500	6,300	9,400
Groundwater Recharge	5,316	8,400	8,400	8,400	8,400
Total	30,854	39,737	42,372	45,970	52,145

The residential water uses reflect the anticipated indoor residential water use standards discussed in AB 1668 and SB 606 of 55 gpcd until January 2025 and 50 gpcd until January 2030. The projected water use demands also reflect low-income house water demands. The total of the “Subtotal” and “Recycled Water Use” equals the total water into the system. Groundwater recharge does not enter the system, in terms of a per capita demand and the remaining supplies produced at the City’s Water Reuse Facility were not used in the system in 2020 but instead discharged to Fancher Creek.

SB X7-7 Compliance

The City’s 2020 per capita water use goal was set in the 2015 UWMP as 199 gallons per capita per day (gpcd). As discussed in the 2020 UWMP Guidebook, the City does not meet any criteria which would necessitate updating the target; therefore, 199 gpcd remains the 2020 water use target. With a water use of 181 gpcd, the City has met the target and achieved SB X7-7 compliance. As shown in the following figure, the City’s per capita water use remains well below the 199 gpcd target.

Figure ES-3: Historic Per Capita Water Use



System Supplies

The City has three main water supply sources: groundwater, surface water, and recycled water. As the City continues to grow, it intends to expand its surface water supply use, recycled water use, and to continue intentional groundwater recharge efforts to relieve pressure on the groundwater aquifer.

Groundwater

The City extracts groundwater from the Kings Subbasin, an unadjudicated basin, with a status of critically overdrafted. The City worked cooperatively with several other agencies in the subbasin to prepare the North Kings Groundwater Sustainability Plan (NKGSP), as required by the Sustainable Groundwater Management Act (SGMA). The NKGSP explains the subbasin characteristics in detail and provides direction for compliance with SGMA, namely sustainable management of the aquifer by 2040.

The City’s system contains more than 30 wells with a total capacity of approximately 37,690 gallons per minute with another 4,750 gpm of additional capacity planned in the next few years. In 2020, the City extracted 12,105 AF and conducted 5,316 AF of intentional recharge activities. It is presently understood that 9,400 AF per year can be sustainably used from the aquifer. The net impact to the subbasin in 2020 was positive and should aid in slowing or reversing the groundwater level declines. The City continues to remain dedicated to recharge, as shown in the projected intentional groundwater recharge numbers above.

Surface Water

In addition to the groundwater supplies, the City also has access to surface water through several different contracts, all of which are delivered to the City by the Fresno Irrigation District (FID). The various surface water supplies are from the Kings River and Central Valley Project.

The City has access to a proportional share of the FID entitlement depending on the water deliveries in a particular year. The average delivery the City has received of its total allocation is just over 17,000 AF per year, with the smallest delivery being 9,452 AF in 2015 and the largest of 24,958 in 2017.

The City, through FID, also has access to Central Valley Project, Class II water supplies, when available (Class II supplies are much less reliable than other surface water supplies).

The City executed a new, firm water supply, agreement with FID in 2019 that provides a surface water supply that does not fluctuate with the FID entitlement or allocation and will be available to the City on a consistent basis. This agreement provides for up to 7,000 AF per year by 2045, beginning at 1,000 AF in 2020.

Finally, as the City grows and annexes portions of the Garfield and International Water Districts, those CVP, Class I water rights will be transferred to the City and added to the overall water supply portfolio.

Recycled Water

The City’s Water Reuse Facility produces tertiary treated effluent that can be used for a variety of applications but is primarily used either as agriculture or landscape irrigation, with the remaining being discharged to nearby creeks. The City intends to continue to expand the beneficial users of the recycled water supply and show the volumes in the water supply portfolio. Use of recycled water in this manner will continue to offset the City’s use of potable sources for non-potable demands, such as irrigation.

Water Supply Reliability

Section 7 shows comparison of the City’s supplies and projected demands, to gauge the systems water supply reliability. This comparison is completed for ‘normal’ years when no drought conditions are present and water supplies are available in their expected quantities. All quantities are shown in acre-feet.

Table ES-3: Normal Year Supply and Demand Comparison

	2025	2030	2035	2040
Supply Totals	50,739	58,937	65,034	74,650
Demand Totals	39,737	42,824	46,422	52,598
Difference	11,002	16,113	18,611	22,052

The comparison is also completed for a single-dry year scenario and a five-year, multiple dry year scenario.

The single-dry year scenario used the 2015 drought as a model, with a significant reduction in surface water supplies. The only demand reduction employed in this scenario was to reduce intentional groundwater recharge; all customer demands were assumed to continue without mandatory conservation strategies. There are sufficient supplies to meet the demands for the single-dry year.

Table ES-4: Single Dry Year Supply and Demand Comparison

	2025	2030	2035	2040
Supply Totals	37,839	43,587	47,233	53,109
Demand Totals	34,272	37,359	40,957	47,133
Difference	3,567	6,228	6,276	5,976

The multiple-dry year scenario used the 2012-2016 drought as a model, utilizing the reductions in surface water supplies of those years for the projected supply totals. The demand reductions fluctuated from 5 percent in the first and fifth year, up to 20 percent in the fourth year. Intentional groundwater recharge was also reduced during this scenario, but not eliminated entirely. Without demand conservation, the City would still have sufficient supply to meet demands in all years except the fourth, but the redundancy or supply buffer is significantly reduced, therefore conservation strategies would be employed during a multiple year drought.

Table ES-5: Multiple Dry Year Supply and Demand Comparison

		2025	2030	2035	2040
First Year	Supply Totals	46,784	54,607	60,330	68,999
	Demand Totals	36,489	39,422	42,840	48,707
	Difference	10,294	15,185	17,489	20,292
Second Year	Supply Totals	45,093	52,576	57,958	66,095
	Demand Totals	34,183	36,962	40,200	45,758
	Difference	10,910	15,614	17,758	20,337
Third Year	Supply Totals	41,895	48,310	52,625	59,717
	Demand Totals	31,346	33,969	37,028	42,277
	Difference	10,550	14,341	15,597	17,440
Fourth Year	Supply Totals	37,839	43,587	47,233	53,109
	Demand Totals	28,005	30,474	33,353	38,293
	Difference	9,834	13,112	13,881	14,815
Fifth Year	Supply Totals	49,743	57,992	64,141	73,716
	Demand Totals	37,825	40,758	44,176	50,043
	Difference	11,918	17,235	19,965	23,674

Finally, the City prepared a Drought Risk Assessment, evaluating the preparedness of the City to contend with a drought immediately, in the next five years. This assessment draws upon the action detailed in the Water Shortage Contingency Plan. Again, in all years, except the fourth, the City is able to meet demands without significant reduction measures, but the redundancy of the system is not as robust, so action from the Water Shortage Contingency Plan would be anticipated.

Table ES-6: Five-Year Drought Risk Assessment

Year	Without WSCP Actions			Planned WSCP Actions			
	Total Water Use	Total Supplies	Surplus/Shortfall w/o WSCP Action	WSCP - supply augmentation benefit	WSCP - use reduction savings benefit	Revised Surplus/ (shortfall)	Resulting % Use Reduction from WSCP action
2021	31,443	41,809	10,366	0	1,275	11,642	4%
2022	32,741	40,513	7,772	0	2,619	10,391	8%
2023	34,040	38,068	4,028	0	4,031	8,059	12%
2024	35,339	34,537	(801)	0	5,511	4,710	16%
2025	36,637	45,893	9,256	0	1,412	10,668	4%

Demand Management Measures

The last portion of the UWMP is documentation of the City’s efforts to educate the public and manage the water system demands proactively. The City utilizes many measures to help manage demand including: Water Waste Prevention Ordinance, Metering, Conservation Pricing, Public Education, Distribution System Loss assistance, Water Conservation Program Coordinator, plumbing retrofits, water surveys, washing machine rebates, toilet replacements, conservation programs, and school education programs.

The City has implemented a water waste ordinance and utilizes the steps listed therein to remind customers that water wasting is not allowed. Additionally, customers can request assistance with their water consumption through these varied programs in an effort to reduce consumption. With a volumetric billing rate and an additional charge during times of drought, the City’s programs are helpful for all types of water customers throughout the system.

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1 Introduction

1.1 Background and Purpose

The California Water Code requires urban water suppliers within the state to prepare and adopt Urban Water Management Plans (UWMPs) for submission to the California Department of Water Resources (DWR). The UWMPs, which must be filed every five years, must satisfy the requirements of the Urban Water Management Planning Act (UWMPA) of 1983 including amendments that have been made to the Act and other applicable regulations. The UWMPA requires urban water suppliers servicing 3,000 or more connections or supplying more than 3,000 acre-feet (AF) of water annually to prepare an UWMP.

The purpose of the UWMP is to maintain efficient use of urban water supplies, continue to promote conservation programs and policies, ensure that sufficient water supplies are available for future beneficial use, and provide a mechanism for response during water drought conditions. This report, which was prepared in compliance with the California Water Code and as set forth in the 2020 Urban Water Management Plan Guidebook for Urban Water Suppliers (DWR, 2021) established by the DWR (UWMP Guidebook), constitutes the City of Clovis (City) 2020 UWMP.

This 2020 UWMP was prepared in compliance with the UWMPA and the Water Conservation Act of 2009 (Senate Bill [SB] X7-7) by Provost & Pritchard Consulting Group and the City. Contact information for the City and Provost & Pritchard Consulting Group is included at the beginning of this document.

1.2 Previous Urban Water Management Plan

The City previously prepared an UWMP in 2015, which was approved and adopted by the City Council in July 2016. Following adoption, the 2015 UWMP was submitted to and approved by DWR.

This 2020 UWMP serves as an update to the 2015 UWMP (Carollo Engineers, Inc, 2016) and complies with all new UWMP requirements and regulations.

1.3 Urban Water Management Planning and the California Water Code

This section summarizes the California Water Code (CWC) sections that are applicable to UWMPs.

1.3.1 Urban Water Management Planning Act of 1983

In 1983, State Assembly Bill (AB) 797 modified the California Water Code Division 6 by creating the UWMPA. Several amendments to the original UWMPA, which were introduced since 1983, have increased the data requirements and planning elements to be included in UWMPs.

Initial amendments to the UWMPA required that total projected water use be compared to water supply sources over the next 20 years in 5-year increments. Recent DWR guidelines also suggest projecting through a 25-year planning horizon to maintain a 20-year timeframe until the next UWMP

update has been completed. This is merely a guideline and not a requirement of the UWMPA. Therefore, the use of a 25-year planning horizon as opposed to a 20-year planning horizon is left up to the discretion of the agency. The City has opted to use a 20-year planning horizon for the purposes of this UWMP.

Other amendments require that UWMPs include provisions for recycled water use, demand management measures (DMMs), and a water shortage contingency plan. The UWMPA requires inclusion of a water shortage contingency plan (WSCP), which meets the specifications, set forth therein. Recycled water was added in the reporting requirements for water usage and figures prominently in the requirements for evaluation of alternative water supplies when future projections predict the need for additional water supplies. Each urban water purveyor must coordinate the preparation of the water shortage contingency plan with other urban water purveyors in the area to the extent practicable. Each water supplier must also describe their water demand management measures that are being implemented or scheduled for implementation.

In addition to the UWMPA and its amendments, several other regulations are related to the content of the UWMP. In summary, the key relevant regulations are:

- **Assembly Bill (AB) 1668 (Friedman, 2018), and Senate Bill (SB) 606 (Hertzberg, 2018):** These two bills amended existing law to provide expanded and new authorities and requirements to enable permanent changes and actions for those purposes, improving the state's water future for generations to come. SB 606 and AB 1668 provides complementary authorities and requirements that affect water conservation and drought planning for urban water suppliers, agricultural water suppliers, small water suppliers, and rural communities.
- **SB 606 (Hertzberg, 2018):** This bill added several new requirements including changes to the stages required by the Water Shortage Contingency Plan from four to six, preparation of a drought risk assessment to be included in the UWMP, and addition of a Lay Description to the UWMP.
- **SB 664 (Hertzberg, 2015):** Requires urban water suppliers to provide a seismic risk assessment and mitigation plan as part of their UWMP update or approved equal plan.
- **AB 1465 (Hill, 2009):** Requires water suppliers to describe opportunities related to recycled water use and stormwater recapture to offset potable water use.
- **AB 1420 (Laird, 2007):** Requires implementation of DMMs/best management practices (BMPs) and meeting the 20x2020 targets to qualify for water management grants or loans.
- **SB 1087 (Flores, 2005):** Requires water suppliers to report single-family residential (SFR) and multi-family residential (MFR) projected water use for lower income areas separately.
- **Amendment SB 318 (Alpert, 2004):** Requires the UWMP to describe the opportunities for development of desalinated water, including but not limited to ocean water, brackish water, and groundwater, as long-term supply.
- **AB 105 (Wiggins, 2004):** Requires urban water suppliers to submit their UWMPs to the California State Library.
- **Amendments SB 610 (Costa, 2001), and AB 901 (Daucher, 2001):** Effective beginning January 1, 2002, require counties and cities to consider information relating to the availability of water to

supply large new developments by mandating the preparation of further water supply planning (Daucher) and Water Supply Assessments (Costa).

1.3.2 Water Conservation Act of 2009 (SB X7-7)

This bill requires the State to achieve a 20-percent reduction in per capita water use by 2020. Retail water suppliers are required to comply with the water conservation requirements in SB X7-7 to be eligible for State water grants or loans. Each retail water agency shall establish water use targets and track progress towards decreasing daily per capita water use.

1.3.3 Applicable Changes to the Water Code since 2015 UWMP

The applicable changes to the CWC since the completion of the City’s 2015 UWMP are summarized in **Table 1.1**.

Table 1-1: Applicable Changes to the Water Code Since 2015

Topic	CWC Section	Legislative Bill	Summary
Water Shortage Contingency Plan	10620(d)(2) 10632 10640(b)	SB 606	Requires each urban water supplier to prepare a water shortage contingency plan. A water shortage contingency plan must include six levels, including 10, 20, 30, 40, 50 and greater than 50 percent supply shortages. The water shortage contingency plan must be provided to the supplier’s customers within 30 days of adoption.
Submittal Date	10621(f)		Requires each urban water supplier to submit its 2020 plan to the Department of Water Resources by July 1, 2021.
UWMP Contents	10630.5	SB 606	Requires each plan to include a simple lay description of its water supply availability, projected needs, and reliability.
UWMP Contents	10631(a)	SB 606	<p>Requires each plan to include the following new or revised items discussing:</p> <ul style="list-style-type: none"> Current and projected land uses within the service area; Supply availability during normal and single dry years and a five-year drought; Conjunctive use, if applicable, and how new supplies will be developed; and The current groundwater sustainability plan (GSP) for the groundwater basin if groundwater is a source supply.
Energy Usage Reporting	16031.2(a)	SB 606	Changes requirements for reporting energy usage for extracting and delivering water from optional to required.

Topic	CWC Section	Legislative Bill	Summary
Seismic Risk Assessment and Mitigation Plan	10632.5	SB 664	Requires urban water suppliers to provide a seismic risk assessment and mitigation plan as part of their UWMP update or approved equal plan.
Drought Risk Assessment	10635.5(b)	SB 606	Requires urban water suppliers to provide a drought risk assessment as part of information considered in developing the demand management measures and water supply projects.
Plan Availability	10645	SB 606	Requires urban water suppliers to make the UWMP and water shortage contingency plan available to the public for review within 30 days of filing the plan(s) with the State.

1.4 Water Management Planning Efforts

The City is committed to provide a reliable and high-quality water supply to its customers. To ensure that the City will be able to continue to reliably serve the residents of Clovis in the future, the City has conducted/participated in several important planning efforts that relate to water supply planning and are related to the UWMP. Some of the most critical water planning efforts are summarized below:

- City of Clovis General Plan:** In August 2014, the City adopted an update to its General Plan that guides land use and development for the Clovis Planning Area that is expected to accommodate 80 years of growth. The General Plan focuses on the preservation and enhancement of the existing Clovis community while allowing the continued development of three Urban Centers to ensure the long-term viability of the City.
- Water Master Plan Update:** The City has previously prepared three Water Master Plans (WMP). The "Phase I" Water Master Plan was completed in 1995, which was prepared to support the City's 1994 Clovis General Plan. The primary purpose of the Phase I Master Plan was to examine the feasibility of continued growth within Clovis from a water resource perspective. The findings of the Phase I Master Plan recommended a conjunctive use approach, where the City would utilize a combination of groundwater, groundwater recharge, and surface water to meet its customers' demands. The 1999 Phase II Water Master Plan was a continuation of the Phase I Master Plan that identified water supply and distribution system infrastructure facilities to support the General Plan growth based on the conjunctive use approach. The Phase III Water Master Plan, completed in 2018, served to update the Phase II Water Master Plan to reflect changes in demands, supplies, and potential service area to correspond with the 2014 General Plan.
- Recycled Water Master Plan:** In 2005, the City developed a Recycled Water Master Plan (RWMP) to serve as a tool for the City to evaluate and implement recycled water infrastructure projects to convey disinfected tertiary-treated water from the City's Water Reuse Facility (WRF), located near the intersection of Ashlan Avenue and McCall Avenue, to recycled water users

within the City. Since the development of the 2005 Recycled Water Master Plan, the Water Reuse Facility has become operational, and the City has begun supplying recycled water. The Recycled Water Master Plan was updated in 2018 to reflect changes in potential use areas, conveyance alignments, and the 2014 General Plan boundaries.

- **Groundwater Sustainability Plan:** The City is a member of the North Kings Groundwater Sustainability Agency (NKGSA). The NKGSA prepared and submitted a Groundwater Sustainability Plan in January 2020 and is awaiting DWR’s review of the GSP that will be completed by or before January 2022. The NKGSA’s GSP was prepared in response to the Sustainable Groundwater Management Act of 2014 (SGMA), which is codified in California Water Code Section 10720 et seq. The legislation created a statutory framework for groundwater management in California that can be sustained during the planning and implementation horizon without causing undesirable results. SGMA requires governments and water agencies of critically overdrafted basins to reach sustainability by 2040.

1.5 UWMP Organization

This report is organized according to the recommended format provided in the DWR’s 2020 UWMP Guidebook. The UWMP contains ten sections, followed by appendices that provide supporting documentation for the information presented in the report. The sections are outlined below:

- **Executive Summary:** This section includes a lay description of the fundamental determinations of the UWMP regarding water service reliability, challenges ahead, and strategies for managing reliability risks.
- **Section 1 – Introduction and Overview:** This section provides background information for the 2020 UWMP and explains why the plan is needed.
- **Section 2 – Plan Preparation:** This section includes information on the development of the UWMP and efforts in coordination and outreach.
- **Section 3 – System Description:** This section describes the service area, population, and climate affecting the supplier’s water management planning. This section also presents an overview of the City’s water distribution system.
- **Section 4 – System Demands:** This section describes and quantifies the current and projected water uses within the City’s service area. This section will also address climate change as it relates to system water use.
- **Section 5 – SB X-7 Baselines, Targets, and Compliance:** This section describes the baselines and targets previously calculated in the 2015 UWMP. It also includes a description of the City’s efforts to meet the 2020 water use target.
- **Section 6 – System Supplies:** This section describes the current and projected sources of water available to the City. Descriptions of potential recycled water use, supply availability, and associated energy use are also included in this section. This section also addresses climate change as it relates to system supplies.

- **Section 7 – Water Service Reliability:** This section describes the reliability of the City’s current supply and evaluates the reliability 20 years out, including normal, single-dry years, and multiple-dry years. This section also provides a five-year reliability analysis and drought risk assessment and addresses climate change as it relates to water supply reliability.
- **Section 8 – Water Shortage Contingency Planning:** This section references the City’s staged plan for dealing with water shortages, including a catastrophic supply interruption.
- **Section 9 – Demand Management Measures:** This section describes the City's efforts to promote conservation and reduce water demand and defines the City's demand management measures.
- **Section 10 – Plan Adoption, Submittal, and Implementation:** This section describes the steps taken to adopt and submit the City’s UWMP and make it publicly available. This section also describes the City’s plan to implement the UWMP.

2 Plan Preparation

This section presents information on the development of the 2020 UWMP and efforts in coordination and outreach.

2.1 Basis for Preparing a Plan

Legal Requirements:

CWC §10617 "Urban water supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells for ultimate resale to customers. This part applies only to water supplied from public water systems subject to Chapter 4 (commencing with Section 116275) of Part 12 of Division 104 of the Health and Safety Code.

CWC §10620(b) Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.

CWC §10621(a) Each urban water supplier shall update its plan at least once every five years on or before December 31, in years ending in five and zero, except as provided in subdivision (d).

CWC §10621 (d) Each urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016.

CWC §10644(a)(2) The plan, or amendments to the plan, submitted to the department ... shall include any standardized forms, tables, or displays specified by the department.

CWC §10608.52(a) The department, in consultation with the board, the California Bay-Delta Authority or its successor agency, the State Department of Public Health, and the Public Utilities Commission, shall develop a single standardized water use reporting form to meet the water use information needs of each agency, including the needs of urban water suppliers that elect to determine and report progress toward achieving targets on a regional basis as provided in subdivision (a) of Section 10608.28.

CWC §10608.52 (b) At a minimum, the form shall be developed to accommodate information sufficient to assess an urban water supplier's compliance with conservation targets pursuant to Section 10608.24... The form shall accommodate reporting by urban water suppliers on an individual or regional basis as provided in subdivision (a) of Section 10608.28.

California Health and Safety Code §116275(h) "Public Water System" means a system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year.

The CWC defines an urban water supplier as “a water supplier, either publicly or privately owned, that directly provides potable municipal water to more than 3,000 end users or supplies more than 3,000 acre-feet of potable water annually at retail for municipal purposes”. **Table 2.1** documents the number of municipal connections and the volume of water supplied in 2020. The City is considered an urban retail water supplier.

Table 2-1: Public Water System (DWR Submittal Table 2-1)

Public Water System Number	Public Water System Name	Number of Municipal Connections 2020	Volume of Water Supplied 2020 (AF)
1010003	Clovis, City of	38,316	24,828

Notes:

Municipal connections include all connections, metered or unmetered, but not construction, recycled, and emergency water service connections.

Volume of Water Supplied includes all potable water into the system without correction for losses.

2.2 Individual Planning and Compliance

Water agencies are given the option to develop UWMPs individually or collectively as a regional group. While efforts to prepare the UWMP were coordinated with appropriate agencies, this UWMP was developed for the City service area only, and the City is not participating in a Regional UWMP as shown in **Table 2-2**.

Table 2-2: Plan Identification (DWR Submittal Table 2-2)

Select Only One	Type of Plan	Name of RUWMP or Regional Alliance (if applicable)
<input checked="" type="checkbox"/>	Individual UWMP	
<input type="checkbox"/>	Water Supplier is also a member of a RUWMP	N/A
<input type="checkbox"/>	Water Supplier is also a member of a Regional Alliance	N/A
<input type="checkbox"/>	Regional Urban Water Management Plan (RUWMP)	N/A

2.3 Fiscal or Calendar Year and Units of Measure

Legal Requirements:

CWC §1608.20(a)(1) *Urban retail water suppliers...may determine the targets on a fiscal year or calendar year basis.*

The City is reporting on a calendar year basis and therefore the 2020 data includes the months of January to December 2020. Additionally, the data presented in this UWMP is presented in the units of acre-feet (AF). **Table 2-3** indicates the City’s type of reporting year and the units of measure for reporting water volumes throughout the 2020 UWMP.

Table 2-3: Agency Identification (DWR Submittal Table 2-3)

Type of Plan	
<input type="checkbox"/>	Supplier is a wholesaler
<input checked="" type="checkbox"/>	Supplier is a retailer
Fiscal or Calendar Year (select one)	
<input checked="" type="checkbox"/>	UWMP Tables are in Calendar Years
<input type="checkbox"/>	UWMP Tables are in Fiscal Years
Units of Measure used in UWMP	
Unit	AF

2.4 Coordination and Outreach

The UWMPA requires that the UWMP identify the water agency’s coordination with appropriate nearby agencies.

Legal Requirements:

CWC §10631(j) *An urban water supplier that relies upon a wholesale agency for a source of water shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier’s plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (c). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (c).*

CWC §10620(d)(2) *Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.*

CWC §10642 *Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area.*

CWC §10621(b) *Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days before the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.*

The City’s 2020 UWMP is intended to address those aspects of the Act, which are under the control of the City, specifically water supply and water use. While preparing the 2020 UWMP, the City coordinated its efforts with relevant agencies to ensure that the data and issues are presented accurately.

2.4.1 Wholesale and Retail Coordination

The City does not receive wholesale water, nor does it plan to in the future (Table 2-4).

Table 2-4: Water Supplier Information Exchange (DWR Submittal Table 2-4)

The retail supplier has informed the following wholesale supplier(s) of projected water use in accordance with CWC §10631
Wholesale Water Supplier Name
N/A

2.4.2 Coordination with Other Agencies and the Community

The City solicited participation from other agencies and organizations for the preparation of the 2020 UWMP. Table 2-5 summarizes how the UWMP preparation was coordinated.

Table 2-5: Coordination with Appropriate Agencies

Coordinating Agencies	Sent Notice of Intention to Update UWMP	Sent Electronic Access to the Draft Plan	Commented on the Draft	Attended Public Meetings
Bakman Water Company	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
City of Fresno Public Utilities Department	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
County of Fresno Public Works	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fresno Irrigation District	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fresno Metropolitan Flood Control District	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Garfield Water District	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
General Public	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
International Water District	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
North Kings Groundwater Sustainability Agency	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2.4.3 Notice to Cities and Counties

The City provided formal written notification to the City of Fresno and Fresno County that the City’s UWMP was being updated. In accordance with the UWMPA, this notification was provided at least 60 days prior to the public hearing of the plan. Electronic copies of the final UWMP will be provided to these agencies no later than 30 days after its submission to the DWR. **Appendix A** contains copies of the outreach documents.

3 System Description

The UWMPA requires that the UWMP include a description of the water purveyor’s service area and various aspects of the area served including climate, population, and other demographic factors.

3.1 General Description

Legal Requirements:

CWC § 10631(a) *[A plan shall be adopted in accordance with this chapter that shall do all of the following:] Describe the service area of the supplier, including current and projected population, climate, and other demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.*

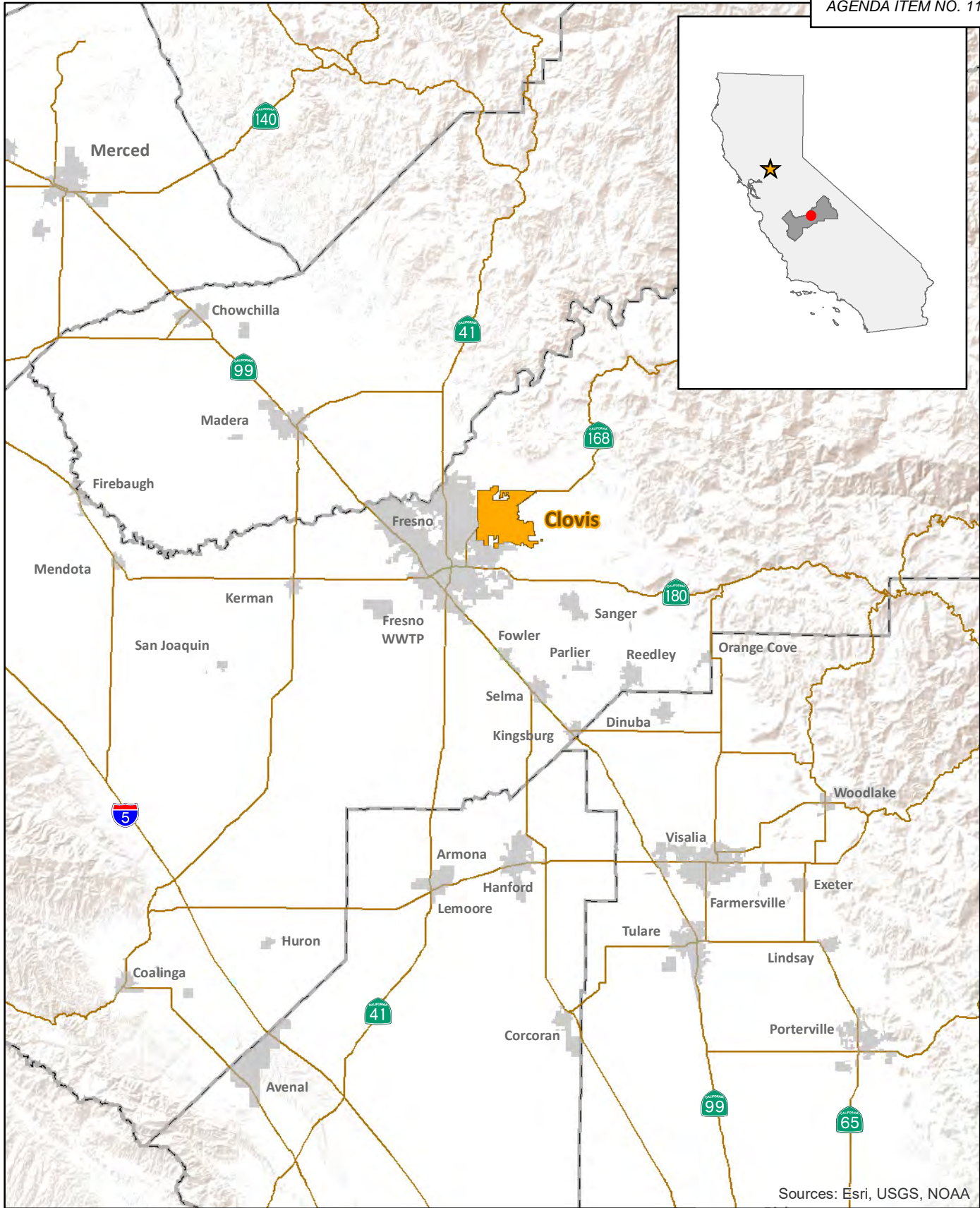
The City is located in the northeast quadrant of the Fresno-Clovis Metropolitan Area and is situated in the midst of the agriculturally rich San Joaquin Valley. Since its incorporation in 1912, Clovis has been the “Gateway to the Sierra.” Dedicated to promoting planned growth while retaining its unique western atmosphere, the City’s population has more than doubled since 1985. The City's economic base consists of retail sales and services and light manufacturing. Availability of housing, quality hospital care, excellent schools with modern facilities, responsive safety services, a mild climate, access to varied recreational opportunities, and strong community identity all contribute to Clovis’ reputation as a great place to live¹. **Figure 3.1** provides a location map for the City.

The formation of alluvial fans in this part of the San Joaquin Valley has led to rather flat regional geography and has an average elevation of approximately 355 feet above mean sea level. The City has a long history of agriculture land use. However, agriculture has given way to residential housing and other aspects of urbanization.

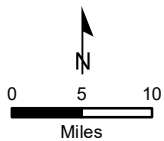
3.2 Service Area Boundary

The City Limits currently encompasses 25.9 square miles. The City’s Sphere of Influence (SOI) covers 34.9 square miles, while the City’s General Plan encompasses approximately 74.3 square miles. **Figure 3.2** illustrates the boundary of the service area, SOI, and General Plan Boundary.

¹ <http://www.ci.clovis.ca.us/>



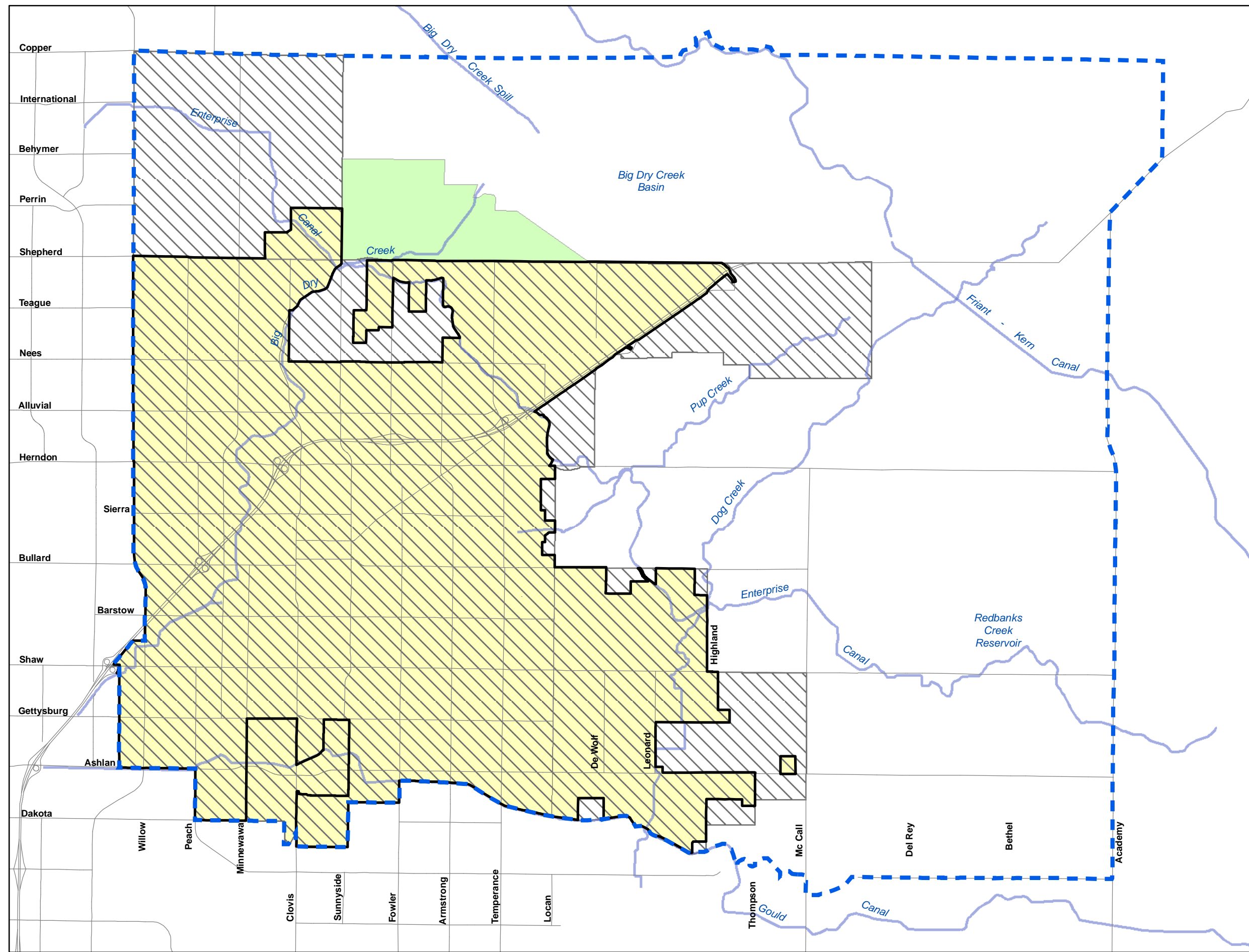
Sources: Esri, USGS, NOAA



- Clovis City Limits
- City/Town
- County



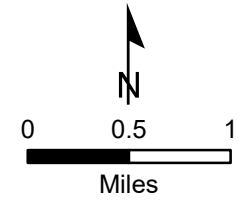
Figure 3-1
Regional Location Map



- Legend**
- Creeks and Canals
 - Major Streets
 - General Plan Boundary
 - Service Area
 - Clovis City Limits
 - Clovis Sphere of Influence (SOI)
 - Proposed SOI Expansion Area

**Figure 3-2
Service Area**

**City of Clovis
2020 Urban Water
Management Plan**



The City is a public agency that operates under a Council-Manager form of government. City residents elect a five-member City Council to serve as the City’s legislative and governing body. The City Council provides policy direction to the City Manager, who is responsible for administering City operations. The City’s Public Utilities Department is responsible for many public services within the City, including water service, sewer service, recycled water service, refuse, streets, parks, street lighting and signals, and fleet maintenance.

The City’s Public Utilities Department is the only municipal water purveyor in the City and provides service to approximately 122,350 City-customers. The City’s service area encompasses the City limits and the small unincorporated community of Tarpey Village. The City’s 2020 estimated population is 118,741² while Tarpey Village has an estimated population of 3,609³ and is mainly comprised of residential housing.

Within the City’s General Plan Area but outside of the SOI are three county service areas (CSA) and one waterworks district (WWD) that provide water service. Currently, the three CSAs and WWD are considered independent of the City’s utilities and service system.

3.3 Service Area Climate

The climate in the City can be classified as a Mediterranean-type climate. Summers are hot and dry, and winters are cool with an average precipitation of about 10.72 inches per year. The area is subject to significant variations in annual precipitation. Most of the annual precipitation occurs during the period from November through April. **Table 3.1** summarizes monthly average evapotranspiration (ET_o) rates, precipitation, and temperature. The total average monthly precipitation and average minimum and maximum monthly temperatures are also shown on **Figure 3.3**.

² Department of Finance (DOF), Table E-1, 2020 population estimate.

³ American Community Survey, 5-Year Estimates 2015-2019.

Table 3-1: Climate Statistics

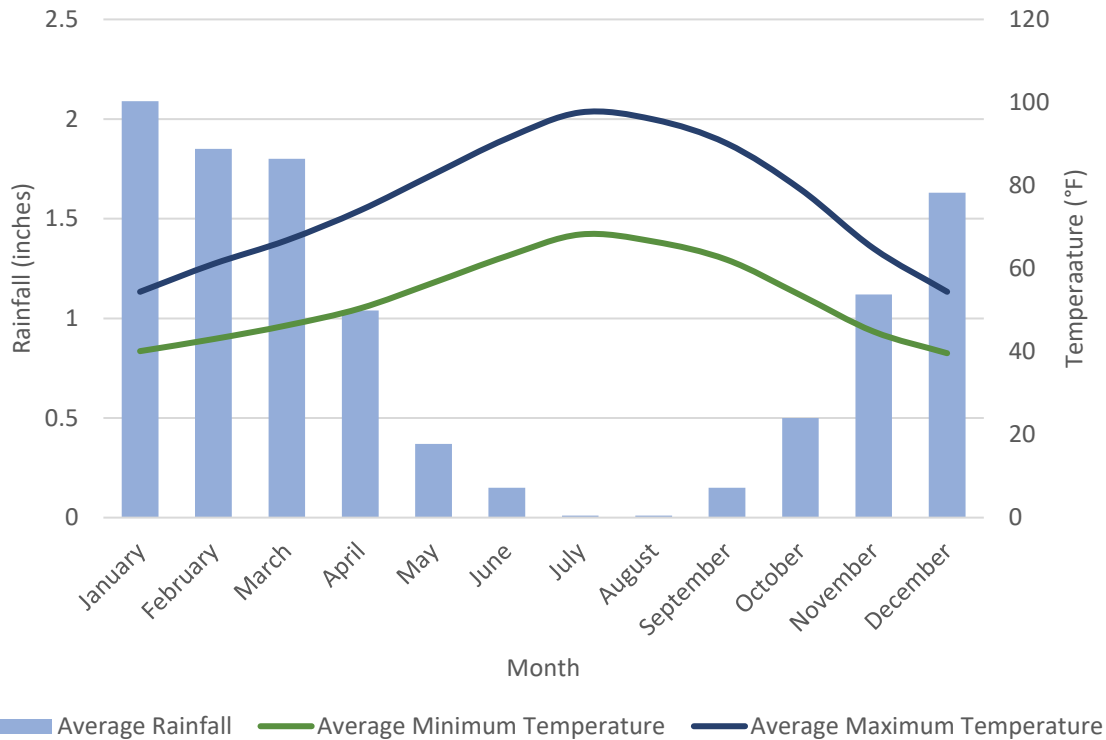
Month	Average ETo [1] (inches)	Average Rainfall [2] (inches)	Average Minimum Temperature [2] (degrees F)	Average Maximum Temperature [2] (degrees F)	Average Temperature [2] (degrees F)
January	1.17	2.09	40.1	54.4	47.2
February	1.98	1.85	43.0	61.1	52.0
March	3.73	1.80	46.3	66.8	56.5
April	5.43	1.04	50.4	74.0	62.1
May	7.33	0.37	56.6	82.7	69.7
June	8.41	0.15	63.0	91.3	77.1
July	8.80	0.01	68.2	97.6	83.0
August	7.82	0.01	66.5	95.9	81.2
September	5.69	0.15	62.1	90.1	76.1
October	3.68	0.50	53.6	79.1	66.3
November	1.85	1.12	44.8	64.8	54.8
December	1.10	1.63	39.6	54.4	47.0
Total/Average	56.99	10.72	52.8	76.0	64.4

Notes:

[1] Source: California Irrigation Management Information System (CIMIS); Fresno State – San Joaquin Valley Station 80 (Period of record 1988-2021).

[2] Source: National Centers for Environmental Information, National Oceanic and Atmospheric Administration, Fresno Yosemite International Station (Period of record 1950-2019)

Figure 3-3: Climograph



The average annual temperature is 64.6 degrees Fahrenheit (°F), although it is not unusual for summer readings to reach well over 100°F. According to the National Oceanic and Atmospheric Administration (NOAA), the monthly average mean temperature in July is 83°F, with an average maximum of 97.6°F and an average minimum of 68.2°F.

3.3.1 Climate Change

DWR guidelines require urban water suppliers to consider the potential effects related to climate change as in the UWMP as it relates to water demands, water supply, and water supply reliability. These topics are addressed in Sections 4, 6, and 7 of the UWMP, respectively.

3.3.1.1 Introduction

California has a Mediterranean climate, which is not expected to change with climate change projections in the future. The climate consists of cool, wet winters and hot, dry summers typically.

According to climate scientists, increases in global greenhouse gas levels are changing climate patterns around the world and, it is speculated, may begin to change them at an accelerated pace from what has occurred in the past. An accelerated rate of change could potentially result in impacts to the local climate of the City in the form of higher temperatures, increased droughts and floods, decreased snowpack amounts and durations, and other extreme variations in weather patterns. As the UWMP projects through 2040, these changes could potentially manifest themselves over that period and could potentially affect the availability and volume of water resources.

3.3.1.2 Potential Impacts

In the past, the amount of rainfall has been consistent with periods of drought and periods of excess precipitation spaced relatively far apart. With climate change, the rainfall levels could begin to vary more from year to year, incurring droughts followed by excesses with less time between them. Typically, climate change predicts a decrease in average rainfall for the area, while temperatures are expected to increase. However, increased temperatures could intensify the El Niño Southern Oscillation (ENSO) cycle, possibly resulting in very abundant precipitation in wet years and drought level dry years.

For areas that rely on surface water deliveries, as the City does, this weather pattern change could mean less dependable surface water deliveries, as the snowpack diminishes in some years. Increasing temperatures could start the snowpack spring melting period earlier and at an increased rate, which will increase the need for capacity in storage and open channel conveyance facilities. The increased melting rate could also lead to extensive flooding in lower lying areas due to lack of storage infrastructure.

3.4 Service Area Population

According to data collected from the California Department of Finance (DOF), the City's population for the year 2020 was approximately 118,741, while the American Community Survey, 5-year estimates (2015-2019) reported that Tarpey Village had a population of 3,609. This corresponds to a service area population of 122,350. The Tarpey Village area is considered built-out; therefore, the population is assumed to remain constant. The City's population increase over the last ten years has averaged 2.2 percent annually, from 100,895 in 2011 to 118,741 in 2020. It is generally accepted by the City the population growth will slow, meeting the 2040 projection of 174,500 (for Clovis only), yielding a growth rate of 1.9 percent annually. **Table 3.2** shows the existing and forecasted population for the service area. As previously stated, Tarpey Village is considered built-out; therefore, the population was assumed to remain constant.

Within the City's service area, the documented population is served water supply through the City's water system and, as the City develops, it is currently anticipated the projected population will be served by the City's water system; therefore, all population projections are utilized in water system demand projections discussed in **Section 4**.

Population projections, shown in **Table 3.2** and **Figure 3.4**, are used to forecast water requirements for the City. Historical population statistics shown on **Figure 3.4** are from California DOF estimates.

Table 3-2: Population – Current and Projected (DWR Submittal Table 3-1)

Service Area Population [1]	Years				
	2020	2025	2030	2035	2040
City of Clovis [2]	118,741	131,406	144,436	158,758	174,500
Tarpey Village [3]	3,609	3,609	3,609	3,609	3,609
Total	122,350	135,015	148,045	162,367	178,109

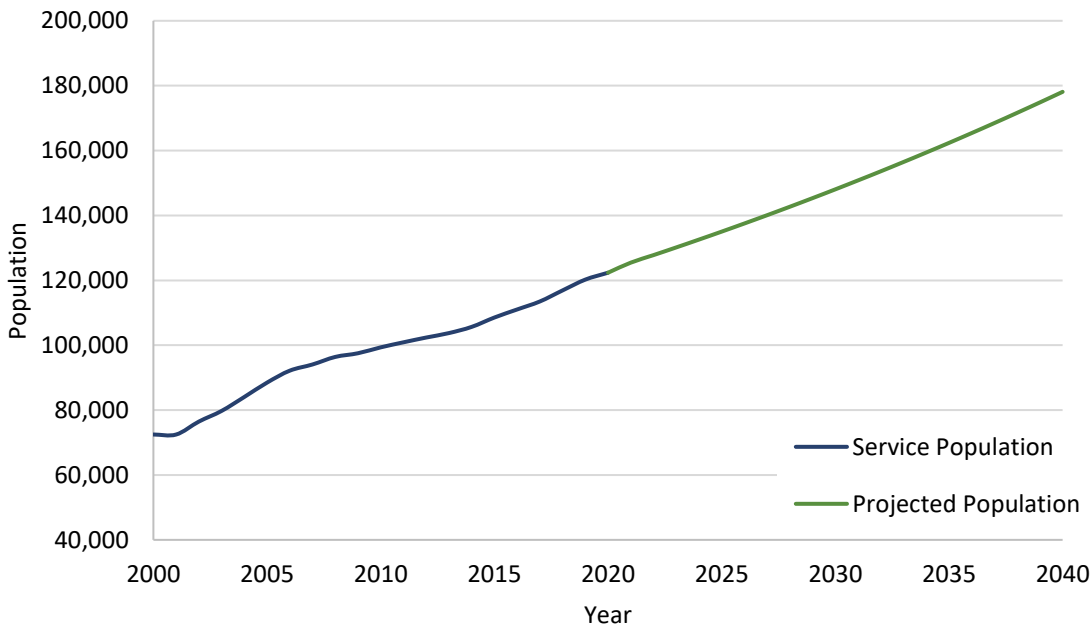
Notes:

[1] Service area population is defined as the population served by the distribution system.

[2] Department of Finance, E-1 and E-4 Estimates, 1.91% growth Projection

[3] American Community Survey, Five-Year Estimates; No Growth Project per City of Clovis

Figure 3-4: Historical and Projected Population



3.5 Land Uses within Service Area

The City has 22 land uses identified in the City’s General Plan (updated in 2014). The existing service area includes the land use acreages shown in **Table 3-3**. The City’s SOI, anticipated to be fully built-out by 2035 and the General Plan boundary, anticipated to be fully built-out in 2083 (or later) have the land use acreages shown in **Table 3-3**.

A request to modify the City’s SOI has been discussed with City staff; however, the request is not complete, and the City has not taken action at this time. The SOI expansion would extend the SOI boundary north and east of the Sunnyside and Shepherd Avenue intersection.

Table 3-3: Land Uses

Land Use Category	SOI Boundary Acreages	General Plan Boundary Acreages
Agriculture	68	5,482
Rural Residential	958	11,114
Very Low Density	774	775
Low Density	4,151	6,226
Medium Density	3,265	4,388
Medium High Density	1,144	1,746
High Density	503	731
Very High Density	32	123
Mixed Use - Village	823	1,021
Mixed Use - Business	1,018	1,018
Office	287	287
Industrial	548	548
Neighborhood Commercial	42	42
Special Commercial	0	170
General Commercial	846	876
Open Space	259	4,273
Public Facilities	246	257
Park	451	535
School	739	1,075
Water	750	1,149
Right-of-Way	3,921	5,415
Planned Rural Community	-	267
Total	20,825	47,518

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4 System Demands

This section describes and quantifies the current and projected water demands within the City’s service area.

4.1 Non-Potable versus Potable Use

This section addresses demands that are met by non-potable and potable water sources. Recycled water which is also available to the City is utilized to meet non-potable water demands and is described comprehensively in **Section 6**. Currently, the City provides recycled water for landscape and agricultural irrigation at 55 metered sites (through 98 metered services). There is a goal of expanding the users to include schools within the Clovis Unified School District in the future as discussed in the City’s Recycled Water Master Plan (RWMP) (Provost & Pritchard Consulting Group, 2017).

4.2 Past, Current, and Projected Water Use by Sector

The UWMPA requires that the UWMP identify the quantity of water supplied to the City’s customers including a breakdown by user classification.

Legal Requirements:

CWC § 10631(d)

- (1) For an urban retail water supplier, quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, based upon information developed pursuant to subdivision (a), identifying the uses among water use sectors, including, but not necessarily limited to, all of the following...*
- (2). The water use projections shall be in the same five-year increments described in subdivision (a).*
- (4)(A) Water use projections, where available, shall display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area.*
- (B) To the extent that an urban water supplier reports the information described in subparagraph (A), an urban water supplier shall do both of the following: (i) Provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections. (ii) Indicate the extent that the water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. Water use projections that do not account for these water savings shall be noted of that fact.*

The City utilizes several water use sectors identified in the CWC and tracks water use within those sectors separately. Historic and projected water use are presented in those sectors.

4.2.1 Water Use Sectors Listed in Water Code

CWC § 10631(d)

(1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors, including, but not necessarily limited to, all of the following uses:

(A) Single-family residential.

(B) Multifamily.

(C) Commercial.

(D) Industrial.

(E) Institutional and governmental.

(F) Landscape.

(G) Sales to other agencies.

(H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.

(I) Agricultural.

(J) Distribution system water loss.

(2) The water use projections shall be in the same five-year increments described in subdivision (a).

The City's water customers are divided into six categories that include single family and multi-family residential, commercial/institutional, industrial, landscape irrigation, and other. Since the 2015 UWMP, the number of new water costumers has increased approximately 3 percent annually. Much of the growth is attributed to single family residents, which currently accounts for 67 percent of the City's total potable water demand. The City also tracks distribution systems losses via the water auditing process annually.

4.2.2 Past Water Use

The City maintains records of past water use, as shown in **Table 4-1** below. Annual water production for 2015 was at its lowest since 2001, while per capita water consumption in 2015 was at a historic low of 165 gallons per capita per day (gpcd). This decrease in demand can be attributed to statewide and local conservation measures enacted as a result of state mandates due to extreme drought conditions within California. **Table 4-1** lists the historical water production from 2000 to 2020. **Table 4-1** only accounts for total potable water.

Table 4-1: Past Water Production (2000 – 2020)

Year	Annual Potable Water Production			Population	
	Total Annual (AF)	Total Annual (MG) [1]	Daily Average (mgd)	Population [2]	Per Capita Consumption (gpcd)
2000	19,355	6,307	17.3	72,473	238
2001	20,196	6,581	18.0	73,949	244
2002	21,277	6,933	19.0	76,471	248
2003	22,599	7,364	20.2	79,762	253
2004	24,352	7,935	21.7	84,068	259
2005	24,134	7,864	21.5	88,509	243
2006	25,426	8,285	22.7	92,196	246
2007	27,424	8,936	24.5	94,112	260
2008	27,761	9,046	24.8	96,441	257
2009	26,178	8,530	23.4	97,586	239
2010	24,735	8,060	22.1	99,335	222
2011	23,931	7,798	21.4	100,895	212
2012	26,110	8,508	23.3	102,362	228
2013	27,120	8,837	24.2	103,739	233
2014	25,067	8,168	22.4	105,640	212
2015	20,031	6,527	17.9	108,532	165
2016	20,623	6,720	18.4	111,015	166
2017	22,470	7,322	20.1	113,477	177
2018	23,123	7,535	20.6	116,891	177
2019	22,951	7,478	20.5	120,218	170
2020	24,828	8,090	22.2	122,350	181

Notes:

[1] Public Water System Statistics; includes all water supplies entering the potable water system such as well and surface water production. Untreated raw water and recycled water used for non-potable demands and delivered through the recycled water system or other agency's facilities are not included.

[2] California Department of Finance and American Community Survey Population Estimate; includes City and Tarpey Village population.

The City used untreated surface water delivered for groundwater recharge of which 5,316 AF (1,732 million gallons [MG]) was delivered to various basins, creeks, and landscape areas throughout the City's Service Area in 2020. Past raw water use, as groundwater recharge, is shown in **Table 4-2**.

Table 4-2: Past Raw Water Use (2010 – 2020)

Year	Past Raw Water Use [1]	
	Total Annual (AF)	Total Annual (MG)
2010	8,365	2,726
2011	8,595	2,801
2012	9,681	3,155
2013	9,254	3,015
2014	3,272	1,066
2015	1,809	589
2016	9,400	3,063
2017	14,077	4,587
2018	8,885	2,895
2019	12,647	4,121
2020	5,316	1,732

Notes:

[1] Raw water usage for recharge purposes and two onsite landscape application locations (Letterman Park and Reagan Center).

4.2.3 Distribution System Losses

Legal Requirements:

CWC § 10631

For an urban retail water supplier, quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, based upon information developed pursuant to subdivision (a), identifying the uses among water use sectors, including, but not necessarily limited to, all of the following...

(I) Distribution system water loss....

CWC §10631(d)(3)

(A) The distribution system water loss shall be quantified for each of the five years preceding the plan update, in accordance with rules adopted pursuant to Section 10608.34.

(B) The distribution system water loss quantification shall be reported in accordance with a worksheet approved or developed by the department through a public process. The water loss quantification worksheet shall be based on the water system balance methodology developed by the American Water Works Association.

(C) In the plan due July 1, 2021, and in each update thereafter, data shall be included to show whether the urban retail water supplier met the distribution loss standards enacted by the board pursuant to Section 10608.34.

California Senate Bill No. 1420 (SB1420) requires water utilities that submit UWMPs to conduct annual system water loss audits in accordance with American Water Works Association (AWWA) standards. Agencies are required to submit their audits every five years as part of the UWMP.

AWWA quantifies water loss as the difference between the quantity of water supplied and the quantity of water delivered to authorized customers. Water loss is further defined under two categories:

apparent losses and real losses. Apparent losses are due to unauthorized consumption, inaccurate metering, and systematic data handling errors. These losses can be considered non-physical losses associated with inaccurate recording. Real losses are the physical loss of water due to leaks within the distribution system.

Table 4-3 summarizes the findings of the City’s water loss audit for the last five years. The detailed water loss audit reports are available in **Appendix B**.

Table 4-3: Last Five Years of Water Loss Audit Reporting (DWR Submittal Table 4-4)

Reporting Period Start Dates	Total Volume of Water Loss (AF)	Percent of total Water Supplied (%)	Complies with CWC §10608.34
01/2016	661	3.2%	Yes
01/2017	897	4.0%	Yes
01/2018	1,154	5.0%	Yes
01/2019	1,363	5.9%	Yes
01/2020	1,090	4.4%	N/A [1]

Notes:

[1] Water Loss Audit for 2020 has not been prepared and submitted to the State as of the preparation of this report. This value is estimated based on total water supplied into the system minus total water demands.

4.2.4 Current Water Use

Table 4-4: Demands for Potable and Non-Potable Water – Actual (DWR Submittal Table 4-1)

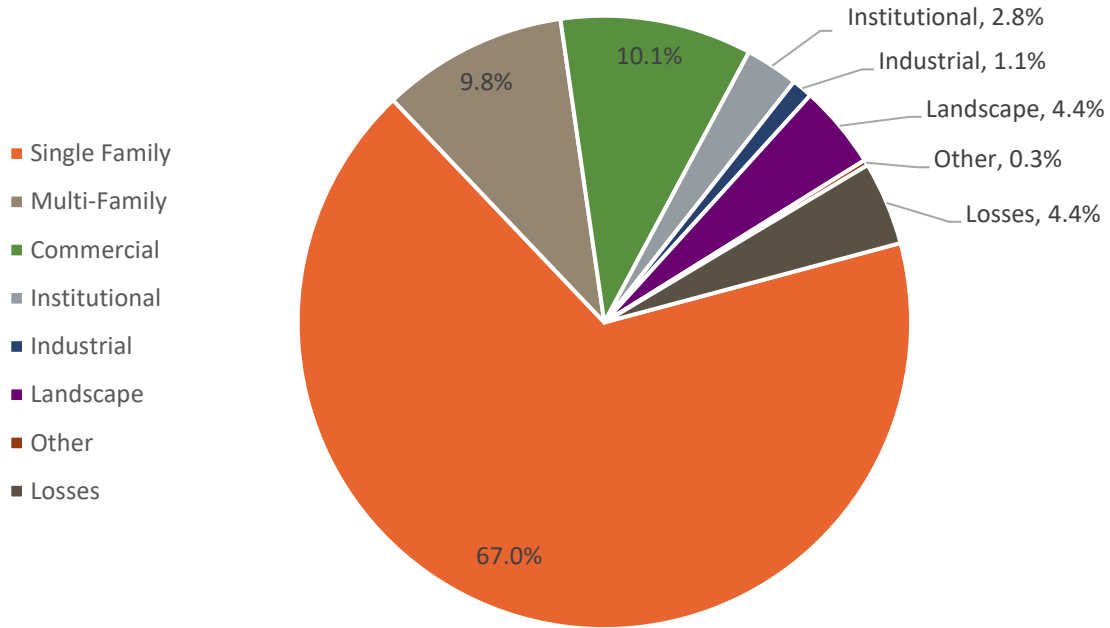
Use Type	Additional Description	Level of Treatment When Delivered	Volume (AF)
Single Family	Includes residential landscaping	Drinking Water	16,638
Multi-Family	Includes residential landscaping	Drinking Water	2,434
Commercial	Includes schools	Drinking Water	2,518
Institutional		Drinking Water	703
Industrial		Drinking Water	267
Landscape		Drinking Water	1,102
Other	Construction	Drinking Water	76
Losses	Accounts for real and apparent losses	Drinking Water	1,090
Groundwater Recharge		Raw Water	5,316
Total			30,144

Notes:

Source: DWR Public Water System Statistics and the City of Clovis.
Recycled water was removed from landscape volume.
Water loss is the total water supplied minus authorized consumption.

Figure 4-1 provides a graphical representation of the information presented in Table 4-4; however, groundwater recharge is not shown on the figure, as it is not a direct use of potable water supplies.

Figure 4-1: Water Use by Sector



Water use throughout the year varies with the greatest monthly use occurring in the summer months, due in large part to the landscape needs.

4.2.5 Projected Water Use

Legal Requirements:

CWC §10635 (a)

Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the long-term total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and a drought lasting five consecutive water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

CWC §10631

(h) An urban water supplier that relies upon a wholesale agency for a source of water shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available...

CWC §10631(d)(4)

(A) Water use projections, where available, shall display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area.

(B) To the extent that an urban water supplier reports the information described in subparagraph (A), an urban water supplier shall do both of the following:

(i) Provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections.

(ii) Indicate the extent that the water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. Water use projections that do not account for these water savings shall be noted of that fact.

This section is based on a normal water year and normal water use without additional restrictions put in place. **Section 7** discusses, in detail, water demand and supply characteristics associated with single-dry and multiple-dry years, including a Drought Risk Assessment.

The following table summarizes the projected water demands by sector for 2025 through 2040, for normal years.

Table 4-5: Use for Potable and Non-Potable Water – Projected (DWR Submittal Table 4-2)

Use Type	Additional Description	Projected Water Use (AF) [1]			
		2025	2030	2035	2040
Single Family	Includes residential landscaping	18,546	18,558	20,353	22,327
Multi-Family	Includes residential landscaping	2,713	2,715	2,978	3,266
Commercial	Includes schools	3,052	3,346	3,670	4,026
Institutional		852	934	1,025	1,124
Industrial		324	355	389	427
Landscape [2]	Potable Water	1,336	1,465	1,607	1,763
Other	Construction	93	101	111	122
Losses [3]	Accounts for real and apparent losses	1,321	1,449	1,589	1,743
Intentional Groundwater Recharge [4]		8,400	8,400	8,400	8,400
Total		36,637	37,324	40,122	43,198

Notes:

[1] Projected water use is based on the 2020 Water Use Target of 199 gpcd for non-residential uses and 183 gpcd and 167 gpcd for residential uses, as discussed above, and the population projections discussed in Section 3.

[2] Recycled water is not reported in this table.

[3] Water loss is the total water supplied minus authorized consumption.

[4] Based on the 30-year average intentional recharge the City has conducted since 1990.

Table 4-5 represents the total sum of projected water demands for potable and raw use within the service area. These demands represent the City’s total water demand in the future. **Section 6** further discusses the current and projected use of recycled water.

4.2.5.1 Water Savings Estimate

Demands in **Table 4-5** are based on the 2020 Water Use Target (199 gpcd) for all uses except single and multi-family. In those instances, the Water Use Target has been reduced to 183 gpcd in 2025 and 167 gpcd in 2030 and beyond. The purpose of this reduction is to address the efficient indoor residential water use standards discussed in AB 1668 and SB 606 of 55 gpcd until January 2025 and 50 gpcd until January 2030. Additional water savings, such as mandated conservation measures, have not been included in the projections to allow for the City to plan in a conservative manner.

Water savings from codes, standards, ordinances, or transportation and land use plans are also known as “passive savings.” These various factors generally decrease the water use for new and future customers, compared to historical customers. These codes and ordinances may include implementation

of the Model Water Efficient Landscape Ordinance (MWELo), the California Energy Commission Title 20 appliances standards for toilets, urinals, faucets, and showerheads, or the CALGreen Building Code.

As shown in **Table 4-5**, passive savings have not been specifically incorporated in projected water demands. Instead, future water demands are projected based on population and the City's target per capita water use, as documented in **Section 5**, and discussed above. However, the City does expect that passive savings, such as continued implementation of the City's MWELo, Title 20 appliance standards for toilets, urinals, faucets, and showerheads, and CALGreen Building Code requirement, will help the City continue to meet its target per capita water demand in the future.

The following table provides a summary of the information provided in **Tables 4-4** and **4-5**, including recycled water demands discussed in greater detail in **Section 6**.

Table 4-6: Total Water Use (Potable and Non-Potable) (DWR Submittal Table 4-3)

Demand Use	2020	2025	2030	2035	2040
Potable Water, Raw, Other Non-Potable	30,144	36,637	37,324	40,122	43,198
Recycled Water	710	3,100	5,500	6,300	9,400
Total Water Demands	30,854	39,737	42,824	46,422	52,598

4.2.6 Characteristic Five-Year Water Use

CWC §10635(b) Every urban water supplier shall include, as part of its urban water management plan, a drought risk assessment for its water service to its customers as part of information considered in developing the demand management measures and water supply projects and programs to be included in the urban water management plan. The urban water supplier may conduct an interim update or updates to this drought risk assessment within the five-year cycle of its urban water management plan update. The drought risk assessment shall include each of the following...

(3) A comparison of the total water supply sources available to the water supplier with the total projected water use for the drought period. [Emphasis added]

(4) Considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria.

As part of the Drought Risk Assessment prepared in **Section 7**, the following five-year water use between 2020 and 2025 can be utilized as a representative five-year normal period.

Table 4-7: Five-Year Projected Water Use

Year	Five-Year Projected Water Use [1]		
	Projected Potable Water Use (AF)	Projected Non-Potable Water Use (AF)	Total Projected Water Use (AF)
2021	25,510	5,933	31,443
2022	26,192	6,550	32,741
2023	26,874	7,166	34,040
2024	27,555	7,783	35,339
2025	28,237	8,400	36,637

Notes:
[1] Projection between 2020 values shown in Table 4-4 and 2025 values shown in Table 4-5.

4.3 Water Use for Low Income Households

Legal Requirements:

CWC § 10631

(a) The water use projections required by Section 10631 shall include projected water use for single-family and multifamily residential housing needed for lower income households, as defined in Section 50079.5 of the Health and Safety Code, as identified in the housing element of any city, county, or city and county in the service area of the supplier. California Health and Safety Code 50079.5

(a) "Lower income households" means persons and families whose income does not exceed the qualifying limits for lower income families... In the event the federal standards are discontinued, the department shall, by regulation, establish income limits for lower income households for all geographic areas of the state at 80 percent of area median income, adjusted for family size and revised annually.

As described above, the UWMP is required to account for low-income household water demands. Low-income households are defined as families with an income less than 80-percent of the area median income, adjusted for family size.

To calculate low-income water demands, the current and projected water use of single-family and multi-family residential households were used in conjunction with the estimated percent of low-income households within the service area. It is assumed that approximately 28 percent of the housing within the City is considered low income (Fresno Council of Governments, 2014). For the determination of projected low-income housing, it is assumed that 28-percent will remain consistent throughout 2040.

To determine water demands for low-income housing, the water demands in **Table 4-4** and **Table 4-5** for single-family and multi-family units were multiplied by the percentage of low-income households. Water demands associated with low-income residential water users through year 2040 are presented in **Table 4-8**.

Table 4-8: Low Income Water Demands

Low Income Water Demands	Water Use (AF)				
	2020	2025	2030	2035	2040
Single and Multi-Family Residential	5,340	5,953	5,956	6,533	7,166
Total (AF)	5,340	5,953	5,956	6,533	7,166

As shown in **Table 4-9**, lower income demand projections presented in **Table 4-8** are included in the total water use projections provided in **Table 4-5**.

Table 4-9: Inclusion of Water Use in Projections (DWR Submittal Table 4-5)

Scenario	Response
Are Future Water Savings Included in Projections?	Yes
If “Yes” to above, state the section or page number where citations of the codes, ordinances, etc. utilized in demand projections are found.	Section 4.3
Are Lower Income Residential Demands Included in Projections?	Yes

4.4 Climate Change Related to System Demands

Legal Requirements:

CWC §10630
It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied, while accounting for impacts from climate change.

CWC §10635(b)
Every urban water supplier shall include, as part of its urban water management plan, a drought risk assessment for its water service to its customers as part of information considered in developing the demand management measures and water supply projects and programs to be included in the urban water management plan. The urban water supplier may conduct an interim update or updates to this drought risk assessment within the five-year cycle of its urban water management plan update. The drought risk assessment shall include each of the following...

(4) Considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria.

As climate change becomes more noticeable and quantifiable, the City’s response will include reducing demands to match possible reduction of water supplies. The potential impacts of climate change on the City’s supply could include such items as more prolonged droughts, shifts in the water supply patterns, and potential flooding.

Reduction of the per capita demands in the system can help respond to climate change in two ways. Reduced water demands equate to less energy use through reduced groundwater pumping and/or movement of water supplies through the system. Further reduction of per capita water demands, at this point of the City’s master planning efforts, may be challenging to achieve, as the City has implemented many conservation methodologies (discussed in further detail in **Section 9**); however, one strategy the City will continue to increase is the use of recycled water to use their water supplies more efficiently.

Additionally, it is anticipated climate change will impact landscape water demands most significantly; however, as the City will maintain the per capita goal, overall water demands are not anticipated to increase. Mitigating possible increased water demands for landscape may require less landscaping, increased use of drought tolerant plantings, or more efficient irrigation strategies. The City employs an approved plant list inclusive of mostly drought tolerant plantings for landscaping on all new construction projects and is considering modification to turf allowances within the City. These measures will help to respond to water demand variations as a result of climate change.

5 SB X7-7 Baselines, Targets, and Compliance

This section describes the baseline (base daily per capita) water use, the 2015 and 2020 water use targets, and the 2020 actual water use.

The UWMPA requires that the UWMP identify a baseline water demand, urban water use target, and interim urban water use target for the City.

Legal Requirements:

CWC § 10608.20

(e) An urban retail water supplier shall include in its urban water management plan . . . due in 2010 the baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.

The base daily per capita use was the first step in determining the City’s urban water use target. The historical per capita use set the “baseline” on which the urban water use target was determined. The City established an Interim 2015 water use target and a subsequent 2020 urban water use target to judge compliance with the 2020 use reductions set forth in the Water Conservation Bill of 2009.

5.1 SB X7-7 Forms and Summary Tables

The City has previously calculated its baseline and targets in the 2010 and 2015 UWMPs and will use these previously calculated values to determine compliance with SB X7-7. The following subsections present the SB X7-7 Verification and Compliance forms, as discussed in the 2020 UWMP Guidebook.

5.1.1 SB X7-7 Verification Form

The 2015 UWMP included a complete SB X7-7 Verification Form, which is provided for reference in **Appendix C**. The Form has not been prepared again for this 2020 UWMP, per the 2020 UWMP Guidebook.

5.1.2 SB X7-7 2020 Compliance Form

This 2020 UWMP includes a complete 2020 Compliance Form, as required, included in **Appendix D**. The Gross Water Use for the system includes groundwater wells, surface water supply, and untreated water and recycled water that are used in place of potable sources. Untreated water or raw water used for groundwater recharge is not included in the Gross Water Use for purposes of calculating per capita water use for the City. If recharge were not conducted due to water supply availability, the per capita water demand would not change. It is considered a use separate from gross water use. The City’s 2020 Compliance Water Use Target was set in the 2015 UWMP at 199 gpcd. The City does not need to modify that target based on any reasons provided in the 2020 UWMP Guidebook and will use the target to document compliance with SB X7-7.

The City achieved a per capita water use of 181 gpcd in 2020, thereby meeting the target by 18 gpcd or approximately 9% additional water use reduction.

5.1.3 DWR Submittal Tables

In addition to reporting compliance on the SB X7-7 Compliance Form, the City is also required to report compliance on the DWR Submittal Tables 5-1 and 5-2, shown below.

Table 5-1: Baselines and Targets Summary (DWR Submittal Table 5-1)

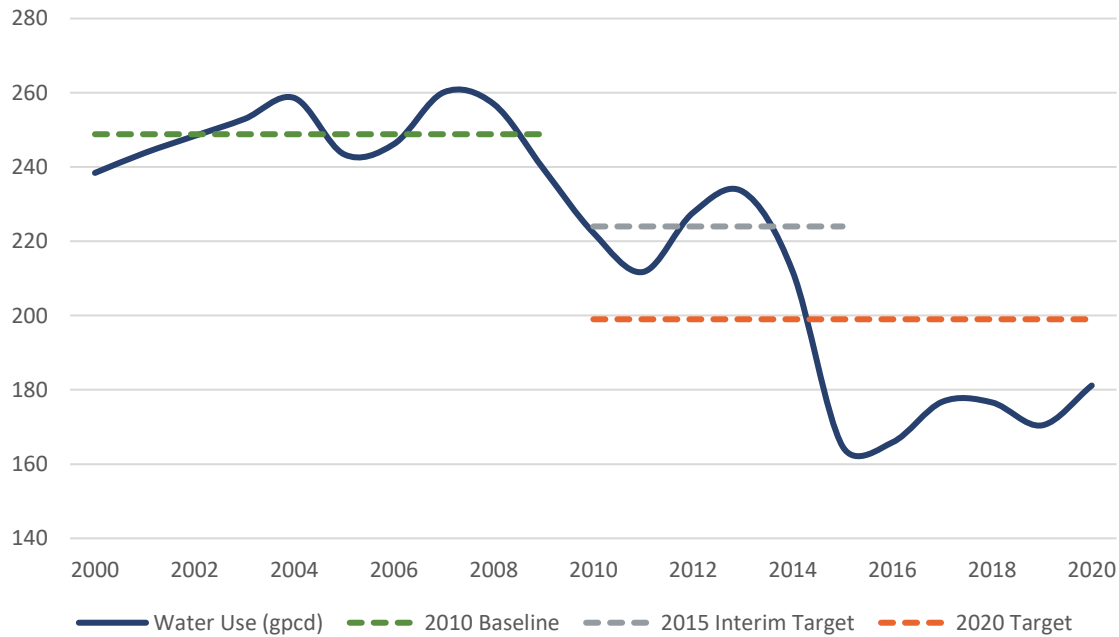
Baseline Period	Start Year	End Year	Average Baseline GPCD	Confirmed 2020 Target
10-15 Year	2000	2009	249	199
5 Year	2004	2008	253	

Table 5-2: 2020 Compliance (DWR Submittal Table 5-2)

Actual 2020 GPCD	2020 Total Adjustments	Adjusted 2020 GPCD	2020 Confirmed Target GPCD	Did Supplier Achieve Targeted Reduction for 2020
181	-	181	199	Yes

Figure 5-1 is a graphical representation of the City Per Capita Water Use since 2010, when the baselines and targets were initially required. This figure highlights the City’s success in consistently decreasing its Per Capita Water Use.

Figure 5-1: Historical Per Capita Water Use



5.2 Baseline and Target Calculations for 2020 UWMPs

The 2020 UWMP Guidebook indicates criteria to determine if the Supplier should or should not consider recalculation of its baselines and targets. Those criteria are discussed in the following subsections. As indicated below, the City does not meet a criterion to recalculate its baselines and targets and meets the criterion to utilize those calculated in the 2015 UWMP.

Supplier Submitted 2015 UWMP, No Change to Service Area

The City did prepare and submit the 2015 UWMP, along with the SB X7-7 Verification Form, both of which were accepted by DWR. The City has also not had a change to its service area, as noted in the Guidebook. The Guidebook clarifies “change to its service area” as follows:

“...changes to the service area based solely on new construction do not require recalculation of the baselines and targets. For purposes of this section, changes to the service area refers to mergers and annexations...”

Based on this definition, the City has not had a change to its service area. The City has prepared the 2020 Compliance Form, see [Appendix D](#) and the 2015 Verification Form, see [Appendix C](#), for review and reference.

Supplier Did Not Submit 2015 UWMP

This criterion does not apply to the City; the 2015 UWMP was submitted and accepted.

Supplier Newly Subject to UWMP Requirements

This criterion does not apply to the City.

Distribution Area Expansion

Stated in the 2020 UWMP Guidebook, “If the Suppliers service area expanded by way of a merger or annexation, the Supplier must provide baseline and targets to include the new area.” While there were annexations within the City, all were the result of new construction and, as discussed in above, new construction does not qualify the City to recalculate its baselines and targets.

Distribution Area Contraction

This criterion does not apply to the City.

Large Partial Customers Become Whole Customers

This criterion does not apply to the City.

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6 System Supplies

The UWMPA requires that the UWMP include a description of the agency's existing and future water supply sources for the next 20 years. The description of water supplies must include detailed information on the groundwater basin such as water rights, determination if the basin is in overdraft, adjudication decree, and other information from the groundwater management plan.

6.1 Water Supply Analysis Overview

Legal Requirements:

CWC §10631(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier [in five-year increments to 20 years or as far as data is available] providing supporting and related information, including all of the following:

(1) A detailed discussion of anticipated supply availability under a normal water year, single dry year, and droughts lasting at least five years, as well as more frequent and severe periods of drought, as described in the drought risk assessment. For each source of water supply, consider any information pertinent to the reliability analysis conducted pursuant to Section 10635, including changes in supply due to climate change.

(2) When multiple sources of water supply are identified, a description of the management of each supply in correlation with the other identified supplies.

(3) For any planned sources of water supply, a description of the measures that are being undertaken to acquire and develop those water supplies.

The City utilizes multiples sources of water supply to meet the demands discussed in **Section 4**, including groundwater, treated surface water, untreated surface water, and recycled water. The following sections quantify each supply, including future planned supplies over five-year increments through 2040. These supply sources will be quantified for the normal year, single-dry year, and a five-year period of multiple dry years.

The City's groundwater supplies stem from the unadjudicated basin underlying the area, the Kings Subbasin, as described in DWR's Bulletin 118. While the basin is not adjudicated and does not have legal limitations on groundwater pumping, the City is a participant in the NKGSA and a party to the North Kings GSP. The NKGSA is working cooperatively with the six (6) other GSAs in the Kings Subbasin to manage the groundwater aquifer and reach sustainability by 2040. As part of those efforts, the agencies have agreed to manage groundwater extraction in a way that does not cause undesirable results in the aquifer. The City is working towards reducing its groundwater reliance and will be using a sustainable groundwater pumping quantity for future supplies planning with the balance of City water demands being met through surface or recycled water supplies.

The City's surface water supply is provided through an agreement with Fresno Irrigation District (FID), which allows the City to receive a share of FID's entitlement to the Kings River and Friant Division of the Central Valley Project (CVP). The City has two agreements that provide surface water supplies to the City, which are detailed in **Section 6.2.3**. Two additional water districts are located within the City's General Plan Boundaries: Garfield Water District (GWD) and International Water District (IWD). Both have access to Class I CVP surface water supplies. As the districts urbanize, supplies associated with

these areas are expected to be added to the City's supply. The City uses their surface water supplies in two primary ways: (1) as potable water supply after being treated at the City's Surface Water Treatment Plant (SWTP) or (2) as groundwater recharge in various basins located in and around the City's service area.

The final component of the City's water supply portfolio is recycled water. The City operates a Water Reuse Facility, treating a portion of the wastewater generated within the service area to a tertiary treatment level. Once treated the recycled water is used in one of two ways: (1) landscape irrigation throughout the City's service area or (2) agricultural irrigation. As the recycled water system is expanded, based on the RWMP, the City can expand the users of those supplies to reduce non-potable demands on the potable water supply.

6.2 Water Supply Characterization

The following subsections provide water supply availability quantification and narrative required under the CWC.

6.2.1 Purchased or Imported Water

The City does not currently purchase or import water from outside entities.

6.2.2 Groundwater

Legal Requirements:

CWC §10631(b)(4) *If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information:*

(A) The current version of any groundwater sustainability plan or alternative adopted pursuant to Part 2.74 (commencing with Section 10720), any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management for basins underlying the urban water supplier's service area.

(B) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For basins that a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. For a basin that has not been adjudicated, information as to whether the department has identified the basin as a high- or medium-priority basin in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to coordinate with groundwater sustainability agencies or groundwater management agencies listed in subdivision (c) of Section 10723 to maintain or achieve sustainable groundwater conditions in accordance with a groundwater sustainability plan or alternative adopted pursuant to Part 2.74 (commencing with Section 10720).

(C) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(D) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

6.2.2.1 Basin Description

For planning purposes, DWR has subdivided the State of California into ten separate hydrologic regions, corresponding to the State's major drainage basins. Furthermore, groundwater within the State is divided into distinct groundwater basins; some of which are further divided into smaller interconnected subbasins.

The groundwater underlying the City is located in the Kings Subbasin, a non-adjudicated basin, high-priority basin, which lies within the Tulare Lake Hydrologic Basin (**Figure 6-1**). This Basin contains multiple interconnected subbasins that transmit, filter, and store water. These subbasins are Kaweah and Tulare Lake to the south, Westside and Delta Mendota to the west, and Madera to the North.

According to the Department of Water Resources Bulletin 118, the Kings Subbasin (Subbasin 5-22.08) covers a surface area of approximately 976,000 acres (1,530 square miles). DWR estimated that, in 1961, total basin storage was about 93,000,000 AF to a depth of more than 1,000 feet (DWR, 2006). The two major rivers overlying the subbasin are the San Joaquin River and Kings River. The Fresno Slough and James Bypass are along the western edge of the southern basin and connect the Kings River to the San Joaquin River.

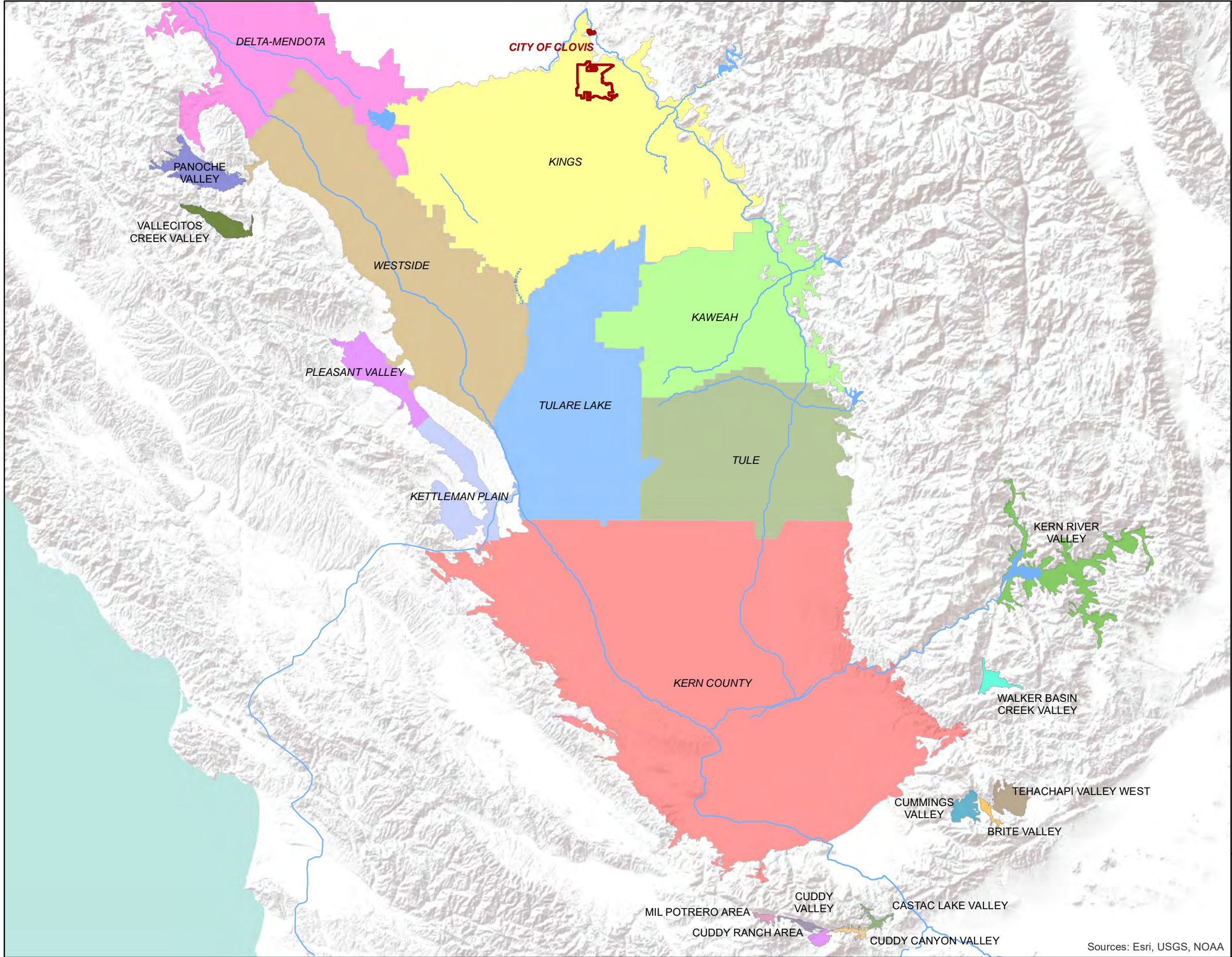
According to DWR, the groundwater in the subbasin is predominately of a bicarbonate type. Total dissolved solids (TDS) values are generally under 600 mg/L. The subbasin does have localized water quality impairments, including Dibromochloropropane (DBCP); Nitrate; Ethylene-Dibromide; 1,2,3-Trichloropropane (TCP); Methyl Tert-butyl Ether (MTBE); uranium; arsenic; hexavalent chromium;

perfluoroalkyl substances (PFAS) and petroleum hydrocarbons. High concentrations of fluoride, boron, and sodium can be found in localized areas of the subbasin.

6.2.2.2 Groundwater Sustainability Plan

The City is a member of the NKGSA. The NKGSA is working collaboratively, under a coordination agreement with the other six (6) Groundwater Sustainability Agencies in the Kings Subbasin to achieve sustainable groundwater conditions by 2040 in accordance with the Sustainable Groundwater Management Act of 2014 (SGMA) for critically overdrafted groundwater basins such as the Kings Subbasin. The NKGSA prepared and submitted a GSP in January 2020 and is awaiting DWR's review of the GSP that will be completed by or before January 2022.

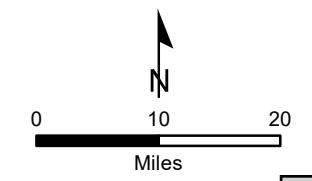
SGMA identifies six (6) sustainability indicators to be monitored and reported in order to document sustainability: lowering groundwater levels, reduced [groundwater] storage, seawater intrusion, degraded [groundwater] quality, land subsidence, and surface water depletion. The NKGSA documents five (5) of those with seawater intrusion not being applicable to this region.



Legend

- Clovis City Limits
- Water Features
- Groundwater Basins**
- San Joaquin Valley (5-22)
- Delta-Mendota (5-22-07)
- Kaweah (5-22-11)
- Kern County (5-22-14)
- Kettleman Plain (5-22-17)
- Kings (5-22-08)
- Pleasant Valley (5-22-10)
- Tulare Lake (5-22-12)
- Tule (5-22-13)
- Westside (5-22-09)
- Other**
- Brite Valley (5-80)
- Castac Lake Valley (5-29)
- Cuddy Canyon Valley (5-82)
- Cuddy Ranch Area (5-83)
- Cuddy Valley (5-84)
- Cummings Valley (5-27)
- Kern River Valley (5-25)
- Mil Potrero Area (5-85)
- Panoche Valley (5-23)
- Tehachapi Valley West (5-28)
- Walker Basin Creek Valley (5-26)

Figure 6-1
Groundwater Basins and Subbasins
 City of Clovis
 2020 Urban Water Management Plan



Sources: Esri, USGS, NOAA

6.2.2.3 Multiple Groundwater Basins

The City only utilizes groundwater supply from the Kings Subbasin; this section does not apply.

6.2.2.4 Other Considerations

The City has documented, in its WMP, a sustainable amount of groundwater that can be extracted from year to year and replenished through naturally occurring groundwater recharge. The City will continue increasing its surface water and recycled water supply usage to a point where the groundwater extraction is not greater than the sustainable yield in a normal year. The sustainable yield is currently estimated at 9,400 AF per year (AFY) for the SOI (discussed in greater detail in the WMP, Table 6.11-1), without additional intentional recharge. This estimate will likely be modified and refined through SGMA efforts.

6.2.2.5 Historical Groundwater Pumping

The water system was initially constructed near the turn of the 20th century, when the first municipal well was installed, and, up until July 2004, the City’s sole source of drinking water was groundwater. The City currently obtains groundwater from 36 active wells and one standby well, which have a total capacity of approximately 37,690 gallons per minute (gpm). There are also six planned wells, adding an additional planned capacity of 4,750 gpm, bringing the total well capacity to 42,440 gpm. Two of the existing active wells (Wells 10 and T-5) are offline due to TCP and PFAS water quality concerns, and one well is listed as standby due to iron and manganese concerns. TCP, PFAS, DBCP and high iron (Fe) and manganese (Mn) are the main water quality constraints in the Clovis area. Five (5) more of the City’s wells are currently on inactive status due to being dry or producing too much sand (Wells 3, 11, 33, T-1, and T-3). **Table 6-1** lists the City’s well inventory and includes the capacity of each well.

Table 6-1: Water Supply Wells

Well No.	Capacity (gpm) ⁴			Current Status	Notes
	Active	Standby	Planned		
2A	1,290	-	-	Active	
3	-	-	-	Inactive	Well is dry
4AA	1,220	-	-	Active	
5A	1,300	-	-	Active	
7A	1,940	-	-	Active	
8A	1,320	-	-	Active	
10	710	-	-	Active	Offline for pending TCP Treatment
11	-	-	-	Inactive	
11A	-	-	1,000	In Construction	Online in 2021
12	870	-	-	Active	
14	1,300	-	-	Active	Offline pending PLC ⁵ repairs

⁴ Current capacity is based on pump tests conducted in April 2017.

⁵ PLC = programable logic controller

Well No.	Capacity (gpm) ⁴			Current Status	Notes
	Active	Standby	Planned		
15A	1,320	-	-	Active	
16	400	-	-	Active	
17	1,040	-	-	Active	
18	710	-	-	Active	
20	-	400	-	Standby	Standby for Fe/Mn contamination
21	780	-	-	Active	
22	540	-	-	Active	
23	510	-	-	Active	
24	700	-	-	Active	
25	780	-	-	Active	
26	1,380	-	-	Active	
27	1,240	-	-	Active	
28	1,900	-	-	Active	
29	880	-	-	Active	
30	450	-	-	Active	
31	580	-	-	Active	Low use due to MN
32	1,300	-	-	Active	
33	-	-	-	Inactive	Sand concerns
34	1,100	-	-	Active	
35	-	-	750	In Construction	Online in 2023
36	1,200	-	-	Active	
37	1,070	-	-	Active	
38	1,610	-	-	Active	
40	1,200	-	-	Active	Low use due to MN and deaeration
41	1,420	-	-	Active	
42	1,980	-	-	Active	
43	1,370	-	-	Active	
45	-	-	500	Future	Planned in the WMP
46	-	-	500	Future	Planned in the WMP
47	-	-	500	Future	Planned in the WMP
T-1	-	-	-	Inactive	Well is dry
T-2	-	-	-	Destroyed	
T-3	-	-	-	Inactive	Well is dry
T-5	650	-	-	Active	Offline due to PFAS contamination
T-6	460	-	-	Active	
T-7	490	-	-	Active	
T-8	280	-	-	Active	
T-9	-	-	1,500	Future	Planned in the WMP
Total	37,290	400	4,750		

In 2020, groundwater provided approximately 49 percent of the total potable water use. The historical volume of groundwater pumped by the City over the past five years is provided in **Table 6-2**. The groundwater extraction has reduced since 2016 and is expected to continue to be reduced, as discussed later in this section.

Table 6-2: Groundwater Volume Pumped (DWR Submittal Table 6-1)

Groundwater Type	Basin Name	2016	2017	2018	2019	2020
Alluvial Basin	Kings Subbasin 5-22.08	13,187	12,001	11,991	10,956	12,105
Total		13,187	12,001	11,991	10,956	12,105
Units: AF						

Recharging the underground aquifer is a very important aspect in the use of groundwater for supply and is one of the means to address basin overdraft. The amount of groundwater recharge varies annually and is highly dependent on precipitation, especially in watersheds to the Kings River. In drought conditions, the City's ability to recharge groundwater is reduced due to decreased surface water supplies. In 2020, recharge was 5,316 AF, while the City's 30-year average groundwater recharge quantity is approximately 8,412 AFY. In the past 30 years the groundwater table has dropped 48 feet, from a depth of 92 feet in 1991 to a depth of 140 feet in 2019. Recharge efforts began in 1974, and in 2004 the City began utilizing surface water with the goal of reducing groundwater extraction. Recharge efforts by the City have not been enough to stem the decline as the basin is shared with other users who either don't recharge or inadequately recharge. A component of recharge for cities is often treated effluent from a wastewater facility; as discussed later, the City sends much of its wastewater supplies to the Fresno-Clovis Regional Wastewater Reclamation Facility (RWRF), which is approximately fourteen miles southwest of the City's center. Due to the direction of the groundwater gradient being also southwesterly from the City's center, this displaced recharge does not benefit the aquifer directly beneath the City from which it extracts groundwater; however, it does benefit the Kings Subbasin from which the City utilizes groundwater. This subject is discussed in greater detail in Section 6.2.5. Figure 6-2 illustrates the historic average depth to groundwater for the City, and Table 6-3 summarizes the average depth to groundwater, intentional recharge efforts by the City, and the average annual rainfall from 1951 through 2020.

Figure 6-2: Historic Depth to Groundwater

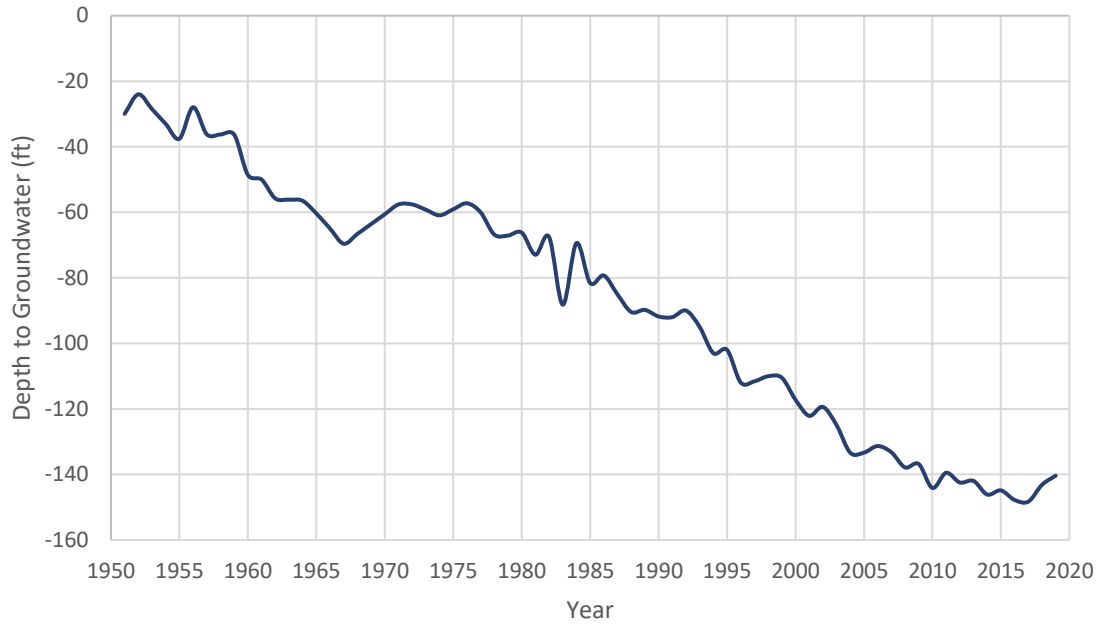


Table 6-3: Historic Depth to Water, Recharge, and Rainfall

Year	Depth to Water (ft)	Total Intentional Recharge (AF)	Rainfall (inches) [1]
1990	91.80	5,500	8.73
1991	92.00	7,369	10.49
1992	90.00	8,395	14.08
1993	95.00	9,224	13.77
1994	103.00	6,403	10.12
1995	102.00	8,751	17.29
1996	111.97	11,024	16.99
1997	111.58	8,591	7.69
1998	110.04	10,250	17.68
1999	110.50	9,076	6.17
2000	117.23	8,365	15.24
2001	122.12	9,141	12.05
2002	119.40	7,901	6.75
2003	124.97	6,661	9.14
2004	133.39	9,204	10.63
2005	133.35	10,760	11.68
2006	131.35	9,718	13.96
2007	133.24	6,257	7.03
2008	137.87	9,157	8.46
2009	136.83	8,225	9.08
2010	144.14	8,400	16.53

Year	Depth to Water (ft)	Total Intentional Recharge (AF)	Rainfall (inches) [1]
2011	139.51	8,356	10.92
2012	142.46	9,876	9.97
2013	141.99	8,262	3.01
2014	146.14	3,261	7.47
2015	144.42	1,788	8.99
2016	147.79	1,788	13.68
2017	148.31	9,925	13.21
2018	143.18	13,590	8.65
2019	140.38	8,858	12.41

Notes:
[1] Source: National Centers for Environmental Information, National Oceanic and Atmospheric Administration, Fresno Yosemite International Station (Period of record 1950-2019)

6.2.3 Surface Water

The City’s surface water supply is provided through an agreement with FID, which allows the City to receive a share of FID’s entitlement to the Kings River and Friant Division of the CVP. Two additional water districts are located within the City’s General Plan Boundaries: GWD and IWD. As the districts urbanize, supply within these areas is expected to be added to the City’s supply. Each water supply agreement is summarized below.

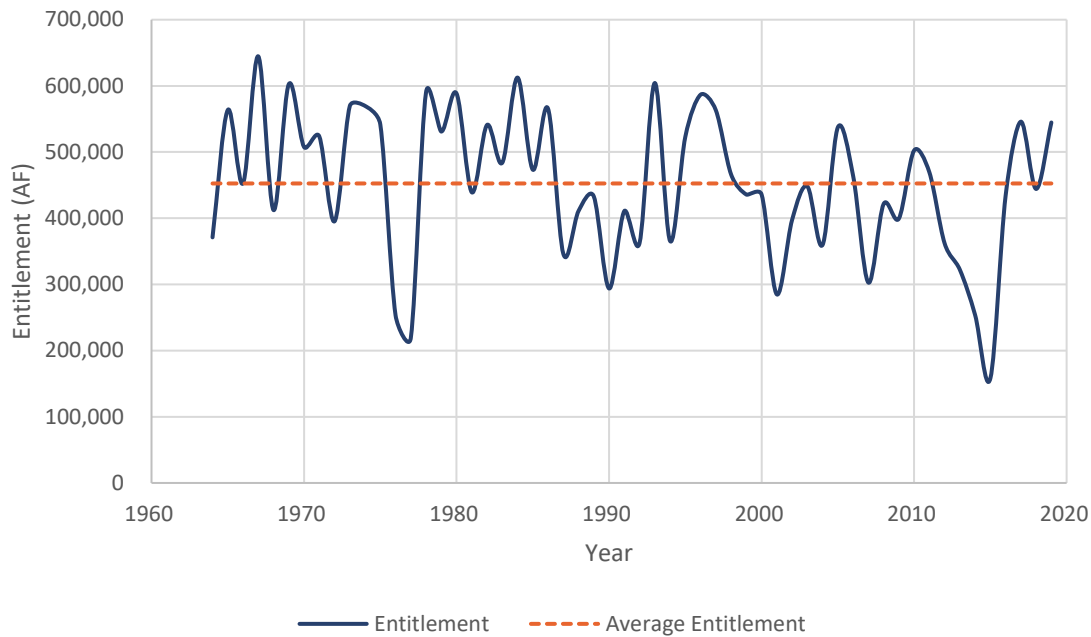
6.2.3.1 Fresno Irrigation District

6.2.3.1.1 Kings River

FID obtains much of its surface water from the Kings River. As a member of the Kings River Water Association, FID holds water rights licenses for all the Kings River and storage rights licenses on Kings River reservoirs. FID is entitled to water based upon a prorated monthly schedule determined by the natural flow of the Kings River as it would occur without reservoir storage above the historic Piedra gauging station. FID is entitled to water from the Kings River at all flows, but the percentage is higher at relatively low Kings River flows. If the snowmelt is slow, the District receives a greater entitlement. FID’s average gross annual entitlement is 452,541 AF. Within the last fifty years, the smallest entitlement received was 158,109 AF, which occurred in 2015. **Figure 6-3** shows FID’s entitlement to the Kings River from 1964 to 2020.

The City’s allocation from the Kings River is proportional to the total acreage of the City’s included area to the total FID area receiving water. Over time, the City has received on average 17,011 AFY, though this has varied from 9,452 AF in the severe drought of 2015 to over 24,958 AF in 2017.

Figure 6-3: FID Historic Kings River Entitlement



6.2.3.1.2 Central Valley Project Water Allocation: Friant Division

The water obtained from the CVP comes from the diversion and storage of water from the San Joaquin River behind Friant Dam. The total available water on the San Joaquin River has been estimated at 2,200,000 AF. Of that, 800,000 AF have been designated as Class I supply (Bureau of Reclamation, 2005). Class I supply is considered to be dependable in most years with shortages only in very dry years. Class II water is in excess of Class I and is therefore much less dependable. FID has a contract with the United States Bureau of Reclamation for 75,000 AF of Class II water from this source (Bureau of Reclamation, 2005). The agreement between the City and FID requires the District to make available to the City the proportional share of all surface water available to the District although it does not allow the City to directly receive FID’s CVP supplies. Therefore, FID is required to make a like amount of Kings River (or any other surface) water available to the City for its proportional share of Class II CVP supplies. FID’s Class II contract has received an average 13,577 AFY with the actual number ranging from zero to the full 75,000 AF depending upon the nature of each water year over that period. **Table 6-4** lists the surface water volume received in 2020 and the projected allocation from Class I and Class II.

6.2.3.2 Garfield Water District

GWD is located north of the City with a portion of the district in the City’s SOI. The GWD holds a Class 1 CVP contract for 3,500 AFY. With half of GWD within the City’s SOI, an estimated 1,750 AFY is expected to be added to the City’s supply upon development.

6.2.3.3 International Water District

IWD is located east of the City’s SOI within the general plan’s boundary. The IWD holds a Class 1 CVP contract for 1,200 AFY. The City’s General Plan designates a portion of the District’s area as industrial

and residential use. At build-out it is estimated that the entire 1,200 AFY supply will be added to the City’s Supply.

Table 6-4 shows the actual volume of surface water the City received in 2020 and the projected volume the City anticipates for 2025 through 2040. Future projections are based on the normal entitlement.

Table 6-4: Actual and Projected Surface Water Supply

Supply Source	2020 (AF)	2025 (AF)	2030 (AF)	2035 (AF)	2040 (AF)
Kings River [1]	18,139	19,227	22,717	26,208	32,100
FID Agreement [2]	0	2500	4000	5,000	6,000
CVP Class II	0	433	867	1,300	1,300
GWD Class I	0	550	1,100	1,650	1,750
IWD Class I	0	0	500	1,000	1,200
Total	18,139	22,710	29,184	35,158	42,350

Notes:

[1] Kings River supply includes surface water supplies from both the City’s agreements with FID, including a cap at 7.12% of the FID area on the first agreement (equating to 32,100 AF and anticipated to be reached in 2040 based on the City’s growth rate) and an additional 7,000 AF firm water supply by 2045. Both provisions are shown in the 2019 agreement.

[2] Per the 2019 FID Agreement, up to 1000 AF in 2020 and up to 7000 AF in 2045, Firm Supply.

6.2.4 Stormwater

Stormwater throughout the City is collected in Fresno Metropolitan Flood Control District’s (FMFCD) basins. Unless the storm season is particularly wet, the collected stormwater is allowed to percolate into the soil as groundwater recharge. Additionally, the FMFCD allows the City to utilize seventeen stormwater basins throughout the City’s Service Area for recharge purposes.

6.2.5 Wastewater and Recycled Water

The UWMPA requires that the UWMP address the opportunities for development of recycled water, including the description of existing recycled water applications, quantities of wastewater currently being treated to recycled water standards, limitations on the use of available recycled water, an estimate of projected recycled water use, the feasibility of said projected uses, and practices to encourage the use of recycled water.

6.2.5.1 Recycled Water Coordination

Legal Requirements:

CWC §10633

The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.

A large portion of the City of Clovis' wastewater is treated at the Fresno-Clovis Regional Wastewater Reclamation Facility (RWRF), located southwest of the City of Fresno. It is approximately 16 miles by trunk sewer to the City of Clovis. Currently, the water is treated to the secondary level and then some is spread in percolation ponds and some is used directly on non-food crops. The plant can utilize wells on the treatment plant property to pump water to reduce groundwater mounding under the plant. The pumped water can then be put into Dry Creek and the Houghton Canal for use by farmers downstream. FID in exchange can provide the City of Fresno an additional one AF of surface water for each two AF of water pumped and put into the canals, which is designated to be used as recharge on the east side of the District. The City of Fresno is in the process of constructing recycled water distribution system infrastructure to convey recycled water from the RWRF to customers within the City of Fresno. Because Clovis contributes a percentage of the flow to the plant and pays a percentage share of maintenance, operations, and capital improvement costs, Clovis is also entitled to a proportionate share of any exchanged water and will be meeting with the City of Fresno and FID to discuss how to obtain said water.

The City also reports its recycled water use, as part of its overall water supply portfolio reporting to the NKGSA for inclusion in its annual report to DWR.

6.2.5.2 Wastewater Collection, Treatment, and Disposal

Legal Requirements:

CWC §10633

A description of the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.

6.2.5.2.1 Wastewater Collection System

The City's wastewater collection system is divided into seven major service areas. These seven major wastewater service areas also represent the City's entire water service area. Under existing conditions, the Herndon, Fowler, Sierra, and Peach service areas discharge into the City's regional trunks, which convey flows to the RWRF. Flow from the remaining three service areas (Northwest, Northeast, and Southeast) are conveyed to the Clovis Water Reuse Facility (WRF).

According to the 2017 Wastewater Collection System Master Plan, the City currently generates an Average Daily Flow of 7.018 million gallons per day (mgd) (7,861 AFY). As shown in **Table 6-5**, in 2020 approximately 5.547 mgd (6,213 AFY) was conveyed to the RWRF, while 2.229 mgd (2,496 AFY) was treated at the WRF; a total average daily flow of 7.775 mgd (8,710 AFY).

The City is exploring ways to recover the treated effluent either directly through a recycled water pipeline project or indirectly through exchanges with the City of Fresno and FID.

6.2.5.2.2 Wastewater Treatment Facilities

By agreement with the City of Fresno, the City of Clovis conveys much of its wastewater to the RWRF and is entitled to a maximum capacity of 9.3 mgd. The RWRF is owned and operated by the City of Fresno and currently has a maximum capacity of 80 mgd. If required, the City has the capability to acquire additional capacity at the RWRF.

The City has constructed a new WRF, which began service in 2009. The WRF produces a disinfected tertiary treated water supply. The plant serves the new growth areas of the City in the Southeast, Northwest, and ultimately the Northeast Urban Centers. The WRF is located on Ashlan Avenue approximately 600 feet west of McCall Avenue. The facility utilizes wastewater flows that were previously being treated at the Regional Wastewater Treatment Plant for a total average daily flow of 2.8 million gallons per day (3,136 AFY). The plant is designed to accommodate future expansion and will ultimately treat 8.4 million gallons per day (9,400 AFY).

As shown in **Table 6-5**, 2,496 AF of wastewater was treated at the WRF and 6,213 AF was treated at the RWRF. One hundred percent of the service area is covered by the wastewater collection system and all population served by the water system is also served by the wastewater collection system. Of the 2,496 AF treated at the WRF, 710 AF was used within the service area, while the remainder was discharged, as shown in **Table 6-6**.

Table 6-5: Wastewater Collected Within Service Area in 2020 (DWR Submittal Table 6-2)

Wastewater Collection			Recipient of Collected Wastewater		
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected from UWMP Service Area 2020	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area?
City of Clovis	Metered	2,496	City of Clovis	Water Reuse Facility	Yes
City of Clovis	Metered	6,213	City of Fresno	Regional Water Reclamation Facility	No
Total Wastewater Collected from Service Area in 2020:		8,709			

Table 6-6: Wastewater Treatment and Discharge (DWR Submittal Table 6-3)

Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Method of Disposal	Does this Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level	2020 Volumes			
						Wastewater Treated (AF)	Discharged Treated Wastewater (AF)	Recycled within Service Area (AF)	Recycled Outside of Service Area (AF)
Clovis Water Reuse Facility	Fancher Creek	Creek and Recycled Water Use Area	River or Creek Outfall	No	Tertiary	2,496	1,786	710	-
Total						2,496	1,786	710	-

The City is also permitted to discharge north into the diversion channel to Little Dry Creek. This discharge location was not utilized this UWMP period but may be in the future.

6.2.5.3 Recycled Water System Description

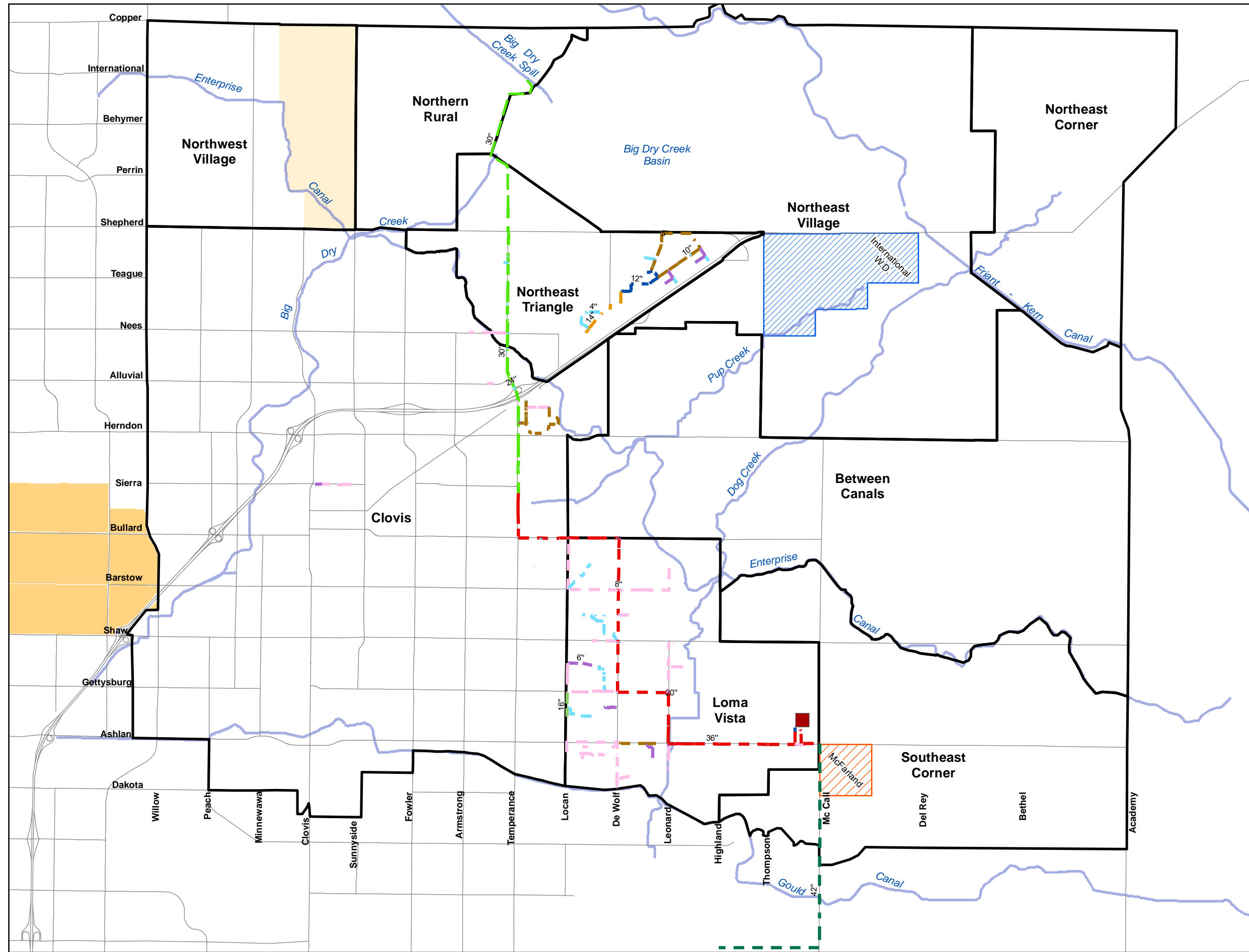
Legal Requirements:

CWC §10633

(c) (Describe) the recycled water currently being used in the supplier’s service area, including, but not limited to, the type, place, and quantity of use.

The City updated its Recycled Water Master Plan in 2017. The goals of the update are to identify and summarize existing and potential future recycled water demands; identify constraints associated with certain recycled water users, evaluate existing recycled water infrastructure, and identify potential capacity for deliveries.

Currently, recycled water is used for irrigation of public and private landscape within the service area. As shown in **Table 6-7**, 574 AF of recycled water was used in 2020 to irrigate landscape, while 136 AF was used for agricultural irrigation. Current areas receiving recycled water include Freeway 168 between Shepherd Avenue and Sierra Avenue, Clovis Community Medical Center, and multiple City parks and landscape areas. **Figure 6-4** shows the location of existing and potential recycled water users.



Legend

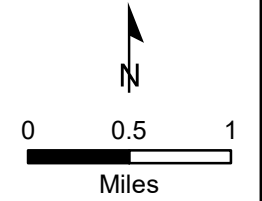
- Village Boundaries
- Water Reuse Facility
- International W.D.
- McFarland
- California State University Fresno
- Creeks and Canals

Existing Recycled Water Pipes

- 4"
- 6"
- 8"
- 10"
- 12"
- 14"
- 16"
- 30"
- 36"
- 42"

Figure 6-4 Recycled Water Use Areas

City of Clovis 2020 Urban Water Management Plan



6.2.5.4 Potential, Current, and Projected Recycled Water Uses

Legal Requirements:

CWC §10633

(b) A description of the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.

(d) A description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.

(e) The projected use of recycled water within the supplier’s service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.

Landscape irrigation will continue to be the main use of recycled water in the future for the City. All public landscape areas within three-quarters of a mile of the distribution system are considered potential recycled water use areas. Clovis Unified School District is evaluating the use of recycled water for its landscape areas. Caltrans has expanded their use of recycled water along Freeway 168 from Armstrong Avenue west to Sierra Avenue. This increase in volume and expansion of uses is expected to increase due to proactive actions taken by the City, which are described in a subsequent section. The City is very interested in exploring the use of recycled water for groundwater recharge. The water could be provided to the recharge facility during periods when no raw water supplies are available or to supplement raw water supplies.

The projected recycled water users in **Table 6-7** are primarily landscape areas within the new growth areas of the City and recharge applications.

The recycled water produced by the tertiary treatment plant could be used for agricultural purposes if other users are not ready to accept the water. The City currently has a farmer adjacent to the WRF that is planning on taking surplus recycled water to irrigate agricultural crops. The crops to be irrigated include almonds, citrus, and alfalfa. Farmers in the International Water District area are also interested in utilizing the water to irrigate crops which mainly are citrus. Currently, this area is not in the City’s service area. Excess recycled water supplies are currently discharged to Fancher Creek and conveyed through irrigation canals to agricultural lands southwest of Clovis.

There are currently no wildlife habitat areas or wetlands within the Clovis service area. Potentially the water discharged to FID could be used for wetlands or wildlife habitat enhancement areas.

The water could also potentially be used by future industrial customers within the new growth areas of the City; however, it will depend on their needs and their proximity to the recycled water transmission and distribution lines. At this point none have been specifically identified.

Table 6-7 shows the current and projected recycled water direct beneficial users.

Table 6-7: Current and Projected Recycled Water Direct Beneficial Uses (DWR Submittal Table 6-4)

Name of Agency Producing (Treating) the Recycled Water		City of Clovis					
Name of Agency Operating the Recycled Water Distribution System		City of Clovis					
Supplemental Water Added in 2020		None					
Source of 2020 Supplemental Water		None					
Beneficial Use Type	General Description of 2020 Users	Level of Treatment	2020	2025	2030	2035	2040
Agricultural Irrigation		Tertiary	136	150	75	0	0
Landscape Irrigation (excludes golf courses)	Public and Private Landscape	Tertiary	574	1,550	2,525	3,501	4,476
Groundwater Recharge			1,786	1,400	2,900	2,799	4,924
Total			2,496	3,100	5,500	6,300	9,400

6.2.5.4.1 *Planned versus Actual Use of Recycled Water*

Legal Requirements:

CWC §10633

(e) (Provide) a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.

According to the 2015 UWMP, the City was projected to use 784 AF for agricultural irrigation, 1,000 AF for groundwater recharge, and 1,219 AF of recycled water for landscape irrigation. As shown in **Table 6-8**, the total 2015 projected water use for the year 2020 was 2,913 and the actual amount of recycled water used in 2020 was 2,496 AF.

Table 6-8: 2015 Recycled Water Use Projection Compared to 2020 Actual (DWR Submittal Table 6-5)

Use Type	2015 Projection for 2020	Actual 2020 Use
Agricultural Use	784	136
Landscape Irrigation (excludes golf courses)	1,129	574
Groundwater Recharge	1,000	1,786
Total	2,913	2,496
Units: AF		

6.2.5.5 Actions to Encourage and Optimize Future Recycled Water Use

Legal Requirements:

CWC §10633 *The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier...and shall include the following:*

(g) A plan for optimizing the use of recycled water in the supplier’s service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.

The City now requires all new development of public landscape near recycled water transmission lines to use recycled water. Additional actions include extending the recycled water distribution system to discharge at groundwater recharge facilities and lowering the cost of recycled water. **Table 6-9** summarizes the City’s methods to expand future recycled water use.

The City updated the Recycled Water Master Plan in 2017, which includes options to maximize the use of recycled water. The Master Plan update helps the City identify required infrastructure, estimate recycled water demands, site recycled water use areas, and develop capital improvement plans. It also identifies the requirements to utilize recycled water for groundwater recharge.

Table 6-9: Methods to Expand Future Recycled Water Use (DWR Submittal Table 6-6)

Name of Action	Description	Planned Implementation Year	Expected Increase in Recycled Water Use (AF)
Facilitate use for groundwater recharge	Revise permit and extend distribution system to utilize water for recharge during low demand periods	2025	1,000
Expand use of recycled water	Expand use of recycled water to potential users within 3/4-mile buffer of existing recycled mains	2025	1,531
Total			2,531

6.2.6 Desalination Water Opportunities

The UWMPA requires that the UWMP address the opportunities for development of desalinated water, including ocean water, brackish water, and groundwater.

Legal Requirements:

CWC §10631(g) *Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.*

Currently, the City does not have any feasible or economic opportunities for desalination. The groundwater that underlies the City is not brackish in nature, and the City is not located in a coastal area. Therefore, the need for desalination is not required.

6.2.7 Exchanges or Transfers

The UWMPA requires that the UWMP address the opportunities for transfers or exchanges.

Legal Requirements:

CWC §10631(c) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

Water exchanges, transfers, and water banking allow purveyors to manage demand and supply variability by ensuring water will be available for the near future.

6.2.7.1 Exchanges

6.2.7.1.1 Fresno-Clovis Regional Wastewater Reclamation Facility

A portion of the City’s wastewater is treated at the RWRF. Under an agreement with FID, the City of Fresno receives approximately one AF of surface water from the Kings River for each two AF of reclaimed water produced by the treatment facility. Clovis will be discussing with Fresno the ability to receive a percentage of the exchange; however, the exchange is not being utilized at this time and has not been included in future water projections. This water is limited by agreement to being used for groundwater recharge activities.

6.2.7.2 Transfers

The City currently has an agreement with Clovis Hills Church and GWD to receive the 23 AFY of Class 1 CVP surface water associated with the land on which Clovis Hills Church was constructed. That supply has been transferred to the City’s water supply portfolio.

The City currently does not have any additional approved plans to facilitate water transfers. As with the Clovis Hills Church property, and in accordance with the City’s 2014 General Plan, lands proposed for annexation must transfer existing water entitlements to the City as a condition of annexation. The City will be communicating that requirement to landowners in the Garfield and International Water Districts so that they will retain the water rights and transfer them to the City upon annexation.

6.2.7.3 Water Banking Facility

Two banking facilities, the Waldron Banking Facilities (WBF) and Boswell Groundwater Banking Facility (BGBF), have been constructed in central Fresno County. The City entered into an agreement with the FID to participate in the financing of the construction of a dedicated water banking facility called the Waldron Banking Facilities. The City is entitled to receive up to ninety percent (9,000 AF) of the annual yield. The City plans on taking the water in dry years to augment supply.

The City and FID have entered into a similar agreement regarding the Boswell Groundwater Banking Facility whereby the City will have access up to 4,500 AFY of surface water. The recharged water will be “banked” for future recovery during dry periods or to accommodate planned growth. In the event the Facility cannot produce the 4,500 AFY of surface water, FID will endeavor to acquire supplemental water for Clovis from other sources, which the City will be required to fund. **Table 6-10** lists the actual and projected amount of water banked at these two facilities.

Table 6-10: Water Banking Opportunities

Agency	Supply	2020	2025	2030	2035	2040
Waldron Banking Facilities	Water Banking	9,000	9,000	9,000	9,000	9,000
Boswell Groundwater Banking Facility	Water Banking	4,500	4,500	4,500	4,500	4,500
Totals		13,500	13,500	13,500	13,500	13,500

6.2.7.4 Emergency Interties

The City has an agreement with the City of Fresno for two interties between the two systems. The northern intertie will provide for treated water from the City of Fresno to be supplied to the City of Clovis. The southern intertie will provide for treated water from the City of Clovis to be supplied to the City of Fresno. The southern intertie has been constructed and was put into service but is not currently being utilized. The northern intertie is planned to be constructed during the next several years. The purpose of the interties is to facilitate the treatment of surface water supplies during the initial years of the agreement and ultimately to provide emergency backup to both systems.

6.2.8 Future Water Projects

Legal Requirements:

CWC §10631(f) *Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use, as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in normal and single dry water years and for a period of drought lasting five consecutive water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.*

The City has been searching for additional land to construct another dedicated groundwater recharge facility in the City. The facility will likely be in North Clovis upgradient of City wells. A minimum of 20 to 40 acres is desired with a minimum recharge capability of 1,500 to 3,000 AF per year. An additional project that the City is pursuing in cooperation with FID, FMFCD, and the City of Fresno, is either reoperation of Big Dry Detention Basin, known as the Redbank-Fancher Creeks Flood Control Project, to allow storage of East Side Stream Flood releases or a project to increase recharge capabilities upstream of the Basin. This is currently in the study phase.

In addition to recharge projects, the City updated its Capital Improvements Plan alongside the WMP Update in 2017 and several water supply projects are included therein, as shown in the following table (Provost & Pritchard Consulting Group, 2018).

Table 6-11: Expected Future Water Supply Projects or programs (DWR Submittal Table 6-7)

Name of Future Projects or Programs	Joint Project with other suppliers?	Description (if needed)	Planned Implementation Year	Planned for Use in Year Type	Expected Increase in Water Supply to Supplier	
Big Dry Detention Basin Reoperation	Yes	FID, FMFCD, and City of Fresno	Increase Recharge Capabilities in Basin	2025	All Year Types	TBD
Clovis Recharge Project	No		Additional Recharge Basin in Clovis	2025	All Year Types	1,500
City Production Well No. 11	No		Additional Water Supply Source	2021	All Year Types	1,615
City Production Well No. 45	No		Additional Water Supply Source	2022	All Year Types	810
City Production Well No. 35	No		Additional Water Supply Source	2023	All Year Types	810
City Production Well No. 46	No		Additional Water Supply Source	2024	All Year Types	810
City Production Well No. 47	No		Additional Water Supply Source	2026	All Year Types	810
Northeast SWTP	No		Additional Water Supply Source	2030	All Year Types	22,400
City Production Well No. T9	No		Additional Water Supply Source	2035	All Year Types	2,420
Southeast SWTP Expansion	No		Additional Water Supply Source	2040+	All Year Types	25,200

6.2.9 Summary of Existing and Planned Sources of Water

Legal Requirements:

CWC §10631

(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision 10631(a).

(4)(D) (Provide a) detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

6.2.9.1 Description of Supplies

6.2.9.1.1 Groundwater

As discussed above, the City has historically relied upon groundwater for a large proportion of its water supply; however, that has been changing the past fifteen years and will continue to do so. The City is operating under the understanding there is a sustainable yield for groundwater pumping of 9,400 AFY; however, SGMA implementation may affect that number. The City will be using groundwater as its secondary supply source and relying on surface water for future growth.

6.2.9.1.2 Surface Water

The City has succeeded in securing sufficient surface water supplies for normal year demands and will be expanding surface water treatment capacity and reliability with several capital projects in the next few years. The expansion at the existing SWTP and the construction of a second SWTP in the northeast portion of the City will support the anticipated growth of the community and associated water demands. Additionally, the City is reviewing options to mitigate the period each year when the existing conveyance to the SWTP is removed from service for maintenance activities. During this period, the City is unable to operate its SWTP and relies solely on groundwater pumping. Fortunately, the period occurs in November or December, one of the lowest water use months of the year. However, to rely more heavily on the SWTP, the City must ensure it can operate 365 days of the year.

6.2.9.1.3 Supply from Storage

The City has access to 9,000 AF of annual water supply from the Waldron Banking facility; this water is considered a dry year supply, so is not shown in the normal year water supply tables. Additionally, the City has access to 4,500 AF of annual water supply from the Boswell (Jameson) Banking facility, which is a normal year water supply and is considered in the overall supply portfolio.

Table 6-12: Water Supplies – Actual (DWR Submittal Table 6-8)

Water Supply	Additional Details on Water Supply	2020		
		Actual Volume (AF)	Water Quality	Total Right or Safe Yield
Groundwater [1]	Tulare Lake Basin 5-22.08	12,105	Drinking Water	9,400
Surface water		18,139	Drinking Water	27,748
Supply from Storage	Waldron and Boswell Banking Facilities	0	Drinking Water	13,500
Recycled Water	Water Reuse Facility	2,497	Recycled Water	3,100
Total		32,741		53,748

Notes:

[1] The City had 5,316 AF of intentional recharge in 2020, offsetting the amount of groundwater used over the sustainable yield volume of 9,400 AF.

Groundwater pumping accounted for twenty-six percent of the City’s total available water supply. As shown in **Table 6-12**, the actual 2020 supply for the service area consisted of surface water, groundwater, supply water from storage and recycled water. Overall supply available to the City for 2020 was 53,748 AF.

Future supply projections through 2040 are shown in **Table 6-13**. The future supply projections assume normal surface water entitlements from the FID and incorporated water districts based on the most recent 30-year averages and anticipated growth rates for the City.

Table 6-13: Water Supplies – Projected (DWR Submittal Table 6-9)

Water Supply	Additional Details on Water Supply	Projected Water Supply (AF)			
		2025	2030	2035	2040
		Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume
Groundwater [1]	Tulare Lake Basin 5-22.08	11,429	10,753	10,076	9,400
Surface Water [2]	Kings River and CVP	22,160	27,584	32,508	39,400
Supply from Storage	Waldron & Boswell banked Supplies	13,500	13,500	13,500	13,500
Recycled Water	Water Reuse Facility	3,100	5,500	6,300	9,400
Transfers	Garfield WD	550	1,100	1,650	1,750
Transfers	International WD	0	500	1,000	1,200
Total		50,739	58,937	65,034	74,650

Notes:

[1] Reasonably available volume shows a steady reduction in reliance on groundwater supply, as planned, to the sustainable yield volume in 2040. The City will be conducting intentional recharge in these years and may extract groundwater in excess of 9,400 AFY based on the groundwater recharge conducted.

[2] Surface water is shown in detail in Table 6-4.

6.2.10 Special Conditions

6.2.10.1 Climate Change Impacts to Water Supply Sources

The impacts on the City’s water supply due to climate change could take many forms but are likely to impact surface water supplies most. It is anticipated that precipitation will occur in the form of rain, not snowpack, more often, and snowmelt and the associated runoff will begin earlier than in the past. This change will require more water storage facilities be available to capture the water supply that would have otherwise been “stored” as snowpack in the mountains.

In years of drought, there are minimal water flows that must be maintained to the Bay Delta for water quality and other environmental reasons. While the City's current surface water supply is primarily (and functionally) only from the Kings River, future water supplies are tied to the CVP, which will be impacted by minimal flow requirements. This could impact the City's ability to obtain those surface water supplies.

If droughts or other impacts limit the ability of the City and other agencies in the Kings Subbasin to utilize surface water to meet potable water demands, the agencies may be forced to enact strict conservation measures and rely on the groundwater supplies more than desired. If the groundwater levels decline further, production wells could be impacted also.

6.2.10.2 Regulatory Conditions

The introduction of SGMA has been a major modification to how water supplies are considered. The Kings Subbasin has a good plan to work cooperatively in managing their groundwater basin and reaching sustainability. It is not anticipated additional regulation will be introduced to further modify how the agencies can access and utilize water supply sources. If the cooperative approach to SGMA compliance does not continue, additional regulation may be a possibility in the form of adjudication of the groundwater basin.

6.3 Energy Consumption

The City tracks their energy use on a per supply source basis (i.e., energy use per well) on a monthly basis. In 2020, through pumps associated with groundwater wells, water storage reservoirs, operation of intentional groundwater recharge basins, and operation of the SWTP, the City used approximately 13,811,057 kilowatt hours (kWh) of power to produce 24,828 AF of water into the distribution system, yielding a power consumption of 556.3 kWh/AF as shown in the following table. These figures do not include energy used by the wastewater system, including wastewater delivered to the RWRP.

Table 6-14: Energy Consumption (Optional DWR Submittal Table O-1A)

Urban Water Supplier:		City of Clovis					
Start Date:	1/1/2020	Urban Water Supplier Operational Control					
End Date:	12/30/2020	Water Management Process					
	Units	Extract and Divert (A)	Place into Storage (B)	Conveyance (C)	Treatment (D)	Distribution (E)	Total Utility
Volume of Water Entering Process	AF	30,854	5,316	0	12,723	24,828	24,828
Energy Consumed	kWh	7,507,975	41,377	0	5,963,055	298,650	13,811,057
Energy Intensity	kWh/AF	249.1	7.8	0.0	468.7	12.0	556.3
Quantity of Self-Generated Renewable Energy:				240,126 kWh			
Data Quality:		Metered Data					
Data Quality Narrative:	<p>The Extract and Divert column accounts for all water into the system, either surface water or groundwater and the associated water to extract it from the ground (i.e., groundwater well pumps).</p> <p>The Place into Storage column accounts for water placed into the Marion Basin and energy required to pump it to that facility.</p> <p>The Treatment column accounts for all water processed through the SWTP and energy required to run the SWTP.</p> <p>The Distribution column accounts for all water distributed through the water system and energy associated with moving it throughout the system via booster pumps, including into and out of temporary storage reservoirs.</p> <p>The City has solar power generation at the SWTP, which is noted above; however, the Energy Consumed is net of the Self-Generated Renewable Energy.</p> <p>The City uses energy to treat its wastewater and create recycled water; however, the portion of energy attributable to the recycled water component only has not been separated from the total energy use at the WRF so is not shown here. The City will make efforts to determine the portion of energy attributable to the recycled water generation for future reporting needs.</p>						

7 Water Supply Reliability

The UWMPA requires that the UWMP address the reliability of the City’s long-term water supplies. This includes a description of supply constraints which may impact the supply. Also included is a comparison between the City’s supply and demand.

Legal Requirements:

CWC §10635(a)

Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the long-term total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and a drought lasting five consecutive water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

7.1 Constraints on Water Sources

Legal Requirements:

CWC §10631(b)(1) *A detailed discussion of anticipated supply availability under a normal water year, single dry year, and droughts lasting at least five years, as well as more frequent and severe periods of drought, as described in the drought risk assessment. For each source of water supply, consider any information pertinent to the reliability analysis conducted pursuant to Section 10635, including changes in supply due to climate change.*

A variety of circumstances can render a source inconsistent; therefore, determining the supply reliability for the City is difficult because of the complex factors that accompany a water source. These factors include legal issues, environmental constraints, water quality, and climatic variations.

7.1.1 Legal

The groundwater supplies the City relies upon are not in the process of adjudication. The surface water supplies have either long-range contracts or newly executed contracts to document quantities and availability to the City.

Since the 2015 UWMP, SGMA has become effective, and the City is working collaboratively with other agencies reliant on the groundwater basin to reach sustainable management of the groundwater aquifer prior to 2040, as required. As noted in previous sections, the supply from groundwater sources has been modified to reflect this change in the City’s supply portfolio. In the 2010 and 2015 UWMPs, the City’s groundwater supplies were shown to be increasing with population growth into the future. The projected groundwater supply in this UWMP shows it decreasing to the estimated sustainable amount of 9,400 AFY.

Additionally, the City is following upcoming regulations regarding indoor and outdoor water standards and has used a reduced residential per capita rate for water use projects to reflect the indoor water standard changes anticipated in 2025 and 2030.

7.1.2 Environmental

The status of environmental regulation in California is routinely changing due to new legislation, endangered species statuses, and other factors. Should new environmental legislation come into existence it could potentially reduce the City's available supply. The recent water supply reductions in the Delta are an example of environmental water needs versus community water supplies. While these reductions do not currently impact the City's water supply, as it continues to grow, new water surface water supplies that are expected to be added to the water supply portfolio may be impacted by the Delta reductions. It will be prudent for the City to continue to be aware of how those reductions change and plan accordingly. Due to the mixture of groundwater and surface water within the City, it is anticipated that alterations to the water supply could be made to accommodate these changes, should they occur.

7.1.3 Water Quality

The quality of the City's water supply is generally good. The Kings River water is low in contaminants and usually easy to treat. Following heavy rain events, the turbidity levels can increase significantly. The City's treatment plant can usually handle the increases, but it may also be shut down temporarily to save on chemical costs. This is not a concern from a supply perspective because storm events normally occur during low demand periods in the winter months. However, the City is looking into pretreatment projects in order to maximize the use of surface water through the treatment plant. The delivery mechanism for the Kings River water, the Enterprise Canal, is patrolled by City staff six days a week and by a Fresno City staff member one day a week. This helps to ensure that the quality of the water stays high. Water quality does not have a significant effect on the supply's reliability as the water is treated to a high quality at the City's Surface Water Treatment Plant. The City's drinking water meets all applicable water quality regulations.

Groundwater quality is also fairly consistent. However, water quality regulations are constantly being revised with new constituents being added for monitoring and new or reduced maximum contaminant levels being established. Water quality concerns have two of the existing active wells temporarily offline (Wells 10 and T-5) and one on standby status (Well 20). TCP, PFAS, DBCP, Nitrates, and high iron and manganese are the main water quality constraints in the Clovis area.

7.1.4 Climatic Factor

As climate change becomes more quantifiable and potentially affects the local water conditions more, alterations in the water supply planning arena will have to take place. Climate change elements such as drought, more rainfall and less snow in the watershed, or massive flooding could potentially affect supply reliability, therefore requiring the City to make modifications to their water supplies.

7.1.4.1 Water Supply Impacts

The most probable water supply in the City's portfolio to be impacted by climate change is their surface water supply. The NKGSP examined the reliability of the Kings River supply and concluded that the agencies reliant on the Kings Subbasin could continue to plan on those supplies with climate change

factored in, stating specifically, “Kings River water supplies available to the Kings Subbasin will be managed in the future to maintain historical levels of water supplies.” Evaluation of the Kings River supplies into the future, considering climate change impacts of warmer temperatures, showed more precipitation occurring as rainfall and less as snowfall and that the snowfall (snowpack) will have a tendency to melt sooner in the season. The biggest impact this shift will have is water management, including additional reservoir storage and increased recharge during low-use periods. The GSP further states that “climate change will have no significant impact on Kings River diversions.”

The climate change impacts on groundwater should be less impactful to overall water management strategies, as the City and others are already positioning to respond to SGMA and achieve groundwater sustainability by 2040. Without groundwater sustainability achieved, groundwater levels could continue to decline, impacting the overall access and amount of groundwater in the aquifer. The City’s reduction in reliance on groundwater will also mean any impact on groundwater due to climate change will have a decreased impact on the City overall.

7.1.4.2 Behavioral Mitigation and Adaption

In response to potential climate changes, the City is proceeding with a two-fold approach including mitigation and adaptation strategies. Mitigation consists of reducing the amount of greenhouse gas emissions to help slow the process of climate change. Adaptation is the process of modifying behaviors in response to the warming climate and related changes.

In relation to water management, emission reduction can be achieved by reducing the amount of water usage per capita, thereby decreasing the energy used to move, treat, and discharge water supplies. As the City continues to implement the demand management measures (DMMs) discussed in **Section 9**, their water usage and related energy usage will decrease. DMMs that conserve water but utilize excess energy supplies to do so will need to be critically evaluated to determine if they are desirable.

Adaptation is generally considered a local principle and, as such, must be contemplated in a very specific manner for each area. Adaptation can consist of more extensive master planning, enhanced management and storage of surface water supplies, increased usage of recycled water, investment in infrastructure to support the previously stated measures, and public outreach for water conservation. As mentioned before, the City is working towards sustainability in relation to their water usage through increased recycled water uses and conservation.

7.2 Reliability by Type Year

This section considers the City’s water supply reliability during three water scenarios: normal/average year, single-dry year, and multiple-dry year period.

7.2.1 Types of Years

The reliability scenarios to be considered are defined as follows:

- **Normal/Average year:** This condition represents the water supplies a Supplier considers available during normal conditions. This could be a single year or averaged range of years that

most closely represents the average water supply available to the Supplier. In the 2020 UWMP Guidebook, DWR uses the terms *average* and *normal* interchangeably when addressing the water year type.

- **Single-dry year:** the year that represents the lowest water supply available to the City. Generally considered to be the lowest annual runoff for a watershed since the water-year beginning in 1903. Suppliers should determine this for each watershed from which they receive supplies.
- **Multiple-dry year period:** the period that represents the lowest average water supply available to the City for a consecutive multiple year period. Generally considered to be the lowest average runoff for a consecutive multiple year period (five years or more).

Table 7-1 summarizes the base years for the average and single- and multi-dry year periods. In addition, the available supply volume, and percent relative to the normal/average year is listed. As shown, the representative normal year is 2018, while 2015 represents the lowest supply year (single dry year).

Table 7-1 reflects the more recent 2012 through 2016 drought since accurate water supply records were available.

Table 7-1: Bases of Water Year Data (DWR Submittal Table 7-1)

Year Type	Base Year	Available Supplies if Year Type Repeats	
		X	
		Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP.	
		Quantification of available supplies is provided in this table as either volume only, percent only, or both.	
		Volume Applied (AF)	Percent of Average Supply
Normal/Average Year	2018	52,376	100
Single-Dry Year	2015	34,508	66
Multiple-Dry Year	2012	46,875	89
Multiple-Dry Year	2013	44,460	85
Multiple-Dry Year	2014	40,306	77
Multiple-Dry Year	2015	34,508	66
Multiple-Dry Year	2016	51,244	98

7.3 Supply and Demand Comparison

Legal Requirements:

CWC §10635

(a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional or local agency population projections within the service area of the urban water supplier.

7.3.1 Reliability – Normal Year

The projected normal water year supplies and demand from 2025 through 2040 are presented in **Table 7-2**. As shown, the supply is greater than the demand for each year and reflects the projected surplus during a normal water year.

Table 7-2: Normal Year Supply and Demand Comparison (DWR Submittal Table 7-2)

	2025	2030	2035	2040
Supply Totals	50,739	58,937	65,034	74,650
Demand Totals	39,737	42,824	46,422	52,598
Difference	11,002	16,113	18,611	22,052

Units: AF

7.3.2 Reliability – Single Dry Year

During a single-dry year, surface water allotments are anticipated to be reduced by as much as 66 percent for Kings River surface water supplies, and CVP Class II supplies are eliminated completely in dry years. In the future, as the City becomes more reliant on surface water supplies, the impact of surface water reductions in dry years will be more significant. The projected single-dry year supply and demand from 2025 through 2040 are presented in **Table 7-3**. As shown, demand reductions due to water shortage measures are included in the demand estimates. During a single-dry year demands will be reduced by temporarily eliminating groundwater recharge activities and implementing the water shortage contingency plan as necessary.

Table 7-3: Single Dry Year Supply and Demand Comparison (DWR Submittal Table 7-3)

	2025	2030	2035	2040
Supply Totals	37,839	43,587	47,233	53,109
Demand Totals	34,272	37,359	40,957	47,133
Difference	3,567	6,228	6,276	5,976

Units: AF

7.3.3 Reliability – Five Consecutive Dry Years

The projected multiple-dry year supply and demand from 2025 through 2040 is presented in **Table 7-4**. To provide protection for the system, planning for a twenty percent supply excess over demands is a guiding principle. Therefore, while during the first-year adequate supplies are available for normal demands and no demand reductions are required, voluntary conservation will be promoted, and recharge activities may be curtailed to maintain an adequate supply buffer for the system. During the subsequent second, third, and fourth years, the Water Shortage Contingency Plan will be implemented with varying levels of mandatory conservation required for all users. In addition, the City may choose to reduce groundwater recharge activities and will be utilizing banked groundwater to augment the City's supply. As with the 2012-2016 drought period, it is anticipated the final year will begin to see an improvement in supply availability and some restrictions may be relaxed; however, if that is not the case, the City may need to continue mandatory conservation strategies.

Table 7-4: Multiple Dry Year Supply and Demand Comparison (DWR Submittal Table 7-4)

		2025	2030	2035	2040
First Year	Supply Totals	46,784	54,607	60,330	68,999
	Demand Totals	36,489	39,422	42,840	48,707
	Difference	10,294	15,185	17,489	20,292
Second Year	Supply Totals	45,093	52,576	57,958	66,095
	Demand Totals	34,183	36,962	40,200	45,758
	Difference	10,910	15,614	17,758	20,337
Third Year	Supply Totals	41,895	48,310	52,625	59,717
	Demand Totals	31,346	33,969	37,028	42,277
	Difference	10,550	14,341	15,597	17,440
Fourth Year	Supply Totals	37,839	43,587	47,233	53,109
	Demand Totals	28,005	30,474	33,353	38,293
	Difference	9,834	13,112	13,881	14,815
Fifth Year	Supply Totals	49,743	57,992	64,141	73,716
	Demand Totals	37,825	40,758	44,176	50,043
	Difference	11,918	17,235	19,965	23,674

7.3.4 Description of Management Tools and Options

Legal Requirements:

CWC §10620(f) *An urban water supplier shall describe in the plan, water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.*

7.3.4.1 Groundwater Reliability

The City's wells currently draw water from a non-adjudicated groundwater basin (Kings Subbasin) with no current limits on pumping and that has been labeled as being in a critical state of overdraft. Therefore, reliability of the groundwater supply will depend on the long-term balance between groundwater extraction and recharge for the subbasin as a whole as discussed in previous sections.

To minimize its contribution to groundwater depletion, sustainable use of groundwater supply sources is a primary focus of the City's urban water management activities extending into the future. The City first maximizes its use of surface water at its surface water treatment plant to reduce its reliance on groundwater. Secondly, the City engages in groundwater recharge activities when surface water supplies are available to replenish the water table. Recycled water is also being utilized to take demands off the potable system; a focus for the City is to maximize the efficient use of water and to promote conservation.

As a member of the NKGSA and participant in the NKGSP, the City continues to actively pursue joint efforts to address overdraft.

7.3.4.2 Surface Water Reliability

Surface water is supplied from the Kings River and conveyed to the City by the FID. The River is impacted by the level of snowmelt and precipitation received in the area and is susceptible to dry conditions. The City's contract with FID ensures that the City receives a percentage of the total FID entitlement, approximately 2.1 AF per acre within the FID boundary; the City's area is capped at 7.12% of the FID boundary or approximately 32,100 AFY in a normal water year. Additionally, the City has recently executed an additional contract with FID for development of a new, firm water supply starting at 1,000 AFY in 2020 and increasing to a maximum of 7,000 AFY by 2045 and thereafter; this new supply will not have the variability of the existing supply based on water year. Historically, FID's entitlement on the Kings River has been considered reliable although it was affected significantly by the recent drought. As previously discussed, Class II supplies from the CVP are not considered reliable. However, these supplies are relatively small and would not have significant impact on the total supply, which was the case for 2015, when the City received a zero percent allotment for Class II supplies.

7.3.4.3 Recycled Water Reliability

Recycled water is considered a consistent source; however, because it is mainly dependent upon indoor residential use, it is susceptible to water rationing. In 2020, the City utilized approximately 28 percent of its treated wastewater, an increase over past years; however, the use primarily was limited by its existing infrastructure and seasonal need. The amount of recycled water the City intends to use for beneficial purposes is expected to increase as additional infrastructure is built, wastewater generation increases, and the Clovis Water Reuse Plant expands.

7.4 Drought Risk Assessment

Legal Requirements:

CWC §10635(b)

Every urban water supplier shall include, as part of its urban water management plan, a drought risk assessment for its water service to its customers as part of information considered in developing the demand management measures and water supply projects and programs to be included in the urban water management plan. The urban water supplier may conduct an interim update or updates to this drought risk assessment within the five-year cycle of its urban water management plan update. The drought risk assessment shall include each of the following:

- (1) A description of the data, methodology, and basis for one or more supply shortage conditions that are necessary to conduct a drought risk assessment for a drought period that lasts five consecutive water years, starting from the year following when the assessment is conducted.*
- (2) A determination of the reliability of each source of supply under a variety of water shortage conditions. This may include a determination that a particular source of water supply is fully reliable under most, if not all, conditions.*
- (3) A comparison of the total water supply sources available to the water supplier with the total projected water use for the drought period.*
- (4) Considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria.*

7.4.1 DRA Data, Methods, and Basis for Water Shortage Conditions

The Drought Risk Assessment (DRA) for the City has been prepared based on the next five years' (2021-2025) supplies and demands and the supply impacts seen during the 2012-2016 drought period. This requires the City to evaluate whether it can accommodate another historic drought if it were to begin in 2021. The DRA shows the City would need to enact water conservation measures as it did in 2014 to reduce demands; the City's efforts in the past proved it is able to reach significant conservation when mandatory measures are enacted.

7.4.1.1 Water Use

The water use values are a projection between the actual water use in 2020 (DWR Submittal Table 4-1) and the projected water use in 2025 (DWR Submittal Table 4-2). This linear projection does not account for conservation or other demand reductions, beginning in 2021 and culminating in 2025.

7.4.1.2 Water Supply

The water supply value considers the City's four primary supply sources: groundwater, surface water, banked groundwater, and recycled water.

- Groundwater: For purposes of the DRA, the groundwater quantity was reduced to the sustainable yield value discussed previously, 9,400 AFY.
- Surface water: For purposes of the DRA, the surface water quantity available assumed no additional FID supplies would be available, no CVP supplies would be available, and the amount of surface water supplies received would follow the trend of the 2012-2016 drought period, varying from 35 to 96 percent of a normal water year, with the exception of the City's 2019 Surface Water agreement with FID providing for a firm surface water supply ranging 1,000 AFY in 2020 to 7,000 AFY in 2045 and thereafter.

- Banked groundwater: For purposes of the DRA, the City would assume to use both the Waldron and Boswell facilities fully, extracting up to 13,500 AFY from the two combined. In the subsequent analysis the banked water is not used during droughts, so it provides an extra level of redundancy for the City.
- Recycled water: For the purposes of the DRA, the recycled water quantity available was assumed to be steady, without showing increases due to plant expansion; however, the assumption is the City would utilize all the supply either for direct use or for groundwater recharge rather than using surface water for that purpose.

7.4.1.3 Water Shortage Conditions

The DRA assumes to utilize the same levels discussed in the WSCP and the related use reduction benefit is shown in the table below. The reductions range from none to 25 percent, depending on the year, similar to the 2012-2016 drought conditions. As the City is currently maintaining a lower water use per capita, the mandatory 36 percent conservation goal enforced by the State several years ago is not anticipated unless the drought conditions are worse than those in 2015, which is not what the DRA contemplates.

7.4.2 Individual Water Source Reliability

- Groundwater: Groundwater is considered a very reliable water supply.
- Surface water: For purposes of the DRA, the surface water quantity available assumed no Class II CVP supplies would be available and the GWD supplies would not be added to the City's portfolio as shown in **Table 6-4** in normal projections. Additionally, the amount of surface water supplies received would follow the trend of the 2012-2016 drought period, varying from 35 to 96 percent of a normal water year. The firm water supply associated with the 2019 agreement is considered extremely reliable.
- Banked groundwater: The banked groundwater is considered very reliable, and the City can extract it each year, as needed, up to the limits at Waldron and Boswell (noted above).
- Recycled water: For the purposes of the DRA, the recycled water quantity available is considered very reliable; data from the previous drought shows the wastewater; therefore, recycled water remains constant.

7.4.3 Total Water Supply and Use Comparison

The following comparison is completed on an annual basis rather than a monthly or quarterly basis for two primary reasons:

- The City's highest demands are in the summer when surface water supplies, even when reduced, are most available.
- The City's other two largest supply sources (groundwater and banked groundwater) are flexible in when they may be utilized.

By being a conjunctive user, the City has flexibility in how and when it uses its water supplies; therefore, it is not anticipated the City will have periods of time during a drought year where water supplies are not sufficient to meet demands.

Table 7-5: Five-Year Drought Risk Assessment (DWR Submittal Table 7-5)

Year	Without WSCP Actions			Planned WSCP Actions			
	Total Water Use	Total Supplies	Surplus/Shortfall w/o WSCP Action	Supply augmentation benefit	Use reduction savings benefit	Revised Surplus/ (shortfall)	Resulting % Use Reduction from WSCP action
2021	31,443	41,809	10,366	0	1,275	11,642	4%
2022	32,741	40,513	7,772	0	2,619	10,391	8%
2023	34,040	38,068	4,028	0	4,031	8,059	12%
2024	35,339	34,537	(801)	0	5,511	4,710	16%
2025	36,637	45,893	9,256	0	1,412	10,668	4%

8 Water Shortage Contingency Planning

Legal Requirements

CWC §10632.3

It is the intent of the Legislature that, upon proclamation by the Governor of a state of emergency under the California Emergency Services Act (Chapter 7 (commencing with Section 8550) of Division 1 of Title 2 of the Government Code) based on drought conditions, the board defer to implementation of locally adopted water shortage contingency plans to the extent practicable.

The UWMPA requires that the UWMP include an urban water shortage contingency analysis that addresses stages of action to be undertaken by the urban water supplier in response to water supply shortages, including more than a 50 percent reduction in water supply and an outline of specific water supply conditions which are applicable to each stage. In addition to the stages of action, the City is required to develop mandatory prohibitions against specific water use during shortages and consumption reduction methods in the most restrictive stages.

The City's WSCP is an independent document from the UWMP and can be found in [Appendix E](#).

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9 Demand Management Measures

This section provides a comprehensive description of the water conservation programs that the City has implemented, is currently implementing, and plans to implement to meet its urban water use reduction targets.

9.1 Demand Management Measures

Legal Requirements:

CWC §10631

(f)(A)...a narrative description that addresses the nature and extent of each water demand management measure implemented over the past five years. The narrative shall describe the water demand management measure that the supplier plans to implement to achieve its water use targets pursuant to Section 10608.20.

(B) The narrative pursuant to this paragraph shall include descriptions of the following water demand management measures:

(i) Water waste prevention ordinances.

(ii) Metering.

(iii) Conservation pricing.

(iv) Public education and outreach.

(v) Programs to assess and manage distribution system real loss.

(vi) Water conservation program coordination and staffing support.

(vii) Other demand management measures that have a significant impact on water use as measured in gallons per capita per day, including innovative measures, if implemented.

The UWMPA requires urban water suppliers provide information regarding water conservation and DMMs compliance; this Section provides that information. The UWMPA was amended in 2014 to streamline DMMs from fourteen specific measures to six more general requirements and an "other" category.

The City has a water conservation and recycling program in place. The City takes water conservation very seriously and considers implementation of DMMs as a necessity to achieve the goals of the conservation program.

9.1.1 Water Waste Prevention Ordinance

The City adopted Ordinance 15-14 in May of 2015 (see [Appendix F](#)). The ordinance levies fines and penalties for noncompliance with the City's water conservation program or water wasting. The penalties include written warnings, fines, and/or measures such as installation of water meters, water audits, landscape evaluation, and generation of a water budget, flow restrictors, termination of water service for exterior use, or complete termination of water service. As shown in [Table 9-1](#), the City levied a significant number of citations in 2020 for water wasting. The City routinely patrols the City during the summer months to identify violators of the water waste ordinance, responds to complaints by City residents, and issues citations when violations are noticed by City employees. The City restricts outside water use to three days a week for all customers from April through October and one day per week November through March.

The City has incorporated long-term ability to assess penalties into its ordinances for non-compliance with mandatory water conservation measures and will continue to enforce this DMM.

Table 9-1: Water Waste Prohibition Program Implementation

Category	2016	2017	2018	2019	2020
Waste Ordinance in effect	Yes	Yes	Yes	Yes	Yes
Number of citations issued	718	366	108	328	297

9.1.2 Metering

Legal Requirements:

CWC §526

(a) Notwithstanding any other provisions of law, an urban water supplier that, on or after January 1, 2004, receives water from the federal Central Valley Project under a water service contract or subcontract... shall do both of the following:

(1) On or before January 1, 2013, install water meters on all service connections to residential and nonagricultural commercial buildings... located within its service area.

CWC §527

(a) An urban water supplier that is not subject to Section 526 shall do both the following:

(1) Install water meters on all municipal and industrial service connections located within its service area on or before January 1, 2025.

The City is nearly fully metered for all customer classes, including separate meters for single-family residential, commercial, industrial, and schools. Multiple-family customers are metered but not necessarily individually by living unit. The 2020 Public Water Systems Statistic Report identifies a total of 1,605 unmetered accounts; however, only 364 are for permanent potable uses. The 364 unmetered accounts are those within Tarpey Village; the City is working with the property owners to continue to install meters and to obtain a fully metered status. The remaining accounts noted as unmetered on the 2020 Public Water Systems Statistic Report are primarily construction water and water standby services for fire sprinklers.

Tarpey Village residential customers who are not individually metered are charged a flat rate, which varies depending on the gross consumption of all the unmetered customers. This has provided an incentive for individually unmetered customers to conserve water and has encouraged many of these customers to request meters. The City offers an incentive to these customers to have meters installed by charging them a discounted cost to have the meter installed and allowing the meter to be paid for over a two-year period at no interest. The City has been offering this program since 1994.

Since the 2015 UWMP, 57 unmetered Tarpey customers have had meters installed and 364 customers remain unmetered. The City will continue to install and read meters on all new services. The City will continue to retrofit existing services as requested by Tarpey Village residents. All customers will be metered prior to January 1, 2025.

The City also has meters installed on 698 potable and 97 recycled water landscape irrigation services throughout the Clovis service area, a significant increase over metered landscape services in 2015. The number of unmetered landscape services also decreased from 5 to 2. The City continues to encourage larger landscaped areas to have an individual, dedicated landscape water service with a separate meter.

The City utilizes Automatic Meter Reading devices on all water service meters, enabling them to track changes more accurately to typical water use (i.e., a potential leak or break) and provide real time information for City staff and customers to better understand their water usage trends.

9.1.3 Conservation Pricing

The City adopted new water rates in July 2020; the new water fees are structured on two rates, which include drought and non-drought rates. The non-drought rates are in effect during normal water supply years and when the City is not required to reduce water use. The drought rate would be effective when the City is short of water or required to significantly reduce water use.

Each customer pays a fixed Dwelling Unit Charge (base charge) regardless of water consumption that is determined based on the customer class and meter size (for some classes). For the City's individually metered residential and commercial customers, the City has a tiered rate structure. Residential users have three tiers while commercial users have two tiers. Non-metered users in Tarpey Village and construction water users have the same fixed rate. Tarpey Village unmetered customers will pay an excess consumption charge under both rate schedules for use over 65,000 gallons in non-drought times or 63,000 gallons in drought times. **Table 9-2** summarizes the current rate structure for the City.

Table 9-2: Water User Rates

Category	Non-Drought	Drought
Residential Water Rates: Clovis		
Dwelling Unit Charge: per 2 Month Period	\$23.90	\$23.90
Volumetric Charge: Tier 1 (0-23,000 gallons)	\$0.98/kgal	\$1.16/kgal
Volumetric Charge: Tier 2 (23,001-40,000 gallons)	\$1.63/kgal	\$2.36/kgal
Volumetric Charge: Tier 3 (over 40,000 gallons)	\$2.00/kgal	\$2.99/kgal
Residential Water Rates: Tarpey Village		
Unmetered Flat Rate: per 2 Month Period	\$119.95	\$149.35
Tarpey Large Lot Surcharge: per 2 Month Period	\$5.76	\$5.76
Tarpey Excess Use Charges: Over 65kgal in Non-Drought period or Over 63kgal in Drought period	\$2.00/kgal	\$2.80/kgal
Commercial: Entire Service Area		
Meter Charge: 1" or smaller	\$19.24	\$19.24
Meter Charge: 1 1/2"	\$25.59	\$25.59
Meter Charge: 2"	\$35.34	\$35.34
Meter Charge: 3"	\$69.99	\$69.99
Meter Charge: 4"	\$176.05	\$176.05
Meter Charge: 6"	\$702.21	\$702.21
Meter Charge: 8"	\$1,244.77	\$1,244.77
Meter Charge: 10"	\$1,950.10	\$1,950.10
Volumetric Charge: Tier 1 (0-23,000)	\$0.98/kgal	\$1.16/kgal
Volumetric Charge: Tier 2 (over 23,000)	\$1.33/kgal	\$1.57/kgal
Notes: kgal = thousand gallons.		

Drought and non-drought fixed charges are the same for metered residential and commercial, while non-metered fixed rates increase. Under the drought scenario, the tiered rates increase above non-drought rates. The increase is considered a surcharge and is intended to compensate for reduced water use. This surcharge will enable the City to recover operation, maintenance, staffing, and other additional costs related to the water shortage response.

The new rates recover a larger portion of revenues from fixed service charges and a smaller portion of revenues from volume rates. This benefits the City by stabilizing revenues and mitigating the loss of revenue due to conservation.

The City does not have plans to modify their rate structure at this time but may do so before the 2025 UWMP is prepared. If the rate structure changes before the 2025 UWMP, it will be explained in that update.

9.1.4 Public Education and Outreach

The City promotes water conservation through its participation in the Central Valley Water Awareness Committee (CVWAC) and through its own programs. The City distributes public information through bill inserts, brochures, the City website, social media, and booths or activities at special events. The City attended twelve special events from 2016 through 2020, with several events being canceled in 2020 due to the COVID-19 Pandemic and shelter-in-place orders. At these events, the City has distributed leaflets, magnets, stickers, litter bags, pencils, pens, hose nozzles, leak detection tablets, and rulers which all carry the water conservation message. The outdoor watering schedule is noted on the back of customer's bills, is listed on the City's website, and is posted to social media outlets prior to the change in water schedule at the season markers. Since 2004, the City's website has included a page which discusses water conservation.

Beginning in 2008, the City began participating with the "Partners for a Clean Community." This group was organized by the FMFCD to pool resources and deliver messages that are common to the members, which include the City of Clovis, the City of Fresno, Caltrans, and Fresno County. With this group, the City has participated in the preparation of a children's activity book that educates them about water and other environmental issues. The City has also participated in funding media spots that promote water conservation.

The City has leased land to a non-profit group at one of its park sites, at no cost, for a botanical garden. The garden emphasizes native, low water using plants. The garden is currently three acres in size. The City provides information regarding water conservation at various events the non-profit group sponsors throughout the year.

The City has also joined the Central Valley Friendly Landscaping Group, whose objective is to promote landscapes in the Central Valley that are appropriate for the area climate and don't require a lot of irrigation. Efforts have included producing a brochure and conducting a recognition program for Central Valley Friendly Landscaping projects.

City water bills show each customer's current usage, their usage in 2013 prior to the 2015 drought, and show last year's consumption so that customers can compare their usage.

Some of these measures have been in effect since 1990. The effectiveness of these measures can be determined based on overall per capita water use. However, since many measures have been implemented by the City in this same period, it is impossible to quantify how much of the per capita demand decrease is attributed to this specific measure.

9.1.5 Programs to Assess and Manage Distribution System Real Loss

The City has been conducting annual water system audits using software provided by AWWA, the most recent being conducted for the calendar year 2019. The percentage of water loss has been consistent

over the past several years; however, the City continues to monitor it and will adjust Operations and Maintenance (O&M) practices if needed. Existing O&M practices include evaluation of system mains on an ongoing basis with a focus on age of infrastructure to identify areas that may need replacement and monitoring of system pressures that could signify a leak. Adjustments could include conducting a leak detection study similar to that completed in 2009, if water losses are increasing. **Appendix B** contains a copy of the water audits for 2016 through 2019.

The water system audits include a data validation score for each piece of data/information inputted into the software. These scores are assigned based on criteria that indicate accuracy or validity of the data/information. At the conclusion, the audit is given an overall score. The City's overall scores have increased from 64 in 2016 to 70 in 2019, indicating a positive trend in water loss management by the City.

All leaks on the City's side of the meter are repaired. Customers are notified to make repairs when leaks are discovered on their side of the meter. The City follows up to make sure that necessary repairs are made by the customer and, if not, the customer may be cited under the Water Waste ordinance discussed above.

9.1.6 Water Conservation Program Coordination and Staffing Support

The City has a full-time Water Conservation Coordinator; the position is staffed by an Engineer with more than 15 years tenure with the City and in the role. This experience enables them to proactively help the City meet its conservation goals.

During the summer months the City dedicates up to four personnel fulltime to patrolling and providing water audits and an additional ten to aid with conservation strategies, resolving water wasting citations, and taking customer calls.

9.1.7 Other Demand Management Measures

The City has several programs that provide rebates and promote water conservation. These programs are further discussed in the subsequent sections.

9.1.7.1 Residential Plumbing Retrofit

The City will conduct an audit of interior water use, at no cost, at the request of any City customer and can also distribute low flow shower heads and faucet aerators. The program to distribute low flow devices began prior to 1995 with a distribution of over 4,000 shower heads which were provided to the City at no cost by Pacific Gas and Electric Company (PG&E). Since then, thousands of showerheads and aerators have been distributed. Current plumbing standards are enforced by the Building Division, so all new construction installs low flow water fixtures. The City will continue to make these retrofit devices available for customers.

9.1.7.2 Water Survey Program

Customers are notified annually of the availability of surveys through their consumer confidence report and on the City website. Additionally, customers are asked if they would like a survey when they request an ultra-low flow toilet rebate (discussed below).

Surveys include the following: check for leaks by using the meter; show customers how to gauge their water usage at the meter; check the flowrate of shower heads and faucet aerators; supply replacements if necessary; check irrigation systems and timers; review the irrigation schedule; measure the landscape area; and check the irrigation coverage. Customers are then provided with recommendations to make improvements. Copies of the surveys are retained.

The City conducted 15 water surveys between 2016 and 2019, with none conducted in 2020 due to the COVID-19 Pandemic and shelter-in-place orders.

9.1.7.3 Washing Machine Rebate

The City currently operates a washing machine rebate program. The City provides a 50-dollar rebate on washers that have an Integrated Water Factor (IWF) of 4.2 or less, which correlates to 4.2 gallons of water used per cubic foot of capacity. With standard washing machines using water in the range of 12.5 to 15.6 gallons per cubic foot of laundry, it is clearly cost effective and water efficient to provide a rebate for low water using washers. **Table 9-3** shows the number of rebates distributed in the previous five years and the associated cost to the City. The overall number of rebates have decreased from the 2015 UWMP, indicating more residents likely have water efficient washing machines already in place.

Table 9-3: Washing Machine Rebate Program Implementation

Category	2016	2017	2018	2019	2020
Number of Rebates	62	18	10	6	16
Expenditures	\$3,100	\$900	\$500	\$300	\$800

9.1.7.4 Ultra-Low Flush Toilet Replacement

The City offers a rebate program for toilet replacement with ultra-low flush toilets (ULFT). A rebate or account credit of up to 75-dollars is made to customers who replace old higher flow toilets with new ultra-low flow models. With the new standard of toilets using 1.28 gallons per flush (gpf), the savings from ranges from 3.72 to 2.22-gpf when replacing 5 and 3.5-gpf toilets, respectively. **Table 9-4** lists the number of ULFT rebates approved, number of toilets installed, and cost to the City in the previous five years.

Table 9-4: Ultra-Low Flush Toilet Replacement Program

Category	2016	2017	2018	2019	2020
Number of ULFT Rebates	27	29	23	10	6
Number of Toilets Installed	46	41	28	18	9
Expenditures	\$3,450	\$3,075	\$2,100	\$1,350	\$675

9.1.7.5 Commercial, Industrial, and Institutional Conservation Programs

Commercial, Industrial, and Institutional (CII) customers are treated similarly to residential customers. As a result, any demand reduction measures which are available and marketed to residential customers are also available for CII customers. For example, surveys, plumbing retrofits, toilet replacements, and public information programs are equally available to these customers and have not been tracked separately. All commercial and industrial projects are reviewed by the City for conformance with the City's water efficient landscape ordinance. Separate water meters are always either recommended or required depending on the size of landscape areas at commercial, industrial, and institutional sites. All landscape projects on commercial sites are required to conform to the City's Water Efficient Landscape Ordinance.

9.1.7.6 School Education Program

The City has participated in many activities that promote water conservation and awareness to school children. Along with the CVWAC, the City has sponsored activities such as tours of water facilities for school groups, teacher training workshops, science fair awards for water related projects, and water awareness contests. The City has a PowerPoint presentation that is used during tours of the Surface Water Treatment Plant to educate children about water. Additionally, the City has constructed an aquaponics demonstration project which is used during these tours to educate children about the water cycle.

9.2 Implementation Over the Past Five Years

Section 9.1 discusses the implementation over the previous five years for each DMM, providing statistics on implementation where applicable and available. Overall, the DMMs continue to increase public awareness towards water conservation by providing rebates, educational programs, and water surveys.

9.3 Planned Implementation to Achieve Water Use Targets

The City has implemented the recommended DMMs cited in the California Water Code 10631 (e)(1)(B) and will continue to do so in the future. The City has met their 2020 target of 199 gpcd with an actual water use of 181 gpcd in 2020.

10 Plan Adoption, Submittal, and Implementation

The City prepared the 2020 UWMP during the spring of 2021. This section documents plan adoption, submittal, and implementation of the 2020 UWMP. A completed UWMP checklist will be included in **Appendix G** of the Final UWMP.

10.1 Inclusion of All 2020 Data

The 2020 UWMP includes the water use and planning data for the calendar year of 2020. The City is reporting on a calendar year basis; therefore, 2020 data includes the months of January to December 2020.

10.2 Notice of Public Hearing

Prior to adoption of the 2020 UWMP, a public hearing was held on July 12, 2021 at the City Council Chamber, located at 1033 Fifth Street, Clovis, CA 93612. Notices were provided to cities and counties and the public. The public hearing provided an opportunity for the public to provide input to the plan before it is adopted. [REDACTED] comments were received at the public hearing. Additionally, the public hearing provided an opportunity for the City’s customers, residents, and employees to learn and ask questions about the current and future water supply of the City.

10.2.1 Notice to Cities and Counties

Legal Requirements:

CWC §10631

(b) Every urban water supplier required to prepare a plan shall... at least 60 days prior to the public hearing on the plan ... notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.

CWC §10642

...The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area....

The City has provided formal written notification to the City of Fresno and Fresno County that the City’s UWMP was being updated for 2020. As shown in **Table 10-1**, this notification was provided to the City of Fresno and Fresno County at least 60 days prior to the public hearing of the plan. Copies of the final UWMP will be provided to the City of Fresno and Fresno County no later than 30 days after its submission to DWR. The notice of public hearing to Cities and Counties and the public is included in **Appendix A**.

Table 10-1: Notification to Cities and Counties (DWR Submittal Table 10-1)

Name	60-Day Notice	Notice of Public Hearing
City of Fresno	X	X
Fresno County	X	X

10.2.2 Notice to Public

Legal Requirements:

CWC §10642
...Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection...Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code [see below]. The urban water supplier shall provide notice of the time and place of a hearing to any city or county within which the supplier provides water supplies.

Government Code §6066
Publication of notice pursuant to this section shall be once a week for two successive weeks. Two publications in a newspaper published once a week or oftener, with at least five days intervening between the respective publication dates not counting such publication dates, are sufficient. The period of notice commences upon the first day of publication and terminates at the end of the fourteenth day, including therein the first day.

The City is committed to encouraging the active involvement of diverse social, cultural, and economic elements of its citizenry. On June 14, 2021 and June 21, 2021, the City placed a notice in the Fresno Bee stating that its UWMP was being updated and that a public hearing would be conducted to take testimony from members of the community. A copy of this notification is included in **Appendix A**. The Draft 2020 UWMP was made available for public inspection at the City of Clovis Operations and Maintenance Service Center, located at 155 N. Sunnyside Avenue, Clovis, California. In addition, the City also posted a copy of the public review draft UWMP on its website (<http://www.ci.clovis.ca.us/>). The notice of public hearing to the public is included in **Appendix A**.

10.3 Public Hearing and Adoption

10.3.1 Public Hearing

Legal Requirements:

CWC §10642
...Prior to adopting either, the [plan or water shortage contingency plan], the urban water supplier shall make both the plan and the water shortage contingency plan available for public inspection and shall hold a public hearing or hearings thereon.

CWC §10608.26
(a) In complying with this part, an urban retail water supplier shall conduct at least one public hearing to accomplish all of the following:

- (1) Allow community input regarding the urban retail water supplier’s implementation plan for complying with this part.*
- (2) Consider the economic impacts of the urban retail water supplier’s implementation plan for complying with this part.*
- (3) Adopt a method, pursuant to subdivision (b) of Section 10608.20 for determining its urban water use target.*

The public hearing was held prior to the adoption of the UWMP and was adopted as prepared. The hearing provided an opportunity for the City’s customers, residents, and employees to learn and ask

questions about the current and future water supply of the City. [REDACTED] comments were provided at the hearing. The public hearing was held on July 12, 2021.

10.3.2 Adoption

Legal Requirements:

CWC §10642

...After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

The plan adoption by City Council occurred after a public hearing on July 12, 2021. The City Adoption Resolution is included in [Appendix H](#).

10.4 Plan Submittal

Legal Requirements:

CWC §10621

(e) Each urban water supplier shall update and submit its 2020 plan to the department by July 1, 2021...

CWC §10644

(a)(1) An urban water supplier shall submit to the department, the California State Library, and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption.

CWC §10635

(b) The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.

The following section outlines the submittal of the 2020 UWMP to DWR, the State Library, and Cities and Counties.

10.4.1 Submitting an UWMP and WSCP to DWR

The 2020 UWMP and WSCP will be submitted to DWR within 30 days of adoption of the UWMP.

10.4.2 Electronic Data Submittal

Legal Requirements:

CWC §10644 (a)(2)

The plan, or amendments to the plan, submitted to the department ... shall be submitted electronically and shall include any standardized forms, tables, or displays specified by the department.

The 2020 UWMP, WSCP, and tabular data will be submitted electronically using the Water Use Efficiency (WUE) data online submittal tool developed by DWR.

10.4.3 Submitting an UWMP and WSCP to the California State Library

The 2020 UWMP and WSCP will be submitted in CD or hardcopy format to the California State Library within 30 days of adoption.

10.4.4 Submitting an UWMP to Cities and Counties

The 2020 UWMP and WSCP will be submitted in electronic format to the City of Fresno and Fresno County within 30 days of adoption.

10.5 Public Availability

Legal Requirements:

CWC §10645

(a) Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

(b) Not later than 30 days after filing a copy of its water shortage contingency plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

Within 30 days of submitting the UWMP and WSCP to DWR, the adopted plans will be available for public review during normal business hours at the City of Clovis Operations and Maintenance Service Center. The City will also post a copy of the adopted UWMP and WSCP on its website: (<http://www.ci.clovis.ca.us/>).

10.6 Amending an Adopted UWMP or WSCP

Legal Requirements:

CWC §10621

(d) The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640).

CWC §10644

(a)(1) Copies of amendments or changes to the plans shall be submitted to the department, the California State Library, and any city or county within which the supplier provides water supplies within 30 days after adoption.

The plan may be updated at any time when the urban water supplier believes significant changes have occurred in population, land use, and/or water sources that may affect the contents of the plan. If major changes are made to this 2020 UWMP, the City will hold an additional public hearing and City Council will readopt the plan. Copies of amendments or changes to the plan shall be submitted to DWR, the California State Library, City of Fresno, and Fresno County within 30 days of adoption.

11 References

- Bureau of Reclamation. (2005, June). Upper San Joaquin River Basin Storage Basin Investigation.
<https://www.usbr.gov/mp/sccao/storage/docs/initial-alt-info/ta-iai-03-vol2-water-ops-ta.pdf>.
- Carollo Engineers, Inc. (2016). *City of Clovis, 2015 Urban Water Management Plan Update*. Clovis.
- DWR. (2006, January). *California's Groundwater Bulletin 118, Tulare Lake Hydrologic Region, San Joaquin Valley Groundwater Basin, Kings Subbasin*. Retrieved from Department of Water Resources:
<https://water.ca.gov/LegacyFiles/groundwater/bulletin118/basindescriptions/5-22.08.pdf>
- DWR. (2021, March). *Urban Water Management Plan Guidebook 2020*.
- Fresno Council of Governments. (2014, July 31). 2013 Fresno County Regional Housing Needs Allocation Plan.
- Provost & Pritchard Consulting Group. (2017). *City of Clovis, Recycled Water Master Plan*. Clovis.
- Provost & Pritchard Consulting Group. (2018). *City of Clovis, Water Master Plan Update, Phase III*. Clovis.

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Appendix A

UWMP Outreach Documents

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CITY *of* CLOVIS

PUBLIC UTILITIES

155 N. Sunnyside Avenue, Clovis, CA 93611 (559) 324-2600

March 2, 2021

Peter Sanchez
Fresno Metropolitan Flood Control District
5469 E. Olive Avenue
Fresno, CA 93727

Dear Mr. Sanchez,

In accordance with the Urban Water Management Planning Act, California Water Code §10621(b), the City of Clovis is notifying the Fresno Metropolitan Flood Control District that the City of Clovis will be reviewing its UWMP and considering amendments or changes to the Plan. Clovis' last UWMP was updated and adopted July 5, 2016.

Once a draft is ready for review, it will be sent to your attention electronically and we would be pleased to receive any comments you may have on this update to the Plan. Should you have any questions regarding this matter, please contact Paul Armendariz at (559) 324-2649 or PaulA@cityofclovis.com.

Sincerely,

A handwritten signature in blue ink, appearing to read "Scott Redelfs".

Scott Redelfs
Public Utilities Director



CITY *of* CLOVIS

PUBLIC UTILITIES

155 N. Sunnyside Avenue, Clovis, CA 93611 (559) 324-2600

March 2, 2021

Michael Carbajal
City of Fresno
2600 Fresno Street
Fresno, CA 93721

Dear Mr. Carbajal,

In accordance with the Urban Water Management Planning Act, California Water Code §10621(b), the City of Clovis is notifying the City of Fresno that the City of Clovis will be reviewing its UWMP and considering amendments or changes to the Plan. Clovis' last UWMP was updated and adopted July 5, 2016.

Once a draft is ready for review, it will be sent to your attention electronically and we would be pleased to receive any comments you may have on this update to the Plan. Should you have any questions regarding this matter, please contact Paul Armendariz at (559) 324-2649 or PaulA@cityofclovis.com.

Sincerely,

Scott Redelfs
Public Utilities Director



CITY *of* CLOVIS

PUBLIC UTILITIES

155 N. Sunnyside Avenue, Clovis, CA 93611 (559) 324-2600

March 2, 2021

Bill Stretch
Fresno Irrigation District
2907 S. Maple Avenue
Fresno, CA 93725

Dear Mr. Stretch,

In accordance with the Urban Water Management Planning Act, California Water Code §10621(b), the City of Clovis is notifying the Fresno Irrigation District that the City of Clovis will be reviewing its UWMP and considering amendments or changes to the Plan. Clovis' last UWMP was updated and adopted July 5, 2016.

Once a draft is ready for review, it will be sent to your attention electronically and we would be pleased to receive any comments you may have on this update to the Plan. Should you have any questions regarding this matter, please contact Paul Armendariz at (559) 324-2649 or PaulA@cityofclovis.com.

Sincerely,

Scott Redelfs
Public Utilities Director



CITY *of* CLOVIS

PUBLIC UTILITIES

155 N. Sunnyside Avenue, Clovis, CA 93611 (559) 324-2600

March 2, 2021

Shay Bakman
Bakman Water Company
5105 E. Belmont Avenue
Fresno, CA 93727

Dear Mr. Bakman,

In accordance with the Urban Water Management Planning Act, California Water Code §10621(b), the City of Clovis is notifying the Bakman Water Company that the City of Clovis will be reviewing its UWMP and considering amendments or changes to the Plan. Clovis' last UWMP was updated and adopted July 5, 2016.

Once a draft is ready for review, it will be sent to your attention electronically and we would be pleased to receive any comments you may have on this update to the Plan. Should you have any questions regarding this matter, please contact Paul Armendariz at (559) 324-2649 or PaulA@cityofclovis.com.

Sincerely,

Scott Redelfs
Public Utilities Director



CITY *of* CLOVIS

PUBLIC UTILITIES

155 N. Sunnyside Avenue, Clovis, CA 93611 (559) 324-2600

March 2, 2021

Steve White
County of Fresno
2220 Tulare Street, 6th Floor
Fresno, CA 93721

Dear Mr. White,

In accordance with the Urban Water Management Planning Act, California Water Code §10621(b), the City of Clovis is notifying the County of Fresno that the City of Clovis will be reviewing its UWMP and considering amendments or changes to the Plan. Clovis' last UWMP was updated and adopted July 5, 2016.

Once a draft is ready for review, it will be sent to your attention electronically and we would be pleased to receive any comments you may have on this update to the Plan. Should you have any questions regarding this matter, please contact Paul Armendariz at (559) 324-2649 or PaulA@cityofclovis.com.

Sincerely,

Scott Redelfs
Public Utilities Director



CITY *of* CLOVIS

PUBLIC UTILITIES

155 N. Sunnyside Avenue, Clovis, CA 93611 (559) 324-2600

March 2, 2021

Kassy Chauhan
 North Kings Groundwater Sustainability Agency
 2907 S. Maple Avenue
 Fresno, CA 93725

Dear Ms. Chauhan,

In accordance with the Urban Water Management Planning Act, California Water Code §10621(b), the City of Clovis is notifying the North Kings Groundwater Sustainability Agency that the City of Clovis will be reviewing its UWMP and considering amendments or changes to the Plan. Clovis' last UWMP was updated and adopted July 5, 2016.

Once a draft is ready for review, it will be sent to your attention electronically and we would be pleased to receive any comments you may have on this update to the Plan. Should you have any questions regarding this matter, please contact Paul Armendariz at (559) 324-2649 or PaulA@cityofclovis.com.

Sincerely,

Scott Redelfs
 Public Utilities Director



CITY *of* CLOVIS

PUBLIC UTILITIES

155 N. Sunnyside Avenue, Clovis, CA 93611 (559) 324-2600

March 2, 2021

Nick Keller
Garfield Water District
209 S. Locust Avenue
Visalia, CA 93291

Dear Mr. Keller,

In accordance with the Urban Water Management Planning Act, California Water Code §10621(b), the City of Clovis is notifying the Garfield Water District that the City of Clovis will be reviewing its UWMP and considering amendments or changes to the Plan. Clovis' last UWMP was updated and adopted July 5, 2016.

Once a draft is ready for review, it will be sent to your attention electronically and we would be pleased to receive any comments you may have on this update to the Plan. Should you have any questions regarding this matter, please contact Paul Armendariz at (559) 324-2649 or PaulA@cityofclovis.com.

Sincerely,

Scott Redelfs
Public Utilities Director



CITY *of* CLOVIS

PUBLIC UTILITIES

155 N. Sunnyside Avenue, Clovis, CA 93611 (559) 324-2600

March 2, 2021

Shawn Stevenson
International Water District
9010 E. Tollhouse Road
Clovis, CA 93612

Dear Mr. Stevenson,

In accordance with the Urban Water Management Planning Act, California Water Code §10621(b), the City of Clovis is notifying the International Water District that the City of Clovis will be reviewing its UWMP and considering amendments or changes to the Plan. Clovis' last UWMP was updated and adopted July 5, 2016.

Once a draft is ready for review, it will be sent to your attention electronically and we would be pleased to receive any comments you may have on this update to the Plan. Should you have any questions regarding this matter, please contact Paul Armendariz at (559) 324-2649 or PaulA@cityofclovis.com.

Sincerely,

A handwritten signature in blue ink, appearing to read "Scott Redelfs". The signature is fluid and cursive.

Scott Redelfs
Public Utilities Director



Beaufort Gazette
 Belleville News-Democrat
 Bellingham Herald
 Bradenton Herald
 Centre Daily Times
 Charlotte Observer
 Columbus Ledger-Enquirer
 Fresno Bee

The Herald - Rock Hill
 Herald Sun - Durham
 Idaho Statesman
 Island Packet
 Kansas City Star
 Lexington Herald-Leader
 Merced Sun-Star
 Miami Herald

el Nuevo Herald - Miami
 Modesto Bee
 Raleigh News & Observer
 The Olympian
 Sacramento Bee
 Fort Worth Star-Telegram
 The State - Columbia
 Sun Herald - Biloxi

The News Tribune Tacoma
 The Telegraph - Macon
 San Luis Obispo Tribune
 Tri-City Herald
 Wichita Eagle

AFFIDAVIT OF PUBLICATION

Account #	Order Number	Identification	Order PO	Amount	Cols	Depth
57248	82083	Print Legal Ad - IPL0028156		\$670.32	2	2.01

Attention: City of
 City of Clovis Public Utilities
 155 N Sunnyside
 Clovis, CA 93611

PUBLIC NOTICE

NOTICE OF PUBLIC HEARING

Pursuant to the California Water Code section 10642 and 10608, the City Council of the City of Clovis will conduct a Public Hearing to take testimony regarding the adoption of the updated 2020 Urban Water Management Plan and the Water Shortage Contingency Plan for the City of Clovis. The hearing is scheduled for July 12, 2021 at 6:00 p.m. at the Clovis City Council Chambers located at 1033 Fifth Street, Clovis, California. Copies of the 2020 Urban Water Management Plan and the Water Shortage Contingency Plan can be reviewed at City of Clovis Operations and Maintenance Service Center at 155 N. Sunnyside Avenue, Clovis, CA, or accessed at the City's website at www.cityofclovis.com.

Paul Armendariz, Assistant Public Utilities Director
 IPL0028156
 Jun 14, 21 2021

COUNTY OF DALLAS STATE OF TEXAS

The undersigned states:

McClatchy Newspapers in and on all dates herein stated was a corporation, and the owner and publisher of The Fresno Bee.

The Fresno Bee is a daily newspaper of general circulation now published, and on all-the-dates herein stated was published in the City of Fresno, County of Fresno, and has been adjudged a newspaper of general circulation by the Superior Court of the County of Fresno, State of California, under the date of November 28, 1994, Action No. 520058-9.

The undersigned is and on all dates herein mentioned was a citizen of the United States, over the age of twenty-one years, and is the principal clerk of the printer and publisher of said newspaper; and that the notice, a copy of which is hereto annexed, marked Exhibit A, hereby made a part hereof, was published in The Fresno Bee in each issue thereof (in type not smaller than nonpareil), on the following dates.

No. of Insertions: 2

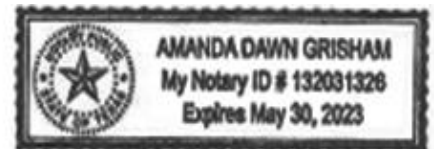
Beginning Issue of: 06/14/2021

Ending Issue of: 06/21/2021

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated: 06/21/2021

Notary Public in and for the state of Texas, residing in Dallas County



Extra charge for lost or duplicate affidavits.
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Appendix B

Water Loss Audit Reporting Worksheets

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AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0
American Water Works Association.
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? Click to access definition
+ Click to add a comment

Water Audit Report for: **City of Clovis (CA1010003)**
Reporting Year: **2016** 1/2016 - 12/2016

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

WATER SUPPLIED

----- Enter grading in column 'E' and 'J' ----->

Volume from own sources:	+ ?	5	6,880.087	MG/Yr
Water imported:	+ ?	n/a		MG/Yr
Water exported:	+ ?	n/a		MG/Yr

Master Meter and Supply Error Adjustments

Pcnt:	Value:	
+ ?	4	160.270 MG/Yr
+ ?		MG/Yr
+ ?		MG/Yr

WATER SUPPLIED: **6,719.817** MG/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

AUTHORIZED CONSUMPTION

Billed metered:	+ ?	6	6,346.231	MG/Yr
Billed unmetered:	+ ?	7	141.111	MG/Yr
Unbilled metered:	+ ?	10	0.352	MG/Yr
Unbilled unmetered:	+ ?	5	16.800	MG/Yr

Click here: ?
for help using option buttons below

Pcnt:	Value:	
		16.800 MG/Yr

AUTHORIZED CONSUMPTION: **6,504.494** MG/Yr

Use buttons to select percentage of water supplied OR value

WATER LOSSES (Water Supplied - Authorized Consumption)

215.324 MG/Yr

Apparent Losses

Unauthorized consumption: + ? **16.800** MG/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies:	+ ?	4	161.000	MG/Yr
Systematic data handling errors:	+ ?		15.866	MG/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: **193.665** MG/Yr

Pcnt:	Value:	
0.25%		161.000 MG/Yr

Pcnt:	Value:	
0.25%		161.000 MG/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: **21.659** MG/Yr

WATER LOSSES: **215.324** MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: **232.475** MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	+ ?	8	503.9	miles
Number of active AND inactive service connections:	+ ?	8	33,631	
Service connection density:	?		67	conn./mile main

Are customer meters typically located at the curbside or property line? **Yes**

Average length of customer service line: + ? (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: + ? 8 63.4 psi

COST DATA

Total annual cost of operating water system:	+ ?	10	\$13,637,000	\$/Year
Customer retail unit cost (applied to Apparent Losses):	+ ?	8	\$2.26	\$/1000 gallons (US)
Variable production cost (applied to Real Losses):	+ ?	8	\$1,202.61	\$/Million gallons <input type="checkbox"/> Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 64 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

- 1: Volume from own sources
- 2: Customer metering inaccuracies
- 3: Billed metered

Click to access definition
 Click to add a comment

Water Audit Report for: **City of Clovis (CA1010003)**
Reporting Year: **2017** 1/2017 - 12/2017

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

WATER SUPPLIED

----- Enter grading in column 'E' and 'J' ----->

Volume from own sources:	<input type="button" value="+"/>	<input type="button" value="?"/>	6	7,543.525	MG/Yr
Water imported:	<input type="button" value="+"/>	<input type="button" value="?"/>	n/a		MG/Yr
Water exported:	<input type="button" value="+"/>	<input type="button" value="?"/>	n/a		MG/Yr

Master Meter and Supply Error Adjustments

Pcnt:	<input type="button" value="8"/>	Value:	224.960	MG/Yr
<input type="button" value="+"/>	<input type="button" value="?"/>	<input type="button" value="0"/>	<input type="button" value="0"/>	MG/Yr
<input type="button" value="+"/>	<input type="button" value="?"/>	<input type="button" value="0"/>	<input type="button" value="0"/>	MG/Yr
<input type="button" value="+"/>	<input type="button" value="?"/>	<input type="button" value="0"/>	<input type="button" value="0"/>	MG/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 7,318.565 MG/Yr

AUTHORIZED CONSUMPTION

Billed metered:	<input type="button" value="+"/>	<input type="button" value="?"/>	5	6,869.993	MG/Yr
Billed unmetered:	<input type="button" value="+"/>	<input type="button" value="?"/>	8	137.279	MG/Yr
Unbilled metered:	<input type="button" value="+"/>	<input type="button" value="?"/>	10	0.729	MG/Yr
Unbilled unmetered:	<input type="button" value="+"/>	<input type="button" value="?"/>	5	18.296	MG/Yr

Click here: for help using option buttons below

Pcnt:	<input type="button" value="0"/>	Value:	18.296	MG/Yr
-------	----------------------------------	--------	--------	-------

Use buttons to select percentage of water supplied OR value

AUTHORIZED CONSUMPTION: ? 7,026.297 MG/Yr

WATER LOSSES (Water Supplied - Authorized Consumption)

292.269 MG/Yr

Apparent Losses

Unauthorized consumption: 18.296 MG/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies:	<input type="button" value="+"/>	<input type="button" value="?"/>	5	211.246	MG/Yr
Systematic data handling errors:	<input type="button" value="+"/>	<input type="button" value="?"/>		17.175	MG/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: ? 246.718 MG/Yr

Pcnt: 0.25% Value: 211.246 MG/Yr

0.25% Value: 211.246 MG/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: **45.551** MG/Yr

WATER LOSSES: 292.269 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: ? 311.294 MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	<input type="button" value="+"/>	<input type="button" value="?"/>	8	515.2	miles
Number of active AND inactive service connections:	<input type="button" value="+"/>	<input type="button" value="?"/>	9	34,674	
Service connection density:	<input type="button" value="?"/>			67	conn./mile main

Are customer meters typically located at the curbside or property line?

Average length of customer service line: (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: 9 62.3 psi

COST DATA

Total annual cost of operating water system:	<input type="button" value="+"/>	<input type="button" value="?"/>	10	\$13,771,016	\$/Year
Customer retail unit cost (applied to Apparent Losses):	<input type="button" value="+"/>	<input type="button" value="?"/>	9	\$2.39	\$/1000 gallons (US)
Variable production cost (applied to Real Losses):	<input type="button" value="+"/>	<input type="button" value="?"/>	8	\$1,200.67	\$/Million gallons <input type="checkbox"/> Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 69 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

- 1: Volume from own sources
- 2: Billed metered
- 3: Customer metering inaccuracies

Water Audit Report for: **City of Clovis (CA1010003)**
 Reporting Year: **2018** 1/2018 - 12/2018

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: **MILLION GALLONS (US) PER YEAR**

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

WATER SUPPLIED

----- Enter grading in column 'E' and 'J' ----->

Volume from own sources:	<input type="button" value="+"/> <input type="button" value="?"/>	5	7,807.119	MG/Yr
Water imported:	<input type="button" value="+"/> <input type="button" value="?"/>	n/a	0.000	MG/Yr
Water exported:	<input type="button" value="+"/> <input type="button" value="?"/>	n/a	0.000	MG/Yr

Master Meter and Supply Error Adjustments

Pcnt:	<input type="button" value="+"/> <input type="button" value="?"/>	8	<input type="text" value=""/>	MG/Yr
Value:	<input type="button" value="+"/> <input type="button" value="?"/>		<input type="text" value=""/>	MG/Yr
	<input type="button" value="+"/> <input type="button" value="?"/>		<input type="text" value=""/>	MG/Yr

Enter negative % or value for under-registration
 Enter positive % or value for over-registration

WATER SUPPLIED: **7,807.119** MG/Yr

AUTHORIZED CONSUMPTION

Billed metered:	<input type="button" value="+"/> <input type="button" value="?"/>	5	7,244.577	MG/Yr
Billed unmetered:	<input type="button" value="+"/> <input type="button" value="?"/>	8	140.217	MG/Yr
Unbilled metered:	<input type="button" value="+"/> <input type="button" value="?"/>	10	26.826	MG/Yr
Unbilled unmetered:	<input type="button" value="+"/> <input type="button" value="?"/>	5	19.518	MG/Yr

Click here: for help using option buttons below

Pcnt:	<input type="button" value="+"/> <input type="button" value="?"/>		<input type="text" value=""/>	MG/Yr
Value:	<input type="button" value="+"/> <input type="button" value="?"/>		<input type="text" value="19.518"/>	MG/Yr

Use buttons to select percentage of water supplied OR value

AUTHORIZED CONSUMPTION: **7,431.138** MG/Yr

WATER LOSSES (Water Supplied - Authorized Consumption)

375.981 MG/Yr

Apparent Losses

Unauthorized consumption: **19.518** MG/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies:	<input type="button" value="+"/> <input type="button" value="?"/>	7	122.594	MG/Yr
Systematic data handling errors:	<input type="button" value="+"/> <input type="button" value="?"/>		18.111	MG/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: **160.223** MG/Yr

Pcnt: 0.25%

Value:

Value:

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: **215.758** MG/Yr

WATER LOSSES: **375.981** MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: **422.325** MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	<input type="button" value="+"/> <input type="button" value="?"/>	8	535.0	miles
Number of active AND inactive service connections:	<input type="button" value="+"/> <input type="button" value="?"/>	9	36,400	
Service connection density:	<input type="button" value="+"/> <input type="button" value="?"/>		68	conn./mile main

Are customer meters typically located at the curbside or property line?

Average length of customer service line: (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: 10 psi

COST DATA

Total annual cost of operating water system:	<input type="button" value="+"/> <input type="button" value="?"/>	10	\$15,480,009	\$/Year
Customer retail unit cost (applied to Apparent Losses):	<input type="button" value="+"/> <input type="button" value="?"/>	9	\$2.47	\$/1000 gallons (US)
Variable production cost (applied to Real Losses):	<input type="button" value="+"/> <input type="button" value="?"/>	8	\$482.29	\$/Million gallons <input type="checkbox"/> Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 67 out of 100 ***

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

- 1: Volume from own sources
- 2: Billed metered
- 3: Unauthorized consumption



?	Click to access definition
+	Click to add a comment

Water Audit Report for: **City of**
 Reporting Year: **2015**

Please enter data in the white cells below. Where available, metered values should be used. Grade the input data by grading each component (n/a or 1-10) using the drop-down list to the left of each cell.

All volumes to be

To select the correct data grading for each input, determine the utility meets or exceeds all criteria for that grade.

WATER SUPPLIED

Volume from own sources:	+	?
Water imported:	+	?
Water exported:	+	?

WATER SUPPLIED:

AUTHORIZED CONSUMPTION

Billed metered:	+	?
Billed unmetered:	+	?
Unbilled metered:	+	?
Unbilled unmetered:	+	?

AUTHORIZED CONSUMPTION:

WATER LOSSES (Water Supplied - Authorized Consumption)

Apparent Losses

Unauthorized consumption:	+	?
---------------------------	---	---

Default option selected for unauthorized consumption

Appendix C

2015 SB X7-7 Verification Form

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SB X7-7 Table 0: Units of Measure Used in UWMP*

(select one from the drop down list)

Acre Feet

**The unit of measure must be consistent with Table 2-3*

NOTES:

SB X7-7 Table-1: Baseline Period Ranges			
Baseline	Parameter	Value	Units
10- to 15-year baseline period	2008 total water deliveries	9,045	Acre Feet
	2008 total volume of delivered recycled water	-	Acre Feet
	2008 recycled water as a percent of total deliveries	0.00%	Percent
	Number of years in baseline period ^{1, 2}	10	Years
	Year beginning baseline period range	2000	
5-year baseline period	Year ending baseline period range ³	2009	
	Number of years in baseline period	5	Years
	Year beginning baseline period range	2004	
	Year ending baseline period range ⁴	2008	
<p>¹ If the 2008 recycled water percent is less than 10 percent, then the first baseline period is a continuous 10-year period. If the amount of recycled water delivered in 2008 is 10 percent or greater, the first baseline period is a continuous 10- to 15-year period. ² The Water Code requires that the baseline period is between 10 and 15 years. However, DWR recognizes that some water suppliers may not have the minimum 10 years of baseline data.</p>			
<p>³ The ending year must be between December 31, 2004 and December 31, 2010.</p>			
<p>⁴ The ending year must be between December 31, 2007 and December 31, 2010.</p>			
<p>NOTES:</p>			

SB X7-7 Table 2: Method for Population Estimates	
Method Used to Determine Population (may check more than one)	
<input checked="" type="checkbox"/>	1. Department of Finance (DOF) DOF Table E-8 (1990 - 2000) and (2000-2010) and DOF Table E-5 (2011 - 2015) when available
<input type="checkbox"/>	2. Persons-per-Connection Method
<input type="checkbox"/>	3. DWR Population Tool
<input type="checkbox"/>	4. Other DWR recommends pre-review
NOTES:	

SB X7-7 Table 3: Service Area Population		
Year	Population	
10 to 15 Year Baseline Population		
Year 1	2000	72,473
Year 2	2001	73,949
Year 3	2002	76,471
Year 4	2003	79,762
Year 5	2004	84,068
Year 6	2005	88,509
Year 7	2006	92,196
Year 8	2007	94,112
Year 9	2008	96,441
Year 10	2009	97,586
<i>Year 11</i>		
<i>Year 12</i>		
<i>Year 13</i>		
<i>Year 14</i>		
<i>Year 15</i>		
5 Year Baseline Population		
Year 1	2004	84,068
Year 2	2005	88,509
Year 3	2006	92,196
Year 4	2007	94,112
Year 5	2008	96,441
2015 Compliance Year Population		
	2015	108,227
NOTES:		

SB X7-7 Table 4: Annual Gross Water Use *								
Baseline Year <i>Fm SB X7-7 Table 3</i>	Volume Into Distribution System <i>This column will remain blank until SB X7-7 Table 4-A is completed.</i>	Deductions					Annual Gross Water Use	
		Exported Water	Change in Dist. System Storage (+/-)	Indirect Recycled Water <i>This column will remain blank until SB X7-7 Table 4-B is completed.</i>	Water Delivered for Agricultural Use	Process Water <i>This column will remain blank until SB X7-7 Table 4-D is completed.</i>		
10 to 15 Year Baseline - Gross Water Use								
Year 1	2000	19,354			-		-	19,354
Year 2	2001	20,196			-		-	20,196
Year 3	2002	21,277			-		-	21,277
Year 4	2003	22,600			-		-	22,600
Year 5	2004	24,352			-		-	24,352
Year 6	2005	24,135			-		-	24,135
Year 7	2006	25,425			-		-	25,425
Year 8	2007	27,425			-		-	27,425
Year 9	2008	27,761			-		-	27,761
Year 10	2009	26,179			-		-	26,179
Year 11	0	-			-		-	-
Year 12	0	-			-		-	-
Year 13	0	-			-		-	-
Year 14	0	-			-		-	-
Year 15	0	-			-		-	-
10 - 15 year baseline average gross water use								23,870
5 Year Baseline - Gross Water Use								
Year 1	2004	24,352			-		-	24,352
Year 2	2005	24,135			-		-	24,135
Year 3	2006	25,425			-		-	25,425
Year 4	2007	27,425			-		-	27,425
Year 5	2008	27,761			-		-	27,761
5 year baseline average gross water use								25,820
2015 Compliance Year - Gross Water Use								
2015		20,030	-		-		-	20,030
* NOTE that the units of measure must remain consistent throughout the UWMP, as reported in Table 2-3								
NOTES:								

SB X7-7 Table 4-A: Volume Entering the Distribution System(s)

Complete one table for each source.

Name of Source		All Sources		
This water source is:				
<input checked="" type="checkbox"/>	The supplier's own water source			
<input checked="" type="checkbox"/>	A purchased or imported source			
Baseline Year <i>Fm SB X7-7 Table 3</i>	Volume Entering Distribution System	Meter Error Adjustment* <i>Optional (+/-)</i>	Corrected Volume Entering Distribution System	
10 to 15 Year Baseline - Water into Distribution System				
Year 1	2000	19,354		19,354
Year 2	2001	20,196		20,196
Year 3	2002	21,277		21,277
Year 4	2003	22,600		22,600
Year 5	2004	24,352		24,352
Year 6	2005	24,135		24,135
Year 7	2006	25,425		25,425
Year 8	2007	27,425		27,425
Year 9	2008	27,761		27,761
Year 10	2009	26,179		26,179
Year 11	0			-
Year 12	0			-
Year 13	0			-
Year 14	0			-
Year 15	0			-
5 Year Baseline - Water into Distribution System				
Year 1	2004	24,352		24,352
Year 2	2005	24,135		24,135
Year 3	2006	25,425		25,425
Year 4	2007	27,425		27,425
Year 5	2008	27,761		27,761
2015 Compliance Year - Water into Distribution System				
2015		20,030		20,030
<i>* Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document</i>				
NOTES:				

SB X7-7 Table 5: Gallons Per Capita Per Day (GPCD)				
Baseline Year <i>Fm SB X7-7 Table 3</i>		Service Area Population <i>Fm SB X7-7 Table 3</i>	Annual Gross Water Use <i>Fm SB X7-7 Table 4</i>	Daily Per Capita Water Use (GPCD)
10 to 15 Year Baseline GPCD				
Year 1	2000	72,473	19,354	238
Year 2	2001	73,949	20,196	244
Year 3	2002	76,471	21,277	248
Year 4	2003	79,762	22,600	253
Year 5	2004	84,068	24,352	259
Year 6	2005	88,509	24,135	243
Year 7	2006	92,196	25,425	246
Year 8	2007	94,112	27,425	260
Year 9	2008	96,441	27,761	257
Year 10	2009	97,586	26,179	239
<i>Year 11</i>	0	-	-	
<i>Year 12</i>	0	-	-	
<i>Year 13</i>	0	-	-	
<i>Year 14</i>	0	-	-	
<i>Year 15</i>	0	-	-	
10-15 Year Average Baseline GPCD				249
5 Year Baseline GPCD				
Baseline Year <i>Fm SB X7-7 Table 3</i>		Service Area Population <i>Fm SB X7-7 Table 3</i>	Gross Water Use <i>Fm SB X7-7 Table 4</i>	Daily Per Capita Water Use
Year 1	2004	84,068	24,352	259
Year 2	2005	88,509	24,135	243
Year 3	2006	92,196	25,425	246
Year 4	2007	94,112	27,425	260
Year 5	2008	96,441	27,761	257
5 Year Average Baseline GPCD				253
2015 Compliance Year GPCD				
2015		108,227	20,030	165
NOTES:				

SB X7-7 Table 6: Gallons per Capita per Day <i>Summary From Table SB X7-7 Table 5</i>	
10-15 Year Baseline GPCD	249
5 Year Baseline GPCD	253
2015 Compliance Year GPCD	165
NOTES:	

SB X7-7 Table 7: 2020 Target Method
Select Only One

Target Method		Supporting Documentation
<input checked="" type="checkbox"/>	Method 1	SB X7-7 Table 7A
<input type="checkbox"/>	Method 2	SB X7-7 Tables 7B, 7C, and 7D <i>Contact DWR for these tables</i>
<input type="checkbox"/>	Method 3	SB X7-7 Table 7-E
<input type="checkbox"/>	Method 4	Method 4 Calculator

NOTES:

SB X7-7 Table 7-A: Target Method 1 20% Reduction	
10-15 Year Baseline GPCD	2020 Target GPCD
249	199
NOTES:	

SB X7-7 Table 7-F: Confirm Minimum Reduction for 2020 Target			
5 Year Baseline GPCD <i>From SB X7-7 Table 5</i>	Maximum 2020 Target ¹	Calculated 2020 Target ²	Confirmed 2020 Target
253	240	199	199
¹ Maximum 2020 Target is 95% of the 5 Year Baseline GPCD Target is calculated based on the selected Target Method, see SB X7-7 Table 7 and corresponding tables for agency's calculated target. ² 2020			
NOTES:			

SB X7-7 Table 8: 2015 Interim Target GPCD		
Confirmed 2020 Target <i>Fm SB X7-7 Table 7-F</i>	10-15 year Baseline GPCD <i>Fm SB X7-7 Table 5</i>	2015 Interim Target GPCD
199	249	224
NOTES:		

SB X7-7 Table 9: 2015 Compliance								
Actual 2015 GPCD	2015 Interim Target GPCD	Optional Adjustments (in GPCD)					2015 GPCD (Adjusted if applicable)	Did Supplier Achieve Targeted Reduction for 2015?
		Enter "0" if Adjustment Not Used			TOTAL Adjustments	Adjusted 2015 GPCD		
		Extraordinary Events	Weather Normalization	Economic Adjustment				
165	224	<i>From Methodology 8 (Optional)</i>	<i>From Methodology 8 (Optional)</i>	<i>From Methodology 8 (Optional)</i>	-	165	165	YES
NOTES:								

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Appendix D

2020 SB X7-7 Verification Form

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SB X7-7 Table 0: Units of Measure Used in 2020 UWMP* <i>(select one from the drop down list)</i>
Acre Feet
<i>*The unit of measure must be consistent throughout the UWMP, as reported in Submittal Table 2-3.</i>
NOTES:

SB X7-7 Table 2: Method for 2020 Population Estimate	
Method Used to Determine 2020 Population (may check more than one)	
<input checked="" type="checkbox"/>	1. Department of Finance (DOF) or American Community Survey (ACS)
<input type="checkbox"/>	2. Persons-per-Connection Method
<input type="checkbox"/>	3. DWR Population Tool
<input type="checkbox"/>	4. Other DWR recommends pre-review
NOTES:	

SB X7-7 Table 3: 2020 Service Area Population	
2020 Compliance Year Population	
2020	122,350
NOTES:	

SB X7-7 Table 4: 2020 Gross Water Use							
Compliance Year 2020	2020 Volume Into Distribution System <i>This column will remain blank until SB X7-7 Table 4-A is completed.</i>	2020 Deductions					2020 Gross Water Use
		Exported Water *	Change in Dist. System Storage* (+/-)	Indirect Recycled Water <i>This column will remain blank until SB X7-7 Table 4-B is completed.</i>	Water Delivered for Agricultural Use*	Process Water <i>This column will remain blank until SB X7-7 Table 4-D is completed.</i>	
	24,828	-	-	-		-	24,828
<p>* Units of measure (AF, MG , or CCF) must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.</p> <p>NOTES:</p>							

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment
 Complete one table for each source.

Name of Source		Groundwater Wells	
This water source is (check one) :			
<input checked="" type="checkbox"/>	The supplier's own water source		
<input type="checkbox"/>	A purchased or imported source		
Compliance Year 2020	Volume Entering Distribution System ¹	Meter Error Adjustment ² Optional (+/-)	Corrected Volume Entering Distribution System
	12,105	-	12,105
¹ Units of measure (AF, MG , or CCF) must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3. ² Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document			
NOTES			

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s) Meter Error Adjustment
 Complete one table for each source.

Name of Source		Surface Water	
This water source is (check one) :			
<input checked="" type="checkbox"/>	The supplier's own water source		
<input type="checkbox"/>	A purchased or imported source		
Compliance Year 2020	Volume Entering Distribution System ¹	Meter Error Adjustment ² Optional (+/-)	Corrected Volume Entering Distribution System
	12,723	0	12,723
¹ Units of measure (AF, MG , or CCF) must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3. ² Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document			
NOTES:			

SB X7-7 Table 5: 2020 Gallons Per Capita Per Day (GPCD)		
2020 Gross Water <i>Fm SB X7-7 Table 4</i>	2020 Population <i>Fm</i> <i>SB X7-7 Table 3</i>	2020 GPCD
24,828	122,350	181
NOTES:		

SB X7-7 Table 9: 2020 Compliance

Actual 2020 GPCD ¹	Optional Adjustments to 2020 GPCD				2020 Confirmed Target GPCD ^{1,2}	Did Supplier Achieve Targeted Reduction for 2020?	
	Enter "0" if Adjustment Not Used			TOTAL Adjustments ¹			Adjusted 2020 GPCD ¹ <i>(Adjusted if applicable)</i>
	Extraordinary Events ¹	Weather Normalization ¹	Economic Adjustment ¹				
181	-	-	-	-	181	199	YES

¹ All values are reported in GPCD

² **2020 Confirmed Target GPCD** is taken from the Supplier's SB X7-7 Verification Form Table SB X7-7, 7-F.

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Appendix E

Water Shortage Contingency Plan

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Appendix F

City Ordinance 15-14

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ORDINANCE 15-14**AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF CLOVIS
AMENDING SUBSECTION (b), OF SECTION 6.5.110, OF CHAPTER 6.5, OF
TITLE 6 CLOVIS MUNICIPAL CODE RELATING TO WATER SERVICE
PENALTIES**

The City Council of the City of Clovis does ordain as follows:

SECTION 1. Subsection (b), of Section 6.5.110, of Chapter 6.5, of Title 6 of the Clovis Municipal Code is hereby amended to read as follows:

6.5.110 Other regulations.

(b) Water service penalties for waste or violations. For any water supplied by the City which is wasted by a customer a fee shall be charged to the customer and added to the customer's account. For the first violation, a written warning will be given to the customer. For the second violation within a one (1) year period, a fee of Thirty and no/100ths (\$30.00) Dollars shall be charged. For the third violation within a one (1) year period, a fee of Sixty and no/100ths Dollars (\$60.00) shall be charged. For the fourth and subsequent violations within a one (1) year period, a fee of Ninety and no/100ths (\$90.00) Dollars shall be charged. Additionally, any unmetered customer shall have a meter installed after the fourth violation at the customer's expense. The cost of the meter installation shall be added to the customer's account and paid over a maximum six (6) month period. For any customer who incurs within a one (1) year period four (4) or more water waste violations or does not comply with the water efficient landscape requirements, the City may implement any or all of the following measures:

- (1) Require a customer to get a landscape evaluation, lawn water audit, and water budget, as appropriate, in order to learn efficient water use. This work would be completed at customer expense;
- (2) Require a customer to repair any defects in the watering system of such customer within fourteen (14) days notice by the City to repair;
- (3) Require installation by the City of flow restrictors or termination of water service for exterior use;
- (4) Termination of all water service to a customer.

In addition to the foregoing, during any declared State of Emergency by the State or City related to drought or potable water conditions that mandate water conservation in the City, State or Federal regulations that mandate water conservation in the City, or during local water shortages, the City Council may by Resolution adopt mandatory water usage limits and impose penalties on the customer for violations of those usage limits. The penalties shall be added to the customer's account. A violation of the usage limits shall also be deemed a violation of the Municipal Code.

Water service shall be turned off and discontinued to any premises on which water supplied by the City is being disposed or used in violation of any law of the City other than wasting or noncompliance with water efficient landscape requirements. Water service shall not be restored to any premises until the owner and the occupant thereof terminate any violation and agree not to continue to repeat such violation. Such agreement shall be guaranteed by a cash deposit in such sum as the Director of Finance shall fix, not to exceed One Hundred and no/100ths (\$100.00) Dollars.

SECTION 2. EFFECTIVE DATE.

This ordinance shall go into effect and be in full force and operation from and after thirty (30) days after its final passage and adoption.

APPROVED: April 20, 2015



Mayor



City Clerk

* * * *

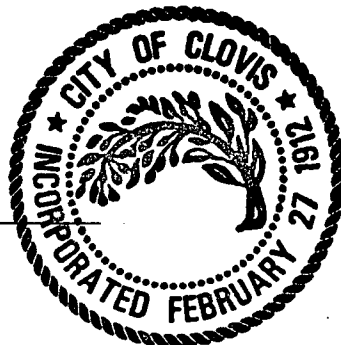
The foregoing ordinance was introduced at a regular meeting of the City Council held on April 20, 2015 and was adopted at a regular meeting of said Council held on May 4, 2015 by the following vote, to wit:

- AYES: Councilmembers Armstrong, Ashbeck, Flores, Mayor Magsig
- NOES: None
- ABSENT: Councilmember Whalen
- ABSTAIN: None

DATED May 4, 2015



City Clerk



Appendix G

2020 UWMP Checklist

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Appendix G: UWMP Checklist

2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Chapter 1	10615	A plan shall describe and evaluate sources of supply, reasonable and practical efficient uses, reclamation and demand management activities.	Introduction and Overview	Section 1
Chapter 1	10630.5	Each plan shall include a simple description of the supplier's plan including water availability, future requirements, a strategy for meeting needs, and other pertinent information. Additionally, a supplier may also choose to include a simple description at the beginning of each chapter.	Summary	Executive Summary
Section 2.2	10620(b)	Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.	Plan Preparation	Section 2.1
Section 2.6	10620(d)(2)	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	Plan Preparation	Section 2.4
Section 2.6.2	10642	Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan and contingency plan.	Plan Preparation	Section 2.4 Section 10.2 Section 10.3
Section 2.6, Section 6.1	10631(h)	Retail suppliers will include documentation that they have provided their wholesale supplier(s) - if any - with water use projections from that source.	System Supplies	Section 2.4
Section 3.1	10631(a)	Describe the water supplier service area.	System Description	Section 3.1
Section 3.3	10631(a)	Describe the climate of the service area of the supplier.	System Description	Section 3.3
Section 3.4	10631(a)	Provide population projections for 2025, 2030, 2035, 2040 and optionally 2045.	System Description	Section 3.4

Appendix G: UWMP Checklist

2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Section 3.4.2	10631(a)	Describe other social, economic, and demographic factors affecting the supplier's water management planning.	System Description	Section 3.2
Sections 3.4 and 5.4	10631(a)	Indicate the current population of the service area.	System Description and Baselines and Targets	Section 3.4
Section 3.5	10631(a)	Describe the land uses within the service area.	System Description	Section 3.5
Section 4.2	10631(d)(1)	Quantify past, current, and projected water use, identifying the uses among water use sectors.	System Water Use	Section 4.2
Section 4.2.4	10631(d)(3)(C)	Retail suppliers shall provide data to show the distribution loss standards were met.	System Water Use	Section 4.2.3
Section 4.2.6	10631(d)(4)(A)	In projected water use, include estimates of water savings from adopted codes, plans, and other policies or laws.	System Water Use	Section 4.2.5
Section 4.2.6	10631(d)(4)(B)	Provide citations of codes, standards, ordinances, or plans used to make water use projections.	System Water Use	Section 4.2.5
Section 4.3.2.4	10631(d)(3)(A)	Report the distribution system water loss for each of the 5 years preceding the plan update.	System Water Use	Section 4.2.3
Section 4.4	10631.1(a)	Include projected water use needed for lower income housing projected in the service area of the supplier.	System Water Use	Section 4.3
Section 4.5	10635(b)	Demands under climate change considerations must be included as part of the drought risk assessment.	System Water Use	Section 4.2.6 Section 4.4
Chapter 5	10608.20(e)	Retail suppliers shall provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting Data.	Baselines and Targets	Section 5
Chapter 5	10608.24(a)	Retail suppliers shall meet their water use target by December 31, 2020.	Baselines and Targets	Section 5.1.3

Appendix G: UWMP Checklist

2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Section 5.2	10608.24(d)(2)	If the retail supplier adjusts its compliance GPCD using weather normalization, economic adjustment, or extraordinary events, it shall provide the basis for, and data supporting the adjustment.	Baselines and Targets	Section 5.1.3
Section 5.5	10608.22	Retail suppliers' per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use of the 5-year baseline. This does not apply if the suppliers base GPCD is at or below 100.	Baselines and Targets	Section 5.1.3
Section 5.5 and Appendix E	10608.4	Retail suppliers shall report on their compliance in meeting their water use targets. The data shall be reported using a standardized form in the SBX7-7 2020 Compliance Form.	Baselines and Targets	Section 5.1.3 Appendix D
Sections 6.1 and 6.2	10631(b)(1)	Provide a discussion of anticipated supply availability under a normal, single dry year, and a drought lasting five years, as well as more frequent and severe periods of drought.	System Supplies	Section 7.3
Sections 6.1	10631(b)(1)	Provide a discussion of anticipated supply availability under a normal, single dry year, and a drought lasting five years, as well as more frequent and severe periods of drought, <i>including changes in supply due to climate change.</i>	System Supplies	Section 6.2.10
Section 6.1	10631(b)(2)	When multiple sources of water supply are identified, describe the management of each supply in relationship to other identified supplies.	System Supplies	Section 6.2
Section 6.1.1	10631(b)(3)	Describe measures taken to acquire and develop planned sources of water.	System Supplies	N/A
Section 6.2.8	10631(b)	Identify and quantify the existing and planned sources of water available for 2020, 2025, 2030, 2035, 2040 and optionally 2045.	System Supplies	Section 6.2.9
Section 6.2	10631(b)	Indicate whether groundwater is an existing or planned source of water available to the supplier.	System Supplies	Section 6.2.2 Section 6.2.9

Appendix G: UWMP Checklist

2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Section 6.2.2	10631(b)(4)(A)	Indicate whether a groundwater sustainability plan or groundwater management plan has been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	System Supplies	Section 6.2.2.2
Section 6.2.2	10631(b)(4)(B)	Describe the groundwater basin.	System Supplies	Section 6.2.2.1
Section 6.2.2	10631(b)(4)(B)	Indicate if the basin has been adjudicated and include a copy of the court order or decree and a description of the amount of water the supplier has the legal right to pump.	System Supplies	N/A
Section 6.2.2.1	10631(b)(4)(B)	For unadjudicated basins, indicate whether or not the department has identified the basin as a high or medium priority. Describe efforts by the supplier to coordinate with sustainability or groundwater agencies to achieve sustainable groundwater conditions.	System Supplies	Section 6.2.2.1
Section 6.2.2.4	10631(b)(4)(C)	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years	System Supplies	Section 6.2.2.5
Section 6.2.2	10631(b)(4)(D)	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	System Supplies	Section 6.2.9.1
Section 6.2.7	10631(c)	Describe the opportunities for exchanges or transfers of water on a short-term or long- term basis.	System Supplies	Section 6.2.7
Section 6.2.5	10633(b)	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	System Supplies (Recycled Water)	Section 6.2.5.2
Section 6.2.5	10633(c)	Describe the recycled water currently being used in the supplier's service area.	System Supplies (Recycled Water)	Section 6.2.5.3
Section 6.2.5	10633(d)	Describe and quantify the potential uses of recycled water and provide a determination of the technical and economic feasibility of those uses.	System Supplies (Recycled Water)	Section 6.2.5.4

Appendix G: UWMP Checklist

2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Section 6.2.5	10633(e)	Describe the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	System Supplies (Recycled Water)	Section 6.2.5.4
Section 6.2.5	10633(f)	Describe the actions which may be taken to encourage the use of recycled water and the projected results of these actions in terms of acre-feet of recycled water used per year.	System Supplies (Recycled Water)	Section 6.2.5.5
Section 6.2.5	10633(g)	Provide a plan for optimizing the use of recycled water in the supplier's service area.	System Supplies (Recycled Water)	Section 6.2.5.4
Section 6.2.6	10631(g)	Describe desalinated water project opportunities for long-term supply.	System Supplies	Section 6.2.6
Section 6.2.5	10633(a)	Describe the wastewater collection and treatment systems in the supplier's service area with quantified amount of collection and treatment and the disposal methods.	System Supplies (Recycled Water)	Section 6.2.5.2
Section 6.2.8, Section 6.3.7	10631(f)	Describe the expected future water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and for a period of drought lasting 5 consecutive water years.	System Supplies	Section 6.2.8
Section 6.4 and Appendix O	10631.2(a)	The UWMP must include energy information, as stated in the code, that a supplier can readily obtain.	System Suppliers, Energy Intensity	Section 6.3
Section 7.2	10634	Provide information on the quality of existing sources of water available to the supplier and the manner in which water quality affects water management strategies and supply reliability.	Water Supply Reliability Assessment	Section 7.1.3
Section 7.2.4	10620(f)	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	Water Supply Reliability Assessment	Section 7.3.4

Appendix G: UWMP Checklist

2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Section 7.3	10635(a)	Service Reliability Assessment: Assess the water supply reliability during normal, dry, and a drought lasting five consecutive water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years.	Water Supply Reliability Assessment	Section 7.3
Section 7.3	10635(b)	Provide a drought risk assessment as part of information considered in developing the demand management measures and water supply projects.	Water Supply Reliability Assessment	Section 7.4
Section 7.3	10635(b)(1)	Include a description of the data, methodology, and basis for one or more supply shortage conditions that are necessary to conduct a drought risk assessment for a drought period that lasts 5 consecutive years.	Water Supply Reliability Assessment	Section 7.4.1
Section 7.3	10635(b)(2)	Include a determination of the reliability of each source of supply under a variety of water shortage conditions.	Water Supply Reliability Assessment	Section 7.4.2
Section 7.3	10635(b)(3)	Include a comparison of the total water supply sources available to the water supplier with the total projected water use for the drought period.	Water Supply Reliability Assessment	Section 7.4.3
Section 7.3	10635(b)(4)	Include considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria.	Water Supply Reliability Assessment	Section 7.4.1
Chapter 8	10632(a)	Provide a water shortage contingency plan (WSCP) with specified elements below.	Water Shortage Contingency Planning	Section 8 Appendix E, Section xx
Chapter 8	10632(a)(1)	Provide the analysis of water supply reliability (from Chapter 7 of Guidebook) in the WSCP	Water Shortage Contingency Planning	Appendix E, Section xx

Appendix G: UWMP Checklist

2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Section 8.10	10632(a)(10)	Describe reevaluation and improvement procedures for monitoring and evaluation the water shortage contingency plan to ensure risk tolerance is adequate and appropriate water shortage mitigation strategies are implemented.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.2	10632(a)(2)(A)	Provide the written decision- making process and other methods that the supplier will use each year to determine its water reliability.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.2	10632(a)(2)(B)	Provide data and methodology to evaluate the supplier's water reliability for the current year and one dry year pursuant to factors in the code.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.3	10632(a)(3)(A)	Define six standard water shortage levels of 10, 20, 30, 40, 50 percent shortage and greater than 50 percent shortage. These levels shall be based on supply conditions, including percent reductions in supply, changes in groundwater levels, changes in surface elevation, or other conditions. The shortage levels shall also apply to a catastrophic interruption of supply.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.3	10632(a)(3)(B)	Suppliers with an existing water shortage contingency plan that uses different water shortage levels must cross reference their categories with the six standard categories.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.4	10632(a)(4)(A)	Suppliers with water shortage contingency plans that align with the defined shortage levels must specify locally appropriate supply augmentation actions.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.4	10632(a)(4)(B)	Specify locally appropriate demand reduction actions to adequately respond to shortages.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.4	10632(a)(4)(C)	Specify locally appropriate operational changes.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.4	10632(a)(4)(D)	Specify additional mandatory prohibitions against specific water use practices that are in addition to state-mandated prohibitions are appropriate to local conditions.	Water Shortage Contingency Planning	Appendix E, Section xx

Appendix G: UWMP Checklist

2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Section 8.4	10632(a)(4)(E)	Estimate the extent to which the gap between supplies and demand will be reduced by implementation of the action.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.4.6	10632.5	The plan shall include a seismic risk assessment and mitigation plan.	Water Shortage Contingency Plan	Appendix E, Section xx
Section 8.5	10632(a)(5)(A)	Suppliers must describe that they will inform customers, the public and others regarding any current or predicted water shortages.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.5 and 8.6	10632(a)(5)(B) 10632(a)(5)(C)	Suppliers must describe that they will inform customers, the public and others regarding any shortage response actions triggered or anticipated to be triggered and other relevant communications.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.6	10632(a)(6)	Retail supplier must describe how it will ensure compliance with and enforce provisions of the WSCP.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.7	10632(a)(7)(A)	Describe the legal authority that empowers the supplier to enforce shortage response actions.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.7	10632(a)(7)(B)	Provide a statement that the supplier will declare a water shortage emergency Water Code Chapter 3.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.7	10632(a)(7)(C)	Provide a statement that the supplier will coordinate with any city or county within which it provides water for the possible proclamation of a local emergency.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.8	10632(a)(8)(A)	Describe the potential revenue reductions and expense increases associated with activated shortage response actions.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.8	10632(a)(8)(B)	Provide a description of mitigation actions needed to address revenue reductions and expense increases associated with activated shortage response actions.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.8	10632(a)(8)(C)	Retail suppliers must describe the cost of compliance with Water Code Chapter 3.3: Excessive Residential Water Use During Drought	Water Shortage Contingency Planning	Appendix E, Section xx

Appendix G: UWMP Checklist

2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Section 8.9	10632(a)(9)	Retail suppliers must describe the monitoring and reporting requirements and procedures that ensure appropriate data is collected, tracked, and analyzed for purposes of monitoring customer compliance.	Water Shortage Contingency Planning	Appendix E, Section xx
Section 8.11	10632(b)	Analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas.	Water Shortage Contingency Planning	Appendix E, Section xx
Sections 8.12 and 10.4	10635(c)	Provide supporting documentation that Water Shortage Contingency Plan has been, or will be, provided to any city or county within which it provides water, no later than 30 days after the submission of the plan to DWR.	Plan Adoption, Submittal, and Implementation	Appendix E, Section xx
Section 8.14	10632(c)	Make available the Water Shortage Contingency Plan to customers and any city or county where it provides water within 30 after adopted the plan.	Water Shortage Contingency Planning	Appendix E, Section xx
Sections 9.1 and 9.3	10631(e)(2)	Wholesale suppliers shall describe specific demand management measures listed in code, their distribution system asset management program, and supplier assistance program.	Demand Management Measures	
Sections 9.2 and 9.3	10631(e)(1)	Retail suppliers shall provide a description of the nature and extent of each demand management measure implemented over the past five years. The description will address specific measures listed in code.	Demand Management Measures	Section 9
Chapter 10	10608.26(a)	Retail suppliers shall conduct a public hearing to discuss adoption, implementation, and economic impact of water use targets (recommended to discuss compliance).	Plan Adoption, Submittal, and Implementation	Section 10.2

Appendix G: UWMP Checklist

2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Section 10.2.1	10621(b)	Notify, at least 60 days prior to the public hearing, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. Reported in Table 10-1.	Plan Adoption, Submittal, and Implementation	Section 10.2.1
Section 10.4	10621(f)	Each urban water supplier shall update and submit its 2020 plan to the department by July 1, 2021.	Plan Adoption, Submittal, and Implementation	Section 10
Sections 10.2.2, 10.3, and 10.5	10642	Provide supporting documentation that the urban water supplier made the plan and contingency plan available for public inspection, published notice of the public hearing, and held a public hearing about the plan and contingency plan.	Plan Adoption, Submittal, and Implementation	Section 10.2
Section 10.2.2	10642	The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water.	Plan Adoption, Submittal, and Implementation	Section 10.2
Section 10.3.2	10642	Provide supporting documentation that the plan and contingency plan has been adopted as prepared or modified.	Plan Adoption, Submittal, and Implementation	Appendix H
Section 10.4	10644(a)	Provide supporting documentation that the urban water supplier has submitted this UWMP to the California State Library.	Plan Adoption, Submittal, and Implementation	Section 10.4
Section 10.4	10644(a)(1)	Provide supporting documentation that the urban water supplier has submitted this UWMP to any city or county within which the supplier provides water no later than 30 days after adoption.	Plan Adoption, Submittal, and Implementation	Section 10.4
Sections 10.4.1 and 10.4.2	10644(a)(2)	The plan, or amendments to the plan, submitted to the department shall be submitted electronically.	Plan Adoption, Submittal, and Implementation	Section 10.4

Appendix G: UWMP Checklist

2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Section 10.5	10645(a)	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	Section 10.5
Section 10.5	10645(b)	Provide supporting documentation that, not later than 30 days after filing a copy of its water shortage contingency plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	Section 10.5
Section 10.6	10621(c)	If supplier is regulated by the Public Utilities Commission, include its plan and contingency plan as part of its general rate case filings.	Plan Adoption, Submittal, and Implementation	N/A
Section 10.7.2	10644(b)	If revised, submit a copy of the water shortage contingency plan to DWR within 30 days of adoption.	Plan Adoption, Submittal, and Implementation	Section 10.6

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Appendix H

UWMP Adopting Resolution

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Appendix I

DWR Submittal Tables

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City of Clovis

Water Shortage Contingency Plan 2020 Update

July 2021



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Abbreviations

AB..... State Assembly Bill
 af..... acre-feet
 afy..... acre-feet per year
 bgs.....below ground surface
 CWC..... California Water Code
 ft..... feet
 BPU.....City of Tulare, Board of Public Utilities
 DMM.....Demand Management Measures
 DRA..... Drought Risk Assessment
 DWR.....Department of Water Resources
 gpd.....gallons per day
 gpcd..... gallons per capita per day
 mgd.....million gallons per day
 psi..... pounds per square inch
 SB.....State Senate Bill
 SGMA.....Sustainable Groundwater Management Act
 SWRCB.....State Water Resources Control Board
 UAFW.....unaccounted-for water
 UWMP..... Urban Water Management Plan
 UWMPA..... Urban Water Management Planning Act
 WSCP.....Water Shortage Contingency Plan

2020 Water Shortage Contingency Plan

Definitions

The following words and phrases whenever used in the Water Shortage Contingency Plan will have the meaning defined in this Section:

City means the City of Clovis.

Customer means any person, business, corporation, public or private entity, public or private association, public or private agency, government agency or institution, school district, college, or any other user of water provided by the City of Clovis.

Days are defined as calendar days, unless otherwise indicated.

Drought will mean any shortage in water supply based upon expected demands that are caused by hydrological, environmental, legislative, judicial actions, or by infrastructure failure.

Normal Water Supply is defined as sufficient water supply to meet the unconstrained water demand of the preceding three years, averaged.

UWMP means the 2020 Urban Water Management Plan.

Waste means among other things, violations of the restrictions set forth in this policy at each specific response level.

Water Conservation means the efficient management of water resources for beneficial uses, preventing waste, or accomplishing additional benefits with the same amount of water.

Water will refer to potable water, unless otherwise specified.

WSCP refers to the City of Clovis' Water Shortage Contingency Plan contained herein and as readopted or amended from time to time, or an equivalent plan of the City to manage or allocate supplies during shortages.

1 Purpose of Plan

Legal Requirements:

CWC §10632.3 *It is the intent of the Legislature that, upon proclamation by the Governor of a state of emergency under the California Emergency Services Act (Chapter 7 (commencing with Section 8550) of Division 1 of Title 2 of the Government Code) based on drought conditions, the board defer to implementation of locally adopted water shortage contingency plans to the extent practicable.*

The Urban Water Management Planning Act (UWMPA) requires that the Urban Water Management Plan (UWMP) include an urban water shortage contingency analysis that addresses levels of action to be undertaken by the urban water supplier in response to water supply shortages, including a more than 50 percent reduction in water supply and an outline of specific water supply conditions which are applicable to each level. In addition to the levels of action, the City of Clovis (City) is required to develop mandatory prohibitions against specific water use during shortages and consumption reduction methods in the most restrictive levels.

This Water Shortage Contingency Plan (WSCP) was prepared according to the California Water Code (CWC) Section 10632 and 10635, as set forth in the 2020 Urban Water Management Plan Guidebook for Urban Water Suppliers (DWR, 2021) established by the DWR (UWMP Guidebook), and includes the requirements listed in **Table 1-1**.

Table 1-1 WSCP Requirements

Topic	CWC Sections	WSCP Location
Water Supply Reliability Analysis	10632 (a)(1)	Section 2
Annual Assessment Procedures	10632 (a)(2)	Section 3
Water Shortage Levels	10632 (a)(3)	Section 4
Shortage Response Actions	10632 (a)(4) and (b)	Section 5
Communication Protocols	10632 (a)(5)	Section 6
Compliance and Enforcement	10632 (a)(6)	Section 7
Legal Authority	10632 (a)(7)	Section 8
Financial Consequences of WSCP	10632 (a)(8)	Section 9
Monitoring and Reporting	10632 (a)(9)	Section 10
WSCP Refinement Procedures	10632 (a)(10)	Section 11
Special Water Feature Distinction		Section 12
Plan Adoption, Submittal, and Availability		Section 13

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2 Water Supply Reliability Analysis

Legal Requirements:

§10632(a)(1) *The analysis of water supply reliability conducted pursuant to §10635.*

2.1 Findings Related to Water System Reliability

As discussed in the City’s 2020 UWMP (Provost & Pritchard Consulting Group, 2021), the reliability of the water system is reasonably robust; however, in a multiple dry year condition, the City will need to enact this WSCP to reduce demands. The following are the summary tables of the normal, single-dry, and multiple dry year supply and demand comparisons shown in the 2020 UWMP. As noted in Table 2-3, all years of the multiple dry year scenario utilize WSCP levels of conservation efforts.

2.1.1 Normal Year Supply and Demand

Table 2-1: Normal Year Supply and Demand Comparison (DWR UWMP Submittal Table 7-2)

	2025	2030	2035	2040
Supply Totals	50,739	58,937	65,034	74,650
Demand Totals	39,737	42,824	46,422	52,598
Difference	11,002	16,113	18,611	22,052

Units: AF

The 2040 Supply Total includes the following components (as described and discussed in greater detail in the 2020 UWMP):

- Groundwater, Firm Supply: 9,400 acre-feet per year (AFY)
- Recycled Water, Firm Supply: 9,400 AFY
- Surface Water, Firm Supply:
 - FID Firm Water Agreement: 6,000 AFY
- Banked Water, Firm Supply:
 - Boswell Banking Facility: 4,500 AFY
 - Waldron Banking Facility: 9,000 AFY
- Surface Water, Variable Supply (dependent on water year type):
 - FID Conveyance: 32,100 AFY
 - Central Valley Project (CVP), Class II: 1,300 AFY
 - Garfield Water District: 1,750 AFY
 - International Water District: 1,200 AFY

2.1.2 Single Dry Year Supply and Demand

Table 2-2: Single Dry Year Supply and Demand Comparison (DWR UWMP Submittal Table 7-3)

	2025	2030	2035	2040
Supply Totals	37,839	43,587	47,233	53,109
Demand Totals	34,272	37,359	40,957	47,133
Difference	3,567	6,228	6,276	5,976

Units: AF

2.1.3 Multiple Dry Year Supply and Demand

Table 2-3: Multiple Dry Year Supply and Demand Comparison (DWR UWMP Submittal Table 7-4)

		2025	2030	2035	2040
First Year	Supply Totals	46,784	54,607	60,330	68,999
	Demand Totals [1]	36,489	39,422	42,840	48,707
	Difference	10,294	15,185	17,489	20,292
Second Year	Supply Totals	45,093	52,576	57,958	66,095
	Demand Totals [1]	34,183	36,962	40,200	45,758
	Difference	10,910	15,614	17,758	20,337
Third Year	Supply Totals	41,895	48,310	52,625	59,717
	Demand Totals [1]	31,346	33,969	37,028	42,277
	Difference	10,550	14,341	15,597	17,440
Fourth Year	Supply Totals	37,839	43,587	47,233	53,109
	Demand Totals [1]	28,005	30,474	33,353	38,293
	Difference	9,834	13,112	13,881	14,815
Fifth Year	Supply Totals	49,743	57,992	64,141	73,716
	Demand Totals [1]	37,825	40,758	44,176	50,043
	Difference	11,918	17,235	19,965	23,674

Notes:

[1] Demand conservation utilized based on Levels described below. Years 1 and 5 utilize Level 1 voluntary reductions, while Years 2, 3 and 4 utilize Level 2, 3, and 4 mandatory reductions, respectively.

2.1.4 Drought Resiliency Assessment

The water supply values consider the City’s four primary supply sources: groundwater, surface water, banked groundwater, and recycled water.

- Groundwater: For purposes of the Drought Resiliency Assessment (DRA), the groundwater quantity was reduced to the sustainable yield value discussed in the 2020 UWMP, 9,400 AFY.
- Surface water: For purposes of the DRA, the surface water quantity available assumed no additional FID supplies would be available, no CVP supplies would be available, and the amount of surface water supplies received would follow the trend of the 2012-2016 drought period, varying from 35 to 96 percent of a normal water year.
- Banked groundwater: For purposes of the DRA, the City would assume to use both the Waldron and Boswell facilities fully, extracting up to 13,500 AFY from the two, combined.
- Recycled water: For the purposes of the DRA, the recycled water quantity available was assumed to be steady, without showing increases due to plant expansion; however, the assumption is the City would utilize all the supply either for direct use or for groundwater recharge rather than using surface water for that purpose.

Table 2-4: Five-Year Drought Risk Assessment (DWR UWMP Submittal Table 7-5)

Condition	2021	2022	2023	2024	2025
Total Water Use	31,443	32,741	34,040	35,339	36,637
Total Supplies	41,809	40,513	38,068	34,537	45,893
Surplus/Shortfall w/o WSCP Action	10,366	7,772	4,028	(801)	9,256
Planned WSCP Actions (use reduction and supply augmentation)					
WSCP - supply augmentation benefit	0	0	0	0	0
WSCP - use reduction savings benefit	1,275	2,619	4,031	5,511	1,412
Revised Surplus/(shortfall)	11,642	10,391	8,059	4,710	10,668
Resulting % Use Reduction from WSCP action	4%	8%	12%	16%	4%

2.2 Key Issues Creating a Shortage Condition

Given there are a variety of circumstances that can render a source inconsistent, determining the supply reliability for the City is difficult because of the complex factors that accompany a water source. These factors are discussed below.

2.2.1 Groundwater Shortages

Aquifer Regulations

The groundwater supplies are not withdrawn from a groundwater aquifer that is adjudicated, but that could change and the implementation of SGMA could have an impact on the quantity of water the City can utilize each year.

Groundwater Levels

Additionally, if groundwater levels continue to decline, the City’s wells could become inoperable due to groundwater elevation, creating a temporary water shortage until the City is able to rehabilitate the well

or construct a new one. The City has a redundant network of wells, limiting the impact of one or even two wells becoming inoperable for a period.

Groundwater Quality

The City has three wells either offline or in standby status, due to water quality concerns; however, they have thirty-six other active wells and six new wells planned. Again, the redundancy in their well network provides a safeguard if a well has an emerging contaminant concern. However, if a new contaminant were identified that widely impact the City's wells, a program would be needed quickly to ensure a water shortage could be avoided. In the instance of a catastrophic water quality issue, impacting multiple wells (such as intentional contamination or an environmental spill), the City would be able to implement this Plan to mitigate impacts to City customers.

2.2.1.1 Surface Water Shortages

The surface water supplies can be limited from year to year due to drought conditions and lack of snowpack in the Sierra. When those supplies are limited, the City's surface water supplies are reduced creating a water supply shortage condition. The impacts of climate change are likely to alter the historic management of surface water supplies and increase the frequency and magnitude of droughts, requiring the City and stakeholder agencies to adapt their water supply management practice to avoid shortages.

Again, intentional contamination of the surface water supply could lead the City into a water shortage condition as discussed in this Plan and require they enact demand reductions to switch entirely to groundwater while a solution was determined. This is unlikely to occur, however, the City is prepared with this and other planning documents.

3 Annual Water Supply and Demand Assessment Procedures

Legal Requirements:

CWC §10632(a)(2) *The procedures used in conducting an annual water supply and demand assessment that include, at a minimum, both of the following:*

(A) *The written decision-making process that an urban water supplier will use each year to determine its water supply reliability.*

(B) *The key data inputs and assessment methodology used to evaluate the urban water supplier’s water supply Decision Making Process reliability for the current year and one dry year, including all of the following:*

(iv) *A defined set of locally applicable evaluation criteria that are consistently relied upon for each annual water supply and demand assessment.*

When it is determined by the Director of Public Utilities that a change in water shortage level is required, the City Council will be notified. However, the requirements for the declared level are effective immediately upon the Director of Public Utilities determination and customer notification as required. Per Ordinance 15-14 (see Appendix A), the City Council may by resolution adopt penalties for usage more than mandatory reductions. These penalties are in addition to water waste penalties per Section 6.5.110(b) of the Clovis Municipal Code. **Table 4-1** shows the shortage levels, the reduction goals, and the initiating conditions.

3.1 Data Input and Assessment Methodology

3.1.1 Current Water Demands

Legal Requirements:

§10632(a)(2)(B)(i) *Current year unconstrained demand, considering weather, growth, and other influencing factors, such as policies to manage current supplies to meet demand objectives in future years, as applicable.*

Demands in **Table 3-1** are based on the 2020 Water Use Target (199 gpcd) for all uses except single and multi-family. In those instances, the Water Use Target has been reduced to 183 gpcd in 2025 and 167 gpcd in 2030 and beyond. The purpose of this reduction is to address the efficient indoor residential water use standards discussed in AB 1668 and SB 606 of 55 gpcd until January 2025 and 50 gpcd until January 2030. Additional water savings, such as mandated conservation measures, have not been included in the projections to allow for the City to plan in a conservative manner.

Water savings from codes, standards, ordinances, or transportation and land use plans are also known as “passive savings.” These various factors generally decrease the water use for new and future customers, compared to historical customers. These codes and ordinances may include implementation of the Model Water Efficient Landscape Ordinance (MWELO), the California Energy Commission Title 20 appliances standards for toilets, urinals, faucets, and showerheads, or the CALGreen Building Code.

Passive savings have not been specifically incorporated in projected water demands. Instead, future water demands are projected based on population and the City's target per capita water use, as documented in Chapter 5 of the 2020 UWMP and discussed above. However, the City does expect that

passive savings, such as continued implementation of the City’s Water Efficient Landscape Ordinance (See Appendix A), Title 20 appliance standards for toilets, urinals, faucets, and showerheads and CALGreen Building Code requirement, will help the City continue to meet its target per capita water demand in the future.

The following table provides a summary of the information provided in **Tables 4-4** and **4-5**, including recycled water demands discussed in greater detail in Section 6 of the UWMP.

Table 3-1: Use for Potable and Non-Potable Water (DWR UWMP Submittal Tables 4-1 and 4-2)

Use Type	Actual 2020 Water Use (AF)	Projected Water Use (AF) [1]			
		2025	2030	2035	2040
Single Family	16,638	18,546	18,558	20,353	22,327
Multi-Family	2,434	2,713	2,715	2,978	3,266
Commercial	2,518	3,052	3,346	3,670	4,026
Institutional	703	852	934	1,025	1,124
Industrial	267	324	355	389	427
Landscape [2]	1,102	1,336	1,465	1,607	1,763
Other	76	93	101	111	122
Losses [3]	1,090	1,321	1,449	1,589	1,743
Groundwater Recharge	5,316	8,400	8,400	8,400	8,400
Total	30,144	36,637	37,324	40,122	43,198

Notes:

[1] Projected water use is based on the 2020 Water Use Target of 199 gpcd for non-residential uses and 183 gpcd and 167 gpcd for residential uses, as discussed above, and the population projections discussed in Section 3 of the 2020 UWMP.

[2] Recycled water is not reported in this table.

[3] Water loss is the total water supplied minus authorized consumption.

The following table summarizes potable and non-potable demands alongside the current and anticipated recycled water demands. In dry years, the use of recycled water will be important to utilize rather than utilizing potable supplies for non-potable demands, such as landscaping.

Table 3-2: Total Water Use (Potable and Non-Potable) (DWR UWMP Submittal Table 4-3)

Demand Use	2020	2025	2030	2035	2040
Potable Water, Raw, Other Non-Potable	30,144	36,637	37,324	40,122	43,198
Recycled Water	710	3,100	5,500	6,300	9,400
Total Water Demands	30,854	39,737	42,824	46,422	52,598

3.1.2 Quantification of Water Supply

Legal Requirements:

§10632(a)(2)(B) *The key data inputs and assessment methodology used to evaluate the urban water supplier's water supply reliability for the current year and one dry year, including all of the following:*

(ii) Current year available supply, considering hydrological and regulatory conditions in the current year and one dry year. The annual supply and demand assessment may consider more than one dry year solely at the discretion of the urban water supplier.

(v) A description and quantification of each source of water supply.

3.1.2.1 Groundwater

As discussed in the 2020 UWMP, the City has historically relied upon groundwater for a large portion of its water supply; however, that has been changing the past fifteen years and will continue to do so. The City's is operating with the understanding there is a sustainable yield for groundwater pumping of 9,400 AFY; however, SGMA implementation may change that number.

3.1.2.2 Surface Water

The City has succeeded in securing sufficient surface water supplies for normal year demands and will be expanding surface water treatment capacity and reliability with several capital projects in the next few years. The expansion at the existing SWTP and the construction of a second SWTP in the northeast portion of the City will support the anticipated growth of the community and associated water demands. Additionally, the City is reviewing options to mitigate the period each year when the existing conveyance to the SWTP is removed from service for maintenance activities. During this period, the City is unable to operate its SWTP and relies solely on groundwater pumping. Fortunately, the period occurs in November or December, two of the lowest water use months of the year.

3.1.2.3 Supply from Storage

The City has access to 9,000 AF of annual water supply from the Waldron Banking facility and to 4,500 AF of annual water supply from the Boswell (Jameson) Banking facility, which is a normal year water supply and is considered in the overall and dry year supply portfolios.

3.1.2.4 Recycled Water

The City updated its Recycled Water Master Plan in 2017. The goals of the update are to identify and summarize existing and potential future recycled water demands; identify constraints associated with certain recycled water users, evaluate existing recycled water infrastructure, and identify potential capacity for deliveries.

Currently, recycled water is used for irrigation of public and private landscape within the service area; areas receiving recycled water include Freeway 168 between Shepherd and Sierra Avenues, Clovis Community Medical Center, and multiple City parks and landscape areas.

Table 3-3: Water Supplies (DWR UWMP Submittal Tables 6-8 and 6-9)

Water Supply	Additional Details on Water Supply	2020 Actual Volume Used (AF)	Projected Reasonably Available Water Supply (AF)			
			2025	2030	2035	2040
Groundwater	Tulare Lake Basin 5-22.08	12,105	11,429	10,753	10,076	9,400
Surface Water	Kings River and CVP	18,139	22,160	27,584	32,508	39,400
Supply from Storage	Waldron & Boswell Banked Supplies	0	13,500	13,500	13,500	13,500
Recycled Water	Water Reuse Facility	2,497	3,100	5,500	6,300	9,400
Transfers	Garfield and International Water Districts	0	550	1,600	2,650	2,950
Total		32,741	50,739	58,937	65,034	74,650

3.1.3 Existing Infrastructure Constraints

Legal Requirements:

§10632(a)(2) *The procedures used in conducting an annual water supply and demand assessment that include, at a minimum, both of the following:*

(B) The key data inputs and assessment methodology used to evaluate the urban water supplier’s water supply reliability for the current year and one dry year, including all of the following:

(iii) Existing infrastructure capabilities and plausible constraints.

The City’s infrastructure, regarding water supply reliability, can be separated into the two water supply systems: potable and recycled water. The potable water system includes 555 miles of water mains (6-inches and larger) and is well looped to deliver potable water supplies throughout the system, regardless of the supply source. The City’s recycled water system is primarily centered around existing users; however, the City has identified in its Recycled Water Master Plan (RWMP) (Provost & Pritchard Consulting Group, 2017) several possible users within ¼-mile of the existing system and will be working towards converting those users from the potable to recycled water system for landscape uses. This is discussed in greater detail in Section 6 of the 2020 UWMP.

4 Standard Water Shortage Levels

Legal Requirements:

§10632(a)(3)(A) Six standard water shortage levels corresponding to progressive ranges of up to 10, 20, 30, 40, and 50 percent shortages and greater than 50 percent shortage. Urban water suppliers shall define these shortage levels based on the suppliers' water supply conditions, including percentage reductions in water supply, changes in groundwater levels, changes in surface elevation or level of subsidence, or other changes in hydrological or other local conditions indicative of the water supply available for use. Shortage levels shall also apply to catastrophic interruption of water supplies, including, but not limited to, a regional power outage, an earthquake, and other potential emergency events.

The City has six triggering levels which correspond to water shortage levels. The water shortage levels are defined based on the percent reduction in available water supply when compared to a typical year. Each water shortage level has an accompanying goal for water consumption reduction varying from 10 percent to more than 50 percent. The six (6) levels are shown in **Table 4-1**. Total available water production includes any combination of the City's water supply sources shown in **Section 3** and detailed in the 2020 UWMP. At any time, a State or Federal mandate may require the City to enact a more stringent level than they would otherwise base solely on available water production, such as the State-wide conservation measures mandated in 2015.

Table 4-1: Levels of Water Shortage Contingency Plan (DWR Submittal Table 8-1)

Level	Percent Supply Reduction	Water Supply Condition	Targeted Demand Reduction
1	up to 10	total available water production is within 10 percent of estimated monthly peak hourly demands	10 percent of normal water demands
2	up to 20	total available water production is within 20 percent of estimated monthly peak hourly demands	20 percent of normal water demands
3	up to 30	total available water production is within 30 percent of estimated monthly peak hourly demands	30 percent of normal water demands
4	up to 40	total available water production is within 40 percent of estimated monthly peak hourly demands	40 percent of normal water demands
5	up to 50	total available water production is within 50 percent of estimated monthly peak hourly demands	50 percent of normal water demands
6	over 50	total available water production is less than 50 percent of estimated monthly peak hourly demands	more than 50 percent of normal water demands

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5 Shortage Response Actions

5.1 Demand Reduction

The first step in a demand reduction program is to prohibit wasteful practices and provide enforcement methods. The current City ordinance regulates wastage of water and provides penalties for wastage and failure to comply with any water conservation program the City enacts. The penalties range from a warning, to fines, to flow restrictors or discontinuance of service.

Table 5-2 contains prohibitions and the water shortage level in which they may be enacted. The Public Utilities Director, or their designee, can elect to choose all or a portion of each measure, as they deem appropriate.

Legal Requirements:

§10632(a)(4) Shortage response actions that align with the defined shortage levels.

5.1.1 Level 1: (Up to 10% Reduction of Normal Water Supply)

Minor water shortages initiate a voluntary demand reduction effort and enforcement of the water waste ordinance, where the Public Utilities Director, or their designee, through City Council guidance, determines what is considered wasting water.

- Wasting water, as determined by the City Council, includes excessive runoff from landscape irrigation, washing automobiles with hoses without self-closing nozzles, evaporative coolers overflowing, and leaks not being repaired in a timely manner.
- A public information campaign is initiated in which the water shortage situation is explained along with potential upcoming levels of the water shortage, and what may be expected in the future. Information about methods to save water is sent to customers along with the request to conserve water voluntarily.
- Additionally, the City participates in committees which promote water conservation through their activities.

5.1.2 Level 2: (Up to 20% Reduction of Normal Water Supply)

Moderate water shortages require a voluntary demand reduction effort.

- Public information dissemination continues and participation in water conservation committees is continued.
- Customers are asked to conserve 10 percent or more of their typical water use. Rate changes may be adopted to promote conservation.

- The water use threshold for the higher rate may be lowered from current levels to a volume indicated by the needed reduction for residential customers. These increased rates will be explained to customers along with water conservation strategies.
- The City evaluates its water use for main flushing, street cleaning, and landscaping to see if reductions are possible.
- The number of meters tested and repaired is increased.
- Outdoor water use is restricted to three days a week for all customers. Landscape watering may be restricted to outside of peak demand hours.
- Enforcement of the water waste and water conservation ordinance is continued.

5.1.3 Level 3: (Up to 30% Reduction of Normal Water Supply)

Moderately severe water shortages require mandatory reductions in consumption through a rationing program.

- The rationing program includes either fixed allotments or percentage reductions for residential customers and percent reductions for commercial and industrial customers.
 - For single family residential customers, the allotment is 75 percent of the 10-year baseline monthly average per capita residential consumption times 3 persons per household.
 - For multiple family customers the allotment is 75 percent of the 10-year baseline monthly average per capita residential consumption times 2.5 persons per unit.
 - Allotments can be appealed by customers if they can demonstrate that occupancy is greater than that assumed.
 - Alternately for residential customers, 25 percent reductions from average consumption for the previous two years in the same billing period may be required.
 - For commercial, institutional, and industrial customers the percent reduction is 30 percent from average consumption for the previous two years in the same billing period.
 - Landscaping-only accounts are allotted 70 percent of the previous 2-year average in the same billing period.
 - The fixed allotments are also applied to all residential unmetered accounts with the average consumption for the entire unmetered service area being the basis for comparison of consumption.
- Drought rate schedules and penalties are implemented to penalize use over allotment.
- Main flushing is only done on a sand, odor, or taste complaint basis or due to contamination and public health reasons.

- Outdoor water use is limited to two days a week for all customers. Landscape watering time restrictions are continued.
- Water waste patrols must be used in this level to patrol for non-compliance.
- Pool covers are encouraged. No draining and refilling of pools is allowed.
- No new potable connections are allowed unless the developer can offset the new expected water use by a one-to-one water savings in existing development.

5.1.4 Level 4: (Up to 40% Reduction of Normal Water Supply)

Severe water shortages require large reductions in water usage.

- All the Level 3 steps apply but the allotments are smaller and percentage reductions are larger.
 - Single family residential customers have an allotment of 65 percent of the 10-year baseline monthly average per capita residential consumption times 3 persons per household.
 - Multiple family residential customers have an allotment of 65 percent of the 10-year baseline monthly average per capita residential consumption times 2.5 persons per unit, and percentage reductions are increased to 35 percent of the average monthly consumption for the previous two years.
 - Commercial, institutional, and industrial customers are required to reduce consumption by 35 percent from the average monthly consumption for the previous two years.
 - Landscape-only accounts are allowed 50 percent of the previous average monthly consumption for the previous two years.
- Outdoor water use is restricted to once a week except for drip irrigation systems.
- No new water service connections are allowed.
- Construction water usage is limited or prohibited for dust control, new main disinfection, and new home construction.
- For Level 4 and above implementation, a resolution that provides the specifics for the rationing program and additional water penalties must be adopted.
- The billing information provided to customers is modified to reflect the rationing program requirements.

5.1.5 Level 5: (Up to 50% Reduction of Normal Water Supply)

Critical water shortages require drastic reductions in water usage.

- All the Level 3 and Level 4 prohibitions apply but the allotments are smaller and percentage reductions are larger.

- Single family residential customers have an allotment of 55 percent of the 10-year baseline monthly average per capita residential consumption times 3 persons per household.
- Multiple family residential customers have an allotment of 55 percent of the 10-year baseline monthly average per capita residential consumption times 2.5 persons per unit, and percentage reductions are increased to 45 percent of the average monthly consumption for the previous two years.
- Commercial, institutional, and industrial customers are required to reduce consumption by 45 percent from the average monthly consumption for the previous two years.
- Landscape-only accounts are allowed 30 percent of the previous average monthly consumption for the previous two years.
- Outdoor water use is strictly prohibited for landscaping.
- A resolution that provides the specifics for the rationing program and additional water penalties must be adopted by the City.
- The billing information provided to customers is modified to reflect the rationing program requirements.

5.1.6 Level 6: (Greater than 50% Reduction of Normal Water Supply)

Extreme water shortages require drastic reductions in water usage.

- All the Level 5 prohibitions apply but the allotments are smaller and percentage reductions are larger.
 - Single family residential customers have an allotment of 45 percent of the 10-year baseline monthly average per capita residential consumption times 3 persons per household.
 - Multiple family residential customers have an allotment of 45 percent of the 10-year baseline monthly average per capita residential consumption times 2.5 persons per unit, and percentage reductions are increased to 55 percent of the average monthly consumption for the previous two years.
 - Commercial, institutional, and industrial customers are required to reduce consumption by 55 percent from the average monthly consumption for the previous two years.
 - Landscape-only accounts are allowed 10 percent of the previous average monthly consumption for the previous two years.
- Outdoor water use is strictly prohibited for landscaping.
- A resolution that provides the specifics for the rationing program and additional water penalties must be adopted by the City.

- The billing information provided to customers is modified to reflect the rationing program requirements.

The following matrix represents the reduction actions described above.

Table 5-1: Demand Reduction Action Matrix

Response Actions	Levels					
	1	2	3	4	5	6
Enforcement of Water Waste Ordinance	X	X	X	X	X	X
City participates in water conservation committees	X	X	X	X	X	X
Customers asked to conserve a portion of their typical water use (percent shown is expected water use reduction).		<ul style="list-style-type: none"> • 10% for all customers 	<ul style="list-style-type: none"> • 25% - Residential • 30% - CII • 30% - Landscape Only 	<ul style="list-style-type: none"> • 35% - Residential and CII • 50% - Landscape Only 	<ul style="list-style-type: none"> • 45% - Residential and CII • 70% - Landscape Only 	<ul style="list-style-type: none"> • 65% - Residential and CII • 90% - Landscape Only
City evaluates water use for main flushing, street cleaning, and landscape		X	X	X	X	X
Number of meters tested/repaired is increased		X	X	X	X	X
Outdoor water use restricted for landscaping		3 days/week	2 days/week	1 day/week	Not allowed	Not allowed
Drought rate schedules and penalties implemented [1]			X	X	X	X
Water waste patrols implemented			X	X	X	X
Pool covers encouraged			X	X	X	X
Draining and refilling of pools prohibited			X	X	X	X
No new potable connections allowed, with exceptions			X	X	X	X
Construction water usage is limited				X	X	X
Resolution for rationing program is drafted and adopted by Council				X	X	X
Notes: [1] Per the City's Municipal Code, Section 6.5.103: "During any declared state of emergency by the State or City related to potable water conditions that mandate water conservation in the City, when State or Federal regulations that mandate water conservation in the City are in effect, or during local water shortages, the following [drought] rates are effective."						

Table 5-2: Demand Reduction Actions (Submittal Table 8.2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap?	Penalty, Charge, or Other Enforcement?
1	Expand Public Information Campaign	5%	No
1	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	1%	Yes
1	Other - Require automatic shut-off hoses	1%	Yes
2	Expand Public Information Campaign	1%	No
2	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	1%	Yes
2	Other - Require automatic shut-off hoses	1%	Yes
2	Implement or Modify Drought Rate Structure or Surcharge	9%	Yes
2	Decrease Line Flushing	1%	No
2	Reduce System Water Loss	1%	No
2	Landscape - Limit landscape irrigation to specific days	5%	Yes
3	Expand Public Information Campaign	1%	No
3	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	1%	Yes
3	Other - Require automatic shut-off hoses	1%	Yes
3	Implement or Modify Drought Rate Structure or Surcharge	19%	Yes
3	Decrease Line Flushing	1%	No
3	Reduce System Water Loss	1%	No
3	Landscape - Limit landscape irrigation to specific days	6%	Yes
3	Landscape - Limit landscape irrigation to specific times	2%	Yes
3	Increase Water Waste Patrols	2%	No
4	Expand Public Information Campaign	1%	No
4	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	1%	Yes
4	Other - Require automatic shut-off hoses	1%	Yes
4	Implement or Modify Drought Rate Structure or Surcharge	25%	Yes
4	Decrease Line Flushing	1%	No
4	Reduce System Water Loss	1%	No

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap?	Penalty, Charge, or Other Enforcement?
4	Landscape - Limit landscape irrigation to specific days	7%	Yes
4	Landscape - Limit landscape irrigation to specific times	2%	Yes
4	Increase Water Waste Patrols	2%	No
5	Expand Public Information Campaign	1%	No
5	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	1%	Yes
5	Other - Require automatic shut-off hoses	1%	Yes
5	Implement or Modify Drought Rate Structure or Surcharge	32%	Yes
5	Decrease Line Flushing	1%	No
5	Reduce System Water Loss	1%	No
5	Landscape - Prohibit all landscape irrigation	10%	Yes
5	Increase Water Waste Patrols	2%	No
6	Expand Public Information Campaign	1%	No
6	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	1%	Yes
6	Other - Require automatic shut-off hoses	1%	Yes
6	Implement or Modify Drought Rate Structure or Surcharge	34%	Yes
6	Decrease Line Flushing	1%	No
6	Reduce System Water Loss	1%	No
6	Landscape - Prohibit all landscape irrigation	10%	Yes
6	Increase Water Waste Patrols	2%	No

5.2 Supply Augmentation

Legal Requirements:

§10632(a)(4)(A) *Locally appropriate supply augmentation actions.*

As discussed above, there are a variety of circumstances that can render a source inconsistent.

Groundwater Limitations and Augmentations

It is anticipated the groundwater supply will be limited to the sustainable yield by 2040, in line with the Sustainable Groundwater Management Act (SGMA). The City has set its water supply with that limit in mind and is working towards reduction of groundwater extraction to be within that limit. The City also actively participates in groundwater recharge programs throughout the City that will be considered when determining sustainable groundwater extractions and may allow for greater groundwater pumping in short-term periods that could augment the supply portfolio if needed.

As new water quality standards emerge, there may be further impact to the City's wells. If a well is removed from production due to water quality issues, the City's supply augmentation plan would be either to (a) locate a new well in an area without extraction zones from the contaminant plume, or (b) identify and construct a water treatment system that would restore the water supply to the system. If there was an emergency water quality issue, such as a massive point contamination, the City has an emergency intertie with the City of Fresno that could be utilized to augment the water supply.

Emergency Limitations and Augmentations

The City could experience emergencies, such as a wide-spread power outage, natural disaster (such as an earthquake), or removal of a major source due to significant maintenance activities. The City has protected its water supply sources from power outages by having emergency standby generators at some of their well sites and at the Surface Water Treatment Plant (SWTP), no further augmentation is needed. If an earthquake were to damage the SWTP to a great enough level to remove it from service, the City could rely on additional groundwater pumping in the short term to augment the overall system supplies and has wells existing or planned that would allow for sufficient supplies.

Finally, the City currently does experience a shutdown of the SWTP each year for approximately one month and every 4-5 years for up to 3 months for maintenance activities on the conveyance facilities and utilizes its groundwater supply to augment the missing surface water supply in those periods, which are scheduled in the winter, during the lowest demand periods.

Surface Water Limitations and Augmentations

In a dry year situation, the largest impact to the City's water supply will be the reduction of surface water. The City already has two water banks in place, one that is primarily for drought conditions, in its water supply management process. The additional supply associated with those water banks is 13,500 acre-feet per year; however, it is already accounted for in the Drought Risk Assessment and dry-year scenarios.

The City does not rely on a surface water supply, currently, that is restricted by environmental constraints. However, as the City grows, the CVP water supplies may be impacted by the Bay-Delta Water Quality Control Plan. The City has planned for short term limits to those supplies during drought years.

Augmentation Conclusions

As described above, most of the augmentation plans the City would need are already in place and, as stated in the 2020 Guidebook, are not appropriate to count as "Supply Augmentation"; however, the

emergency intertie with Fresno and the possible supply has not been accounted for previously and is therefore shown below.

Table 5-3: Supply Augmentation and Other Actions (DWR Submittal Table 8-3)

Shortage Level	Supply Augmentation Methods and Other Actions by Water Supplier	How much is this going to reduce the shortage gap?	Additional Explanation or Reference
3 thru 6	Other Actions (Describe)	710 gallons per minute (gpm)	Well 10 is offline due to TCP Contamination but could be used on a temporary basis with approval from the State Water Resources Control Board.
3 thru 6	Other Actions (Describe)	400 gallons per minute (gpm)	Well 20 is offline due to Iron and Manganese contamination but could be used on a temporary basis with approval from the State Water Resources Control Board. A chlorination system would be needed.
5 and 6	Transfers	5%	Emergency Intertie with the City of Fresno

5.3 Operational Changes

As stated above, the City would increase water waste monitoring, increase its metering inspections to replace or calibrate more meters, decrease or modify its line flushing operations, and change its billing information to provide water use comparisons for customers to understand their conservation effort impacts. The City could also monitor water use daily to track trends and the impact of water reduction mandates and programs and make modifications to operations as needed.

5.4 Emergency Response Plan

As mentioned above, the City has a robust and redundant system. For most anticipated emergencies, the City has a plan of action or backup in place or reasonably accessible for its water system. These are documented in the City’s Emergency Response Plan (ERP) (see Appendix B for an excerpt of the ERP showing the Action Plans listed below). The City also has had a program in place for years, the Clovis Emergency Response Team, comprised of trained citizens to assist other emergency crews in responding to a state of emergency within the City.

The ERP includes Action Plans (AP) for various types of emergencies, including:

- AP1: Threat of or Actual Contamination to Water System
- AP2: Structural Damage from Explosive Device
- AP3: Employee Assaulted with Weapon (Armed Intruder)

- AP4: SCADA, Process Controls, and Utility Billing System Security
- AP5: Assault on Water System Infrastructure
- AP6: Power Outages
- AP7: Natural Event (Flood, Earthquake, Drought)
- AP8: Water Supply Interruption
- AP9: Bomb Threat

Each AP has *Initiation and Notification* triggers, methods to *Assess the Problem*, methods to *Isolate and Fix the Problem*, *Monitoring* strategies, and *Recover and Return to Safety* steps. Many of the methods are similar to those discussed in this WSCP; however, the triggers vary and the WSCP is responsive to the Six Shortage Levels required in the CWC and noted in the 2020 UWMP Guidebook.

5.5 Seismic Risk Assessment and Mitigation Plan

CWC §10632.5(a) *In addition to the requirements of paragraph (3) of subdivision (a) of Section 10632, beginning January 1, 2020, the plan shall include a seismic risk assessment and mitigation plan to assess the vulnerability of each of the various facilities of a water system and mitigate those vulnerabilities.*

(b) An urban water supplier shall update the seismic risk assessment and mitigation plan when updating its urban water management plan as required by Section 10621.

(c) An urban water supplier may comply with this section by submitting, pursuant to Section 10644, a copy of the most recent adopted local hazard mitigation plan or multihazard mitigation plan under the federal Disaster Mitigation Act of 2000 (Public Law 106-390) if the local hazard mitigation plan or multihazard mitigation plan addresses seismic risk.

The City is included in the Fresno County Multi-Hazard Mitigation Plan (MHMP), adopted in May 2018. The MHMP covers the entire Fresno County, however, several agencies have an additional component addressing their facilities, called “Annexes” to the MHMP. The City is Annex A to the MHMP (see Appendix C).

The MHMP, Annex A, covering the City’s area, includes sections on the following topics:

- Hazard Identification and Summary
- Vulnerability Assessment (Assets at Risk and Potential Losses)
- Capability Assessment (Mitigation Capabilities)
- Mitigation Strategy

The MHMP discusses seismic risk and identifies the level of probability of a significant seismic event occurring in the area. In addition, the MHMP identified a separate effort the City is proceeding through to conduct a seismic vulnerability assessment of City-owned critical facilities.

In addition, the City’s ERP addresses seismic risk and response in Action Plan 7.

These two plans satisfy the CWC 10632.5 requirements.

5.6 Shortage Response Action Effectiveness

The anticipated effectiveness of each shortage response action is shown in **Table 5-1**. The anticipated percentage reductions for each measure are derived from a combination of the City's experience, historic water use reductions noted in the California Drought Contingency Plan (State of California, Department of Water Resources, & Natural Resources Agency, 2010) and calculated reductions based on mandated water use limits for various customer classes.

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6 Communication Protocols

Legal Requirements:

CWC §10632

(a)(5) Communication protocols and procedures to inform customers, the public, interested parties, and local, regional, and state governments, regarding, at a minimum, all the following:

(A) Any current or predicted shortages as determined by the annual water supply and demand assessment described pursuant to Section 10632.1.

(B) Any shortage Response Actions triggered or anticipated to be triggered by the annual water supply and demand assessment described pursuant to Section 10632.1.

(C) Any other relevant communications.

In the spring of each year, the City projects peak demands and anticipated supply. All wells are sounded for depth in early spring, typically in March. A preliminary schedule of shortage stages is determined following these efforts and City Council is notified of the preliminary schedule of shortage levels. During the months of April, May, June, July, August, and September, each week the water production figures are compared to the projected production figures to determine if conservation goals are being met. Projected available supply for the next week is also compared to the previous week's production, adjusted for the next weeks expected weather. This indicates whether a change in level, increase in public information, or increased enforcement is necessary.

Implementing Steps:

1. In April of each year City staff will project demands and supplies for the year. At that time a schedule of water shortage levels will be determined. If there is no change to the Level from the previous year, no action will be taken.
2. If a Level 3 or higher level is anticipated, the draft resolution may be adopted by the City Council for implementation of the required measures.
3. The levels will be declared by the Public Utilities Director and shall be effective immediately upon publication. Each level shall be effective until a new level is declared, or the level has been declared ended and so published.

The public and any interested parties shall be notified of any potential water shortages, declarations of water shortages, and response actions via public notices, the billing process, announcements on the utility's website, and through posting on the City's social media accounts.

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7 Compliance and Enforcement

Legal Requirements:

Water Code Section 10632 (a)(6) For an urban retail water supplier, customer compliance, enforcement, appeal, and exemption procedures for triggered shortage response actions as determined pursuant to Section 10632.2.

The City's Public Utilities Director, or their designee, will be responsible for evaluating available data on a consistent basis and adequately determining the proper water shortage level, progress made on conservation efforts, and if the appropriate level of water consumption reduction is being met.

Section 5 – Shortage Response Actions outlines the various water conservation measures during each water shortage level, as well as the various enforcements. The penalties for each level are also outlined in this section and can vary depending on the activated Water Shortage Level. Enforcement of various water conservation strategies is carried out by staff member of the water utility including water wastage patrols.

7.1 Penalties, Charges, Other Enforcement or Prohibitions

The City will utilize various measures to verify compliance with shortage response actions described above. Specific measures are noted in the following subsections.

7.1.1 Education and Communication Programs

The City employs staff to conduct its education and communication programs. The Public Utilities Director, or their designee, and City Manager will verify established education and communication programs are executed timely.

7.1.2 Water Waste Patrols and Irrigation Malfunctions

The City employs staff that are responsible for patrolling the service area and identifying water wasters, irrigation malfunctions, or other water use concerns. As noted in Section 9 of the 2020 UWMP, the City tracks and cites water wasters in accordance with the Clovis Municipal Code and as described below.

In addition, the City utilizes a mobile application called "GO Clovis" which allows citizens to identify water wasting, irrigation malfunctions, or other issues. The information is then transmitted to a main City staff contact and then distributed to the appropriate department; in this case, that would be the Public Utilities Department.

7.1.3 Warning and Citation Protocols, and Fines and Surcharges

The City has established the following penalties to address excessive water use as shown on Table 5-3. These penalties are current as of 2021 but may change in the future.

Table 7-1: Enforcement Measures

Enforcement Measure	Level When Penalty Takes Effect
<p>Water Waste Violations:</p> <p>1st Violation: Written Warning</p> <p>2nd Violation: \$30 Fine</p> <p>3rd Violation (within 1 year): \$60 Fine</p> <p>4th Violation (within 1 year): \$90 Fine</p> <p>Additional possible measures:</p> <ul style="list-style-type: none"> (1) Require customer to get a landscape evaluation, lawn water audit, or water budget at customer's expense. (2) Require customer to repair defects to water system within 14 days' notice by the City. (3) Require installation by City of flow restrictors or termination of water service for outdoor use. (4) Termination of all water service. 	<p>All levels</p>
<p>A violation of the usage limits shall also be deemed a violation of the Municipal Code per section §6.5110 of the Municipal Code.</p>	<p>Levels 3 thru 6</p>

8 Legal Authorities

§10632 (a)(7)

(A) A description of the legal authorities that empower the urban water supplier to implement and enforce its shortage Response Actions specified in paragraph (4) that may include, but are not limited to, statutory authorities, ordinances, resolutions, and contract provisions.

(B) A statement that an urban water supplier shall declare a water shortage emergency in accordance with Chapter 3 (commencing with Section 350) of Division 1.

(C) A statement that an urban water supplier shall coordinate with any city or county within which it provides water supply services for the possible proclamation of a local emergency, as defined in Section 8558 of the Government Code.

This WSCP adheres with the California Water Code 10632. This document is also required by State law as outlined in the Water Code, which states that, “Every urban water supplier shall prepare and adopt a water shortage contingency plan as part of its urban water management plan...” (WC 10632). As an established California Water Utility, the City of Clovis has the authority to implement the WSCP, declare water shortages, and implement shortage response actions including statutory authorities, ordinances, resolutions, and contract provisions.

The City will follow the protocols outlined in this Plan should it become necessary to declare a water shortage emergency. The process will follow the pertinent sections of the California Water Code and be noticed for a public hearing, typically at a City Council meeting.

The City has included the implementation methods in its Municipal Code and the WSCP will be adopted by the City Council, as described in Section 13, providing City staff the authorization to implement the Shortage Response Actions.

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9 Financial Consequences of WSCP

The various revenue sources available to the City during droughts include, but are not limited to water sales, system connection fees, interest income, special assessments, reserves, and other non-operating revenues, such as grant funding when available. In addition, there may be special outside funding sources made available to water agencies during a water emergency (e.g., Levels 4 through 6).

9.1 Potential Revenue Reductions and Expense Increases

Legal Requirement

§10632 (a)(8) A description of the financial consequences of, and responses for, drought conditions, including, but not limited to, all of the following:

(A) A description of potential revenue reductions and expense increases associated with activated shortage Response Action described in paragraph (4)

Potential revenue reductions may include, but are not limited to:

- Decreased water sales to all customer classes

Potential expense increases may include, but are not limited to:

- Water wastage patrols
- Water usage and data analysis
- Purchases of higher priced surface water

9.2 Mitigation Actions

Legal Requirement

§10632 (a)(8)(B) A description of mitigation actions needed to address revenue reductions and expense increases associated with activated shortage Response Actions described in paragraph (4).

The City's water rates (see Appendix D) are structured on two rates which include fixed and volumetric. Fixed rates are based on the meter size or number of dwelling units and are collected regardless of volume consumed. Volumetric rates are applied for all volumes of water consumption in the bimonthly billing period and are billed according to each thousand gallons of water metered.

The City will have the ability to increase water use rates during a drought to account for the increased costs experienced. While the fixed charges do not change during drought periods, the volume rates are higher than the non-drought rate scenario reflecting the recovery of costs over a smaller base of water use. The rates are considered revenue neutral, as they are designed to maintain a revenue equivalent to 2015, which was approximately \$13.7 million. Financial reserves will be used as necessary to pay for the higher cost of utilizing banked water supplies during drought conditions.

9.3 Cost of Compliance

Legal Requirement

§10632 (a)(8)(C) *A description of the cost of compliance with Chapter 3.3 (commencing with Section 365) of Division 1.*

The City has its standard policies that address penalties for wasteful use of water. They also have a model drought ordinance that they will revise as necessary depending on specific circumstances. Declaring a water shortage and enforcing response actions can be performed by existing staff with no significant increases in operating cost.

In 2016, the City completed a *Water User Rates and Fee Study*, which analyzed current rates and proposed rates under non-drought conditions and drought conditions. Non-drought conditions are considered normal year water conditions and use fiscal year 2020 as the base year. Under Drought conditions, a higher rate is charged on the volumetric usage. This drought rate will enable the City to recover operation, maintenance, staffing, and additional costs related to the water shortage response.

10 Monitoring and Reporting

Legal Requirement

§10632 (a)(9) *For an urban retail water supplier, monitoring and reporting requirements and procedures that ensure appropriate data is collected, tracked, and analyzed for purposes of monitoring customer compliance and to meet state reporting requirements.*

The City is, and historically has been, in compliance with the state reporting requirements. The City uses meters to monitor all water deliveries to consumers, which assists in assuring customer compliance. Additionally, the City maintains a protocol for receiving and addressing complaints of non-compliance and misuse.

The procedures for monitoring reductions throughout the six different water shortage levels are outlined below:

- In normal water supply conditions (Level 1) production and pumping totals are reported monthly to the Public Utilities Director.
- During Levels 2 through 4 water shortage conditions, weekly production and pumping amounts are reported to the Public Utilities Director to compare the weekly data to the targets to verify that reduction goals are being met.
- During Level 5 or 6 water shortage, a daily production and pumping report is provided to the Public Utilities Director to verify that goals are being met.

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11 WSCP Refinement Procedures

Legal Requirement

§10632 (a)(10) *Reevaluation and improvement procedures for systematically monitoring and evaluating the functionality of the water shortage contingency plan in order to ensure shortage risk tolerance is adequate and appropriate water shortage mitigation strategies are implemented as needed.*

The City has revised and re-adopted its WSCP several times to incorporate refinements and improvements and as regulations are updated; the most recent adoption being in 2016. In addition, this WSCP incorporates important lessons learned during the historic drought of 2012-2016. The WSCP will be re-evaluated at least every five years and at the end of each drought period to assess its performance. If deemed necessary, it will be modified and improved based on lessons learned. The Plan may also be updated in the middle of a drought year if needed.

The plan may be updated at any time when the urban water supplier believes significant changes have occurred that may affect the contents of the plan. If major changes are made to this 2020 WSCP, the City will hold an additional public hearing and City Council will readopt the plan. Copies of amendments or changes to the plan shall be submitted to DWR, the California State Library, City of Fresno, and Fresno County within 30 days of adoption.

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12 Special Water Feature Distinction

Legal Requirements:

§10632(a)(10)(B) For purposes of developing the water shortage contingency plan pursuant to subdivision (a), an urban water supplier shall analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas, as defined in subdivision (a) of Section 115921 of the Health and Safety Code.

Health and Safety Code Section §115921 As used in this article the following terms have the following meanings: (a) "Swimming pool" or "pool" means any structure intended for swimming or recreational bathing that contains water over 18 inches deep. "Swimming pool" includes in-ground and aboveground structures and includes, but is not limited to, hot tubs, spas, portable spas, and non-portable wading pools.

The water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, are to be defined separately from swimming pools and spas.

Water features are defined in City of Clovis Municipal Code section 6-5.514 as containing 500 gallons or more of water. Water features include artificial ponds, lakes, waterfalls, and fountains. Per the existing Code, water features shall utilize recirculating water, or the water must be reused for landscape irrigation. Recirculating water is not required if the water feature is supplied with untreated surface water or recycled water.

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13 Plan Adoption, Submittal, and Availability

Legal Requirements:

CWC §10632 (c)

The urban water supplier shall make available the water shortage contingency plan prepared pursuant to this article to its customers and any city or county within which it provides water supplies no later than 30 days after adoption of the water shortage contingency plan.

13.1 Notice of Public Hearing

Prior to adoption of the 2020 WSCP, a public hearing was held on July 12, 2021 at the City Council Chamber, located at 1033 Fifth Street, Clovis, CA 93612. Notices were provided to cities and counties, and the public. The public hearing provided an opportunity for the public to provide input to the plan before it is adopted.

On June 14, 2021 and June 21, 2021, the City placed a notice in the Fresno Bee stating that its WSCP was being prepared and that a public hearing would be conducted. The 2020 WSCP was made available for public inspection at the City of Clovis Operations and Maintenance Service Center, located at 155 N. Sunnyside Avenue, Clovis, California.

13.2 Public Hearing and Adoption

The public hearing was held prior to the adoption of the WSCP. The hearing provided an opportunity for the City's customers, residents, and employees to learn and ask questions about the City's plans to mitigate water shortage plans in the future. The public hearing was held on July 12, 2021.

The plan adoption by City Council occurred after a public hearing on July 12, 2021. The City Adoption Resolution is included in Appendix E.

13.3 Plan Submittal

The 2020 WSCP will be submitted to DWR and the City of Fresno and Fresno County, electronically, and to the California State Library, in CD or hardcopy format, within 30 days of adoption.

13.4 Public Availability

Within 30 days of submitting the WSCP to DWR, the adopted plan will be available for public review during normal business hours at the City of Clovis Operations and Maintenance Service Center. The City will also post a copy of the adopted UWMP and WSCP on its website (<http://www.ci.clovis.ca.us/>).

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Appendix

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Appendix A

City Ordinances

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ORDINANCE 15-14**AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF CLOVIS
AMENDING SUBSECTION (b), OF SECTION 6.5.110, OF CHAPTER 6.5, OF
TITLE 6 CLOVIS MUNICIPAL CODE RELATING TO WATER SERVICE
PENALTIES**

The City Council of the City of Clovis does ordain as follows:

SECTION 1. Subsection (b), of Section 6.5.110, of Chapter 6.5, of Title 6 of the Clovis Municipal Code is hereby amended to read as follows:

6.5.110 Other regulations.

(b) Water service penalties for waste or violations. For any water supplied by the City which is wasted by a customer a fee shall be charged to the customer and added to the customer's account. For the first violation, a written warning will be given to the customer. For the second violation within a one (1) year period, a fee of Thirty and no/100ths (\$30.00) Dollars shall be charged. For the third violation within a one (1) year period, a fee of Sixty and no/100ths Dollars (\$60.00) shall be charged. For the fourth and subsequent violations within a one (1) year period, a fee of Ninety and no/100ths (\$90.00) Dollars shall be charged. Additionally, any unmetered customer shall have a meter installed after the fourth violation at the customer's expense. The cost of the meter installation shall be added to the customer's account and paid over a maximum six (6) month period. For any customer who incurs within a one (1) year period four (4) or more water waste violations or does not comply with the water efficient landscape requirements, the City may implement any or all of the following measures:

- (1) Require a customer to get a landscape evaluation, lawn water audit, and water budget, as appropriate, in order to learn efficient water use. This work would be completed at customer expense;
- (2) Require a customer to repair any defects in the watering system of such customer within fourteen (14) days notice by the City to repair;
- (3) Require installation by the City of flow restrictors or termination of water service for exterior use;
- (4) Termination of all water service to a customer.

In addition to the foregoing, during any declared State of Emergency by the State or City related to drought or potable water conditions that mandate water conservation in the City, State or Federal regulations that mandate water conservation in the City, or during local water shortages, the City Council may by Resolution adopt mandatory water usage limits and impose penalties on the customer for violations of those usage limits. The penalties shall be added to the customer's account. A violation of the usage limits shall also be deemed a violation of the Municipal Code.

Water service shall be turned off and discontinued to any premises on which water supplied by the City is being disposed or used in violation of any law of the City other than wasting or noncompliance with water efficient landscape requirements. Water service shall not be restored to any premises until the owner and the occupant thereof terminate any violation and agree not to continue to repeat such violation. Such agreement shall be guaranteed by a cash deposit in such sum as the Director of Finance shall fix, not to exceed One Hundred and no/100ths (\$100.00) Dollars.

SECTION 2. EFFECTIVE DATE.

This ordinance shall go into effect and be in full force and operation from and after thirty (30) days after its final passage and adoption.

APPROVED: April 20, 2015



Mayor



City Clerk

* * * *

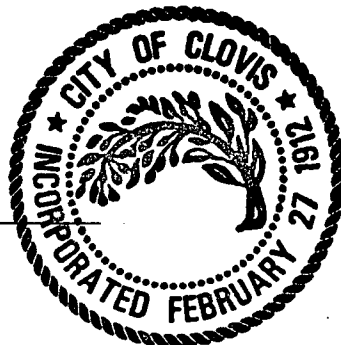
The foregoing ordinance was introduced at a regular meeting of the City Council held on April 20, 2015 and was adopted at a regular meeting of said Council held on May 4, 2015 by the following vote, to wit:

- AYES: Councilmembers Armstrong, Ashbeck, Flores, Mayor Magsig
- NOES: None
- ABSENT: Councilmember Whalen
- ABSTAIN: None

DATED May 4, 2015



City Clerk



ORDINANCE 15-28

**AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF CLOVIS
AMENDING ARTICLE 5, OF CHAPTER 6.5, OF TITLE 6 OF THE
CLOVIS MUNICIPAL CODE RELATING TO WATER EFFICIENT
LANDSCAPE REQUIREMENTS**

THE CITY COUNCIL OF THE CITY OF CLOVIS DOES ORDAIN AS FOLLOWS:

SECTION 1. FINDINGS.

In adopting this Ordinance, the City Council finds that:

1. The waters of the City are of limited supply and are subject to ever increasing demands.
2. The continuation of Clovis' economic prosperity is dependent on the availability of adequate supplies of water for future uses.
3. It is the policy of the City to promote the conservation and efficient use of water and to prevent the waste of this valuable resource.
4. Landscapes are essential to the quality of life in Clovis by providing areas for active and passive recreation and as an enhancement to the environment by cleaning air and water, preventing erosion, offering fire protection, and replacing ecosystems lost to development.
5. Landscape design, installation, maintenance and management can and should be water efficient.
6. Section 2 of Article X of the California Constitution specifies that the right to use water is limited to the amount reasonably required for the beneficial use to be served and the right does not and shall not extend to waste or unreasonable method of use.
7. The City of Clovis is required to adopt by reference or in detail the California Code of Regulations Title 23. Waters, Division 2. Department of Water Resources, Chapter 2.7. Model Water Efficient Landscape Ordinance or adopt a local ordinance as effective to meet the requirements contained in the regulations.
8. The City of Clovis has an existing Water Efficient Landscape Ordinance ("WELO" or "Ordinance") that is proposed to be amended to conform to the new State requirements, as set forth herein.
9. City staff compared the amended WELO to the provisions in the Model Ordinance and found the amended WELO be as effective based upon the following:
 - The Ordinance is applicable to the same landscapes as identified in the Model Ordinance.
 - The Ordinance requires a Maximum Applied Water Allowance water budget based on an evapotranspiration adjustment factor (ETAF) of 0.55 for new and rehabilitated residential landscapes and an ETAF of 0.45 for non-residential projects.

- The Ordinance defines the irrigation efficiency of drip irrigation as 0.81 and overhead irrigation and other technologies must meet a minimum irrigation efficiency of 0.75.
- The Ordinance precludes the use of high water use plants in street median strips.
- The Ordinance requires that areas less than 10 feet wide must be irrigated with subsurface irrigation or other means that produce no runoff or overspray.
- For multi-lot projects the Ordinance requires that soil testing should be completed using a soil sampling rate of approximately 1 in 7 lots or 15 percent.
- Prior to planting 4 yards of compost must be incorporated per 1,000 square feet of permeable area. Compacted soils must be transformed to a friable condition.
- The depth of mulch required has been increased from 2 to 3 inches.
- Graywater and storm retention components must be indicated on the landscape plan.
- Dedicated landscape meters or submeters are required for residential landscapes over 5,000 square feet and non-residential landscapes over 1,000 square feet.
- Irrigation systems are required to have pressure regulation to ensure correct and efficient operation.
- All irrigation emission devices must meet the American National Standards Institute standard, American Society of agricultural and Biological Engineers'/International Code Council's 802-2014 "Landscape Irrigation Sprinkler and Emitter Standard".
- Flow sensors that detect and report high flow conditions due to broken pipes and/or popped sprinkler heads are required for landscape areas greater than 5,000 square feet.
- Master shut-off valves that prevent water waste in case of large failures of irrigation systems due to breakage or vandalism are required on all landscapes except where sprinklers can be individually controlled.
- The irrigation auditor must be a local agency auditor or a third party auditor and must be certified by one of the U.S. EPA WaterSense labeled auditing programs.
- Landscapes that are less than 2,500 square feet and are irrigated entirely with graywater or captured rainwater are subject only to the irrigation system requirements of the prescriptive compliance option.
- Landscape areas are required to have friable soil to maximize stormwater infiltration.
- Based upon calculations the prescriptive compliance option is determined to be as effective as the traditional Model Water Efficient Landscape Ordinance approach.
- Under the Model Ordinance, the prescriptive compliance option is available to all landscapes between 500 and 2,500 square feet in size. The City's Ordinance will additionally allow use of the prescriptive option for single family residential landscapes of any size. The reason for this additional option is that there is no requirement that new single family homes have landscaping installed prior to building permit final and no permit or plan review is required to install landscaping once the valves for the irrigation system have been approved with the building final. Therefore, builders could avoid the Ordinance by not installing the landscaping prior to building permit final. By expanding the ability for all single family landscapes to utilize the prescriptive option, builders will be

encouraged to install the landscape prior to building permit final. This will increase the number of new single family landscapes that meet the goals of the Ordinance and is determined to be more effective than the Model Ordinance.

SECTION 2. AMENDMENT OF MUNICIPAL CODE.

Article 5, of Chapter 6.5, of Title 6 of the Clovis Municipal Code is hereby amended to read in its entirety as follows:

Article 5. Water Efficient Landscape Requirements

6.5.501 Applicability.

(a) The requirements herein shall apply to all of the following landscape projects:

- (1) new construction projects with an aggregated landscape area equal to or greater than 500 square feet requiring a building or landscape permit, plan check or design review;
- (2) rehabilitated landscape projects with an aggregate landscape area equal to or greater than 2,500 square feet requiring a building or landscape permit, plan check, or design review;
- (3) existing landscapes constructed prior to the effective date of this chapter are limited to Sections 6.5.512 and 6.5.513.
- (4) new and rehabilitated cemeteries are limited to Sections 6.5.503(b)(2), 6.5.506 and 6.5.507; and existing cemeteries are limited to Sections 6.5.512; and 6.5.513.

(b) Any individual single family residential lot of any size or any project with an aggregate landscape area of 2,500 square feet or less may comply with the performance requirements of this ordinance or conform to the prescriptive measures contained in Section 6.5.515.

(c) For projects using treated or untreated graywater or rainwater captured on site, any lot or parcel within the project that has less than 2,500 square feet of landscape and meets the lot or parcel’s landscape water requirement (Estimated Total Water Use) entirely with treated or untreated graywater or through stored rainwater captured on site is subject only to 6.5.515(b)(5).

(d) This ordinance does not apply to:

- (1) registered local, state or federal historic sites;
- (2) ecological restoration projects that do not require a permanent irrigation system;
- (3) mined-land reclamation projects that do not require a permanent irrigation system; or
- (4) existing plant collections, as part of botanical gardens and arboretums open to the public.

6.5.502 Definitions.

The terms used in this article have the meaning set forth below:

(a) “applied water” means the portion of water supplied by the irrigation system to the landscape.

(b) “automatic irrigation controller” means timing device used to remotely control valves that operate an irrigation system. Automatic irrigation controllers are able to self-adjust and schedule irrigation events using either evapotranspiration (weather-based) or soil moisture data.

(c) “backflow prevention device” means a safety device used to prevent pollution or contamination of the water supply due to the reverse flow of water from the irrigation system.

(d) “Certificate of Completion” means the document required under Section 6.5.04.

(e) “certified irrigation designer” means a person certified to design irrigation systems by an accredited academic institution, a professional trade organization or other program such as the US Environmental Protection Agency’s WaterSense irrigation designer certification program and the Irrigation Association’s Certified Irrigation Designer program.

(f) “certified landscape irrigation auditor” means a person certified to perform landscape irrigation audits by an accredited academic institution, a professional trade organization or other program such as the US Environmental Protection Agency’s WaterSense irrigation auditor certification program and the Irrigation Association’s Certified Landscape Irrigation Auditor program.

(g) “check valve” or “anti-drain valve” means a valve located under a sprinkler head, or other location in the irrigation system, to hold water in the system to prevent drainage from sprinkler heads when the sprinkler is off.

(h) “City” shall mean the City of Clovis Department of Planning and Development Services unless indicated otherwise.

(i) “common interest developments” means community apartment projects, condominium projects, planned developments, and stock cooperatives per Civil Code Section 1351.

(j) “compost” means the safe and stable product of controlled biologic decomposition of organic materials that is beneficial to plant growth.

(k) “conversion factor (0.62)” means the number that converts acre-inches per acre per year to gallons per square foot per year

(l) “distribution uniformity” means the measure of the uniformity of irrigation water over a defined area.

(m) “drip irrigation” means any non-spray low volume irrigation system utilizing emission devices with a flow rate measured in gallons per hour. Low volume irrigation systems are specifically designed to apply small volumes of water slowly at or near the root zone of plants.

(n) “ecological restoration project” means a project where the site is intentionally altered to establish a defined, indigenous, historic ecosystem.

(o) “effective precipitation” or “usable rainfall” (Eppt) means the portion of total precipitation which becomes available for plant growth.

(p) “emitter” means a drip irrigation emission device that delivers water slowly from the system to the soil.

(q) “established landscape” means the point at which plants in the landscape have developed significant root growth into the soil. Typically, most plants are established after one or two years of growth.

(r) “establishment period of the plants” means the first year after installing the plant in the landscape or the first two years if irrigation will be terminated after establishment. Typically, most plants are established after one or two years of growth. Native habitat mitigation areas and trees may need three to five years for establishment.

(s) "Estimated Total Water Use" (ETWU) means the total water used for the landscape as described in Section 6.5.503(b)(2)(ii)(ac).

(t) "ET adjustment factor" (ETAF) means a factor of 0.55 for residential areas and 0.45 for non-residential areas, that, when applied to reference evapotranspiration, adjusts for plant factors and irrigation efficiency, two major influences upon the amount of water that needs to be applied to the landscape. The ETAF for a new and existing (non-rehabilitated) Special Landscape Area shall not exceed 1.0. The ETAF for existing non-rehabilitated landscapes is 0.8.

(u) "evapotranspiration rate" means the quantity of water evaporated from adjacent soil and other surfaces and transpired by plants during a specified time.

(v) "flow rate" means the rate at which water flows through pipes, valves and emission devices, measured in gallons per minute, gallons per hour, or cubic feet per second.

(w) "flow sensor" means an inline device installed at the supply point of the irrigation system that produces a repeatable signal proportional to flow rate. Flow sensors must be connected to an automatic irrigation controller, or flow monitor capable of receiving flow signals and operating master valves. This combination flow sensor/controller may also function as a landscape water meter or submeter.

(x) "friable" means a soil condition that is easily crumbled or loosely compacted down to a minimum depth per planting material requirements, whereby the root structure of newly planted material will be allowed to spread unimpeded.

(y) "Fuel Modification Plan Guideline" means guidelines from a local fire authority to assist residents and businesses that are developing land or building structures in a fire hazard severity zone.

(z) "graywater" means untreated wastewater that has not been contaminated by any toilet discharge, has not been affected by infectious, contaminated, or unhealthy bodily wastes, and does not present a threat from contamination by unhealthful processing, manufacturing, or operating wastes. "Graywater" includes, but is not limited to, wastewater from bathtubs, showers, bathroom washbasins, clothes washing machines, and laundry tubs, but does not include wastewater from kitchen sinks or dishwashers. Health and Safety Code Section 17922.12.

(aa) "hardscapes" means any durable material (pervious and non-pervious).

(bb) "hydrozone" means a portion of the landscaped area having plants with similar water needs and rooting depth. A hydrozone may be irrigated or non-irrigated.

(cc) "infiltration rate" means the rate of water entry into the soil expressed as a depth of water per unit of time (e.g., inches per hour).

(dd) "invasive plant species" means species of plants not historically found in California that spread outside cultivated areas and can damage environmental or economic resources. Invasive species may be regulated by county agricultural agencies as noxious species. Lists of invasive plants are maintained at the California Invasive Plant Inventory and USDA invasive and noxious weeds database.

(ee) "irrigation audit" means an in-depth evaluation of the performance of an irrigation system conducted by a Certified Landscape Irrigation Auditor. An irrigation audit includes, but is not limited to: inspection, system tune-up, system test with distribution uniformity or emission uniformity, reporting overspray or runoff that causes overland flow, and preparation of an irrigation schedule. The audit must be conducted in a manner consistent with the Irrigation Association's Landscape Irrigation Auditor Certification program or other U.S. Environmental Protection Agency "Watersense" labeled auditing program.

(ff) "irrigation efficiency" (IE) means the measurement of the amount of water beneficially used divided by the amount of water applied. Irrigation efficiency is derived from measurements and estimates of irrigation system characteristics and management practices. The irrigation efficiency for purposes of this ordinance are 0.75 for overhead spray devices and 0.81 for drip systems.

(gg) "irrigation survey" means an evaluation of an irrigation system that is less detailed than an irrigation audit. An irrigation survey includes, but is not limited to: inspection, system test, and written recommendations to improve performance of the irrigation system.

(hh) "irrigation water use analysis" means an analysis of water use data based on meter readings and billing data.

(ii) "landscape architect" means a person who holds a license to practice landscape architecture in the state of California Business and Professions Code, Section 5615.

(jj) "landscape area" means all the planting areas, turf areas, and water features in a landscape design plan subject to the Maximum Applied Water Allowance calculation. The landscape area does not include footprints of buildings or structures, sidewalks, driveways, parking lots, decks, patios, gravel or stone walks, other pervious or non-pervious hardscapes, and other non-irrigated areas designated for non-development (e.g., open spaces and existing native vegetation).

(kk) "landscape contractor" means a person licensed by the state of California to construct, maintain, repair, install, or subcontract the development of landscape systems.

(ll) "Landscape Documentation Package" means the documents required under Section 6.5.503.

(mm) "landscape project" means total area of landscape in a project as defined in "landscape area" for the purposes of this ordinance, meeting requirements under Section 6.5.501.

(nn) "landscape water meter" means an inline device installed at the irrigation supply point that measures the flow of water into the irrigation system and is connected to a totalizer to record water use.

(oo) "lateral line" means the water delivery pipeline that supplies water to the emitters or sprinklers from the valve.

(pp) "low volume irrigation" means the application of irrigation water at low pressure through a system of tubing or lateral lines and low-volume emitters such as drip, drip lines, and bubblers. Low volume irrigation systems are specifically designed to apply small volumes of water slowly at or near the root zone of plants.

(qq) "main line" means the pressurized pipeline that delivers water from the water source to the valve or outlet.

(rr) "master shut-off valve" is an automatic valve installed at the irrigation supply point which controls water flow into the irrigation system. When this valve is closed water will not be supplied to the irrigation system. A master valve will greatly reduce any water loss due to a leaky station valve.

(ss) "Maximum Applied Water Allowance" (MAWA) means the upper limit of annual applied water for the established landscaped area as specified in Section 6.5.503(b)(2)(ii)(ab). It is based upon the area's reference evapotranspiration, the ET Adjustment Factor, and the size of the landscape area. The Estimated Total Water Use shall not exceed the Maximum Applied Water Allowance. Special Landscape Areas, including recreation areas, areas permanently and solely dedicated to edible plants such as orchards and vegetable gardens, and areas irrigated with recycled water are

subject to the MAWA with an ETAF not to exceed 1.0. $MAWA = (ET_o)(0.62)[(ETAF \times LA) + ((1-ETAF) \times SLA)]$

(tt) "median" is an area between opposing lanes of traffic that may be unplanted or planted with trees, shrubs, perennials, and ornamental grasses.

(uu) "microclimate" means the climate of a small, specific area that may contrast with the climate of the overall landscape area due to factors such as wind, sun exposure, plant density, or proximity to reflective surfaces.

(vv) "mined-land reclamation projects" means any surface mining operation with a reclamation plan approved in accordance with the Surface Mining and Reclamation Act of 1975.

(ww) "mulch" means any organic material such as leaves, bark, straw, compost, or inorganic mineral materials such as rocks, gravel, or decomposed granite left loose and applied to the soil surface for the beneficial purposes of reducing evaporation, suppressing weeds, moderating soil temperature, and preventing soil erosion.

(xx) "new construction" means a new building with a landscape or other new landscape, such as a park, playground, or greenbelt without an associated building.

(yy) "non-residential landscape" means landscapes in commercial, institutional, industrial and public settings that may have areas designated for recreation or public assembly. It also includes portions of common areas of common interest developments with designated recreational areas.

(zz) "operating pressure" means the pressure at which the parts of an irrigation system are designed by the manufacturer to operate.

(aaa) "overhead sprinkler irrigation systems" or "overhead spray irrigation systems" means systems that deliver water through the air (e.g., spray heads and rotors).

(bbb) "overspray" means the irrigation water which is delivered beyond the target area.

(ccc) "parkway" means the area between a sidewalk and the curb or traffic lane. It may be planted or unplanted, and with or without pedestrian egress.

(ddd) "permit" means an authorizing document issued by the City for new construction or rehabilitated landscapes.

(eee) "pervious" means any surface or material that allows the passage of water through the material and into the underlying soil.

(fff) "plant factor" or "plant water use factor" is a factor, when multiplied by the reference evapotranspiration (ET_o), estimates the amount of water needed by plants. For purposes of this chapter, the plant factor range for very low water use plants is 0 to 0.1, the plant factor range for low water use plants is 0.1 to 0.3, the plant factor range for moderate water use plants is 0.4 to 0.6, and the plant factor range for high water use plants is 0.7 to 1.0. Plant factors cited in this chapter are derived from the publication "Water Use Classification of Landscape Species". Plant factors may also be obtained from horticultural researchers from academic institutions or professional associations as approved by the California Department of Water Resources (DWR).

(ggg) "project applicant" means the individual or entity submitting a Landscape Documentation Package required under Section 6.5.503, to request a permit, plan check, or design review from the City. A project applicant may be the property owner or his or her designee.

(hhh) "rain sensor" or "rain sensing shutoff device" means a component which automatically suspends an irrigation event when it rains.

(iii) "record drawing" or "as-builts" means a set of reproducible drawings which show significant changes in the work made during construction and which are usually based on drawings marked up in the field and other data furnished by the contractor.

(kkk) "recreational area" means areas, excluding private single family residential areas, designated for active play, recreation or public assembly in parks, sports fields, picnic grounds, amphitheatres or golf tees, fairways, roughs, surrounds and greens.

(lll) "recycled water", "reclaimed water", or "treated sewage effluent water" means treated or recycled waste water of a quality suitable for non-potable uses such as landscape irrigation and water features. This water is not intended for human consumption.

(mmm) "reference evapotranspiration" or "ETo" means a standard measurement of environmental parameters which affect the water use of plants. ETo is expressed in inches per day, month, or year as represented in Section 6.5.503(b)(2)(ii)(aa), and is an estimate of the evapotranspiration of a large field of four- to seven-inch tall, cool-season grass that is well watered. Reference evapotranspiration is used as the basis of determining the Maximum Applied Water Allowance so that regional differences in climate can be accommodated.

(nnn) "rehabilitated landscape" means any re-landscaping project that requires a permit, plan check, or design review, meets the requirements of Section 6.5.501, and the modified landscape area is equal to or greater than 2,500 square feet.

(ooo) "residential landscape" means landscapes surrounding single or multi-family homes.

(ppp) "run off" means water which is not absorbed by the soil or landscape to which it is applied and flows from the landscape area. For example, runoff may result from water that is applied at too great a rate (application rate exceeds infiltration rate) or when there is a slope.

(qqq) "soil moisture sensing device" or "soil moisture sensor" means a device that measures the amount of water in the soil. The device may also suspend or initiate an irrigation event.

(rrr) "soil texture" means the classification of soil based on its percentage of sand, silt, and clay.

(sss) "Special Landscape Area" (SLA) means an area of the landscape dedicated solely to edible plants, recreational areas, areas irrigated with recycled water, or water features using recycled water.

(ttt) "sprinkler head" or "spray head" means a device which delivers water through a nozzle.

(uuu) "static water pressure" means the pipeline or municipal water supply pressure when water is not flowing.

(vvv) "station" means an area served by one valve or by a set of valves that operate simultaneously.

(www) "swing joint" means an irrigation component that provides a flexible, leak-free connection between the emission device and lateral pipeline to allow movement in any direction and to prevent equipment damage.

(xxx) "submeter" means a metering device to measure water applied to the landscape that is installed after the primary utility water meter.

(yyy) "turf" means a ground cover surface of mowed grass. Annual bluegrass, Kentucky bluegrass, Perennial ryegrass, Red fescue, and Tall fescue are cool-season grasses. Bermudagrass, Kikuyugrass, Seashore Paspalum, St. Augustinegrass, Zoysiagrass, and Buffalo grass are warm-season grasses.

(zzz) “valve” means a device used to control the flow of water in the irrigation system.

(aaaa) “water conserving plant species” means a plant species identified as having a very low or low plant factor.

(bbbb) “water feature” means a design element where open water performs an aesthetic or recreational function. Water features include ponds, lakes, waterfalls, fountains, artificial streams, spas, and swimming pools (where water is artificially supplied). The surface area of water features is included in the high water use hydrozone of the landscape area. Constructed wetlands used for on-site wastewater treatment or stormwater best management practices that are not irrigated and used solely for water treatment or stormwater retention are not water features and, therefore, are not subject to the water budget calculation. Groundwater recharge ponds which utilize untreated surface water or recycled water are not water features and, therefore, are not subject to the water budget calculation.

(cccc) “watering window” means the time of day irrigation is allowed.

(dddd) “WUCOLS” means the Water Use Classification of Landscape Species published by the University of California Cooperative Extension and the Department of Water Resources 2014.

6.5.503 Landscape Documentation Package Submittal Requirements

(a) Prior to issuance of a building permit, encroachment permit, or beginning of construction, the project applicant shall submit a Landscape Documentation Package to the City for review and approval. The Landscape Documentation Package shall contain the information required by (b) and shall be incorporated into the improvement plan and/or landscape plan set required for permit approvals.

(b) Elements of the Landscape Package. The Landscape Package shall include the following six (6) elements:

(1) project information, which shall include the following;

- (i) date;
- (ii) project applicant;
- (iii) project address;
- (iv) total landscape area (square feet), including a breakdown of turf and plant material;
- (v) project type (e.g. new, rehabilitated, public, private, cemetery, homeowner installed);
- (vi) water supply type (e.g. potable, recycled, private well, untreated surface water);
- (vii) checklist of all documents in Landscape Package;
- (viii) project contacts to include contact information for the project applicant and property owner; and
- (ix) applicant signature and date with statement, “I agree to comply with the requirements of the water efficient landscape ordinance and submit a complete Landscape Documentation Package.”

(2) Water Efficient Landscape Worksheet;

- (i) hydrozone information table for the landscape project, and
- (ii) water budget calculations

(aa) For the calculation of the Maximum Applied Water Allowance and Estimated Total Water Use, a project applicant shall use the following ETo values:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual ETo
1.0	1.5	3.2	4.8	6.4	7.7	8.5	7.3	5.3	3.4	1.4	0.7	51.4

Water budget calculations shall adhere to the following requirements:

1. The plant factor used shall be from WUCOLS (Water Use Classification Of Landscape Species) or from horticultural researchers with academic institutions or professional associations as approved by the California Department of Water Resources (DWR). The plant factor ranges from 0 to 0.1 for very low water using plants, 0.1 to 0.3 for low water use plants, from 0.4 to 0.6 for moderate water use plants, and from 0.7 to 1.0 for high water use plants.
2. All water features shall be included in the high water use hydrozone and temporarily irrigated areas shall be included in the low water use hydrozone.
3. All Special Landscape Areas shall be identified and their water use calculated as described below.
4. ETAF for new and existing (non-rehabilitated) Special Landscape Areas shall not exceed 1.0.

(ab) The Maximum Applied Water Allowance (MAWA) shall be calculated using the equation:

MAWA = (ETo) (0.62) [(ETAF x LA) + ((1-ETAF) x SLA)] where:
 MAWA = Maximum Applied Water Allowance (gallons per year)
 ETo = Reference Evapotranspiration (inches per year)
 0.62 = Conversion Factor (to gallons)
 ETAF = ET Adjustment Factor (0.55 for residential areas and 0.45 for non-residential areas)
 LA = Landscape Area including SLA (square feet)
 SLA = Special Landscape Area (square feet)

(ac) The Estimated Total Water Use shall be calculated using the equation below. The sum of the Estimated Total Water Use calculated for all hydrozones shall not exceed MAWA.

$$ETWU = (ETo)(0.62) \left(\frac{PF \times HA}{IE} + SLA \right)$$

Where:

ETWU = Estimated Total Water Use per year (gallons)
 ETo = Reference Evapotranspiration (inches)
 PF = Plant Factor from WUCOLS (see Section 6.5.502)
 HA = Hydrozone Area [high, moderate, low, and very low water use areas] (square feet)

SLA = Special Landscape Area (square feet)

0.62 = Conversion Factor

IE = Irrigation Efficiency (0.75 for spray head and 0.81 for drip)

(3) Soil Management Report. In order to reduce runoff and encourage healthy plant growth, a soil management report shall be completed by the project applicant or designee, as follows:

(i) Submit soil samples to a laboratory for analysis and recommendations.

(aa) Soil sampling shall be conducted in accordance with laboratory protocol, including protocols regarding adequate sampling depth for the intended plants.

(ab) The soil analysis shall include:

1. soil texture;
2. infiltration rate determined by laboratory test or soil texture infiltration rate table;
3. pH;
4. total soluble salts;
5. sodium;
6. percent organic matter; and
7. recommendations.

(ac) In projects with multiple landscape installations (i.e. production home developments) a soil sampling rate of 1 in 7 lots or approximately 15% will satisfy this requirement. Large landscape projects shall sample at a rate equivalent to 1 in 7 lots.

(ii) The project applicant or designee shall comply with one of the following:

(aa) If significant mass grading is not planned, the soil analysis report shall be submitted as part of the Landscape Documentation Package; or

(ab) If significant mass grading is planned, the soil analysis report shall be submitted as part of the Certificate of Completion.

(iii) The soil analysis shall be made available, in a timely manner, to the professionals preparing the landscape design plans and irrigation design plans to make any necessary adjustments.

(iv) Upon completion of construction and prior to issuance of an occupancy permit or project acceptance, the project applicant or designee shall submit documentation verifying implementation of soil analysis report recommendations within the landscaped area to the City with the Certificate of Completion.

(4) Landscape Design Plan. Landscape plans, including plant selection shall be designed consistent with City Landscape Design Standards and guidelines. A landscape design plan meeting the following design criteria shall be submitted as part of the Landscape Documentation Package.

(i) Plant material. The Estimated Total Water Use for plants selected for the landscape area shall not exceed the Maximum Applied Water Allowance. The landscape plan shall identify landscape materials, trees, shrubs, groundcover, and turf. Plant symbols shall be clearly drawn and plants shall be labeled by botanical name, common name, container size, spacing and quantities for each group of plants specified. Planting areas dedicated permanently and solely to edible plants should be clearly delineated.

(ii) Plant selection. Plants shall be selected and planted appropriately based upon their adaptability to the climatic, geologic, and topographical conditions of the project site and consideration of the following factors: protection and preservation of native species and natural vegetation; selection of water conserving plant, tree and turf species, especially local native plants; selection of plants based on local climate

suitability, disease and pest resistance; selection based on climate zone tolerance, selection based on the horticultural attributes of plants such as mature plant size and invasive roots to minimize damage to property or infrastructure; allow for adequate soil volume for healthy root growth; selection of trees based on tree shading requirements; the solar orientation for plant placement to maximize summer shade and winter solar gain; selection of plants from local Fuel Modification Plan Guidelines; and selection from City recommended plant lists.

(iii) Hydrozone information. Delineate and label each hydrozone by number, letter, or other method; identify each hydrozone as low, moderate, high water, or mixed water use; identify recreational areas; identify areas permanently and solely dedicated to edible plants; identify areas irrigated with recycled water; identify type and surface area of water features; Surface area of a water feature shall be included in the high water use hydrozone area of the water budget calculation. Temporarily irrigated areas of the landscape shall be included in the low water use hydrozone for the water budget calculation. Each hydrozone shall have plant materials with similar water use, with the exception of hydrozones with plants of mixed water use, as specified in Section 6.5.503(b)(5)(ii)(ad).

(iv) Turf is not allowed on slopes greater than 25% where the toe of the slope is adjacent to an impermeable hardscape and where 25% means 1 foot of vertical elevation change for every 4 feet of horizontal length.

(v) High water use plants, characterized by a plant factor of 0.7 to 1.0 are prohibited in street medians.

(vi) The architectural guidelines of a common interest development, which include community apartment projects, condominiums, planned developments, and stock cooperatives, shall not prohibit or include conditions that have the effect of prohibiting the use of low-water use plants as a group.

(vii) Water features may be permitted, subject to design review, and the provisions of Section 6.5.514.

(viii) Soil Preparation, Mulch and Amendments. Prior to the planting of any materials, compacted soils shall be transformed to a friable condition. On engineered slopes, only amended planting holes need meet this requirement. Soil amendments shall be incorporated according to recommendations of the soil report and what is appropriate for the plants selected. For landscape installations, compost at a rate of a minimum of four cubic yards per 1,000 square feet of permeable area shall be incorporated to a depth of six inches into the soil. Soils with greater than 6% organic matter in the top 6 inches of soil are exempt from adding compost and tilling. A minimum three inch (3") layer of mulch shall be applied on all exposed soil surfaces of planting areas except in turf areas, creeping or rooting groundcovers, or direct seeding applications where mulch is contraindicated. To provide habitat for beneficial insects and other wildlife, up to 5% of the landscape area may be left without mulch. Designated insect habitat must be included in the landscape design plan as such. Stabilizing mulching products shall be used on slopes that meet current engineering standards. The mulching portion of the seed/mulch slurry in hydro-seeded applications shall meet the mulching requirement.

(ix) Other design considerations. The landscape design plan shall also identify; hardscapes (pervious and non-pervious); property lines; utilities and utility easements; streets; buildings and structures; natural features to remain; location, installation details, and 24-hour retention or infiltration capacity of any applicable stormwater best management practices that encourage on-site retention and infiltration of stormwater;

any applicable rain harvesting or catchment technologies (e.g., rain gardens, cisterns, etc.); and any applicable graywater discharge piping, system components and area(s) of distribution.

(x) Verification. The landscape plan shall contain the following statement: "I have complied with the criteria of the Water Efficient Landscape Requirements Ordinance and applied them for the efficient use of water in the landscape design plan"; and shall bear the signature of a licensed landscape architect, licensed landscape contractor, or any other person authorized to design a landscape. (See Sections 5500.1, 5615, 5641, 5641.1, 5641.2, 5641.3, 5641.4, 5641.5, 5641.6, 6701, 7027.5 of the Business and Professions Code, Section 832.27 of Title 16 of the California Code of Regulations, and Section 6721 of the Food and Agriculture Code.)

(5) Irrigation Design Plan. This section applies to landscaped areas requiring permanent irrigation, not areas require temporary irrigation for the plant establishment period. For the efficient use of water, an irrigation system shall meet all the requirements listed in this section and the manufacturers' recommendations. The irrigation system and its related components shall be planned and designed to allow for proper installation, management, and maintenance.

(i) System requirements.

(aa) Landscape water meters shall be installed for all non-residential irrigated landscapes of 1,000 square feet or more and residential irrigated landscapes of 5,000 square feet or greater.

(ab) Automatic irrigation controllers utilizing either evapotranspiration or soil moisture sensor data utilizing non-volatile memory shall be required for irrigation scheduling in all irrigation systems.

(ac) If the water pressure is below or exceeds the recommended pressure of the specified irrigation devices, the installation of a pressure regulating device is required to ensure that the dynamic pressure at each emission device is within the manufacturer's recommended pressure range for optimal performance.

1. If the static pressure is above or below the required dynamic pressure of the irrigation system, pressure-regulating devices such as inline pressure regulators, booster pumps, or other devices shall be installed to meet the required dynamic pressure of the irrigation system.

2. Static water pressure, dynamic or operating pressure and flow reading of the water supply shall be measured at the point of connection. These pressure and flow measurements shall be conducted at the design stage. If the measurements are not available at the design stage, the measurements shall be conducted at installation.

(ad) Sensors (rain, freeze, wind, etc.), either integral or auxiliary, that suspend or alter irrigation operation during unfavorable weather conditions shall be required on all irrigation systems, as appropriate for local climatic conditions. Irrigation should be avoided during windy or freezing weather or during rain.

(ae) Manual shut-off valves (such as a gate valve, ball valve, or butterfly valve) shall be required, as close as possible to the point of connection of the water supply, to minimize water loss in case of an emergency (such as a main line break) or routine repair.

(af) Backflow prevention devices shall be provided as required by the City Water Division to protect the water supply from contamination by the irrigation system.

(ag) Flow sensors that detect high flow conditions created by system damage or malfunction are required for all non-residential landscapes and residential landscapes of 5,000 square feet or larger.

(ah) Master shut-off valves are required on all projects except landscapes that make use of technologies that allow for the individual control of sprinklers that are individually pressurized in a system equipped with low pressure shut down features.

(ai) The irrigation system shall be designed to prevent runoff, low head drainage, overspray, or other similar conditions where irrigation water flows onto non-targeted areas, such as adjacent property, non-irrigated areas, hardscapes, roadways, or structures.

(aj) Relevant information from the soil management plan, such as soil type and infiltration rate, shall be utilized when designing irrigation systems.

(ak) The design of the irrigation system shall conform to the hydrozones of the landscape design plan.

(al) The irrigation system must be designed and installed to meet the irrigation efficiency criteria as described in Section 6.5.503(b)(2) regarding the Maximum Applied Water Allowance.

(am) All irrigation emission devices must meet the requirements set in the American National Standards Institute (ANSI) standard, American Society of Agricultural and Biological Engineers'/International Code Council's (ASABE/ICC) 802-2014 "Landscape Irrigation Sprinkler and Emitter Standard. All sprinkler heads installed in the landscape must document a distribution uniformity low quarter of 0.65 or higher using the protocol defined in ASABE/ICC 802-2014.

(an) The project applicant shall consult with the City Water Division about peak water operating demands (on the water supply system) or water restrictions that may impact the effectiveness of the irrigation system.

(ao) Low volume irrigation shall be used in mulched planting areas to maximize water infiltration into the root zone.

(ap) Sprinkler heads and other emission devices shall have matched precipitation rates, unless otherwise directed by the manufacturer's recommendations.

(aq) Sprinkler spacing shall be designed to achieve the highest possible distribution uniformity using the manufacturer's recommendations.

(ar) Swing joints or other riser-protection components shall be provided on all risers subject to damage that are adjacent to hardscapes or in high traffic areas of turfgrass.

(as) Check valves or anti-drain valves are required on all sprinkler heads where low point drainage could occur.

(at) Areas less than ten (10) feet in width in any direction, shall be irrigated with subsurface irrigation or other means that produces no runoff or overspray.

(au) Overhead irrigation shall not be permitted within 24 inches of any non-permeable surface. Allowable irrigation within the setback from non-permeable surfaces may include drip, drip line, or other low volume non-spray technology. The setback area may be planted or unplanted. The surfacing of the setback may be mulch, gravel, or other porous material. These restrictions may be modified if:

1. the landscape area is adjacent to permeable surfacing and no runoff occurs; or

2. the adjacent non-permeable surfaces are designed and constructed to drain entirely to landscaping; or

3. the irrigation designer specifies an alternative design or technology, as part of the Landscape Documentation Package and clearly demonstrates strict adherence to irrigation system design criteria in Section 6.5.503(b)(5)(i)(ai). Prevention of overspray and runoff must be confirmed during the irrigation audit.

(av) Slopes greater than 25% shall not be irrigated with an irrigation system with a application rate exceeding 0.75 inches per hour. This restriction may be modified if the

landscape designer specifies an alternative design or technology, as part of the Landscape Documentation Package, and clearly demonstrates no runoff or erosion will occur. Prevention of runoff and erosion must be confirmed during the irrigation audit.

(ii) Hydrozone irrigation design parameters.

(aa) Each valve shall irrigate a hydrozone with similar site, slope, sun exposure, soil conditions, and plant materials with similar water use.

(ab) Sprinkler heads and other emission devices shall be selected based on what is appropriate for the plant type within that hydrozone.

(ac) Where feasible, trees shall be placed on separate valves from shrubs, groundcovers, and turf to facilitate the appropriate irrigation of trees. The mature size and extent of the root zone shall be considered when designing irrigation for the tree.

(ad) Individual hydrozones that mix plants of moderate and low water use, or moderate and high water use, may be allowed if:

1. plant factor calculation is based on the proportions of the respective plant water uses and their plant factor; or

2. plant factor of the higher water using plant is used for calculations.

(ae) Individual hydrozones that mix high and low water use plants shall not be permitted.

(af) The areas irrigated by each valve shall be designated, and each valve shall be assigned a number corresponding to the hydrozones identified on the landscape plan. The valve numbers shall be listed in the Hydrozone Information Table on the plans.

(iii) The irrigation design plan, at a minimum, shall identify:

(aa) location and size of separate water meters for landscape;

(ab) location, type and size of all components of the irrigation system, including controllers, main and lateral lines, valves, sprinkler heads, moisture sensing devices, rain switches, quick couplers, pressure regulators, and backflow prevention devices;

(ac) static water pressure at the point of connection to the public water supply;

(ad) flow rate (gallons per minute), application rate (inches per hour), and design operating pressure (pressure per square inch) for each station;

(ae) recycled water irrigation systems as specified in Section 6.5.509;

(iv) Verification. The irrigation plan shall contain the following statement: "I have complied with the criteria of the Water Efficient Landscape Requirements Ordinance and applied them accordingly for the efficient use of water in the irrigation design plan"; and shall bear the signature of a licensed landscape architect, certified irrigation designer, licensed landscape contractor, or any other person authorized to design an irrigation system. (See Sections 5500.1, 5615, 5641, 5641.1, 5641.2, 5641.3, 5641.4, 5641.5, 5641.6, 6701, 7027.5 of the Business and Professions Code, Section 832.27 of Title 16 of the California Code of Regulations, and Section 6721 of the Food and Agricultural Code.)

(6) Grading Design Plan. For the efficient use of water, grading of a project site shall be designed to minimize soil erosion, runoff, and water waste. A grading plan shall be submitted as part of the Landscape Documentation Package. A comprehensive grading plan prepared by a civil engineer for other permits satisfies this requirement.

(i) The project applicant shall submit a landscape grading plan that indicates finished configurations and elevations of the landscape area including: height of graded slopes; drainage patterns; pad elevations; finish grade; proposed underground and in-ground drainage improvements; and stormwater retention improvements, if applicable.

(ii) The grading design plan shall contain the following statement: "I have complied with the criteria of the Water Efficient Landscape Requirements Ordinance and applied them accordingly for the efficient use of water in the grading design plan" and shall bear the signature of a licensed professional as authorized by law.

(c) Approval required. Upon approval of the Landscape Documentation Package by the City, the project applicant shall:

(1) receive a permit or approval of the plan check or design review and record the date of the permit in the Certificate of Completion;

(2) submit a copy of the approved Landscape Documentation Package along with the record drawings, and any other information to the property owner or his/her designee; and

(3) submit a copy of the Water Efficient Landscape Worksheet to the City Water Division.

6.5.504 Landscape certificate of completion.

(a) Prior to issuance of a certificate of occupancy or final project acceptance, project applicant shall submit a signed Certificate of Completion to the City for review. The Certificate of Completion shall include the following elements:

(1) project information sheet that contains: date; project name; project applicant name, telephone, and mailing address; project address and location; and property owner name, telephone, and mailing address;

(2) certification by either the signer of the landscape design plan, the signer of the irrigation design plan, or the licensed landscape contractor that the landscape project has been installed per the approved Landscape Documentation Package. Where there have been significant changes made in the field during construction, "as-built" or record drawings shall be included with the certification; A diagram of the irrigation plan showing hydrozones shall be kept with the irrigation controller for subsequent management purposes.

(3) irrigation scheduling parameters used to set the controller (see Section 6.5.505);

(4) landscape and irrigation maintenance schedule (see Section 6.5.506);

(5) irrigation audit report (see Section 6.5.507); and

(6) soil analysis report, if not initially submitted with the Landscape Documentation Package, and documentation verifying implementation of soil report recommendations.

(b) The project applicant shall: ensure that copies of the approved Certificate of Completion are submitted to the City Water Division and property owner or his or her designee.

(c) The City shall receive and either approve or deny the Certificate of Completion. If the Certificate of Completion is denied, the City shall provide information to the project applicant regarding reapplication, appeal, or other assistance.

6.5.505 Irrigation scheduling.

(a) For the efficient use of water, all irrigation schedules shall be developed, managed, and evaluated to utilize the minimum amount of water required to maintain plant health. Irrigation schedules shall meet the following criteria:

(1) Irrigation scheduling shall be regulated by automatic irrigation controllers.

(2) Overhead irrigation shall be scheduled between 8:00 p.m. and 10:00 a.m. unless weather conditions prevent it. Operation of the irrigation system outside the normal watering window is allowed for auditing, system maintenance and during plant establishment period.

(3) The irrigation schedule shall factor in irrigation run times, emission device, flow rate, and current reference evapotranspiration, so that applied water meets the Estimated Total Water Use. Total annual applied water shall be less than or equal to Maximum Applied Water Allowance (MAWA). Actual irrigation schedules shall be regulated by automatic irrigation controllers using current reference evapotranspiration data (e.g., CIMIS) or soil moisture sensor data.

(4) Parameters used to set the automatic controller shall be developed and submitted for each of the following:

- (i) the plant establishment period;
- (ii) the established landscape; and
- (iii) temporarily irrigated areas.

(5) Each irrigation schedule shall consider for each station all of the following that apply:

- (i) irrigation interval (days between irrigation);
- (ii) irrigation run times (hours or minutes per irrigation event to avoid runoff);
- (iii) number of cycle starts required for each irrigation event to avoid runoff;
- (iv) amount of applied water scheduled to be applied on a monthly basis;
- (v) application rate setting;
- (vi) root depth setting;
- (vii) plant type setting;
- (viii) soil type;
- (ix) slope factor setting;
- (x) shade factor setting; and
- (xi) irrigation uniformity or efficiency setting.

6.5.506 Landscape and irrigation maintenance.

(a) Landscapes shall be maintained to ensure water use efficiency. A regular maintenance schedule shall be submitted with the Certificate of Completion.

(b) A regular maintenance schedule shall include, but not be limited to, routine inspection; auditing, adjustment and repair of the irrigation system and its components; aerating and dethatching turf areas; topdressing with compost, replenishing mulch; fertilizing; pruning; weeding in all landscape areas, and removing obstructions to emission devices.

(c) Repair of all irrigation equipment shall be done with the originally installed components or their equivalents or with components with greater efficiency.

6.5.507 Irrigation Audit, Irrigation Survey, and Irrigation Water Use Analysis.

(a) All landscape irrigation audits shall be conducted by a City landscape irrigation auditor or a third party certified landscape irrigation auditor. Landscape audits shall not be conducted by the person who designed the landscape or installed the landscape.

(b) In large projects or projects with multiple landscape installations (i.e. production home developments) an auditing rate of 1 in 7 lots or approximately 15% will satisfy this requirement.

(c) For new construction and rehabilitated landscape projects installed after December 1, 2015, as described in Section 6.5.501:

(1) the project applicant shall submit an irrigation audit report with the Certificate of Completion to the City that shall include, but is not limited to: inspection, system tune-up, system test with distribution uniformity, reporting overspray or run off that causes overland flow, and preparation of an irrigation schedule, including configuring irrigation

controllers with application rate, soil types, plant factors, slope, exposure and any other factors necessary for accurate programming;

(2) The City Public Utilities Department shall administer programs that may include, but not be limited to, irrigation water use analysis, irrigation audits, and irrigation surveys for compliance with the Maximum Applied Water Allowance.

6.5.508 Irrigation Efficiency.

For the purpose of determining Estimated Total Water Use, average irrigation efficiency is assumed to be 0.75 for overhead spray devices and 0.81 for drip system devices.

6.5.509 Recycled Water.

(a) The installation of recycled water irrigation systems shall allow for the current and future use of recycled water.

(b) All recycled water irrigation systems shall be designed and operated in accordance with all applicable City and State laws.

(d) Landscapes using recycled water are considered Special Landscape Areas. The ET Adjustment Factor for new and existing (non-rehabilitated) Special Landscape Areas shall not exceed 1.0.

6.5.510 Stormwater Management.

Project applicants shall implement stormwater best management practices as required in chapter 6.7, Urban Storm Water Quality Management and Discharge Control.

6.5.511 Public Education.

(a) The City shall make available information to owners of permitted renovations and new single-family residential homes regarding the design, installation, management, and maintenance of water efficient landscapes based on a water budget.

(b) Model homes. All model homes that are landscaped shall use signs and written information to demonstrate the principles of water efficient landscapes described in this chapter.

(1) Signs shall be used to identify the model as an example of a water efficient landscape featuring elements such as hydrozones, irrigation equipment, and others that contribute to the overall water efficient theme. Signage shall include information about the site water use as designed; specify who designed and installed the water efficient landscape; and demonstrate low water use approaches to landscaping such as using native plants, graywater systems, and rainwater catchment systems.

(2) Information shall be provided about designing, installing, managing, and maintaining water efficient landscapes.

6.5.512 Provisions for Existing Landscapes

a) This section, shall apply to all existing landscapes that were installed before December 1, 2015 and are over one acre in size.

(1) For all landscapes in 6.5.512(a) that have a water meter, the City Public Utilities Department shall administer programs that may include, but not be limited to, irrigation water use analyses, irrigation surveys, and irrigation audits to evaluate water use and provide recommendations as necessary to reduce landscape water use to a level that does not exceed the Maximum Applied Water Allowance for existing landscapes. The

Maximum Applied Water Allowance for existing landscapes shall be calculated as:
 $MAWA = (0.8) (ET_o)(LA)(0.62)$.

(2) For all landscapes in 6.5.512 (a), that do not have a meter, the City Public Utilities Department shall administer programs that may include, but not be limited to, irrigation surveys and irrigation audits to evaluate water use and provide recommendations as necessary in order to prevent water waste.

(b) All required landscape irrigation audits shall be conducted by a certified landscape irrigation auditor.

6.5.513 Water Waste Prevention.

Water wasting is prohibited and for purposes of this chapter shall be defined as runoff leaving a landscape due to low head drainage, overspray, or other similar conditions where water flows onto adjacent property, non-irrigated areas, walks, roadways, parking lots, or structures. Runoff and overspray is not considered water waste if the landscape area is adjacent to permeable surfacing and no runoff occurs from the property, or the adjacent non-permeable surfaces are designed and constructed to drain entirely to landscaping. Penalties for water wasting shall be per Section 6.5.110.

6.5.514 Water features.

(a) Regulated water features for purposes of this section contain 500 gallons of water or more and in the case of swimming pools are more than eighteen inches (18") in depth.

(b) Recirculating water. All water features shall use recirculating water or the water shall be reused for landscape irrigation. If untreated surface water or recycled water is used and is used for artificial recharge of the groundwater aquifer, recirculating water is not required.

(c) Permits required. No water feature shall be constructed or installed within the City by any person without first securing a permit therefore from the Building Division of the Planning and Development Services Department in accordance with Title 8, Building Regulations.

(d) Management Plan. All persons applying for a permit to construct or install a water feature shall prior to permit issuance provide a management plan prepared by a registered engineer or other professional determined to be competent by the City for the water feature. The management plan shall indicate how the water feature will be maintained and shall be reviewed and approved by the City Water Division prior to permit issuance.

(e) Seepage. All water features, unless filled with reclaimed or untreated surface water, shall not lose more than one inch (1") per year in water depth due to seepage. The applicant shall by calculations based on the type of material used for the water feature lining, determine the expected water loss due to seepage prior to permit approval.

6.5.515 Prescriptive Compliance Option

(a) This section contains prescriptive requirements which may be used as a compliance option per Section 6.5.01(b) and Section 6.5.01(c).

(b) Compliance with the following items is required and shall be documented on a landscape plan to utilize the prescriptive compliance option.

(1) Project applicant or designee shall submit a Landscape Documentation Package which includes the following elements:

- (i) date.
- (ii) project applicant.
- (iii) project address (if available, parcel and/or lot number(s)).
- (iv) total landscape area (square feet), including a breakdown of turf and plant material.
- (v) project type (e.g. new, rehabilitated, public, private, cemetery, homeowner installed).
- (vi) water supply type (e.g., potable, recycled, private well).
- (vii) contact information for the project applicant and property owner.
- (viii) applicant signature and date with statement, "I agree to comply with the requirements of the prescriptive compliance option of the Water Efficient Landscape Ordinance".

(2) Project applicant or designee shall incorporate compost at a rate of at least four cubic yards per 1,000 square feet to a depth of six inches into landscape area (unless contra-indicated by a soil test);

(3) Plant material shall comply with all of the following:

(i) For residential areas, install climate adapted plants that require occasional, little or no summer water (WUCOLS) plant factor 0.3) for 75% of the plant area excluding edibles and areas using recycled water. For non-residential areas, install climate adapted plants that require occasional, little or no summer water (average WUCOLS plant factor 0.3) for 100% of the plant area excluding edibles and areas using recycled water;

(ii) A minimum three inch (3") layer of mulch shall be applied on all exposed soil surfaces of planting areas except in turf areas, creeping or rooting groundcovers, or direct seeding applications where mulch is contraindicated.

(4) Turf shall comply with all of the following:

(i) Turf shall not exceed 25% of the landscape area in residential areas, and there shall be no turf in non-residential areas;

(ii) Turf shall not be planted on sloped areas which exceed a slope of 1 foot vertical elevation change for every 4 feet of horizontal length;

(iii) Turf is prohibited in parkways less than 10 feet wide, unless the parkway is adjacent to a parking strip and used to enter and exit vehicles. Any turf in parkways must be irrigated by sub-surface irrigation or by other technology that creates no overspray or runoff.

(5) Irrigation systems shall comply with the following:

(i) Automatic irrigation controllers are required and must use evapotranspiration or soil moisture sensor data and utilize a rain sensor.

(ii) Irrigation controllers shall be of a type which does not lose programming data in the event the primary power source is interrupted.

(iii) Pressure regulators shall be installed on the irrigation system to ensure the dynamic pressure of the system is within the manufacturers recommended pressure range.

(iv) Manual shut-off valves (such as a gate valve, ball valve, or butterfly valve) shall be installed as close as possible to the point of connection of the water supply.

(v) All irrigation emission devices must meet the requirements set in the ANSI standard, ASABE/ICC 802-2014. "Landscape Irrigation Sprinkler and Emitter Standard." All sprinkler heads installed in the landscape must document a distribution

uniformity low quarter of 0.65 or higher using the protocol defined in ASABE/ICC 802-2014.

(vi) Areas less than ten (10) feet in width in any direction shall be irrigated with subsurface irrigation or other means that produces no runoff or overspray.

(vii) Flow sensors that detect high flow conditions created by system damage or malfunction are required for residential landscapes of 5,000 square feet or larger.

(6) Dedicated landscape meters or submeters are required for residential landscapes over 5,000 square feet and for non-residential projects with landscape areas of 1,000 square feet or more, private submeter(s) to measure landscape water use shall be installed.

(c) At the time of final inspection, the permit applicant must provide the owner of the property with a certificate of completion, certificate of installation, irrigation schedule and schedule of landscape and irrigation maintenance. The permit applicant shall also provide the owner of the property a plan for the completion of the backyard landscape if backyard landscape is not included with the original permit meeting the requirements of this section.

SECTION 3. EFFECTIVE DATE.

This Ordinance shall go into effect and be in full force from and after thirty (30) days after its final passage and adoption.

APPROVED: December 7, 2015

 _____ Mayor	 _____ City Clerk
* * * * *	* * * * *

The foregoing Ordinance was introduced and read at a regular meeting of the City Council held on December 7, 2015, and was adopted at a regular meeting of said Council held on December 14, 2015 by the following vote, to wit:


AYES: Councilmembers Armstrong, Ashbeck, Flores, Whalen, Mayor Magsig

NOES: None


ABSENT: None

ABSTAIN: None

DATED: December 14, 2015



City Clerk



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Appendix B

Emergency Response Plan Excerpt

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ACTION PLAN 1A - Threat of or Actual Contamination to Water System POSSIBLE STAGE

ACTION PLAN 1A - Threat of or Actual Contamination to Water System POSSIBLE STAGE	
AP Summary:	This Action Plan applies to the intentional introduction of a contaminant into the water system. The contaminant could be introduced at any point within the system, including raw water, treatment facilities, distribution system including distribution pipes, finished water storage, or pump stations. The adversary may or may not give notice of the contaminant or provide the location. Contamination may have actually occurred or it may be a hoax.

ACTION PLAN 1A - Threat of or Actual Contamination to Water System

POSSIBLE STAGE

<p>Initiation and Notification:</p>	<p>1. Initiate this AP if any of the following has occurred:</p> <p>Security Breach (including, for example):</p> <ul style="list-style-type: none"> • Unsecured Doors • Open Hatches • Unlocked/Forced Gates • Alarm Triggered <p>Witness Account (including, for example):</p> <ul style="list-style-type: none"> • Suspicious Activity • Trespassing • Breaking and Entering • Tampering with Equipment or Property <p>Direct Notification by Perpetrator (including, for example):</p> <ul style="list-style-type: none"> • Verbal Threat • Threat in Writing <p>Notification by Law Enforcement (including, for example):</p> <ul style="list-style-type: none"> • Suspicious Activity • Threat made to Water System <p>Notification by News Media (including, for example):</p> <ul style="list-style-type: none"> • Threat Delivered to News Media • Media Discovers Threat <p>Unusual Water Quality Parameters (including, for example):</p> <ul style="list-style-type: none"> • Changes in pH, chlorine residual or turbidity • Unexpected monitoring or sampling results • Strange odor, color or appearance <p>Customer Complaints (including, for example unexplained or unusually high complaints of):</p> <ul style="list-style-type: none"> • Odor • Color or Appearance • Taste <p>Public Health Notification (including, for example):</p> <ul style="list-style-type: none"> • Victims in Emergency Rooms and/or Clinics • High Incidence of Similar Health Complaints in one Local Area 	<p><i>Use this AP if you receive any incident warning (see types of warnings to left) indicating possible contamination of your water system</i></p> <p><i>If you have evidence that corroborates the warning, or if collective information indicates that contamination is likely, GO TO AP 1B – CREDIBLE STAGE.</i></p> <p><i>If there is confirmed evidence and/or definitive information that the water system has been contaminated. GO TO AP 1C – CONFIRMED STAGE.</i></p>
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ACTION PLAN 1A - Threat of or Actual Contamination to Water System								
POSSIBLE STAGE								
Initiation and Notification:	2. Notify WUERM or Alternate WUERM immediately upon discovery of any of the above Threat Warnings.	<i>The individual who first notices or receives the threat warning should contact the WUERM immediately by whatever means of communication may be available.</i>						
Equipment Identified:	<table border="1"> <thead> <tr> <th>Equipment</th> <th>Location</th> </tr> </thead> <tbody> <tr> <td>Phones</td> <td>Corporation Yard</td> </tr> <tr> <td>Vehicles</td> <td></td> </tr> </tbody> </table>	Equipment	Location	Phones	Corporation Yard	Vehicles		<i>This equipment is available to assist in the execution of this AP.</i>
Equipment	Location							
Phones	Corporation Yard							
Vehicles								
Specific Activities:								

ACTION PLAN 1A - Threat of or Actual Contamination to Water System

POSSIBLE STAGE

<p>I. Assess the Problem</p>	<p>A. Complete the following Threat Warning Report Forms according to the type of Threat Warning received. (Appendix of ERP).</p> <ul style="list-style-type: none"> • Security Incident Report Form • Witness Account Report Form • Phone Threat Report Form (to be filled out during actual phone call) • Written Threat Report Form • Water Quality / Consumer Complaint Report Form • Public Health Information Report Form <p>B. Complete Threat Evaluation Worksheet (Appendix of ERP).</p> <p>C. Evaluate Threat Evaluation Worksheet, and determine if threat is Possible. If YES, perform Response Steps 1 – 8 below. If NO, return to normal operations.</p>	<p><i>Threat Warning Report Forms help document, organize and summarize information about a security incident. The individual who discovers the incident warning, the WUERM, or another designated individual may complete the form. Only the form that corresponds to the type of threat warning needs to be completed. Completion of the form should not distract emergency responders from more urgent matters.</i></p> <p><i>Threat Evaluation Worksheets help organize information about a threat warning that will be used during the Threat Evaluation Process. The individual responsible for conducting the Threat Evaluation (e.g., the WUERM) should complete this worksheet.</i></p>
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ACTION PLAN 1A - Threat of or Actual Contamination to Water System

POSSIBLE STAGE

<p>II. Isolate and Fix the Problem</p>	<ol style="list-style-type: none"> 3. Notify local law enforcement. 4. Notify State Drinking Water Agency. 5. Do not disturb site if location could be possible crime scene. Consult Maintaining Crime Scene Integrity Form in Appendix. 6. Alert staff and emergency response personnel about threat. 7. Consider containment / isolation, elevating chlorination, and/or discharge of suspect water. 8. Evaluate spread of suspect water and potential impact on public health. 	<p><i>Notification phone numbers of appropriate City personnel may be obtained from the current Callback List.</i></p> <p><i>The immediate operational response actions are primarily intended to limit exposure of customers to potentially contaminated water.</i></p> <p><i>See EPA Toolbox Module 2, Section 3.3.2 for guidance on containing contaminants and evaluating movement of potentially contaminated water through distribution systems.</i></p>
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ACTION PLAN 1A - Threat of or Actual Contamination to Water System

POSSIBLE STAGE

<p>III. Monitoring</p>	<p>9. Initiate Site Characterization Activities:</p> <ul style="list-style-type: none"> • Define the investigation site. • Designate site characterization team members. • Conduct preliminary assessment of potential site hazards. • Approach site and conduct field safety screening to detect any hazards to the characterization team. • Search for physical evidence (discarded containers, etc.). • Investigate records from CCTV cameras. • Look for environmental indicators (dead animals or fish, dead vegetation, unusual odors or residues). • Perform rapid field testing of the water. • Collect water samples according to the site locations of the Bacteriological Sampling Plan. Water quality sampling may incorporate Title 22 chemicals such as Volatile Organic Chemicals (VOCs) and Synthetic Organic Chemicals (SOCs) to determine the contaminant. 	<p><i>Site Characterization is intended to gather critical information to support the ‘credible’ stage of threat evaluation.</i></p> <p><i>If signs of a hazard are evident during the site approach, the team should halt their approach and immediately inform the WUERM of their findings. The site may then be turned over to the HAZMAT Team.</i></p> <p><i>The WUERM may determine the threat is credible based preliminary information before the site characterization has been completed.</i></p>
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ACTION PLAN 1A - Threat of or Actual Contamination to Water System		
POSSIBLE STAGE		
<p>IV. Recovery and Return to Safety</p>	<p>10. Determine if threat is credible. If YES, initiate AP 1B. If NO, Return to normal operations. Store water samples for one month.</p>	<p><i>You should determine whether or not the threat is 'credible' within 2 to 8 hours (preferably within 2 hours) from the time the threat is deemed 'possible', depending on the effectiveness of the containment strategy.</i></p> <p><i>If the threat is not deemed 'credible', the samples obtained during site characterization should be stored in case the situation changes and analysis is determined to be necessary.</i></p>
<p>V. Report of Findings</p>	<p>11. File incident reports.</p>	<p><i>The Utility Assistant Public Utilities Director should file an internal report for the Utility's files, and also provide information as requested to Local Law Enforcement.</i></p>
<p>VI. AP-1A Revision Dates</p>	<p>09/30/2020</p>	

ACTION PLAN 1B - Threat of or Actual Contamination to Water System CREDIBLE STAGE

ACTION PLAN 1B - Threat of or Actual Contamination to Water System CREDIBLE STAGE	
AP Summary:	This Action Plan applies to the intentional introduction of a contaminant into the water system. The contaminant could be introduced at any point within the system, including raw water, treatment facilities, distribution system including distribution pipes, finished water storage, or pump stations. The adversary may or may not give notice, identify the contaminant, or provide the location. Contamination may have actually occurred or it may be a hoax.

ACTION PLAN 1B - Threat of or Actual Contamination to Water System

CREDIBLE STAGE

<p>Initiation and Notification:</p>	<ol style="list-style-type: none"> 1. Initiate this AP if there is credible evidence that the water system has been contaminated: <ol style="list-style-type: none"> a. Additional information collected during the investigation corroborates the threat warning. b. Collective information indicates that contamination is likely. c. Signs of contamination are observed during site characterization. d. Additional water quality data shows unusual trends that are consistent with the initial data and corroborate the threat. e. A pattern of customer complaints emerges. f. Previous threats and incidents corroborate the current threat. 2. Notify WUERM or Alternate WUERM immediately upon discovery of credible evidence of threat (if not already notified). 3. Initiate ERP. 4. Initiate partial or full activation of the Emergency Operations Center (EOC). 5. Perform internal and external notifications according to ERP. 	<p><i>If there is confirmed evidence and/or definitive information that the water system has been contaminated, GO TO AP 1C – CONFIRMED STAGE.</i></p> <p><i>The individual who first notices or receives the credible evidence should contact the WUERM immediately by whatever means of communication may be available.</i></p> <p><i>The WUERM will decide whether to initiate the ERP on a partial or full basis. The WUERM will also decide when and to what extent to activate the Emergency Operations Center (EOC).</i></p> <p><i>Notification phone numbers of appropriate City personnel may be obtained from the current Callback List.</i></p> <p><i>The Information Officer, IO is the only one authorized to make notifications to outside agencies.</i></p>
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ACTION PLAN 1B - Threat of or Actual Contamination to Water System								
CREDIBLE STAGE								
Equipment Identified:	<table border="1"> <thead> <tr> <th>Equipment</th> <th>Location</th> </tr> </thead> <tbody> <tr> <td>Phones</td> <td>Corporation Yard</td> </tr> <tr> <td>Vehicles including valve trucks</td> <td></td> </tr> </tbody> </table>	Equipment	Location	Phones	Corporation Yard	Vehicles including valve trucks		<i>This equipment is available to assist in the execution of this AP.</i>
	Equipment	Location						
Phones	Corporation Yard							
Vehicles including valve trucks								
Specific Activities:								
I. Assess the Problem	<ul style="list-style-type: none"> 6. Assess results of previous sample analysis. 7. Perform additional site characterization at primary sites as needed. 8. Perform site characterization at any new investigation sites. 							
II. Isolate and Fix the Problem	<ul style="list-style-type: none"> 9. Perform actions to estimate the contaminated area and predict movement of contamination. 10. Take actions to isolate portions of system containing suspect water. See ERP Appendix for System Shut Down Plan. 11. Issue “Boil Water”, “Do not Drink”, or “Do not Use” orders and Press Releases as appropriate. See Appendix of ERP for Press Release Forms. 12. Initiate Alternate Water Supply Plan (ERP Section 3.1) to provide alternate water supply for customers and fire protection as necessary. 	<i>The contaminated area can be estimated using hydraulic models, consumer complaints, public health agency reports, water quality data, or other available information. The estimate may define additional locations where site characterization should be performed</i>						
III. Monitoring	<ul style="list-style-type: none"> 13. Continue to monitor water quality in suspect parts of system by manual sampling, rapid field testing, or automated means. Water quality sampling may incorporate Title 22 chemicals such as Volatile Organic Chemicals (VOCs) and Synthetic Organic Chemicals (SOCs) to determine the contaminant. If the location of the contaminated area is not known, then spot sampling throughout the water system may be performed by utilizing the locations indicated on the Bacteriological Sampling Plan (see appendix) in order to determine the extent of the contaminated area. 							

ACTION PLAN 1B - Threat of or Actual Contamination to Water System
CREDIBLE STAGE

<p>IV. Recovery and Return to Safety</p>	<p>14. Determine if threat is Confirmed. If YES, Initiate AP 1C. If NO,</p> <ul style="list-style-type: none"> • Verify that water is safe. • Notify public that water is safe. • Notify outside agencies that water is safe. • Return to normal operations. • Store water samples for (enter predetermined time period here). 	<p><i>It may take several days to collect sufficient evidence to confirm a contamination incident, depending on the type of information used for confirmation. (Some microbiological analytical procedures may take several days.)</i></p> <p><i>If the threat is not deemed ‘confirmed’, the samples obtained during site characterization should be stored in case the situation changes and an analysis is determined to be necessary.</i></p>
<p>V. Report of Findings</p>	<p>15. File incident reports.</p>	<p><i>The Utility Assistant Public Utilities Director should file an internal report for the Utility’s files, and also provide information as requested to Local Law Enforcement and other outside agencies.</i></p>
<p>VI. AP-1B Revision Dates</p>	<p>09/30/2020</p>	

ACTION PLAN 1C - Contamination to Water System CONFIRMED STAGE

ACTION PLAN 1C - Contamination to Water System CONFIRMED STAGE	
AP Summary:	This Action Plan applies to the intentional introduction of a contaminant into the water system. The contaminant could be introduced at any point within the system, including raw water, treatment facilities, distribution system including distribution pipes, finished water storage, or pump stations. The adversary may or may not give notice, identify the contaminant, or provide the location. Contamination may have actually occurred or it may be a hoax.

ACTION PLAN 1C - Contamination to Water System

CONFIRMED STAGE

<p>Initiation and Notification:</p>	<ol style="list-style-type: none"> 1. Initiate this AP if there is confirmed evidence that the water system has been contaminated: 2. There is analytical confirmation of the presence of one or more contaminants in the water system. 3. The preponderance of the evidence confirms that a contamination incident has occurred. <ul style="list-style-type: none"> • There is a security breach with obvious signs of contamination along with unusual water quality and consumer complaints in the vicinity of the security breach. • Additional findings (laboratory analysis, field observations) of continued site characterization activities add to other credible evidence of contamination. • There is information from public health officials, area hospitals, or 911 call centers indicating a problem with the water supply. • Law enforcement agencies have discovered crucial evidence or apprehended a suspect that helps confirm that the water has been contaminated. • Specific information on a number of potential contaminants can be used in conjunction with other available information to narrow down the number of contaminant candidates. 	<p><i>If there is no confirmed evidence and no definitive information that the water system has been threatened or contaminated, GO TO AP 1B – CREDIBLE STAGE.</i></p> <p><i>It may take several days to collect sufficient evidence to confirm a contamination incident, and the required time will depend on the type of information used for confirmation (some microbial analytical procedures may take several days).</i></p>
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ACTION PLAN 1C - Contamination to Water System								
CONFIRMED STAGE								
Initiation and Notification:	<ol style="list-style-type: none"> 4. Notify WUERM or [Alternate WEURM] immediately upon discovery of confirmed evidence of contamination (if not already notified). 5. Initiate full ERP activation. 6. Initiate full activation of Emergency Operations Center (EOC). 7. Engage other organization as needed (drinking water primacy agency, public health agency, response agencies, law enforcement). 8. Perform internal and external notifications according to ERP. 	<p><i>The individual who first becomes aware of the confirmed evidence should contact the WUERM immediately by whatever means of communication may be available.</i></p> <p><i>The WUERM will decide whether to initiate the ERP on a partial or full basis. The WUERM will also decide when and to what extent to activate the Emergency Operations Center (EOC).</i></p> <p><i>Notification phone numbers of appropriate City personnel may be obtained from the current Callback List.</i></p> <p><i>The Information Officer, IO, should make the notifications to the outside agencies.</i></p>						
Equipment Identified:	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Equipment</th> <th style="width: 50%; text-align: center;">Location</th> </tr> </thead> <tbody> <tr> <td>Phones</td> <td>Corporation Yard</td> </tr> <tr> <td>Vehicles</td> <td></td> </tr> </tbody> </table>	Equipment	Location	Phones	Corporation Yard	Vehicles		<p><i>This equipment is available to assist in the execution of this AP.</i></p>
Equipment	Location							
Phones	Corporation Yard							
Vehicles								
Specific Activities:								
I. Assess the Problem	<ol style="list-style-type: none"> 9. Assess results of previous sample analysis and attempt to identify the contaminant. 10. Confirm the identity of the contaminant. 	<p><i>Effective implementation of response actions depends on positive identification of the contaminant and knowledge of contaminant properties, including public health protection strategies and selection of treatment technologies.</i></p>						

ACTION PLAN 1C - Contamination to Water System

CONFIRMED STAGE

<p>I. Assess the Problem</p>	<p>11. Perform a full characterization of the contaminated area, including contaminant properties, contaminant concentration profiles, and characteristics of the impacted area.</p> <p>12. Evaluate the likely direction and extent of future movement of the contaminant within the distribution system.</p> <p>13. Evaluate all available information about the contamination incident</p>	<p><i>If information from site characterization activities indicates that the contaminant impacts water quality in a certain manner (i.e., consumes free chlorine or imparts a certain odor to the water), the contaminant specific information may facilitate tentative identification of a contaminant and determine the analytical approach that should be used to positively identify the specific contaminant. Sources of contaminant information include:</i></p> <p>http://www.bt.cdc.gov/agent/agentlistchem.asp</p> <p>http://www.cdc.gov/atsdr/index.html</p> <p>http://www.waterisac.org/</p> <p><i>EPA Water Contaminant Information Tool (WCIT) – under development</i></p>
<p>II. Isolate and Fix the Problem</p>	<p>14. Take actions to isolate portions of system containing suspect water. See ERP Appendix for System Shut Down Plan.</p> <p>15. Shut down system if obvious or confirmed contamination warrants.</p> <p>16. Issue “Boil Water”, “Do not Drink”, or “Do not Use” orders and Press Releases as appropriate. See Appendix of ERP for Press Release Forms.</p> <p>17. Initiate Alternate Water Supply Plan (ERP Section III.G) to provide alternate water supply for customers and fire protection as necessary.</p> <p>18. Revise public health response measures and public notifications as necessary.</p>	<p><i>The contaminated area can be estimated using hydraulic modes, consumer complaints, public health agency reports, water quality data, or other available information. The estimate may define additional locations where site characterization should be performed.</i></p>
<p>III. Monitoring</p>	<p>19. Continue sampling and analysis to monitor the status and extent of the contamination, and to verify that containment strategies are working.</p>	

ACTION PLAN 1C - Contamination to Water System

CONFIRMED STAGE

<p>IV. Recovery and Return to Safety</p>	<p>20. Consult with appropriate officials to develop a Remediation and Recovery Plan.</p> <ul style="list-style-type: none"> a. Evaluate options for treating contaminated water and rehabilitating system components. b. Select treatment and rehabilitation technology/approach. c. Develop strategy for disposal of contaminated residuals. d. Develop sampling and analysis plan to verify remediation. e. Develop communications and public relations plan. <p>21. Implement Remediation and Recovery Plan.</p> <ul style="list-style-type: none"> f. Verify that water is safe by performing additional sampling and analysis to confirm the progress of system treatment and remediation. g. Notify public that water is safe. h. Notify outside agencies that water is safe. i. Return to normal operations. j. Store water samples for one month. 	<p><i>Remediation and recovery activities will likely be planned and implemented by a number of agencies. The first step of the process is to establish the roles and responsibilities of each organization</i></p> <p><i>The samples obtained during site characterization and monitoring should be stored in case the situation changes and further analysis is determined to be necessary.</i></p>
<p>V. Report of Findings</p>	<p>22. File incident reports with internal and external agencies as required.</p>	<p><i>The Utility Assistant Public Utilities Director should file an internal report for the Utility's files, and also provide information as requested to outside agencies.</i></p>
<p>VI. AP-1C Revision Dates</p>	<p>09/30/2020</p>	

ACTION PLAN 2 - Structural Damage from Explosive Device

ACTION PLAN 2 - Structural Damage from Explosive Device		
AP Summary:	This Action Plan applies to an incident where intentional structural damage has occurred to the water system as a result of an explosive device. The assumed intent of the explosion is to disrupt normal system operations any point within the system, including raw water, treatment, finished water storage, or the distribution network.	
Initiation and Notification:	<ul style="list-style-type: none"> • Initiate this AP if it appears that an explosive device has caused damage, or has the potential to cause damage to one or more components of the water system. The event will begin with an “incident discovery” which may come to City of Clovis by one (or more) of the following: <ul style="list-style-type: none"> • Security Equipment • Employee Discovery • Witness Account of Explosion • Notification By Adversary • Notification by Fire Department • Notification By Law Enforcement • Notification By News Media • Call 911 and notify WUERM or Alternate WUERM immediately upon discovery of the explosion. The WUERM should then notify others as appropriate. Examples include: <ul style="list-style-type: none"> a. Local Fire Department b. FBI c. ATF 	<p><i>The individual who first notices or receives word of the explosion should contact the WUERM immediately by whatever means of communication are available.</i></p> <p><i>Notification phone numbers of appropriate City personnel may be obtained from the current Callback List.</i></p>

ACTION PLAN 2 - Structural Damage from Explosive Device								
Initiation and Notification:	<ul style="list-style-type: none"> In cases where an adversary calls a City of Clovis employee in advance that employee should complete the Bomb Threat Checklist OR Phone Threat Report Form found in Appendix of the ERP. Initiate partial or full ERP activation. Initiate partial or full activation of the Emergency Operations Center (EOC). Engage other organization as needed (Law Enforcement, Fire Protection, FBI). Perform internal and external notifications according to ERP. 		<p><i>The Bomb Threat Checklist and the Phone Threat Report Form contain questions that should be asked the caller if possible to help determine the specifics of the threat including the location of the explosive device, type of device, time of detonation, and reason for the attack.</i></p> <p><i>The WUERM will decide whether to initiate the ERP on a partial or full basis. The WUERM will also decide when and to what extent to activate the Emergency Operations Center (EOC).</i></p>					
	Equipment Identified:	<table border="1"> <thead> <tr> <th>Equipment</th> <th>Location</th> </tr> </thead> <tbody> <tr> <td>Phone</td> <td rowspan="3">Corporation Yard</td> </tr> <tr> <td>Vehicles</td> </tr> <tr> <td>Heavy Equipment</td> </tr> </tbody> </table>	Equipment	Location	Phone	Corporation Yard	Vehicles	Heavy Equipment
Equipment	Location							
Phone	Corporation Yard							
Vehicles								
Heavy Equipment								
Specific Activities:								

ACTION PLAN 2 - Structural Damage from Explosive Device		
I. Assess the Problem	<ol style="list-style-type: none"> 1. Deploy Damage Assessment Team(s) (DAT) <ul style="list-style-type: none"> • Perform a thorough assessment of the structural damage caused by the explosion. • Determine how explosion is affecting system operations. 2. Check and monitor all other water system functions and facilities to ensure that the rest of the system is operating normally. (The initial explosion could be a diversion to a larger event, or it could be the first in a series of similar attacks.) 3. If the damage appears to be intentional, treat as a crime scene. Consult with local police, state police, and the FBI on evidence preservation. Also see Maintaining Crime Scene Integrity Form, Appendix of ERP. 4. Isolate damaged facility from rest of water system, and take measures to bypass the damaged area if possible. 5. Inform local police, state police, and the FBI of potential hazardous materials. 	<p><i>The DAT will work in conjunction with local/state law enforcement in terms of incident command and control.</i></p> <p><i>UNDER NO CIRCUMSTANCES WILL THE DAT TEAM ENTER THE AREA CONTAINING THE EXPLOSIVE DEVICE UNTIL AFTER THE LOCAL LAW ENFORCEMENT EXPLOSION SPECIALISTS (BOMB SQUAD) HAS DETERMINED THAT THE AREA IS SAFE.</i></p>
II. Isolate and Fix the Problem	<ol style="list-style-type: none"> 6. Physically secure water system facilities and implement heightened security procedures throughout the system. 7. Initiate Alternate Water Supply Plan (ERP Section III.G) to provide alternate water supply for customers and fire protection as necessary. 8. Based on extent of damage, consider alternate (interim) treatment schemes. 9. Issue public notification, “Boil Water”, “Do not Drink”, or “Do not Use” orders and other Press Releases as appropriate. See Appendix of ERP for Press Release Forms. 10. Request assistance from outside contractors or other water utilities if needed to help repair the damage. 	
III. Monitoring	<ol style="list-style-type: none"> 11. Perform sampling and monitoring activities and analysis to determine if the explosion has rendered the water supply unsafe for customers. 12. Perform a system pressure evaluation to determine how the explosion has affected customers and fire water capability in each pressure zone. 	

ACTION PLAN 2 - Structural Damage from Explosive Device		
IV. Recovery and Return to Safety	13. Repair damage to critical equipment and facilities as soon as possible. 14. Determine and mitigate effects on other system components. For example, replace water storage capacity if it was diminished during repairs. 15. Clean and disinfect system components as necessary. 16. Resume normal operations. 17. Asses need for additional protection/security measures.	<p><i>The WUERM will inspect the repairs and will give the OK to resume normal operation of the water system</i></p> <p><i>The WUERM will evaluate a heightened security posture. As a result, security will be increased or decreased as necessary according to the perceived threat.</i></p>
V. Report of Findings	18. File incident reports.	<p><i>The Utility Assistant Public Utilities Director should file an internal report for the Utility's files, and also provide information as requested to Local Law Enforcement and other outside agencies.</i></p>
VI. AP-2 Revision Dates	09/30/2020	

ACTION PLAN 3 – Employee Assaulted with Weapon (Armed Intruder)

ACTION PLAN 3 – Employee Assaulted with Weapon (Armed Intruder)						
AP Summary:	<p>This Action Plan applies to the threat of an employee(s) being assaulted by an intruder (possibly an ex-employee), with a weapon. Incidents of this type will vary in scale and severity, but the following should generally apply across the spectrum of threat conditions.</p> <p>If you believe this threat is of current importance and have not yet dialed 911 or an emergency equivalent, do so immediately before proceeding.</p>					
Initiation and Notification:	<p>Initial notification of the incident will vary in both method and urgency, however in any scenario the first priority is the welfare of the assault victim. Under all circumstances, emergency personnel should be notified and consulted immediately.</p> <p>This threat requires a response addressing three distinct categories:</p> <ul style="list-style-type: none"> • Ensuring the health and safety of the victim and other employees. • Notifying and facilitating involvement of the proper authorities. • Communicating specifics of the incident to other staff, the media, and the victim’s relatives. <p>Remain aware of these aspects of your response as the AP is initiated and consulted.</p>	<p><i>The individual who first notices or receives word of the assault should contact 911 immediately by whatever means of communication may be available.</i></p> <p><i>Notification phone numbers of appropriate City personnel may be obtained from the current Callback List.</i></p>				
Equipment Identified:	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Equipment</th> <th style="width: 50%; text-align: center;">Location</th> </tr> </thead> <tbody> <tr> <td>Phone Alert Fobs</td> <td style="text-align: center;">Corporation Yard</td> </tr> </tbody> </table>	Equipment	Location	Phone Alert Fobs	Corporation Yard	<p><i>This equipment is available to assist in the execution of this AP.</i></p>
Equipment	Location					
Phone Alert Fobs	Corporation Yard					
Specific Activities:						

<p>I. Assess the Problem</p>	<p>Assessment of the severity of injury should not be made by Utility staff, proper diagnosis should be made only by trained medical personnel. The following general steps will be prudent:</p> <ol style="list-style-type: none"> 1. The first task upon discovery of the incident is to dial 911 and report the incident in detail. 2. An ambulance (or other transportation to the hospital in less urgent situations) should be immediately arranged in all cases. 3. Decision-making control of the situation should be readily surrendered to the proper authorities. 4. In the event of a hostage situation or extended incident, Utility staff should notify the authorities and evacuate the area quickly. 5. Under no circumstances should Utility personnel attempt to subdue the adversary or bring personal weapons onto the scene. 	<p><i>Notification phone numbers of appropriate City personnel may be obtained from the current Callback List.</i></p>
<p>II. Isolate and Fix the Problem</p>	<ol style="list-style-type: none"> 6. If witnesses were present they should be readily available to provide information to the authorities. Fill out the Suspect Identification Form. See Appendix of ERP. 7. The area surrounding the incident is a crime scene and care should be taken not to alter anything that may impair the ability of the authorities to interpret or recreate the assault. Consult the Maintaining Crime Scene Integrity Form located in Appendix of this ERP. 8. The weapon, if present, should not be handled or touched in any way. 	
<p>III. Monitoring</p>	<ol style="list-style-type: none"> 9. Communication with the media should be handled in a proactive fashion, with statements made only by the identified Utility spokesperson. Similarly, employees should not be left to spread the word through gossip and hearsay. An announcement carrying relevant details should be disseminated promptly. 10. If the assault victim is injured or otherwise unable to perform his/her duties, the replacement personnel may also be under significant stress. Care should be taking in selecting replacement personnel including monitoring of performance and behavior 	

<p>IV. Recovery and Return to Safety</p>	<p>11. Staff stress may have serious ramifications. It is important to evaluate these effects in an ongoing fashion and address them accordingly. The Utility should consider temporary mental health counselors under such tragic circumstances.</p> <p>12. In the event of a fatality, notification of family is an unfortunate duty, which may be best handled by the local police or other authorities experienced in such tasks.</p> <p>13. If security was breached during the incident, rapidly address any weakness the incident may have identified. Evaluate access to the incident location and modify where necessary.</p> <p>14. If the adversary was acting with an identifiable motive, consider the mentality and culture of the utility to evaluate if the underlying issue may be significant and widespread.</p> <p>15. If assault was of a sexual nature consider awareness training for utility staff.</p> <p>16. The need to maintain a heightened security posture should be evaluated, and security should be increased and decreased as necessary according to the perceived threat.</p>	
<p>V. Report of Findings</p>	<p>17. In addition to completing the appropriate filings with the local police and other agencies, the utility should assemble relevant personnel to review the effectiveness of the action plan and reinforce lessons learned in the process.</p>	
<p>VI. AP-3 Revision Dates</p>	<p>09/30/2020</p>	

ACTION PLAN 4 – SCADA, Process Controls, and Utility Billing System Security

ACTION PLAN 4 – SCADA, Process Controls, and Utility Billing System Security		
AP Summary:	<p>This Action Plan applies to a cyber attack on a SCADA network system, Process Controls, and Utility Billing System when the cyber intruder is:</p> <ul style="list-style-type: none"> • Conducting DoS (Denial of Service) • Initiating SCADA/DCS command spoofing • Attempting to take the SCADA/DCS system down • Attempting to take control of or is in control of the system <p><u>Prepare for problems by:</u></p> <ul style="list-style-type: none"> • <i>Updating all network documentation around the SCADA/DCS</i> • <i>Documenting all network data flows to/from Intranet systems, SCADA/DCS and surrounding systems</i> • <i>Identifying Zones of Vulnerability</i> • <i>Identifying ramifications and feasibility of disconnecting networks, computers and data flows</i> • <i>Ensuring that sufficient monitoring and network control points (firewalls, IPS, etc.) are in place to both know what’s happening on your network and how to control it</i> • <i>Characterizing network traffic so that anomalous behavior can be identified</i> • <i>Becoming familiar with computer forensics tools and practices before being forced to learn them “under fire”</i> • <i>Becoming familiar with host-based monitoring and intrusion detection, since most hacking over networks is now conducted via encrypted tunnels or data streams.</i> • <i>Ensuring that backup/restore procedures are up to date, as are the backups themselves</i> 	
Initiation and Notification:	<p>Notify immediately upon discovery of the attack:</p> <ul style="list-style-type: none"> • WUERM, • Data (IT) Manager <p>Others as appropriate (for example):</p> <ul style="list-style-type: none"> • Internet Service Provider • Computer Equipment Vendor • Computer Emergency Response Team 	<p><i>The individual that first notices or receives word of an attack should contact the Data (IT) manager and WUERM immediately by whatever means of communication may be available.</i></p> <p><i>Notification phone numbers of appropriate City personnel may be obtained from the current Callback List.</i></p>

ACTION PLAN 4 – SCADA, Process Controls, and Utility Billing System Security						
Equipment Identified:	<table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Equipment</td> <td style="width: 50%;">Location</td> </tr> <tr> <td>Phones</td> <td>Corporation Yard</td> </tr> </table>	Equipment	Location	Phones	Corporation Yard	<i>This equipment is available to assist in the execution of this AP.</i>
Equipment	Location					
Phones	Corporation Yard					
Specific Activities:						
I. Assess the Problem	<p>An attack on SCADA system may be manifested in several different manners and may be quite difficult to initially determine the specific mode of attack or objective of the SCADA threat. Initial areas for investigation are:</p> <ul style="list-style-type: none"> • SCADA is not controlling plant parameters • Complaints from customers • Quality of water results • Inadequate throughput 	<i>In a DoS an intruder breaks into a number of computers and plants programs that lie dormant until activated by the attacker. The computers then send a steady stream of data packets to a targeted Web site in an attempt to crash a service (or server), overload network links, or disrupt other mission-critical resources. DoS attacks are powerful because they can be launched simultaneously from hundreds of remotely controlled computers, thereby amplifying their reach. The objective of a DoS attack is to exhaust the resources of the target until the underlying network fails. The tools for DoS attacks are widely available and can be found at numerous hacker Web sites.</i>				

ACTION PLAN 4 – SCADA, Process Controls, and Utility Billing System Security

<p>II. Isolate and Fix the Problem</p>	<ol style="list-style-type: none"> 1. Restrict physical access to the area. 2. Physically unplug any phone lines that could dial in to the attacked computer. 3. Unplug the computer from the network. 4. Determine if the SCADA system needs to be isolated from process operations and taken completely off line. 5. Photograph the scene, including connections to any peripherals. 6. IF the computer is off, DO NOT turn it on (preferred method is to jumper system disk drive(s) as read only, and perform a post-mortem on a separate computer using suitable tools.) 7. IF the computer is on, DO NOT reboot it. 8. Avoid accessing any files on the compromised machine. 9. Increase sampling at or near system intakes – consider whether to isolate. 10. Preserve latest full battery background test at baseline. 11. Increase sampling efforts. 12. Check for an NIPC water sector warnings (NIPC may contain additional protective actions to consider: http://www.NIPC.gov or https://www.infraguard.org for secure access infraguard members) 	<p><i>Restricting access helps to preserve fingerprints for later prosecution (if physical access to systems is involved)</i></p> <p><i>These steps isolate the SCADA system from the outside world where the cyber attack is originating.</i></p> <p><i>The SCADA system itself may be malfunctioning as a result of the attacks with equipment not operating as originally intended.</i></p> <p><i>Useful for later reference if the machine needs to be disassembled for examination.</i></p> <p><i>Merely turning on a Windows computer changes time stamps and other important evidence, for example.</i></p> <p><i>Rebooting your computer may launch viruses or time bombs.</i></p> <p><i>Access timestamps may be altered.</i></p> <p><i>Manual sampling may be necessary if computerized process are not functioning properly.</i></p> <p><i>A baseline analysis is important for determining if changes of an unknown nature are made to the water supply</i></p> <p><i>Contamination may pass through the system unnoticed if an insufficient number of sampling points are used or if sampling points and mis-specified.</i></p>
<p>III. Monitoring</p>	<ol style="list-style-type: none"> 13. Monitor unmanned components (storage tanks & pumping stations) – consider whether to isolate. 	<p><i>With the SCADA system down, it may be easier for attackers to physically enter the site undetected</i></p>

<p style="text-align: center;">ACTION PLAN 4 – SCADA, Process Controls, and Utility Billing System Security</p>		
<p>IV. Recovery and Return to Safety</p>	<p>14. Solicit the assistance of a Computer Emergency Response Team or Network Forensics Specialists. OR with appropriate training, develop site-specific procedures to:</p> <p>15. Retrieve logged data from the various equipment and server logs. 16. Collect adequate information (make image copies) 17. With law enforcement/FBI assistance, check for implanted backdoors and other malicious code (i.e., Trojan horse, or worm). 18. Install safeguards and patch to current levels.</p>	<p><i>Computer Emergency Response Teams:</i></p> <p><i>Preserve the evidence,</i></p> <p><i>Determine the extent of damage,</i></p> <p><i>Return the system to normal operation.</i></p> <p><i>The goal is for proper forensics to be performed on these logs such that it cannot be claimed that these logs were tampered or altered and prosecution can therefore take place.</i></p> <p><i>The goal is to preserve evidence for identifying and prosecuting the attacker utilizing assistance from the proper authorities in command (FBI, EPA, Police, Computer Emergency Response Team, etc.).</i></p>
<p>IV. Recovery and Return to Safety</p>	<p>19. Test security breach to ensure plugged (in a safe mode, in case either the problem hasn't been fixed or some other attack was installed unbeknownst). 20. Assess / implement additional precautions for SCADA system.</p>	<p><i>Prematurely returning the system to operation may make the utility susceptible to specific attack via purposefully implanted attack pathways.</i></p> <p><i>Simply returning the system to operation may be insufficient and invite future attacks.</i></p> <p><i>Ensures attacker cannot use same method to compromise SCADA system.</i></p> <p><i>Simply restoring from recent backup media may be insufficient to restore the system to a trusted state.</i></p>
<p>V. Report of Findings</p>	<p>21. Turn over evidence to the proper authorities</p>	<p><i>Prosecution of attack</i></p>
<p>VI. AP-4 Revision Dates</p>	<p>09/30/2020</p>	

ACTION PLAN 5 – Assault on Water System Infrastructure

ACTION PLAN 5 – Assault on Water System Infrastructure		
<p>This Action Plan applies to an incident where structural damage has occurred to the water system due to a malicious assault. Examples may include intentional damage to the following: transmission mains, Enterprise Canal SWTP intake, pressure sustaining valves, SWTP, chlorination system at well sites, Granular Activated Carbon vessels at well sites, Armstrong Booster Station, SWTP high service pump station, pumps at well sites, etc.</p>		
<p>Initiation and Notification:</p>	<p>Initiate this AP if it appears that a sabotage has caused damage, or has the potential to cause damage to one or more components of the water system. The event will begin with an “incident discovery” which may come to City of Clovis by one (or more) of the following:</p> <ul style="list-style-type: none"> • Security Equipment • Employee Discovery • Witness Account of Sabotage • Notification By Adversary • Notification by Fire Department • Notification By Law Enforcement • Notification By News Media <p>Call 911 and notify WUERM or Alternate WUERM immediately upon discovery of a sabotage to the water system. The WUERM should then notify others as appropriate. Examples include:</p> <ol style="list-style-type: none"> a. Local Fire Department b. Local Police Department c. FBI 	<p><i>The individual who first notices or receives the threat warning should contact the WUERM immediately by whatever means of communication may be available.</i></p> <p><i>Notification phone numbers of appropriate City personnel may be obtained from the current Callback List.</i></p>

ACTION PLAN 6 – Power Outage

ACTION PLAN 6 – Power Outage																
AP Summary:	<p>This Action Plan applies to events that result in power outages. Note that this Action Plan may need to be implemented in conjunction with other Action Plans (for example, severe weather) as necessary.</p> <p>Consider agreement with the power company to determine the priority of drinking water and wastewater systems for recovery prior to the emergency.</p>															
Initiation and Notification:	<p>Initiate this AP upon a loss of offsite power</p> <p>Notify:</p> <ul style="list-style-type: none"> • WUERM • Alternate WUERM <p>Others as appropriate, examples include:</p> <ul style="list-style-type: none"> • Fuel supplier (backup generator) • Critical Care Customers • Large Water Users 	<p><i>Notify the WUERM by whatever means of communication may be available.</i></p> <p><i>Notification phone numbers of appropriate City personnel may be obtained from the current Callback List.</i></p>														
Equipment Identified:	<table border="1"> <thead> <tr> <th>Equipment</th> <th>Location</th> </tr> </thead> <tbody> <tr> <td>Mobile battery-powered radios</td> <td>Corporation Yard</td> </tr> <tr> <td>Mobile/cellular phones</td> <td>City worker should have in their possession.</td> </tr> <tr> <td>Flashlights</td> <td>Corporation Yard & Vehicles</td> </tr> <tr> <td>Spare batteries</td> <td>Corporation Yard</td> </tr> <tr> <td>Accessory requirements (cables for generators, transformers, load banks, bus bars, distribution panels, feeder panels, fuses, outlets, load centers, etc)</td> <td>Corporation Yard</td> </tr> <tr> <td>Emergency kits</td> <td>Offices & Vehicles</td> </tr> </tbody> </table> <p><i>Radios should have access to a frequency compatible with the local fire dept, sheriff, public health officials, other government departments, utilities, services, or consultants.</i></p> <p><i>Cell phones may not be available during power outages.</i></p>		Equipment	Location	Mobile battery-powered radios	Corporation Yard	Mobile/cellular phones	City worker should have in their possession.	Flashlights	Corporation Yard & Vehicles	Spare batteries	Corporation Yard	Accessory requirements (cables for generators, transformers, load banks, bus bars, distribution panels, feeder panels, fuses, outlets, load centers, etc)	Corporation Yard	Emergency kits	Offices & Vehicles
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Emergency kits	Offices & Vehicles															

ACTION PLAN 6 – Power Outage		
Specific Activities:		
I. Assess the Problem	<ol style="list-style-type: none"> 1. Call local hydro-electric supply company – request information on the estimated down time. 2. IF backup generation is available, THEN assess the ability to supply fuel for extended periods. 3. Assess ability for HVAC or alternate to provide proper temperatures for SCADA, computer, and control systems. 4. Estimate potable water requirements under the emergency condition and determine if the utility can still meet requirements. 5. IF telephone is also down, THEN SCADA communications may be blocked. 6. Loss of power could affect utility access gates, CCTV, intrusion alarms and other remote monitoring abilities. Loss of power may be a diversionary tactic for other terrorist activity. Be alert. 	<p><i>Consider agreements with fuel supply company to supply fuel automatically upon a power loss if the capability to store fuel on site is not practical. A fuel tank with capacity for at least 24 hours of run time is advisable.</i></p> <p><i>If on-staff personnel are not experienced with power-generation equipment, it is necessary to arrange for professional assistance to install and operate the mobile units.</i></p> <p><i>Evaluate back-up power with controllers that sense problems with purchased power and come up automatically.</i></p> <p><i>Complete assessment as quickly as possible.</i></p>
II. Isolate and Fix the Problem	<ol style="list-style-type: none"> 7. Turn off unnecessary electrical equipment 8. Start backup generators as necessary for key components: Note: Uninterruptible Power Supply (UPS) for SCADA and computers, battery back-up for Remote Terminal Unit (RTU) may only supply power for a few hours. 	<p><i>This can prevent injuries and damage from unexpected equipment startups, power surges to the equipment and possible fires. If power goes out, an Uninterruptible Power Supply (UPS) provides battery power at a constant rate for several minutes, allowing you to safely turn off equipment with minimal risk or loss.</i></p> <p><i>If you permanently connect a backup electrical generator, the connection may have to meet certain technical standards required by law. Some states also require you to notify your electric utility. If you do not, utility personnel working nearby could be seriously injured.</i></p>

ACTION PLAN 6 – Power Outage		
II. Isolate and Fix the Problem	<p>9. Increase disinfectant residual as a precaution to potential contamination.</p> <p>10. IF not able to meet community requirements for water THEN arrange for water to be supplied by another source. See Mutual aid agreements Section II B. of ERP and Section III.G of ERP for Alternate Water Sources.</p> <p>11. Notify priority customers</p> <p>12. Notify users of interruption of service if backup pump(s) is/are not capable of maintaining supply.</p> <p>13. Issue “Boil Water”, “Do not Drink”, or “Do not Use” orders and Press Releases as appropriate. See Appendix of ERP for Press Release Forms.</p> <p>14. Initiate back up plan for retrieval of current information from outside sources</p>	<p><i>A temporary portable generator should not be connected to building wiring unless the building meets the same technical standards legally required for a permanent generator. Most buildings are not so equipped. As an alternative, use properly rated extension cords to connect electrical loads directly to the generator receptacles.</i></p> <p><i>This is an analysis of all available sources of water, not just those used under conditions of normal operation. These sources might include both new intakes or wells, public or private ponds, reservoirs, swimming pools, interconnections with other water utilities, water stored within building water systems, water provided in bottles or tank trucks from outside sources of potable water, local dairies or bottling plants, etc.</i></p> <p><i>Since computers may be down, access to Water ISAC, police, government, etc. could be compromised.</i></p>
II. Isolate and Fix the Problem	<p>15. Consider initiating back-up portable pumping and generating capability to serve areas with limited storage, critical wastewater collection and treatment operations.</p> <p>16. Facilities with freezing temperatures should turn off and drain the following lines in the event of a long term power loss:</p> <ul style="list-style-type: none"> a. Fire sprinkler system b. Standpipes c. Potable Water Lines d. Toilets 	
III. Monitoring	<p>17. IF damage to equipment occurs, THEN contact vendor/mutual aid companies to replace/repair damaged equipment.</p> <p>18. Monitor the status of the backup power supply and regularly test whether battery levels are adequate and the backup generators are functional.</p>	<p><i>Ask your vendors about specific limitations of your equipment. Find out how long it would take to repair or replace damaged equipment.</i></p>

ACTION PLAN 6 – Power Outage		
IV. Recovery and Return to Safety	19. Conduct disinfection, flushing, and bacteriological sampling after repairs of equipment lost. 20. IF power outage occurs during freezing conditions THEN allow electronic equipment to reach ambient temperatures before energizing to prevent condensate from forming on circuitry. 21. Fire and potable water piping should be checked for leaks from freeze damage after the heat has been restored to the facility and water turned back on. 22. Notify public/customers when it is safe to use the drinking water again.	
V. Report of Findings	23. All the components of the incident should be correlated and established in writing. This would include how the response was managed and suggestions to improve the facility / community response in the future. The report should incorporate all relevant data from the incident and suggested changes in the emergency response plans and procedures. 24. Suggestions from the report should be submitted to the governing board/individuals for evaluation and actions to be taken.	<i>To learn from the incident and reduce the likelihood of future such events, a Report of Findings should be provided to the decision makers for the Utility so consideration can be given for changes in facility structure, security, procedures or personnel.</i>
VI. AP-7 Revision Dates	09/30/2020	

ACTION PLAN 7A – Natural Event - Flood

ACTION PLAN 7A – Natural Event (Flood)												
AP Summary:	This Action Plan applies to flooding events. In general, these events occur with reasonable lead times, and it is possible to take proactive measures, as outlined below. Response and recovery can be time consuming during flood events, as they can involve loss of electrical power supply, damage of structures and equipment, disruptions of service, and injuries to utility personnel.											
Initiation and Notification:	<p>This AP should be initiated upon official notification of either a flood “watch” (a flood is possible in your area), or a flood “warning” (flooding is already occurring or will occur soon in your area). Such information will almost certainly be issued in the form of forecasts from the National Weather Service (NWS) and other governmental agencies. Also initiate if actual flooding is discovered.</p> <p>Notify</p> <ul style="list-style-type: none"> • WUERM • Alternate WUERM <p>The WUERM will make the decision to contact local response authorities to request possible assistance.</p>	<p><i>Links to specific RFCs can be found at the following website: http://www.nws.noaa.gov/oh/hic/rfc.html</i></p> <p><i>The NWS maintains 13 regional River Forecast Centers (RFC) that are responsible for issuing flood forecasts synthesized from hydro-meteorological data. These centers offer current river conditions and observations, as well as forecast and guidance for both major river and flash floods, hydrographs for gauging stations, and flood outlook potentials. Be aware that floods often occur without local precipitation as a result of precipitation upstream.</i></p> <p><i>Flash flood guidance values can also typically be obtained via your local RFC. These values show data suggesting the amount of rain necessary over 1-, 3-, and 6-hour periods that could cause flash floods.</i></p> <p><i>While major floods can take several hours to days to develop, flash floods can take only a few minutes to a few hours to develop.</i></p> <p><i>Notification phone numbers can be obtained from the current Callback List.</i></p>										
Equipment Identified:	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Equipment</th> <th style="width: 50%;">Location</th> </tr> </thead> <tbody> <tr> <td>Heavy equipment</td> <td>Corporation Yard</td> </tr> <tr> <td>flooded signs</td> <td></td> </tr> <tr> <td>sand</td> <td></td> </tr> <tr> <td>pumps</td> <td></td> </tr> </tbody> </table>	Equipment	Location	Heavy equipment	Corporation Yard	flooded signs		sand		pumps		This equipment is available to assist in the execution of this AP.
Equipment	Location											
Heavy equipment	Corporation Yard											
flooded signs												
sand												
pumps												
Specific Activities:												

**ACTION PLAN 7A – Natural Event
(Flood)**

<p>I. Assess the Problem</p>	<p>If a Flood Watch or Warning is received:</p> <ol style="list-style-type: none"> 1. Implement “Emergency Flood Control Procedures” plan. 2. Contact local representative of NWS for additional information on exact location and probable extent (stage) of flooding, relative to utility facilities. 3. Use site maps or other available information to assess location of all facilities for location in flood plain 4. Prioritize pre-flooding activities on basis of flooding potential (in part, based on location) 5. If flooding has already occurred: 6. Conduct site assessment from nearest safe location 7. Based on peak flood stage, predict and build inventory of equipment likely to be most affected 8. List equipment needed to restore water service when flood waters recede. 	<p><i>Flood damage is proportional to the to the volume and the velocity of the water. Floods are extremely dangerous because they destroy through inundation and soaking as well as the incredible force of moving water. High volumes of water can move heavy objects and undermine roads and bridges. Flooding can also facilitate other hazards such as landslides, or cause other hazards such as material hazard events</i></p>
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**ACTION PLAN 7A – Natural Event
(Flood)**

<p>II. Isolate and Fix the Problem</p>	<p>The following steps should be taken in preparation for the event:</p> <ol style="list-style-type: none"> 1. Activate Emergency Operations Center (EOC). 2. Assemble essential personnel and designate duties, such as: <ul style="list-style-type: none"> • Elevate in-place or remove water-sensitive equipment within structures to prevent flood damage. • Anchor fuel tanks. • Elevate electrical system components. • Take appropriate flood-proofing steps (sandbags or other). • Install sewer backflow valves. • Flood-proof or elevate heating, cooling, and ventilating equipment. • Assemble and stage mobile stand-by generators and auxiliary water pumps. 	<p><i>Steps in advance of flooding obviously will be different than steps in reaction to flooding. Both may be needed for any one flooding event.</i></p>
<p>II. Isolate and Fix the Problem</p>	<ol style="list-style-type: none"> 3. Notify neighboring utilities or other sources of emergency response support if manpower or equipment will be needed. 4. The IO is to notify customers, media, and state and local authorities that service may be disrupted and/or that demand reductions may be necessary. 5. Pre-test and/or initiate emergency communications plan 6. Consider shut-down if flooding appears imminent. 	<p><i>Flood water may have to be pumped out of facilities before utility equipment can be restored.</i></p> <p><i>Decision to shutdown must balance protection of utility equipment and maintenance of fire flows.</i></p>

ACTION PLAN 7A – Natural Event (Flood)

<p>III. Monitoring</p>	<p>Observe the following recommended practices during the flood event:</p> <ul style="list-style-type: none"> • Take pictures of the damage, both of buildings and their contents, for insurance claims. • Instruct Utility personnel to avoid floodwaters whenever possible. • If a vehicle stalls in rapidly rising waters, abandon it immediately and climb to higher ground. Vehicles can be swept away in two feet of water. • Stay out of any building if floodwaters remain around the building. • Avoid smoking inside buildings. Smoking in confined areas can cause fires. • Wear sturdy shoes. The most common injury following a disaster is cut feet. • Use battery-powered lanterns or flashlights when examining buildings. Battery-powered lighting is the safest and easiest, preventing fire hazard for the user, occupants, and building. • Look for fire hazards. There may be broken or leaking gas lines, flooded electrical circuits, or submerged furnaces or electrical appliances. Flammable or explosive materials may travel from upstream. Fire is the most frequent hazard following floods. • The WUERM or IO is to communicate with customers and the Local Emergency Planning Committee (LEPC) as to current conditions. 	<p><i>If it is moving swiftly, even water six inches deep can knock an individual off their feet. Many people are swept away wading through floodwaters, resulting in injury or death. Floodwaters may still be rising. Staff may not be able to see on the surface how fast floodwater is moving or see holes and submerged debris.</i></p> <p><i>Floodwaters often undermine foundations, causing sinking, floors can crack or break and buildings can collapse. Buildings may have hidden damage that makes them unsafe such as gas leaks or electric hazards.</i></p>
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**ACTION PLAN 7A – Natural Event
(Flood)**

<p>IV. Recovery And Return to Safety</p>	<p>Once floodwaters recede, the following may be of relevance:</p> <ul style="list-style-type: none"> • Check insurance policy for procedures to recover losses, including the national Flood Insurance Program. • Inspect foundations for cracks or other damage. • Check power lines for damages • Arrange for alternate source of electrical power or fuel for diesel generators, sufficient for period of outage following flood. See AP-7 Power Outage. • Throw away all food that has come into contact with floodwaters. • Inspect, clean, rebuild, replace all affected equipment as necessary • Contact state and local authorities to determine if there are any restrictions on disposal of materials and debris removed from the site or if a temporary discharge permit (NPDES or other) is needed for the water pumped from tanks and other flooded structures. 	<p><i>More information can be found here:</i> http://www.fema.gov/nfip</p> <p><i>Cracks and damage to a foundation can render a building uninhabitable.</i></p> <p><i>See AP-7 Power Outage</i></p> <p><i>Contaminated floodwater contains bacteria and germs. Eating foods exposed to flood waters can make personnel very sick.</i></p> <p><i>In the longer-term, mitigation against loss of life and property caused by flood events is principally accomplished before the events, through sensible floodplain management and regulation. This involves strategies to modify flooding and to modify infrastructure to reduce likelihood of damage.</i></p> <p><i>Guidelines to a variety of flood-proofing and elevation methods are available from FEMA and NOAA.</i></p>
<p>V. Report of Findings</p>	<p>Assemble relevant personnel to review effectiveness of action plan and reinforce lessons learned.</p>	
<p>VI. AP-8A Revision Dates</p>	<p>09/30/2020</p>	

ACTION PLAN 7B – Natural Event - Earthquake

ACTION PLAN 7B – Natural Event (Earthquake)			
AP Summary:	<p>This Action Plan applies to earthquakes. Note that this Action Plan may need to be implemented in conjunction with other Action Plans (for example, power outage) as necessary.</p> <p>Response and recovery can be time consuming especially during destructive earthquake events, as they can involve loss of electrical power supply, damage of structures and equipment, disruptions of service, and injuries to utility personnel.</p> <p>Earthquake is considered to be one of the most potentially destructive threats to life and property in Clovis. According to the California Division of Mines and Geology, no active faults exist in the City of Clovis, however, a moderate to severe seismic incident on any of several fault zones in relative close proximity to the city is expected to cause:</p> <ul style="list-style-type: none"> • Damage to water and sewage systems. • Significant numbers of fatalities and injuries. • Disruption of communication systems. • Broken gas mains and petroleum pipelines, resulting in numerous fires. • Disruption of surface transportation arteries. • Extensive property damage, particularly to pre-1930s un-reinforced masonry structures. • Competing requests for scarce mutual aid response resources. 		
Initiation and Notification:	<p>This AP should be initiated upon an earthquake event occurring.</p> <p>Notify</p> <ul style="list-style-type: none"> • WUERM • Alternate WUERM <p>The WUERM will make the decision to contact local response authorities to request possible assistance.</p>		
Equipment Identified:	Equipment	Location	<i>This equipment is available to assist in the execution of this AP.</i>
	Heavy equipment	Corporation Yard	

ACTION PLAN 7C – Natural Event - Drought

ACTION PLAN 7C – Natural Event (Drought)		
AP Summary:	This Action Plan applies to drought events. Response and recovery can be time consuming during times of drought based on the duration and severity of the drought as it may have impacts on the water distribution supply. For instance, times of drought may have impacts on the already declining groundwater levels in the Kings Groundwater Subbasin as well as disrupting water flow through the Enterprise Canal via the Kings River which provides surface water to the City.	
Initiation:	This AP should be initiated during a severe drought event with guidance from the City’s Urban Water Management Plan.	<i>The Urban Water Management Plan may be viewed online at https://cityofclovis.com/public-utilities/water/resources/.</i>

ACTION PLAN 8 – Water Supply Interruption

ACTION PLAN 8 – Water Supply Interruption		
AP Summary:	This action plan applies to water supply interruptions. These events will vary in scale from compromised incremental supply volumes to complete, catastrophic loss of water supply. The ability for a utility to successfully respond to a catastrophic water supply interruption will be highly correlated to the existence of interconnections and alternative sources of supply.	
Initiation and Notification:	Catastrophic water supply interruptions will generally be identified by other events, such as physical equipment damage, severe weather or others, which are likely to have a specific direct action plan. Incremental interruptions due to longer-term events such as drought or acute loss of one source, will lead to a prescribed series of contingency measures, as outlined below.	<p><i>It is recognized that many utilities will already have an action plan in place to address this event.</i></p> <p><i>Notification phone numbers of appropriate City personnel may be obtained from the current Callback List.</i></p>
Equipment Identified:	Equipment	Location
	<i>This equipment is available to assist in the execution of this AP.</i>	
Specific Activities:		
I. Assess the Problem	<p>There are a number of potential levels of severity involved in a water supply interruption. A series of stages of action corresponding to increasing impacts on water are:</p> <ul style="list-style-type: none"> • Normal Conditions • Water Alert • Water Warning • Water Crisis • Water Emergency 	
II. Isolate and Fix the Problem	<p>Each stage has specific customized definitions, in terms of percent of Water Supply reduction, with appropriate actions or restrictions at each stage. Utilities will have a series of escalating penalties for successive violations of restrictions. These stages are:</p> <p>Normal Conditions – Normal conditions apply. Water is available; but in arid environments there are specific watering days for various addresses or penalties for excess watering.</p>	

ACTION PLAN 8 – Water Supply Interruption

II. Isolate and Fix the Problem

Water Alert -- A 5% or greater reduction in water usage is to meet the immediate needs of customers. Voluntary conservation encouraged. The water shortage situation is explained to the public and voluntary water conservation is requested (see standard press releases). [City of Clovis](#) maintains an ongoing public information campaign consisting of distribution of literature, speaking engagements, bill inserts, and conversation messages printed in local newspapers.

Water Warning -- A 15% or greater reduction in water usage is to meet the immediate needs of customers. Water supply shortage is moderate. The utility aggressively continues its public information and education programs. Consumers are asked for a 15 percent or greater voluntary or mandatory water use reduction. Additional landscape irrigation restrictions may be implemented. Businesses may be asked not to serve water in restaurants unless requested.

Water Crisis – A 30% or greater reduction in water usage is to meet the immediate needs of customers. Water supply shortage is severe. Additional requirements may include: Dramatic landscape irrigation restrictions; Restrictions on use of potable water to fill or refill new swimming pools, artificial lakes, ponds, or streams until the water crisis is declared over; Prohibition of water use for ornamental ponds and fountains; Restrictions on washing of automobiles and equipment (such as requiring that it shall be done on the lawn or at a commercial establishment that uses recycled or reclaimed water); Restriction of flushing of sewers or fire hydrants to cases of emergency and essential operations, and; Introduction of a permanent water meter on existing non-metered services and/or flow restrictors on existing metered services at customer’s expense upon receipt of the second water violation.

ACTION PLAN 8 – Water Supply Interruption		
II. Isolate and Fix the Problem	<p>Water Emergency -- A 50% or greater reduction in water usage is to meet the immediate needs of customers. Water shortage is critical. Additional requirements may include: Disallowing all landscape irrigation; Disallowing potable water use for construction purposes such as dust control, compaction, or trench jetting. In addition, large industrial users, for example canneries and other food manufacturers, may be required to reduce or cease all water use.</p> <p>In addition to these incremental stages, the Utility should prepare for a catastrophic interruption of water supplies. A catastrophic event that constitutes a proclamation of a water shortage would be any event, either natural or manmade, that causes a severe water supply interruption, synonymous with or with greater severity than the “Water Warning” water supply shortage condition outlined above.</p>	
III. Monitoring	<p>Communication of water supply interruption stages should be handled according to the identified public notification procedures.</p> <p>Press releases should also be handled according to the identified utility procedures.</p>	<i>See Appendix for Press Releases</i>

ACTION PLAN 8 – Water Supply Interruption

<p>IV. Recovery and Return to Safety</p>	<p>Alternative water supply options have been identified in the utility emergency response plan (ERP). In the event of a catastrophic, immediate need, it is likely these will be utilized. This includes information on local interconnections with neighboring sources, area water haulers, temporary storage options, etc.</p> <p>If there have been lines with no water or negative pressures, a precautionary boil order should be issued by the utility until line tests on two consecutive days show the lines to be safe. Chlorine residuals should be increased temporarily.</p> <p>The water system may have to valve off portions of the distribution system until above ground storage tanks are refilled. Valved off areas have the potential for external contamination to enter the system through leaking joints or cracked pipe. Before placing a valved off area back in service, the system should issue a precautionary boil order, increase the chlorine residual throughout the system and obtain safe bacteriological samples from representative areas of the system on two consecutive days. The precautionary boil order may be lifted once the required safe samples are obtained.</p> <p>The system should be repressurized slowly to avoid water hammer and the potential for damage to the lines.</p> <p>Air should be bled from lines as they refill since entrapped air can impede flows and may cause line damage.</p>	<p><i>See ERP Alternative Water Sources section in this ERP.</i></p> <p><i>See boil order release in Appendix.</i></p>
<p>V. Report of Findings</p>	<p>In addition to completing the appropriate filings with local authorities and agencies, it is recommended that the Utility assemble the relevant personnel to review the effectiveness of the action plan and reinforce lessons learned in the process.</p>	
<p>VI. AP-9 Revision Dates</p>		

ACTION PLAN 9 – Bomb Threat (Telephone/In Person)

ACTION PLAN 9 – Bomb Threat (Telephone / In Person)		
AP Summary:	This Action Plan applies to the receipt of a bomb threat via telephone or in person. It is important to develop this plan in counsel with the local police and the local fire department services.	
Initiation and Notification:	Initiate this AP as soon as the bomb threat is received As soon as possible, notify: <ul style="list-style-type: none"> • 911 • WUERM The WUERM should then notify others as appropriate. Examples include: <ul style="list-style-type: none"> • Local Fire Department • FBI • ATF 	<i>Notification phone numbers of appropriate City personnel may be obtained from the current Callback List.</i>
Equipment Identified:	Equipment	Location
	Phones	Corporation Yard
Specific Activities:		
I. Assess the Problem	As a rule, all bomb threats should be considered credible until proven otherwise.	<i>Due to the diversity of facilities, each utility is encouraged to undertake an audit of their own facilities and consult with local emergency services such as fire and police while creating their evacuation plan. If it is not possible during the creation, then certainly consult before instituting the plan.</i>

ACTION PLAN 9 – Bomb Threat (Telephone / In Person)

<p>II. Isolate and Fix the Problem</p>	<p>Threat received via Telephone</p> <ol style="list-style-type: none"> 1. Remain Calm 2. If possible record the message 3. Fill out Bomb Threat Checklist while performing the following: <ol style="list-style-type: none"> a. Listen b. Be Calm and Courteous c. Keep the caller on the line as long as possible d. Ask him/her to repeat the message e. Record every word spoken by the person f. Do not speak to anyone unless directed to do so g. WHEN caller hangs up, THEN implement City of Clovis policy to either hang up or not hang up the phone. 4. Notify the WUERM if not already done 5. Call the local police (911 or the emergency number for your area) and report the threat immediately. 6. Implement the City of Clovis policy on searching for the bomb. 7. Implement the City of Clovis policy evacuation. 8. IF evacuating building, THEN Take the Bomb Threat Checklist with you. 	<p><i>It is always desirable that more than one person listens in on the call. To do this, have a pre-established signaling system in place to engage another listener if possible.</i></p> <p><i>Not hanging up the phone may be useful to law enforcement authorities in tracing the call. Hanging up and dialing *57 (where available) may allow a trace of the call. Consult with City of Clovis management and local law enforcement.</i></p> <p><i>Develop a plan for conducting a bomb search. Establish time considerations in the plan commensurate with utility size and resources. For example, if time until detonation is less than 1/2 hour, immediate evacuation may be advisable. If greater than 1/2 hour a search should be conducted. Consult with the local police, local fire department, or other local authority to determine who will conduct the search. In most cases, because of their familiarity with the facility, the search is best conducted by utility personnel, however this requires that they be trained properly in search techniques. The police or fire department may be available to assist in the training or be able to provide advice as to who can provide the training.</i></p>
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**ACTION PLAN 9 – Bomb Threat
(Telephone / In Person)**

<p>II. Isolate and Fix the Problem</p>	<ul style="list-style-type: none"> • Make a quick visual sweep of your area for any unusual items and proceed to a designated gathering area sufficiently located away from the building. • Direct any media questions to the Information Officer, IO. <p>If a bomb is found note:</p> <ul style="list-style-type: none"> • Exact location of the object • Size of object • Type of container or wrappings and marking on package • Any sound coming from object <p>Threat received in person:</p> <ol style="list-style-type: none"> 1. Cooperate with the individual or group 2. Try to get the attention of a co-worker. 3. Co-worker call 911 4. Co-worker call WUERM 5. Create a description of the adversary using a Suspect Description Form (See Appendix). 6. Direct any media questions to the Information Officer, IO. 	<p><i>Let the trained bomb technician determine what is or is not a bomb.</i></p> <p><i>Note that a bomber wishing to cause personal injuries could place a bomb near an exit normally used to evacuate and then call in the threat.</i></p>
<p>III. Monitoring</p>	<p>During a search of the building, rapid two-way communication is essential.</p> <ol style="list-style-type: none"> 1. Use existing installed telephones. 2. Alert medical personnel to stand by in the event of an accident caused by the explosion of the devise. 3. Alert fire department to stand by. <p>In event of an explosion:</p> <ol style="list-style-type: none"> 1. Get out of the building as quickly as calmly as possible. 2. IF items are falling from bookshelves or the ceiling, THEN get under a sturdy table or desk until the situation has stabilized enough for your safe passage. 3. Ensure your own safety before trying to help others. 	<p><i>DO NOT USE RADIOS OR OTHER WIRELESS DEVICES DURING A SEARCH.</i> <i>The radio transmission energy can cause premature detonation of an electric initiator (blasting cap)</i></p>
<p>IV. Recovery</p>	<p>IF evacuated, THEN do not return to the building until it is determined safe by appropriate authorities</p>	

<p style="text-align: center;">ACTION PLAN 9 – Bomb Threat (Telephone / In Person)</p>		
and Return to Safety		
V. Report of Findings	Debrief after every bomb threat response to improve procedures.	<i>The Utility WUERM should file an internal report for the Utility's files and also provide information as requested to Local Law Enforcement and other outside agencies</i>
VI. AP 10A Revision Dates	09/30/2020	

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Appendix C

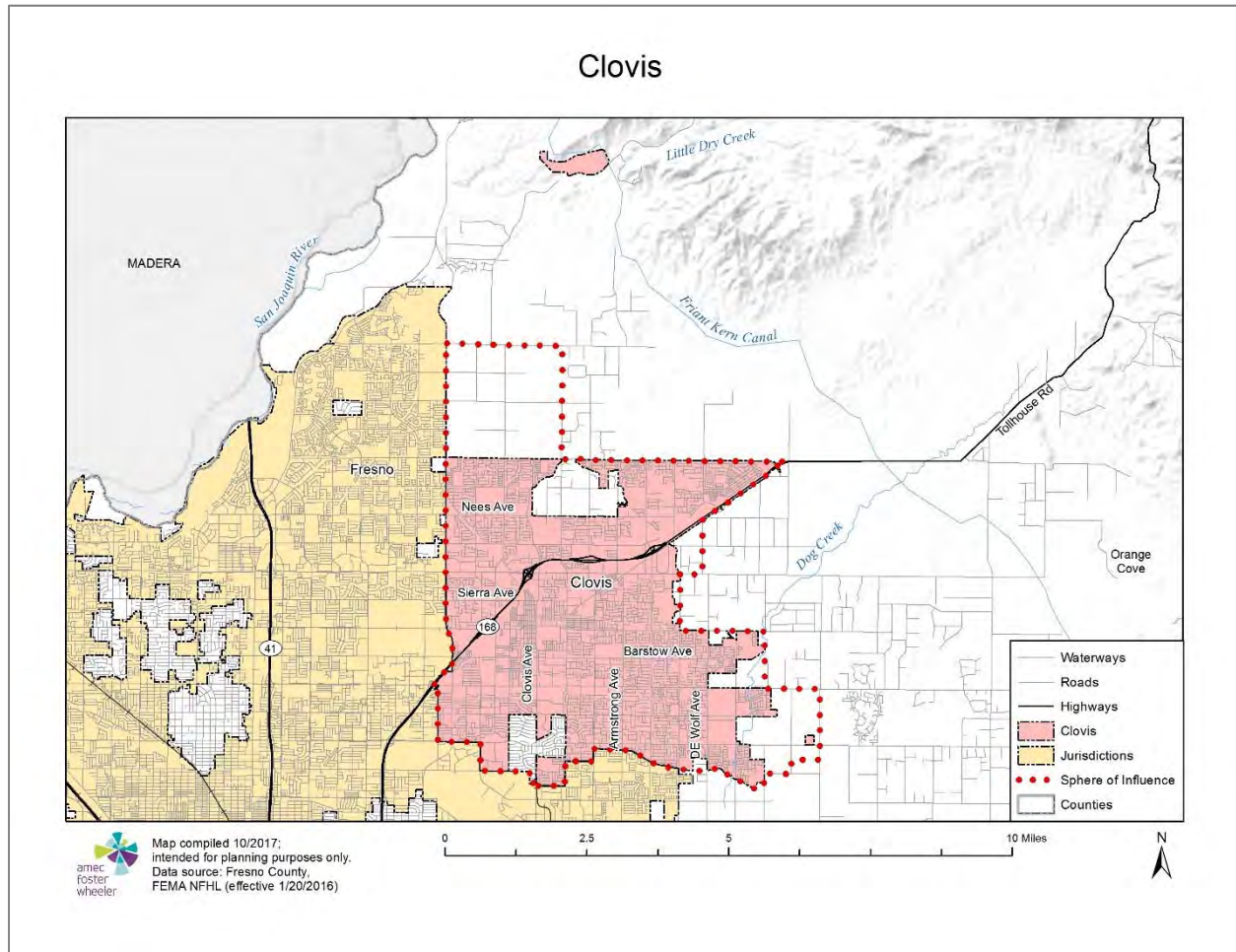
Hazard Mitigation Plan

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A.1 Community Profile

Figure A.1 displays a map and the location within Fresno County of the City of Clovis and its Sphere of Influence.

Figure A.1: The City of Clovis



A.1.1 Geography and Climate

Located in the northeast quadrant of the Fresno-Clovis Metropolitan Area in northern Fresno County, Clovis is situated in the midst of the agriculturally rich San Joaquin Valley. It covers a roughly 21,108-acre area that encompasses the City of Clovis and unincorporated Fresno County, inclusive of the City’s Sphere of Influence. Over the past decade, the City has annexed land in the southeast near Dog Creek and expanded its Sphere of Influence in the north. All lands outside of the City’s Sphere of Influence are regulated by the Fresno County General Plan and zoning designations. However, state law requires that cities plan for areas outside of their immediate jurisdiction if the areas have a direct relationship to planning needs.

Clovis consists of three distinct geographical areas: The City, which represents the incorporated City within the City limit boundaries; the Sphere of Influence, which corresponds to the City's existing Sphere of Influence; and the study area, which includes unincorporated Fresno County lands outside of the City's Sphere of Influence. Immediately beyond Clovis to the northeast are the western foothills of the Sierra Nevada Mountains. The City of Fresno and its Sphere of Influence are located to the southwest. The southwestern portion of Clovis is characterized by mostly urbanized land uses, whereas the northern and eastern portions of Clovis are predominantly rural in nature, comprised of agricultural, rural, residential, and vacant land uses.

Clovis has an average annual temperature of 63.2°F and receives 10.2 inches of rain. While the average is relatively temperate, summer and winter months bring unique weather patterns to the region. During the winter, high temperatures hover around 55°F. Combined with the regional geography and precipitation during this time, Clovis experiences numerous days with dense fog, which has its greatest impact on transportation: accident rates jump 50 percent on foggy days.

During the summer months, the region has extended periods where temperatures exceed 100°F. While the average temperature is 90°F during the summer, these extended heat waves impact the medically fragile, elderly, and animal populations. In addition to heat waves, the Fresno County region continues to suffer regular drought due to lower than normal snowpack in the Sierra Nevada, which supplies water for agricultural use and replenishes the groundwater supply.

A.1.2 History

The City of Clovis was named after the spirited pioneer, Clovis M. Cole, who spent nearly all of his life in the vicinity. The area was known for the thousands of acres of wheat that he had cultivated. The first thoughts of settlement, however, are credited to Padre Martin, who explored the area in 1806 while searching for a mission site. Missionaries and trappers were the first nonnative people to roam the area. Miners soon followed during the gold rush, displacing the many Native American tribes that were settled in the foothills and near the rivers.

Another early settler, Marcus Pollasky, proposed and coordinated the construction of a railroad through the grain, cattle, and mining country and into the timber-rich forests of the nearby Sierra. The City eventually grew up around the San Joaquin Division of the Southern Pacific Railroad, which played an important role in the founding and growth of Clovis. In addition to the arrival of the railroad, the completion of the 42-mile-long Shaver log flume, development of the 40-acre Clovis mill and finishing plant, expansion of grain production, and the livestock industry all contributed to the founding of Clovis in 1891. The City was incorporated in 1912.

A.1.3 Economy

The City's economic base consists of retail sales and services and light manufacturing. Availability of housing, quality hospital care, excellent schools with modern facilities, responsive safety

services, a mild climate, access to varied recreational opportunities, and strong community identity all contribute to Clovis’ reputation as a great place to live.

Clovis has actively maintained a small-town community spirit as envisioned by its founders, exemplified by such community events as the annual Rodeo Days, Big Hat Days, and Clovisfest celebration. This community pride, combined with Clovis’ unique growth opportunities, continues to attract new residents, developers, businesses, and industries to the City.

Select estimates of economic characteristics for the City of Clovis are shown in Table A.1.

Table A.1: City of Clovis’ Economic Characteristics, 2015

Characteristic	City of Clovis
Families below Poverty Level	11.7%
All People below Poverty Level	13.8%
Median Family Income	\$72,787
Median Household Income	\$62,666
Per Capita Income	\$28,686
Population in Labor Force	49,156
Population Employed*	44,086
Unemployment	10.0%
Number of Companies	7,100

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Excludes armed forces

Table A.2 and Table A.3 show how the City of Clovis’ labor force breaks down by occupation and industry based on estimates from the 2015 American Community Survey.

Table A.2: City of Clovis’ Employment by Occupation, 2015

Occupation	# Employed	% Employed
Sales and Office Occupations	11,587	26.3
Management, Business, Science, and Arts Occupations	17,568	39.8
<i>Management, Business, and Financial Occupations</i>	<i>(6,296)</i>	<i>(14.3)</i>
<i>Computer, Engineering, and Science Occupations</i>	<i>(1,871)</i>	<i>(4.2)</i>
<i>Education, Legal, Community Service, Arts, and Media Occupations</i>	<i>(5,570)</i>	<i>(12.6)</i>
<i>Healthcare Practitioner and Technical Occupations</i>	<i>(3,831)</i>	<i>(8.7)</i>
Service Occupations	7,971	18.1
Production, Transportation, and Material Moving Occupations	3,732	8.5
Natural Resources, Construction, and Maintenance Occupations	3,228	7.3
Total	194,640	100.0

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

Table A.3: City of Clovis' Employment by Industry, 2015

Industry	# Employed	% Employed
Educational Services, and Health Care and Social Assistance	12,511	28.4
Retail Trade	4,850	11.0
Professional, Scientific, and Mgmt., and Administrative and Waste Mgmt. Services	4,354	9.9
Manufacturing	2,843	6.4
Arts, Entertainment, and Recreation, and Accommodation, and Food Services	3,953	9.0
Construction	2,376	5.4
Finance and Insurance, and Real Estate and Rental and Leasing	2,686	6.1
Public Administration	3,734	8.5
Other Services, Except Public Administration	1,992	4.5
Wholesale Trade	1,557	3.5
Transportation and Warehousing, and Utilities	1,699	3.8
Agriculture, Forestry, Fishing and Hunting, and Mining	664	1.5
Information	867	2.0
Total	194,640	100.0

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

A.1.4 Population

In 2015, according to the U.S. Census Bureau's American Community Survey 5-Year Estimates, the total population for the City of Clovis was estimated at 100,437. Select demographic and social characteristics for the City of Clovis from the 2015 American Community Survey are shown in Table A.4.

Table A.4: City of Clovis' Demographic and Social Characteristics, 2015

Characteristic	City of Clovis
Gender/Age	
Male	48.3%
Female	51.7%
Median age	34.3
Under 5 years	6.5%
Under 18 years	27.4%
65 years and over	11.7%
Race/Ethnicity*	
White	71.1%
Asian	10.7%
Black or African American	2.7%
American Indian/Alaska Native	1.1%
Hispanic or Latino (of any race)	27.8%
Education	
High school graduate or higher	88.9%
Disability Status	
Population 5 years and over with a disability	12.9%

Source: U.S. Census Bureau American Community Survey 2011-2015 5-Year Estimates, www.census.gov/

*Of the 96.1% reporting one race

A.2 Hazard Identification and Summary

Clovis’ planning team identified the hazards that affect the City and summarized their frequency of occurrence, spatial extent, potential magnitude, and significance specific to Clovis (see Table A.5). In the context of the plan’s planning area, there are no hazards that are unique to Clovis.

Table A.5: City of Clovis—Hazard Summaries

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Agricultural Hazards	Limited	Highly Likely	Critical	Medium
Avalanche	N/A	N/A	N/A	N/A
Dam Failure	Extensive	Occasional	Critical	Medium
Drought	Significant	Likely	Limited	Medium
Earthquake	Significant	Occasional	Catastrophic	Medium
Flood/Levee Failure	Extensive	Likely	Critical	High
Hazardous Materials Incident	Significant	Likely	Critical	High
Human Health Hazards:				
Epidemic/Pandemic	Extensive	Occasional	Catastrophic	Medium
West Nile Virus	Limited	Highly Likely	Negligible	Low
Landslide	N/A	N/A	N/A	N/A
Severe Weather				
Extreme Cold/Freeze	Significant	Highly Likely	Negligible	Medium
Extreme Heat	Extensive	Highly Likely	Limited	Medium
Fog	Extensive	Likely	Negligible	Medium
Heavy Rain/Thunderstorm/Hail/Lightning	Extensive	Highly Likely	Limited	Low
Tornado	Extensive	Occasional	Negligible	Low
Windstorm	Extensive	Likely	Limited	Medium
Winter Storm	Extensive	Highly Likely	Negligible	Medium
Soil Hazards:				
Erosion	No Data	Likely	No Data	Low
Expansive Soils	No Data	Occasional	No Data	Low
Land Subsidence	Limited	Occasional	No Data	Low
Volcano	Extensive	Unlikely	Negligible	Low
Wildfire	Extensive	Highly Likely	Critical	Medium
Geographic Extent Limited: Less than 10% of planning area Significant: 10-50% of planning area Extensive: 50-100% of planning area		Magnitude/Severity Catastrophic—More than 50 percent of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths Critical—25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability Limited—10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability Negligible—Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid		
Probability of Future Occurrences Highly Likely: Near 100% chance of occurrence in next year, or happens every year. Likely: Between 10 and 100% chance of occurrence in next year, or has a recurrence interval of 10 years or less. Occasional: Between 1 and 10% chance of occurrence in the next year, or has a recurrence interval of 11 to 100 years. Unlikely: Less than 1% chance of occurrence in next 100 years, or has a recurrence interval of greater than every 100 years.		Significance Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact		

A.3 Vulnerability Assessment

The intent of this section is to assess Clovis' vulnerability separate from that of the planning area as a whole, which has already been assessed in Section 4.3 Vulnerability Assessment in the main plan. This vulnerability assessment analyzes the population, property, and other assets at risk to hazards ranked of medium or high significance that may vary from other parts of the planning area.

The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality or special district to complete during the original outreach process in 2009. Information collected was analyzed and summarized in order to identify and rank all the hazards that could impact anywhere within the County, as well as to rank the hazards and identify the related vulnerabilities unique to each jurisdiction. In addition, the City of Clovis' HMPC team members were asked to validate the matrix that was originally scored in 2009 based on the experience and perspective of each planning team member relative to the City of Clovis.

Each participating jurisdiction was in support of the main hazard summary identified in the base plan (See Table 4.1). However, the hazard summary rankings for each jurisdictional annex may vary slightly due to specific hazard risk and vulnerabilities unique to that jurisdiction (See Table A.5). Identifying these differences helps the reader to differentiate the jurisdiction's risk and vulnerabilities from that of the overall County.

Note: The hazard "Significance" reflects overall ranking for each hazard, and is based on the City of Clovis' HMPC member input from the Data Collection Guide and the risk assessment developed during the planning process (see Chapter 4 of the base plan), which included a more detailed qualitative analysis with best available data.

The hazard summaries in Table A.5 reflect the hazards that could potentially affect City. Those of Medium or High significance for the City of Clovis are identified below. The discussion of vulnerability for each of the following hazards is located in Section A.3.2 Estimating Potential Losses. Based on this analysis, the priority hazards (High Significance) for mitigation include flood/levee failure and hazardous materials incidents.

- agricultural hazards
- dam failure
- drought
- earthquake
- flood/levee failure
- hazardous materials incident
- human health hazards: epidemic/pandemic
- severe weather: extreme cold/freeze, extreme heat, fog, windstorm, winter storm
- wildfire

Other Hazards

Hazards assigned a Significance rating of Low and which do not differ significantly from the County ranking (e.g., Low vs. High) are not addressed further in this plan, and are not assessed individually for specific vulnerabilities in this section. In the City of Clovis, those hazards are as follows:

- human health hazards: West Nile Virus
- severe weather: heavy rain/thunderstorm/hail/lightning, tornado
- soil hazards
- volcano

Additionally, the City’s Committee members decided to rate several hazards as Not Applicable (N/A) to the planning area due to a lack of exposure, vulnerability, and no probability of occurrence. **Avalanche** and **landslide** are considered Not Applicable (N/A) to the City of Clovis.

A.3.1 Assets at Risk

This section considers Clovis’ assets at risk, including values at risk, critical facilities and infrastructure, historic assets, economic assets, and growth and development trends.

Values at Risk

The following data on property exposure is derived from the Fresno County 2017 Parcel and Assessor data. This data should only be used as a guideline to overall values in the City as the information has some limitations. The most significant limitation is created by Proposition 13. Instead of adjusting property values annually, the values are not adjusted or assessed at fair market value until a property transfer occurs. As a result, overall value information is likely low and does not reflect current market value of properties. It is also important to note that in the event of a disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a loss. Table A.6 shows the exposure of properties (e.g., the values at risk) broken down by property type for the City of Clovis.

Table A.6: 2017 Property Exposure for the City of Clovis by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value
Agricultural	9	9	\$2,557,614	\$2,557,614	\$5,115,228
Commercial	857	3,214	\$938,241,308	\$938,241,308	\$1,876,482,616
Exempt	292	715	\$0	\$0	\$0
Industrial	226	439	\$122,817,146	\$184,225,719	\$307,042,865
Multi-Residential	593	7,233	\$521,005,521	\$260,502,761	\$781,508,282
Open Space	1	6	\$316,603	\$316,603	\$633,206
Residential	29,590	29,949	\$5,545,158,353	\$2,772,579,177	\$8,317,737,530
Total	31,568	41,565	\$7,130,096,545	\$4,158,423,181	\$11,288,519,726

Source: Fresno County 2017 Parcel and Assessor data

Since the 2009 Plan, the City of Clovis has experienced notable increases in commercial and residential properties and property values at risk. Compared to improved values from the Fresno County Assessor’s Office’s 2007 Certified Roll Values, commercial improved value has increased by 53.3 percent and total residential improved value has increased by 30.0 percent. Assets directly owned and controlled by the City of Clovis include a range of properties and equipment from each department.

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation.

An inventory of critical facilities in the City of Clovis from Fresno County GIS is provided in Table A.7 and illustrated in Figure A.2.

Table A.7: City of Clovis’ Critical Facilities

Facility Type	Counts
CalARP	2
Colleges & Universities	6
Courthouse	1
Fire Station	6
Health Care	1
Nursing Home	3
Police	2
School	37
Urgent Care	1
Total	59

Source: Fresno County, HIFLD 2017

FEMA’s Hazus-MH loss estimation software uses three categories of critical assets. Essential facilities are those that if damaged would have devastating impacts on disaster response and recovery. High potential loss facilities are those that would have a high loss or impact on the community. Transportation and lifeline facilities are the third category.

Essential Facilities

Essential facilities as identified by Hazus-MH are as follows:

- Clovis Fire/Police Department Headquarters—1233 Fifth Street
- Clovis Fire Stations
 - CFD 1—633 Pollasky
 - CFD 2—2300 Minnewawa
 - CFD 3—555 North Villa
 - CFD 4—2427 Armstrong

- CFD 5—790 North Temperance
- CFD Logistics Center—650 Fowler
- Clovis Community Medical Center—2755 Herndon
- Kaiser Medical Offices—2071 Herndon
- Central Valley Indian Health Inc.— 20 North DeWitt

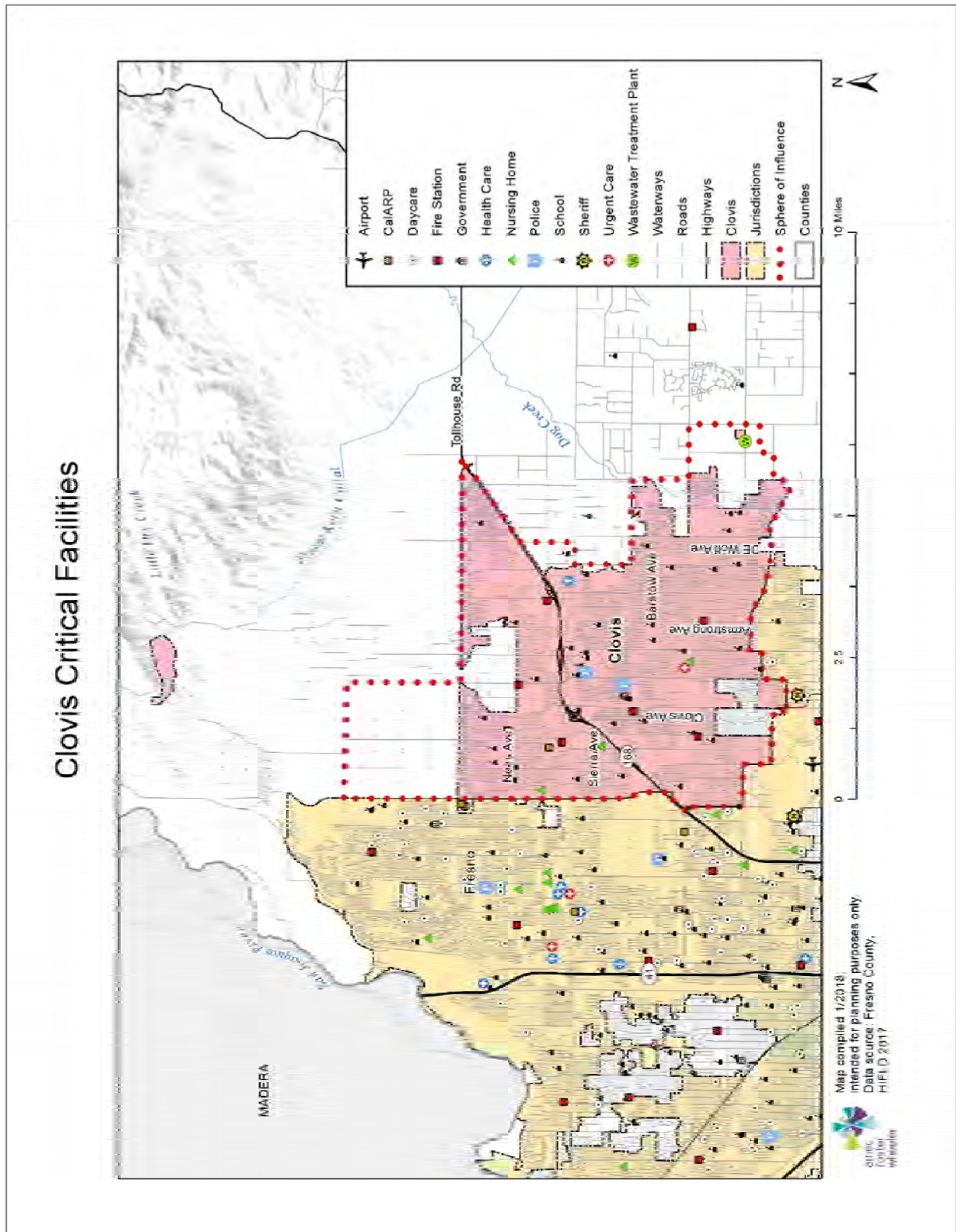
High Potential Loss Facilities

High potential loss facilities as identified by FEMA Hazus-MH are located throughout Clovis. Clovis works closely with the Clovis Unified School District, Fresno Metropolitan Flood Control District, and elder care property owners in monitoring and assessing facilities that fall into this category that are not owned by the City.

Transportation and Lifeline Facilities

Transportation and lifeline facilities are located in the center and northeast portion of Clovis. Highway 168 is the major thoroughfare through Clovis. The surface water treatment plant converts raw water from the Enterprise Canal (originating from the Kings River) into potable water for the residents of Clovis. This additional water production enables the City to turn off a portion of its groundwater wells throughout the year, resulting in the replenishment of the water table. The plant is capable of treating and delivering up to 15 million gallons per day of potable water to the City's customers (expandable to 45 million gallons per day).

Figure A.2: City of Clovis' Critical Facilities



Historic Resources

While the City of Clovis has no registered state or federal historic sites, there are several assets within Clovis that define the community and represent the City's history. Some of the historical sites of importance to Clovis are listed below.

- The Tarpey Depot—Northeast corner of Pollasky and Fourth
- First National Bank of Clovis/Clovis Museum—Southeast corner of Pollasky and Fourth*
- Carnegie Library Building—325 Pollasky*
- Hoblitt/Clovis Hotel —Northwest corner of Pollasky and Fourth
- American Legion—Southeast corner of Fourth and Woodworth
- Dr. McMurtry Home—431 Fourth
- May Case Home—420 Woodworth
- Whiton Home—446 Woodworth
- Burke Home—460 Woodworth
- United Methodist Church—Southwest corner of Woodworth and Fifth
- Mayo/Flume House—406 Fifth Street
- Masonic Temple—Northwest corner of Fifth and DeWitt
- The Jackson/Brandon Home—406 DeWitt
- Clovis M. Cole Home—304 Harvard
- Blasingame House—406 Oxford
- Richard Norrish Home—36 Pollasky
- Agnes G. de Jahn House—6 Pollasky
- Gibson Home 940—Third Street*
- Clovis Union High School—901 Fifth
- Clovis Water Towner—Southeast corner of Clovis
- Nestor Freitas Hall—500 Club
- John Good Building—Northwest corner of Clovis and Fifth
- McFarland Building—Southeast corner of Fifth and Pollasky
- Lewis Gibson Store—Northwest corner of Fifth and Pollasky
- Ingmire House—Seventh and Pollasky
- Macias House—931 Pollasky

* Fresno County Historical Landmarks

Economic Assets

Clovis is the home of two of the largest agile manufactures in the Central Valley—PELCO (1,600 employees) and Anlin (350 employees). Loss of either employer would have the net result of 2,000 displaced employees and sales tax revenue in the millions of dollars.

Growth and Development Trends

Clovis continues to be the premier choice for housing developers and home buyers in the Fresno/Clovis metropolitan area. The City has been aided by an outstanding school district, which ranks among the best in the nation. The City has a reputation for being a safe and friendly community to raise a family. However, land is costly and becoming very short in supply for housing, commercial, and industrial development. As Clovis strives to be more than a bedroom community, attention needs to be paid to preserving land for job generating activity in order to meet the jobs/housing balance.

Continued growth and development trends continue to be addressed at a local level and regional level through the Local Agency Formation Commission. These agencies coordinate to develop solutions that mitigate the impact of growth to land use, transportation, land use, air quality and access to services. Hazard vulnerability and mitigation is addressed through these governing bodies based on the subject matter expertise of local public safety agencies or special districts who have the jurisdictional authority in particular areas.

Table A.8 illustrates how the City has grown in terms of population and number of housing units between 2010 and 2015. As of 2015, the population of Clovis was 95,631 with an average growth rate of 5.03 percent.

Table A.8: City of Clovis' Change in Population and Housing Units, 2010-2015

2010 Population	2015 Population Estimate	Estimated Percent Change 2010-2015	2010 # of Housing Units	2015 Estimated # of Housing Units	Estimated Percent Change 2010-2015
95,631	100,437	+5.03	35,306	36,270	+2.73

Source: U.S. Census Bureau 2010 Decennial Census; American Community Survey 2011-2015 5-Year Estimates

Of the 36,270 housing units in Clovis, 95.2 percent are occupied. Owner-occupied units account for 60.2 percent of all occupied housing. Single family detached homes comprise 72.0 percent of the housing stock in the City.

The southwestern portion of Clovis is characterized by mostly urbanized land uses, whereas the northern and eastern portions of Clovis are predominantly rural in nature and characterized by agricultural, rural, residential and vacant land uses.

California state law (Government Code Section 65302) requires each city and county to have an adopted general plan, a blueprint for future growth and development that addresses issues directly related to land use decisions (see Figure A.3 for current land use designations). The law specifies that each general plan address seven issue areas: land use, circulation, open space, conservation, housing, safety, and noise. Adopted in 1993, the City of Clovis General Plan Program provides comprehensive planning for the future. It encompasses what the City is now, and what it intends to be, and provides the overall framework of how to achieve this future condition. Estimates are

made about future population, household types, and employment base, so that plans for land use, circulation, and facilities can be made to meet future needs. The general plan represents an agreement on the fundamental values and vision that is shared by the residents and the business community of Clovis and the surrounding area of interest. Its purpose is to provide decision makers and City staff with direction for confronting present issues as an aid in coordinating planning issues with other governmental agencies and for navigating the future.

Clovis' 2014 general plan is an update, expansion, and reorganization of the 1993 general plan. Significant changes to the planning area have occurred, expanding the boundaries of the new planning area to the north and east to include both a Sphere of Influence and a study area beyond the sphere. Pressure for development in the metropolitan area in and around the City of Clovis, the need for linkage to the regional transportation network, and the desire to establish Clovis in a pivotal position in the regional context warrant the decision to greatly expand the planning area as the foundation for the update and augmentation of the general plan. Clovis' general plan consists of eight separate elements:

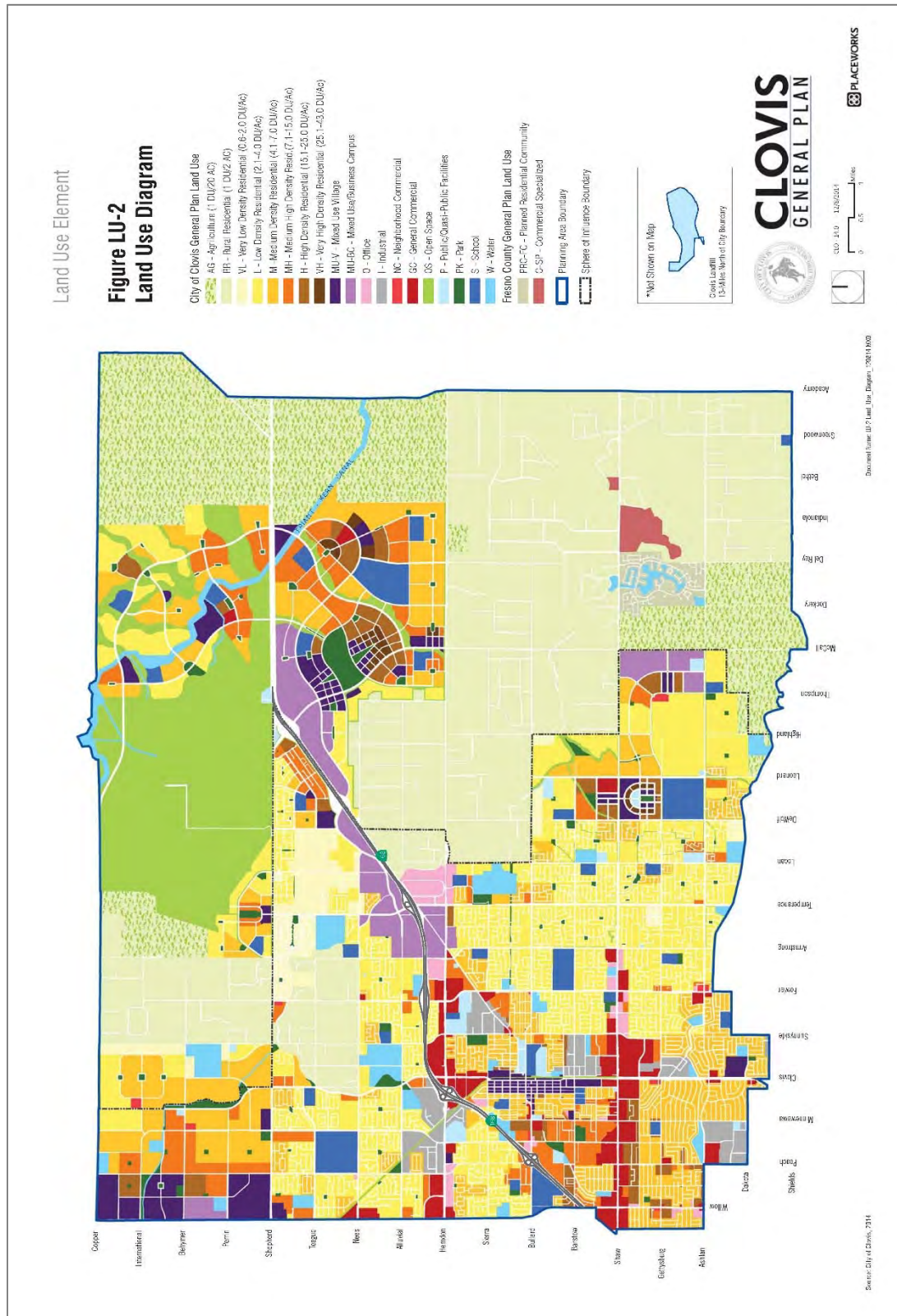
1. Land Use
2. Economic Development
3. Circulation
4. Housing
5. Public Facilities and Services
6. Environmental Safety
7. Open Space and Conservation
8. Air Quality

Mitigation activities continue to be done in accordance with applicable state and federal requirements for floodplain management and in coordination with the Fresno Metropolitan Flood Control District which maintains regional responsibility for water management. Additional mitigation measures for critical infrastructure protection and rehabilitation are done through the City's Capital Improvement Project (CIP) budget. To date, those mitigation projects have included fire station security, water/sewer infrastructure improvements and City Hall building rehabilitation.

For more information on hazard mitigation-related aspects of the general plan, see the discussion in Section A.4.1 Regulatory Mitigation Capabilities.

More general information on growth and development in Fresno County as a whole can be found in "Growth and Development Trends" in Section 4.3.1 Fresno County Vulnerability and Assets at Risk of the main plan.

Figure A.3: City of Clovis' Land Use Designations



A.3.2 Estimating Potential Losses

Note: This section details vulnerability to specific hazards, where quantifiable, and/or where (according to HMPC member input) it differs from that of the overall County.

Table A.6 above shows Clovis' exposure to hazards in terms of number and value of structures. Fresno County's parcel and assessor data was used to calculate the improved value of parcels. The most vulnerable structures are those in the floodplain (especially those that have been flooded in the past), unreinforced masonry buildings, and buildings built prior to the introduction of modern day building codes. Impacts of past events and vulnerability to specific hazards are further discussed below (see Section 4.1 Hazard Identification for more detailed information about these hazards and their impacts on Fresno County as a whole).

Note: The risk and vulnerability related to windstorm and winter storm hazards in Clovis do not differ from those of the County at large. Please refer to Chapter 4 Risk Assessment of the main plan for more details on these hazards.

Agricultural Hazards

Agricultural hazards are considered a lower significance hazard for the City of Clovis than for the overall planning area due to the limited role of agriculture in the City's land use and economy. The medium significance reflects the impacts the City would experience as a result of the importance of agriculture to the overall planning area.

Dam Failure

Potential flooding also exists in the form of reservoirs to the northeast and southeast of Clovis: Fancher Creek Reservoir and Big Dry Creek Reservoir. The major inundation areas from potential overflows from the Big Dry Creek Reservoir affect a major part of the northwesterly portion of Clovis as well as the northwesterly portions of the current City Sphere of Influence and City boundaries.

The Big Dry Creek Dam, approximately 3.5 miles upstream from the City of Clovis, impounds stormwater runoff from Big Dry Creek in the Big Dry Creek Reservoir. The Big Dry Creek Reservoir is owned and operated by the Fresno County Metropolitan Flood Control District and is intended primarily for flood control of winter runoff from the Dry Creek and Dog Creek watersheds. In the 1990s, modifications were made to increase the capacity of the reservoir, and it now provides protection against the 200-year flood.

Under wet conditions, the Big Dry Creek Reservoir captures runoff and controls releases into artificial ditches and canals, which drain into either Little Dry Creek, located north of the reservoir, or in a southerly direction into Mill Ditch. Flows from Little Dry Creek and Mill Ditch eventually drain to the San Joaquin River. Flows from the reservoir can also be diverted into Dog Creek, which also eventually drains into the San Joaquin River. During dry weather conditions, the

reservoir does not discharge water and is normally empty, with the exception of a 156 acre-foot residual pool. The top of the pool remains below the elevation of an existing discharge gate.

Drought

In 1988, 45 California counties experienced water shortages that adversely affected about 30 percent of the state's population, much of the dry farmed agriculture, and over 40 percent of the irrigated agriculture. Fish and wildlife resources suffered, recreational use of lakes and rivers decreased, forestry losses and fires increased, and hydroelectric power production decreased. Since 1976, Clovis has experienced one state declaration for drought within Fresno County and one U.S. Department of Agriculture declaration for crop losses associated with drought.

The City of Clovis rated drought as a lower priority hazard than for the County as a whole. In part, drought is of lower significance because unlike the unincorporated County and smaller jurisdictions, the City is not dependent on agriculture, which is highly vulnerable to drought.

Earthquake

Clovis is subject to relatively low seismic hazards compared to many other parts of California. The primary seismic hazard is ground shaking produced by earthquakes generated on regional faults. The northwest-trending Clovis fault is believed to be located approximately five to six miles east of the City of Clovis, extending from an area just south of the San Joaquin River to a few miles south of Fancher Creek. It is considered a pre-Quaternary fault or fault without recognized Quaternary displacement. This fault is not necessarily inactive.

The most probable sources of earthquakes that might cause damage in Clovis are the Owens Valley Fault Group about 68 miles to the northeast, the Foothills Suture Fault Zone approximately 75 miles to the north, the San Andreas fault approximately 80 miles to the southwest, and the White Wolf fault located about 120 miles to the south. A maximum probable earthquake on any of the major faults would produce a maximum ground acceleration in the area of about 0.1g as ground deceleration generally decreases with increasing distance from the earthquake source.

Several unreinforced masonry buildings are located in the Old Town part of the City. The recreation building also may be vulnerable to earthquakes.

Flood/Levee Failure

Clovis is traversed by three natural stream systems. Each of these systems consists of substreams or creeks that collect together to discharge to a centralized natural drainage channel. These systems are the Red Bank, Fancher, and Dog Creek System; the Dry and Dog Creek System; and the Pup Creek/Alluvial Drain System. The latter is a tributary of the original Dry Creek channel. These stream systems collect storm runoff from the foothills east of Clovis and convey such runoff through the Clovis/Fresno metropolitan areas to the Fresno Slough, which is located west of the City of Fresno.

Many of these channels have been modified over time such that they have become dual use stormwater conveyance channels and irrigation water conveyance channels. Those streams that have not been used for irrigation purposes have essentially remained in their natural state and have flowed uncontrolled during storm runoff events. These stream channels have limited flow capacity. In some cases, the uncontrolled grading of land has obliterated or severely modified the natural channels to the extent that their flow capacity has been seriously limited. Flooding has been a serious problem in the Clovis/Fresno metropolitan area when these channel capacities are exceeded.

The flat slope characteristics in Clovis that exhibit natural slopes of less than .001 feet per foot can make the control of drainage runoff difficult and many natural depressions within the flat topography naturally collect and pond stormwater runoff. Nevertheless, the soils within or relatively near the stream courses tend to be the loamy, well-drained soils with high permeability.

The major sources of flooding include areas along the Pup Creek alignment from the northeasterly portion of the Clovis through the center of the City of Clovis. Most of this flooding is confined to the areas in and around the Pup Creek channel. Pup Creek enters the northeastern portion of the City of Clovis near the intersection of Armstrong and East Bullard avenues. Most flood flows enter a culvert at Minnewawa Avenue, north of Barstow Avenue, and are conveyed to Dry Creek in the vicinity of North Helm and Mitchell Avenues. Dry Creek enters the northwestern portion of the City of Clovis near the intersection of the Union Pacific Railroad and Herndon Avenue. The creek flows out of the City at the southwestern corporate limits just south of the intersection of Shaw and Winery avenues.

Other areas of flooding are related to the Alluvial Drain area, the Big Dry Creek Reservoir and its possible overflow areas, along the Dog Creek channel alignment, and in low depressed areas along the easterly sides of the Enterprise Canal. Small areas of localized flooding occur in the southeastern part of the City during periods of moderate rainfall or heavy cloudburst storms. There are also a number of ponding areas in the City:

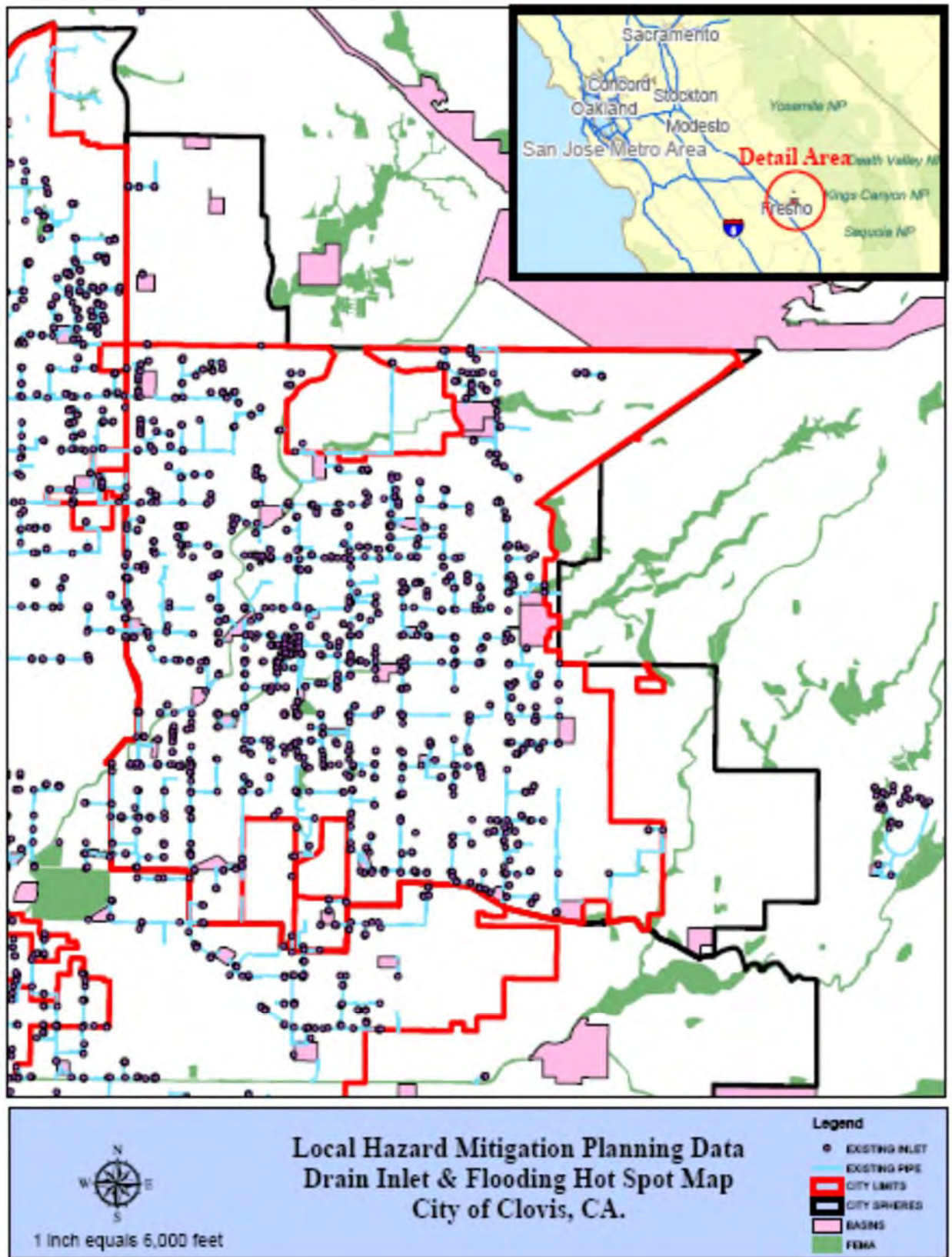
- The ponding area at the northern corporate limits of the City of Clovis, east of Dry Creek and north of the railroad, is caused by the limited channel capacity of Dry Creek from the vicinity of Herndon Avenue to the vicinity of Nees Avenue outside the corporate limits of the City of Clovis.
- The ponding area along Pup Creek between Minnewawa and Peach avenues is caused by excessive overland losses from Dry Creek and limited culvert capacity for Pup Creek at Minnewawa Avenue.
- The ponding area south of Pup Creek and east of the railroad between Jefferson and Barstow avenues is caused by excessive overbank losses on Pup Creek crossing back over the railroad and from a local drainage problem east of Brookhaven Avenue.

The City of Clovis actively uses GIS and FEMA's Flood Insurance Rate Map (FIRM) to assess flood risk and infrastructure mitigation. According to the City's FIRM, all City facilities are within

B, C, or X zones, which are outside the 100-year floodplain; insurance purchase is not required in these zones. While past flooding has resulted in reimbursable expenses, the majority of the costs were for emergency protective measures and not direct property loss.

Figure A.4 shows the City inlet system compared to the FEMA 100-year floodplain threat.

Figure A.4: City of Clovis' Drain Inlet and Flooding Hot Spot Map



Flood protection in Clovis is afforded by Big Dry Creek Dam on Dry Creek. Big Dry Creek Dam is located approximately 3.5 miles upstream of the City of Clovis. Its main purpose is flood control, and it has a storage capacity of 16,250 acre-feet. Big Dry Creek Reservoir has prevented an estimated \$15 million in damage in the Fresno-Clovis area since its completion in 1948.

Even with significant investment in planning/mitigation and water management through Fresno Metropolitan Flood Control District, portions of the City of Clovis, the Sphere of Influence areas, and the unincorporated Fresno County area, have been subject to historical flooding. Flooding occurred in January 2006 (CDAA-2006-01) and March of 2006 (CDAA-2006-03). The combined impact of these storms left Clovis with \$14,562 in damage that was reimbursable since Fresno County received state declarations for the storms. In both instances, there were short periods when intersections were closed due to flooding and customers could not reach businesses.

According to FEMA's 2016 Flood Insurance Study (FIS), damaging floods also occurred in the area in 1938, 1955, 1958, 1969, and 1978. Details on some of these events follow:

- **December 1955**—Pup Creek overflowed and flooded more than 20 homes in the vicinity of Clovis Avenue and Ninth Street. Floodwater two feet deep in some places blocked streets and disrupted traffic.
- **March 1958**—Pup Creek overflowed and flooded areas along Ninth Street. Floodwater was up to three feet deep, but damage was limited to streets, external residential improvements, and disruption of traffic.
- **January-February 1969**—Creeks and canals in the area overflowed and inundated agricultural land, residential property, and streets and roads. Many homes were evacuated and others protected by sandbags. Traffic was disrupted by flooded streets and roads. Dry Creek and tributaries flooded approximately 1,400 acres and caused an estimated \$329,000 in damage below Big Dry Creek Reservoir.
- **February 1978**—Pup Creek overflowed. Residential property was inundated, homes were evacuated, roads and streets were closed, and traffic was disrupted. The recurrence interval of this flood was 74 years.

The 2016 FIS also notes problems of localized flooding in the City of Clovis. Localized flooding primarily occurs in areas east of Clovis Avenue and south of Shaw Avenue in addition to an area south of Keats Avenue and an area south of Celeste Street. In each of these locations, flooding is common following moderate rainfall or heavy cloudburst storms.

Values at Risk

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a flood map for the City of Clovis was created (see Figure A.5). Table A.9 and Table A.10 summarize the values at risk in the City's 100-year and 500-year floodplain, respectively. These tables also detail loss estimates for each flood.

Figure A.5: City of Clovis' 100- and 500-Year Floodplains

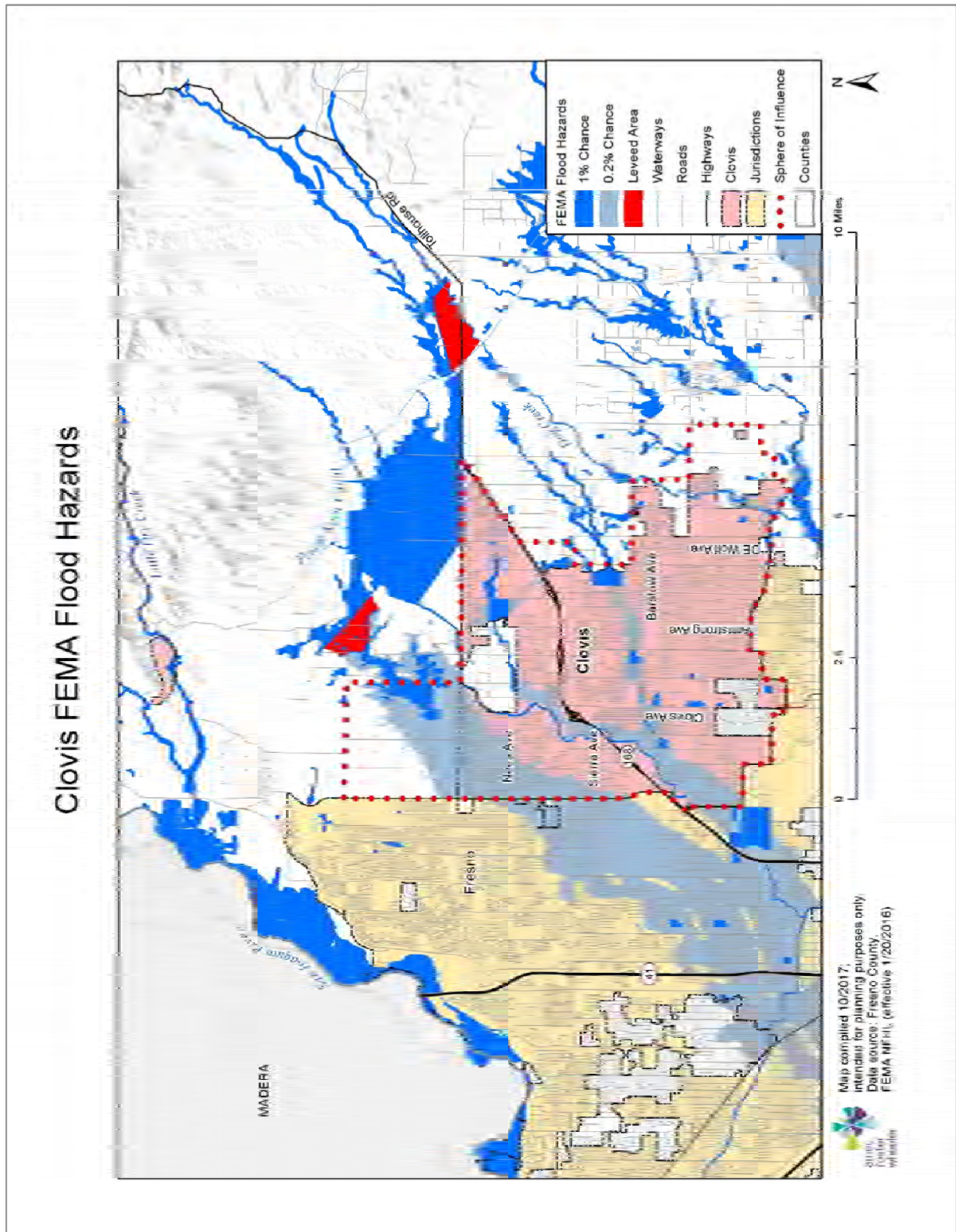


Table A.9: City of Clovis' FEMA 1% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Commercial	19	24	\$9,800,415	\$9,800,415	\$19,600,830	\$4,900,208
Exempt	8	8	\$0	\$0	\$0	\$0
Industrial	14	27	\$2,479,947	\$3,719,921	\$6,199,868	\$1,549,967
Multi-Residential	6	40	\$3,863,098	\$1,931,549	\$5,794,647	\$1,448,662
Residential	123	133	\$30,418,012	\$15,209,006	\$45,627,018	\$11,406,755
Total	170	232	\$46,561,472	\$30,660,891	\$77,222,363	\$19,305,591

Source: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

Table A.10: City of Clovis' FEMA 0.2% Annual Chance Flood Hazard by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Content Value	Total Value	Loss Estimate
Agricultural	1	0	\$88,794	\$88,794	\$177,588	\$44,397
Commercial	152	927	\$218,953,803	\$218,953,803	\$437,907,606	\$109,476,902
Exempt	47	176	\$0	\$0	\$0	\$0
Industrial	17	38	\$6,781,245	\$10,171,868	\$16,953,113	\$4,238,278
Multi-Residential	146	2,599	\$149,271,660	\$74,635,830	\$223,907,490	\$55,976,873
Residential	5,766	5,804	\$1,092,919,916	\$546,459,958	\$1,639,379,874	\$409,844,969
Total	6,129	9,544	\$1,468,015,418	\$850,310,253	\$2,318,325,671	\$579,581,418

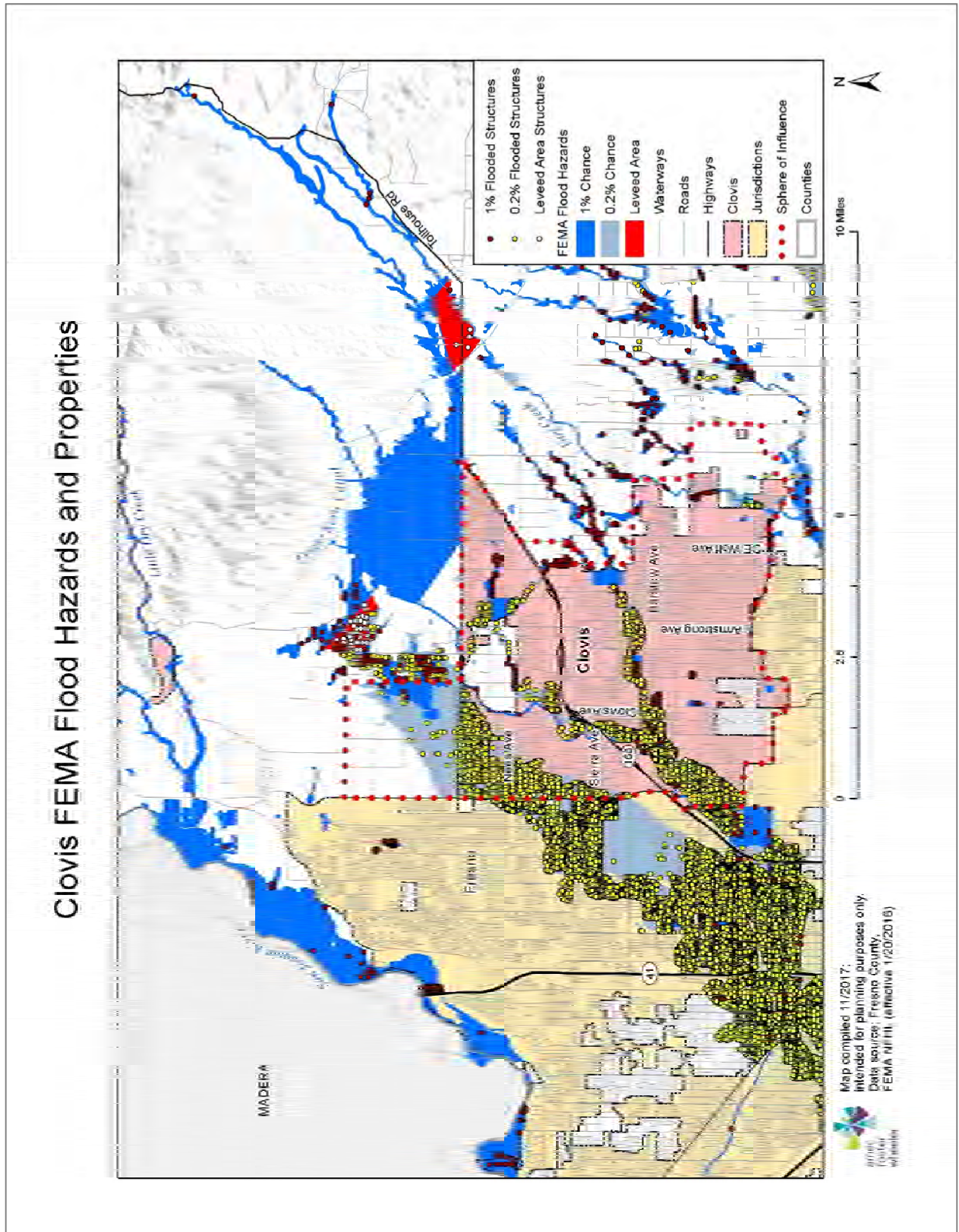
Source: Fresno County 2017 Parcel and Assessor data; FEMA 2009 FIRM

Based on this analysis, the City of Clovis has significant assets at risk to the 100-year and greater floods. 170 improved parcels are located within the 100-year floodplain for a total value of over \$77 million. An additional 6,129 improved parcels valued at over \$2.3 billion fall within the 500-year floodplain.

Applying the 25 percent damage factor as previously described in Section 4.3.2, there is a 1 percent chance in any given year of a 100-year flood causing roughly \$19 million in damage in the City of Clovis and a 0.2 percent chance in any given year of a 500-year flood causing roughly \$599 million in damage (combined damage from both floods). Figure A.6 shows the properties at risk to flooding in and around the City of Clovis in relation to the mapped floodplain.

Limitations: This model may include structures in the floodplains that are elevated at or above the level of the base-flood elevation, which will likely mitigate flood damage. Also, the assessed values are well below the actual market values. Thus, the actual value of assets at risk may be significantly higher than those included herein.

Figure A.6: City of Clovis' Properties at Risk in 100- and 500-Year Floodplains



Population at Risk

Using parcel data from the County and the digital flood insurance rate map, population at risk was calculated for the 100-year and 500-year floods based on the number of residential properties at risk and the average number of persons per household (3.17). The following are at risk to flooding in the City of Clovis:

- 100-year flood—409 people
- 500-year flood—18,741 people
- **Total flood**—19,150 people

Insurance Coverage, Claims Paid, and Repetitive Losses

The City of Clovis joined the National Flood Insurance Program (NFIP) on March 16, 1983. NFIP Insurance data indicates that as of March 30, 2017, there were 103 flood insurance policies in force in the City with \$31,999,500 of coverage. Of the 103 policies, 100 were residential (97 for single-family homes) and 3 were nonresidential. There were 12 policies in A zones, and the remaining 91 were in B, C, and X zones.

There have been 14 historical claims for flood losses totaling \$134,920.02. All claims were for residential properties; 12 were in A zones and 2 were in B, C or X zones; and 13 were pre-FIRM structures (the one post-FIRM structure with a reported loss was in a B, C, or X zone). According to the FEMA Community Information System accessed 9/17/2018 there are no Repetitive Loss or Severe Repetitive Loss properties located in the jurisdiction.

Critical Facilities at Risk

Critical facilities are those community components that are most needed to withstand the impacts of disaster as previously described. Table A.11 lists the critical facilities in the City’s 100- and 500-year floodplains. The impact to the community could be great if these critical facilities are damaged or destroyed during a flood event.

Table A.11: Critical Facilities in the 100- and 500-Year Floodplains: City of Clovis

Critical Facility Type	100-Year Floodplain	500-Year Floodplain
Colleges & Universities	-	1
Nursing Home	-	1
School	-	6
Total	-	8

Source: Fresno County, HIFLD 2017

There are no critical facilities in the City’s 100-year floodplain, but according to the risk assessment for the County, floods in Clovis tend to be 500-year events. Thus, it is particularly important to note that the critical facilities in the 500-year floodplain are all facilities that serve vulnerable populations and thus should be given special attention.

Hazardous Materials Incident

Hazardous materials likely to be involved in a spill or release within the City include herbicides, pesticides, chemicals in gas, liquid, solid, or slurry form; flammables; explosives; petroleum products; toxic wastes; and radioactive substances. The County Health Department is the designated administering agency for the Fresno County area hazardous material monitoring program.

There are two CalARP hazardous materials facilities located in the City of Clovis. As identified in Table A.12, there are three critical facilities in Clovis located within a half mile of a CalARP facility.

Table A.12: Critical Facilities within ½ mile of CalARP Facility: City of Clovis

Critical Facility Type	Count
Fire Station	1
School	2
Total	3

Source: Fresno County, HIFLD 2017

Severe Weather: Extreme Cold/Freeze

Figure A.7 below illustrates the average temperature by month. From the figure, one can see that December and January have the greatest potential for extreme cold/freeze with an average minimum temperature of 37.5°F. In Clovis, it is not uncommon to have consecutive days with a minimum overnight low temperature of 32°F. Clovis has been impacted by severe freezing in winters past. Most notable were the freezes of 1997/98 and 2006/2007. Severe cold/freeze declarations occurred in 1990, 1998, and 2001. These incidents impacted local agriculture and City infrastructure. Estimated agricultural losses in 2006/2007 totaled \$1 million with another \$10,000 in damage to infrastructure. The following chronicles historic periods of extreme cold in Clovis:

Low Temperature of 20°F or Below

- 2 days from 1/16/1888–1/17/1888
- 2 days from 1/6/1913–1/7/1913
- 2 days from 1/10/1949–1/11/1949
- 3 days from 12/22/1990–12/24/1990

Low Temperature of 24°F or Below

- 4 days from 1/14/1888–1/17/1888
- 4 days from 1/3/1949–1/6/1949
- 5 days from 1/3/1950–1/7/1950
- 6 days from 12/12/1963–1/17/1963
- 5 days from 12/31/1975–1/4/1976

- 6 days from 12/21/1990–12/26/1990

Low Temperature of 28°F or Below

- 12 days from 1/7/1888–1/18/1888
- 7 days from 1/12/1963–1/18/1963
- 9 days from 1/17/1966–1/25/1966
- 14 days from 12/20/1990–1/2/1991
- 8 days from 1/20/1998–12/27/1998

Low Temperature of 32°F or Below

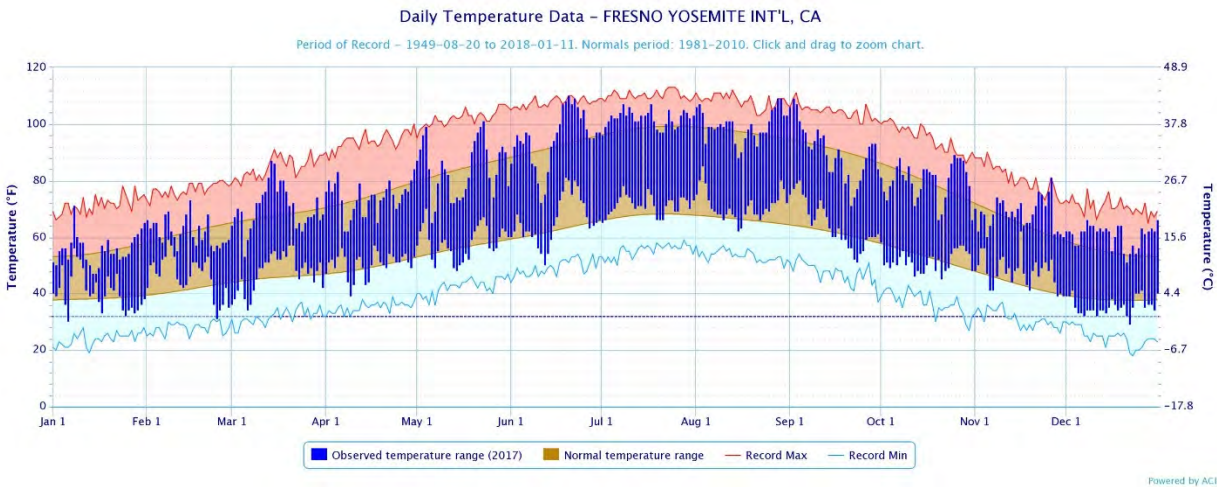
- 21 days from 1/3/1947–1/22/1947
- 15 days from 12/28/1960–1/11/1961
- 15 days from 1/11/1963–1/25/1963
- 16 days from 12/19/1990–1/2/1991
- 19 days from 1/6/2007–1/24/2007

During the January 2007 freeze (CDA 2007-02), Clovis experienced 19 days of consecutive low temperatures at or below 32°F. In response, Clovis coordinated the resources and staff necessary to establish a warming station at the Clovis Senior Center. Public safety personnel continually monitored calls for service related to vulnerable populations, such as the homeless and seniors who might have needed these services. In addition, fire prevention staff checked on mobile home residents during their normal smoke alarm check/installs. Fortunately, Clovis residents were prepared, and the City did not have to open a warming center.

School facilities incurred \$55,000 in damage. In the urban area, there was some damage to wells, and some small businesses reported leaky/broken sprinkler pipes. City damage reimbursable through the state declaration totaled \$9,373. Agricultural losses were greatest in the citrus growing and packaging industry. Local growers/packers included P&R Farms and Harlan Ranch. Since P&R Farms primarily handles stone fruit (i.e., peaches, apricots), impact to their crops was minimal. Harlan Ranch suffered 100 percent crop loss due to the fact that their primary commodity was citrus, and they had planted over 100 new acres of trees. At last check, their crop loss was \$2.5 million. While some oranges were juiced, Harlan Ranch representatives said the juice market was break-even at best.

Severe Weather: Extreme Heat

The following data support the City of Clovis' decision to rate extreme heat a medium significance hazard (higher than the overall County rating). As recently as 2006 and 2007, Clovis experienced heat waves that exceeded 24 days. While no direct loss of livestock was reported, the City staffed cooling centers to protect vulnerable populations, and there were several power outages that rotated through the area. Figure A.7. shows historical temperatures in Clovis.

Figure A.7: Historical Temperatures in Clovis

Source: High Plains Regional Climate Center; climod.unl.edu

It is not uncommon in Clovis to have consecutive days over 100°F. In the past decade (2008-2017), There were 62 periods of three days or longer where temperatures remained above 100 degrees. The longest period of extreme temperatures occurred in August of 2012, where daily high temperatures remained above 100°F for 19 consecutive days. The highest temperature reached was 112°F, which occurred once in July of 2008 and again in July of 2009. The following chronicles heat waves in Clovis prior to 2006:

High Temperature of 112°F or Greater

- 4 days from 7/30/1908 – 8/2/1908
- 5 days from 7/22/2006–7/26/2006

High Temperature of 110°F or Greater

- 4 days from 6/29/1891–7/2/1891
- 4 days from 7/8/1896–7/11/1896
- 6 days from 7/26/1898–7/31/1898
- 5 days from 7/5/1905–7/9/1905
- 5 days from 7/29/1908–8/2/1908
- 4 days from 7/24/1931–7/27/1931
- 5 days from 7/22/2006–7/26/2006

High Temperature of 105°F or Greater

- 10 days from 7/28/1889–8/6/1889
- 9 days from 7/6/1896–7/14/1896
- 10 days from 7/18/1931–7/27/1931
- 9 days from 7/21/1980–7/29/1980

- 14 days from 7/17/1988–7/30/1988
- 9 days from 7/13/2005–7/21/2005
- 12 days from 7/16/2006–7/27/2006

High Temperature of 95°F or Greater

- 51 days from 6/23/1908–8/12/1908
- 53 days from 7/6/1910–8/27/1910
- 51 days from 7/7/1939–8/26/1939
- 50 days from 6/6/1967–8/24/1967
- 51 days from 6/30/2006–8/19/2006

In response to extreme heat events in 2007, the City implemented Phase II of the City’s Heat Emergency Plan, which entailed opening facilities and using volunteer staff from 12–10 p.m. to provide cooling for individuals impacted by the heat. The cost to provide this level of service was negligible since the facility used was already open and volunteers staffed the center. While few people sought relief, the most significant benefit was from volunteers checking the welfare of vulnerable seniors who rely on swamp coolers for cooling and who cannot always determine their physiological need for hydration. For the summer, Phase II of the plan was activated seven times. Over 20 individuals sought refuge in the center, and volunteers placed over 183 personal welfare calls to the medically fragile. In Clovis, there was no loss of human or livestock life.

Severe Weather: Fog

In Fresno/Clovis, the average number of days with dense fog per year is 35.1 (see Table A.13). The most consecutive days with dense fog were the following:

- 14 days from 12/19/1929-1/2/1930
- 16 days from 12/13/1985-12/28/1985

Table A.13: Average Number of Days in Fresno/Clovis with Dense Fog

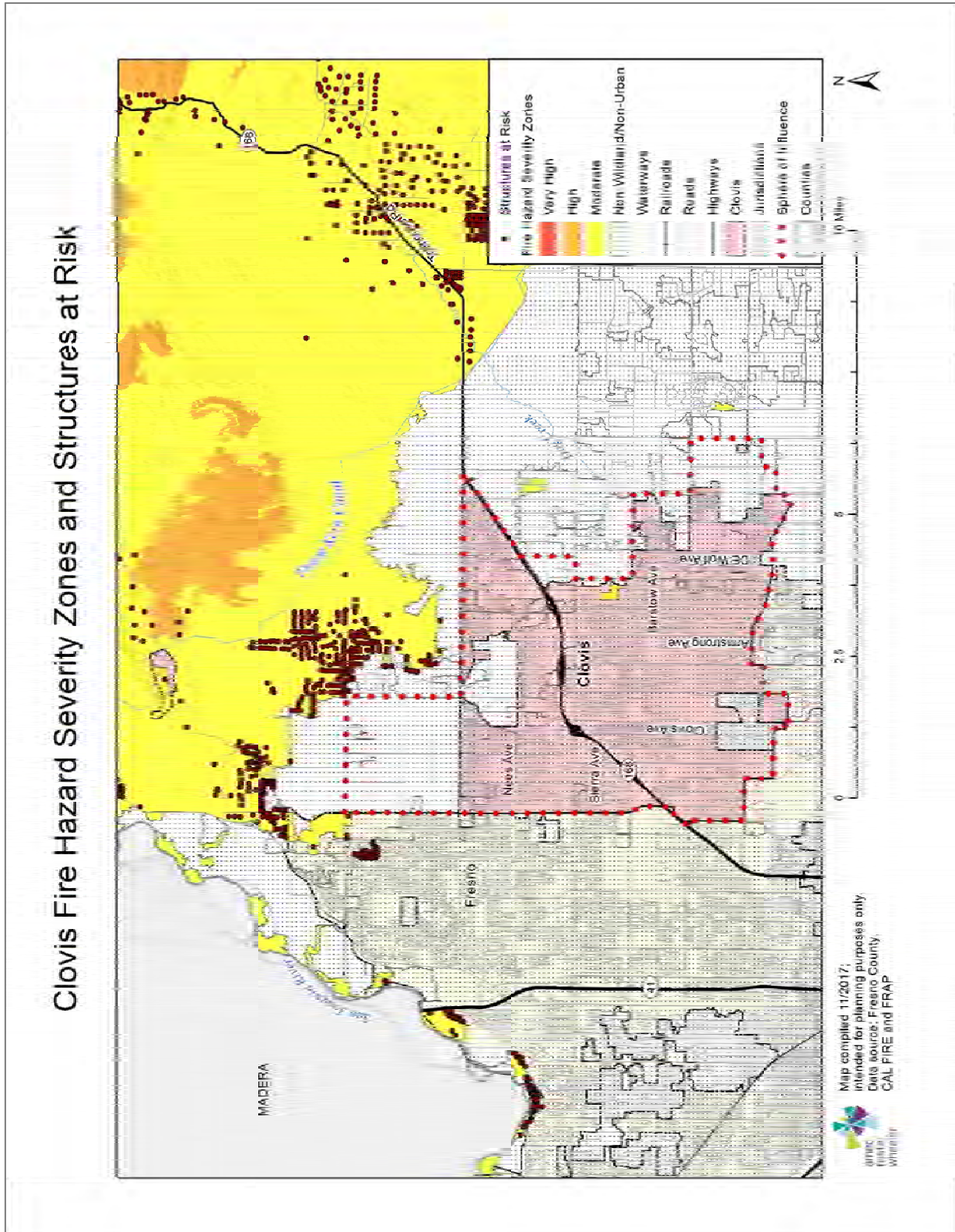
Month	Number of Days
January	11.5
February	5.1
March	1.5
April	0.2
May	0
June	0
July	0
August	0
September	0
October	0.6
November	5.2
December	11.0
Annual	35.1

Wildfire

Following the methodology described in Section 4.3.2 Vulnerability of Fresno County to Specific Hazards, a wildfire map for the City of Clovis was created (see Figure A.8). An analysis was performed using GIS software that determined that there were not any critical facilities in wildfire threat zones in Clovis.

Only one parcel in Clovis is considered at risk to moderate fire severity, and it does not have any improved value, indicating lower risk to wildfire in the City compared to the Fresno County planning area as a whole.

Figure A.8: City of Clovis' Wildfire Threat



A.4 Capability Assessment

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment is divided into five sections: regulatory mitigation capabilities, administrative and technical mitigation capabilities, fiscal mitigation capabilities, mitigation outreach and partnerships, and other mitigation efforts.

To develop this capability assessment, the jurisdictional planning representatives used a matrix of common mitigation activities to inventory which of these policies or programs were in place. The team then supplemented this inventory by reviewing additional existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses.

During the plan update process, this inventory was reviewed by the jurisdictional planning representatives and Amec Foster Wheeler consultant team staff to update information where applicable and note ways in which these capabilities have improved or expanded. Additionally, in summarizing current capabilities and identifying gaps, the jurisdictional planning representatives also considered their ability to expand or improve upon existing policies and programs as potential new mitigation strategies. The City of Clovis’ updated capabilities are summarized below.

A.4.1 Regulatory Mitigation Capabilities

Table A.14 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Clovis.

Table A.14: City of Clovis’ Regulatory Mitigation Capabilities

Regulatory Tool	Yes/No	Comments
General plan	Yes	2014
Zoning ordinance	Yes	
Subdivision ordinance	Yes	
Growth management ordinance	Yes	
Floodplain ordinance	Yes	
Other special purpose ordinance (stormwater, water conservation, wildfire)	Yes	
Building code	Yes	Version: 2016
Fire department ISO rating	Yes	Rating: 2
Erosion or sediment control program	Yes	
Stormwater management program	Yes	
Site plan review requirements	Yes	
Capital improvements plan	Yes	
Economic development plan	Yes	
Local emergency operations plan	Yes	2017
Other special plans		
Flood Insurance Study or other engineering study for streams	Yes	FEMA Flood Insurance Study, 2016

Elevation certificates (for floodplain development)	Yes
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The City of Clovis General Plan Program, 2014

The City of Clovis General Plan Program serves as the blueprint for future growth and development and provides comprehensive planning for the future. It encompasses what the City is now, and what it intends to be, and provides the overall framework of how to achieve this future condition (see the discussion in Section A.3.3 Growth and Development Trends).

The general plan includes a Safety Element that focuses on safety issues to be considered in planning for the present and future development of the Clovis planning area. Identified hazards include fire, geologic/seismic, flooding, and hazardous materials. Mitigation-related goals, policies, and actions are presented below.

Goal 1:	Protect the Clovis community from hazards associated with the natural environment.
Policy 1.1:	Minimize risks of personal injury and property damage associated with natural hazards. Actions: <ul style="list-style-type: none"> • Educating the community on procedures regarding preparedness and response to natural disasters providing information describing procedures and evacuation routes to be followed in the event of a disaster. • Establishing design criteria for publicly accessible stream corridors, detention basins, and drainage facilities to minimize potential for accidents and injury. • Preserve as open space areas along waterways, detention basins, and ponding areas, and in areas of wildfire and known flooding hazards where building for human occupancy is hazardous.
Policy 1.2:	Provide flood protection for existing development and for areas planned for new development. Actions: <ul style="list-style-type: none"> • Coordinate with the Fresno Metropolitan Flood Control District (FMFCD) in its efforts to enact a program of channel preservation, renovation, and maintenance. • Support the FMFCD in the creation of an inventory of all streams draining from the foothills areas and identifying all channels that have been obliterated or altered. • Require, as a condition of development, protection of channel alignments, identification of floodway areas, and construction of channel improvement so that projected 100-year flood flows can pass without affecting new development. • Utilize zoning and other land use regulation to limit and or prohibit development in flood-prone areas. • Map dam inundation areas and develop, maintain, and inform the public of an evacuation procedure for all affected areas in the event of failure of dams.
Policy 1.3:	Utilize the unprotected 100-year floodplain for low density uses such as agriculture, open space, recreation, and for reclaiming water and wetlands. Actions: <ul style="list-style-type: none"> • Establish development set-back requirements from natural water courses that traverse the project areas.
Policy 1.4:	Mitigation potential adverse impacts of geologic and seismic hazards. Actions: <ul style="list-style-type: none"> • Require geologic and soils studies to identify potential hazards as part of the approval process for all new development prior to grading activities. • Conduct a building survey to identify structures that are substandard in terms of seismic safety. Develop a program to bring these structures up to current seismic safety code standards. • Require that underground utilities be designed to withstand seismic forces. • Coordinate with the FMFCD to regularly inspect and repair levees as part of their proposed program of channel preservation, renovation, and maintenance.

Goal 1:	Protect the Clovis community from hazards associated with the natural environment.
	<ul style="list-style-type: none"> Incorporate appropriate earthquake prevention standards into the uniform technical codes and require that all new structures are engineered to meet seismic safety code standards.

The Public Facilities Element of the general defines policy for public facilities and services, including infrastructure, and addresses the issues of providing adequate infrastructure and community services to expanding populations by planning in conjunction with land use. Clovis' infrastructure consists of water, wastewater, storm drainage/flood control, and solid waste systems. The element does not address how new facilities and infrastructure are sited in regard to known hazard areas. It does include hazard-related policies to provide effective storm drainage facilities for planned development by maintaining agreement with the Fresno Metropolitan Flood Control District to reduce the effect that development has on natural watercourses and to ensure that adequate water supply can be provided through water reuse and water conservation.

Clovis Municipal Code

The following ordinances are used for implementing the general plan and/or are critical to the mitigation of hazards identified in this plan.

Zoning Ordinance (Title 9—Chapter 9.08)

The purpose of the Zoning Ordinance is to encourage, classify, designate, regulate, restrict, and segregate the highest and best locations for, and uses of, buildings, structures, and land for agriculture, residence, commerce, trade, industry, water conservation, or other purposes in appropriate places; to regulate and limit the height, number of stories, and size of buildings and other structures hereafter designed, erected, or altered; to regulate and determine the size of yards and other open spaces; and to regulate and limit the density of population, and for such purposes to divide the City into districts of such number, shape, and area as may be deemed best suited to provide for their enforcement. Further, the Zoning Ordinance addresses the following:

- Most appropriate uses of land
- Conservation and stabilization of property values
- Provision of adequate open space for light and air and to prevent and fight fires
- Prevention of undue concentration of population
- Lessening of congestion of streets
- Facilitation of adequate provision of community utilities, such as transportation, water, sewerage, schools, parks, and other public requirements
- Promotion of the public health, safety, and general welfare

Site Plan Ordinance (Title 9—Chapter 9.56)

The site plan review is performed by the Clovis Planning and Development Services Department. During the review, the owner of a parcel is required to submit a plan to scale demonstrating all of the uses for a specific parcel of land. This review ensures compliance with applicable law and the zoning requirements within the City.

Subdivision Ordinance (Title 9—Chapter 9.100)

The Subdivision Ordinance specifically provides for proper grading and erosion control and prevention of sedimentation or damage to off-site property. Each local agency may by ordinance regulate and control other subdivisions, provided that the regulations are not more restrictive than the regulations commencing in California Government Code Section 66410.

Erosion or Sediment Control Program (Title 9—Chapter 9.2.309)

Every map approved pursuant to the provisions of the Subdivisions Ordinance are conditioned on compliance with the requirements for grading and erosion control, including the prevention of sedimentation or damage to off-site property, set forth in Appendix Chapter 70 of the California Building Code, as adopted and amended by the City.

Flood Hazard Ordinance (Title 8—Chapter 8.12)

Flood losses are caused by uses that are inadequately elevated, floodproofed, or protected from flood damage. The cumulative effect of obstructions in areas of special flood hazards that increase flood heights and velocities also contribute to flood loss. It is the purpose of the Flood Hazard Ordinance to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:

- Protect human life and health;
- Minimize expenditure of public money for costly flood control projects;
- Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- Minimize prolonged business interruptions;
- Minimize damage to public facilities and utilities such as water and gas mains; electric, telephone, and sewer lines; and streets and bridges located in areas of special flood hazard;
- Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future blighted areas caused by flood damage;
- Ensure that potential buyers are notified that property is in an area of special flood hazard; and
- Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

In order to reduce flood losses, the ordinance includes methods and provisions to:

- Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights or velocities;
- Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- Control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters;
- Control filling, grading, dredging, and other development which may increase flood damage; and

- Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas.

Emergency Services Ordinance (Title 4—Chapter 4.2)

The declared purposes of the Emergency Services Ordinance are to provide for the preparation and carrying out of plans for the protection of persons and property within the City in the event of an emergency; the direction of the emergency organization; and the coordination of the emergency functions of the City with all other public agencies, corporations, organizations, and affected private persons.

Stormwater Management Program (Emergency Flood Control Procedures 2007-2008)

The City's Public Utilities Department has three Stormwater Patrol teams, made up of 22 public utilities employees, to implement emergency flood control measures. The plan contains information and procedures to rapidly address flooding throughout the City. Contact information and team assignment data is updated regularly as are geographic locations subject to flooding. Appendices include suppliers/contractors, storm basin list, problem drain lists, and partnerships and agencies with shared responsibility for storm preparedness, mitigation, and response.

Five-Year Community Investment Program

The Five-Year Community Investment Program (CIP) represents an effort to identify major capital needs and schedule projects consistent with community priorities and available funding. A major portion of the funding for these projects comes from development fees. Projects identified in the CIP are broken down as follows:

- **General Government Facilities**—The capital projects for the General Government Facilities program consist of acquisition of new facilities, improvement to existing facilities, and maintenance of existing improvements required by City departments to enable them to adequately carry out their mission.
- **Sewer Capital Projects**—The Enterprise budget includes projects that will repair and/or replace existing sanitary sewer mains that are severely deteriorated or are not adequately sized for the flows being experienced. The Developer budget includes the debt service payments for the 2007 Sewer Revenue Bond for the Sewage Treatment and Water Reuse Facility.
- **Parks Improvements**—These primarily consist of master planning and design and construction of park improvements. Community park improvements are funded by development fees and state grants when available. Neighborhood parks are installed by development. Park fees are paid by all new developments constructed within the City of Clovis.
- **Street Improvements**—These include traffic signal installation, street repair and improvement, sidewalk installation/modification, and design work throughout the City.

- **Water**—This includes projects that will continue to improve the water distribution system, and improve water quality through the addition of treatment facilities at existing wells, and increase the reliability of the water supply by the addition of auxiliary power generators.
- **Refuse**—This includes regulatory design and maintenance of City-owned landfill and associated projects.
- **Clovis Community Development Agency**—This focuses on projects that provide affordable housing in the community and on encouraging and enhancing the business environment of Clovis.
- **Police/Fire**—This addresses facility design and maintenance for satellite locations and main headquarters.

Economic Development Strategy, 2014

On July 14, 2014, the City Council adopted an updated Economic Development Strategy, developed by the City's Economic Development Strategy Advisory Committee (EDSAC) and based on presentations from experts regarding perspectives on current markets, the regulatory environment, access to capital, characteristics of the local labor force, public incentive programs, and the local commercial and industrial real estate market.

The City of Clovis adopted the initial Economic Development Strategy in March 1998. The 1998 strategy included a mission statement as well as goals and objectives for three individual strategies: Industrial Development, Commercial Development, and Tourism. The City of Clovis believes that these three individual strategies make up the basis for a well-rounded economic development program. If progress is made in the implementation of the stated goals and objectives in each of these strategies, the City will be better able to create the wealth necessary to provide municipal services to Clovis residents and businesses.

City of Clovis Emergency Operations Plan

The City of Clovis Emergency Operations Plan (EOP) Basic Plan addresses the planned response for the City of Clovis to emergencies associated with disasters, technological incidents, or other dangerous conditions created by either man or nature. It provides an overview of operational concepts, identifies components of the City emergency management organization, and describes the overall responsibilities of local, state, and federal entities. The City will place emphasis on emergency planning; training of full-time, auxiliary, and reserve personnel; public awareness and education; and assuring the adequacy and availability of sufficient resources to cope with emergencies. Emphasis will also be placed on mitigation measures to reduce losses from disasters, including the development and enforcement of appropriate land use, design, and construction regulations.

The EOP's section on hazard mitigation establishes actions, policies, and procedures for implementing Section 409 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act following a presidentially declared emergency or major disaster. It also assigns hazard

mitigation responsibilities to various elements of federal, state, and local governments in California.

Heat Emergency Contingency Plan

The Heat Emergency Contingency Plan describes City operations during heat-related emergencies and provides guidance for City departments and personnel. It recognizes the need to communicate and coordinate with local agencies and mobilize and initiate actions in advance of local requests and supports local actions according to the Standardized Emergency Management System and the National Incident Management System. The plan goal is to reduce the incidence of morbidity and mortality associated with local extreme heat events.

Urban Water Management Plan

Clovis proactively manages water supplies and has policies in place to effectively deliver water to local residents. In order to appropriately manage water resources within Clovis, the City updated its Urban Water Management Plan in 2005 in coordination with the City of Fresno, County of Fresno, Fresno Irrigation District, and Fresno Metropolitan Flood Control district. The City of Clovis utilizes many water management tools and options to maximize water resources and minimize the need to import water. The City has an existing groundwater management plan (1997) and is involved in the Fresno-Area Regional Groundwater Management Plan.

Clovis Unified School District Hazard Mitigation Plan

The Clovis Unified School District is a K-12 public school system that serves the Cities of Clovis and Fresno, some unincorporated areas of Fresno County, and the rural community of Friant. It covers approximately 198 square miles and has a student population of nearly 38,000. The overall goal of the Clovis Unified School District Hazard Mitigation Plan is to reduce or prevent injury and damage from natural hazards in the District by addressing the hazards that present the greatest risk to the District, its students, staff, facilities, infrastructure, properties, and the natural environment. The plan examines past events and hazard mitigation programs already in place and prioritizes additional mitigation activities for the District. Planning goals include facilitating the integration of City and County hazard mitigation planning activities into District efforts.

A.4.2 Administrative/Technical Mitigation Capabilities

Table A.15 identifies the personnel responsible for activities related to mitigation and loss prevention in Clovis.

Table A.15: City of Clovis' Administrative and Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position
Planner/engineer with knowledge of land development/land management practices	Yes	City Planner
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Building Official
Planner/engineer/scientist with an understanding of natural hazards	Yes	City Engineer
Personnel skilled in GIS	Yes	Senior IT Analyst
Full time building official	Yes	Building Official
Floodplain manager	Yes	Building Official
Emergency manager	Yes	Life Safety Enforcement Manager
Grant writer	Yes	Various
Other personnel		
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)	Yes	IT Division and Planning/Development Services
Warning systems/services (Reverse 9-11, outdoor warning signals)	Yes	Facebook, NextDoor

A.4.3 Fiscal Mitigation Capabilities

Table A.16 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table A.16: City of Clovis' Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	Yes
Capital improvements project funding	Yes
Authority to levy taxes for specific purposes	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	Yes
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes
Incur debt through private activities	No
Withhold spending in hazard prone areas	No

A.4.4 Mitigation Outreach and Partnerships

The City of Clovis has two fire prevention specialists dedicated to public education, reaching 17,000 kids per year in the school system. The city also runs a responsible water use outreach program to encourage conservation and efficiency. Additionally, the City has a Community Emergency Response Team volunteer program and a Citizens On Patrol volunteer group.

A.4.5 Other Mitigation Efforts

The fire department is accredited through the Commission on Fire Accreditation International, which is part of the Center for Public Safety Excellence. Additionally, the City is recognized by the National Weather Service as a StormReady Community.

A.4.6 Opportunities for Enhancement

Based on the capabilities assessment, the City of Clovis has several existing mechanisms in place that already help to mitigate hazards. In addition to these existing capabilities, there are also opportunities for the City to expand or improve on these policies and programs to further protect the community. Future improvements may include providing training for staff members related to hazards or hazard mitigation grant funding in partnership with the County and Cal OES. Additional training opportunities will help to inform City staff members on how best to integrate hazard information and mitigation projects into their departments. Continuing to train City staff on mitigation and the hazards that pose a risk to the City of Clovis will lead to more informed staff members who can better communicate this information to the public.

A.5 Mitigation Strategy

A.5.1 Mitigation Goals and Objectives

The City of Clovis adopts the hazard mitigation goals and objectives developed by the HMPC and described in Chapter 5 Mitigation Strategy.

Incorporation into Existing Planning Mechanisms

The information contained within this plan, including results from the Vulnerability Assessment, and the Mitigation Strategy will be used by the City to help inform updates and the development of local plans, programs and policies. The Engineering Division may utilize the hazard information when implementing the City's Community Investment Program and the Planning and Building Divisions may utilize the hazard information when reviewing a site plan or other type of development applications. The City will also incorporate this LHMP into the Safety Element of their General Plan, as recommended by Assembly Bill (AB) 2140.

As noted in Chapter 7.0 Plan Implementation, the HMPC representatives from Clovis will report on efforts to integrate the hazard mitigation plan into local plans, programs and policies and will report on these efforts at the annual HMPC plan review meeting.

Continued Compliance with the National Flood Insurance Program

The City has been an NFIP participating community since 1983. In addition to the mitigation actions identified herein the City will continue to comply with the NFIP. This includes ongoing activities such as enforcing local floodplain development regulations, including issuing permits

for appropriate development in Special Flood Hazard Areas and ensuring that this development mitigated in accordance with the regulations. This will also include periodic reviews of the floodplain ordinance to ensure that it is clear and up to date and reflects new or revised flood hazard mapping.

A.5.2 Completed 2009 Mitigation Actions

The City of Clovis completed nine mitigations actions identified in the 2009 plan. These completed actions are as follows:

- Establish Post-Disaster Action Plan for City Continuity of Operations Plan
- Train and Certify City Inspectors to Conduct Post-Disaster Damage Assessment
- Implement a System of Automatic Vehicle Location
- Install Battery Back-Up Systems at Traffic Signals in the City of Clovis on Major Transportation Routes
- Replace Traffic Management Center Software and Herndon Avenue Traffic Signal Equipment and Implement Communications Upgrades
- Modify and Enhance Emergency Traffic Control System
- Implement a System to Share Information with City Police Officers/Employees (SharePoint)
- Integrate Local Hazard Mitigation Plan into Safety Element of General Plan
- Implement a Flood Awareness Program for the Public

These completed actions have reduced vulnerability to hazards and increased local capability to implement additional mitigation actions.

A.5.3 Mitigation Actions

The planning team for the City of Clovis identified and prioritized the following mitigation actions based on the risk assessment. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. Actions with an “*” are those that mitigate losses to future development.

In addition to implementing the mitigation actions below the City of Clovis will be participating in the county-wide, multi-jurisdictional action of developing and conducting a multi-hazard seasonal public awareness program. The county-wide project will be led by the County in partnership with all municipalities and special districts. The City agrees to help disseminate information on hazards provided by the County. More information on the action can be found in the base plan Chapter 5 Mitigation Strategy (see Section 5.3.3 Multi-Jurisdictional Mitigation Actions, Action #1. Develop and Conduct a Multi-Hazard Seasonal Public Awareness Program).

1. Construct a Water Intertie between the Cities of Clovis and Fresno

Hazard(s) Addressed: Multi-Hazard: dam failure, drought, earthquake, flood, severe weather, wildfire, hazardous materials

Issue/Background: The City of Clovis operates a water system that serves over 95,000 residents. During rolling power blackouts or earthquakes or due to potential contamination of the water supply, there is a need to have a backup supply of potable water available. The City has an agreement with the City of Fresno to construct an intertie between the two water systems to act as an emergency backup.

Other Alternatives: The City has backup power at many of its facilities but not all of them. Additionally, backup power will not help if the issue is unrelated to a power blackout.

Responsible Office: City of Clovis Public Utilities Department Water Division

Priority (High, Medium, Low): High

Cost Estimate: \$890,000

Potential Funding: City of Clovis Water Enterprise Fund

Benefits (Avoided Losses): This will prevent the loss of human life, illness, customer confidence, and revenue.

Schedule: Estimated completion in 2019

Status: 2009 project, implementation in progress

2. Modernize Information Technology Backup Infrastructure

Hazard(s) Addressed: Multi-Hazard: dam failure, earthquake, flood, severe weather, wildfire, volcano, hazardous materials

Issue/Background: During the last emergency operations center exercise, it became evident that many of the technology systems needed to coordinate services during a disaster were limited or not available at all. Personal computer systems were out of date, the telecommunications system and phones were not properly functioning, and many resources (software applications) were not configured or available. The City could benefit from disaster recovery/business continuity technology systems that use virtualization and storage area network backup infrastructure systems for emergency operations center operations.

Other Alternatives: Tapes and backup systems that are not real time are not as reliable and cause delays in data restoration.

Responsible Office: City of Clovis Information Services Division

Priority (High, Medium, Low): High

Cost Estimate: \$100,000

Potential Funding: General fund

Benefits (Avoided Losses): Ensures business continuity and avoids downtime. Thus, speeds up relief efforts during a disaster.

Schedule: Estimated completion in 2020

Status: 2009 project, implementation in progress

3. Improve the City's Capabilities for Sheltering Animals in a Disaster

Hazard(s) Addressed: Multi-Hazard: dam failure, flood, wildfire, hazardous materials

Issue/Background: During a disaster, not only do people need to be rescued, but their pets do also. Hurricane Katrina showed the nation that shelters do not typically allow pets, so pets may be left behind when their owners evacuate. The care of the animals left behind falls to local animal shelters. Currently, the City of Clovis Animal Shelter does not have the supplies to handle a large scale animal emergency. The City has approximately 8,000 licensed dogs. If a disaster occurred, they would only be able to house 102 of them. Overcrowding of animals usually causes diseases and loss of animal life. Purchasing new cages would alleviate some of the overcrowding created by a disaster.

Other Alternatives: Ask other agencies for supplies, if they have them available.

Responsible Office: City of Clovis Police Department

Priority (High, Medium, Low): High

Cost Estimate: \$44,000

Potential Funding: General fund

Benefits (Avoided Losses): This will cut down on the spread of disease and animal loss during an emergency or disaster.

Schedule: Estimate completion in 2020

Status: 2009 project, implementation in progress

4. Purchase Hazard Mitigation Public Notification Boards

Hazard(s) Addressed: Multi-Hazard: dam failure, flood, wildfire, hazardous materials

Issue/Background: Purchase mobile self-contained changeable message signs to pre-alert motorists to avoid a “real time” traffic (or other) hazard.

Other Alternatives: Rely on contract service providers who may not be able to respond with adequate resources in a timely fashion.

Responsible Office: City of Clovis Engineering Division Traffic Management Group, Public Utilities Department Streets Division, Police Department, and Fire Department

Priority (High, Medium, Low): High

Cost Estimate: 4 signs @ \$35,000 each = \$140,000

Potential Funding: Departmental operational budgets or grant funding

Benefits (Avoided Losses): Provides the ability for City forces to aid emergency response crews by dispatching mobile sign units to be stationed at critical locations to alert motorists and citizens of potential hazard areas. This will allow for better routing of nonessential vehicle traffic that may impede the delivery of critical health and safety services and ultimately result in quicker overall response delivery times.

Schedule: Estimate completion in 2019/2020

Status: 2009 project, implementation not yet started

5. Improve Emergency Evacuation and Emergency Vehicle Routes

Hazard(s) Addressed: Multi-Hazard: dam failure, flood, wildfire, hazardous materials

Issue/Background: Currently, there are several street segments within the City of Clovis that could serve as evacuation routes or detour routes in the event of a disaster. These segments are currently deficient in terms of traffic carrying capacity and serviceability. Improvements to these routes would provide the additional pavement width necessary to provide increased flexibility and capacity in routing traffic and emergency vehicles. Routes include:

- Shepherd Avenue from Clovis to Fowler (1 mile)
- Nees Avenue from Clovis to Armstrong (1.6 miles)
- Alluvial Avenue from Sunnyside to Temperance (1.25 miles)
- Sunnyside Avenue from Nees to Shepherd (1 mile)

Other Alternatives: No action. Existing road segments would remain constricted, impeding evacuation expediency and limiting detour alternatives.

Responsible Office: City of Clovis Public Utilities Department—Long-term Maintenance, City of Clovis Engineering Department—Construction

Priority (High, Medium, Low): High

Cost Estimate: \$7,500,000

Potential Funding: None identified, potential for federal or state grant funding

Benefits (Avoided Losses): Improved traffic flow and increased flexibility in moving traffic and emergency vehicles during a disaster

Schedule: One year

Status: 2009 project, implementation not yet started

6. Conduct a Seismic Vulnerability Assessment of City-Owned Critical Facilities

Hazard(s) Addressed: earthquake

Issue/Background: The City is interested in performing a building-specific, seismic vulnerability assessment of City-owned critical facilities constructed prior to 1980 (including infrastructure). Included in this assessment will be recommended mitigation alternatives that meet goals and objectives of this plan.

Other Alternatives: No action

Responsible Office: City of Clovis Planning and Development Services—Building

Priority (High, Medium, Low): Medium

Cost Estimate: \$200,000

Potential Funding: General fund, FEMA’s Pre-Disaster Mitigation grants

Benefits (Avoided Losses): This will prevent the loss of human life, economic loss, and property loss.

Schedule: Long term

Status: 2009 project, implementation in progress

7. Construct Channel Improvements for Dog Creek Stream, South of Gettysburg-Ashlan

Hazard(s) Addressed: flood

Issue/Background: Dog Creek has been identified in the Fresno Metropolitan Flood Control District’s (FMFCD) Rural Streams Program as a facility that needs master planned drainage improvements to adequately convey rural stream floodwaters. The FMFCD requires all development within rural stream areas to provide and construct the necessary channel

improvements. The channel improvements required of Dog Creek include relocation/reconstruction of the existing channels geometry to allow a flow of 315 cubic feet per second to be passed. In order to meet this flow capacity, Dog Creek must have geometry of approximately 60 feet in width and 12 feet in depth.

Other Alternatives: No action

Responsible Office: City of Clovis Planning and Development Services Department, Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): High

Cost Estimate: \$700,000

Potential Funding: California Department of Water Resources grant

Benefits (Avoided Losses): The project goals and objectives are to improve flood management of Dog Creek for future development, as planned for in the area, thus minimizing the potential of rural stream flows to flood urbanized areas. Development activity in the City of Clovis is managed through the FMFCD for both urbanized development and rural stormwater flows. FMFCD policy does not allow for the mixing of urban and rural flows in the same channel.

Schedule: Long term

Status: 2009 project, implementation in progress

8. Improve Flow Design Parameters for Big Dry Creek and the Enterprise Canal*

Hazard(s) Addressed: flood

Issue/Background: In order to meet the Fresno Metropolitan Flood Control District's flow design parameters for Big Dry Creek and the Enterprise Canal, the existing siphon at the confluence of the two waterways needs to be replaced with a similar type structure. The new structure will have enhanced flow measurement and control for both the Big Dry Creek and Enterprise Canal and would incorporate a walkway to accommodate a path along Big Dry Creek for the general public.

The primary purpose of the project is to provide for the long term integrity of the siphon to pass Big Dry Creek and Enterprise Canal flows. The existing structure on the Enterprise Canal (located beneath Dry Creek) was constructed in the early 1900s (estimated 1915). The replacement of this structure is essential to the reliable delivery of water over the long term. The existing structure consists of a box culvert with an integrally constructed weir. Material strength testing was conducted at the siphon, which included two concrete cores and rebar mapping of the top slab. This testing determined that the concrete compressive strength was a minimum of 4,300 pounds per square inch. Several large cracks were found in the center culvert wall approximately ¼ inch wide by 10 feet long. The cut-off wall located at the end of the apron extending from the weir

structure had significant damage where rebar has been exposed and pieces of concrete have broken off.

Other Alternatives: No action

Responsible Office: City of Clovis Planning and Development Services Department, City of Clovis Public Utilities Department, Fresno Irrigation District, Fresno County, City of Fresno, Fresno Metropolitan Flood Control District

Priority (High, Medium, Low): High

Cost Estimate: \$845,000

Potential Funding: California Department of Water Resources grant

Benefits (Avoided Losses): The project goals and objectives are to provide for the long-term integrity of the siphon to carry Dry Creek and Enterprise Canal flows.

Schedule: Long term

Status: 2009 project, implementation in progress

9. Improve City's Floodplain Management Program and Apply to Community Rating System*

Hazard (s) Addressed: flood

Issue/Background: Seek Community Rating System (CRS) classification improvements within the capabilities of City programs, including adoption and administration of FEMA-approved ordinances and flood insurance rate maps.

Other Alternatives: No action

Responsible Office: City of Clovis Fire Department—Emergency Preparedness

Priority (High, Medium, Low): Medium

Cost Estimate: \$300,000

Potential Funding: General fund, FEMA's Pre-Disaster Mitigation grants

Benefits (Avoided Losses): Participation in the CRS and improvements outlined by the system will translate into improved flood mitigation and reduced flood insurance rates for local citizens. Ultimately, it will prevent the loss of human life and economic and property losses.

Schedule: Long term

Status: 2009 project, implementation in progress

10. Enforce Master Drainage Plan Requirements*

Hazard(s) Addressed: flood

Issue/Background: The City of Clovis requires a master drainage plan as part of the approval process for all specific plans and large development projects as determined by the City's Public Works director. The master drainage plan requirements consider cumulative regional drainage and flooding mitigation. The intent of a master drainage plan is to ensure that the overall rate of runoff from a project does not exceed pre-development levels. If necessary, this objective shall be achieved by incorporating run-off control measures to minimize peak flows and/or assistance in financing or otherwise implementing comprehensive drainage plans. Enforcement will include review of development during and after construction to ensure that drainage requirements have been implemented as proposed.

Other Alternatives: No action

Responsible Office: City of Clovis Fire Department—Emergency Preparedness

Priority (High, Medium, Low): Low

Cost Estimate: Developer-based funding under specific plan requirements

Potential Funding: Developer-based funding under specific plan requirements

Benefits (avoided Losses): This will prevent the loss of human life and economic and property losses and addresses flood mitigation with future development. Enforcement of these requirements ensures that the overall rate of runoff from a project does not exceed pre-development levels, thus prevents making stormwater flooding worse.

Schedule: Long term

Status: 2009 project, implementation in progress

11. Install a System of Surface Water Hazard Detection

Hazard(s) Addressed: hazardous materials

Issue/Background: The City operates a surface water treatment plant that supplies water to a community of over 95,000 people. The water is delivered to the plant via an open canal that travels approximately 30 miles from the source to the plant. There have been several incidents where items have been dumped into the canal, requiring the plant to shut down. The City is concerned that the dumping of hazardous chemicals could occur and, without some advance notification, that the chemicals could get through the treatment plant and into the distribution system, making customers sick.

Equipment is available that can be installed upgradient from the plant that will sample the water, analyze the water on-site, and provide notification to the plant prior to it reaching the plant.

Other Alternatives: Continue patrolling the canal on a daily basis.

Responsible Office: City of Clovis Public Utilities Department Water Division

Priority (High, Medium, Low): High

Cost Estimate: \$100,000

Potential Funding: City of Clovis Water Operations Fund

Benefits (Avoided Losses): This will prevent the loss of human life, illness, customer confidence, and revenue.

Schedule: Estimate completion in 2019

Status: 2009 project, implementation in progress

12. Sustainable Groundwater Management Act Compliance including Groundwater Sustainability Planning and Implementation

Hazard(s) Addressed: Drought

Issue/Background: The Kings subbasin underlays the City of Clovis and like many groundwater basins throughout the State, this subbasin is in overdraft condition with underground aquifers adversely impacted by overuse. Such impacts include significant decline in water storage and water levels, degradation of water quality, and land subsidence resulting in the permanent loss of storage capacity. The Sustainable Groundwater Management Act (SGMA) provides for the establishment of local Groundwater Sustainability Agencies (GSAs) to manage groundwater sustainability within groundwater subbasins defined by the California Department of Water Resources (DWR). The City of Clovis has become a joint power authority of the North Kings Groundwater Sustainability Agency, other members of the Agency include the County of Fresno, City of Kerman, City of Fresno Biola Community Services District, Garfield Water District and International Water District. As a member of the North Kings GSA, the City of Clovis is required to participate in the development and implementation, no later than January 31, 2020, of a Groundwater Sustainability Plan (GSP) to ensure a sustainable yield of groundwater, without causing undesirable results. Failure to comply with that requirement could result in the State asserting its power to manage local groundwater resources. Participation in the North Kings GSA and the implementation of a GSP will allow the City to maintain sustainable groundwater supplies while providing insurance against periods of long-term drought.

Other Alternatives: None, compliance required by law, failure to meet requirements will result in State intervention and oversight.

Responsible Office: City Engineer and North Kings GSA

Priority (High, Medium, Low): High

Cost Estimate: Varies by GSA for preparation of the required GSP. Further expenses are anticipated to be accrued for the planning and construction of groundwater recharge projects.

Potential Funding: Property owner assessments along with grant funding opportunities from the State.

Benefits (Avoided Losses): Preparation and implementation of the GSP by the respective GSAs will result in the management of groundwater in a manner that is sustainable and avoids undesirable results as defined by the California State Department of Water Resources.

Schedule: GSAs must complete and submit the required GSP to DWR by January 31, 2020, which is to be fully implemented and result in sustainability of the groundwater basin, with no undesirable effects, by the year 2040.

Status: New project in 2018

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Appendix D

City Water Rates

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6.5.103 Water rates inside the City.

Each customer connected to the City's water system shall pay, as a condition of water service, the following rates for one month of service:

(a) For single-family living units; multiple-family units; two (2) or more living units with separate toilet, kitchen or washroom facilities situated on the same lot; hotels; motels; and auto courts or mobile home parks wherein individual units or cabins are provided with kitchen facilities the minimum charge to each customer shall be ten and 61/100ths dollars (\$10.61) per month per unit. In addition each customer shall pay at the rate of 86/100ths dollars (\$0.86) per one thousand (1,000) gallons for no more than eleven thousand five hundred (11,500) gallons per month per unit, and for amounts in excess of eleven thousand five hundred (11,500) gallons but no more than twenty thousand (20,000) gallons per month per unit, in addition the customer shall pay at the rate of one and 45/100ths dollars (\$1.45) per one thousand (1,000) gallons of water used. For amounts of water used in excess of twenty thousand (20,000) gallons per month per unit, the customer shall pay, in addition, the rate of one and 78/100ths dollars (\$1.78) per one thousand (1,000) gallons of water used over twenty thousand (20,000) gallons per month.

During any declared state of emergency by the State or City related to potable water conditions that mandate water conservation in the City, when State or Federal regulations that mandate water conservation in the City are in effect, or during local water shortages, the following rates are effective. For single-family living units; multiple-family units; two (2) or more living units with separate toilet, kitchen or washroom facilities situated on the same lot; hotels; motels; and auto courts or mobile home parks wherein individual units or cabins are provided with kitchen facilities the minimum charge to each customer shall be ten and 61/100ths dollars (\$10.61) per month per unit. In addition each customer shall pay at the rate of one and 04/100ths dollars (\$1.04) per one thousand (1,000) gallons for no more than eleven thousand five hundred (11,500) gallons per month per unit, and for amounts in excess of eleven thousand five hundred (11,500) gallons but no more than twenty thousand (20,000) gallons per month per unit, in addition the customer shall pay at the rate of two and 10/100ths dollars (\$2.10) per one thousand (1,000) gallons of water used. For amounts of water used in excess of twenty thousand (20,000) gallons per month per unit, the customer shall pay, in addition, the rate of two and 66/100ths dollars (\$2.66) per one thousand (1,000) gallons of water used over twenty thousand (20,000) gallons per month.

(1) For residential customers with landscape meters, the charge for water consumption of such landscape meters shall be at the minimum of the commercial rate provided in subsection (b) of this section and in addition each customer shall pay at the rate of 86/100ths dollars (\$0.86) per one thousand (1,000) gallons for no more than eleven thousand five hundred (11,500) gallons per month. For amounts of water used in excess of eleven thousand five hundred (11,500) gallons per month, the customer shall pay, in addition, the rate of one and 17/100ths dollars (\$1.17) per one thousand (1,000) gallons of water used over eleven thousand five hundred (11,500) gallons per month.

During any declared state of emergency by the State or City related to potable water conditions that

mandate water conservation in the City, when State or Federal regulations that mandate water conservation in the City are in effect, or during local water shortages, the following rates are effective. For residential customers with landscape meters, the charge for water consumption of such landscape meters shall be at the minimum of the commercial rate provided in subsection (b) of this section and in addition each customer shall pay at the rate of one and 04/100ths dollars (\$1.04) per one thousand (1,000) gallons for no more than eleven thousand five hundred (11,500) gallons per month. For amounts of water used in excess of eleven thousand five hundred (11,500) gallons per month, the customer shall pay, in addition, the rate of one and 40/100ths dollars (\$1.40) per one thousand (1,000) gallons of water used over eleven thousand five hundred (11,500) gallons per month.

(b) For all other customers, commercial uses, industrial uses, schools and churches, wherein water service is provided, the minimum charge shall be eight and 55/100ths dollars (\$8.55) per account per month for water services one inch (1") or smaller in size. For water services one and one-half inches (1-1/2") in size, the minimum charge shall be eleven and 37/100ths dollars (\$11.37) per account per month. For water services two inches (2") in size, the minimum charge shall be fifteen and 70/100ths dollars (\$15.70) per account per month. For water services three inches (3") in size, the minimum charge shall be thirty-one and 09/100ths dollars (\$31.09) per account per month. For services four inches (4") in size, the minimum charge shall be seventy-eight and 21/100ths dollars (\$78.21) per account per month. For services six inches (6") in size, the minimum charge shall be three hundred eleven and 95/100ths dollars (\$311.95) per account per month. For services eight inches (8") in size, the minimum charge shall be five hundred fifty-two and 98/100ths dollars (\$552.98) per account per month. For services ten inches (10") in size, the minimum charge shall be eight hundred sixty-six and 32/100ths dollars (\$866.32) per account per month. In addition each customer shall pay at the rate of 86/100ths dollars (\$0.86) per one thousand (1,000) gallons for no more than eleven thousand five hundred (11,500) gallons per month. For amounts of water used in excess of eleven thousand five hundred (11,500) gallons per month, the customer shall pay, in addition, the rate of one and 17/100ths dollars (\$1.17) per one thousand (1,000) gallons of water used over eleven thousand five hundred (11,500) gallons per month. "Account" as used in this subsection shall mean each meter connection whether serving one business or multiple businesses under one or multiple ownership.

During any declared state of emergency by the State or City related to potable water conditions that mandate water conservation in the City, when State or Federal regulations that mandate water conservation in the City are in effect, or during local water shortages, the following rates are effective. For all other customers, commercial uses, industrial uses, schools and churches, wherein water service is provided, the minimum charge shall be eight and 55/100ths dollars (\$8.55) per account per month for water services one inch (1") or smaller in size. For water services one and one-half inches (1-1/2") in size, the minimum charge shall be eleven and 37/100ths dollars (\$11.37) per account per month. For water services two inches (2") in size, the minimum charge shall be fifteen and 70/100ths dollars (\$15.70) per account per month. For water services three inches (3") in size, the minimum charge shall be thirty-one and 09/100ths dollars (\$31.09) per account per month. For services four inches (4") in size, the minimum charge shall be seventy-eight and 21/100ths dollars (\$78.21) per account per

month. For services six inches (6") in size, the minimum charge shall be three hundred eleven and 95/100ths dollars (\$311.95) per account per month. For services eight inches (8") in size, the minimum charge shall be five hundred fifty-two and 98/100ths dollars (\$552.98) per account per month. For services ten inches (10") in size, the minimum charge shall be eight hundred sixty-six and 32/100ths dollars (\$866.32) per account per month. In addition each customer shall pay at the rate of one and 04/100ths dollars (\$1.04) per one thousand (1,000) gallons for no more than eleven thousand five hundred (11,500) gallons per month. For amounts of water used in excess of eleven thousand five hundred (11,500) gallons per month, the customer shall pay, in addition, the rate of one and 40/100ths dollars (\$1.40) per one thousand (1,000) gallons of water used over eleven thousand five hundred (11,500) gallons per month. "Account" as used in this subsection shall mean each meter connection whether serving one business or multiple businesses under one or multiple ownership.

(c) For any standby service, including fire sprinkler systems, the availability charge to each customer shall be seventy-eight and 21/100ths dollars (\$78.21) per month per account.

(d) As a condition of and prior to the issuance of any building permit for the construction of a building where water service is to be utilized, but where no water meter has been installed, the person to whom such permit is issued shall pay an on-site construction water charge for each service of fifty-three and 29/100ths dollars (\$53.29) per building per two (2) months, for a period of time not to exceed six (6) months provided the permittee installs, at his cost, an approved spacer. At the conclusion of said six (6) months, water service will only be provided after the installation of a water meter in accordance with the regulations and rates set forth in this article. The spacer shall become the property of the City.

During any declared state of emergency by the State or City related to potable water conditions that mandate water conservation in the City, when State or Federal regulations that mandate water conservation in the City are in effect, or during local water shortages, the following rates are effective. As a condition of and prior to the issuance of any building permit for the construction of a building where water service is to be utilized, but where no water meter has been installed, the person to whom such permit is issued shall pay an on-site construction water charge for each service of sixty-six and 35/100ths dollars (\$66.35) per building per two (2) months, for a period of time not to exceed six (6) months provided the permittee installs, at his cost, an approved spacer. At the conclusion of said six (6) months, water service will only be provided after the installation of a water meter in accordance with the regulations and rates set forth in this article. The spacer shall become the property of the City.

(e) Any person receiving a permit to take water from a fire hydrant shall pay a minimum fee of thirty-one and 09/100ths dollars (\$31.09) per month, or portion thereof, under such permit, and in addition each customer shall pay at the rate of 86/100ths dollars (\$0.86) per one thousand (1,000) gallons for no more than eleven thousand five hundred (11,500) gallons per month. For amounts of water used in excess of eleven thousand five hundred (11,500) gallons per month, the customer shall pay, in addition, the rate of one and 17/100ths dollars (\$1.17) per one thousand (1,000) gallons of water used over eleven thousand five hundred (11,500) gallons per month.

During any declared state of emergency by the State or City related to potable water conditions that mandate water conservation in the City, when State or Federal regulations that mandate water conservation in the City are in effect, or during local water shortages, the following rates are effective. Any person receiving a permit to take water from a fire hydrant shall pay a minimum fee of thirty-one and 09/100ths dollars (\$31.09) per month, or portion thereof, under such permit, and in addition each customer shall pay at the rate of one and 04/100ths dollars (\$1.04) per one thousand (1,000) gallons for no more than eleven thousand five hundred (11,500) gallons per month. For amounts of water used in excess of eleven thousand five hundred (11,500) gallons per month, the customer shall pay, in addition, the rate of one and 40/100ths dollars (\$1.40) per one thousand (1,000) gallons of water used over eleven thousand five hundred (11,500) gallons per month.

(f) Annual adjustment. The monthly user rates and minimum charges as provided in this section shall be adjusted beginning July 1, 2017, and annually each July 1st thereafter by three percent (3%). Prior to June 30th of each year beginning in 2017, the Public Utilities Director shall evaluate the water fund balance and, if adequate without the annual adjustment or with a lesser adjustment or with a rate reduction, shall recommend to the City Council a suspension or reduction of the rate adjustment or rate reduction for the next fiscal year. (§§ 7—9, Ord. 09-21, eff. December 2, 2009; § 2, Ord. 16-08, eff. June 1, 2016)

6.5.104 Water rates outside the City.

(a) The charge for each outside the City water system user shall be at the rate paid by inside the City water system users established by this article except as otherwise provided by this article or by resolution adopted by the City Council.

(b) Each customer located within the former Fresno County Waterworks District No. 8, now called Tarpey Village, connected to the City's water system shall pay, as a condition of water service, the following rates for two (2) months:

(1) For each unmetered customer occupying up to a seventeen-thousand-five-hundred (17,500) square-foot lot and utilizing a one-inch (1") service connection the customer shall pay one hundred six and 58/100ths dollars (\$106.58) per service connection per two (2) months. For up to every additional seven thousand five hundred (7,500) square feet in excess of seventeen thousand five hundred (17,500) square feet per lot, the customer shall pay an additional five and 12/100ths dollars (\$5.12) per two (2) months. An additional charge of five and 12/100ths dollars (\$5.12) shall be paid for every one-quarter inch (1/4") in excess of a one-inch (1") service per two (2) months. For system-wide water production in excess of sixty-three thousand (63,000) gallons per service connection per two (2) months, each customer shall pay an additional one and 78/100ths dollars (\$1.78) per one thousand (1,000) gallons produced per service connection.

During any declared state of emergency by the State or City related to potable water conditions that mandate water conservation in the City, when State or Federal regulations that mandate water conservation

in the City are in effect, or during local water shortages, the following rates are effective. For each unmetered customer occupying up to a seventeen-thousand-five-hundred (17,500) square-foot lot and utilizing a one-inch (1") service connection the customer shall pay one hundred thirty-two and 70/100ths dollars (\$132.70) per service connection per two (2) months. For up to every additional seven thousand five hundred (7,500) square feet in excess of seventeen thousand five hundred (17,500) square feet per lot, the customer shall pay an additional five and 12/100ths dollars (\$5.12) per two (2) months. An additional charge of five and 12/100ths dollars (\$5.12) shall be paid for every one-quarter inch (1/4") in excess of a one-inch (1") service per two (2) months. For system-wide water production in excess of sixty-three thousand (63,000) gallons per service connection per two (2) months, each customer shall pay an additional two and 49/100ths dollars (\$2.49) per one thousand (1,000) gallons produced per service connection.

(2) For the use of water-cooled air conditioning in a building the customer shall pay nineteen and 46/100ths dollars (\$19.46) per ton of cooling capacity per two (2) months. For the use of cooling towers, the customer shall pay three and 08/100ths dollars (\$3.08) per ton of cooling capacity or per horsepower per two (2) months. For the use of heat pumps, the customer shall pay twenty-five and 60/100ths dollars (\$25.60) per ton of cooling capacity or per horsepower per two (2) months.

(3) For any standby service, including fire sprinklers, the customer shall pay an availability charge of one hundred fifty-six and 42/100ths dollars (\$156.42) per two (2) months.

(4) Any metered Tarpey Village customer shall pay the same rates as customers located within the City.

(c) Annual adjustment. The monthly user rates and minimum charges as provided in this section shall be adjusted beginning July 1, 2017, and annually each July 1st thereafter by three percent (3%). Prior to June 30th of each year beginning in 2017, the Public Utilities Director shall evaluate the water fund balance and, if adequate without the annual adjustment or with a lesser adjustment or with a rate reduction, shall recommend to the City Council a suspension or reduction of the rate adjustment or a rate reduction for the next fiscal year. (§§ 7—9, Ord. 09-21, eff. December 2, 2009; § 2, Ord. 16-08, eff. June 1, 2016)

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Appendix E

Adoption Resolution

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Appendix F

DWR Submittal Tables

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CITY of CLOVIS

REPORT TO THE CITY COUNCIL

TO: Mayor and City Council

FROM: Planning & Development Services

DATE: July 12, 2021

SUBJECT: Consider – Status update regarding the City’s ongoing efforts to establish procedures for reviewing and analyzing potential Vehicle Miles Traveled (VMT) impacts and policy direction regarding proposed modifications to the Circulation Element of the 2014 Clovis General Plan incorporating VMT-related goals and/or policies.

Staff: Ricky Caperton, Senior Planner &
Sean Smith, Supervising Civil Engineer

Recommendation: Provide Policy Direction

ATTACHMENTS:

1. Proposed Modifications to Circulation Element
2. February 18, 2020 City Council Staff Report
3. July 20, 2020 City Council Staff Report
4. April 5, 2021 City Council Staff Report
5. BIA Letter of Support
6. Frequently Asked Questions
7. Interim Transportation Impact Analysis Guidelines

CONFLICT OF INTEREST

None.

RECOMMENDATION

Staff is seeking Council policy direction related to the proposed modifications to the Circulation Element of the 2014 Clovis General Plan incorporating VMT-related goals and/or policies, as shown in **Attachment 1**.

EXECUTIVE SUMMARY

Earlier this year, Staff amended an existing consultant agreement between the City and Kittelson and Associates, Inc. (Consultant) for additional VMT-related analysis at a citywide scale. The scope of this additional work includes an update to the Circulation Element of the City’s 2014 General Plan to incorporate VMT-related policies and preparation of a Supplemental Environmental Impact Report (SEIR) for compliance with the California Environmental Quality Act (CEQA).

The proposed modifications to the Circulation Element (**Attachment 1**) are intended to underscore the City's commitment and effort in meeting the requirements of VMT regulation, while implementing and balancing the overall vision of the General Plan in a manner that allows for projects to continue being processed in the most efficient manner.

The benefit of these efforts is to provide a mechanism whereby future development projects may "tier off" the VMT analysis included in the SEIR for streamlining purposes, and look to the new VMT goals and policies to support efficient processing and implementation of projects. As long as a project is consistent with the General Plan land use designation, the effects of VMT may not in and of itself trigger the need for preparation of an EIR even if the threshold(s) cannot be met. This concept is described in more detail below under the "Purpose of the Supplemental EIR" section below.

In order to move forward, Staff is seeking policy direction regarding the proposed modifications to the Circulation Element and to elicit any feedback from City Council related to VMT goals and policies.

BACKGROUND

This section briefly provides a status update on the City's efforts and summarizes background information related to the City's efforts related to VMT compliance. A more full and complete background can be found in the February 18, 2020, July 20, 2020, and April 5, 2021 Council staff reports, included as **Attachments 2, 3 and 4**, respectively.

- **February 18, 2020:** The City Council authorized the City Manager to enter into a consultant agreement with Kittelson and Associates, Inc. for preparation of the City's VMT Analysis Guidelines. Much of this contract has been fulfilled with the exception of development of a user tool and staff and developer training on VMT. The remaining tasks are in process.
- **July 1, 2020:** The metric by which transportation impacts were assessed pursuant to the California Environmental Quality Act (CEQA) guidelines shifted from a level of service (LOS) based analysis, to VMT analysis.
- **July 20, 2020:** The City Council adopted VMT Interim Guidelines (included as **Attachment 5**) for the City so that development could continue moving forward and appropriately assess traffic impacts using the new VMT metric. The "final" version will be brought for consideration as part of the efforts currently underway in preparing the SEIR and modifications to the Circulation Element. This is to ensure consistency between the VMT Guidelines, the revised Circulation Element, and the Supplemental EIR.

- **April 5, 2021:** The City Council authorized the City Manager to amend an existing consultant agreement for additional VMT services requested by staff for ongoing efforts related to development of City-wide VMT procedures, including making modifications to the City's 2014 General Plan Circulation Element. These efforts were a result of working closely with the local Building Industry Association (BIA) exploring methods for continuing to process entitlements in the most efficient manner. The BIA has provided a letter of support included as **Attachment 5**.

During the April 5, 2021 City Council meeting several questions were raised by Council related to VMT and how the City's ongoing efforts would help development move forward as efficiently as possible related to VMT analysis. While most of those questions were addressed at the April 5 meeting, Staff wants to provide an opportunity for Council to clarify or address any additional VMT-related questions directly with the consultants at tonight's meeting.

In addition, this is an opportunity for Staff to present draft modifications to the Circulation Element and garner any feedback and input Council may have prior to moving forward. The draft revisions to the General Plan Circulation Element are provided in **Attachment 1**. The revisions to the Circulation Element goals and policies are considered a "project" under CEQA, thus a Supplemental EIR will be prepared. Upon completion of the SEIR, Staff will return to Council for adoption of the SEIR and modifications to the Circulation Element.

As mentioned earlier, the intent of this report is to provide a brief status update on the City's efforts, but more importantly provide an opportunity for the City Council to ask or address any VMT-related questions directly with the City's VMT consultants, Kittelson and Associates and De Novo Planning Group (consultant preparing the Supplemental EIR). This allows for the VMT "experts" to be able to address the intricacies of VMT and provide additional information related to how VMT functions, how the VMT metrics were determined, and to provide insight of how development could be positively and/or negatively affected by VMT. **Attachment 6** includes a list of some frequently asked questions and responses for additional background.

In addition, Staff seeks input and direction related to the proposed modifications to the Circulation Element.

PROPOSAL AND ANALYSIS

The following discussion provides an overview of Staff's efforts related to VMT compliance.

Status Update

Following the April 5, 2021 Council approval for an amendment to the existing VMT consultant agreement, the City held a kickoff meeting with the consultant to begin next steps. Staff has begun analyzing the goals and policies of the existing Circulation Element in the 2014 Clovis General Plan. Staff has developed VMT-related goals and policies to the General Plan Circulation Element, which are included as **Attachment 1**. The purpose of these goals and policies is to ensure compliance with VMT regulation.

Kittelson and Associates have been working with staff to calculate VMT on a citywide scale based on the most up-to-date existing General Plan land use map. Once VMT has been fully calculated, De Novo Planning Group (subconsultant to Kittelson and Associates) will prepare the Supplemental EIR to ensure that the newly modified Circulation Element goals and policies are adequately assessed in compliance with CEQA Guidelines.

These efforts are anticipated to take approximately 6 to 8 months to complete. Once complete, staff will present the findings and recommendation to the Council for consideration.

2014 Clovis General Plan Circulation Element

Staff has proposed modifications to the Circulation Element incorporating VMT-related policies. In general, the goals and/or policies are intended to reference the City's ongoing efforts and commitment to complying with VMT regulation. These proposed modifications can be found in **Attachment 1**.

Purpose of the Supplemental EIR

The primary purpose of these efforts is to provide a mechanism under CEQA in which projects can "tier" from the citywide analysis of VMT. Under CEQA, if impacts are analyzed and determined to be "significant and unavoidable," a "statement of overriding considerations" may be prepared declaring that impacts are in fact un-mitigatable, even with mitigation measures.

The benefit for projects is that if they are consistent with the land use designation analyzed under SEIR, VMT would not in and of itself trigger the need for that individual project to prepare its own separate Environmental Impact Report since the City's SEIR already declared VMT impacts as "significant and unavoidable"; thus, providing for streamlining of CEQA so long as a project is consistent with the City's land use designations. Under this scenario, however, a project would still be required to mitigate to the extent feasible even if the result is still "significant and unavoidable."

Future projects that include a general plan amendment may require additional analysis which can result in the need for further CEQA documentation, including preparation of an EIR. Thus, while the SEIR will provide a means for streamlining in most cases, it is not intended to entirely prevent the need for future CEQA analysis which could result in subsequent EIR's.

VMT Mitigation

At the time of this staff report, Staff has only worked on projects that have been able to "screen out" based on criteria established under our Interim VMT Impact Analysis Guidelines (**Attachment 7**). This means that projects have either been of the size and/or type that were determined not to require a full VMT analysis or implement VMT-related mitigation measures and presumed to have a "less-than-significant" VMT impact.

However, there are several projects either in process and/or will be requiring preparation of an Environmental Impact Report partly due to exceeding the VMT threshold and are unable to “screen out.” Therefore, the full spectrum of preparing a VMT analysis necessitating the need for VMT mitigation measures has not been fully realized or tested since adoption of the City’s Interim VMT Impact Analysis Guidelines.

As part of the City’s efforts, mitigation measures will be further refined and analyzed to provide a better sense of what is feasible in terms of measures that would reduce VMT impacts for projects. In turn, this will aid in providing additional clarity to the development community on what to expect for potential mitigation. It is important to note that although mitigation measures will be further refined, the nature of VMT and how it is analyzed makes it such that VMT mitigation measures may or may not be as effective depending on project type, size, and/or location.

In terms of establishing a fee-based VMT mitigation, that may only provide for some relief but not necessarily absolve the need to prepare an EIR if the VMT threshold cannot be met. Thus, a VMT fee really only functions as a single tool for mitigation. In some cases a fee could help a project reduce VMT where all other mitigations are infeasible or where reduction is still needed in combination with other measures, but if the threshold cannot be met, an EIR would still be required.

FISCAL IMPACT

None.

REASON FOR RECOMMENDATION

Staff is seeking City Council direction related to the proposed modifications to the Circulation Element. At this time, no formal recommendation is needed.

ACTIONS FOLLOWING APPROVAL

City staff will continue working with the consultant and will present the completed products for adoption by City Council upon completion.

Prepared by: Ricky Caperton, Senior Planner / Sean Smith, Supervising Engineer

Reviewed by: City Manager *SA*

Circulation Element

Purpose

The circulation element determines the transportation system necessary to accommodate the planned land use and development.

Key Issues

The primary issue for the circulation element is to maintain and improve the road network to safely and efficiently move people and goods in cars and trucks. However, it is also important to reduce vehicle miles traveled through coordinated land use planning and facilitating non-automotive travel (i.e., transit, bikes, and walking). Additionally, the community highly values an extensive recreational trail system that adds to the quality of life.

The circulation element and the associated diagrams set forth the goals, policies, and general parameters for the development of the transportation system. However, the specific designs and geometry of the transportation elements, (such as street and bicycle path cross sections, street alignment, streetscape widths and treatments, etc.), are to be determined by a comprehensive street system master plan that will also incorporate the standards from existing specific plans.

Figure C-1 provides the basic structure of the roadway system. Within the northwest growth area, arterials and the collectors are considered major roadways (generally on the half-mile grid including International, Perrin, Peach, Minnewawa north of Behymer, Sunnyside diagonal, Auberry Road, and Preuss), with alignments that are similar to those shown on the diagram. The exact locations of these streets will be determined by a separate action utilizing a plan line or other appropriate geometry study. Other collectors are shown conceptually and the exact alignment and number of collectors may vary.

Figure C-2 is reflective of the current Bicycle System Master Plan that is updated periodically and is the guiding document for implementation of the bicycle transportation system.

ATTACHMENT 1

Goals and Policies

OVERARCHING GOAL: A comprehensive and well-maintained multimodal circulation system that provides for the safe and efficient movement of people and goods, as well as encourages reductions in Vehicle Miles Traveled (VMT) through well-planned pedestrian connections and improved connectivity.

Goal 1: A context-sensitive and “complete streets” transportation network that prioritizes effective connectivity and accommodates a comprehensive range of mobility needs.

Goal 2: A roadway network that is well planned, funded, and maintained.

Goal 3: A multimodal transportation network that is safe and comfortable in the context of adjacent neighborhoods.

Goal 4: A well-planned and maintained pedestrian circulation network that promotes increased use of the City’s bicycle, ~~and transit, and pedestrian system facilities in order to reduce that serves as a functional alternative to~~ commuting by single-occupancy vehicles whenever possible.

Goal 5: A complete system of trails and pathways accessible to all residents focusing on connectivity between adjacent neighborhoods, parks, trails, and goods and services.

Goal 6: Safe and efficient goods movement with minimal impacts on local roads and neighborhoods.

Goal 7: A regional transportation system that connects Clovis to the San Joaquin Valley region.

Goal 8: Improve and enhance the circulation network in a manner that reduces VMT through improved connectivity by focusing on modes of transportation that promotes the reduction in the use of single-occupancy vehicles whenever possible.

Goal 1: A context-sensitive and “complete streets” transportation network that prioritizes effective connectivity and accommodates a comprehensive range of mobility needs.

Policy 1.1 **Multimodal network.** The city shall plan, design, operate, and maintain the transportation network to promote safe and convenient travel for all users: pedestrians, bicyclists, transit riders, freight, and motorists.

Policy 1.2 **Transportation decisions.** Decisions should balance the comfort, convenience, and safety of pedestrians, bicyclists, and motorists.

Policy 1.3 **Age and mobility.** The design of roadways shall consider all potential users, including children, seniors, and persons with disabilities.

Policy 1.4 **Jobs and housing.** Encourage infill development that would provide jobs and services closer to housing, and vice versa, to reduce citywide vehicle miles travelled and effectively utilize the existing transportation infrastructure, as well as promote carpooling whenever possible.

Policy 1.5 **Neighborhood connectivity.** The transportation network shall provide multimodal access between neighborhoods and neighborhood-serving uses (educational, recreational, or neighborhood commercial uses).

Policy 1.6 **Internal circulation.** New development shall utilize a grid or modified-grid street pattern. Areas designated for residential and mixed-use village developments should feature short block lengths of 200 to 600 feet.

Policy 1.7 **Narrow streets.** The City may permit curb-to-curb dimensions that are narrower than current standards on local streets to promote pedestrian and bicycle connectivity and enhance safety.

Policy 1.8 **Network completion.** New development shall complete the extension of stub streets planned to connect to adjacent streets, where appropriate.

Goal 2: A roadway network that is well planned, funded, and maintained.

Policy 2.1 **Level of service.** The following is the City's level of service (LOS) standards:

- A. Achieve LOS D vehicle traffic operations during the a.m. and p.m. peak hours
- B. Allow exceptions on a case-by-case basis where lower levels of service would result in other public benefits, such as:
 - i. Preserving agriculture or open space land
 - ii. Preserving the rural/historic character of a neighborhood
 - iii. Preserving or creating a pedestrian-friendly environment in Old Town or mixed-use village districts
 - iv. Avoiding adverse impacts to pedestrians, cyclists, and mass transit riders
 - v. Where right-of-way constraints would make capacity expansion infeasible

Policy 2.2 **Multimodal LOS.** Monitor the evolution of multimodal level of service (MMLOS) standards. The city may adopt MMLOS standards when appropriate.

Policy 2.3 **Fair share costs.** New development shall pay its fair share of the cost for circulation improvements in accordance with the city's traffic fee mitigation program.

Policy 2.4 **Right-of-way dedication.** The city may require right-of-way dedication essential to the circulation system in conjunction with any development or annexation. The City shall request the County of Fresno to apply the same requirements in the Clovis planning area.

Policy 2.5 **Regional and state roadway funding.** Coordinate with the County of Fresno, City of Fresno, Fresno Council of Governments, and Caltrans to fund roadway improvements adjacent to and within the City's Planning Area.

Policy 2.6 **Vehicle Miles Travelled.** Development projects shall comply with the City's VMT Transportation Analysis Guidelines and provide the appropriate VMT mitigation measures as determined through the analysis.

Policy 2.7 **VMT Mitigation Fee Program.** Evaluate the feasibility of a VMT mitigation fee program and explore opportunities for establishing an in-lieu mitigation fee to offset VMT impacts from development.

Policy 2.8 **Partner with local agencies and stakeholders.** Partner with other local and regional agencies and stakeholders to explore VMT mitigation measures at the regional scale.

Goal 3: A multimodal transportation network that is safe and comfortable in the context of adjacent neighborhoods.

Policy 3.1 **Traffic calming.** Employ traffic-calming measures in new developments and existing neighborhoods to control traffic speeds and maintain safety.

Policy 3.2 **Neighborhood compatibility.** Periodically review and update design standards to ensure that new and redesigned streets are compatible with the context of adjacent neighborhoods.

Policy 3.3 **Old Town and mixed use village centers.** Transportation decisions on local streets in Old Town and mixed-use village centers shall prioritize pedestrians, then bicyclists, then mass transit, then motorists.

Policy 3.4 **Road diets.** Minimize roadway width as feasible to serve adjacent neighborhoods while maintaining sufficient space for public safety services.

Policy 3.5 **Roadway widening.** Only consider street widening or intersection expansions after considering multimodal alternative improvements to non-automotive facilities.

Policy 3.6 **Soundwalls.** Design roadway networks to disperse traffic to minimize traffic levels. Discourage soundwalls along new collector and local streets when feasible.

Policy 3.7 **Conflict points.** Minimize the number of and enhance safety at vehicular, pedestrian, and bicycle conflict points.

Policy 3.8 **Access management.** Minimize access points and curb cuts along arterials and prohibit them within 200 feet of an intersection where possible. Eliminate and/or consolidate driveways when new development occurs or when traffic operation or safety warrants.

Policy 3.9 **Park-once.** Encourage “park-once” designs where convenient, centralized public parking areas are accompanied by safe, visible, and well-marked access to sidewalks and businesses.

Policy 3.10 **Pedestrian access and circulation.** Entrances at signalized intersections should provide sidewalks on both sides of the entrance that connect to an internal pedestrian pathway to businesses and throughout nonresidential parking lots larger than 50 spaces.

Policy 3.11 **Right-of-way design.** Design landscaped parkways, medians, and right-of-ways as aesthetic buffers to improve the community’s appearance and encourage non-motorized transportation.

Policy 3.12 **Residential orientation.** Where feasible, residential development should face local and collector streets to increase visibility and safety of travelers along the streets, and encourage pedestrian and bicycle access.

Goal 4: A bicycle and transit system that serves as a functional alternative to commuting by car.

Policy 4.1 **Bike and transit backbone.** The bicycle and transit system should connect Shaw Avenue, Old Town, the Medical Center/R&T Park, and the three Urban Centers.

Policy 4.2 **Priority for new bicycle facilities.** Prioritize investments in the backbone system over other bicycle improvements.

Policy 4.3 **Freeway crossings.** Require separate bicycle and pedestrian crossings for new freeway extensions and encourage separate crossings where Class I facilities are planned to cross existing freeways.

Policy 4.4 **Bicycles and transit.** Coordinate with transit agencies to integrate bicycle access and storage into transit vehicles, bus stops, and activity centers.

Policy 4.5 **Transit stops.** Improve and maintain safe, clean, comfortable, well-lit, and rider-friendly transit stops that are well marked and visible to motorists.

Policy 4.6 **Transit priority corridors.** Prioritize investments for, and transit services and facilities along the transit priority corridors.

Policy 4.7 **Bus rapid transit.** Plan for bus rapid transit and transit-only lanes on transit priority corridors as future ridership levels increase.

Goal 5: A complete system of trails and pathways accessible to all residents.

- Policy 5.1 **Complete street amenities.** Upgrade existing streets and design new streets to include complete street amenities, prioritizing improvements to bicycle and pedestrian connectivity or safety, consistent with the Bicycle Transportation Master Plan and other master plans.
- Policy 5.2 **Development-funded facilities.** Require development to fund and construct facilities as shown in the [Active Transportation Plan](#) ~~Bicycle Transportation Plan~~ when facilities are in or adjacent to the development.
- Policy 5.3 **Pathways.** Encourage pathways and other pedestrian amenities in Urban Centers and new development 10 acres or larger.
- Policy 5.4 **Homeowner associations.** The city may require homeowner associations to maintain pathways and other bicycle and pedestrian facilities within the homeowner association area.
- Policy 5.5 **Pedestrian access.** Require sidewalks, paths, and crosswalks to provide access to schools, parks, and other activity centers and to provide general pedestrian connectivity throughout the city.

Goal 6: Safe and efficient goods movement with minimal impacts on local roads and neighborhoods.

Policy 6.1 Truck routes. Plan and designate truck routes that minimize truck traffic through or near residential areas.

Policy 6.2 Land use. Place industrial and warehousing businesses near freeways and truck routes to minimize truck traffic through or near residential areas.

Goal 7: A regional transportation system that connects Clovis to the San Joaquin Valley region.

Policy 7.1 Clovis Avenue extension. Invest in the extension of Clovis Avenue north to Copper Avenue as funding is available.

Policy 7.2 Right-of-way for future extensions. Coordinate with Fresno County, the Fresno Council of Governments, and Caltrans to preserve future right-of-way for extending Clovis Avenue north of Copper Avenue to Auberry Road and future State Route 65.

Policy 7.3 San Joaquin River crossing. Collaborate with the Fresno Council of Governments and appropriate agencies to secure a San Joaquin River crossing between State Route 41 and North Fork Road.

Goal 8: Improve and enhance the circulation network in a manner that reduces VMT through improved connectivity by focusing on modes of transportation that promotes the reduction in the use of single-occupancy vehicles whenever feasible.

Policy 8.1 Transportation Demand Management. Develop Transportation Demand Management (TDM) measures that promote, enhance, and make available feasible alternative modes of transportation to residents, employees, and visitors.

Policy 8.2 Transit Routes. As development occurs in the City's growth areas, continue to evaluate transit routes to determine the most efficient methods of transporting people between residential neighborhoods and goods and services.

Policy 8.3 Bicycle Lanes. Partner with any local bicycle advocacy groups to improve the design, location, and functionality of bicycle lanes to encourage safe and efficient travel lanes.

Policy 8.4 Connectivity between residential and commercial. Continue to explore opportunities for increased non-vehicular connectivity between new and existing residential development and commercial uses.

Policy 8.5 Community outreach and education. Explore the feasibility of a community outreach and education program that promotes and highlights opportunities for safe and efficient non-vehicular modes of transportation for commuting and recreation.

Policy 8.6 Employer commute programs. Work with businesses to encourage commuter programs and infrastructure that promotes alternative modes of transportation reducing the use of single-occupancy vehicles, such as additional bicycle racks/lockers, on-site shower facilities, and perks for employees who commute.

Figure C-1. Circulation Diagram

Figure C-2. Bicycle and Trails System

Figure C-3. Transit System



CITY *of* CLOVIS

REPORT TO THE CITY COUNCIL

TO: Mayor and City Council

FROM: Planning and Development Services

DATE: February 18, 2020

SUBJECT: Approval – Authorize the City Manager to execute a Consultant Agreement between the City of Clovis and a consultant for services related to assisting the City in preparation to review traffic impact studies under the provisions of Senate Bill 743 related to Vehicle Miles Traveled.

ATTACHMENTS: 1. Consultant Proposal

CONFLICT OF INTEREST

None.

RECOMMENDATION

For the City Council to authorize the City Manager to enter into an agreement with the selected consultant for professional services in an amount not to exceed \$164,820 for services related to assisting the City in preparation to review traffic impact studies under the provisions of Senate Bill 743 (SB 743) related to Vehicle Miles Traveled. The contract amount includes the base cost estimate of \$134,400 in addition to costs associated with the completion of two (2) optional tasks of \$30,420 for a total contract amount up to \$164,820.

EXECUTIVE SUMMARY

The City seeks to enter into an agreement with a consultant to assist in developing a guidance document for staff, developers, decision-makers, and the public in preparing traffic impact analyses under the provisions of SB 743. Under SB 743, the primary metric for analyzing and determining potential traffic-related impacts under the California Environmental Quality Act (CEQA) will shift from Level of Service (LOS) to Vehicle Miles Traveled (VMT). In order to comply with CEQA Guidelines, the City must begin utilizing VMT by July 1, 2020. The agreement would allow for the City to enter into a contract with the selected consultant to be able to begin work immediately to ensure the City is adequately prepared to analyze VMT impacts by July 1, 2020.

BACKGROUND

The following is a brief summary of SB 743 for purposes of this request for the City Council to authorize the City Manager to enter into a Consultant Agreement with a consultant; however, it is the intent of City staff to come back to the City Council in March 2020 to present a more detailed discussion on the background and future of analyzing traffic impacts under SB 743.

Senate Bill 743 was signed into law in 2013 with the intent to promote infill development, encourage more active and pedestrian-oriented development, and reduce greenhouse gas emissions. In order to achieve those objectives, SB 743 requires a fundamental shift in how projects will measure potential traffic related impacts evaluated under the California Environmental CEQA after July 1, 2020.

Prior to SB 743, CEQA required analysis of traffic impacts using LOS as the primary metric for determining whether or not a project would have significant impacts. In short, LOS refers to the delay of traffic so that lead agencies can compare that to their adopted standards. If a project demonstrated that it exceeded or exacerbated that standard beyond what a lead agency deemed acceptable, then presumably a significant impact could occur and mitigation would be required.

Under SB 743, LOS will no longer be the primary metric for analyzing and determining traffic impacts under CEQA. Rather, traffic impacts of projects will be measured by VMT which is the measurement of how many vehicle miles are produced on average. In general, VMT is typically analyzed on a per capita basis for residential projects, and per employee for non-residential projects. The Governor's Office of Planning and Research (OPR) issued a technical guidance document in 2018 suggesting that the threshold or standard be that projects result in fifteen percent (15%) reduction in VMT than the countywide average in order to result in a less-than-significant impact. For example, if the countywide average is 10 VMT per capita, a new residential project would have to demonstrate the project results in only 8.5 VMT per capita (15% reduction from 10 VMT) in order to result in a less-than-significant impact under CEQA.

In general, the impetus behind SB 743 is that the number of vehicle miles traveled is a more accurate measure of greenhouse gas emissions as opposed to the amount of delay at an intersection. The LOS metric (i.e. measuring delay) often penalizes the last developer in as a result of surrounding development contributing to delay. As a result, LOS was often viewed as discouraging infill development. Under VMT as the metric, the thought is that infill, higher densities, and mix of uses will now be encouraged.

With Council approval, the City will be able to work with the selected consultant in order to develop a more detailed guidance document tailored to the City to ensure the City is in compliance with SB 743 by July 1, 2020. It is important to note that the Fresno Council of Governments (Fresno COG) is currently working with a consultant on a countywide guidance document and user tool in anticipation for SB 743, as well as the City of Fresno.

FISCAL IMPACT

The total contract for this work shall not exceed \$164,820. The City will utilize General Plan Consultant revenues to cover the cost of the contract. The contract amount includes the base cost of \$134,400 in addition to costs associated with two (2) optional tasks of \$30,420 for a total contract amount of \$164,820.

REASON FOR RECOMMENDATION

Staff recommends that Council authorize execution of the Consultant Agreement to allow for the timely preparation of a guidance document so that City staff is able to adequately analyze VMT traffic impacts starting July 1, 2020 in compliance with SB 743.

ACTIONS FOLLOWING APPROVAL

If approved by City Council, staff will execute the contract and the consultant will commence work immediately.

Prepared by: Ricky Caperton, AICP, Senior Planner

Reviewed by: City Manager *JH*

CONSULTANT PROPOSAL

ATTACHMENT 1

CITY OF CLOVIS

PREPARATION OF
**VMT IMPLEMENTATION
GUIDELINES,
THRESHOLDS,
AND MITIGATION
MEASURES**

FEBRUARY 5, 2020

PROPOSAL

CITY OF CLOVIS

PREPARATION OF VMT IMPLEMENTATION GUIDELINES, THRESHOLDS, AND MITIGATION MEASURES

PROPOSAL | February 5, 2020

Submitted by:

Kittelson & Associates, Inc.
750 The City Drive, Suite 410
Orange, CA 92868
(714) 468-1997

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February 5, 2020

Project #: 24913

Ricky Caperton, AICP
City of Clovis, Planning & Development
1033 Fifth Street
Clovis, CA 93612

RE: City of Clovis – RFP for the Preparation of Vehicle Miles Traveled (VMT) Implementation Guidelines, Thresholds, and Mitigation Measures

Dear Mr. Caperton:

To achieve the state's goals of significant greenhouse gas emission reductions in the coming decades, Senate Bill 743 (SB 743) prohibits traditional vehicle capacity metrics such as level of Service (LOS) for analyzing transportation impacts under the California Environmental Quality Act (CEQA). The California Office of Planning and Research (OPR) provided guidance for local jurisdictions (Technical Advisory on Evaluating Transportation Impacts in CEQA) in December 2018 that included vehicle-miles traveled (VMT) as the preferred metric for assessing transportation impacts under CEQA. Compliance for cities and counties in the state will become mandatory by July 1, 2020.

Kittelison & Associates, Inc. (Kittelison) is pleased to present this response to the request for proposals (RFP) to the City of Clovis to support you with Professional Services for State Bill 743 (SB 743) Implementation Guidelines, Thresholds and Mitigation Measures. We have assembled a comprehensive team of professionals highly experienced in this topic area. Our proposal describes our firm, our staff, and selected relevant qualifications that demonstrate our ability to support the City of Clovis.

Kittelison has supported many communities in developing their transportation analysis guidance and appropriate tools in response to recent changes such as the SB 743 legislation. We are supporting a number of agencies with this transition and feel we can provide similar value to the City of Clovis. Our team combines the strong, objective technical analysis needed to assist the City of Clovis in assisting the City with implementation of guidelines, thresholds and mitigation measures to comply with SB743.

As a team:

- We have been working closely with state agencies on the development of the alternative performance metrics and their implementation and have participated and contributed to multiple working groups and conferences across the state with respect to SB 743 methodology development and implementation.
- We have been advising cities and other jurisdictions to plan for the policy and procedural changes of SB 743 and other CEQA reform measures.

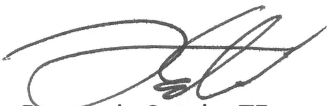
- We have in-house experts on CEQA traffic analysis, transportation demand management programs, and travel demand modeling to conduct VMT calculations.
- Our staff participated in the preparation of the 2014 City of Clovis General Plan Update and Environmental Impact Report (EIR) and worked on many other projects in the region.
- Our travel modelers have experience updating and using the Fresno Council of Governments (COG) Regional Travel Demand Forecasting Model; we have applied the model for many regional and local studies including VMT analysis.
- Our team will be supported by **De Novo Planning Group**, who has practical experience in processing projects for environmental review under CEQA and will act as an advisor to discuss potential implications from implementation of SB743 in Clovis from a CEQA standpoint.

Fernando Sotelo, TE/PTP will serve as Kittelson’s project manager, **Michael Aronson**, PE, will serve as Principal in Charge; and **Tim Erney**, AICP, PTP, CTP, will serve as Quality Assurance/Quality Control manager. I will work closely with our staff in our Orange and Oakland offices and will be supported by resources in transportation modeling, transportation demand management and tool development.

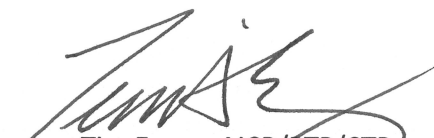
We believe our understanding of the technical work to be done as part of the changes for SB 743 compliance will allow us to efficiently and effectively support the City of Clovis in developing its vision for future CEQA and SB 743 compliance.

I will serve as primary point of contact for this contract. Michael Aronson and Tim Erney are authorized to negotiate a contract for the proposed services with the City of Clovis on behalf of the Kittelson team. If you have any questions or need additional information, please contact me directly at (714) 468-1186 or fsotelo@kittelson.com.

Sincerely,
KITTELSON & ASSOCIATES, INC.



Fernando Sotelo, TE
Associate Engineer



Tim Erney, AICP/PTP/CTP
Senior Principal

1. FIRM DESCRIPTION

Kittelson & Associates, Inc. (Kittelson) has provided comprehensive transportation engineering, planning, and research services to government and private organizations since 1985. Our staff is united by collective expertise, local and national experts who offer decades of progressive research, technological innovation, and a diverse portfolio of industry-leading work. We recognize that healthy, sustainable societies depend on efficient, active, and safe multi-modal transportation that is cost-effective to manage, operate, enhance, and use.

With a staff of over 240 people working in 25 offices nationwide (including four offices in California), we are able to address our clients' needs with local experience and national expertise.

Kittelson has conducted transportation impact studies and site access/circulation assessments for jurisdictions throughout California, and thus is extremely familiar with the state-of-the-practice with respect to the development and application of impact study guidelines and establishment of thresholds. Kittelson staff are working closely with Caltrans and multiple jurisdictions to address the requirements of SB 743 and utilize VMT for the assessment of CEQA-related impacts. In addition, our staff have supported transportation planning in the San Joaquin Valley for over 20 years, including several stages of development of the Fresno COG travel model.

De Novo Planning Group (De Novo) is a land use and environmental planning firm specializing in community planning, environmental studies, design, and development services. For the past 10 years, De Novo Planning Group has successfully completed over 300 projects consisting of comprehensive general plans, specific plans, housing elements, environmental impact reports, negative declarations, initial studies, NEPA analyses, climate action plans, biological assessments, wetland delineations, and development projects throughout California, including multiple projects in Fresno County and the Central Valley.

2. KEY STAFF



FERNANDO SOTELO, TE, AICP
Project Manager

Fernando Sotelo, TE, AICP - Project Manager

Fernando Sotelo is a registered traffic engineer in California and a certified transportation planner. He has extensive experience in CEQA and the technical aspects of transportation planning, including travel demand forecasting, traffic impact analyses, and the preparation of transportation sections for EIRs for major projects such as general

plan updates and specific plans on the City of Clovis General Plan coordinating with the transportation consultant for the preparation of the technical study and preparing the transportation analysis for the EIR. As project manager, Fernando will manage the consultant team, provide direction on technical work and deliverables, conduct quality control checks for analysis and deliverables, and lead communications with the City of Clovis's project manager.

- » City of Clovis General Plan Update
- » County of San Bernardino General Plan Update & EIR (including SB-743 metrics)
- » City of Palo Alto General Plan Update & EIR (including VMT scenario evaluations and TDM metrics)



MIKE ARONSON, PE
Principal-in-Charge

Mike Aronson has over 30 years of experience in all aspects of transportation planning and traffic operations analysis. He has managed transportation studies for general plans, major corridor studies, rail transit extensions, Caltrans highway project development, and many types of development and master plans. In addition, Mike has led the development or updates of numerous travel demand models (including Fresno County, Kings County and several other counties in the San Joaquin Valley) and their use in estimating the effects of transportation demand management (TDM) measures. As Principal in Charge, Mike will provide oversight for the project team and ensure that deliverables meet the city's needs and the project remains on schedule.

- » Alameda County Transportation Commission Modeling On-Call and SB 743 Support
- » Caltrans Transportation Analysis Framework
- » Fresno COG Model Updates and On-Call Services

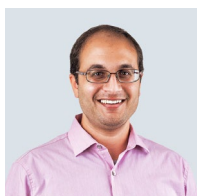


TIM ERNEY, AICP, PTP, CTP
Quality Control/Quality Assurance Manager

Tim Erney is a certified transportation planner with 22 years of extensive experience with planning and engineering projects throughout California. His primary focus has been on managing analyses and documentation for environmental review projects, access and circulation studies, sustainable transportation practices, TDM measures, parking evaluations, pedestrian and bicycle reviews, and data collection programs. In addition, he has done detailed technical analyses of local and regional roadway facilities, including traffic forecasting, modal split analyses, traffic diversion, and operational analyses. He has experience working with cities and other jurisdictions throughout California to implement

transportation analyses consistent with SB 743, including as part of citywide general plan updates and environmental impact reports. As Quality Control/Quality Assurance Manager, Tim will support the project team in providing quality control/quality assurance overview of all work products.

- » Orange County Transportation Authority (OCTA) SB 743 Support
- » City of San Marcos General Plan Update & EIR (including SB 743 approach, traffic study guidelines, and TDM reduction tool)
- » Fresno West Area Specific Plan EIR



MICHAEL SAHIMI, AICP
Transportation Planner

Michael Sahimi is a transportation planner experienced in traffic operations, environmental analysis, travel demand modeling and forecasting, circulation studies,

and parking studies. He is also involved in active transportation, safety analysis, and transit planning. Michael's recent work in Orange and Los Angeles Counties includes providing guidance for local and regional jurisdictions in developing their approach to SB 743 compliance. Michael recently worked with travel demand modelers to prepare SB 743 recommendations for OCTA as the agency looks to provide guidance for local agencies in the county. He is currently providing assistance to the City of La Verne as the City is updating its General Plan, providing the City with sample VMT metrics, significance thresholds, and VMT screening maps to guide its SB 743 approach. He is also assisting the City of San Marcos in developing a comprehensive SB 743 approach as it undertakes its General Plan Update; Michael is involved in assisting the City with finalizing its SB 743 approach (including methodology and metrics), developing SB 743-compliant transportation impact analysis guidelines, and developing a TDM reduction calculator tool that is sensitive to conditions unique to the city.

- » OCTA SB 743 Support
- » City of La Verne General Plan Update & EIR (including SB 743 guidance)
- » City of San Marcos General Plan Update & EIR (including SB 743 approach, traffic study guidelines, and TDM reduction tool)



MIAO GAO
Travel Demand Modeler

Miao Gao has applied her formal education in transportation planning and her strong analytical skills to the completion of projects across the US for numerous transportation

agencies. Miao has eight years of experience including in travel demand modeling, long-range transportation

planning, general plan updates, simulation, operational analysis. She has utilized her experience with the OCTAM, SCAG and SANDAG travel demand models, as well as sketch VMT estimation and reduction tools, to develop VMT metric, significance thresholds and other guidance for multiple jurisdictions. Miao is also working with the City of San Marcos develop an approach to estimate VMT from a regional travel demand model, and how to utilize this information to support future development projects.

- » Orange County Transportation Authority (OCTA) SB 743 Support
- » City of San Marcos General Plan Update & EIR (including SB 743 approach, traffic study guidelines, and TDM reduction tool)
- » City of La Verne General Plan Update & EIR



AARON ELIAS, PE
Transportation Engineer

Aaron Elias is a senior engineer with expertise in traffic operations, multimodal level of service, and environmental analysis. Aaron is currently serving as the project

manager for the Dublin SB 743 VMT Implementation and Model Update and leading the transportation analysis efforts for the Fresno West Area Specific Plan. In addition, Aaron has experience in assessing transportation conditions to support technical studies and implementation of traffic study guidelines. Aaron is an expert on the application of the urban street facilities chapter of the Highway Capacity Manual (HCM), and has served on the Highway Capacity Subcommittee that oversees the pedestrian and bicycle chapters of the HCM.

- » City of Dublin SB 743 VMT Implementation and Model Update
- » Fresno West Area Specific Plan EIR
- » Fresno Blackstone-Shaw Activity Center Study

BEN RITCHIE (DE NOVO)

Ben Ritchie is a founding principal at De Novo Planning Group with over 17 years of experience. Ben's expertise includes managing long range planning documents, completing complex and controversial CEQA documents, and facilitating community outreach and public communications efforts for the firm. Ben has extensive knowledge of CEQA and has assisted jurisdictions in drafting and updating their local CEQA implementation guidelines. He served as the Environmental Coordinator for the City of Rancho Cordova, where he oversaw the environmental planning division and the preparation of all CEQA documents prepared by staff and outside consultants. His experience includes a variety of land use, transportation, and sustainability projects throughout California.

- » City of Lake Forest General Plan Update & EIR
- » City of San Jacinto General Plan Update, Zoning Code Update, Climate Action Plan, and EIR
- » Fresno West Area Specific Plan EIR

STEVE MCMURTRY (DE NOVO)

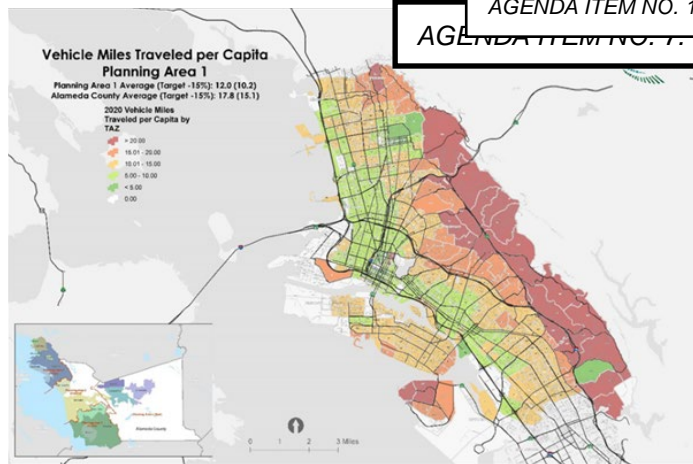
Steve McMurtry is a Principal with De Novo Planning Group and is responsible for project management, preparation of environmental documents, land use plans, air quality modeling, biological assessments, LESA modeling, regulatory permitting, litigation support, and expert witness testimony Steve’s experience includes service in engineering and planning firms, as well as in the building industry. He has served as the project manager for thirteen RTP EIRs in California and is known as an expert in transportation environmental planning. He has successfully led multidisciplinary teams to complete hundreds of environmental, land use planning, and development projects in 32 California counties. Steve has extensive experience preparing environmental documents and obtaining regulatory permits for state and federally funded projects, including projects within the State Highway System. Because of his expertise, he has been called on for litigation support and expert witness testimony relative to environmental and CEQA issues .

- » Ventana Specific Plan EIR, City of Merced
- » Merced County 2014 RTP EIR, Merced County Association of Governments
- » Family Entertainment Zone Master Plan EIR, City of Manteca

3. RELEVANT EXPERIENCE

Over the last 20 years, Kittelson has been conducting transportation/traffic impact studies throughout California, which have traditionally focused on intersection and roadway operations and the effect of a project on traffic flow conditions. With the passage of SB 743, however, most jurisdictions are unsure how to implement the new VMT requirements, in terms of methodology, significance criteria and data sources. Based on the firm’s experiences, Kittelson has been retained to provide consulting services to cities and agencies to help understand SB 743 and to develop an implementation approach. Relevant projects related to implementation and application of SB 743 are provided below.

- » Caltrans Transportation Analysis Framework & SB 743 Implementation
- » Alameda CTC SB 743 VMT Mapping
- » City of San Marcos General Plan Update & EIR
- » City of San Mateo VMT Guidelines
- » OCTA SB 743 Support
- » City of Glendale General Plan & VMT SB 743 Update
- » City of La Verne General Plan Update & EIR



- » City of Colma General Plan & VMT Guidelines
- » San Francisco - Various VMT Applications
- » Oakland - Various VMT Applications

The following section provides detailed information on three relevant projects.

CALTRANS TRANSPORTATION ANALYSIS FRAMEWORK

BUDGET \$218,223
CONTACT Robert Ferwerda, Caltrans, Robert.Ferwerda@dot.ca.gov, (916) 654-5672

Kittelson is preparing a transportation analysis framework for Caltrans that will provide district engineers and planners with the technical supporting information they need to determine how best to forecast the VMT, transit, and non-motorized impacts of projects on the State Highway System in compliance with SB 743. This work involves working closely with Caltrans management groups in the development of the framework document, the creation of case study projects demonstrating the application of the framework in real world conditions, and the development and delivery of training materials, workshops, and courses to Caltrans district personnel who will be implementing the framework.

ALAMEDA CTC MONITORING, ON-CALL, AND SB 743 SUPPORT

BUDGET \$278,000
CONTACT Saravana Suthanthira, Alameda County Transportation Commission, (510) 208-7426

Kittelson has been the Alameda CTC on-call travel modeling consultant for over 10 years. In addition to providing modeling updates and assistance, Kittelson has supported Alameda CTC in assessing VMT across Alameda County, which is in turn used to support local jurisdictions’ SB 743 efforts. Kittelson has prepared VMT maps of Alameda CTC’s planning areas, showing levels of VMT per capita or per employee by TAZ using the countywide travel demand model. Kittelson is currently creating an associated online address and parcel lookup tool.

BUDGET \$220,000

CONTACT Karen Brindley, Planning Manager, Planning Division, City of San Marcos, KBrindley@san-marcos.net, (760) 744-1050

Kittelson is developing the updated mobility element for this General Plan Update. For this effort, Kittelson will be providing additional transportation planning services, namely preparing new SB 743-consistent Transportation Impact Study Guidelines for the City and tools for SB 743-related analyses. Kittelson is assisting City staff in the preparation of updated TIS Guidelines, with methodologies and thresholds for the evaluation of VMT. In addition, City-specific significance thresholds, analysis methodologies and processes/procedures will be developed for the evaluation of new development and transportation projects. Kittelson is also designing and implementing an off-model VMT spreadsheet tool that can combine travel demand model-derived data with adjustments based on input factors that influence VMT.

4. PROJECT APPROACH

The following describes our approach to the project, which has been derived from the scope of work provided in the RFP.

TASK 1: PROJECT INITIATION

This task corresponds to Task A of the RFP. As a first step, Kittelson will meet with City staff in order to assess the City's preferences for certain decision points and to determine the priorities the City has for this project. As part of this kickoff meeting, Kittelson will work with City staff to confirm roles for City and consultant staff during the project, the scope of work and expectations, project goals, deliverables for each task, and details of the project schedule. Based on this meeting, a project work plan will be developed by Kittelson and distributed to City staff and the team.

Kittelson will coordinate with Fresno COG on behalf of the City to obtain preliminary analyses, results and recommendations derived from their ongoing SB743 Local Assistance Program and Regional Guidelines Development effort. Kittelson will provide an overview of the results and findings and potential implications for the City of Clovis. As part of the project initiation discussion, Kittelson will provide examples of SB 743 implementation conducted to date by other jurisdictions including Fresno COG, City of Fresno and others across the state such as WRCOG. The feedback received from the City during this session will help determine the next steps and the nature of the recommendations throughout this process.

Task 1 Deliverables:

/ Memorandum on SB 743 implementation to date

including Fresno COG's pre
/ Project work plan

AGENDA ITEM NO. 12.
AGENDA ITEM NO. 7.

TASK 2: INTERIM VMT ANALYSIS GUIDE

This task includes elements of tasks B and C of the RFP. In this task, Kittelson will work with the City to prepare an interim analysis guide for staff and the public describing requirements for the preparation of transportation impact studies in the City of Clovis. Given the accelerated schedule to finalize this guidance prior to July 1, 2020, an interim guide will be prepared, which will be refined and finalized after completion of all tasks. The analysis guide will include recommendations for VMT analysis tools, include land use and transportation project VMT metrics and thresholds, provide VMT screening criteria that are sensitive to the City's context that can be used to screen out low VMT-producing projects, and mitigation measures to reduce VMT. The following summarizes the steps for the preparation of the interim analysis guide and to set methodologies and thresholds.

TASK 2.1: ESTABLISH METRICS AND THRESHOLDS

OPR provides jurisdictions with recommended VMT metrics and thresholds, as well as the baseline geographies to use for VMT comparisons. However, jurisdictions ultimately can decide their approach in order to reflect local conditions, provided it is based on substantial evidence. As such, Kittelson will utilize the Fresno COG model to provide the following information for land use projects:

- » VMT averages at the city and county levels for comparison purposes
- » VMT data for distinct areas of the City based on land use and transportation network patterns

Kittelson will document and recommend VMT metrics and geographies that the City can utilize in assessing land use projects. For example, based on the diversity of the City and the uniqueness of areas and planned projects to the northeast such as Heritage Grove, northwest such as Harlan Ranch and the southeast such as Loma Vista, Kittelson may recommend establishing a series of districts as the baseline comparison geography for projects as opposed to the entire city or county (similar to the approach taken by the City of Los Angeles).

In terms of the significance threshold, OPR recommends a 15% reduction from the baseline for residential and office projects, which may be difficult to achieve in some portions of the City. As such, Kittelson will provide recommended impact thresholds for different land uses and regions. To reflect the City's diverse sub-areas and to base VMT reduction thresholds on substantial local evidence, Kittelson will review VMT for distinct subareas in the City to determine realistic VMT reduction thresholds.

on an area's VMT.

TASK 2.3: DEVELOP VMT MITIGATION MEASURES

Following the establishment of VMT methodologies and thresholds for land use and transportation projects in the City, Kittelson will work with the City to ensure that it has the appropriate tools to reduce the VMT impacts of projects. Primarily, this will be in the form of transportation demand management (TDM) measures. Utilizing resources such as the CAPCOA "Quantifying Greenhouse Gas Mitigation Measures," Kittelson will review available TDM measures for addressing VMT-related impacts and will recommend measures that are applicable for the various areas in the City. The effectiveness of mitigation measures will be reviewed in the context of different areas in the City.

Task 2 Deliverables:

- / Mapping of VMT per capita and per employee
- / Memorandum and maps for recommended screening criteria,
- / Metrics, geographies, and thresholds
- / Draft and final Interim City of Clovis VMT Analysis Guide

TASK 3: CASE STUDIES AND DISCUSSION OF FUTURE PROGRAMMATIC APPROACHES

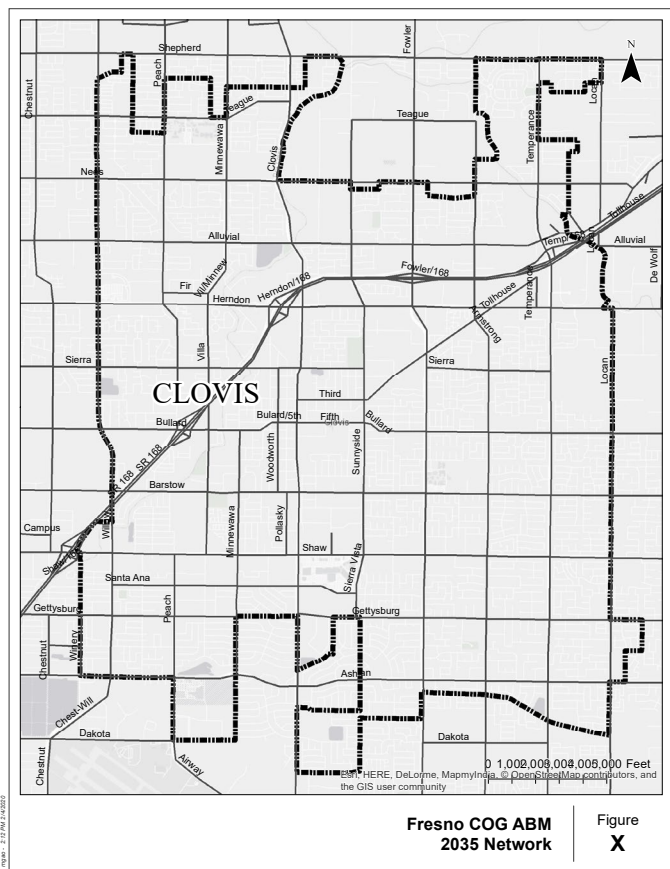
This task incorporates portions of Tasks C and D included in the RFP, and would be completed after the essential tasks described in Task 2 are completed for the July 2020 deadline.

Kittelson will coordinate with the City to identify up to ten (10) case studies of recent and future projects in different areas of the City indicative of localized land use patterns to inform the potential for screening, to assess the thresholds level, effectiveness of potential mitigation measures and the implications for developers and processing projects under CEQA.

De Novo will assist the project team as a CEQA advisor to provide advice on the implications of adopting new metrics and thresholds to process CEQA documents, opportunities to screen out and streamline project applications, and when to conduct updates to the VMT tool and these guidelines. De Novo will also assist with practical expertise in how the application of VMT metrics, thresholds and mitigation measures would affect the processing of land use projects under CEQA and in respect to legal defensibility.

As part of this task Kittelson will recommend future programmatic approaches to update the VMT-based metrics in future planning efforts such as General Plan Updates and also for opportunities to tier off transportation analysis from large scale EIRs for subsequent projects.

Kittelson and De Novo will also review the City's



KITTELSON & ASSOCIATES

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TASK 2.2: DEVELOP SCREENING CRITERIA

In its Technical Advisory, OPR provides suggestions that jurisdictions can utilize to screen out or exempt projects from undergoing CEQA VMT analysis. The proposed approach to each element is outlined below.

- » **Map-based screening:** OPR recommends screening out projects in low-VMT TAZs. Based on the sub-area geographies selected in Task B1, we will utilize the travel demand model to produce maps of TAZs that exhibit low per capita and/or low per employee VMT.
- » **Small projects:** OPR recommends exempting projects that generate fewer than 100 trips per day, which can be adjusted based on local conditions. We will utilize the model to test various trip thresholds to determine their effects on area VMT.
- » **High-quality transit:** OPR recommends exempting projects within ½ mile of an existing major transit stop or existing stop along a high-quality transit corridor (with certain exceptions). We will produce maps of these areas in the city.
- » **Local-serving retail:** OPR recommends exempting retail projects smaller than 50,000 square feet, since they are likely to be local-serving and reduce trip distances. Kittelson will confirm these thresholds for retail and other land uses (entertainment, recreation, etc...). During Task 3, we will utilize the travel model to test various project sizes to determine their effects

current transportation fee program in order to determine if it should be updated from a trip-based fee to a VMT-based fee. Factors impacting this consideration will include, but not be limited to: whether the City plans to maintain a LOS methodology for non-CEQA purposes; the transportation improvements and mitigation measures linked to the fee; and the level and type of new development anticipated in the City. Kittelson will prepare a memo detailing these considerations and any recommended changes to the existing fee program. This scope would not establish the fees and calculations to determine them.

Task 3 Deliverables:

- / Memorandum documenting the results of the case studies efforts
- / Memorandum summarizing future programmatic approaches including transportation impact fee program

TASK 4: UPDATED VMT ANALYSIS GUIDE

Kittelson will refine the methodologies and thresholds and utilize the findings of the case studies to revise and finalize the transportation impact analysis (TIA) guidelines in coordination with the city. Kittelson will work with the City to determine whether the current LOS requirements are appropriate or if they should be revised to focus the traffic operations analysis at project driveways and the immediate vicinity of the project. As part of these changes, Kittelson recommends updates to the guidelines to incorporate requirements for non-automobile evaluations, including impacts to bicyclists, pedestrians and transit, and accommodation of passenger pick-ups/drop-offs and delivery vehicles. The final VMT analysis guide will be conducted after completion of Tasks 2 and 3.

Task 4 Deliverables:

- / Draft and final updated City of Clovis VMT Analysis Guide

TASK 5: PROJECT MANAGEMENT, MEETINGS, AND HEARINGS

This task corresponds to Task E in the RFP.

To ensure that the project proceeds and deadlines are met, Kittelson will schedule and facilitate biweekly conference calls with relevant City staff. This scope also includes three (3) in-person meetings, and two (2) public hearings.

OPTIONAL TASKS

OPTIONAL TASK 01: VMT USER TOOL

Kittelson will develop a user-friendly online tool to estimate VMT and mitigation effectiveness for projects in the city. This tool would display TAZ-level

VMT information from the travel demand model can be looked up based on the parcel number.

Kittelson will research adjustment factors based on state sources such as the CAPCOA “Quantifying Greenhouse Gas Mitigation Measures” and factors used by other jurisdictions before incorporating adjustments into the online tool. Kittelson will also research thresholds used by other jurisdictions in determining the need for a full travel demand model run versus utilizing online VMT tools.

The VMT User Tool will combine the model-derived data with adjustments based on input factors that influence VMT such as location of the project, proposed development land uses, and project design and the effect of mitigation measures.

Deliverables

- / Online tool incorporating mapping and adjustments

OPTIONAL TASK 02: STAFF AND DEVELOPER TRAINING

Under this task Kittelson will present the draft VMT tools and Guidelines in a workshop format with an electronic presentation, and possibly boards and handouts to train City staff and interest groups for conducting transportation studies using the VMT-based guidelines and VMT user tool. The City would facilitate the training by providing a venue and by conducting outreach efforts in preparation for the training session. For this scope it is anticipated that the training will be conducted over the course of one day for up to two sessions.

5. PROJECT SCHEDULE

AGENDA ITEM NO. 12.

		MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	
TASK	1. PROJECT INITIATION	█									
	KICK-OFF MEETING		█								
	BI-WEEKLY CALLS		█	█	█	█	█	█	█	█	█
	PROJECT MEETINGS				█	█			█		█
	2. INTERIM GUIDE	█									
	3. CAST STUDIES AND FUTURE					█					
	4. FINAL GUIDE						█				
	O1: USER TOOL			INTERIM TOOL					FINAL TOOL		
	O2: TRAINING										█
	DELIVERABLES (DRAFT AND FINAL)				DRAFT	FINAL			DRAFT	FINAL	

Cost Summary

The Kittelson Team						
Task	Kittelson		De Novo		Totals	
	Hours	Amount	Hours	Amount	Hours	Amount
1 Project Initiation	62	\$11,420	0	\$0	62	\$11,420
2 Interim VMT Analysis Guide	230	\$39,060	0	\$0	230	\$39,060
3 Case Studies and Discussion of Future Programmatic Approaches	130	\$20,460	8	\$1,400	138	\$21,860
4 Updated VMT Analysis Guide	100	\$17,320	12	\$2,100	112	\$19,420
5 Project Management, Meetings and Hearings	126	\$30,640	8	\$2,000	134	\$32,640
Contingency		\$10,000		\$0		\$10,000
TOTAL	648	\$128,900	28	\$5,500	676	\$134,400

Optional Tasks	Kittelson		De Novo		Totals	
Optional Task 1: VMT User Tool	112	\$19,400	0	\$0	112	\$19,400
Optional Task 2: Staff and Developer Training	52	\$11,020	0	\$0	52	\$11,020
TOTAL	164	\$30,420	0	\$0	164	\$30,420

TOTAL WITH OPTIONAL TASKS	812	\$159,320	28	\$5,500	840	\$164,820
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7. CONFLICTS OF INTEREST

Kittelson & Associates has been under contract to Costco to prepare traffic studies and traffic design plans for the Costco site in Clovis. To the best of Kittelson's knowledge, Kittelson has no financial, business, or other relationship with the City of Clovis or any other private parties doing business in the city that would constitute a conflict of interest with regard to this contract. Should the City have any questions or concerns, please contact Fernando Sotelo, Kittelson Associate Engineer, at fsotelo@kittelson.com or (714) 468-1186.

Consultant's finally determined liability as determined by a court of competent jurisdiction.

Consultant and City agree that said indemnity and defense obligations shall survive the expiration or termination of this Agreement for any items specified herein that arose or occurred during the term of this Agreement.

EXCEPTIONS

Kittelson has reviewed the City of Clovis's sample Consultant Services Agreement and Insurance Requirements and requests the City's consideration of the following proposed modifications if awarded this contract:

As a design professional, Consultant's professional liability coverage prohibits additional insureds under any circumstance. Accordingly, this coverage also bars any third-party, upfront defense. The policy will, however, reimburse indemnitees for those reasonable legal costs and expenses incurred as a result of the Consultant's liability as determined by a court of competent jurisdiction. As written the language in Section 18 of the City's sample agreement subjects the Consultant to uninsurable claims and defense costs. To ensure this language is consistent with the parameters of the Consultant's insurance professional and general liability insurance and that the City has benefit of said coverage, would the City be amenable to modifying this language as follows upon any contact award:

18. Indemnity and Defense. Consultant hereby agrees to indemnify, defend and hold the City, its officials, officers, employees, agents, and volunteers harmless from and against all claims, demands, causes of action, actions, damages, losses, expenses, and other liabilities, (including without limitation reasonable attorney fees and costs of litigation) of every nature: Arising out of or in connection with the alleged or actual tortious acts, or; to the extent caused by the errors, omissions or negligence of Consultant or its subcontractors relating to the performance of Services described herein, unless the injuries or damages are the result of City's sole negligence or willful misconduct. Notwithstanding the foregoing and relative to professional liability claims, Consultant has no obligation to defend or pay City's defense costs incurred prior to a final determination of liability or to pay any amount that exceeds the proportionate share of





CITY of CLOVIS

REPORT TO THE CITY COUNCIL

TO: Mayor and City Council

FROM: Planning & Development Services

DATE: July 20, 2020

SUBJECT: Consider Approval - Res. 20-____ - Establishing Vehicle Miles Traveled (VMT) thresholds and interim guidelines for assessing traffic impacts in compliance with the provisions of Senate Bill 743 (SB 743).

Staff: Ricky Caperton, AICP, Senior Planner
Recommendation: Approve

ATTACHMENTS: 1. Res. 20-____
 2. Interim Transportation Impact Analysis Guidelines
 3. SB 743 Background Memo (dated March 18, 2020)
 4. Technical Advisory on Evaluating Transportation Impacts in CEQA

CONFLICT OF INTEREST

None.

RECOMMENDATION

For the City Council to approve a resolution (**Attachment 1**) adopting *Interim Transportation Impact Analysis Guidelines* (**Attachment 2**) establishing vehicle miles traveled (VMT) thresholds and interim guidelines for assessing traffic impacts in compliance with provisions of Senate Bill 743 (SB 743).

EXECUTIVE SUMMARY

As of July 1, 2020, the metric by which transportation impacts are assessed pursuant to the California Environmental Quality Act (CEQA) guidelines shifted from a level of service (LOS) based analysis, to VMT analysis. In short, this means that the methodology for analyzing transportation impacts under CEQA transitioned from assessing increase in delay and congestion caused by a project to assessing the average distance traveled related to the project. To prepare for this new law, the City Council approved a request on February 18, 2020 for City staff to enter into a contract with transportation consultant Kittelson & Associates to assist staff with developing VMT transportation impact analysis guidelines. The *Interim Transportation Impact Analysis Guidelines*, provided as **Attachment 2**, are presented for Council consideration.

ATTACHMENT 3

KEY TERMINOLOGY

Because this staff report introduces a new methodology for analyzing traffic impacts for purposes of CEQA, several new or lesser known terms will be introduced. In order to provide some context, several of these newer key terms are defined below.

- **Senate Bill 743 (SB 743):** SB 743 is the law that established (2013) changing the metric of assessing transportation impacts from level of service to vehicle miles traveled.
- **Vehicle Miles Traveled (VMT):** VMT is the term used for referring to the metric by which transportation impacts will be assessed under CEQA. VMT is expressed as an average number of miles a project will produce either per capita (residential) or per employees (non-residential). In general, the higher the VMT, the greater the impact.
- **Transportation Demand Management (TDM):** TDM is the concept of focusing on improvements to the transportation network by encouraging less reliance on single-occupancy automobile use, and focuses more on pedestrian infrastructure and increasing other modes of transportation such as public transit, biking, carpooling, and/or commuting.
- **Threshold of Significance:** Refers to a threshold by which to measure an impact in order to determine the level of impact caused by a project. Most commonly used for CEQA analysis purposes, a threshold of significance is generally the point of which an acceptable level of impact is defined, and if impacts of a project exceed that threshold, then an impact may occur.
- **Mitigation Measure:** Measures to reduce an impact. Mitigation measures can come in the form of in-lieu fees (i.e. developer pays a fee to mitigate the impact) or project improvements (i.e. developer alters the design and installs something to offset the impact). Generally, the mitigation measure should be commensurate with the type and level of significance of said impact caused by a project.
- **VMT Per Capita:** VMT per capita refers to the metric that is used for residential projects for purposes of assessing transportation impacts. VMT per capita is representative of the average number of annual miles of travel divided by the total population of a region.
- **VMT Per Employee:** VMT per employee refers to the metric that is used for non-residential projects for purposes of assessing transportation impacts of a particular non-residential use. VMT per employee is representative of the average number of annual miles of commute travel divided by the employees.
- **Governor's Office of Planning and Research (OPR):** Commonly referred to as OPR, this is the staff serving the Governor and the Cabinet as staff for long-range planning and research. OPR is responsible for the drafting of CEQA Guidelines and formulation of long-range land use goals and policies at the State level.

BACKGROUND

Under the existing CEQA Guidelines, traffic impacts have been analyzed on the basis of the amount of delay or congestion a project would cause at particular intersections, commonly referred to as level of service (LOS). Level of service is generally expressed on a scale ranging from “A” to “F” with LOS “A” resulting in the least amount of vehicle congestion, and degrading to a lower LOS as traffic congestion increases. A project’s potential to increase delay was then compared to the City’s established threshold for what is considered an “acceptable” delay, which is LOS “D” or better.

Signed into law in 2013, SB 743 established a new methodology to “*more appropriately balance the needs of congestion management with statewide goals related to infill development, promotion of public health through active transportation, and reduction of greenhouse gas emissions.*” As a result, the Governor’s Office of Planning and Research (OPR) was tasked with developing a criteria for approval by the Natural Resources Agency to update the State CEQA guidelines to incorporate a metric to more effectively measure transportation impacts for the purpose of achieving the goals of SB 743.

On December 28, 2018, the Natural Resources Agency certified and adopted the revised CEQA guidelines which included, among other changes, the updated metric for analyzing transportation impacts under CEQA. This new transportation analysis metric, known as vehicle miles traveled (VMT), goes into effect on July 1, 2020.

Analyzing VMT shifts the methodology in how traffic impacts are assessed under CEQA from a traffic delay and congestion focus (e.g. LOS) to vehicular trip- or travel-based distance (e.g. VMT) focus. Thus, as of July 1, 2020, CEQA analysis will be required to consider VMT as the primary metric for determining the potential for transportation impacts of a project. Therefore, a project may no longer be considered to have a “significant” impact under CEQA with regards to traffic congestion (i.e. increases in level of service caused by a project). Rather, a project’s potential to result in transportation impacts will be based on the average number of miles produced by the project, expressed either as VMT per capita for residential projects, or VMT per employee for non-residential projects. This concept is explained in greater detail below.

It is important to note that an analysis of LOS impacts may still be required for purposes of roadway and infrastructure planning, as well as to ensure compliance with existing General Plan policies, and the City’s existing Traffic Impact Study Guidelines (2014) for maintaining the safe movement of vehicles throughout the City. Thus, VMT is not in and of itself eliminating or replacing the need to continue analyzing LOS impacts of a project. Rather, VMT will be the metric for determining transportation impacts for CEQA purposes.

In order to better understand the shift from LOS to VMT, it’s important to first provide context and a description of the components of VMT. Those components are summarized below; however, for informational purposes and included as **Attachment 3**, an SB 743 background memorandum is provided which includes more detailed information on VMT, as well examples of what some other agencies have adopted for thresholds and methodology.

Level of Service (LOS) Methodology

In the context of CEQA, the existing methodology for analyzing transportation impacts focuses on the quantification of a project's potential to cause increases in delay (i.e. congestion) at intersections, known as level of service (LOS). Under this method, a project's vehicle trips are calculated through a traffic study or trip generation analysis expressed by a measure in the amount of delay those trips would contribute to nearby intersections. If the intersection delays increased beyond a certain level as a result of the project (i.e. threshold of significance), then an impact would occur and mitigation measures were prescribed.

Under LOS, typical mitigation measures might include contribution of fees for future traffic signals, installation of signals or stop signs, and/or the widening of streets or addition of travel and/or turning lanes. These mitigations would generally achieve the goal of reducing a project's contribution to congestion by controlling the timing or capacity of affected intersections through a new or modified traffic signal, or by widening a roadway or adding lanes, thus, reducing the project's impacts on traffic.

Vehicle Miles Traveled (VMT) Methodology

Vehicle miles traveled is a metric in which the average distance (in miles) a use generates is quantified and compared to the regional average VMT. The VMT is considered to be "tour-based," meaning that the average VMT is intended to account for a round-trip (i.e. not a one-way trip). For example, if a household generates an average VMT of 15 miles, that 15 miles theoretically accounts for a trip that may include miles traveled to the workplace, the workplace to the grocery store, then the grocery store back to home. It is important to note that VMT is expressed as an average of the total number of miles divided by the total population in a given region.

As a result of this new metric, a shift in the types of mitigation measures will need to be considered in order to reduce and/or to encourage reduction in VMT. These types of measures are typically referred to as Transportation Demand Management (TDM). TDM measures generally focus more on behavioral shifts in modes of transportation as well as enhancements to infrastructure that promote walkability, biking, transit improvements, and pedestrian infrastructure, and less on capacity inducing measures such as the widening of roadways and addition of travel lanes. In other words, TDM measures generally focus on discouraging the single-occupancy vehicle trips, as well as promoting and encouraging other modes of transportation other than vehicular travel.

Threshold of Significance

In order to adequately assess VMT, the City must have adopted thresholds by which to compare projects for purposes of determining if a project would result in a "significant" impact under CEQA. Although thresholds of significance were not explicitly established by SB 743 or OPR, the *Technical Advisory on Evaluating Transportation Impacts in CEQA* (December 2018) published by OPR, and included as **Attachment 4**, recommends a significance threshold of projects achieving a fifteen percent (15%) reduction in VMT below that of the regional average VMT. Thresholds can either apply to both residential and non-residential uses. This percentage is thought to be reasonably achievable at the project level by the California Air Pollution Control Officer's Association (CAPCOA), as well as for

achieving consistency with statewide GHG emissions reduction goals in *California's 2017 Climate Change Scoping Plan*. Although OPR has recommended a threshold, lead agencies are able to adopt their own thresholds as long as substantial evidence is provided to demonstrate that the reduction targets and goals of SB 743 can be achieved.

Assessing Projects Using VMT

Under the current methodology for assessing transportation impacts under CEQA, a project's LOS was compared to the adopted threshold established by the City for what was considered "acceptable" congestion. This was typically achieved through a trip generation or traffic impact assessment (TIA). The City's existing LOS traffic guidelines currently require a full TIA if a project exceeds certain criteria, one of which being that the project has the potential to exceed 100 peak hour trips.

Under VMT, the general review process would be similar, although the metrics to measure impacts would differ. Using a variety of "screening" criteria, projects would first be reviewed to see if they can be "screened out" from preparing a full VMT analysis. The screening criteria are based on a variety of maps, trip thresholds, size of project, and location. If a project meets these standards, the VMT impact is presumed to be less-than-significant in which case a full traffic analysis may not be required under CEQA. However, if a project cannot be screened out, an analysis may be required to further assess the VMT impacts and determine CEQA mitigation measures (if applicable). If mitigation measures cannot sufficiently reduce the VMT to a less-than-significant level, an Environmental Impact Report (EIR) may be required in which a finding of significant and unavoidable impact may be found.

Although the existing LOS methodology for determining traffic and congestion impacts under CEQA is relatively germane to any land use type or project (i.e. residential, non-residential, capital improvement, redevelopment, etc.) based on a scale of LOS "A" to LOS "F," VMT is more complex in that different land use types may now be analyzed slightly differently. This is based on many factors including project location, existing conditions and land use types surrounding a project site, land use type, and proximity to features such as bus routes, trails, etc.

While OPR provides recommendations for residential, office, and retail land uses, there were no specific recommendations for other land use types, such as industrial, other non-residential land use types, or schools. Thus, lead agencies may develop thresholds for these other land use types or utilize a similar metric as office and/or retail.

The basic factors for VMT assessment are the regional VMT (i.e. baseline), thresholds (i.e. the percentage reduction needed to be considered to have a less than significant impact), and mitigation measures (i.e. measures required to reduce VMT).

Regional Average VMT

As mentioned above, in order to assess the potential traffic impact of a project under VMT, a regional average VMT must be established which serves as the "baseline." Because the threshold of significance is expressed as a percentage reduction from the regional average VMT, it is important to understand what the region is defined as. However, the *Technical*

Advisory on Evaluating Transportation Impacts in CEQA does not explicitly define what a “region” is. That said, lead agencies that have already adopted thresholds have gone with either a countywide and/or citywide average VMT. It is recommended that the entire Fresno County region be considered for the baseline for the City.

The average VMT per capita (i.e. for residential land use types) is 16.1 citywide, and 16.2 countywide, therefore not much of a difference. For non-residential land use (i.e. office only), the VMT per employee is 25.6.

Proposed VMT Thresholds

Although the OPR recommends projects achieve a 15% reduction in VMT from the “regional” average, lead agencies have the discretion to adopt different thresholds as long as they are supported by substantial evidence. If a lead agency chooses a different threshold, substantial evidence is required to demonstrate that the metric can support the three statutory goals; (1) reduction in greenhouse gas emissions; (2) development of multimodal transportation networks; and (3) a diversity of land uses. The significance threshold shall also align with state laws with regards to achieving GHG reduction goals.

The proposed VMT thresholds for the City are described below under the “Proposal and Analysis” section of the staff report.

VMT Mitigation Measures

Under the VMT methodology, mitigation measures to reduce transportation impacts will shift from relieving traffic congestion through capacity inducing solutions (i.e. adding lanes, road widening, and traffic signals) to more TDM-based measures aimed more on behavioral and infrastructure changes to support and/or encourage shifts in transportation modes away from single-occupancy vehicle use. Because VMT is dependent on location and proximity of residential to employment, goods and services, mitigation measures will be determined on a case-by-case basis – similarly to how standard practice is for determining mitigations under LOS.

The variety of VMT mitigation measures will likely vary much greater than typical LOS based mitigations for a couple of reasons. First, VMT mitigation measures will have a varying degree in the amount of reduction achieved based on the measure proposed comparatively to the project location and use. For example, adding a pedestrian trail may only reduce VMT by one percent (1%), whereas adding a new transit route may reduce VMT by two percent (2%). The amount of mitigation needed will depend on how great the impact is from a project and how much VMT reduction is needed to attain a less-than-significant CEQA impact. Second, several VMT mitigation measures may be needed to achieve the required level of reduction. In the previous example, a project may need to reduce the VMT by three percent (3%) in which case a pedestrian trail and bus route would need to be added. This concept of mitigation is different than LOS based measures in which a project needs to reduce congestion and the primary way to achieve that is to add or construct a physical street improvement.

Under CEQA, mitigation can, in some cases, take the form of compensation (i.e. mitigation banks, exchanges, and/or fee program). However, for consideration as adequate mitigation under CEQA, the fees need to be adopted as part of a fee program in which CEQA was prepared. This entails a fee nexus study as well to justify the fee, the programs it would fund, and the quantification of reductions. While the concept of a fee-based program for purposes of sufficiently offsetting VMT impacts is being considered and explored by many lead agencies, it has yet to be implemented on a large scale.

PROPOSAL AND ANALYSIS

This section describes the proposed *Interim Transportation Impact Analysis Guidelines (Attachment 2)*. If approved by Council, the City will begin using the guidelines upon adoption. The interim status of the guidelines is to be able to have the methodology in place and to allow continued processing of entitlements while allowing for additional time to fine-tune the guidelines, including development of a user tool that will allow staff, the public, and the development community to anticipate VMT of projects. While the user tool may not necessarily in and of itself take place of requiring or needing a transportation impact analysis, it will help to determine if one may be required.

As previously mentioned, it is important to note that while VMT will become the primary metric for analyzing transportation impacts under CEQA, LOS analysis may still be required for purposes of designing the overall roadway network and for complying with other City policies. As such, LOS may continue to be utilized for assessing transportation impacts from an infrastructure design and build function, but not for purposes of determining CEQA transportation impacts.

Interim Status, Final VMT Guidelines, and User Tool

In order to achieve compliance with SB 743 and allow projects to continue to be processed, City staff has developed, in consultation with Kittelson & Associates, interim guidelines for assessing how transportation impacts will be analyzed using VMT. The interim status is so that the guidelines can be fine-tuned and for the development of a user tool that the public, developers, and staff can use for determining anticipated VMT of a project. During the interim status, mitigation measures will be explored in more detail to determine which might be the most effective for Clovis. Although “interim,” the proposed guidelines will ensure that the City is legally compliant with SB 743. The user tool would allow for project details to be input into a formula of some type and be able to anticipate VMT. While the tool would provide a high level expected result of VMT of a project, it would not necessarily supplant the need for a formal VMT analysis.

Once the guidelines have been refined and the user tool developed, Council would be required to take action on the final guidelines which is anticipated sometime during the Fall 2020.

Interim Transportation Impact Analysis Guidelines

The *Interim Transportation Impact Analysis Guidelines (Interim TIA Guidelines)* document is intended to provide guidance to City staff, applicants, and consultants on the requirements

to evaluate transportation impacts for projects. This document identifies the framework for when and how to analyze transportation impacts utilizing VMT.

The Interim TIA Guidelines is organized into three (3) main sections, including an Introduction, CEQA-Analysis Requirements, and Local Transportation Analysis. Each of these sections are summarized below.

Section 1: Introduction

This section of the Interim TIA Guidelines provides an overview of the document, as well as summarizes the general requirements of SB 743. It also includes a discussion of what would normally be included in a transportation impact analysis, such as a CEQA analysis and a local transportation analysis. In general, the CEQA analysis portion of traffic reports would assess VMT, and the local transportation impact analysis section would include an analysis of LOS for purposes of continued compliance with General Plan policies related to traffic.

Section 2: CEQA Analysis Requirements

This section of the Interim TIA Guidelines discusses the requirements for conducting analyses for projects pursuant to CEQA. According to CEQA Guidelines Appendix G, which most commonly serves as the “environmental checklist” as the basis for CEQA analysis (i.e. preparation of Initial Studies and/or Environmental Impact Reports), a project would have a significant transportation impact if:

- It conflicts with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities;
- It conflicts with or is inconsistent with CEQA Guidelines Section 15064.3(b) (requirement to use VMT);
- It substantially increases hazards due to a geometric feature or incompatible uses; or
- It results in inadequate emergency access.

The Interim TIA Guidelines are designed to address impacts related to CEQA Guidelines Section 15064.3, Determining the Significance of Transportation Impacts. The general process for analyzing projects under VMT would include the following steps:

Step 1: Project Screening

Using the VMT screening maps, user tool (future tool to be developed), and/or based on the project size and use, determine if the project may be “screened out” and therefore assumed to have a less-than-significant impact. If a project can be screened out, with substantial evidence, then a VMT traffic impact analysis may not be required. If a project cannot be screened out, a VMT traffic impact report may be required to further determine the existing and potential for VMT impacts based on the project size, location, and/or proposed use.

The Interim TIA Guidelines identify five (5) screening criteria, including 1) small projects; 2) affordable housing; 3) local-serving retail; 4) projects near high-quality transit areas; and 5)

projects located in low VMT areas. Each of these screening criterion are briefly summarized below, and described in greater detail in Section 2.1.1, Project Screening, in the *Interim Transportation Impact Analysis Guidelines* included as **Attachment 2** to this staff report.

- *Small Projects*: Projects that generate fewer than 500 vehicle trips per day.
- *Affordable Housing*: Residential projects with 100% deed restricted affordable housing.
- *Local-Serving Retail*: Projects that are locally serving retail with 100,000 square feet of gross floor or less. The determination of local-serving retail considers factors such as location, and goods and services the retail would provide. The City may request a market study as substantial evidence to determine if a project may be screened out under this criteria.
- *High-Quality Transit Area*: Project near high-quality transit areas, as defined by the State, may be screened out. Generally, these are areas served by public transit with at least 15-minute headways during peak hour times of travel. Although most of Clovis would not qualify for this, there is a portion of west Clovis where the Fresno Area Express (FAX) bus system meets this criteria.
- *Low VMT Areas*: Residential and employment projects that area proposed in areas that generate below the City's VMT thresholds may be screened out. The screening maps identify these areas.

Step 2: Significance Impact Thresholds

If a project cannot be "screened out" based on the screening criteria, projects would be required to prepare a VMT traffic analysis. This analysis would determine the level of VMT impact a project may have, and ultimately the level of mitigation measures required to reduce those impacts. The proposed VMT thresholds are summarized below, and described in greater detail in Section 2.1.2, Significant Impact Thresholds, in the *Interim Transportation Impact Analysis Guidelines* included as **Attachment 2** to this staff report.

The proposed VMT impact thresholds for the City are as follows:

- *Residential*: A 13% reduction below existing average VMT/capita in Fresno County.
- *Office*: A 13% reduction below existing average VMT/employee in Fresno County.
- *Retail*: No net increase in total VMT.
- *Other Land Uses*: Determined on a case-by-case basis, supported by substantial evidence.
- *Mixed Use Projects*: Evaluate each component of a mixed-use and apply the significance threshold for each land use type.

For determining the VMT reduction, a projects potential VMT is calculated and compared to the regional average VMT, in this case Fresno County region. For residential projects, the regional average VMT was determined to be 16.1 VMT/capita. Therefore, in order for a residential project to be considered to have less-than-significant traffic impacts under CEQA, the project may not exceed 14.1 VMT/capita – which is a 13% reduction from the regional average.

For office uses, the regional average was determined to be 25.6 VMT/employee. Therefore, for an office project to be considered to have a less-than-significant traffic impact under CEQA, the project may not exceed 22.3 VMT/employee.

Step 3: Mitigation Measures

If after Step 2 a project cannot meet the City VMT threshold, mitigation measures may be required to reduce the traffic impact to a level as close to the threshold as possible. If the threshold cannot be reached, then the project may result in a significant VMT impact. As mentioned earlier in the staff report, mitigation measures under VMT will likely be different than those typically required to mitigation LOS (i.e. congestion based) impacts.

FISCAL IMPACT

None. However, failure to comply with SB 743 regulations would expose the City to potential for litigation and financial loss, as well as cause delays in the processing of entitlement applications.

REASON FOR RECOMMENDATION

Staff has concluded that the guidelines will continue to allow for the processing of entitlements while being in compliance with the provisions of SB 743. The proposed thresholds will allow for the continued implementation of the General Plan, as well as maintaining compliance with VMT analysis for CEQA analysis.

Staff recommends the City Council to approve a resolution adopting *Interim Transportation Impact Analysis Guidelines* for assessing traffic impacts in compliance with provisions of SB 743.

ACTIONS FOLLOWING APPROVAL

No further action is required. However, upon completion of the user tool and final version of the VMT guidelines, staff will present those for action by City Council.

Prepared by: Ricky Caperton, AICP, Senior Planner

Reviewed by: City Manager 



CITY *of* CLOVIS

REPORT TO THE CITY COUNCIL

TO: Mayor and City Council

FROM: Planning & Development Services

DATE: April 5, 2021

SUBJECT: Consider Various Actions associated with an existing consultant agreement between the City of Clovis and Kittelson and Associates, Inc. related to analysis and assessment of Vehicle Miles Traveled (VMT).

a. Consider Approval - Res. 21-____, A request authorizing the City Manager to execute an amendment to an existing consultant agreement between the City of Clovis and Kittelson and Associates, Inc. for additional analysis related to Vehicle Miles Traveled and environmental assessment pursuant to the California Environmental Quality Act.

b. Consider Approval - Res. 21-____, A request to initiate an amendment to the Circulation Element of the 2014 Clovis General Plan to modify, add, and/or edit policies to ensure compliance with VMT guidelines.

Staff: Ricky Caperton, Senior Planner / Sean Smith, Supervising Civil Engineer

Recommendation: Approve

ATTACHMENTS:

1. July 20, 2020 City Council Staff Report
2. Interim Transportation Impact Analysis Guidelines
3. Existing VMT Contract Scope of Work
4. BIA Letter of Support
5. Proposed Scope of Work and Cost Amendment
6. Draft Res. 21-____, Contract Amendment Scope and Cost
7. Draft Res. 21-____, 2014 General Plan Circulation Element Update

CONFLICT OF INTEREST

None.

RECOMMENDATION

Staff recommends that the City Council approve requests authorizing the City Manager to execute an amendment to an existing consultant agreement between the City of Clovis and Kittelson and Associates, Inc. for additional analysis related to Vehicle Miles Traveled (VMT), and to initiate an amendment to the Circulation Element of the 2014 Clovis General Plan.

EXECUTIVE SUMMARY

On July 1, 2020, the metric by which transportation impacts were assessed pursuant to the California Environmental Quality Act (CEQA) guidelines shifted from a level of service (LOS) based analysis, to VMT analysis. In short, the methodology for analyzing transportation impacts under CEQA transitioned from assessing increases in delay and congestion caused by a project to assessing the average distance traveled by vehicles related to the project, known as VMT. A more comprehensive background on VMT and Senate Bill 743 may be found in the July 20, 2020 City Council staff report included as **Attachment 1**.

In advance of the new law taking effect, City Council approved a contract with transportation consultant Kittelson & Associates to assist the City with developing VMT transportation impact analysis guidelines. On July 20, 2020, City Council adopted VMT Interim Guidelines for the City so that development could continue moving forward and appropriately assess traffic impacts using the new VMT metric.

To continue those efforts, staff is recommending that Council consider an amendment to its existing contract with Kittelson to perform additional work beyond the scope and cost contemplated in the original contract. It is important to note that these efforts will not entirely negate the need for preparation of new Environmental Impact Reports (EIRs) at the project-level. However, in many cases it could provide for increased streamlining of traffic analysis at the project level and provide a level of protection for when individual projects would otherwise require an EIR.

BACKGROUND

This section provides additional background on VMT implementation since July 20, 2020, when the City's Interim TIA Guidelines were adopted and an overview of how development activity has progressed since VMT analysis became required. As mentioned above, a comprehensive background on VMT is provided in **Attachment 1** to this staff report. Additionally, the City's adopted *Interim Transportation Impact Analysis Guidelines* are provided as **Attachment 2**, along with the existing scope of work under the City's current contract with Kittelson (**Attachment 3**). The proposed scope of work and budget amendment is included as **Attachment 5**.

Adopted Interim Transportation Impact Analysis Guidelines

On July 20, 2020, the City Council adopted the *Interim Transportation Impact Analysis Guidelines* (TIA) for VMT (see **Attachment 1**). The TIA functions as the City's VMT user guide and outlines the steps to determine if a VMT analysis is required for a project. The TIA identifies screening criteria as well as the City's thresholds for VMT for when projects cannot "screen out."

Although the OPR recommends projects achieve a 15% reduction in VMT from the existing “regional” average, lead agencies have the discretion to adopt different thresholds as long as they are supported by substantial evidence.

The City’s adopted thresholds are as follows:

- *Residential*: A 13% reduction below existing average VMT/capita in Fresno County.
- *Office*: A 13% reduction below existing average VMT/employee in Fresno County.
- *Retail*: No net increase in total VMT.
- *Other Land Uses*: Determined on a case-by-case basis, supported by substantial evidence.
- *Mixed Use Projects*: Evaluate each component of a mixed-use and apply the significance threshold for each land use type.

For residential projects, the existing regional average VMT is 16.1 VMT/capita. Therefore, in order for a residential project to be considered to have less-than-significant traffic impacts under CEQA, the project may not exceed 14.1 VMT/capita (13% reduction from the regional average).

For office uses, the existing regional average VMT is 25.6 VMT/employee. Therefore, for an office project to be considered to have a less-than-significant traffic impact under CEQA, the project may not exceed 22.3 VMT/employee.

VMT Mitigation Measures

Under the VMT methodology, mitigation measures to reduce transportation impacts will shift from relieving traffic congestion through capacity inducing solutions (i.e. adding lanes, road widening, and traffic signals) to more Transportation Demand Management (TDM) based. TDM measures focus more on behavioral and infrastructure changes to support and/or encourage shifts in transportation modes away from single-occupancy vehicle use. Because VMT is dependent on location and proximity of residential to employment, goods and services, mitigation measures will be determined on a case-by-case basis.

Development Activity

Since adoption of the City’s VMT Guidelines, development activity within the City has slowed, partly due to COVID-19, but also, from growing concerns from the development community regarding how VMT analysis could affect the level of CEQA review. Staff has worked diligently with the local Building Industry Association (BIA), our traffic consultant and other applicants to navigate the complexities of VMT analysis, including determining what and how mitigation measures can be implemented. The BIA has provided a letter of support (**Attachment 4**) which reflects our ongoing efforts to work collaboratively on the best approach.

After several months of exploring ways to achieve a balance between compliance with VMT guidelines and the future of traffic analysis for development projects, staff is recommending that the Circulation Element of the 2014 Clovis General Plan be modified to incorporate VMT-related goals and policies. As part of this effort, a Supplemental Environmental Impact Report (EIR) would be prepared in compliance with the CEQA Guidelines to provide a citywide programmatic analysis of VMT.

The Supplemental EIR will serve as a tool which future development projects may use to tier off of, thus creating a mechanism for a more streamlined approach to traffic analysis. In essence, future projects may utilize and tier off of the results of the citywide traffic impact analysis in the Supplemental EIR for greater efficiency when preparing project-specific traffic analysis as it relates to CEQA.

PROPOSAL AND ANALYSIS

The following discussion provides an overview of how VMT has been implemented since adoption of the City's TIA on July 20, 2020, as well as a summary of the proposed scope of work and cost for the additional work being requested by staff.

VMT Implementation

Since the TIA was adopted by Council, there has yet to be a project that has necessitated a full VMT analysis. However, one project prepared a traffic study that included support for screening out using the "small projects" thresholds resulting in fewer than 500 average daily trips. That said, there are multiple projects being processed or preparing to submit applications that will have full VMT analyses as part of their scope. These projects will be the first in Clovis to utilize VMT as the metric for CEQA review.

Anecdotally, staff has heard from the development community that they are concerned with VMT analysis and the uncertainty it has created with regard to both time and cost. Projects that need to undergo the EIR process to address VMT will add six months to a year of processing time above what would have otherwise occurred if an initial study and mitigated negative declaration were completed. Because mitigation strategies are still being developed within the region and across the State, the cost of mitigating VMT impacts is unpredictable. These impacts, in combination with COVID-19, may be part of the reason staff has not yet processed an entitlement with a complete and full VMT analysis.

For those reasons above, staff currently does not have tangible data as it relates to VMT implementation utilizing the City's adopted VMT TIA Guidelines.

Scope and Budget Amendment

In the months following adoption of the City's VMT TIA Guidelines, staff, consultants, and the development community have worked closely to determine the best path forward in order to keep development moving forward within the confines of VMT compliance.

One solution is to prepare a Supplemental EIR in compliance with CEQA Guidelines to address VMT programmatically at the citywide scale. This would allow future projects to tier off of such analysis and improve the streamlining and efficiency of subsequent traffic studies prepared for individual projects. In preparing a citywide VMT analysis, so long as the later project is consistent with what was analyzed, the likelihood increases that a future traffic study would not necessarily result in the need for another EIR. This citywide approach also provides additional options for future CEQA documents such as addenda, supplemental, and subsequent EIRs, versus having to complete an entirely new EIR.

In order to prepare a Supplemental EIR, there first needs to be a “project” as defined by CEQA. Thus, staff is proposing to amend only the Circulation Element of the 2014 Clovis General Plan, which would qualify as a “project” under CEQA. The purpose of the amendment to the Circulation Element would be to incorporate new or modified goals and policies reflecting VMT. This, in turn, adds another level of protection in compliance with VMT by allowing the future projects to refer back to stated goals and policies of the Circulation Element for the purpose of supporting consistency findings.

For these efforts, Kittelson has included a modified scope and budget (**Attachment 5**). Because the scope is related to existing work being conducted under the current consultant agreement, staff is requesting the amendment to augment the current agreement to include the new scope of work and cost.

The additional work is anticipated to take approximately 6 to 8 months to complete at an additional cost of \$90,685. This is in addition to the original contract amount of \$164,820 (includes \$134,400 base amount plus \$30,420 in optional tasks). Therefore, if approved by Council, the total amended contract amount would be \$255,505 (\$164,820 original contract amount plus \$90,685 amendment).

In addition to the added scope and cost of \$90,685, there are miscellaneous County Clerk filing fees throughout the EIR process, as well as potentially paying a mandatory Fish and Wildlife fee. These additional fees could cost up to an additional \$4,000 and would be in addition to the amended scope and budget.

FISCAL IMPACT

The total contract amendment amount is for \$90,685 plus the cost of County Clerk filing, and Fish and Wildlife fees which could total up to an additional \$4,000, for a total request of \$94,685. This contract amendment will be funded using the City’s General Plan Consultant revenues, which has adequate capacity to fund the project.

REASON FOR RECOMMENDATION

Staff has concluded that this approach best allows for development to continue in the most streamlined and efficient manner, while also achieving compliance with the provisions of VMT regulations.

ACTIONS FOLLOWING APPROVAL

At the completion of the update to the Circulation Element update and Supplement EIR, staff will return to City Council for approval of the update and certification of the EIR.

Prepared by: Ricky Caperton, Senior Planner / Sean Smith, Supervising Engineer

Reviewed by: City Manager JS



Building Industry Association
of Fresno/Madera Counties, Inc.

July 2, 2021

Clovis City Council
1033 Fifth Street
Clovis, CA 93611

RE: Analysis of Vehicle Miles Traveled (VMT)

Dear Councilmembers:

The Planning and Development Services Department has informed the Building Industry Association (BIA) that on July 12 a status report will be provided to the City Council on the City's efforts to modify the Circulation Element of the City's General Plan. The work to amend the Circulation Element to incorporate the VMT goals and policies will require a citywide analysis of VMT and a Supplemental Environmental Impact Report (EIR).

The BIA supports such actions that would achieve the completion of further analysis on the impacts of VMT and appropriate amendments to the Circulation Element. This process will identify lands within the City's General Plan that will be unable to achieve the baseline threshold for VMT and provide possible mitigation measures. The City Staff and the BIA have been cooperating to develop mitigation measures for implementation to reduce VMT to the baseline threshold.

The preparation of a citywide analysis and environmental assessment will eliminate the requirement for each development to prepare an EIR to identify the project's VMT impacts. If individual projects are required to initiate such an expensive and time-consuming endeavor it will only add to the cost of housing, which will erode the affordability of homes in Clovis.

If you have any question, please call me at (559) 226-5900.

Sincerely,

Michael Prandini
President & CEO

ATTACHMENT 5

FREQUENTLY ASKED QUESTIONS

1. **With regard to the “small projects” exemption in the TIA guidelines how did the Clovis Interim VMT Guidelines establish that 500 trips would screen out projects as opposed to the Office of Planning & Research (OPR) recommended threshold of 110 trips? How did Fresno COG reach the “500 trips” number, versus OPR’s “110 trips”?**

Fresno Council of Governments (Fresno COG) recommended to apply screening criteria for projects under 500 trips. This is based on calculations where this level of daily trips would not result in significant Greenhouse Gas (GHG) impacts. The GHG impacts would be consistent with criteria adopted for the Air Quality district. Substantial evidence was presented in the TIA guidelines. The 110 from OPR is based on trips that would normally be processed as a Categorical Exemption. The City of Fresno implemented this screening criteria. The City of Clovis and Kittelson reviewed these options (110, 500, and also San Diego’s 2,500) and concluded that 500 would be a reasonable threshold that would be defensible, as substantial evidence to support this criteria was provided.

2. **How is the “small projects” exemption applied?**

If a project generates less than 500 daily trips it may be presumed that less than significant VMT impacts would occur.

3. **When do the impact thresholds apply versus the screening criteria?**

The screening criteria was developed to allow consultants and lead agencies to presume that VMT impacts would be less than significant if a project would meet one of the criteria. Projects that do not meet the screening criteria must include a detailed evaluation of the VMT generated by the project. In this case the thresholds would apply.

4. **Since the TIA guidelines haven’t been finalized, do we need to amend the City’s VMT thresholds to address such issues?**

We are planning on finalizing the interim guidelines with additional background information and substantial evidence to justify the guidelines’ screening criteria and thresholds.

5. **What is going to be the scope of the VMT analysis?**

The VMT will be calculated for the baseline year, and currently adopted General Plan future year. VMT per capita and VMT per employee and total VMT will be provided, and compared to the regional VMT. Thresholds would be consistent with OPR’s for plan areas such as specific plans and corridor plans.

6. What is going to be the scope of the General Plan amendment?

The General Plan amendment is to the Circulation Element only. The City staff will modify goals and/or polices incorporating VMT-related.

7. What is the scope of the Supplemental Environmental Impact Report?

The scope of the SEIR is a transportation chapter only. An Initial Study will be prepared to scope out all other environmental topics.

8. What sort of timeline are we looking at for completion of the SEIR?

Once the amended Circulation element is vetted and policies are solidified, it will be approximately 6 to 8 months until completion.

9. How do the changes to the General Plan affect current or pending projects?

They should not affect current or pending projects and the SEIR should provide coverage under a Statement of Overriding Consideration for those projects that don't meet the VMT thresholds that are consistent with the General Plan land use designation.

10. What needs to be done to reconcile the City's land use assumptions with the Fresno COG model? Are all known projects being considered within the VMT analysis? (Implementing new things not in COG's model would increase VMT)

Kittelson will review the land uses assumed in the current Fresno COG travel model forecasts. For this task, Kittelson is coordinating with City Staff to confirm the land uses to be evaluated consistent with the current General Plan land use map. As part of this task we are confirming if the analysis would include the full buildout of the plan or a constrained horizon year, and the assumptions for major planned areas such as Heritage Grove.

11. Does the City require an amendment to update the latest land use assumptions in the General Plan?

No, if the land uses change then it opens up the rest of the EIR and would not allow us to limit the scope to just traffic. The efforts being undertaken only assume changes to the Circulation Element.

12. What mitigation measures are anticipated to be taken?

A list of measures will be prepared that can be considered for individual projects as they are developed to reduce VMT (i.e. increase transit, add carpool facilities, provide bike/ped facilities, etc.), but ultimately there will be some projects that cannot meet the VMT reduction threshold and would result in significant and unavoidable impacts at the time of environmental review.

13. What EIR alternatives are anticipated?

The CEQA-required No Project Alternative, which is the existing General Plan. We have not yet contemplated other alternatives for analysis.

14. What are the anticipated challenges to the SEIR and General Plan Amendment?

The EIR and General Plan amendment is really just a response to the State's new legislation that requires a consideration of VMT. It doesn't drive growth or land use changes, and it doesn't result in a physical project. As such, we don't see major challenges, it is more of an administrative process.

INTERIM TRANSPORTATION IMPACT ANALYSIS GUIDELINES

City of Clovis, CA



July 14, 2020

ATTACHMENT 7

1. INTRODUCTION

The Interim Transportation Impact Analysis Guidelines document provides guidance to City of Clovis (City) staff, applicants, and consultants on the requirements to evaluate transportation impacts for projects in the city for the purpose of determining impacts under the California Environmental Quality Act (CEQA). The Interim Transportation Impact Analysis Guidelines are intended to:

- promote conformance with applicable City and State regulations;
- provide evaluation consistent with CEQA;
- ensure consistency in preparation of studies by applicants and consultants; and
- provide predictability in content for City staff and the public in reviewing studies.

Although these guidelines are intended to be comprehensive, not all aspects of every transportation analysis can be addressed within this framework. City staff reserve the right to use judgement to request exemptions and/or to modify requirements for specific projects at the time of the review application.

1.1. BACKGROUND

The Interim Transportation Impact Analysis Guidelines specifically address the requirements of California Senate Bill 743 (SB 743) which mandates specific types of CEQA analysis of transportation projects, effective July 1, 2020.

1.1.1. SB 743 Requirements

Prior to implementation of SB 743, CEQA transportation analyses of individual projects typically determined impacts on the circulation system in terms of roadway delay (i.e., congestion) and/or capacity usage at specific locations, such as street intersections or freeway segments. Senate Bill 743, signed into law in September 2013, requires changes to the guidelines for CEQA transportation analysis. The changes include the elimination of auto delay, level of service (LOS), and other similar measures of vehicular capacity or traffic congestion as a basis for determining transportation impacts. The purpose of SB 743 is to promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses.

Under SB 743, a project's effect on automobile delay shall not constitute a significant environmental impact under CEQA. Therefore, LOS and other similar vehicle delay or capacity metrics may no longer serve as transportation impact metrics for CEQA analysis. The California Office of Planning and Research (OPR) has updated the CEQA Guidelines and provided a final technical advisory (December 2018), which recommends vehicle miles traveled (VMT) as the most appropriate measure of transportation impacts under CEQA. The California Natural Resources Agency certified and adopted the CEQA Guidelines including the Guidelines section implementing SB 743. The changes have been approved by the Office of the Administrative Law and took effect on July 1, 2020.

LOS analysis is still appropriate and necessary to determine consistency with General Plan policies as they relate to LOS. More specifically, Appendix G of the CEQA Guidelines asks whether a project would “conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities.” As the City’s currently adopted 2014 General Plan Circulation Element includes a LOS standard, in order to ensure that a project is consistent with the General Plan policy, a LOS analysis may be required at the request of the City Engineer to determine necessary roadway infrastructure improvements and capacity. Any improvements necessary to ensure LOS standards are met may be required as part of the project entitlement.

1.1.2. Local Transportation Analysis

It shall be noted that revisions to CEQA transportation analysis requirements do not preclude the application of local general plan policies, municipal and zoning codes, conditions of approval, or any other planning requirements through a city’s planning approval process to ensure adequate operation of the transportation system in terms of transportation congestion measures related to vehicular delay and roadway capacity. As such, the City of Clovis continues to apply congestion-related transportation impact analysis and conditions or requirements for land development projects through planning approval processes outside of the CEQA Guidelines in order to continue implementation of Clovis General Plan policies. These requirements are discussed in Section 3, Local Transportation Analysis.

1.2. TRANSPORTATION IMPACT ANALYSIS REPORTS

This document provides guidance for the two types of analysis that normally comprise a Transportation Impact Analysis (TIA) report:

1. CEQA Analysis
2. Local Transportation Analysis

Not all projects will require all components of a CEQA analysis and a local transportation analysis. For example, a project could meet the screening criteria for being located in a high-quality transit area and be exempt from the preparation of a detailed CEQA VMT analysis. Such a project may only be required to provide a local transportation analysis. Conversely, a project may require a VMT analysis, but not necessarily require a local transportation analysis. Thus, the final scope of the Transportation Impact Analysis would need to be determined by the City.

1.2.1. CEQA Analysis

A CEQA analysis of transportation impacts consists of evaluation measures including conflicts with circulation policies, VMT, hazards, and emergency access. The quantitative methodology, significance thresholds, and mitigation measures for conducting the transportation analysis in

accordance with the requirements of SB 743 are primarily based on VMT metrics. The CEQA analysis is part of the environmental review process and must meet CEQA requirements.

1.2.2. Local Transportation Analysis

The City can require that local non-CEQA analysis address traffic operations, safety issues and needed project design features related to a proposed land use project, as well as analyze site access and internal circulation. The local transportation analysis may be used to assess transportation impacts in relation to the City's policies in the General Plan and other planning documents.

2. CEQA ANALYSIS REQUIREMENTS

This section discusses the requirements for conducting analyses for projects under environmental review, consistent with requirements from SB 743. Under CEQA, a lead agency has the authority to determine its own significance thresholds and methodologies for technical analysis, taking into account its own development patterns, policy goals and context. Lead agencies can make their own specific decisions regarding methodology and thresholds, presuming their choices are supported by substantial evidence.

The CEQA Appendix G Environmental Checklist Form identifies the following four impact types for transportation:

- a) Would the project conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?
- b) Would the project conflict with or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b) (requirement to use VMT)?
- c) Would the project substantially increase hazards due to a geometric feature or incompatible uses?
- d) Would the project result in inadequate emergency access?

Consistent with State CEQA Guidelines section 15064.3, the City of Clovis has adopted thresholds of significance to determine when a project will have a significant transportation impact based on VMT. The City has developed screening criteria to streamline the analysis for projects that meet certain criteria, referred to as Project Screening, as further described below in Section 2.1.1.

2.1. LAND USE PROJECTS

This section provides information for analyzing individual land use projects, including the process to aid in deciding if a detailed VMT analysis is needed for a land use project. Figure 1 presents a flow chart depicting how a land use project would be analyzed under VMT-based metrics.

2.1.1. Project Screening

A project will require a detailed VMT analysis unless it meets at least one of the City's five screening criteria:

1. Small projects
2. Provision of affordable housing
3. Local-serving retail
4. Project located in a High-Quality Transit Area (HQTA)
5. Project located in low VMT area

Figure 1: Land Use Projects VMT Analysis

LAND USE PROJECTS VMT ANALYSIS FLOW CHART

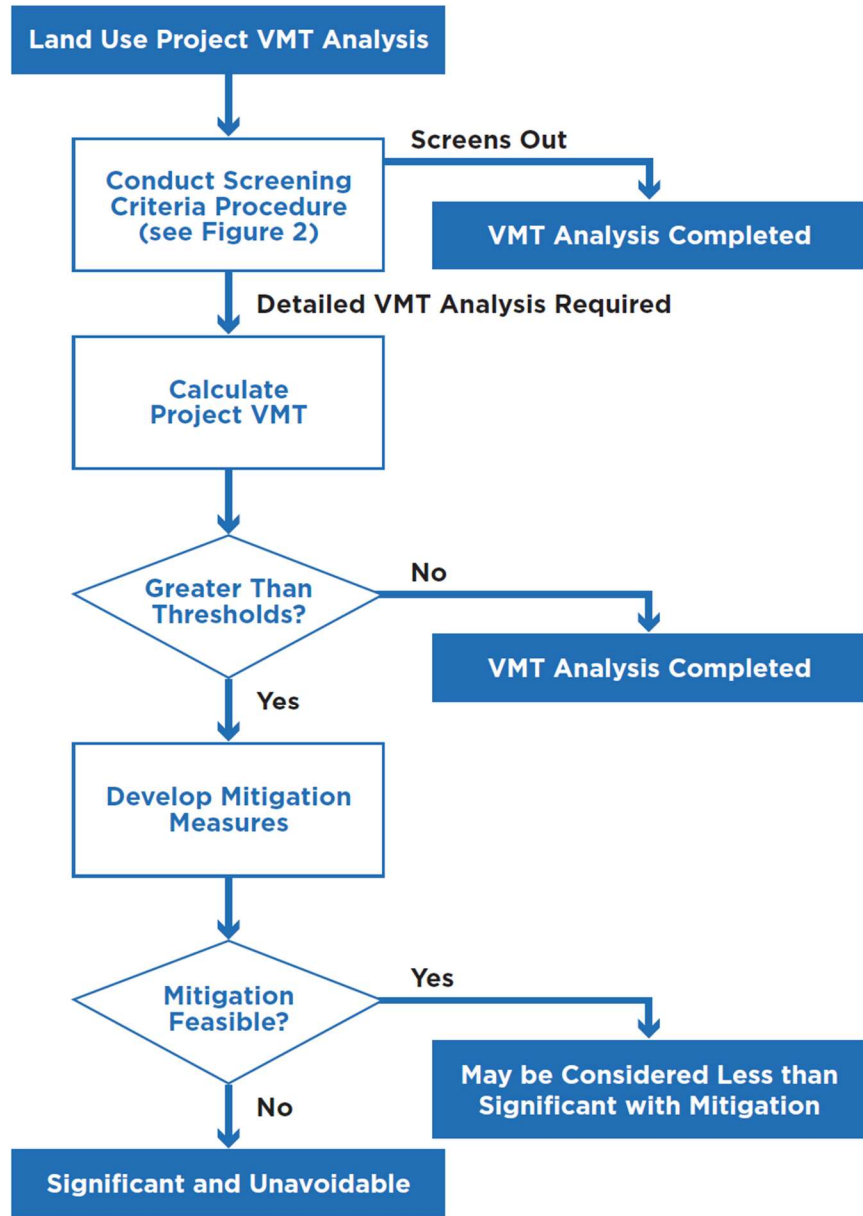
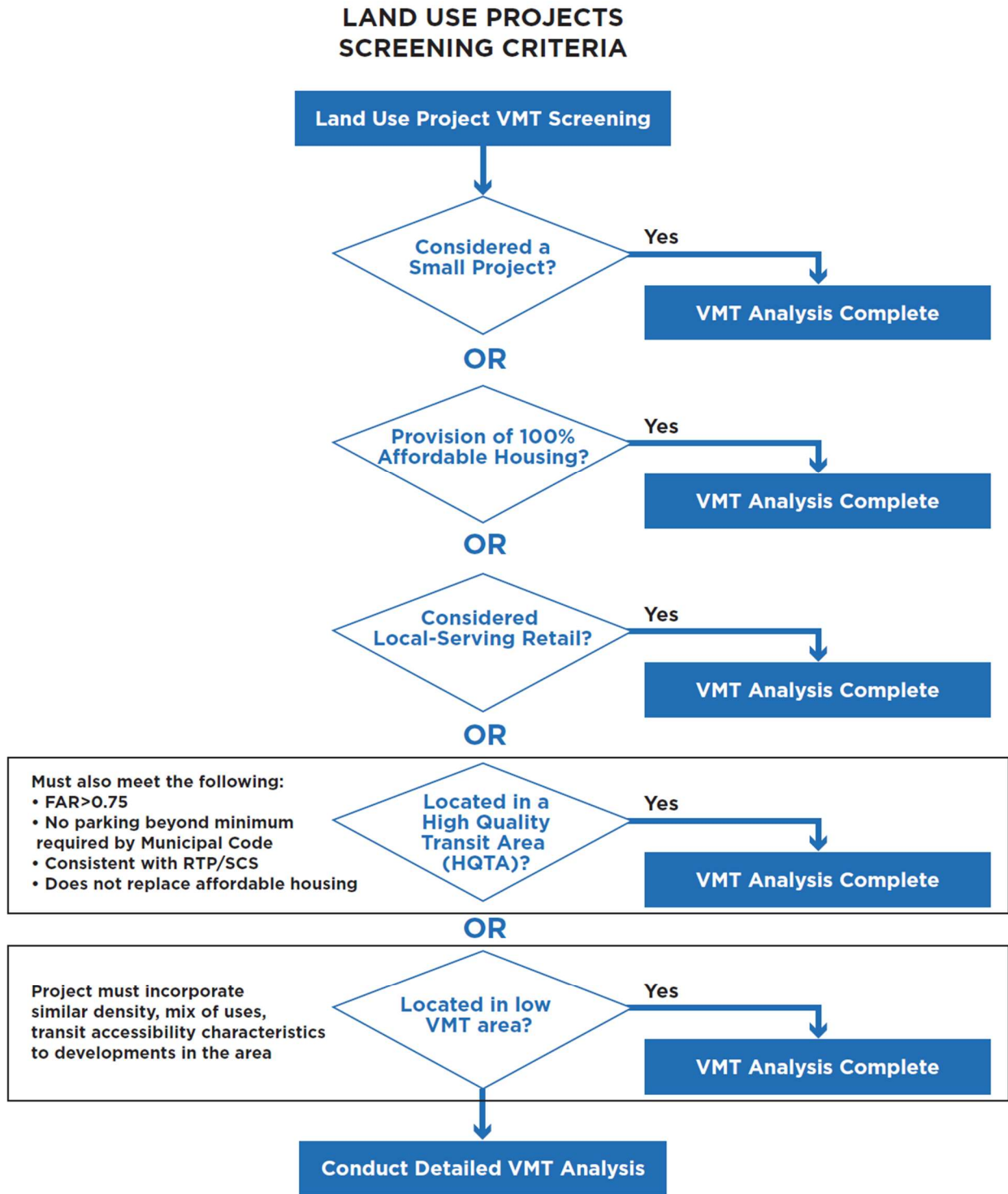


Figure 2 presents a chart depicting how a land use project would be analyzed under the proposed screening criteria. A project that meets at least one of the screening criteria could have a less-than-significant VMT impact due to project or location characteristics.

Figure 2: Land Use Projects Screening Criteria Flow Chart



2.1.1.1. Small Projects

Projects that generate or attract fewer than 500 vehicle trips per day are presumed to cause a less-than-significant VMT impact. Projects that typically generate 500 vehicle daily trips are shown in Table 1.

Table 1: Sample Small Projects (less than 500 daily trips)

Land Use Type	Number of Units/ Square Feet
Single Family Residential	53 Dwelling Units
Townhome/Attached Residential	68 Dwelling Units
Retail	13,250 SF
Light Industrial	100,800 SF

Note: calculated trip rates from the ITE *Trip Generation Manual*, 10th Edition.

2.1.1.2. Affordable Housing

Affordable housing is designated as housing for sale or for rent below market rate. Residential projects in high quality transit areas with a high proportion of affordable housing are presumed to have a less-than-significant transportation impact. Projects can only be screened out if they are located in an area supported by a quality walking and biking network with nearby retail and employment opportunities. If a project contains less than 100 percent affordable housing, the portion that is affordable should be screened out of a detailed VMT analysis.

2.1.1.3. Local-Serving Retail and Public Facilities

Projects that are local-serving retail with 100,000 square feet gross floor area or less are presumed to have a less-than-significant impact. This applies to the entirety of a retail project; for a mixed-use project, this screening criteria should be applied to the retail/commercial component separately to determine if that portion of the project screens out of a detailed VMT analysis.

The determination of local-serving retail is based on location, the characteristics of the project and the vicinity of the site, as well as the envisioned goods and services the retail development would provide. Generally, local-serving retail primarily provides goods and services that most people need on a regular basis and be located close to where people live. Groceries, medicines, fast food and casual restaurants, fitness and beauty services are typical goods and services provided by local-serving retail centers.

The City may require that a project applicant provide a market analysis to demonstrate that the project meets the characteristics of a local-serving retail development based on the goods and services provided relative to the geographic location, the customer base, and other nearby retail uses.

Public services (e.g., police, fire stations, public utilities, neighborhood parks¹) do not generally generate substantial amounts of trips and VMT. Instead, these land uses are often built to support other nearby land uses (e.g., office and residential). Therefore, these land uses can be presumed to have less-than-significant impacts on VMT. However, this presumption would not apply if the project is sited in a location that requires employees or visitors to travel substantial distances and may require a detailed VMT analysis.

2.1.1.4. High-Quality Transit Area (HQTA)

Projects that are located in a high-quality transit area would not require a detailed VMT analysis. However, this presumption does not apply if the project:

- has a floor area ratio (FAR) of less than 0.75;
- includes substantially more parking for use by residents, customers, or employees of the project than required by the City (per Section 9.32.040 of the Municipal Code) such that it discourages use of alternative modes (transit, biking, walking) by promoting auto ownership and making driving very convenient;
- is inconsistent with the applicable Fresno Council of Governments (Fresno COG) Sustainable Communities Strategy (SCS), as determined by the City; or
- replaces affordable residential units with a smaller number of moderate- or high-income residential units.

A map of the existing High-Quality Transit Areas in the city is provided in Attachment A.

2.1.1.5. Project Located in Low VMT Areas

Residential and employment projects that are proposed in areas that generate VMT below adopted City thresholds are presumed to have a less-than-significant VMT impact and thus can be screened out. The City provides screening maps based on transportation analysis zones (TAZs) and results from the Fresno COG travel model. The following types of projects may be screened out of detailed VMT analysis using these criteria:

- Residential projects proposed in TAZs with total daily resident-based VMT per capita that is 13 percent less than the existing average baseline level for Fresno County
- Office or the employment portions of other non-residential uses with total daily employee-based VMT per employee that is 13 percent less than the existing average baseline level for Fresno County

The TAZs that fall into these categories are shown in green in the maps provided in Attachment B.

¹ For the purpose of conducting VMT analyses, neighborhood parks are defined as typically including playground equipment, playfields, and picnic facilities; ranging in size of up to 30 acres; and serving as social and recreational focal points for neighborhoods.

2.1.1.6. Consistency with RTP/SCS

If a proposed project is inconsistent with the adopted Fresno COG Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS), the City will evaluate whether that inconsistency may result in a significant impact on transportation. Therefore, projects that are inconsistent with the RTP/SCS would not qualify for screening out of a detailed VMT analysis.

2.1.2. Significant Impact Thresholds

For projects which do not meet any of the screening criteria, the City of Clovis has adopted VMT thresholds for land use development based on a review of long-range plans and policies for the City and for the metropolitan planning organization for the region, Fresno COG.² Fresno COG³ has set a goal to reduce greenhouse gas (GHG) emissions by 13 percent per capita by 2035 as a target for the Fresno region. The intent of SB 743 is to bring CEQA transportation analyses into closer alignment with other statewide policies regarding GHG, complete streets, and smart growth. Therefore, using a threshold of 13 percent below average VMT for residential and office projects is consistent with established regional GHG emission goals.

The OPR technical advisory recommends comparing a project's estimated VMT per capita or VMT per employee to average values on a regional or citywide basis. For retail projects, total VMT within the area affected by the project is measured.

The significance thresholds and specific VMT metrics used to indicate a significant transportation impact are described by land use type in Table 2.

2.1.3. VMT Analysis Methodology

Projects that do not meet the screening criteria must include a detailed evaluation of the VMT generated by the project.

2.1.3.1. Regional Average VMT

Regional average VMT per capita and VMT per employee values are determined using the Fresno COG regional travel model. The travel demand model is a set of mathematical procedures and equations that represent the variety of transportation choices that people make, and how those choices result in trips on the transportation network. The Fresno COG regional travel model is an activity-based model that simulates the County's population, based on detailed Census data, and

² SB 375 Greenhouse Emission Reduction Target for the Fresno County Region, Fresno Council of Governments, April 25, 2017.

³ SB 375 Greenhouse Emission Reduction Target for the Fresno County Region, Fresno Council of Governments, April 25, 2017.

models the daily activity patterns of each simulated individual along with resulting travel demand. The OPR guidelines recommend using a tour-based approach whenever possible.

The daily activity patterns in the travel model are based on a statistical analysis of a household travel survey, where a representative sample of households were asked to track all daily activities and trips by all members of their household. A simulated travel tour might consist of, for example, travel from the home to the gym to work to supermarket to home in a typical weekday. The travel model was calibrated to these surveyed travel patterns, and also validated by its ability to replicate counted traffic volumes, transit ridership, and total Fresno County VMT from the Highway Performance Measurement System (HPMS) which is based on traffic counts.

The VMT per capita includes all trips made by residents, including their trips while away from home, but does not include trips visiting residences (e.g., trips made by delivery vans). The regional average VMT per capita is calculated by summing the vehicle mileage (excluding trips made by transit, bicycle or walking) for all trips made by Fresno County residents, and dividing by the county population.

The VMT per employee includes trips made by employees to and from their workplaces, including trips to and from points other than the employees' homes, but does not include visitors to the employment sites. The regional average VMT per employee is calculated by summing the vehicle mileage (excluding trips made by transit, bicycle or walking) for all trips made by Fresno County employees, and dividing by the total number of employees in the county.

2.1.3.2. VMT per Capita or per Employee

For residential or employment land uses where VMT per capita or VMT per employee are used to determine impacts, the following analysis methods are available:

- The VMT per capita or VMT per employee may be looked up using the latest screening maps (Attachment B) and the TAZ (or TAZs) containing the project site.
- If the value for the TAZ is zero or significantly different compared to the values in surrounding TAZs due to a lack of land use data in the existing condition for the project TAZ, the City may allow the VMT per capita or VMT per employee to be based on an average of surrounding adjacent TAZs.
- If a proposed project affects the balance of residential and non-residential land uses in an area and is a relatively large project, it is recommended that the Fresno COG model be rerun to include the proposed project, and that the VMT per capita and VMT per employee be recalculated.

2.1.3.3. Exclusion of Truck VMT

It shall be noted that SB 743 does not apply to goods movement (i.e., trucks). Section 15064.3 of the CEQA Guidelines states that VMT for transportation impacts refers to "... the amount and distance of automobile travel...". Therefore, the VMT associated with trucks and the movement of

goods is not required to be analyzed and mitigated for the evaluation of transportation impacts under CEQA. Projects that generate a substantial amount of truck traffic also generate automobile trips, and project-related automobile trips would be subject to VMT analysis and mitigation. The VMT for all vehicles, including heavy trucks related to a project, will still be calculated as input for air quality, GHG, noise and energy impact analyses to be evaluated in non-transportation parts of the environmental analysis. The local transportation analysis requires an evaluation of truck traffic in terms of roadway and intersection operations, as discussed in Section 3.

Table 2: Impact Thresholds by Land Use Type

Land Use Type	Impact Threshold
Residential	<p>A proposed project exceeding a level of 13 percent below existing average VMT per capita in Fresno County.</p> <p>Regional Average: 16.1 VMT/capita Impact Threshold: 14.1 VMT/capita</p>
Office	<p>A proposed project exceeding a level of 13 percent below existing average VMT per employee in Fresno County.</p> <p>Regional Average: 25.6 VMT/employee Impact Threshold: 22.3 VMT/employee</p>
Retail	<p>A net increase in total VMT. The total VMT for the region without and with the project is calculated. The difference between the two scenarios is the net change in total VMT that is attributable to the project.</p>
Other land uses	<p>The City will make a determination of the applicable thresholds on a case-by-case basis based on the land use type, project description, and setting. Research and development, medical offices, assisted living, and industrial projects may be evaluated similar to office projects using the VMT per employee metric. Projects such as religious institutions, regional parks, hotels, private schools and medical offices may be evaluated using the net VMT criteria similar to retail projects.</p>
Mixed-Use Projects	<p>Evaluate each component of a mixed-use project independently and apply the significance threshold for each land use type. Alternatively, the evaluation would apply only the project’s dominant use.</p>

2.1.4. Redevelopment Projects

If a project results in a net decrease in overall VMT, it may be presumed that the project would result in a less-than-significant impact.

If a project replaces existing uses and leads to a net overall increase in VMT compared to the previous uses, then the thresholds for the new land uses should apply. If net VMT increases, then the appropriate VMT metrics and thresholds should be applied. For example, if a residential project replaces an office project resulting in a net increase in VMT, then the project's VMT per capita should be compared with the thresholds for residential projects. If the project is a mixed-use project, then the recommended approach for analyzing mixed-use projects should be applied to analyze each individual use.

2.1.5. Land Use Plans

For land use plans such as specific plans, community plans, and general plan updates, consistent with OPR's recommendations, the City requires comparing the applicable VMT thresholds (such as VMT per capita and/or VMT per employee) described in Section 2.1.3 under existing conditions with the applicable VMT metrics for the expected horizon year for the land use plan. If there is a net increase in the applicable VMT metrics under horizon year conditions, then the project will have a significant impact.

2.1.6. Cumulative Impacts

Per Section 15064 (h) (1) of the CEQA code, "when assessing whether a cumulative effect requires an Environmental Impact Report (EIR), the lead agency shall consider whether the cumulative impact is significant and whether the effects of the project are cumulatively considerable."

Generally, an analysis of cumulative impacts falls under two categories:

1. VMT per capita or per employee
2. Total VMT

These are described below.

2.1.6.1. VMT per Capita or per Employee

For land uses evaluated under an efficiency metric (VMT per capita for residential or VMT per employee for office/employment), if a project falls below the threshold, it would also result in less-than-significant cumulative impacts. In other words, a project that falls below an efficiency-based threshold would have no cumulative impact distinct from the project impact.

2.1.6.2. Total VMT

For land uses evaluated using total VMT (e.g., retail, hotels, etc.), when absolute VMT metrics (such as total VMT recommended for retail and transportation projects) are used, a cumulative VMT

impact analysis may be appropriate. Projects must demonstrate consistency with the City of Clovis General Plan to address cumulative impacts. A determination for consistency with the General Plan or RTP/SCS would be made by the City Engineer and based on factors such as density, design and consistency with the City's General Plan goals and policies. Inconsistencies may be identified if the proposed land use quantities are beyond the designation for the project site in the General Plan or RTP/SCS, in which case the project may result in higher VMT compared to the applicable plan.

If a project is consistent with the General Plan or RTP/SCS, it will be considered as part of the cumulative condition to meet the General Plan's long-range transportation goals, and therefore will result in a less-than-significant cumulative impact. If a project is not consistent with the General Plan, a cumulative impact analysis will be required to determine if the project would result in a net increase in VMT.

2.1.7. Mitigation

If a project would result in significant impacts, CEQA requires feasible mitigation measures to be implemented to reduce or mitigate an impact. Mitigation includes⁴:

- (a) Avoiding the impact altogether by not taking a certain action or parts of an action
- (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation
- (c) Rectifying the impact by repairing, rehabilitating, or restoring the impacted environment
- (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action
- (e) Compensating for the impact by replacing or providing substitute resources or environments, including through permanent protection of such resources in the form of conservation easements

For VMT impacts, a combination of measures from several VMT reduction strategies may be implemented: project characteristics, multimodal improvements, parking, and Transportation Demand Management (TDM). VMT is reduced by implementing strategies that reduce the number of automobile trips generated by the project, shift more trips from automobile to non-automobile modes, and/or reduce the distances that people drive. Generally, these reductions can be achieved by the implementation of TDM strategies.

TDM strategies are designed to change travel behavior in order to reduce the demand for roadway travel and increase the overall efficiency of a local or regional transportation system. This is accomplished by encouraging mode shifts away from the Single Occupant Vehicle (SOV) and auto trips away from peak periods. TDM strategies typically involve some form of incentives for employers and residents in order to reduce driving and encourage transit, walking, biking, and

⁴ According to CEQA code Section 15370

carpooling. These incentives can include, but are not limited to, supplying transit passes, rideshare programs, parking cash out, and guaranteed ride home programs. The implementation of TDM measures outcomes include increased transit use and non-motorized travel, reduced VMT, reduced roadway congestion, and reduced parking demand.

Measures to reduce VMT have been documented by several sources. Sources most commonly referenced include the California Air Resources Board (CARB) list of transportation and land use strategies for reducing greenhouse gas emissions;⁵ the California Pollution Control Officers Association (CAPCOA) report on quantifying the greenhouse gas mitigation measures;⁶ and the San Diego Association of Governments (SANDAG) Mobility Management VMT Reduction Calculator Tool – Design Document. The City recommends the use of these sources to select and apply mitigation measures and appropriate VMT reductions. The project applicant will be required to provide evidence for identifying specific values for mitigations to demonstrate the quantification in reduction of VMT to a level that would be less than significant. The mitigation measures included in the CAPCOA report are included in Attachment D. The mitigation measures included from SANDAG are included in Attachment E.

Projects for which impacts are determined to be significant are required to propose a list of VMT reduction measures and document the associated percentage of VMT reduction supported by substantial evidence. Project VMT is calculated by applying the percentage in reduction. Project VMT is then compared to the threshold of significance to evaluate the project's CEQA transportation impact. The City will review and approve the proposed mitigation and the calculated percentage in VMT reduction.

VMT mitigation fees, mitigation banks, and mitigation exchange programs are potential future methods for handling mitigation. Cities have been exploring the establishment of programs such as mitigation banking and VMT exchanges. VMT exchange banks allow program-level mitigation to take place for projects located in high-VMT areas where mitigation at the project level alone may not be effective. A considerable amount of effort is needed to set up these types of fee programs, which are implemented in advance and independent of the environmental review for a specific land development project. As a first step, the City will need to identify mitigation strategies that are feasible for the City or individual projects to implement. This can include determining the physical feasibility of infrastructure projects or determining the implementation feasibility of programs that would contribute to development of regional pedestrian, bicycle/scooter, and transit projects and possibly TDM actions aimed at changing travel behavior.

⁵ <https://ww3.arb.ca.gov/cc/sb375/policies/policies.htm>

⁶ Quantifying Greenhouse Gas Mitigation Measures, California Pollution Control Officers Association 2010.

2.2. TRANSPORTATION PROJECTS

This section provides information for analyzing transportation projects on roads within the City's jurisdiction.

2.2.1. Determining Need for Detailed VMT Analysis

The City of Clovis requires an analysis of transportation projects if they are expected to increase VMT, primarily projects that encourage the use of single-occupancy automobile such as the addition of through travel lanes. However, transportation projects that have already been specifically analyzed in a citywide plan (such as a General Plan update) may be exempt from a detailed VMT analysis. This exemption may be granted if the necessary VMT analysis and potential mitigations have already been calculated and identified at the plan level.

Conversely, projects that would likely not lead to an increase in vehicle travel and which promote use of transit and active transportation, should not require a VMT analysis. Project types that would likely not lead to a substantial or measurable increase in vehicle travel and generally should not require a VMT analysis include:

- road rehabilitation
- safety projects
- auxiliary lanes less than one mile in length
- turning lanes
- conversion to managed or transit lanes
- road diets
- removal or relocation of parking spaces
- addition of non-motorized, transit, and active transportation facilities

A full list is provided in Attachment C.

This approach is consistent with the intent of SB 743 in that it streamlines VMT-reducing projects and thoroughly assesses and mitigates, as appropriate, projects that have the potential to increase VMT.

2.2.2. Thresholds for Transportation Projects

Projects that have already been included and evaluated in the General Plan or the RTP/SCS are presumed to have a less-than-significant impact.

For projects that have not been included in the General Plan or RTP/SCS or are modifications and replacements, any growth in VMT attributable to the transportation project could result in a significant impact. For example, a transportation project that replaces a project included in the General Plan and would generate less VMT compared to the project included in the General Plan would have a less than significant impact. Projects not included in the General Plan or RTP/SCS would have a significant impact if they cause a net increase in VMT.

2.2.3. VMT Analysis Methodology and Tools

For transportation projects (e.g., those that increase vehicular throughput or are not included in a citywide plan) that require a detailed VMT analysis, the City should require analysis using the most current travel demand model (i.e., Fresno COG model) to estimate changes to citywide VMT due to rerouted trips. To capture long-term effects, an induced demand assessment using the following formula should be required:

$$[\% \text{ increase in lane miles}] \times [\text{existing VMT}] \times [\text{elasticity}] = [\text{VMT resulting from the project}]$$

The City requires total VMT in the city as the appropriate VMT metric, with the impact threshold being any increase in total VMT. The analysis shall be performed for the long-range horizon year, normally 20 years out. This approach would discourage induced demand impacts by requiring that a baseline level of VMT in the city not be exceeded.

2.2.4. Mitigation for Transportation Projects

Mitigation measures for transportation projects generally seek to reduce VMT by discouraging single-passenger automobile travel or through funding TDM measures. The following potential mitigation measures for transportation projects are listed as examples for consideration:

- Tolling new lanes to encourage carpooling and fund transit improvements
- Converting existing general-purpose lanes to HOV or HOT lanes
- Implementing or funding off-site travel demand management
- Implementing Intelligent Transportation Systems (ITS) strategies to improve passenger throughput on existing lanes

The City may pursue other mitigation measures supported by substantial evidence.

3. LOCAL TRANSPORTATION ANALYSIS

3.1. PURPOSE

A local transportation analysis (LTA) may be required for land use projects, in addition to the CEQA analysis, to evaluate the effects of a development project on the circulation network, primarily on local access and circulation in the proximity of a project site. The LTA ensures that the project provides safe connections for cyclists, pedestrians, and transit users. This analysis is required to address operational and safety potential issues for all transportation modes, and to identify improvements needed with project implementation and consistent with City policies.

These guidelines are provided to establish general procedures and requirements for the preparation of LTAs associated with development within the city of Clovis. The City recognizes that every development project and analysis context is unique. Therefore, emphasis is placed on the term “guidelines,” and not every aspect of the guideline is necessarily applicable to all projects. These guidelines are intended as a checklist for analysis preparers to ensure common analysis items are not overlooked. They are not intended to be prescriptive to the point of eliminating professional judgment.

3.1.1. Thresholds for LTA Preparation

Unless waived by the City Engineer, an LTA will be required by the City to adequately assess the impacts of development projects on the existing and/or planned street system when the following thresholds are met:

1. When project-generated traffic is expected to be greater than 100 vehicle trips during any peak hour
2. When a project includes a General Plan Amendment (GPA) which changes the use to a designation that has a potential to generate a higher number of vehicle trips than the existing, or originally planned land use designation
3. When the project traffic will substantially affect an intersection or roadway segment already identified as operating at an unacceptable level of service
4. When the project will substantially change the offsite transportation system or connection to it, as determined by the City Engineer

An LTA requires updating when two or more years with no activity have passed since the preparation of the analysis. After two years with no activity, an LTA is considered antiquated and irrelevant. For cases in which a master LTA was prepared for a large development, the specific phases will generally not require supplemental analyses if the master LTA analyzed the large development in phases and the specific phases are consistent with the master LTA.

3.2. STUDY AREA

The intersections and roadway segments to be covered by the LTA will be determined on a case-by-case basis and shall be sufficient in size to include existing and planned streets and intersections that may be impacted by the proposed development. The scope of the LTA, including the study area, proposed trip distribution, and trip generation, shall be reviewed and approved by the Traffic Engineering Manager or designee prior to preparation of the study.

The following guidelines determine the extents of the study area for local transportation analysis:

- Pedestrian, bicycle and transit facilities within a half-mile distance from the project site boundary
- All intersections of major streets that would provide direct access to the project
- All signalized intersections within one-half mile of the project site boundary where the project would add 50 or more peak hour trips, and signalized intersections beyond one-half mile where the project would add 100 or more peak hour trips
- All unsignalized intersections within a half-mile of the project site boundary where the project would add more than 50 peak hour trips

Local transportation analyses shall provide sufficient detail regarding existing pedestrian, bicycle, and transit facilities. This could include identification of deficient facilities, existing and planned bicycle facilities, and existing and planned transit routes and facilities.

3.2.1. Coordination with Caltrans

The LTA and/or City staff shall consult with the State of California Department of Transportation (Caltrans) to determine traffic impacts on Caltrans' State facilities. This consultation should include a request to Caltrans for their concurrence with the scope of analysis for Caltrans' State facilities, or a recommendation from Caltrans for specific modifications to the scope. This analysis must follow the most current Caltrans guidance to analyze transportation impacts from development projects on the State highway system. The consultation should also include a review of recommendations to reduce any impacts to Caltrans' State facilities.

3.2.2. Coordination with Other Agencies

The LTA preparer and/or City staff shall consult with the City of Fresno and/or Fresno County to determine the levels of significance with regard to traffic impacts on Fresno or County roadway facilities. Correspondence with the neighboring agencies shall be provided to the City Engineering Department.

If a consultant is performing work in an adjacent agency and is analyzing circulation and transportation facilities and infrastructure within one mile of the City of Clovis sphere of influence, City of Clovis City Engineer should be contacted for review of the scope of work, as well as receive a completed document for comment.

3.3. LEVELS OF SERVICE

All city intersections and roadway segments shall operate at a LOS D or better under the near-term conditions, unless a finding of overriding consideration was adopted in the General Plan EIR. Under long-term conditions, all city intersections and roadway segments shall operate at a LOS D or better, except for the roadway segments adopted in the General Plan EIR to operate at LOS E or F. Exceptions to this standard may be allowed on a case-by-case basis where lower levels of service would result in other public benefits, such as:

- Preserving agriculture or open space land
- Preserving the rural/historic character of a neighborhood
- Preserving or creating a pedestrian-friendly environment in Old Town or mixed-use village districts
- Avoiding adverse impacts to pedestrians, cyclists, and transit riders
- Where right-of-way constraints would make capacity expansion infeasible

3.3.1. Level of Service Methodologies

The LOS shall be based on average delay for signalized and unsignalized intersections and service volume tables (such as those prepared by the Florida Department of Transportation) for roadway segments. Average delay for study intersections shall be summarized in a table. The traffic analysis methodologies for the facility types indicated below will be accepted without prior consultation:

3.3.1.1. Signalized Intersections

Analysis of signalized intersections shall use the most current edition of the Highway Capacity Manual (HCM) using Synchro, Vistro, Highway Capacity Software (HCS), or other software approved by the City Traffic Engineer.

The procedures in the Highway Capacity Manual do not explicitly address operations of closely spaced signalized intersections. Under such conditions, several unique characteristics must be considered, including spill-back potential from the downstream intersection to the upstream intersection, effects of downstream queues on upstream saturation flow rate, and unusual platoon dispersion or compression between intersections. An example of such closely spaced operations is signalized ramp terminals at urban interchanges. Queue intersections between closely spaced intersections may seriously distort the procedures in the HCM. In this case, simulation of the study area may be necessary, as determined by the City Engineer.

3.3.1.2. Unsignalized Intersections

Analysis of unsignalized intersections shall use the most current edition of the HCM and Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) using Synchro, Vistro, HCS, or other software approved by the City Engineer.

3.3.1.3. Signal Warrants

Analysis of signal warrants shall apply the current MUTCD Signal Warrants.

3.3.1.4. Roundabouts

The SIDRA software does not account for the chaining of two roundabouts and the queues associated between the roundabouts. Simulation with proper assumptions is the only way to ensure this analysis is performed correctly. The consultant shall discuss methodology with City staff prior to performing the work for roundabout analysis. The consultant will need a conceptual design of the roundabout for the analysis. The analysis should reflect United States and Clovis/Fresno driver behavior.

3.3.1.5. LOS Analysis Default Values

While the City of Clovis does not officially advocate the use of any software, Synchro is the software used by City staff. The analysis shall use the latest published version of the HCM. The LOS analysis at study intersections shall be conducted using the following default values as applicable:

- Use of signal timing plans, if available. If not available, then:
 - Minimum split time for protected left-turn phase shall not be less than 12 seconds.
 - Minimum pedestrian times should be satisfied on all phases with pedestrian phase for signals modeled as coordinated signals.
 - For study intersections modeled as actuated uncoordinated signals, the intersections shall be evaluated with at least 10 pedestrian calls per hour in the Existing plus Project and Long-Range conditions, if pedestrian projections are not available.
 - If existing cycle lengths are available, they should be utilized. In instances where existing cycle lengths are not available, LOS calculations should be conducted using the natural cycle lengths. The cycle lengths should remain constant for comparison purposes, unless the project is changing the character of the intersection and it is noted in the report.
 - In instances where signalized intersections are coordinated, coordinated cycle lengths should be determined based on the natural cycle lengths of the coordinated signals and shall be used for evaluation purposes.
 - Minimum All-Red time(s) shall equal 1.0 seconds (2.0 seconds when dual left turn lanes are used).
 - Minimum Yellow time shall equal 3.5 seconds, or greater based on the approach speeds (3.0 seconds for left turn phases).
- Where existing traffic volumes are collected and peak hour factors are available, then LOS calculations for Existing Condition scenarios and the Near-Term scenarios should use available counted peak hour factors, provided that the traffic counts are included in

- the Appendix. For all Cumulative scenarios and Existing Conditions where peak hour factors are not available, default factors per the HCM shall be used and shall be consistent throughout the Cumulative scenarios and peak hours.
- Existing storage lengths shall be entered as input data if LOS calculations are conducted using Synchro.
 - All assumptions and defaults used shall have proper citation and justification for their use in the LTA.

3.4. TRAFFIC ANALYSIS SCENARIOS

The following scenarios shall be included in the LTA:

- A. For projects requiring a General Plan Amendment, intersection LOS analysis and calculation worksheets, as well as figures showing turning volumes and lane configurations, shall be included in the report for the following traffic scenarios:
 - a) Existing Conditions – Current year traffic volumes and peak hour LOS analysis
 - b) Existing plus Project Conditions – Trip generation and trip distribution added to the previous scenario and LOS analysis
 - c) Near-Term Analysis (Existing plus Approved and Pending Projects plus Proposed Project Conditions) – Trip generation and trip distribution added to the previous scenario and LOS analysis
 - d) Cumulative Long-Range Conditions – Long-Range conditions (20 years from existing conditions and/or consistent with the latest Fresno COG model)
 - e) Cumulative Long-Range Conditions – Project traffic added to the previous scenario
 - f) If any phasing is to take place, then such phasing should be studied at its appropriate build out year in addition to the above scenarios.
 - g) Trip traces to affected Caltrans freeway interchanges shall be performed for the current General Plan land use and the land use proposed per the GPA.
- B. For projects with planned land uses consistent with the General Plan, intersection LOS analysis and calculation worksheets, as well as figures showing turning volumes, shall be included in the report for the following traffic scenarios:
 - a) Existing Conditions – Current year traffic volumes and peak hour LOS analysis
 - b) Existing plus Project Conditions – Trip generation and trip distribution added to the previous scenario and LOS analysis
 - c) Near-Term Analysis (Existing plus Approved and Pending Projects plus Proposed Project Conditions) – Trip generation and trip distribution added to the previous scenario and LOS analysis
 - d) If any phasing is to take place, then such phasing should be studied at its appropriate build out year in addition to the above scenarios.
 - e) Trip distribution to affected Caltrans freeway interchanges shall be performed for the proposed project.

"No Project" scenarios do not require analyses for improvements. For the proposed project, no physical improvements shall be assumed to be implemented unless there is a Capital Improvement Project already identified and fully funded. If the improvement is identified in an impact fee program and the improvement is fully funded, then that improvement can be assumed under Cumulative Analysis scenarios. However, the "project" may be conditioned with constructing the assumed improvement.

3.4.1. Cumulative Traffic Volumes

Cumulative Long-Range Conditions traffic volumes shall be projected based on the method documented by the Fresno COG model steering committee using procedures such as the increment method. The methodology for developing the forecasts shall be clearly documented in the report. Information from model runs provided by Fresno COG shall be included in the Appendix.

The following scenarios shall be requested from Fresno COG staff to perform this forecasting correctly:

- Current Year Model Run (Existing Conditions Model),
- Cumulative Long-Range No Project Model Run (Cumulative Conditions Model),
- Cumulative Long-Range Project SelectZone FRATAR Model Run, and
- Near-Term Opening Year Model Run, if necessary.

In order to correctly use the model to forecast Cumulative volumes, consultants should contact Fresno COG staff and/or review the Fresno COG webpage.

Consultants should work with Fresno COG staff to prepare a model scope of work request for a basic LTA, and if the analysis is more involved, it may need additional information. The minimum will include reviewing the existing land uses assumed in the model; potentially splitting the TAZs as necessary to more accurately reflect driveways and land uses; and reviewing roadway circulation in the model near the project site. If the consultant is not familiar with the Fresno COG model and the assumptions and information that went into validating the model, the consultant is encouraged to schedule some time with the Fresno COG staff to become an expert on the model as the information provided from the model is the basis for the analysis. The consultant will be accountable for the information provided by Fresno COG.

The consultant should also provide, in the Appendix, the request for modeling services to Fresno COG and the response provided by Fresno COG when the data is returned. An email response from Fresno COG staff is sufficient.

All assumptions shall have proper citation and justification for their use in the LTA.

3.5. TRAFFIC COUNTS

Traffic counts should be collected and included in the Appendix. Available existing counts can be used if they are less than twelve (12) months old and the traffic volumes have not been significantly changed due to more recent development in the vicinity. The City Engineer or the designee shall approve all requests to use other available traffic counts.

Common rules for conducting traffic counts include, but are not limited to, the following:

- Peak hour turning movement volumes shall be conducted on Tuesdays, Wednesdays, or Thursdays during weeks not containing a holiday. Counts shall be conducted in favorable weather conditions.
- Counts shall be collected when schools and colleges are in session, but not during the first two weeks that the schools and colleges are in session. Counts collected when schools and colleges are not in session shall be approved by the City Engineer, including a methodology for adding historical school traffic volumes into the analysis.
- Counts shall be collected during AM (7:00 a.m. to 9:00 a.m.) and PM (4:00 p.m. to 6:00 p.m.) peak periods, unless otherwise specified (such as midday or weekend peak periods).
- Counts should include the peak hour factor calculation.
- A qualified traffic analyst shall observe each study intersection during peak hours of analysis and document their observations such as lane utilization, delay, queue lengths in the field, adjacent intersection queues affecting study intersection capacity, etc.

3.6. TRIP GENERATION

Trip generation should be based on one or more of the following:

- Institute of Transportation Engineers (ITE) Trip Generation Manual (most current edition)
 - Rates should be calculated using the average weight or weighted average formula when applicable.
 - Special consideration should be given for ITE rates based on old data or a small sample and may require additional data collection to determine the appropriate trip generation.
- New rates should be generated using community examples for uses not updated or included in the ITE Trip Generation Manual.
- No pass-by trip reductions are allowed unless justified and approved by the City Engineer.
- All assumptions shall have proper citation and justification for their use in the LTA.

Projected daily trips, AM and PM peak hour trips for the approved, pending and proposed project shall be summarized in a table. Trip generation rates, factors and source, as well as the totals for

the inbound and outbound trips shall also be provided in a table. Trip generation should be summarized in a table form similar to the one below:

Proposed Trip Generation for Weekday

Land Use	Size	Daily		A.M. Peak Hour			P.M. Peak Hour		
		Rate	Trips	Rate In/Out	Trips In/Out	Trips Total	Rate In/Out	Trips In/Out	Trips Total
Retail	4 ksf	120	480	4 60/40	12/8	19	13.25 50/50	26/26	53
Townhomes	32 Apts	7.5	240	10 35/65	8/16	24	0.75 65/35	16/8	24
Senior	100 Units	3.6	360	12 40/60	17/26	43	0.43 60/40	26/170	43
Total Trips			1080		37/49	86		68/52	120

3.7. TRIP DISTRIBUTION

Trip distribution shall be based on existing travel patterns, locations of complimentary land uses, and/or information derived from the Fresno COG travel model such as a “select zone” analysis.

A figure illustrating the percentage of peak hour traffic going to and from various destinations along the transportation network shall be provided. A figure illustrating peak hour project-only trips at the driveways, study intersections, and roadway segments shall be provided based on the trip distribution. If the trip distribution is different between Existing, Near-Term, and Cumulative conditions, then a figure needs to be provided for each different trip distribution with supporting discussion and justification.

The travel model should be used for a general trip distribution to and from the north, south, east, and west directions; however, the project trips should be manually distributed to the driveways, intersections, and roadway segments. The travel model should not be relied upon to distribute project trips to specific intersection and driveway turn movements.

For General Plan Amendments, the local transportation analysis shall include a trip distribution to affected Caltrans freeway interchanges for both the current General Plan land use and the proposed land use per the GPA. All assumptions shall have proper citation and justification for their use.

3.8. APPROVED AND PENDING PROJECTS

Approved and pending projects located within the vicinity of the project (i.e., developments generating vehicle trips that would impact study intersections and/or roadway segments) or as determined by the City Engineer, that can reasonably be expected to be in place by the project's build out year must be included in the analysis. Related projects shall include all approved, pending,

or constructed projects that are not occupied at the time of the existing traffic counts. A list of approved and pending projects shall be submitted to the Engineering Division for review and approval along with the scope of work. Engineering staff will work with consultants to develop the list if necessary.

A table summarizing the approved and pending projects with their locations, and trip generation shall be provided. If conditional use permit/parcel map/tract numbers are available, then they should be provided in the table. Pending projects are defined as those projects that have been accepted for processing by the City of Clovis Planning and Development Department.

Capital Improvement Projects (CIP) should be identified and documented with funding source and anticipated completion year. City Engineering staff should be contacted for information on CIP projects near a given project.

3.9. SITE ACCESS AND CIRCULATION

Site access and circulation analysis shall be conducted, and recommendations shall be included in the local transportation analysis to address safe and acceptable traffic operations. A figure illustrating the proposed site plan with proposed primary access points should be provided. Discussion on the location and distance of the access points from nearby intersections shall also be provided. The proposed site plan shall illustrate access points and peak hour project-only trips at the access points. For projects that are anticipated to generate truck traffic, truck operations shall also be evaluated to ensure adequacy of site design to satisfy truck loading demand on-site and within the vicinity of the project site, and to ensure that traffic operations on roadways and intersection are satisfactory.

The local transportation analysis should calculate anticipated queues and minimum required throat depth (MRTD) at the project access points and summarize these in a table. The analysis should also evaluate the proposed site plan for sight distance and other unsafe traffic conditions and provide recommendations to mitigate them.

The local transportation analysis shall also conceptually address safe pedestrian paths of travel from:

- residential developments to school sites;
- public streets to commercial and residential areas; and
- nearby bus stops to project sites.

3.10. QUEUING AT STUDY INTERSECTIONS

Queuing analysis for study intersections shall be conducted and documented in the local transportation analysis based on the LOS calculations. Recommendations for queues under existing conditions or projected to exceed the available storage shall be provided. Recommendations such

as, but not limited to, extending existing storage and adding exclusive turn lanes and innovative techniques shall be considered and recommended.

3.11. TRAFFIC OPERATIONS THRESHOLDS

For study signalized intersections, a traffic operations issue is identified if the addition of the traffic generated from the proposed project results in any one of the following:

- Triggers a signalized intersection operating at acceptable LOS to operate at unacceptable levels of service
- Increases the average delay for a study signalized intersection that is already operating at unacceptable LOS

Unsignalized intersections should maintain a Level of Service no worse than LOS D. Unsignalized intersections may include all-way stop, or two-way stop controlled. The delay for unsignalized intersections should be computed as follows:

- All-way stop-controlled – use average delay
- Two-way stop-controlled – use worst approach delay

For unsignalized study intersections, an adverse traffic operations issue is identified if the addition of the traffic generated from the proposed project results in any one of the following:

- Triggers an unsignalized intersection operating at acceptable LOS to operate at unacceptable levels of service (from E or better to F) and meet the signal warrants criteria
- Increases the applicable delay for an unsignalized study intersection that is already operating at unacceptable LOS and meets the signal warrant criteria

Improvements to unsignalized intersections may include a change of traffic control, including yield control, traffic circle/roundabout, or a traffic signal. The CA MUTCD states that if one or more of the criteria for signal warrants is met, an engineering study is required to evaluate other factors to determine if an intersection must be signalized. When analyzed, the peak hour and 8-hour traffic signal warrants should be used to determine if a traffic signal is recommended to improve the adverse effects identified at an unsignalized intersection. Additionally, if a project is near a school or a downtown area with substantial pedestrian activity, then the City may require additional warrants to be evaluated such as pedestrian, accident history, etc. The City reserves the right to determine if a warranted signal will be installed.

3.12. ANALYSIS DISCUSSION

The local transportation analysis should discuss conclusions regarding the transportation issues caused by the proposed project on the roadway system. If the traffic generated by this and other projects requires improvements that are not covered by current impact fees, then the project's fair

share percentage shall be calculated using peak-hour volumes and provided in the local transportation analysis.

For all recommendations to increase the number of travel lanes on a street or at an intersection as an improvement, the report must clearly identify the impacts associated with such a change, such as whether or not additional right of way will be required and whether it is feasible to acquire the right of way based on the level of development of the adjacent land and buildings, if any. All improvements should be reviewed in the field to make sure that they can be accommodated. If they cannot be accommodated or are not feasible, those findings need to be included in the local transportation analysis.

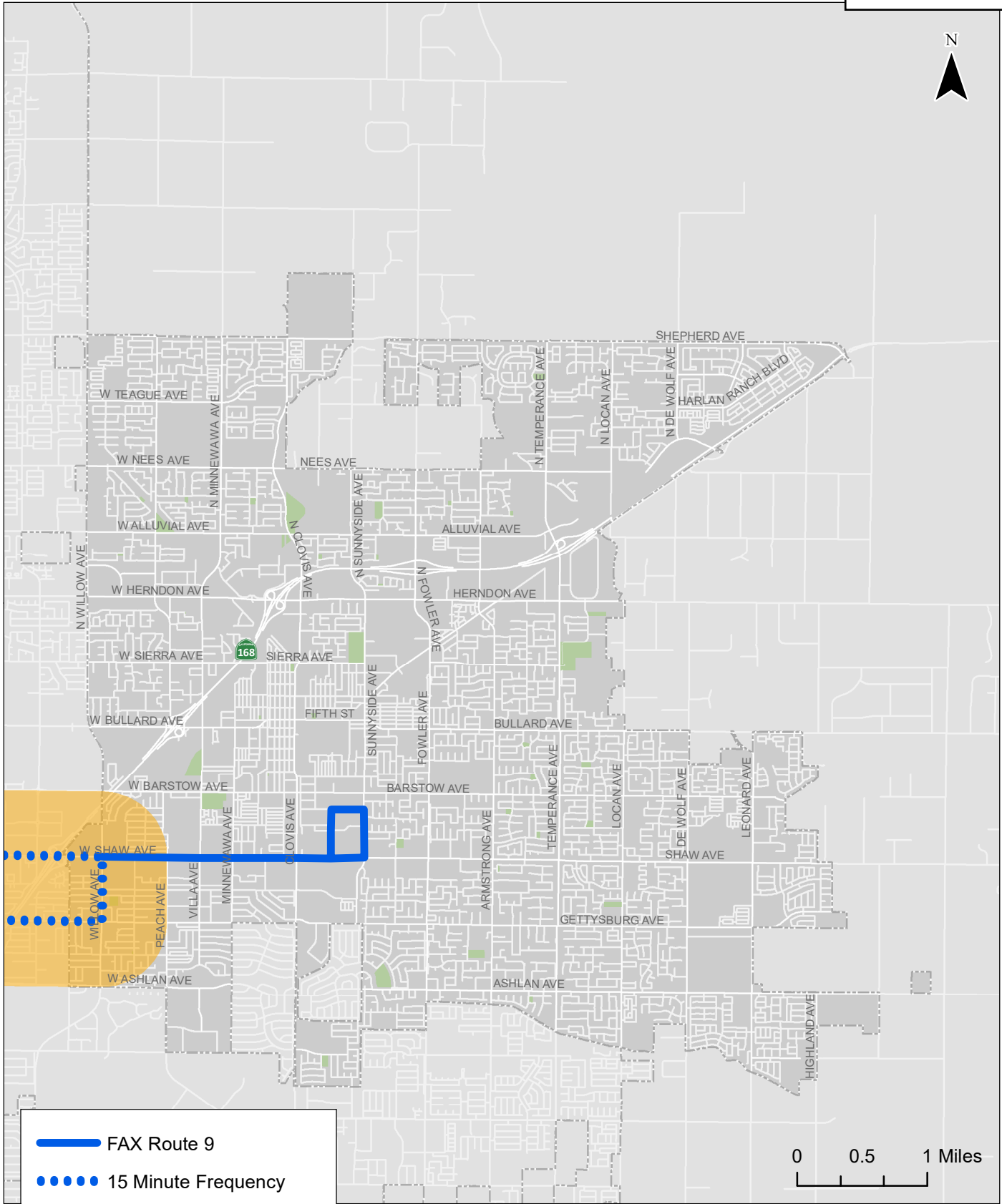
The local transportation analysis should discuss other possible adverse impacts on traffic. Examples of such impacts include:





- the limited visibility of access points on curved roadways
- the need for pavement widening to provide left-turn and right-turn lanes at access points into the proposed project
- the impact of increased traffic volumes on local residential streets
- the need for road realignment to improve sight distance

Projects which propose to amend the City's General Plan Land Use and substantially increase potential traffic generation must provide an analysis of the project at current planned land use versus proposed land use in the build out condition for the project area, including future cumulative conditions. The purpose of such analysis is to provide decision makers with the understanding of the planned circulation network's ability to accommodate additional traffic generation caused by the proposed General Plan Land Use amendments.

The LTA shall be provided as an electronic PDF copy to the City of Clovis City Engineer, according to the report format presented in Attachment F.

Attachment A: High Quality Transit Areas Map



-  FAX Route 9
-  15 Minute Frequency
-  High Quality Transit Area
-  City Boundary

0 0.5 1 Miles

**Existing High Quality Transit Areas
City of Clovis VMT Implementation**

**Figure
A1**

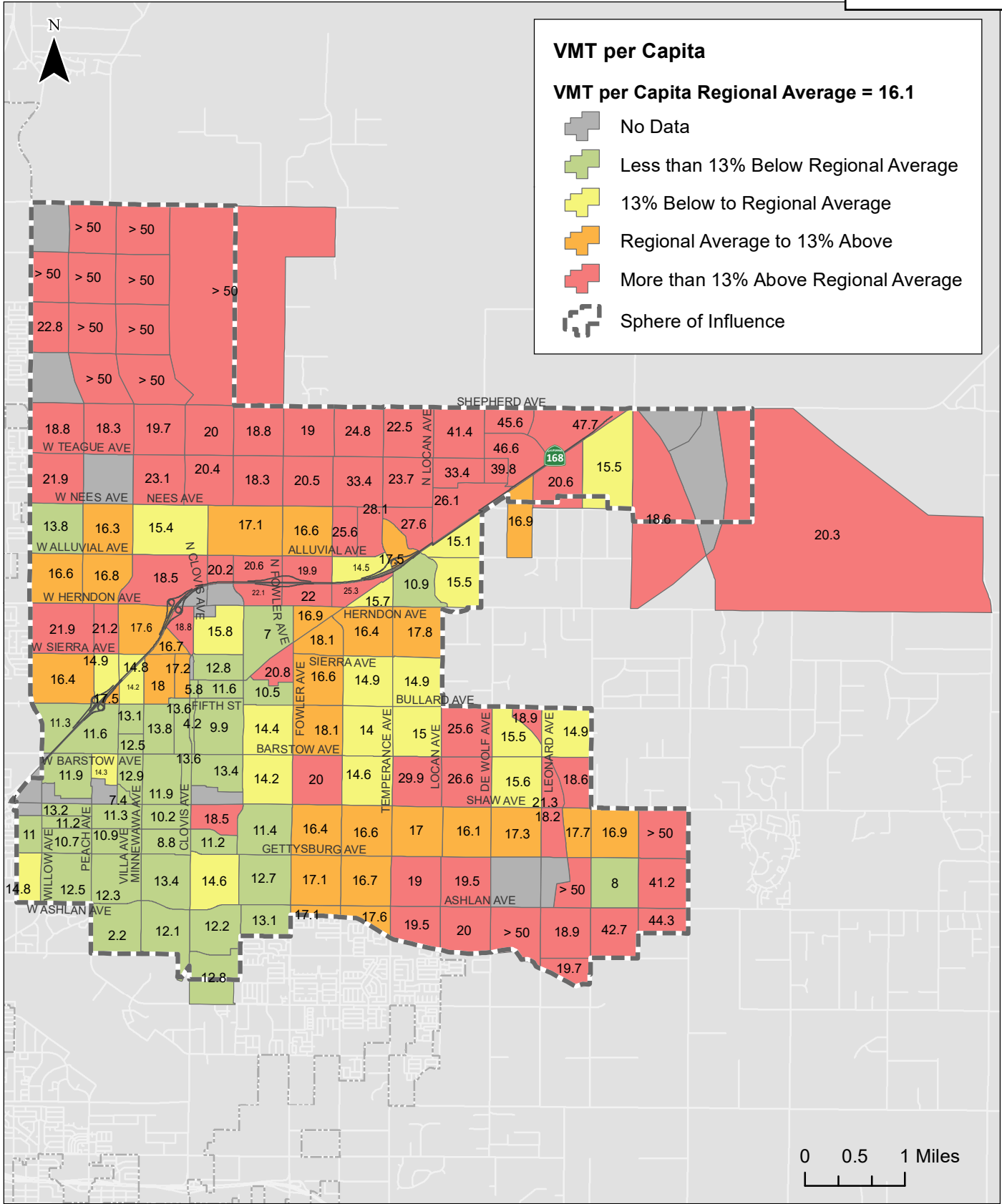
H:\2424727 - Ceres SSAR\p\gis\High_Quality_Transit - v3.mxd - gcransky - 8/14 AM 7/14/2020

Attachment B: VMT Screening Maps

VMT per Capita

VMT per Capita Regional Average = 16.1

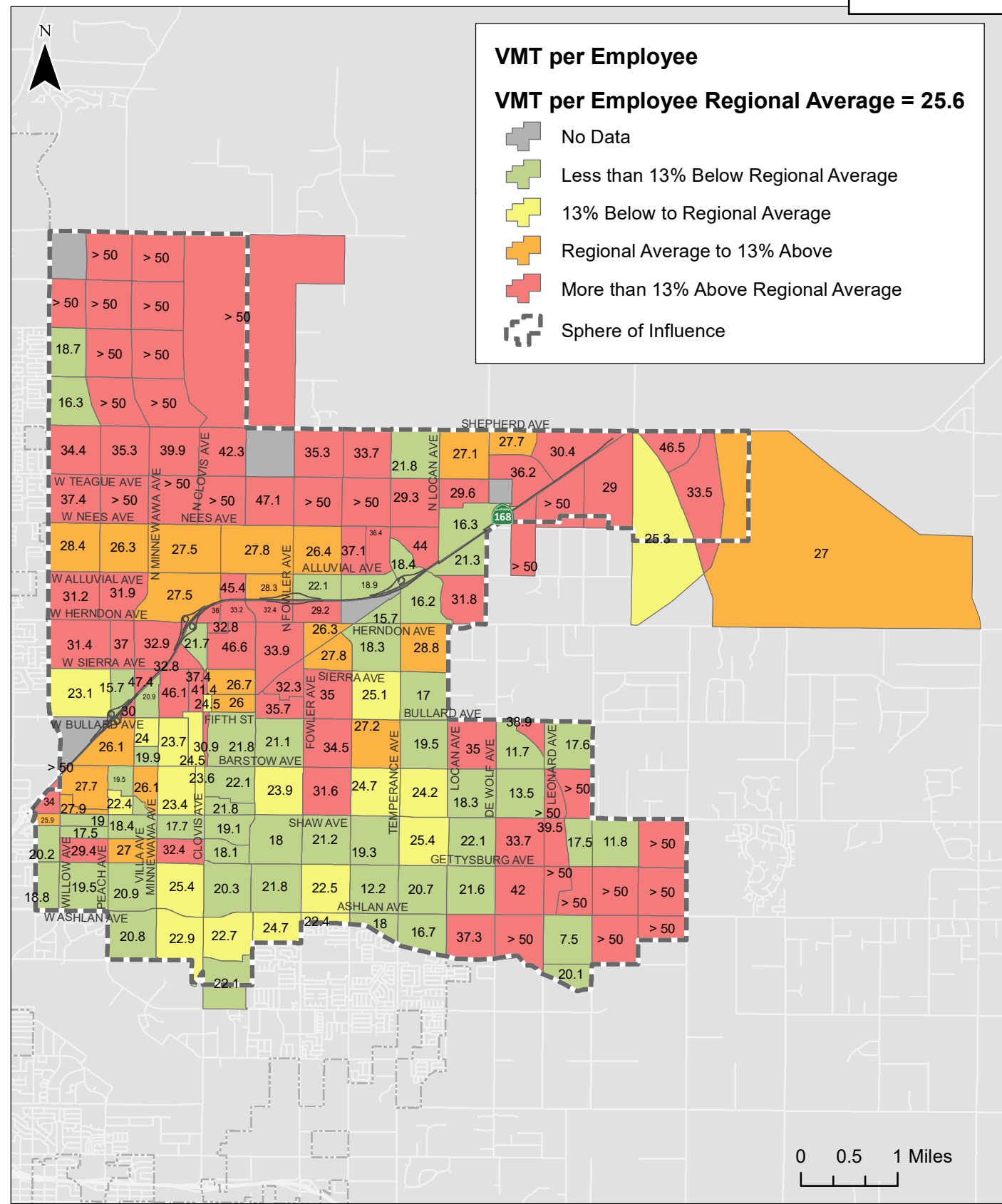
- No Data
- Less than 13% Below Regional Average
- 13% Below to Regional Average
- Regional Average to 13% Above
- More than 13% Above Regional Average
- Sphere of Influence



Existing VMT Per Capita (2019)
City of Clovis VMT Implementation

Figure
B1

H:\2424913 - City of Clovis VMT Implementation\gis\Clovis_VMTpercapa_(2019).mxd - gersky - 8:17 AM 7/14/2020



Existing VMT Per Employee (2019)
City of Clovis VMT Implementation

Figure
B2

H:\2424913 - City of Clovis VMT Implementation\gis\Clovis_VMTPeremp(2019).mxd - gearsky - 8:19 AM 7/14/2020

Attachment C: VMT-Reducing Transportation Projects

VMT-Reducing Transportation Projects

Rehabilitation, maintenance, replacement, safety, and repair projects designed to improve the condition of existing transportation assets (e.g., highways; roadways; bridges; culverts; Transportation Management System field elements such as cameras, message signs, detection, or signals; tunnels; transit systems; and assets that serve bicycle and pedestrian facilities) and that do not add additional motor vehicle capacity

Roadside safety devices or hardware installation such as median barriers and guardrails

Roadway shoulder enhancements to provide “breakdown space,” dedicated space for use only by transit vehicles, to provide bicycle access, or to otherwise improve safety, but which will not be used as automobile vehicle travel lanes

Addition of an auxiliary lane of less than one mile in length designed to improve roadway safety

Installation, removal, or reconfiguration of traffic lanes that are not for through traffic, such as left, right, and U-turn pockets, two-way left turn lanes, or emergency breakdown lanes that are not utilized as through lanes

Addition of roadway capacity on local or collector streets provided the project also substantially improves conditions for pedestrians, cyclists, and, if applicable, transit

Conversion of existing general purpose lanes (including ramps) to managed lanes or transit lanes, or changing lane management in a manner that would not substantially increase vehicle travel

Addition of a new lane that is permanently restricted to use only by transit vehicles

Reduction in number of through lanes

Grade separation to separate vehicles from rail, transit, pedestrians or bicycles, or to replace a lane in order to separate preferential vehicles (e.g., HOV, HOT, or trucks) from general vehicles

Installation, removal, or reconfiguration of traffic control devices, including Transit Signal Priority (TSP) features

Installation of traffic metering systems, detection systems, cameras, changeable message signs and other electronics designed to optimize vehicle, bicycle, or pedestrian flow

Timing of signals to optimize vehicle, bicycle, or pedestrian flow

Installation of roundabouts or traffic circles

Installation or reconfiguration of traffic calming devices

Adoption of or increase in tolls

Addition of tolled lanes, where tolls are sufficient to mitigate VMT increase

Initiation of new transit service

VMT-Reducing Transportation Projects

Conversion of streets from one-way to two-way operation with no net increase in number of traffic lanes

Removal or relocation of off-street or on-street parking spaces

Adoption or modification of on-street parking or loading restrictions (including meters, time limits, accessible spaces, and preferential/reserved parking permit programs)

Addition of traffic wayfinding signage

Rehabilitation and maintenance projects that do not add motor vehicle capacity

Addition of new or enhanced bike or pedestrian facilities on existing streets/highways or within existing public rights-of-way

Addition of Class I bike paths, trails, multi-use paths, or other off-road facilities that serve non-motorized travel

Installation of publicly available alternative fuel/charging infrastructure

Addition of passing lanes, truck climbing lanes, or truck brake-check lanes in rural areas that do not increase overall vehicle capacity along the corridor

Attachment D:CAPCOA Mitigation Measures

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Appendices

- A. Glossary of Terms
- B. Calculation Methods for Unmitigated Emissions
- C. Transportation Methods
- D. Building Quantification Methods
- E. Select Data Tables

Chapter 6: Understanding and Using the Fact Sheets

This chapter of the Report explains how the quantification of individual strategies is presented in Fact Sheets, how those fact sheets are designed and organized, and how to use them. This chapter also explains how and why mitigation measures have been grouped, and provides detailed discussion of how to apply the quantification methods when more than one strategy is being applied to the same project. A summary of the range of effectiveness for different measures is also provided for general information purposes, in table form, however it is very important that those generalized ranges NOT be used in place of the more specific quantification methods for the measure as detailed in the measure Fact Sheet. Finally, at the end of the Chapter there are step-by-step instructions on using the Fact Sheets, including an example.

Mitigation Strategies and Fact Sheets:

Accurate and reliable quantification depends on properly identifying the important variables that affect the emissions from an activity or source, and from changes to that activity or source. In order to provide a clear summary of those variables and usable instructions on how to find and apply the data needed, we have designed a Fact Sheet format to present each strategy or measure.

Types of Mitigation Strategies: There are three different types of mitigation strategies described in Chapter 7: Quantified measures, Best Management Practices, and General Plan strategies.

Quantified Measures: Quantified measures are fully quantified, project-level mitigation strategies. They are presented in categories where the nature of the underlying emissions sources are the same; the categories are discussed under “Organization of Fact Sheets” below. In addition, the measures may either stand alone, or be considered in connection with one or more other measures (that is, “grouped”). Groups of measures are always within a category; more detailed explanation is provided in “Grouping of Strategies” below. The majority of the strategies in this Report are fully Quantified Measures, and a strategy may be assumed to be of this type unless the Fact Sheet notes otherwise.

Best Management Practices: Several strategies are denoted as Best Management Practice (BMP). These measures are of two types. The first type of BMPs are quantifiable and describe methods that can be used to quantify the GHG mitigation reductions provided the project Applicant can provide substantial evidence supporting the values needed to quantify the reduction. These are listed as BMPs since there is not adequate literature at this time to generalize the mitigation measure reductions. However, the project Applicant may be able to provide the site specific information necessary to quantify a reduction. The second type of BMPs do not have methods for quantifying GHG mitigation reductions. These measures have preliminary evidence suggesting they will reduce GHG emissions if implemented, however, at this time adequate literature and methodologies are not available to quantify these reductions or

they involve life-cycle GHG emission benefits. The measures are encouraged to be implemented nonetheless. Local Agencies may decide to provide incentives to encourage implementation of these measures.

General Plan Strategies: The measures listed under the General Plan category are measures that will have the most benefit when implemented at a General Plan level, but are not quantifiable or applicable at the project specific level. While on a project basis some of these measures may not be quantifiable, at the General Plan level they may be quantified under the assumption that this will be implemented on a widespread basis. Local Agencies may decide to provide incentives or allocate the General Plan level reductions to specific projects by weighting the overall effect by the number of projects the General Plan reduction would apply to.

Introduction to the Fact Sheets: This Report presents the quantification of each mitigation measure in a Fact Sheet format. Each Fact Sheet includes: a detailed summary of each measure's applicability; the calculation inputs for the specific project; the baseline emissions method; the mitigation calculation method and associated assumptions; a discussion of the calculation and an example calculation; and finally a summary of the preferred and alternative literature sources for measure efficacy. The Fact Sheets are found in Chapter 7.

Layout of the Fact Sheets: Each Fact Sheet describes one mitigation measure. The mitigation measure has a unique number and is provided at the bottom of each page in that measure's Fact Sheet. This will assist the end user in determining where a mitigation measure fact sheet begins and ends while still preserving consecutive page numbers in the overall Report.

At the top of each Fact Sheet, the name of the measure category appears on the left, and the subcategory on the right. Cross-references to prior CAPCOA documents appear at the top left, below the category name. Specifically, measures labeled CEQA #: are from the *CAPCOA 2008 CEQA & Climate Change*¹ and measures labeled MP#: are from the *CAPCOA 2009 Model Policies for Greenhouse Gases in General Plans*². This cross-referencing is also included in the list of measures at the beginning of Chapter 7, and is intended to allow the user to move easily between the documents. The measure number is at the bottom of the page, on the right-hand side.

The fact sheets begin with a measure description. This description includes two critical components:

- (1) Specific language regarding the measure implementation – which should be consistent with the implementation method suggested by the project Applicant; and

¹ Available online at <http://www.capcoa.org/wp-content/uploads/downloads/2010/05/CAPCOA-White-Paper.pdf>

² Available online at <http://www.capcoa.org/wp-content/uploads/downloads/2010/05/CAPCOA-ModelPolicies-6-12-09-915am.pdf>

(2) A discussion of key support strategies that are required for the reported range of effectiveness.

Appendices with additional calculations and assumptions for some of the fact sheets are provided at the end of this document. Default assumptions should be carefully reviewed for project applicability. Appendix B details the methodologies that should be used to calculate baseline GHG emissions for a project.

Organization of the Fact Sheets – Categories and Subcategories: The Fact Sheets are organized by general emission category types as follows:

- Energy
- Transportation
- Water
- Landscape Equipment
- Solid Waste
- Vegetation
- Construction
- Miscellaneous Categories
- General Plans

Several of these main categories are split into subcategories, for ease of understanding how to properly address the effects of combining the measures. Strategies are organized into categories and subcategories where they affect similar types of emissions sources. As an example, the category of “Energy” includes measures that reduce emissions associated with energy generation and use. Within that category, there are subcategories of measures that address “Building Energy Use,” “Alternative Energy,” and “Lighting,” each with one or more measures in it. The measures in the subcategory are closely related to each other.

Categories and subcategories for the measures are illustrated in Charts 6-1 and 6-2, below. Chart 6-1 shows all of the measure categories EXCEPT the Transportation category, including their subcategories; note that not all categories have subcategories. Measures in the Transportation category are shown in Chart 6-2. There are a number of subcategories associated with the Transportation category. As shown in Chart 6-2, the primary measures in each subcategory are indicated in bold type, and the measures shown in normal type are either support measures, or they are explicitly “grouped” measures.

It is important to note that subcategories are NOT the same as “grouped” measures / strategies. The grouping of strategies connotes a specific relationship, and is explained in the next section, below.

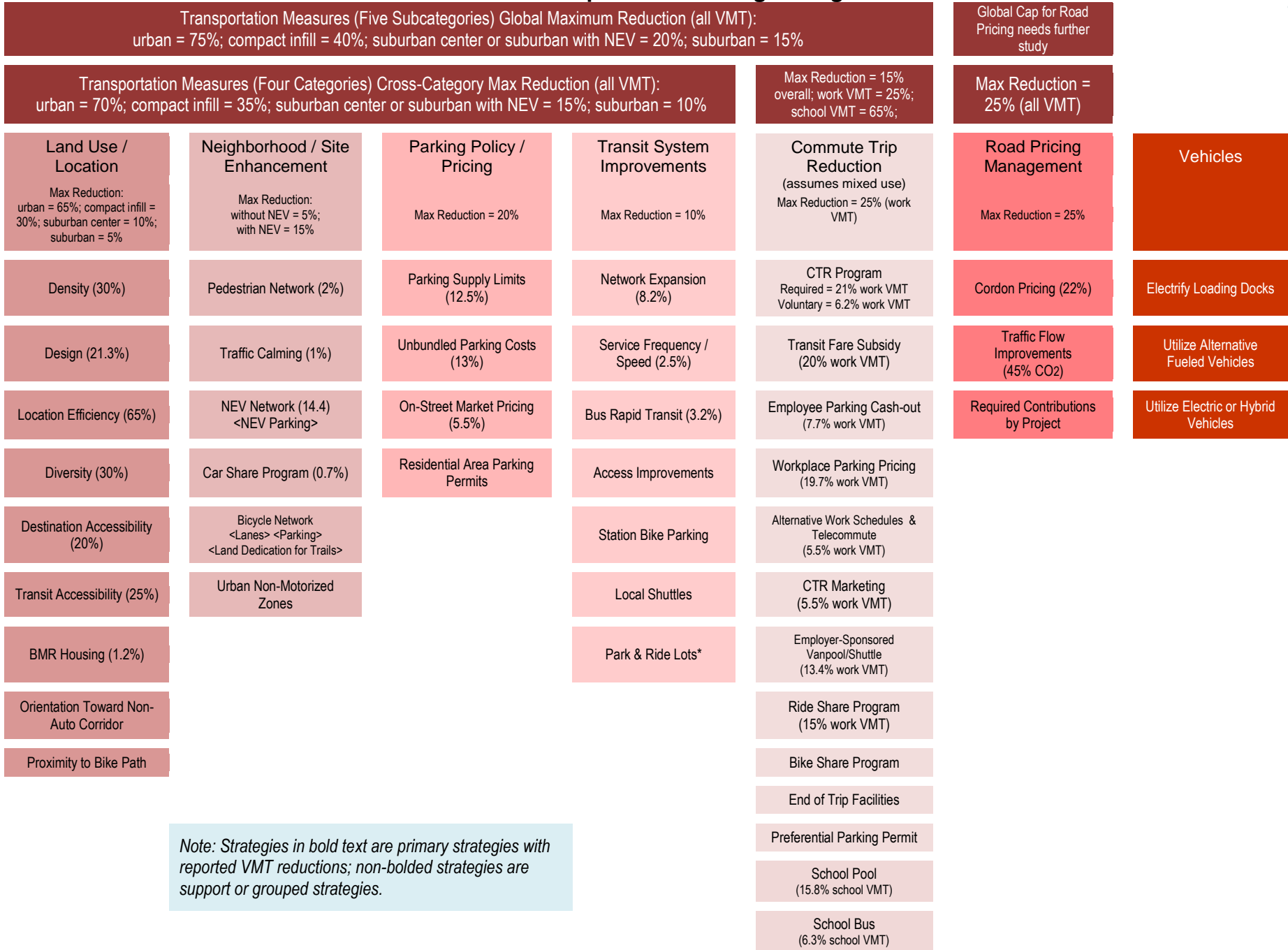
Understanding and Using the Fact Sheets

Chart 6-1: Non-Transportation Strategies Organization

Energy			Water		Area Landscaping	Solid Waste	Vegetation	Construction	Miscellaneous	General Plans
BE	AE	LE	WSW	WUW	A	SW	V	C	Misc	GP
Building Energy	Alternative Energy	Lighting	Water Supply	Water Use	Landscaping Equipment	Solid Waste	Vegetation	Construction	Miscellaneous	General Plans
Exceed Title 24	Onsite Renewable Energy	Install High Efficacy Lighting	Adopt a Water Conservation Strategy		Prohibit gas Powered Landscape Equipment	Institute or Extend Recycling & Composting Services	Plant Urban Trees	Use Alternative Fuels for Construction Equipment	Establish Carbon Sequestration	Fund Incentives for Energy Efficiency
OR										
Install Energy Efficient Appliances	Utilize Combined Heat & Power	Limit Outdoor Lighting	Use Reclaimed Water	Install Low-Flow Fixtures	Implement Lawnmower Exchange Program Reduction: Grouped	Recycle Demolished Construction Material	New Vegetated Open Space	Use Electric or Hybrid Construction Equipment	Establish Off-site Mitigation	Establish a Local Farmer's Market
Install Programmable Thermostats Reduction: Grouped	Establish Methane Recovery	Replace Traffic Lights with LED Reduction: Additional	Use Graywater	Design Water-Efficient Landscapes	Electric Yard Equipment Compatibility Reduction Grouped			Limit Construction Equipment Idling	Implement an Innovative Strategy	Establish Community Gardens
Obtain 3rd Party Commissioning Reduction: Grouped			Use Locally Sourced Water	Use Water-Efficient Irrigation				Institute a Heavy-Duty Off-Road Vehicle Plan	Use Local and Sustainable Building Materials	Plant Urban Shade Trees
				Reduce Turf				Implement a Construction Vehicle Inventory Tracking System	Require BMP in Agriculture and Animal Operations	Implement Strategies to Reduce Urban Heat-Island Effect
				Plant Native or Drought-Resistant Vegetation					Require Environmentally Responsible Purchasing	

Note: Strategies in bold text are primary strategies with reported VMT reductions; non-bolded strategies are support or grouped strategies.

Chart 6-2: Transportation Strategies Organization



Note: Strategies in bold text are primary strategies with reported VMT reductions; non-bolded strategies are support or grouped strategies.

Grouping of Strategies

Strategies noted as “grouped” are separately documented in individual Fact Sheets but must be paired with other strategies within the category. When these “grouped” strategies are implemented together, the combination will result in either an enhancement to the primary strategy by improving its effectiveness or a non-negligible reduction in effectiveness that would not occur without the combination.

Rules for Combining Strategies or Measures

Mitigation measures or strategies are frequently implemented together with other measures. Often, combining measures can lead to better emission reductions than implementing a single measure by itself. Unfortunately, the effects of combining the measures are not always as straightforward as they might at first appear. When more and more measures are implemented to mitigate a particular source of emissions, the benefit of each additional measure diminishes. If it didn't, some odd results would occur. For example, if there were a series of measures that each, independently, was predicted to reduce emissions from a source by 10%, and if the effect of each measure was independent of the others, then implementing ten measures would reduce all of the emissions; and what would happen with the eleventh measure? Would the combination reduce 110% of the emissions? No. In fact, each successive measure is slightly less effective than predicted when implemented on its own.

On the other hand, some measures enhance the performance of a primary measure when they are combined. This Report includes a set of rules that govern different ways of combining measures. The rules depend on whether the measures are in the *same* category, or different categories. Remember, the categories include: Energy, Transportation, Water, Landscape Equipment, Solid Waste, Vegetation, Construction, Miscellaneous Categories, and General Plans.

Combinations Between Categories: The following procedures must be followed when combining mitigation measures that fall in separate categories. In order to determine the overall reduction in GHG emissions compared to the baseline emissions, the relative magnitude of emissions between the source categories needs to be considered. To do this, the user should determine the percent contribution made by each individual category to the overall baseline GHG emissions. This percent contribution by a category should be multiplied by the reduction percentages from mitigation measures in that category to determine the scaled GHG emission reductions from the measures in that category. This is done for each category to be combined. The scaled GHG emissions for each category can then be added together to give a total GHG reduction for the combined measures in all of the categories.

For example, consider a project whose total GHG emissions come from the following categories: transportation (50%), building energy use (40%), water (6%), and other (4%). This project implements a transportation mitigation measure that results in a 10% reduction in VMT. The project also implements mitigation measures that result in a 30% reduction in water usage. The overall reduction in GHG emissions is as follows:

Reduction from Transportation: $0.50 \times 0.10 = 0.05$ or 5%
 Reduction from Water: $0.06 \times 0.30 = 0.018$ or 1.8%

Total Reduction: $5\% + 1.8\% = 6.8\%$

This example illustrates the importance of the magnitude of a source category and its influence on the overall GHG emission reductions.

The percent contributions from source categories will vary from project to project. In a commercial-only project it may not be unusual for transportation emissions to represent greater than 75% of all GHG emissions whereas for a residential or mixed use project, transportation emissions would be below 50%.

Combinations Within Categories: The following procedures must be followed when combining mitigation measures that fall within the same category.

Non-Transportation Combinations: When combining non-transportation subcategories, the total amount of reductions for that category should not exceed 100% except for categories that would result in additional excess capacity that can be used by others, but which the project wants to take credit for (subject to approval of the reviewing agency). This may include alternative energy generation systems tied into the grid, vegetation measures, and excess graywater or recycled water generated by the project and used by others. These excess emission reductions may be used to offset other categories of emissions, with approval of the agency reviewing the project. In these cases of excess capacity, the quantified amounts of excess emissions must be carefully verified to ensure that any credit allowed for these additional reductions is truly surplus.

Category Maximum- Each category has a maximum allowable reduction for the combination of measures in that category. It is intended to ensure that emissions are not double counted when measures within the category are combined. Effectiveness levels for multiple strategies within a subcategory (as denoted by a column in the appropriate chart, above) may be multiplied to determine a combined effectiveness level up to a maximum level. This should be done first to mitigation measures that are a source reduction followed by those that are a reduction to emission factors. Since the combination of mitigation measures and independence of mitigation measures are both complicated, this Report recommends that mitigation measure reductions within a category be multiplied unless a project applicant can provide substantial evidence indicating that emission reductions are independent of one another. This will take the following form:

$$\text{GHG emission reduction for category} = 1 - [(1-A) \times (1-B) \times (1-C)]$$

Where:

A, B and C = Individual mitigation measure reduction percentages for the strategies to be combined in a given category.

Global Maximum- A separate maximum, referred to as a global maximum level, is also provided for a combination across subcategories. Effectiveness levels for multiple strategies across categories may also be multiplied to determine a combined effectiveness level up to global maximum level.

For example, consider a project that is combining 3 mitigation strategies from the water category. This project will install low-flow fixtures (measure WUW-1), use water-efficient irrigation (measure WUW-4, and reduce turf (measure WUW-5). Reductions from these measures will be:

- low-flow fixtures 20% or 0.20 (A)
- water efficient irrigation 10% or 0.10 (B)
- turf reductions 20% or 0.20 (C)

To combine measures within a category, the reductions would be

$$= 1-[(1-A) \times (1-B) \times (1-C)]$$

$$= 1-[(1-.20) \times (1-.10) \times (1-.20)]$$

$$= 1-[(0.8) \times (0.9) \times (.8)]$$

$$= 1-0.576 = 0.424$$

$$= 42.4\%$$

Transportation Combinations: The interactions between the various categories of transportation-related mitigation measures is complex and sometimes counter-intuitive. Combining these measures can have a substantive impact on the quantification of the associated emission reductions. In order to safeguard the accuracy and reliability of the methods, while maintaining their ease of use, the following rules have been developed and should be followed when combining transportation-related mitigation measures. The rules are presented by sub-category, and reference Chart 6-2 Transportation Strategies Organization. The maximum reduction values also reflect the highest reduction levels justified by the literature. The chart indicates maximum reductions for individual mitigation measures just below the measure name.

Cross-Category Maximum- A cross-category maximum is provided for any combination of land use, neighborhood enhancements, parking, and transit strategies (columns A-D in Chart 6-1, with the maximum shown in the top row). The total project VMT reduction across these categories should be capped at these levels based on empirical evidence.³ Caps are provided for the location/development type of the project. VMT reductions may be multiplied across the four categories up to this maximum. These include:

- Urban: 70% VMT
- Compact Infill: 35%
- Suburban Center (or Suburban with NEV): 15%
- Suburban: 10% (note that projects with this level of reduction must include a diverse land use mix, workforce housing, and project-specific transit; limited empirical evidence is available)

(See blue box, pp. 58-59.)

³ As reported by Holtzclaw, et al for the State of California.

As used in this Report, location settings are defined as follows:

Urban: A project located within the central city and may be characterized by multi-family housing, located near office and retail. Downtown Oakland and the Nob Hill neighborhood in San Francisco are examples of the typical urban area represented in this category. The urban maximum reduction is derived from the average of the percentage difference in per capita VMT versus the California statewide average (assumed analogous to an ITE baseline) for the following locations:

Location	Percent Reduction from Statewide VMT/Capita
Central Berkeley	-48%
San Francisco	-49%
Pacific Heights (SF)	-79%
North Beach (SF)	-82%
Mission District (SF)	-75%
Nob Hill (SF)	-63%
Downtown Oakland	-61%

The average reflects a range of 48% less VMT/capita (Central Berkeley) to 82% less VMT/capita (North Beach, San Francisco) compared to the statewide average. The urban locations listed above have the following characteristics:

- Location relative to the regional core: these locations are within the CBD or less than five miles from the CBD (downtown Oakland and downtown San Francisco).
- Ratio or relationship between jobs and housing: jobs-rich (jobs/housing ratio greater than 1.5)
- Density character
 - typical building heights in stories: six stories or (much) higher
 - typical street pattern: grid
 - typical setbacks: minimal
 - parking supply: constrained on and off street
 - parking prices: high to the highest in the region
- Transit availability: high quality rail service and/or comprehensive bus service at 10 minute headways or less in peak hours

Compact infill: A project located on an existing site within the central city or inner-ring suburb with high-frequency transit service. Examples may be community redevelopment areas, reusing abandoned sites, intensification of land use at established transit stations, or converting underutilized or older industrial buildings. Albany and the Fairfax area of Los Angeles are examples of typical compact infill area as used here. The compact infill maximum reduction is derived from the average of the percentage difference in per capita VMT versus the California statewide average for the following locations:

Location	Percent Reduction from Statewide VMT/Capita
Franklin Park, Hollywood	-22%
Albany	-25%
Fairfax Area, Los Angeles	-29%
Hayward	-42%

The average reflects a range of 22% less VMT/capita (Franklin Park, Hollywood) to 42% less VMT/capita (Hayward) compared to the statewide average. The compact infill locations listed above have the following characteristics:

- Location relative to the regional core: these locations are typically 5 to 15 miles outside a regional CBD
- Ratio or relationship between jobs and housing: balanced (jobs/housing ratio ranging from 0.9 to 1.2)
- Density character
 - typical building heights in stories: two to four stories
 - typical street pattern: grid
 - typical setbacks: 0 to 20 feet
 - parking supply: constrained
 - parking prices: low to moderate
- Transit availability: rail service within two miles, or bus service at 15 minute peak headways or less

Understanding and Using the Fact Sheets

As used in this Report, additional location settings are defined as follows:

Suburban Center: A project typically involving a cluster of multi-use development within dispersed, low-density, automobile dependent land use patterns (a suburb). The center may be an historic downtown of a smaller community that has become surrounded by its region's suburban growth pattern in the latter half of the 20th Century. The suburban center serves the population of the suburb with office, retail and housing which is denser than the surrounding suburb. The suburban center maximum reduction is derived from the average of the percentage difference in per capita VMT versus the California statewide average for the following locations:

Location	Percent Reduction from Statewide VMT/Capita
Sebastopol	0%
San Rafael (Downtown)	-10%
San Mateo	-17%

The average reflects a range of 0% less VMT/capita (Sebastopol) to 17% less VMT/capita (San Mateo) compared to the statewide average. The suburban center locations listed above have the following characteristics:

- Location relative to the regional core: these locations are typically 20 miles or more from a regional CBD
- Ratio or relationship between jobs and housing: balanced
- Density character
 - typical building heights in stories: two stories
 - typical street pattern: grid
 - typical setbacks: 0 to 20 feet
 - parking supply: somewhat constrained on street; typically ample off-street
 - parking prices: low (if priced at all)
- Transit availability: bus service at 20-30 minute headways and/or a commuter rail station

While all three locations in this category reflect a suburban "downtown," San Mateo is served by regional rail (Caltrain) and the other locations are served by bus transit only. Sebastopol is located more than 50 miles from downtown San Francisco, the nearest urban center. San Rafael and San Mateo are located 20 miles from downtown San Francisco.

Suburban: A project characterized by dispersed, low-density, single-use, automobile dependent land use patterns, usually outside of the central city (a suburb). Suburbs typically have the following characteristics:

- Location relative to the regional core: these locations are typically 20 miles or more from a regional CBD
- Ratio or relationship between jobs and housing: jobs poor
- Density character
 - typical building heights in stories: one to two stories
 - typical street pattern: curvilinear (cul-de-sac based)
 - typical setbacks: parking is generally placed between the street and office or retail buildings; large-lot residential is common
 - parking supply: ample, largely surface lot-based
 - parking prices: none
- Transit availability: limited bus service, with peak headways 30 minutes or more

The maximum reduction provided for this category assumes that regardless of the measures implemented, the project's distance from transit, density, design, and lack of mixed use destinations will keep the effect of any strategies to a minimum.

Global Maximum- A global maximum is provided for any combination of land use, neighborhood enhancements, parking, transit, and commute trip reduction strategies (the first five columns in the organization chart). This excludes reductions from road-pricing measurements which are discussed separately below. The total project VMT reduction across these categories, which can be combined through multiplication, should be capped

at these levels based on empirical evidence.⁴ Maximums are provided for the location/development type of the project. The Global Maximum values can be found in the top row of Chart 6-2.

These include:

- Urban: 75% VMT
- Compact Infill: 40% VMT
- Suburban Center (or Suburban with NEV): 20%
- Suburban: 15% (limited empirical evidence available)

Specific Rules for Subcategories within Transportation- Because of the unique interactions of measures within the Transportation Category, each subcategory has additional rules or criteria for combining measures.

❖ **Land Use/Location Strategies – Maximum Reduction Factors:** Land use measures apply to a project area with a radius of ½ mile. If the project area under review is greater than this, the study area should be divided into subareas of radii of ½ mile, with subarea boundaries determined by natural “clusters” of integrated land uses within a common watershed. If the project study area is smaller than ½ mile in radius, other land uses within a ½ mile radius of the key destination point in the study area (i.e. train station or employment center) should be included in design, density, and diversity calculations. Land use measures are capped based on empirical evidence for location setting types as follows:⁵

- Urban: 65% VMT
- Compact Infill: 30% VMT
- Suburban Center: 10% VMT
- Suburban: 5% VMT

❖ **Neighborhood/Site Enhancements Strategies – Maximum Reduction Factors:** The neighborhood/site enhancements category is capped at 12.7% VMT reduction (with Neighborhood Electric Vehicles (NEVs)) and 5% without NEVs based on empirical evidence (for NEVs) and the multiplied combination of the non-NEV measures.

❖ **Parking Strategies – Maximum Reduction Factors:** Parking strategies should be implemented in one of two combinations:

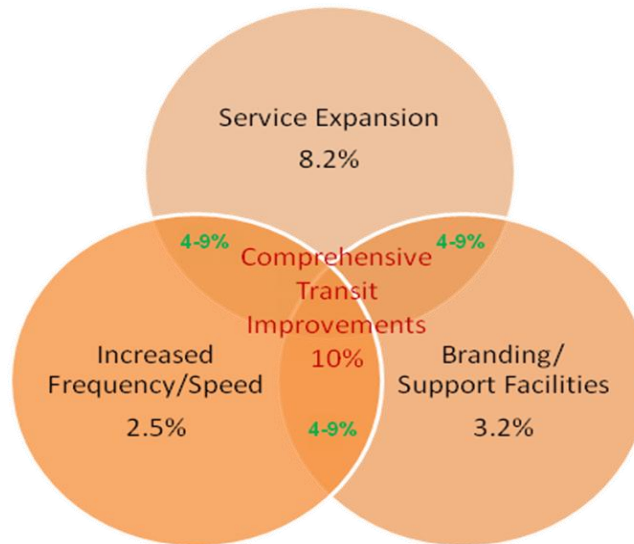
- Limited (reduced) off-street supply ratios plus residential permit parking and priced on-street parking (to limit spillover), or
- Unbundled parking plus residential permit parking and priced on-street parking (to limit spillover).

⁴ As reported by Holtzclaw, et al for the State of California. Note that CTR strategies must be converted to overall VMT reductions (from work-trip VMT reductions) before being combined with strategies in other categories.

⁵ As reported for California locations in Holtzclaw, et al. “Location Efficiency: Neighborhood and Socioeconomic Characteristics Determine Auto Ownership and Use – Studies in Chicago, Los Angeles, and San Francisco.” *Transportation Planning and Technology*, 2002, Vol. 25, pp. 1–27.

Note: The reduction maximum of 20% VMT reflects the combined (multiplied) effect of unbundled parking and priced on-street parking.

- ❖ Transit System Strategies – Maximum Reduction Factors: The 10% VMT reduction maximum for transit system improvements reflects the combined (multiplied) effect of network expansion and service frequency/speed enhancements. A comprehensive transit improvement would receive this type of reduction, as shown in the center overlap in the Venn diagram, below.



- ❖ Commuter Trip Reductions (CTR) Strategies – Maximum Reduction Factors: The most effective commute trip reduction measures combine incentives, disincentives, and mandatory monitoring, often through a transportation demand management (TDM) ordinance. Incentives encourage a particular action, for example parking cash-out, where the employee receives a monetary incentive for not driving to work, but is not punished for maintaining status quo. Disincentives establish a penalty for a status quo action. An example is workplace parking pricing, where the employee is now monetarily penalized for driving to work. The 25% maximum for work-related VMT applies to comprehensive CTR programs. TDM strategies that include only incentives, only disincentives, and/or no mandatory monitoring, should have a lower total VMT reduction than those with a comprehensive approach. Support strategies to strengthen CTR programs include guaranteed-ride-home, taxi vouchers, and message boards/marketing materials. A 25% reduction in work-related VMT is assumed equivalent to a 15% reduction in overall project VMT for the purpose of the global maximum; this can be adjusted for project-specific land use mixes.

Two school-related VMT reduction measures are also provided in this category. The maximum reduction for these measures should be 65% of school-related VMT based on the literature.

- ❖ Road Pricing/Management Strategies – Maximum Reduction Factors: Cordon pricing is the only strategy in this category with an expected VMT reduction potential. Other forms of road pricing would be applied at a corridor or region-wide level rather than as mitigation applied to an individual development project. No domestic case studies are available for cordon pricing, but international studies suggest a VMT reduction maximum of 25%. A separate, detailed, and project-specific study should be conducted for any project where road pricing is proposed as a VMT reduction measure.

Additional Rules for Transportation Measures- There are also restrictions on the application of measures in rural applications, and application to baseline, as follows:

- ❖ Rural Application: Few empirical studies are available to suggest appropriate VMT reduction caps for strategies implemented in rural areas. Strategies likely to have the largest VMT reduction in rural areas include vanpools, telecommute or alternative work schedules, and master planned communities (with design and land use diversity to encourage intra-community travel). NEV networks may also be appropriate for larger scale developments. Because of the limited empirical data in the rural context, project-specific VMT reduction estimates should be calculated.
- ❖ Baseline Application: As discussed in previous sections of this report, VMT reductions should be applied to a baseline VMT expected for the project, based on the Institute of Transportation Engineers’ 8th Edition *Trip Generation Manual* and associated typical trip distance for each land use type. Where trip generation rates and project VMT provided by the project Applicant are derived from another source, the VMT reductions must be adjusted to reflect any “discounts” already applied.

Range of Effectiveness of Mitigation Measures

The following charts provide the range of effectiveness for the quantified mitigation measures. Each chart shows one category of measures, with subcategories identified. The charts also show the basis for the quantification, and indicate applicable groupings. **IMPORTANT:** these ranges are approximate and should NOT be used in lieu of the specific quantification method provided in the fact sheet for each measure. Restrictions on combining measures must be observed.

Table 6-1: Energy Category

Energy						
Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
Building Energy Use	BE-1	Buildings exceed Title 24 Building Envelope Energy Efficiency Standards by X% (X is equal to the percentage improvement selected for the project)			For a 10% improvement over 2008 Title 24: Non-Residential electricity use: 0.2-5.5%; natural gas use: 0.7-10% Residential electricity use: 0.3-2.6%; natural gas use: 7.5-9.1%	
	BE-2	Install Programmable Thermostat Timers	X		BMP	
	BE-3	Obtain Third-party HVAC Commissioning and Verification of Energy Savings	X	BE-1	BMP	
	BE-4	Install Energy Efficient Appliances			Residential building: 2-4% Grocery Stores: 17-22%	Appliance Electricity Use
	BE-5	Install Energy Efficient Boilers			1.2-18.4%	Fuel Use
Alternative Energy Generation	AE-1	Establish Onsite Renewable Energy Systems-Generic			0-100%	
	AE-2	Establish Onsite Renewable Energy Systems-Solar Power			0-100%	
	AE-3	Establish Onsite Renewable Energy Systems-Wind Power			0-100%	
	AE-4	Utilize a Combined Heat and Power System			0-46%	
	AE-5	Establish Methane Recovery in Landfills			73-77%	
	AE-6	Establish Methane Recovery in Wastewater Treatment Plants			95-97%	
Lighting	LE-1	Install Higher Efficacy Public Street and Area Lighting			16-40%	Outdoor Lighting Electricity Use
	LE-2	Limit Outdoor Lighting Requirements	X		BMP	
	LE-3	Replace Traffic Lights with LED Traffic Lights			90%	Traffic Light Electricity Use

Table 6-2: Transportation Category

Transportation						
Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
Land Use / Location	LUT-1	Increase Density			1.5-30.0%	VMT
	LUT-2	Increase Location Efficiency			10-65%	VMT
	LUT-3	Increase Diversity of Urban and Suburban Developments (Mixed Use)			9-30%	VMT
	LUT-4	Incr. Destination Accessibility			6.7-20%	VMT
	LUT-5	Increase Transit Accessibility			0.5-24.6%	VMT
	LUT-6	Integrate Affordable and Below Market Rate Housing			0.04-1.20%	VMT
	LUT-7	Orient Project Toward Non-Auto Corridor			NA	
	LUT-8	Locate Project near Bike Path/Bike Lane			NA	
	LUT-9	Improve Design of Development			3.0-21.3%	VMT
Neighborhood / Site Design	SDT-1	Provide Pedestrian Network Improvements			0-2%	VMT
	SDT-2	Traffic Calming Measures			0.25-1.00%	VMT
	SDT-3	Implement a Neighborhood Electric Vehicle (NEV) Network			0.5-12.7%	VMT
	SDT-4	Urban Non-Motorized Zones		SDT-1	NA	
	SDT-5	Incorporate Bike Lane Street Design (on-site)		LUT-9	NA	
	SDT-6	Provide Bike Parking in Non-Residential Projects		LUT-9	NA	
	SDT-7	Provide Bike Parking in Multi-Unit Residential Projects		LUT-9	NA	
	SDT-8	Provide EV Parking		SDT-3	NA	
	SDT-9	Dedicate Land for Bike Trails		LUT-9	NA	
Parking Policy / Pricing	PDT-1	Limit Parking Supply			5-12.5%	
	PDT-2	Unbundle Parking Costs from Property Cost			2.6-13%	
	PDT-3	Implement Market Price Public Parking (On-Street)			2.8-5.5%	
	PDT-4	Require Residential Area Parking Permits		PDT-1, 2 & 3	NA	

Transportation - continued						
Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
Trip Reduction Programs	TRT-1	Implement Voluntary CTR Programs			1.0-6.2%	Commute VMT
	TRT-2	Implement Mandatory CTR Programs – Required Implementation/Monitoring			4.2-21.0%	Commute VMT
	TRT-3	Provide Ride-Sharing Programs			1-15%	Commute VMT
	TRT-4	Implement Subsidized or Discounted Transit Prog.			0.3-20.0%	Commute VMT
	TRT-5	Provide End of Trip Facilities		TRT-1, 2 & 3	NA	
	TRT-6	Telecommuting and Alternative Work Schedules			0.07-5.50%	Commute VMT
	TRT-7	Implement Commute Trip Reduction Marketing			0.8-4.0%	Commute VMT
	TRT-8	Implement Preferential Parking Permit Program		TRT-1, 2 & 3	NA	
	TRT-9	Implement Car-Sharing Program			0.4-0.7%	VMT
	TRT-10	Implement School Pool Program			7.2-15.8%	School VMT
	TRT-11	Provide Employer-Sponsored Vanpool/Shuttle			0.3-13.4%	Commute VMT
	TRT-12	Implement Bike-Sharing Program		SDT-5, LUT-9	NA	
	TRT-13	Implement School Bus Program			38-63%	School VMT
	TRT-14	Price Workplace Parking			0.1-19.7%	Commute VMT
	TRT-15	Implement Employee Parking “Cash-Out”			0.6-7.7%	Commute VMT

Transportation - continued

Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
Transit System Improvements	TST-1	Provide a Bus Rapid Transit System			0.02-3.2%	VMT
	TST-2	Implement Transit Access Improvements		TST-3, TST-4	NA	
	TST-3	Expand Transit Network			0.1-8.2%	VMT
	TST-4	Increase Transit Service Frequency/Speed			0.02-2.5%	VMT
	TST-5	Provide Bike Parking Near Transit		TST-3, TST-4	NA	
	TST-6	Provide Local Shuttles		TST-3, TST-4	NA	
Road Pricing / Management	RPT-1	Implement Area or Cordon Pricing			7.9-22.0%	VMT
	RPT-2	Improve Traffic Flow			0-45%	VMT
	RPT-3	Require Project Contributions to Transportation Infrastructure Improvement Projects		RPT-2, TST-1 to 6	NA	
	RPT-4	Install Park-and-Ride Lots		RPT-1, TRT-11, TRT-3, TST-1 to 6	NA	
Vehicles	VT-1	Electrify Loading Docks and/or Require Idling-Reduction Systems			26-71%	Truck Idling Time
	VT-2	Utilize Alternative Fueled Vehicles			Varies	
	VT-3	Utilize Electric or Hybrid Vehicles			0.4-20.3%	Fuel Use

Table 6-3: Water Category

Water						
Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
Water Supply	WSW-1	Use Reclaimed Water			up to 40% for Northern California up to 81% for Southern California	Outdoor Water Use
	WSW-2	Use Gray Water			0-100%	Outdoor Water Use
	WSW-3	Use Locally-Sourced Water Supply			0-60% for Northern and Central California; 11-75% for Southern California	Indoor and Outdoor Water Use
Water Use	WUW-1	Install Low-Flow Water Fixtures.			Residential: 20% Non-Residential: 17-31%	Indoor Water Use
	WUW-2	Adopt a Water Conservation Strategy.			varies	
	WUW-3	Design Water-Efficient Landscapes			0-70%	Outdoor Water Use
	WUW-4	Use Water-Efficient Landscape Irrigation Systems			6.1%	Outdoor Water Use
	WUW-5	Reduce Turf in Landscapes and Lawns			varies	
	WUW-6	Plant Native or Drought-Resistant Trees and Vegetation			BMP	

Table 6-4: Area Landscaping

Area Landscaping						
Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
Area Landscaping	A-1	Prohibit Gas Powered Landscape Equipment.			LADWP: 2.5-46.5% PG&E: 64.1-80.3% SCE: 49.5-72.0% SDGE: 38.5-66.3% SMUD: 56.3-76.0%	Fuel Use
	A-2	Implement Lawnmower Exchange Program			BMP	
	A-3	Electric Yard Equipment Compatibility		A-1 or A-2	BMP	

Table 6-5: Solid Waste Category

Solid Waste						
Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
Solid Waste	SW-1	Institute or Extend Recycling and Composting Services			BMP	
	SW-2	Recycle Demolished Construction Material			BMP	

Table 6-6: Vegetation Category

Vegetation						
Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
Vegetation	V-1	Urban Tree Planting		GP-4	varies	
	V-2	Create new vegetated open space.			varies	

Table 6-7: Construction Category

Construction						
Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
Construction	C-1	Use Alternative Fuels for Construction Equipment			0-22%	Fuel Use
	C-2	Use Electric and Hybrid Construction Equipment			2.5-80%	Fuel Use
	C-3	Limit Construction Equipment Idling beyond Regulation Requirements			varies	
	C-4	Institute a Heavy-Duty Off-Road Vehicle Plan		Any C	BMP	
	C-5	Implement a Vehicle Inventory Tracking System		Any C	BMP	

Table 6-8: Miscellaneous Category

Miscellaneous						
Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
Miscellaneous	Misc-1	Establish a Carbon Sequestration Project			varies	
	Misc-2	Establish Off-Site Mitigation			varies	
	Misc-3	Use Local and Sustainable Building Materials	x		BMP	
	Misc-4	Require Best Management Practices in Agriculture and Animal Operations	x		BMP	
	Misc-5	Require Environmentally Responsible Purchasing	x		BMP	
	Misc-6	Implement an Innovative Strategy for GHG Mitigation	x		BMP	

Table 6-9: General Plans

General Plan Strategies						
Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
General Plans	GP-1	Fund Incentives for Energy Efficiency	x		BMP	
	GP-2	Establish a Local Farmer's Market	x		BMP	
	GP-3	Establish Community Gardens	x		BMP	
	GP-4	Plant Urban Shade Trees	x	V-1	BMP	
	GP-5	Implement Strategies to Reduce Urban Heat-Island Effect	x		BMP	

Applicability of Quantification Fact Sheets Outside of California

In order to apply the quantification methods in this Report to projects located outside of California, the assumptions and methods in the baseline methodology and in the Fact Sheets should be reviewed prior to applying them. First, evaluate the basis for use metrics and emission factors for applicability outside of California. The Report references various sources for use metrics and emission factors; if these are California-specific, the method should be evaluated to determine if these same use metrics and emission factors are applicable to the project area. If they are not applicable, factors appropriate for the project area should be substituted in the baseline and project methods. Key factors to consider are climate zone⁶, precipitation, building standards, end-user behavior, and transportation environment (land use and transportation characteristics). Use metrics likely to vary outside of California include:

- Building Energy Use
- Water Use
- Vehicle Trip Lengths and Vehicle Miles Traveled
- Building Standards
- Waste Disposal Rates
- Landscape Equipment Annual Usage

Emission factors relate the use metric to carbon intensity to estimate GHG emissions. Depending on the type of emission factor, these values may or may not change based on location. For instance, the emission factor for combustion of a specific amount of fuel does not typically change; however the engine mix may change by location, and fuel use by those engines may be different. Other emission factors are regionally dependent and alternative sources should be investigated. Emission factors likely to vary outside of California include:

- Electricity associated with water and wastewater supply and treatment
- Carbon intensity of electricity supplied
- Fleet and model year distribution of vehicles which influences emission factors

The user should be able to adjust the methodologies to: (1) calculate the baseline for a given mitigation measure; and then (2) incorporate the appropriate data and assumptions into the calculations for the emission mitigation associated with the measure.

There is at least one mitigation measure that will not be applicable outside of California unless adjustments are made by substituting location-specific factors in the baseline methodology: the improvement beyond Title 24 (BE-1) is not applicable outside of California since buildings outside California would be subject to different building codes. The project Applicant may be able to estimate a baseline energy use for building envelope systems under other building standards and estimate the change in energy use for improvements to building envelope systems using building energy software or literature surveys.

⁶ Climate zones are specific geographic areas of similar climatic characteristics, including temperature, weather, and other factors which affect building energy use. The California Energy Commission identified 16 Forecasting Climate Zones (FCZs) within California.

How to Use a Fact Sheet to Quantify a Project

This section provides step-by-step instructions and an example regarding how a fact sheet can be used. After choosing the appropriate fact sheet(s), follow these general steps. Steps may need to be adjusted for different types of fact sheets.

Step 1: Does this fact sheet apply?

Carefully read the measure's description and applicability to ensure that you are using the correct fact sheet.

Step 2: Is the measure "grouped"?

Check Tables 6-1 to 6-9 to see if the measure is "grouped" with other measures. If it is, then all measures in the group must be implemented together.

Step 3: Review defaults

Review the default assumptions in the fact sheet.

Step 4: Data inputs

Determine the type of data and data sources necessary. Refer to Appendix B and other suggested documents.

Step 5: Calculate baseline emissions

Calculate baseline emissions using formulas provided in the fact sheet.

Step 6: Percent reductions

If applicable, calculate the percent reduction for the specific action in the measure.

Step 7: Quantify reductions

Quantify emission reductions for a particular mitigation measure using the provided formula.

Step 8: Grouped measures

If you are using a mitigation measure that is grouped with another measure, refer to Tables 6-1 to 6-9 and complete the calculations for all measures that are grouped together for a particular mitigation strategy.

Step 9: Multiple measures

See Chapter 6 for how to combine reductions from multiple measures.

IMPORTANT: Clearly document information such as data sources, data used, and calculations.

Example:

The following is an example calculation for a building project that will use Fact Sheet 2.1.1 - *Exceed Title 24 Building Envelope Energy Efficiency Standards by X%*. In this example, a large office building is being built, and it will be designed to do 10% more than Title 24 standards for both electricity and natural gas.

➤ Step 1 – Does this fact sheet apply?

The project and fact sheet have been reviewed, and YES, this fact sheet is appropriate to use to estimate reductions from the project.

- **Step 2 - Is the measure “grouped”?**
NO, this is a measure that does not have to be done with other measures.
- **Step 3 – Review defaults**
Default assumptions and emission factors have been reviewed and used, as appropriate.
- **Steps 4 – Data inputs**
The table below shows the data needed for the example, the sample data input, and the source of the sample data. Make sure the data use the units specified in the equation. *

Data for Fact Sheet 2.1.1 Example		
Data Needed	Input	Source of Data
Project type	Commercial land use = Large Office	User Input
Size	100,000 sq. ft	User Input
Climate Zone	1	From Figure BE 1.1
Electricity Intensity _{baseline}	8.32 kWh/SF/yr	From Fact Sheet 2.1.1
Utility Provider	PG&E	User Input
Emission Factor _{Electricity}	2.08E-4 MT CO ₂ e/kWh	Fact Sheet 2.1.1
Natural Gas Intensity _{baseline}	18.16 kBtu/SF/yr	From Fact Sheet 2.1.1
Emission Factor _{Natural Gas}	5.32E-5 MT CO ₂ e/therm	From Fact Sheet 2.1.1
% Reduction Commitment	10% over 2008 Title 24 Standards	User Input

- **Step 5 – Calculate baseline emissions**
Once all necessary information has been obtained, use the equation provided to determine the baseline emissions. Round results to the nearest MT.
 - ⇒
$$\begin{aligned} \text{GHG Emissions Baseline}_{\text{Electricity}} &= \text{Electricity Intensity}_{\text{Baseline}} \times \text{Size} \times \text{Emission Factor}_{\text{Electricity}} \\ &= 8.32 \text{ kWh/SF/yr} \times 100,000 \text{ SF} \times (2.08\text{E-}4 \text{ MT CO}_2\text{e/kWh}) \\ &= \mathbf{173 \text{ MT CO}_2\text{e/yr [Baseline GHG Emissions for Electricity]}} \end{aligned}$$
 - ⇒
$$\begin{aligned} \text{GHG Emissions Baseline}_{\text{Natural Gas}} &= \text{Natural Gas Intensity}_{\text{Baseline}} \times \text{Size} \times \text{Emission Factor}_{\text{Natural Gas}} \\ &= 18.16 \text{ kBtu/SF/yr} \times 100,000 \text{ SF} \times (5.32\text{E-}5 \text{ MT CO}_2\text{e/kBtu}) \\ &= \mathbf{97 \text{ MT CO}_2\text{e/yr [Baseline GHG Emissions for Natural Gas]}} \end{aligned}$$
 - ⇒
$$\begin{aligned} \text{GHG Emissions}_{\text{Baseline}} &= \text{GHG Emissions Baseline}_{\text{Electricity}} + \text{GHG Emissions Baseline}_{\text{Natural Gas}} \\ &= 173 \text{ MT CO}_2\text{e/yr} + 97 \text{ MT CO}_2\text{e/yr} \\ &= \mathbf{270 \text{ MT CO}_2\text{e/yr}} \end{aligned}$$
- **Step 6 – Percent reductions**

Understanding Fact Sheets

Now calculate the percent GHG emission reduction based on the stated improvement goal. In this example the goal is a 10% reduction over Title 24 Energy Efficiency Standards. See Table BE-1.1 for data used for this step.

⇒ Reduction_{Electricity} from 1% over 2008 Title 24 Standards = 0.20%
 Reduction_{NaturalGas} from 1% over 2008 Title 24 Standards = 1.00%

From Table BE-1.1

⇒ Multiply the Percent Factor from Table BE-1.1 by the Percent Reduction Commitment (10% for this example)

Reduction in GHG emissions from electricity generation:

= 0.20% x 10
 = 2%

Reduction Percentage X 10% goal

Reduction in GHG emissions from natural gas combustion:

= 1% x 10
 = 10%

Reduction Percentage X 10% goal

➤ Step 7 – Quantify reductions

Using the percent reductions, the emission reductions can be calculated, as shown below.

⇒ Total Building GHG emissions = GHG Emissions Baseline_{Electricity} x (Reduction_{Electricity})
 + GHG Emissions Baseline_{NaturalGas} x (Reduction_{NaturalGas})

= 173 MT CO₂e/yr x $\frac{(100\% - 2\%)}{100}$ + 97 MT CO₂e/yr x $\frac{(100\% - 10\%)}{100}$
 = **257 MT CO₂e/yr**

Net reductions are the difference between the baseline emissions and the emissions calculated above for what will occur with this strategy implemented.

⇒ Net reductions = Baseline – Total Building GHG Emissions

= 270 MT CO₂e/yr - 257 MT CO₂e/yr
 = **13 MT CO₂e/yr**

This shows that a 10% improvement in energy consumption over 2008 Title 24 Standards from electricity and natural gas will result in a GHG reduction of 13 MT CO₂e/yr.

➤ **Step 8 – Grouped measures**

In this example, the measure is not grouped. For grouped measures, refer to Tables 6-1 to 6-9 in Chapter 6 for how to combine reductions.

➤ **Step 9 – Multiple measures**

See “Rules for Combining Strategies or Measures” section in Chapter 6 for how to add reductions from multiple measures

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1.0 Introduction

Chapter 7 is made up of a series of Fact Sheets. Each sheet summarizes the quantification methodology for a specific mitigation measure. As described in Chapter 6, the measures are grouped into Categories, and, in some cases, into subcategories. For information about the development of the Fact Sheets, please see Chapter 4. For a discussion of specific quantification issues in select measure categories or subcategories, please refer to Chapter 5. Chapter 6 provides a detailed explanation of the organization and layout of the Fact Sheets, including rules that govern the quantification of measures that have been, or will be, implemented in combination.

In order to facilitate navigation through, and the use of, the Fact Sheets, they have been color coded to reflect the Category the measure is in, and if applicable, the subcategory. The color scheme is shown in Charts 6-1 and 6-2, and also in Table 7-1 (below).

The colored bar at the top of each Fact Sheet corresponds to the Category color as shown in Charts 6-1 and 6-2, and in Table 7-1; the Category name is shown in the colored bar at the left hand margin. The second colored bar, immediately below the first one, shows the name of the subcategory, if any, and corresponds to subcategory color in those charts and tables. The subcategory name appears at the right hand margin.

At the left hand margin, below the Category name, is a cross-reference to the corresponding measure in the previous two CAPCOA reports (*CEQA and GHG*; and *Model Policies for GHG in General Plans*). The term “MP#” refers to a measure in the Model Policies document. The term CEQA# refers to a measure in the CEQA and GHG report.

At the bottom of the page is a colored bar that corresponds to the Category, and, where applicable, there is a colored box at the right hand margin, contiguous with the colored bar. This color of the box corresponds to the subcategory, where applicable. The box contains the measure number.

The layout of information in each Fact Sheet is covered in detail in Chapter 6.

Table 7-1, below, provides an index and cross-reference for the measure Fact Sheets. It is color-coded, as explained above, and may be used as a key to more quickly and easily navigate through the Fact Sheets

Table 7-1: Measure Index & Cross Reference

Section	Category	Page #	Measure #	BMP	MP #	CEQA #
2.0	Energy	85				
2.1	Building Energy Use	85				
2.1.1	Buildings Exceed Title 24 Building Envelope Energy Efficiency Standards By X%	85	BE-1		EE-2	MM-E6
2.1.2	Install Programmable Thermostat Timers	99	BE-2	x	EE-2	-
2.1.3	Obtain Third-party HVAC Commissioning and Verification of Energy Savings	101	BE-3	x	EE-2	-
2.1.4	Install Energy Efficient Appliances	103	BE-4		EE-2.1.6	MM E-19
2.1.5	Install Energy Efficient Boilers	111	BE-5		-	-
2.2	Lighting	115				
2.2.1	Install Higher Efficacy Public Street and Area Lighting	115	LE-1		EE-2.1.5	-
2.2.2	Limit Outdoor Lighting Requirements	119	LE-2	x	EE-2.3	-
2.2.3	Replace Traffic Lights with LED Traffic Lights	122	LE-3		EE-2.1.5	-
2.3	Alternative Energy Generation	125				
2.3.1	Establish Onsite Renewable Energy Systems-Generic	125	AE-1		AE-2.1	MM E-5
2.3.2	Establish Onsite Renewable Energy Systems-Solar Power	128	AE-2		AE-2.1	MM E-5
2.3.3	Establish Onsite Renewable Energy Systems-Wind Power	132	AE-3		AE-2.1	MM E-5
2.3.4	Utilize a Combined Heat and Power System	135	AE-4		AE-2	-
2.3.5	Establish Methane Recovery in Landfills	143	AE-5		WRD-1	-
2.3.6	Establish Methane Recovery in Wastewater Treatment Plants	149	AE-6			
3.0	Transportation	155				
3.1	Land Use/Location	155				
3.1.1	Increase Density	155	LUT-1		LU-1.5 & LU-2.1.8	MM D-1 & D-4
3.1.2	Increase Location Efficiency	159	LUT-2		LU-3.3	-
3.1.3	Increase Diversity of Urban and Suburban Developments (Mixed Use)	162	LUT-3		LU-2	MM D-9 & D-4
3.1.4	Increase Destination Accessibility	167	LUT-4		LU-2.1.4	MM D-3
3.1.5	Increase Transit Accessibility	171	LUT-5		LU-1,LU-4	MM D-2
3.1.6	Integrate Affordable and Below Market Rate Housing	176	LUT-6		LU-2.1.8	MM D-7
3.1.7	Orient Project Toward Non-Auto Corridor	179	LUT-7		LU-4.2	LUT-3
3.1.8	Locate Project near Bike Path/Bike Lane	181	LUT-8		-	LUT-4
3.1.9	Improve Design of Development	182	LUT-9		-	-
3.2	Neighborhood/Site Enhancements	186				
3.2.1	Provide Pedestrian Network Improvements	186	SDT-1		LU-4	MM-T-6
3.2.2	Provide Traffic Calming Measures	190	SDT-2		LU-1.6	MM-T-8
3.2.3	Implement a Neighborhood Electric Vehicle (NEV) Network	194	SDT-3		TR-6	MM-D-6
3.2.4	Create Urban Non-Motorized Zones	198	SDT-4		LU-3.2.1 & 4.1.4	SDT-1
3.2.5	Incorporate Bike Lane Street Design (on-site)	200	SDT-5		TR-4.1	LUT-9
3.2.6	Provide Bike Parking in Non-Residential Projects	202	SDT-6		TR-4.1	MM T-1
3.2.7	Provide Bike Parking with Multi-Unit Residential Projects	204	SDT-7		TR-4.1.2	MM T-3
3.2.8	Provide Electric Vehicle Parking	205	SDT-8		TR-5.4	MM T-17 & E-11
3.2.9	Dedicate Land for Bike Trails	206	SDT-9		TR-4.1	LUT-9
3.3	Parking Policy/Pricing	207				
3.3.1	Limit Parking Supply	207	PDT-1		LU-1.7 & LU-2.1.1.4	-
3.3.2	Unbundle Parking Costs from Property Cost	210	PDT-2		LU-1.7	-
3.3.3	Implement Market Price Public Parking (On-Street)	213	PDT-3		-	-
3.3.4	Require Residential Area Parking Permits	217	PDT-4		-	PDT-1, PDT-2, PDT-3

Section	Category	Page #	Measure #	BMP	MP #	CEQA #
3.4	Commute Trip Reduction Programs	218				
3.4.1	Implement Commute Trip Reduction Program - Voluntary	218	TRT-1		-	-
	Implement Commute Trip Reduction Program – Required					
3.4.2	Implementation/Monitoring	223	TRT-2		MO-3.1	T-19
3.4.3	Provide Ride-Sharing Programs	227	TRT-3		MO-3.1	-
3.4.4	Implement Subsidized or Discounted Transit Program	230	TRT-4		MO-3.1	-
						TRT-1, TRT-2,
3.4.5	Provide End of Trip Facilities	234	TRT-5		MO-3.2	TRT-3
3.4.6	Encourage Telecommuting and Alternative Work Schedules	236	TRT-6		TR-3.5	-
3.4.7	Implement Commute Trip Reduction Marketing	240	TRT-7		-	-
						TRT-1, TRT-2,
3.4.8	Implement Preferential Parking Permit Program	244	TRT-8		TR-3.1	TRT-3
3.4.9	Implement Car-Sharing Program	245	TRT-9		-	-
3.4.10	Implement a School Pool Program	250	TRT-10		-	-
3.4.11	Provide Employer-Sponsored Vanpool/Shuttle	253	TRT-11		MO-3.1	-
3.4.12	Implement Bike-Sharing Programs	256	TRT-12		-	SDT-5, LUT-9
3.4.13	Implement School Bus Program	258	TRT-13		TR-3.4	-
3.4.14	Price Workplace Parking	261	TRT-14		-	-
3.4.15	Implement Employee Parking “Cash-Out”	266	TRT-15		TR-5.3	MM T-9
3.5	Transit System Improvements	270				
3.5.1	Provide a Bus Rapid Transit System	270	TST-1		-	MS-G3
3.5.2	Implement Transit Access Improvements	275	TST-2		LU-3.4.3	TST-3, TST-4
3.5.3	Expand Transit Network	276	TST-3		-	MS-G3
3.5.4	Increase Transit Service Frequency/Speed	280	TST-4		-	MS-G3
3.5.5	Provide Bike Parking Near Transit	285	TST-5		TR-4.1.4	TST-3, TST-4
3.5.6	Provide Local Shuttles	286	TST-6			TST-3, TST-4
3.6	Road Pricing/Management	287				
3.6.1	Implement Area or Cordon Pricing	287	RPT-1		TR-3.6	-
					TR-2.1,	
3.6.2	Improve Traffic Flow	291	RPT-2		TR-2.2	-
	Required Project Contributions to Transportation Infrastructure Improvement					RPT-2, TST-1 to
3.6.3	Projects	297	RPT-3		-	6
3.6.4		298				RPT-1, TRT-11,
	Install Park-and-Ride Lots		RPT-4		TR-1	TRT-3, TST-1 to
						6
3.7	Vehicles	300				
3.7.1	Electrify Loading Docks and/or Require Idling-Reduction Systems	300	VT-1		TR-6	-
3.7.2	Utilize Alternative Fueled Vehicles	304	VT-2		-	MM T-21
3.7.3	Utilize Electric or Hybrid Vehicles	309	VT-3		-	MM T-20
4.0	Water	332				
4.1	Water Supply	332				
4.1.1	Use Reclaimed Water	332	WSW-1		COS-1.3	MS-G-8
4.1.2	Use Gray Water	336	WSW-2		COS-2.3	-
4.1.3	Use Locally Sourced Water Supply	341	WSW-3		-	-
4.2	Water Use	347				
4.2.1	Install Low-Flow Water Fixtures	347	WUW-1		EE-2.1.6; COS 2.2	MM-E23
4.2.2	Adopt a Water Conservation Strategy	362	WUW-2		COS-1.	MS-G-8
4.2.3	Design Water-Efficient Landscapes	365	WUW-3		COS-2.1	-
4.2.4	Use Water-Efficient Landscape Irrigation Systems	372	WUW-4		COS-3.1	MS-G-8
4.2.5	Reduce Turf in Landscapes and Lawns	376	WUW-5		-	-
4.2.6	Plant Native or Drought-Resistant Trees and Vegetation	381	WUW-6	x	COS-3.1	MM D-16

Section	Category	Page #	Measure #	BMP	MP #	CEQA #
5.0	Area Landscaping	384				
5.1	Landscaping Equipment	384				
5.1.1	Prohibit Gas Powered Landscape Equipment.	384	A-1		-	-
5.1.2	Implement Lawnmower Exchange Program	389	A-2	x	EE-4.2	MM D-13 A-1 or A-2; MM D-14
5.1.3	Electric Yard Equipment Compatibility	391	A-3	x	MO-2.4	D-14
6.0	Solid Waste	392				
6.1	Solid Waste	392				
6.1.1	Institute or Extend Recycling and Composting Services	401	SW-1	x	WRD-2	MM D-14
6.1.2	Recycle Demolished Construction Material	402	SW-2	x	WRD-2.3	MM C-4
7.0	Vegetation	402				
7.1	Vegetation	402				
7.1.1	Urban Tree Planting	402	V-1		COS-3.3, COS 3.2	GP-4, MM T-14
7.1.2	Create New Vegetated Open Space	406	V-2		COS-4.1	-
8.0	Construction	410				
8.1	Construction	410				
8.1.1	Use Alternative Fuels for Construction Equipment	410	C-1		TR-6, EE-1	MM C-2
8.1.2	Use Electric and Hybrid Construction Equipment	420	C-2		TR-6, EE-1	-
8.1.3	Limit Construction Equipment Idling beyond Regulation Requirements	428	C-3		TR-6.2	-
8.1.4	Institute a Heavy-Duty Off-Road Vehicle Plan	431	C-4	x	TR-6.2, EE-1	Any C
8.1.5	Implement a Construction Vehicle Inventory Tracking System	432	C-5	x	-	-
9.0	Miscellaneous	433				
9.1	Miscellaneous	433				
9.1.1	Establish a Carbon Sequestration Project	433	Misc-1		LU-5	-
9.1.2	Establish Off-Site Mitigation	435	Misc-2		-	-
9.1.3	Use Local and Sustainable Building Materials	437	Misc-3	x	EE-1	MM C-3, E-17
9.1.4	Require Best Management Practices in Agriculture and Animal Operations	439	Misc-4	x	-	-
9.1.5	Require Environmentally Responsible Purchasing	440	Misc-5	x	MO-6.1	-
9.1.6	Implement an Innovative Strategy for GHG Mitigation	442	Misc-6	x	-	-
10.0	General Plans	444				
10.1	General Plans	444				
10.1.1	Fund Incentives for Energy Efficiency	444	GP-1	x	-	-
10.1.2	Establish a Local Farmer's Market	446	GP-2	x	LU-2.1.4	MM D-18
10.1.3	Establish Community Gardens	448	GP-3	x	LU-2.1.4	MM D-19
10.1.4	Plant Urban Shade Trees	450	GP-4	x	COS-3.2	V-1, MM T-14
10.1.5	Implement Strategies to Reduce Urban Heat-Island Effect	455	GP-5	x	LU-6.1	MM E-8, E-12

Section	Category	#	#
3.0	Transportation	155	
3.1	Land Use/Location	155	
3.1.1	Increase Density	155	LUT-1
3.1.2	Increase Location Efficiency	159	LUT-2
3.1.3	Increase Diversity of Urban and Suburban Developments (Mixed Use)	162	LUT-3
3.1.4	Increase Destination Accessibility	167	LUT-4
3.1.5	Increase Transit Accessibility	171	LUT-5
3.1.6	Integrate Affordable and Below Market Rate Housing	176	LUT-6
3.1.7	Orient Project Toward Non-Auto Corridor	179	LUT-7
3.1.8	Locate Project near Bike Path/Bike Lane	181	LUT-8
3.1.9	Improve Design of Development	182	LUT-9
3.2	Neighborhood/Site Enhancements	186	
3.2.1	Provide Pedestrian Network Improvements	186	SDT-1
3.2.2	Provide Traffic Calming Measures	190	SDT-2
3.2.3	Implement a Neighborhood Electric Vehicle (NEV) Network	194	SDT-3
3.2.4	Create Urban Non-Motorized Zones	198	SDT-4
3.2.5	Incorporate Bike Lane Street Design (on-site)	200	SDT-5
3.2.6	Provide Bike Parking in Non-Residential Projects	202	SDT-6
3.2.7	Provide Bike Parking with Multi-Unit Residential Projects	204	SDT-7
3.2.8	Provide Electric Vehicle Parking	205	SDT-8
3.2.9	Dedicate Land for Bike Trails	206	SDT-9
3.3	Parking Policy/Pricing	207	
3.3.1	Limit Parking Supply	207	PDT-1
3.3.2	Unbundle Parking Costs from Property Cost	210	PDT-2
3.3.3	Implement Market Price Public Parking (On-Street)	213	PDT-3
3.3.4	Require Residential Area Parking Permits	217	PDT-4
3.4	Commute Trip Reduction Programs	218	
3.4.1	Implement Commute Trip Reduction Program - Voluntary	218	TRT-1
3.4.2	Implement Commute Trip Reduction Program – Required Implementation/Monitoring	223	TRT-2
3.4.3	Provide Ride-Sharing Programs	227	TRT-3
3.4.4	Implement Subsidized or Discounted Transit Program	230	TRT-4
3.4.5	Provide End of Trip Facilities	234	TRT-5
3.4.6	Encourage Telecommuting and Alternative Work Schedules	236	TRT-6
3.4.7	Implement Commute Trip Reduction Marketing	240	TRT-7
3.4.8	Implement Preferential Parking Permit Program	244	TRT-8
3.4.9	Implement Car-Sharing Program	245	TRT-9
3.4.10	Implement a School Pool Program	250	TRT-10
3.4.11	Provide Employer-Sponsored Vanpool/Shuttle	253	TRT-11
3.4.12	Implement Bike-Sharing Programs	256	TRT-12
3.4.13	Implement School Bus Program	258	TRT-13
3.4.14	Price Workplace Parking	261	TRT-14
3.4.15	Implement Employee Parking “Cash-Out”	266	TRT-15

Section	Category	#	#
3.5	Transit System Improvements	270	
3.5.1	Provide a Bus Rapid Transit System	270	TST-1
3.5.2	Implement Transit Access Improvements	275	TST-2
3.5.3	Expand Transit Network	276	TST-3
3.5.4	Increase Transit Service Frequency/Speed	280	TST-4
3.5.5	Provide Bike Parking Near Transit	285	TST-5
3.5.6	Provide Local Shuttles	286	TST-6
3.6	Road Pricing/Management	287	
3.6.1	Implement Area or Cordon Pricing	287	RPT-1
3.6.2	Improve Traffic Flow	291	RPT-2
3.6.3	Required Project Contributions to Transportation Infrastructure Improvement Projects	297	RPT-3
3.6.4	Install Park-and-Ride Lots	298	RPT-4
3.7	Vehicles	300	
3.7.1	Electrify Loading Docks and/or Require Idling-Reduction Systems	300	VT-1
3.7.2	Utilize Alternative Fueled Vehicles	304	VT-2
3.7.3	Utilize Electric or Hybrid Vehicles	309	VT-3

Transportation

CEQA# MM D-1 & D-4

MP# LU-1.5 & LU-2.1.8

LUT-1

Land Use / Location

3.0 Transportation

3.1 Land Use/Location

3.1.1 Increase Density

Range of Effectiveness: 0.8 – 30.0% vehicle miles traveled (VMT) reduction and therefore a 0.8 – 30.0% reduction in GHG emissions.

Measure Description:

Designing the Project with increased densities, where allowed by the General Plan and/or Zoning Ordinance reduces GHG emissions associated with traffic in several ways. Density is usually measured in terms of persons, jobs, or dwellings per unit area. Increased densities affect the distance people travel and provide greater options for the mode of travel they choose. This strategy also provides a foundation for implementation of many other strategies which would benefit from increased densities. For example, transit ridership increases with density, which justifies enhanced transit service.

The reductions in GHG emissions are quantified based on reductions to VMT. The relationship between density and VMT is described by its elasticity. According to a recent study published by Brownstone, et al. in 2009, the elasticity between density and VMT is 0.12. Default densities are based on the typical suburban densities in North America which reflects the characteristics of the ITE Trip Generation Manual data used in the baseline estimates.

Measure Applicability:

- Urban and suburban context
 - Negligible impact in a rural context
- Appropriate for residential, retail, office, industrial, and mixed-use projects

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$\text{CO}_2 = \text{VMT} \times \text{EF}_{\text{running}}$$

Where:

traveled

for running emissions

VMT = vehicle miles

EF_{running} = emission factor

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LUT-1

Land Use / Location

Inputs:

The following information needs to be provided by the Project Applicant:

- Number of housing units per acre or jobs per job acre

Mitigation Method:

$$\% \text{ VMT Reduction} = A * B \text{ [not to exceed 30\%]}$$

Where:

A = Percentage increase in housing units per acre or jobs per job acre³³ = (number of housing units per acre or jobs per job acre – number of housing units per acre or jobs per job acre for typical ITE development) / (number of housing units per acre or jobs per job acre for typical ITE development) For small and medium sites (less than ½ mile in radius) the calculation of housing and jobs per acre should be performed for the development site as a whole, so that the analysis does not erroneously attribute trip reduction benefits to measures that simply shift jobs and housing within the site with no overall increase in site density. For larger sites, the analysis should address the development as several ½-mile-radius sites, so that shifts from one area to another would increase the density of the receiving area but reduce the density of the donating area, resulting in trip generation rate decreases and increases, respectively, which cancel one another.

B = Elasticity of VMT with respect to density (from literature)

Detail:

- A: [not to exceed 500% increase]
 - If housing: (Number of housing units per acre – 7.6) / 7.6
(See Appendix C for detail)
 - If jobs: (Number of jobs per acre – 20) / 20
(See Appendix C for detail)
- B: 0.07 (Boarnet and Handy 2010)

Assumptions:

Data based upon the following references:

- Boarnet, Marlon and Handy, Susan. 2010. “DRAFT Policy Brief on the Impacts of Residential Density Based on a Review of the Empirical Literature.” <http://arb.ca.gov/cc/sb375/policies/policies.htm>; Table 1.

³³ This value should be checked first to see if it exceeds 500% in which case A = 500%.

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LUT-1

Land Use / Location

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ³⁴
CO ₂ e	1.5-30% of running
PM	1.5-30% of running
CO	1.5-30% of running
NO _x	1.5-30% of running
SO ₂	1.5-30% of running
ROG	0.9-18% of total

Discussion:

The VMT reductions for this strategy are based on changes in density versus the typical suburban residential and employment densities in North America (referred to as “ITE densities”). These densities are used as a baseline to mirror those densities reflected in the ITE Trip Generation Manual, which is the baseline method for determining VMT.

There are two separate maxima noted in the fact sheet: a cap of 500% on the allowable percentage increase of housing units or jobs per acre (variable A) and a cap of 30% on % VMT reduction. The rationale for the 500% cap is that there are diminishing returns to any change in environment. For example, it is reasonably doubtful that increasing residential density by a factor of six instead of five would produce any additional change in travel behavior. The purpose for the 30% cap is to limit the influence of any single environmental factor (such as density). This emphasizes that community designs that implement multiple land use strategies (such as density, design, diversity, etc.) will show more of a reduction than relying on improvements from a single land use factor.

Example:

Sample calculations are provided below for housing:

$$\begin{aligned} \text{Low Range \% VMT Reduction (8.5 housing units per acre)} \\ = (8.5 - 7.6) / 7.6 * 0.07 = 0.8\% \end{aligned}$$

$$\text{High Range \% VMT Reduction (60 housing units per acre)}$$

$$= \frac{60 - 7.6}{7.6} = 6.9 \text{ or } 690\% \text{ Since greater than } 500\%, \text{ set to } 500\%$$

$$= 500\% \times 0.07 = 0.35 \text{ or } 35\% \text{ Since greater than } 30\%, \text{ set to } 30\%$$

³⁴ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

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LUT-1

Land Use / Location

Sample calculations are provided below for jobs:

$$\begin{aligned} \text{Low Range \% VMT Reduction (25 jobs per acre)} \\ = (25 - 20) / 20 * 0.12 = 3\% \end{aligned}$$

$$\begin{aligned} \text{High Range \% VMT Reduction (100 jobs per acre)} \\ = \frac{100 - 20}{20} = 4 \text{ or } 400\% \\ = 400\% \times 0.12 = 0.48 \text{ or } 48\% \text{ Since greater than } 30\%, \text{ set to } 30\% \end{aligned}$$

Preferred Literature:

- -0.07 = elasticity of VMT with respect to density

Boarnet and Handy's detailed review of existing literature highlighted three individual studies that used the best available methods for analyzing data for individual households. These studies provided the following elasticities: -0.12 - Brownstone (2009), -0.07 - Bento (2005), and -0.08 - Fang (2008). To maintain a conservative estimate of the impacts of this strategy, the lower elasticity of -0.07 is used in the calculations.

Alternative Literature:

- -0.05 to -0.25 = elasticity of VMT with respect to density

The *TRB Special Report 298* literature suggests that doubling neighborhood density across a metropolitan area might lower household VMT by about 5 to 12 percent, and perhaps by as much as 25 percent, if coupled with higher employment concentrations, significant public transit improvements, mixed uses, and other supportive demand management measures.

Alternative Literature References:

TRB, 2009. *Driving and the Built Environment*, Transportation Research Board Special Report 298. <http://onlinepubs.trb.org/Onlinepubs/sr/sr298.pdf> . Accessed March 2010. (p. 4)

Other Literature Reviewed:

None

Transportation

MP# LU-3.3 **LUT-2** Land Use / Location

3.1.2 Increase Location Efficiency

Range of Effectiveness: 10-65% vehicle miles traveled (VMT) reduction and therefore 10-65% reduction in GHG emissions

Measure Description:

This measure is not intended as a separate strategy but rather a documentation of empirical data to justify the “cap” for all land use/location strategies. The location of the Project relative to the type of urban landscape such as being located in an urban area, infill, or suburban center influences the amount of VMT compared to the statewide average. This is referred to as the location of efficiency since there are synergistic benefits to these urban landscapes.

To receive the maximum reduction for this location efficiency, the project will be located in an urban area/ downtown central business district. Projects located on brownfield sites/infill areas receive a lower, but still significant VMT reduction. Finally, projects in suburban centers also receive a reduction for their efficient location. Reductions are based on the typical VMT of a specific geographic area relative to the average VMT statewide.

Measure Applicability:

- Urban and suburban context
- Negligible impact in a rural context
- Appropriate for residential, retail, office, industrial and mixed-use projects

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$CO_2 = VMT \times EF_{\text{running}}$$

Where:

- VMT = vehicle miles traveled
- EF_{running} = emission factor for running emissions

Inputs:

- No inputs are needed. VMT reduction ranges are based on the geographic location of the project within the region.

Mitigation Method:

% VMT reduction =

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MP# LU-3.3 **LUT-2** Land Use / Location

- Urban: 65% (representing VMT reductions for the average urban area in California versus the statewide average VMT)
- Compact Infill: 30% (representing VMT reductions for the average compact infill area in California versus the statewide average VMT)
- Suburban Center: 10% (representing VMT reductions for the average suburban center in California versus the statewide average VMT)

Assumptions:

Data based upon the following references:

- Holtzclaw, et al. 2002. “Location Efficiency: Neighborhood and Socioeconomic Characteristics Determine Auto Ownership and Use – Studies in Chicago, Los Angeles, and Chicago.” *Transportation Planning and Technology*, Vol. 25, pp. 1–27.

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ³⁵
CO ₂ e	10-65% of running
PM	10-65% of running
CO	10-65% of running
NOx	10-65% of running
SO ₂	10-65% of running
ROG	6-39% of total

Discussion:

Example:

N/A – no calculations needed

Alternative Literature:

- 13-72% reduction in VMT for infill projects

Preferred Literature:

Holtzclaw, et al., [1] studied relationships between auto ownership and mileage per car and neighborhood urban design and socio-economic characteristics in the Chicago, Los

³⁵ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

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Land Use / Location

Angeles, and San Francisco metro areas. In all three regions, average annual vehicle miles traveled is a function of density, income, household size, and public transit, as well as pedestrian and bicycle orientation (to a lesser extent). The annual VMT for each neighborhood was reviewed to determine empirical VMT reduction “caps” for this report. These location-based caps represent the average and maximum reductions that would likely be expected in urban, infill, suburban center, and suburban locations.

Growing Cooler looked at 10 studies which have considered the effects of regional location on travel and emissions generated by individual developments. The studies differ in methodology and context but they tend to yield the same conclusion: infill locations generate substantially lower VMT per capita than do greenfield locations, ranging from 13 - 72% lower VMT.

Literature References:

- [1] Holtzclaw, et al. 2002. “Location Efficiency: Neighborhood and Socioeconomic Characteristics Determine Auto Ownership and Use – Studies in Chicago, Los Angeles, and Chicago.” *Transportation Planning and Technology*, Vol. 25, pp. 1–27.
- [2] Ewing, et al, 2008. *Growing Cooler – The Evidence on Urban Development and Climate Change*. Urban Land Institute. (p.88, Figure 4-30)

Other Literature Reviewed:

None

Transportation

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LUT-3

Land Use / Location

MP# LU-2

3.1.3 Increase Diversity of Urban and Suburban Developments (Mixed Use)

Range of Effectiveness: 9-30% vehicle miles traveled (VMT) reduction and therefore 9-30% reduction in GHG emissions.

Measure Description:

Having different types of land uses near one another can decrease VMT since trips between land use types are shorter and may be accommodated by non-auto modes of transport. For example when residential areas are in the same neighborhood as retail and office buildings, a resident does not need to travel outside of the neighborhood to meet his/her trip needs. A description of diverse uses for urban and suburban areas is provided below.

Urban:

The urban project will be predominantly characterized by properties on which various uses, such as office, commercial, institutional, and residential, are combined in a single building or on a single site in an integrated development project with functional interrelationships and a coherent physical design. The mixed-use development should encourage walking and other non-auto modes of transport from residential to office/commercial/institutional locations (and vice versa). The residential units should be within ¼-mile of parks, schools, or other civic uses. The project should minimize the need for external trips by including services/facilities for day care, banking/ATM, restaurants, vehicle refueling, and shopping.

Suburban:

The suburban project will have at least three of the following on site and/or offsite within ¼-mile: Residential Development, Retail Development, Park, Open Space, or Office. The mixed-use development should encourage walking and other non-auto modes of transport from residential to office/commercial locations (and vice versa). The project should minimize the need for external trips by including services/facilities for day care, banking/ATM, restaurants, vehicle refueling, and shopping.

Measure Applicability:

- Urban and suburban context
- Negligible impact in a rural context (unless the project is a master-planned community)
- Appropriate for mixed-use projects

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

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$$CO_2 = VMT \times EF_{\text{running}}$$

Where:

traveled

for running emissions

VMT = vehicle miles

EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Percentage of each land use type in the project (to calculate land use index)

Mitigation Method:

$$\% \text{ VMT Reduction} = \text{Land Use} * B \text{ [not to exceed 30\%]}$$

Where

Land Use = Percentage increase in land use index versus single use development
 = (land use index – 0.15)/0.15 (see Appendix C for detail)

$$\text{Land use index} = -a / \ln(6)$$

(from [2])

$$a = \sum_{i=1}^6 a_i \times \ln(a_i)$$

a_i = building floor area of land use i / total square feet of area considered

- residential a₁ = single family
- a₂ = multifamily residential
- a₃ = commercial
- a₄ = industrial
- a₅ = institutional
- a₆ = park

if land use is not present and a_i is equal to 0, set a_i equal to 0.01

B with respect to land use index (0.09 from [1])
 increase

= elasticity of VMT
 not to exceed 500%

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LUT-3

Land Use / Location

Assumptions:

Data based upon the following references:

- [1] Ewing, R., and Cervero, R., "Travel and the Built Environment - A Meta-Analysis." *Journal of the American Planning Association*, <to be published> (2010). Table 4.
- [2] Song, Y., and Knaap, G., "Measuring the effects of mixed land uses on housing values." *Regional Science and Urban Economics* 34 (2004) 663-680. (p. 669)
http://urban.csuohio.edu/~sugie/papers/RSUE/RSUE2005_Measuring%20the%20effects%20of%20mixed%20land%20use.pdf

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ³⁶
CO ₂ e	9-30% of running
PM	9-30% of running
CO	9-30% of running
NO _x	9-30% of running
SO ₂	9-30% of running
ROG	5.4-18% of total

Discussion:

In the above calculation, a land use index of 0.15 is used as a baseline representing a development with a single land use (see Appendix C for calculations).

There are two separate maxima noted in the fact sheet: a cap of 500% on the allowable percentage increase of land use index (variable A) and a cap of 30% on % VMT reduction. The rationale for the 500% cap is that there are diminishing returns to any change in environment. For example, it is reasonably doubtful that increasing the land use index by a factor of six instead of five would produce any additional change in travel behavior. The purpose for the 30% cap is to limit the influence of any single environmental factor (such as diversity). This emphasizes that community designs that implement multiple land use strategies (such as density, design, diversity, etc.) will show more of a reduction than relying on improvements from a single land use factor.

³⁶ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

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Land Use / Location

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Example:

Sample calculations are provided below:

90% single family homes, 10% commercial

- Land use index = $-[0.9 \ln(0.9) + 0.1 \ln(0.1) + 4 \cdot 0.01 \ln(0.01)] / \ln(6) = 0.3$
- Low Range % VMT Reduction = $(0.3 - 0.15) / 0.15 \cdot 0.09 = 9\%$

1/6 single family, 1/6 multi-family, 1/6 commercial, 1/6 industrial, 1/6 institutional, 1/6 parks

- Land use index = $-[6 \cdot 0.17 \ln(0.17)] / \ln(6) = 1$
- High Range % VMT Reduction (land use index = 1)
- Land use = $(1 - 0.15) / 0.15 = 5.6$ or 566%. Since this is greater than 500%, set to 500%.
- % VMT Reduction = $(5 \times 0.09) = 0.45$ or 45%. Since this is greater than 30%, set to 30%.

Preferred Literature:

- -0.09 = elasticity of VMT with respect to land use index

The land use (or entropy) index measurement looks at the mix of land uses of a development. An index of 0 indicates a single land use while 1 indicates a full mix of uses. Ewing's [1] synthesis looked at a total of 10 studies, where none controlled for self-selection³⁷. The weighted average elasticity of VMT with respect to the land use mix index is -0.09. The methodology for calculating the land use index is described in Song and Knaap [2].

Alternative Literature:

- Vehicle trip reduction = $[1 - (\text{ABS}(1.5 \cdot h - e) / (1.5 \cdot h + e)) - 0.25] / 0.25 \cdot 0.03$

Where :

h = study area housing units, and

e = study area employment.

Nelson\Nygaard's report [3] describes a calculation adapted from Criterion and Fehr & Peers [4]. The formula assumes an "ideal" housing balance of 1.5 jobs per household and a baseline diversity of 0.25. The maximum trip reduction with this method is 9%.

³⁷ Self selection occurs when residents or employers that favor travel by non-auto modes choose locations where this type of travel is possible. They are therefore more inclined to take advantage of the available options than a typical resident or employee might otherwise be.

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LUT-3**Land Use / Location****Alternative Literature References:**

[3] Nelson\Nygaard, 2005. Crediting Low-Traffic Developments (p.12).

<http://www.montgomeryplanning.org/transportation/documents/TripGenerationAnalysisUrbemIS.pdf>

[4] Criterion Planner/Engineers and Fehr & Peers Associates (2001). Index 4D Method. *A Quick-Response Method of Estimating Travel Impacts from Land-Use Changes*. Technical Memorandum prepared for US EPA, October 2001.

Other Literature Reviewed:

None

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CEQA# MM D-3

LUT-4

Land Use / Location

MP# LU-2.1.4

3.1.4 Increase Destination Accessibility

Range of Effectiveness: 6.7 – 20% vehicle miles traveled (VMT) reduction and therefore 6.7-20% reduction in GHG emissions.

Measure Description:

The project will be located in an area with high accessibility to destinations. Destination accessibility is measured in terms of the number of jobs or other attractions reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones. The location of the project also increases the potential for pedestrians to walk and bike to these destinations and therefore reduces the VMT.

Measure Applicability:

- Urban and suburban context
- Negligible impact in a rural context
- Appropriate for residential, retail, office, industrial and mixed-use projects

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$\text{CO}_2 = \text{VMT} \times \text{EF}_{\text{running}}$$

Where:

traveled

for running emissions

VMT = vehicle miles

EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Distance to downtown or major job center

Mitigation Method:

$$\% \text{ VMT Reduction} = \text{Center Distance} * B \text{ [not to exceed 30\%]}$$

Where

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Center Distance = Percentage decrease in distance to downtown or major job center versus typical ITE suburban development = (distance to downtown/job center for typical ITE development – distance to downtown/job center for project) / (distance to downtown/job center for typical ITE development)

Center Distance = 12 - Distance to downtown/job center for project) / 12
See Appendix C for detail

B = Elasticity of VMT with respect to distance to downtown or major job center (0.20 from [1])

Assumptions:

Data based upon the following references:

[1] Ewing, R., and Cervero, R., "Travel and the Built Environment - A Meta-Analysis." Journal of the American Planning Association, <to be published> (2010). Table 4.

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ³⁸
CO ₂ e	6.7 – 20% of running
PM	6.7 – 20% of running
CO	6.7 – 20% of running
NO _x	6.7 – 20% of running
SO ₂	6.7 – 20% of running
ROG	4 – 12% of total

Discussion:

The VMT reductions for this strategy are based on changes in distance to key destinations versus the standard suburban distance in North America. This distance is used as a baseline to mirror the distance to destinations reflected in the land uses for the ITE Trip Generation Manual, which is the baseline method for determining VMT.

The purpose for the 30% cap on % VMT reduction is to limit the influence of any single environmental factor (such as destination accessibility). This emphasizes that community designs that implement multiple land use strategies (such as density,

³⁸ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

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design, diversity, destination, etc.) will show more of a reduction than relying on improvements from a single land use factor.

Example:

Sample calculations are provided below:

- Low Range % VMT Reduction (8 miles to downtown/job center) = $\frac{12-8}{12} \times 0.20 = 6.7\%$
- High Range % VMT Reduction (0.1 miles to downtown/job center) = $\frac{12-0.1}{12} \times 0.20 = 20.0\%$

Preferred Literature:

- -0.20 = elasticity of VMT with respect to job accessibility by auto
- -0.20 = elasticity of VMT with respect to distance to downtown

The Ewing and Cervero report [1] finds that VMT is strongly related to measures of accessibility to destinations. The weighted average elasticity of VMT with respect to job accessibility by auto is -0.20 (looking at five total studies). The weighted average elasticity of VMT with respect to distance to downtown is -0.22 (looking at four total studies, of which one controls for self selection³⁹).

Alternative Literature:

- 10-30% reduction in vehicle trips

The VTPI literature [2] suggests a 10-30% reduction in vehicle trips for “smart growth” development practices that result in more compact, accessible, multi-modal communities where travel distances are shorter, people have more travel options, and it is possible to walk and bicycle more.

Alternative Literature References:

[2] Litman, T., 2009. “Win-Win Emission Reduction Strategies.” Victoria Transport Policy Institute (VTPI). Website: <http://www.vtpi.org/wwclimate.pdf>. Accessed March 2010. (p. 7, Table 3)

³⁹ Self selection occurs when residents or employees that favor travel by non-auto modes choose locations where this type of travel is possible. They are therefore more inclined to take advantage of the available options than a typical resident or employee might otherwise be.

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LUT-4

Land Use / Location

Other Literature Reviewed:

None

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CEQA# MM D-2

MP# LU-1,LU-4

LUT-5

Land Use / Location

3.1.5 Increase Transit Accessibility

Range of Effectiveness: 0.5 – 24.6% VMT reduction and therefore 0.5-24.6% reduction in GHG emissions.⁴⁰

Measure Description:

Locating a project with high density near transit will facilitate the use of transit by people traveling to or from the Project site. The use of transit results in a mode shift and therefore reduced VMT. A project with a residential/commercial center designed around a rail or bus station, is called a transit-oriented development (TOD). The project description should include, at a minimum, the following design features:

- A transit station/stop with high-quality, high-frequency bus service located within a 5-10 minute walk (or roughly ¼ mile from stop to edge of development), and/or
 - A rail station located within a 20 minute walk (or roughly ½ mile from station to edge of development)
- Fast, frequent, and reliable transit service connecting to a high percentage of regional destinations
- Neighborhood designed for walking and cycling

In addition to the features listed above, the following strategies may also be implemented to provide an added benefit beyond what is documented in the literature:

- Mixed use development [LUT-3]
- Traffic calmed streets with good connectivity [SDT-2]
- Parking management strategies such as unbundled parking, maximum parking requirements, market pricing implemented to reduce amount of land dedicated to vehicle parking [see PPT-1 through PPT-7]

Measure Applicability:

- Urban and suburban context
- Appropriate in a rural context if development site is adjacent to a commuter rail station with convenient rail service to a major employment center
- Appropriate for residential, retail, office, industrial, and mixed-use projects

Baseline Method:

⁴⁰ Transit vehicles may also result in increases in emissions that are associated with electricity production or fuel use. The Project Applicant should consider these potential additional emissions when estimating mitigation for these measures.

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LUT-5

Land Use / Location

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$CO_2 = VMT \times EF_{\text{running}}$$

Where:

traveled
for running emissions

VMT = vehicle miles

EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Distance to transit station in project

Mitigation Method:

$$\% \text{ VMT} = \text{Transit} * B \text{ [not to exceed 30\%]}$$

Where

Transit = Increase in transit mode share = % transit mode share for project - % transit mode share for typical ITE development (1.3% as described in Appendix C)

% transit mode share for project (see Table)

Distance to transit	Transit mode share calculation equation (where x = distance of project to transit)
0 – 0.5 miles	-50*x + 38
0.5 to 3 miles	-4.4*x + 15.2
> 3 miles	no impact
Source: Lund et al, 2004; Fehr & Peers 2010 (see Appendix C for calculation detail)	

B = adjustments from transit ridership increase to VMT (0.67, see Appendix C for detail)

Assumptions:

Data based upon the following references:

[1] Lund, H. and R. Cervero, and R. Willson (2004). *Travel Characteristics of Transit-Oriented Development in California*. (p. 79, Table 5-25)

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CEQA# MM D-2

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LUT-5

Land Use / Location

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁴¹
CO ₂ e	0.5 – 24.6% of running
PM	0.5 – 24.6% of running
CO	0.5 – 24.6% of running
NO _x	0.5 – 24.6% of running
SO ₂	0.5 – 24.6% of running
ROG	0.3 – 14.8% of total

Discussion:

The purpose for the 30% cap on % VMT reduction is to limit the influence of any single environmental factor (such as transit accessibility). This emphasizes that community designs that implement multiple land use strategies (such as density, design, diversity, transit accessibility, etc.) will show more of a reduction than relying on improvements from a single land use factor.

Example:

Sample calculations are provided below for a rail station:

- Low Range % VMT Reduction (3 miles from station) = $[(-4.4 \times 3 + 15.2) - 1.3\%] \times 0.67 = 0.5\%$
- High Range % VMT Reduction (0 miles from station) = $[(-50 \times 0 + 38) - 1.3\%] \times 0.67 = 24.6\%$

Preferred Literature:

- 13 to 38% transit mode share (residents in TODs with ½ mile of rail station)
- 5 to 13% transit mode share (residents in TODs from ½ mile to 3 miles of rail station)

The *Travel Characteristics* report [1] surveyed TODs and surrounding areas in San Diego, Los Angeles, San Jose, Sacramento, and Bay Area regions. Survey sites are all located in non-central business district locations, are within walking distance of a transit station with rail service headways of 15 minutes or less, and were intentionally developed as TODs.

⁴¹ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

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CEQA# MM D-2
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LUT-5

Land Use / Location

Alternative Literature:

Alternate:

- -0.05 = elasticity of VMT with respect to distance to nearest transit stop

Ewing and Cervero's meta-analysis [2] provides this weighted average elasticity based on six total studies, of which one controls for self-selection. The report does not provide the range of distances where this elasticity is valid.

Alternate:

- 5.9 – 13.3% reduction in VMT

The Bailey, et al. 2008 report [3] predicted a reduction of household daily VMT of 5.8 miles for a location next to a rail station and 2.6 miles for a location next to a bus station. Using the report's estimate of 43.75 daily average miles driven, the estimated reduction in VMT for rail accessibility is 13.3% (5.8/43.75) and for bus accessibility is 5.9% (2.6/43.75).

Alternate:

- 15% reduction in vehicle trips
- 2 to 5 times higher transit mode share

TCRP Report 128 [4] concludes that transit-oriented developments, compared to typical developments represented by the *ITE Trip Generation Manual*, have 47% lower vehicle trip rates and have 2 to 5 times higher transit mode share. *TCRP Report 128* notes that the *ITE Trip Generation Manual* shows 6.67 daily trips per unit while detailed counts of 17 residential TODs resulted in 3.55 trips per unit (a 47% reduction in vehicle trips). This study looks at mid-rise and high-rise apartments at the residential TOD sites. A more conservative comparison would be to look at the *ITE Trip Generation Manual* rates for high-rise apartments, 4.2 trips per unit. This results in a 15% reduction in vehicle trips.

Alternative Literature References:

- [2] Ewing, R., and Cervero, R., "Travel and the Built Environment - A Meta-Analysis." *Journal of the American Planning Association*, <to be published> (2010). Table 4.
- [3] Bailey, L., Mokhtarian, P.L., & Little, A. (2008). "The Broader Connection between Public Transportation, Energy Conservation and Greenhouse Gas Reduction." ICF International. (Table 4 and 5)
- [4] TCRP, 2008. *TCRP Report 128 - Effects of TOD on Housing, Parking, and Travel*. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_128.pdf (p. 11, 69).

Transportation

CEQA# MM D-2
MP# LU-1,LU-4

LUT-5

Land Use / Location

Other Literature Reviewed:

None

Transportation

CEQA# MM D-7
MP# LU-2.1.8

LUT-6

Land Use / Location

3.1.6 Integrate Affordable and Below Market Rate Housing

Range of Effectiveness: 0.04 – 1.20% vehicle miles traveled (VMT) reduction and therefore 0.04-1.20% reduction in GHG emissions.

Measure Description:

Income has a statistically significant effect on the probability that a commuter will take transit or walk to work [4]. BMR housing provides greater opportunity for lower income families to live closer to jobs centers and achieve jobs/housing match near transit. It also addresses to some degree the risk that new transit oriented development would displace lower income families. This strategy potentially encourages building a greater percentage of smaller units that allow a greater number of families to be accommodated on infill and transit-oriented development sites within a given building footprint and height limit. Lower income families tend to have lower levels of auto ownership, allowing buildings to be designed with less parking which, in some cases, represents the difference between a project being economically viable or not.

Residential development projects of five or more dwelling units will provide a deed-restricted low-income housing component on-site.

Measure Applicability:

- Urban and suburban context
- Negligible impact in a rural context unless transit availability and proximity to jobs/services are existing characteristics
- Appropriate for residential and mixed-use projects

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$\text{CO}_2 = \text{VMT} \times \text{EF}_{\text{running}}$$

Where:

VMT = vehicle miles traveled

for running emissions

EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Percentage of units in project that are deed-restricted BMR housing

Transportation

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MP# LU-2.1.8

LUT-6

Land Use / Location

Mitigation Method:

% VMT Reduction = 4% * Percentage of units in project that are deed-restricted BMR housing [1]

Assumptions:

Data based upon the following references:

- [1] Nelson\Nygaard, 2005. Crediting Low-Traffic Developments (p.15).
<http://www.montgomeryplanning.org/transportation/documents/TripGenerationAnalysisUsingURBEMIS.pdf>
 Criterion Planner/Engineers and Fehr & Peers Associates (2001). Index 4D Method. *A Quick-Response Method of Estimating Travel Impacts from Land-Use Changes*. Technical Memorandum prepared for US EPA, October 2001.
 Holtzclaw, John; Clear, Robert; Dittmar, Hank; Goldstein, David; and Haas, Peter (2002), "Location Efficiency: Neighborhood and Socio-Economic Characteristics Determine Auto Ownership and Use – Studies in Chicago, Los Angeles and San Francisco", *Transportation Planning and Technology*, 25 (1): 1-27.

All trips affected are assumed average trip lengths to convert from percentage vehicle trip reduction to VMT reduction (%VT = %VMT)

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁴²
CO ₂ e	0.04 – 1.20% of running
PM	0.04 – 1.20% of running
CO	0.04 – 1.20% of running
NO _x	0.04 – 1.20% of running
SO ₂	0.04 – 1.20% of running
ROG	0.024 – 0.72% of total

Discussion:

At a low range, 1% BMR housing is assumed. At a medium range, 15% is assumed (based on the requirements of the San Francisco BMR Program[5]). At a high range, the San Francisco program is doubled to reach 30% BMR. Higher percentages of BMR are possible, though not discussed in the literature or calculated.

⁴² The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

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Land Use / Location

Example:

Sample calculations are provided below:

- Low Range % VMT Reduction = $4\% * 1\% = 0.04\%$
- High Range % VMT Reduction = $4\% * 30\% = 1.20\%$

Preferred Literature:

Nelson\Nygaard [1] provides a 4% reduction in vehicle trips for each deed-restricted BMR unit. This is calculated from Holtzclaw [3], with the following assumptions: 12,000 average annual VMT per vehicle, \$33,000 median per capita income (2002 figures per CA State Department of Finance), and average income in BMR units 25% below median. With a coefficient of -0.0565 (estimate for VMT/vehicle as a function of \$/capita) from [3], the VMT reduction is $0.0565 * 33,000 * 0.25 / 12,000 = 4\%$.

Alternative Literature:

- 50% greater transit school trips than higher income households

Fehr & Peers [6] developed Direct Ridership Models to predict the Bay Area Rapid Transit (BART) ridership activity. One of the objectives of this assessment was to understand the land use and system access factors that influence commute period versus off-peak travel on BART. The analysis focused on the Metropolitan Transportation Commission 2000 Bay Area Travel Survey [7], using the data on household travel behavior to extrapolate relationships between household characteristics and BART mode choice. The study found that regardless of distance from BART, lower income households generate at least 50% higher BART use for school trips than higher income households. More research would be needed to provide more applicable information regarding other types of transit throughout the state.

Other Literature Reviewed:

[4] Bento, Antonio M., Maureen L. Cropper, Ahmed Mushfiq Mobarak, and Katja Vinha. 2005. "The Effects of Urban Spatial Structure on Travel Demand in the United States." *The Review of Economics and Statistics* 87,3: 466-478. (cited in Measure Description section)

[5] San Francisco BMR Program: http://www.ci.sf.ca.us/site/moh_page.asp?id=48083 (p.1) (cited in Discussion section).

[6] Fehr & Peers. *Access BART*. 2006.

[7] BATS. 2000. 2000 Bay Area Travel Survey.

Transportation

MP# LU-4.2

LUT-7

Land Use / Location

3.1.7 Orient Project Toward Non-Auto Corridor

Range of Effectiveness: Grouped strategy. [See LUT-3]

Measure Description:

A project that is designed around an existing or planned transit, bicycle, or pedestrian corridor encourages alternative mode use. For this measure, the project is oriented towards a planned or existing transit, bicycle, or pedestrian corridor. Setback distance is minimized.

The benefits of Orientation toward Non-Auto Corridor have not been sufficiently quantified in the existing literature. This measure is most effective when applied in combination of multiple design elements that encourage this use. There is not sufficient evidence that this measure results in non-negligible trip reduction unless combined with measures described elsewhere in this report, including neighborhood design, density and diversity of development, transit accessibility and pedestrian and bicycle network improvements. Therefore, the trip reduction percentages presented below should be used only as reasonableness checks. They may be used to assess whether, when applied to projects oriented toward non-auto corridors, analysis of all of those other development design factors presented in this report produce trip reductions at least as great as the percentages listed below.

Measure Applicability:

- Urban or suburban context; may be applicable in a master-planned rural community
- Appropriate for residential, retail, office, industrial, and mixed-use projects

Alternative Literature:

Alternate:

- 0.25 – 0.5% reduction in vehicle miles traveled (VMT)

The Sacramento Metropolitan Air Quality Management District (SMAQMD) Recommended Guidance for Land Use Emission Reductions attributes 0.5% reduction for a project oriented towards an *existing* corridor. A 0.25% reduction is attributed for a project oriented towards a *planned* corridor. The planned transit, bicycle, or pedestrian corridor must be in a General Plan, Community Plan, or similar plan.

Alternate:

- 0.5% reduction in VMT per 1% improvement in transit frequency
- 0.5% reduction in VMT per 10% increase in transit ridership

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LUT-7**Land Use / Location**

The *Center for Clean Air Policy (CCAP) Guidebook* [2] attributes a 0.5 % reduction per 1% improvement in transit frequency. Based on a case study presented in the CCAP report, a 10% increase in transit ridership would result in a 0.5% reduction. (This information is based on a TIAX review for SMAQMD).

The sources cited above reflect existing guidance rather than empirical studies.

Alternative Literature References:

[1] Sacramento Metropolitan Air Quality Management District (SMAQMD).

“Recommended Guidance for Land Use Emission Reductions.”

<http://www.airquality.org/ceqa/GuidanceLUEmissionReductions.pdf>

[2] Center for Clean Air Policy (CCAP). *Transportation Emission Guidebook*.

http://www.ccap.org/safe/guidebook/guide_complete.html

TIAX Results of 2005 Literature Search Conducted by TIAX on behalf of SMAQMD

Other Literature Reviewed:

None

Transportation

LUT-8

Land Use / Location

3.1.8 Locate Project near Bike Path/Bike Lane

Range of Effectiveness: Grouped strategy. [See LUT-4]

Measure Description:

A Project that is designed around an existing or planned bicycle facility encourages alternative mode use. The project will be located within 1/2 mile of an existing Class I path or Class II bike lane. The project design should include a comparable network that connects the project uses to the existing offsite facilities.

This measure is most effective when applied in combination of multiple design elements that encourage this use. Refer to Increase Destination Accessibility (LUT-4) strategy. The benefits of Proximity to Bike Path/Bike Lane are small as a standalone strategy. The strategy should be grouped with the Increase Destination Accessibility strategy to increase the opportunities for multi-modal travel.

Measure Applicability:

- Urban or suburban context; may be applicable in a rural master planned community
- Appropriate for residential, retail, office, industrial, and mixed-use projects

Alternative Literature:

Alternate:

- 0.625% reduction in vehicle miles traveled (VMT)

As a rule of thumb, the *Center for Clean Air Policy (CCAP) Guidebook* [1] attributes a 1% to 5% reduction associated with comprehensive bicycle programs. Based on the CCAP guidebook, the TIAX report allots 2.5% reduction for all bicycle-related measures and a 1/4 of that for this measure alone. (This information is based on a TIAX review for SMAQMD).

Alternative Literature References:

[1] Center for Clean Air Policy (CCAP). *Transportation Emission Guidebook*. http://www.ccap.org/safe/guidebook/guide_complete.html; TIAX Results of 2005 Literature Search Conducted by TIAX on behalf of SMAQMD.

Other Literature Reviewed:

None

Transportation

LUT-8

Land Use / Location

3.1.9 Improve Design of Development

Range of Effectiveness: 3.0 – 21.3% vehicle miles traveled (VMT) reduction and therefore 3.0-21.3% reduction in GHG emissions.

Measure Description:

The project will include improved design elements to enhance walkability and connectivity. Improved street network characteristics within a neighborhood include street accessibility, usually measured in terms of average block size, proportion of four-way intersections, or number of intersections per square mile. Design is also measured in terms of sidewalk coverage, building setbacks, street widths, pedestrian crossings, presence of street trees, and a host of other physical variables that differentiate pedestrian-oriented environments from auto-oriented environments.

Measure Applicability:

- Urban and suburban context
- Negligible impact in a rural context
- Appropriate for residential, retail, office, industrial and mixed-use projects

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$\text{CO}_2 = \text{VMT} \times \text{EF}_{\text{running}}$$

Where:

traveled
for running emissions

VMT = vehicle miles
EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Number of intersections per square mile

Mitigation Method:

$$\% \text{ VMT Reduction} = \text{Intersections} * B$$

Where

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Land Use / Location

Intersections = Percentage increase in intersections versus a typical ITE suburban development

$$= \frac{\text{Intersections per square mile of project} - \text{Intersections per square mile of typical ITE suburban development}}{\text{Intersections per square mile of typical ITE suburban development}}$$

$$= \frac{\text{Intersections per square mile of project} - 36}{36}$$

See Appendix C for detail [not to exceed 500% increase]

B = Elasticity of VMT with respect to percentage of intersections (0.12 from [1])

Assumptions:

Data based upon the following references:

[1] Ewing, R., and Cervero, R., "Travel and the Built Environment - A Meta-Analysis." *Journal of the American Planning Association*, <to be published> (2010). Table 4.

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁴³
CO ₂ e	3.0 – 21.3% of running
PM	3.0 – 21.3% of running
CO	3.0 – 21.3% of running
NO _x	3.0 – 21.3% of running
SO ₂	3.0 – 21.3% of running
ROG	1.8 – 12.8% of total

Discussion:

The VMT reductions for this strategy are based on changes in intersection density versus the standard suburban intersection density in North America. This standard density is used as a baseline to mirror the density reflected in the *ITE Trip Generation Manual*, which is the baseline method for determining VMT.

The calculations in the Example section look at a low and high range of intersection densities. The low range is simply a slightly higher density than the typical ITE

⁴³ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

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development. The high range uses an average intersection density of mixed use/transit-oriented development sites (TOD Site surveys in the Bay Area for *Candlestick-Hunters Point Phase II TIA*, Fehr & Peers, 2009).

There are two separate maxima noted in the fact sheet: a cap of 500% on the allowable percentage increase of intersections per square mile (variable A) and a cap of 30% on % VMT reduction. The rationale for the 500% cap is that there are diminishing returns to any change in environment. For example, it is reasonably doubtful that increasing intersection density by a factor of six instead of five would produce any additional change in travel behavior. The purpose for the 30% cap is to limit the influence of any single environmental factor (such as design). This emphasizes that community designs that implement multiple land use strategies (such as density, design, diversity, etc.) will show more of a reduction than relying on improvements from a single land use factor.

Example:

Sample calculations are provided below:

- Low Range % VMT Reduction (45 intersections per square mile) = $(45 - 36) / 36 * 0.12 = 3.0\%$
- High Range % VMT Reduction (100 intersections per square mile) = $(100 - 36) / 36 * 0.12 = 21.3\%$

Preferred Literature:

- -0.12 = elasticity of VMT with respect to design (intersection/street density)
- -0.12 = elasticity of VMT with respect to design (% of 4-way intersections)

Ewing and Cervero's [1] synthesis showed a strong relationship of VMT to design elements, second only to destination accessibility. The weighted average elasticity of VMT to intersection/street density was -0.12 (looking at six studies). The weighted average elasticity of VMT to percentage of 4-way intersections was -0.12 (looking at four studies, of which one controlled for self-selection⁴⁴).

Alternative Literature:

Alternate:

- 2-19% reduction in VMT

⁴⁴ Self selection occurs when residents or employees that favor travel by non-auto modes choose locations where this type of travel is possible. They are therefore more inclined to take advantage of the available options than a typical resident or employee might otherwise be.

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LUT-8

Land Use / Location

Growing Cooler [2] looked at various reports which studied the effect of site design on VMT, showing a range of 2-19% reduction in VMT. In each case, alternative development plans for the same site were compared to a baseline or trend plan. Results suggest that VMT and CO₂ per capita decline as site density increases as well as the mix of jobs, housing, and retail uses become more balanced. *Growing Cooler* notes that the limited number of studies, differences in assumptions and methodologies, and variability of results make it difficult to generalize.

Alternate:

- 3 – 17% shift in mode share from auto to non-auto

The Marshall and Garrick paper [3] analyzes the differences in mode shares for grid and non-grid (“tree”) neighborhoods. For a city with a tributary tree street network, a neighborhood with a tree network had auto mode share of 92% while a neighborhood with a grid network had auto mode share of 89% (3% difference). For a city with a tributary radial street network, a tree neighborhood had auto mode share of 97% while a grid neighborhood had auto mode share of 84% (13% difference). For a city with a grid network, a tree neighborhood had auto mode share of 95% while a grid neighborhood had auto mode share of 78% (17% difference). The research is based on 24 California cities with populations between 30,000 and 100,000.

Alternative Literature References:

[2] Ewing, et al, 2008. *Growing Cooler – The Evidence on Urban Development and Climate Change*. Urban Land Institute.

[3] Marshall and Garrick, 2009. “The Effect of Street Network Design on Walking and Biking.” Submitted to the 89th Annual Meeting of Transportation Research Board, January 2010. (Table 3)

Other Literature Reviewed:

None

Transportation

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MP# LU-4

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Neighborhood / Site
Enhancement

3.2 Neighborhood/Site Enhancements

3.2.1 Provide Pedestrian Network Improvements

Range of Effectiveness: 0 - 2% vehicle miles traveled (VMT) reduction and therefore 0 - 2% reduction in GHG emissions.

Measure Description:

Providing a pedestrian access network to link areas of the Project site encourages people to walk instead of drive. This mode shift results in people driving less and thus a reduction in VMT. The project will provide a pedestrian access network that internally links all uses and connects to all existing or planned external streets and pedestrian facilities contiguous with the project site. The project will minimize barriers to pedestrian access and interconnectivity. Physical barriers such as walls, landscaping, and slopes that impede pedestrian circulation will be eliminated.

Measure Applicability:

- Urban, suburban, and rural context
- Appropriate for residential, retail, office, industrial and mixed-use projects
- Reduction benefit only occurs if the project has both pedestrian network improvements on site and connections to the larger off-site network.

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$\text{CO}_2 = \text{VMT} \times \text{EF}_{\text{running}}$$

Where:

traveled

for running emissions

VMT = vehicle miles

EF_{running} = emission factor

Inputs:

The project applicant must provide information regarding pedestrian access and connectivity within the project and to/from off-site destinations.

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SDT-1

**Neighborhood / Site
Enhancement**

Mitigation Method:

Estimated VMT Reduction	Extent of Pedestrian Accommodations	Context
2%	Within Project Site and Connecting Off-Site	Urban/Suburban
1%	Within Project Site	Urban/Suburban
< 1%	Within Project Site and Connecting Off-Site	Rural

Assumptions:

Data based upon the following references:

- Center for Clean Air Policy (CCAP) Transportation Emission Guidebook. http://www.ccap.org/safe/guidebook/guide_complete.html (accessed March 2010)
- 1000 Friends of Oregon (1997) "Making the Connections: A Summary of the LUTRAQ Project" (p. 16): http://www.onethousandfriendsoforegon.org/resources/lut_vol7.html

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁴⁵
CO ₂ e	0 - 2% of running
PM	0 - 2% of running
CO	0 - 2% of running
NO _x	0 - 2% of running
SO ₂	0 - 2% of running
ROG	0 – 1.2% of total

Discussion:

As detailed in the preferred literature section below, the lower range of 1 – 2% VMT reduction was pulled from the literature to provide a conservative estimate of reduction potential. The literature does not speak directly to a rural context, but an assumption was made that the benefits will likely be lower than a suburban/urban context.

Example:

N/A – calculations are not needed.

Preferred Literature:

⁴⁵ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

Transportation

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SDT-1

**Neighborhood / Site
Enhancement**

- 1 - 2% reduction in VMT

The Center for Clean Air Policy (CCAP) attributes a 1% reduction in VMT from pedestrian-oriented design assuming this creates a 5% decrease in automobile mode share (e.g. auto split shifts from 95% to 90%). This mode split is based on the Portland Regional Land Use Transportation and Air Quality (LUTRAQ) project. The LUTRAQ analysis also provides the high end of 10% reduction in VMT. This 10% assumes the following features:

- Compact, mixed-use communities
- Interconnected street network
- Narrower roadways and shorter block lengths
- Sidewalks
- Accessibility to transit and transit shelters
- Traffic calming measures and street trees
- Parks and public spaces

Other strategies (development density, diversity, design, transit accessibility, traffic calming) are intended to account for the effects of many of the measures in the above list. Therefore, the assumed effectiveness of the Pedestrian Network measure should utilize the lower end of the 1 - 10% reduction range. If the pedestrian improvements are being combined with a significant number of the companion strategies, trip reductions for those strategies should be applied as well, based on the values given specifically for those strategies in other sections of this report. Based upon these findings, and drawing upon recommendations presented in the alternate literature below, the recommended VMT reduction attributable to pedestrian network improvements, above and beyond the benefits of other measures in the above bullet list, should be 1% for comprehensive pedestrian accommodations within the development plan or project itself, or 2% for comprehensive internal accommodations and external accommodations connecting to off-site destinations.

Alternative Literature:

Alternate:

- Walking is three times more common with enhanced pedestrian infrastructure
- 58% increase in non-auto mode share for work trips

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MP# LU-4

SDT-1

**Neighborhood / Site
Enhancement**

The Nelson\Nygaard [1] report for the City of Santa Monica Land Use and Circulation Element EIR summarized studies looking at pedestrian environments. These studies have found a direct connection between non-auto forms of travel and a high quality pedestrian environment. Walking is three times more common with communities that have pedestrian friendly streets compared to less pedestrian friendly communities. Non-auto mode share for work trips is 49% in a pedestrian friendly community, compared to 31% in an auto-oriented community. Non-auto mode share for non-work trips is 15%, compared to 4% in an auto-oriented community. However, these effects also depend upon other aspects of the pedestrian friendliness being present, which are accounted for separately in this report through land use strategy mitigation measures such as density and urban design.

Alternate:

- 0.5% - 2.0% reduction in VMT

The Sacramento Metropolitan Air Quality Management District (SMAQMD) Recommended Guidance for Land Use Emission Reductions [2] attributes 1% reduction for a project connecting to *existing* external streets and pedestrian facilities. A 0.5% reduction is attributed to connecting to *planned* external streets and pedestrian facilities (which must be included in a pedestrian master plan or equivalent). Minimizing pedestrian barriers attribute an additional 1% reduction in VMT. These recommendations are generally in line with the recommended discounts derived from the preferred literature above.

Preferred and Alternative Literature Notes:

[1] Nelson\Nygaard, 2010. City of Santa Monica Land Use and Circulation Element EIR Report, Appendix – Santa Monica Luce Trip Reduction Impacts Analysis (p.401). <http://www.shapethefuture2025.net/>

Nelson\Nygaard looked at the following studies: Anne Vernez Moudon, Paul Hess, Mary Catherine Snyder and Kiril Stanilov (2003), Effects of Site Design on Pedestrian Travel in Mixed Use, Medium-Density Environments, <http://www.wsdot.wa.gov/research/reports/fullreports/432.1.pdf>; Robert Cervero and Carolyn Radisch (1995), Travel Choices in Pedestrian Versus Automobile Oriented Neighborhoods, <http://www.uctc.net/papers/281.pdf>;

[2] Sacramento Metropolitan Air Quality Management District (SMAQMD) Recommended Guidance for Land Use Emission Reductions. (p. 11) <http://www.airquality.org/ceqa/GuidanceLUEmissionReductions.pdf>

Other Literature Reviewed:

None

Transportation

CEQA# MM-T-8

MP# LU-1.6

SDT-2

Neighborhood / Site
Enhancement

3.2.2 Provide Traffic Calming Measures

Range of Effectiveness: 0.25 – 1.00% vehicle miles traveled (VMT) reduction and therefore 0.25 – 1.00% reduction in GHG emissions.

Measure Description:

Providing traffic calming measures encourages people to walk or bike instead of using a vehicle. This mode shift will result in a decrease in VMT. Project design will include pedestrian/bicycle safety and traffic calming measures in excess of jurisdiction requirements. Roadways will be designed to reduce motor vehicle speeds and encourage pedestrian and bicycle trips with traffic calming features. Traffic calming features may include: marked crosswalks, count-down signal timers, curb extensions, speed tables, raised crosswalks, raised intersections, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, and others.

Measure Applicability:

- Urban, suburban, and rural context
- Appropriate for residential, retail, office, industrial and mixed-use projects

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$\text{CO}_2 = \text{VMT} \times \text{EF}_{\text{running}}$$

Where:

traveled
for running emissions

VMT = vehicle miles
EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Percentage of streets within project with traffic calming improvements
- Percentage of intersections within project with traffic calming improvements

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Neighborhood / Site
Enhancement

Mitigation Method:

		% of streets with improvements			
		25%	50%	75%	100%
		% VMT Reduction			
% of intersections with improvements	25%	0.25%	0.25%	0.5%	0.5%
	50%	0.25%	0.5%	0.5%	0.75%
	75%	0.5%	0.5%	0.75%	0.75%
	100%	0.5%	0.75%	0.75%	1%

Assumptions:

Data based upon the following references:

- [1] Cambridge Systematics. *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions.* (p. B-25)
http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendices_Complete_102209.pdf
- [2] Sacramento Metropolitan Air Quality Management District (SMAQMD)
Recommended Guidance for Land Use Emission Reductions. (p.13)
<http://www.airquality.org/ceqa/GuidanceLUEmissionReductions.pdf>

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁴⁶
CO ₂ e	0.25 – 1.00% of running
PM	0.25 – 1.00% of running
CO	0.25 – 1.00% of running
NO _x	0.25 – 1.00% of running
SO ₂	0.25 – 1.00% of running
ROG	0.15 – 0.6% of total

Discussion:

The table above allows the Project Applicant to choose a range of street and intersection improvements to determine an appropriate VMT reduction estimate. The Applicant will look at the rows on the left and choose the percent of intersections within

⁴⁶ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

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Enhancement

the project which will have traffic calming improvements. Then, the Applicant will look at the columns along the top and choose the percent of streets within the project which will have traffic calming improvements. The intersection cell of the row and column selected in the matrix is the VMT reduction estimate.

Though the literature provides some difference between a suburban and urban context, the difference is small and thus a conservative estimate was used to be applied to all contexts. Rural context is not specifically discussed in the literature but is assumed to have similar impacts.

For a low range, a project is assumed to have 25% of its streets with traffic calming improvements and 25% of its intersections with traffic calming improvements. For a high range, 100% of streets and intersections are assumed to have traffic calming improvements

Example:

N/A - No calculations needed.

Preferred Literature:

- -0.03 = elasticity of VMT with respect to a pedestrian environment factor (PEF)
- 1.5% - 2.0% reduction in suburban VMT
- 0.5% - 0.6% reduction in urban VMT

Moving Cooler [1] looked at Ewing's synthesis elasticity from the Smart Growth INDEX model (-0.03) to estimate VMT reduction for a suburban and urban location. The estimated reduction in VMT came from looking at the difference between the VMT results for Moving Cooler's strategy of pedestrian accessibility only compared to an aggressive strategy of pedestrian accessibility and traffic calming.

The Sacramento Metropolitan Air Quality Management District (SMAQMD) *Recommended Guidance for Land Use Emission Reductions* [2] attributes 0.25 – 1% of VMT reductions to traffic calming measures. The table above illustrates the range of VMT reductions based on the percent of streets and intersections with traffic calming measures implemented. This range of reductions is recommended because it is generally consistent with the effectiveness ranges presented in the other preferred literature for situations in which the effects of traffic calming are distinguished from the other measures often found to co-exist with calming, and because it provides graduated effectiveness estimates depending on the degree to which calming is implemented.

Alternative Literature:

None

Transportation

CEQA# MM-T-8
MP# LU-1.6

SDT-2

**Neighborhood / Site
Enhancement**

Alternative Literature References:

None

Other Literature Reviewed:

None

Transportation

CEQA# MM-D-6
MP# TR-6

SDT-3

**Neighborhood / Site
Enhancement**

3.2.3 Implement a Neighborhood Electric Vehicle (NEV) Network

Range of Effectiveness: 0.5-12.7% vehicle miles traveled (VMT) reduction since Neighborhood Electric Vehicles (NEVs) would result in a mode shift and therefore reduce the traditional vehicle VMT and GHG emissions⁴⁷. Range depends on the available NEV network and support facilities, NEV ownership levels, and the degree of shift from traditional

Measure Description:

The project will create local "light" vehicle networks, such as NEV networks. NEVs are classified in the California Vehicle Code as a "low speed vehicle". They are electric powered and must conform to applicable federal automobile safety standards. NEVs offer an alternative to traditional vehicle trips and can legally be used on roadways with speed limits of 35 MPH or less (unless specifically restricted). They are ideal for short trips up to 30 miles in length. To create an NEV network, the project will implement the necessary infrastructure, including NEV parking, charging facilities, striping, signage, and educational tools. NEV routes will be implemented throughout the project and will double as bicycle routes.

Measure Applicability:

- Urban, suburban, and rural context
- Small citywide or large multi-use developments
- Appropriate for mixed-use projects

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$\text{CO}_2 = \text{VMT} \times \text{EF}_{\text{running}}$$

Where:

traveled

for running emissions

VMT = vehicle miles

EF_{running} = emission factor

⁴⁷ Transit vehicles may also result in increases in emissions that are associated with electricity production or fuel use. The Project Applicant should consider these potential additional emissions when estimating mitigation for these measures.

Transportation

CEQA# MM-D-6
MP# TR-6

SDT-3

**Neighborhood / Site
Enhancement**

Inputs:

The following information needs to be provided by the Project Applicant:

- low vs. high penetration

Mitigation Method:

$$\% \text{ VMT reduction} = \text{Pop} * \text{Number} * \text{NEV}$$

Where

Penetration = Number of NEVs per household (0.04 to 1.0 from [1])

NEV = VMT reduction rate per household (12.7% from [2])

Assumptions:

Data based upon the following reference:

[1] City of Lincoln, MHM Engineers & Surveyors, *Neighborhood Electric Vehicle Transportation Program Final Report*, Issued 04/05/05

[2] City of Lincoln, *A Report to the California Legislature as required by Assembly Bill 2353, Neighborhood Electric Vehicle Transportation Plan Evaluation*, January 1, 2008.

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁴⁸
CO ₂ e	0.5 – 12.7% of running
PM	0.5 – 12.7% of running
CO	0.5 – 12.7% of running
NO _x	0.5 – 12.7% of running
SO ₂	0.5 – 12.7% of running
ROG	0.3 – 7.6% of total

Discussion:

The estimated number of NEVs per household may vary based on what the project estimates as a penetration rate for implementing an NEV network. Adjust according to project characteristics. The estimated reduction in VMT is for non-NEV miles traveled. The calculations below assume that NEV miles traveled replace regular vehicle travel.

⁴⁸ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

Transportation

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This may not be the case and the project should consider applying an appropriate discount rate on what percentage of VMT is actually replaced by NEV travel..

Example:

Sample calculations are provided below:

- Low Range % VMT Reduction (low penetration) = $0.04 * 12.7\% = 0.5\%$
- High Range % VMT Reduction (high penetration) = $1.0 * 12.7\% = 12.7\%$

Preferred Literature:

- 12.7% reduction in VMT per household
- Penetration rates: 0.04 to 1 NEV / household

The NEV Transportation Program plans to implement the following strategies: charging facilities, striping, signage, parking, education on NEV safety, and NEV/bicycle lines throughout the community. . One estimate of current NEV ownership reported roughly 600 NEVs in the city of Lincoln in 2008⁴⁹. With current estimated households of ~13,500⁵⁰, a low estimate of NEV penetration would be 0.04 NEV per household. A high NEV penetration can be estimated at 1 NEV per household. The 2007 survey of NEV users in Lincoln revealed an average use of about 3,500 miles per year [2]. With an estimated annual 27,500 VMT/household⁵¹, this results in a 12.7% reduction in VMT per household.

Alternative Literature:

- 0.5% VMT reduction for neighborhoods with internal NEV connections
- 1% VMT reduction for internal and external connections to surrounding neighborhoods
- 1.5% VMT reduction for internal NEV connections and connections to other existing NEV networks serving all other types of uses.

The Sacramento Metropolitan Air Quality Management District (SMAQMD) Recommended Guidance for Land Use Emission Reductions notes that current studies show NEVs do not replace gas-fueled vehicles as the primary vehicle. For the purpose

⁴⁹ Lincoln, California: A NEV-Friendly Community, Bennett Engineering, the City of Lincoln, and LincolnNEV, August 28, 2008 - <http://electricrickenmotorsports.com/news.php>

⁵⁰ SACOG Housing Estimates Statistics (<http://www.sacog.org/about/advocacy/pdf/factsheets/HousingStats.pdf>). Linearly interpolated 2008 household numbers between 2005 and 2035 projections.

⁵¹ SACOG SACSIm forecasts for VMT per household at 75.4 daily VMT per household * 365 days = 27521 annual VMT per household

Transportation

CEQA# MM-D-6
MP# TR-6

SDT-3

**Neighborhood / Site
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of providing incentives for developers to promote NEV use, a project will receive the above listed VMT reductions for implementation.

Alternative Literature Reference:

[1] Sacramento Metropolitan Air Quality Management District (SMAQMD)
Recommended Guidance for Land Use Emission Reductions. (p. 21)
<http://www.airquality.org/ceqa/GuidanceLUEmissionReductions.pdf>

Other Literature Reviewed:

None

Transportation

MP# LU-3.2.1 & 4.1.4

SDT-4

Neighborhood / Site
Enhancement

3.2.4 Create Urban Non-Motorized Zones

Range of Effectiveness: Grouped strategy. [See SDT-1]

Measure Description:

The project, if located in a central business district (CBD) or major activity center, will convert a percentage of its roadway miles to transit malls, linear parks, or other non-motorized zones. These features encourage non-motorized travel and thus a reduction in VMT.

This measure is most effective when applied with multiple design elements that encourage this use. Refer to Pedestrian Network Improvements (SDT-1) strategy for ranges of effectiveness in this category. The benefits of Urban Non-Motorized Zones alone have not been shown to be significant.

Measure Applicability:

- Urban context
- Appropriate for residential, retail, office, industrial, and mixed-use projects

Alternative Literature:

Alternate:

- 0.01 – 0.2% annual Vehicle Miles Traveled (VMT) reduction

Moving Cooler [1] assumes 2 – 6% of U.S. CBDs/activity centers will convert to non-motorized zones for the purpose of calculating the potential impact. At full implementation, this would result in a range of CBD/activity center annual VMT reduction of 0.07-0.2% and metro VMT reduction of 0.01-0.03%.

Alternate:

Pucher, Dill, and Handy (2010) [2] note several international case studies of urban non-motorized zones. In Bologna, Italy, vehicle traffic declined by 50%, and 8% of those arriving in the CBD came by bicycle after the conversion. In Lubeck, Germany, of those who used to drive, 12% switched to transit, walking, or bicycling with the conversion. In Aachen, Germany, car travel declined from 44% to 36%, but bicycling stayed constant at 3%

Notes:

No literature was identified that quantifies the benefits of this strategy at a smaller scale.

Transportation

MP# LU-3.2.1 & 4.1.4

SDT-4**Neighborhood / Site
Enhancement****Alternative Literature References:**

[1] Cambridge Systematics. *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*. Technical Appendices. Prepared for the Urban Land Institute.

http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendix%20B_Effectiveness_102209.pdf

[2] Pucher J., Dill, J., and Handy, S. *Infrastructure, Programs and Policies to Increase Bicycling: An International Review*. February 2010. *Preventive Medicine* 50 (2010) S106–S125.

http://policy.rutgers.edu/faculty/pucher/Pucher_Dill_Handy10.pdf

Other Literature Reviewed:

None

Transportation

MP# TR-4.1

SDT-5

Neighborhood / Site
Enhancement

3.2.5 Incorporate Bike Lane Street Design (on-site)

Range of Effectiveness: Grouped strategy. [See LUT-9]

Measure Description:

The project will incorporate bicycle lanes, routes, and shared-use paths into street systems, new subdivisions, and large developments. These on-street bike accommodations will be created to provide a continuous network of routes, facilitated with markings and signage. These improvements can help reduce peak-hour vehicle trips by making commuting by bike easier and more convenient for more people. In addition, improved bicycle facilities can increase access to and from transit hubs, thereby expanding the “catchment area” of the transit stop or station and increasing ridership. Bicycle access can also reduce parking pressure on heavily-used and/or heavily-subsidized feeder bus lines and auto-oriented park-and-ride facilities.

Refer to Improve Design of Development (LUT-9) strategy for overall effectiveness levels. The benefits of Bike Lane Street Design are small and should be grouped with the Improve Design of Development strategy to strengthen street network characteristics and enhance multi-modal environments.

Measure Applicability:

- Urban and suburban context
- Appropriate for residential, retail, office, industrial, and mixed-use projects

Alternative Literature:

Alternate:

- 1% increase in share of workers commuting by bicycle (for each additional mile of bike lanes per square mile)

Dill and Carr (2003) [1] showed that each additional mile of Type 2 bike lanes per square mile is associated with a 1% increase in the share of workers commuting by bicycle. Note that increasing by 1 mile is significant compared to the current average of 0.34 miles per square mile. Also, an increase in 1% in share of bicycle commuters would double the number of bicycle commuters in many areas with low existing bicycle mode share.

Alternate:

- 0.05 – 0.14% annual greenhouse gas (GHG) reduction
- 258 – 830% increase in bicycle community

Moving Cooler [2], based off of a national baseline, estimates 0.05% annual reduction in GHG emissions and 258% increase in bicycle commuting assuming 2 miles of bicycle

Transportation

MP# TR-4.1

SDT-5

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Enhancement

lanes per square mile in areas with density > 2,000 persons per square mile. For 4 miles of bicycle lanes, estimates 0.09% GHG reductions and 449% increase in bicycle commuting. For 8 miles of bicycle lanes, estimates 0.14% GHG reductions and 830% increase in bicycle commuting. Companion strategies assumed include bicycle parking at commercial destinations, busses fitted with bicycle carriers, bike accessible rapid transit lines, education, bicycle stations, end-trip facilities, and signage.

Alternate:

- 0.075% increase in bicycle commuting with each mile of bikeway per 100,000 residents

A before-and-after study by Nelson and Allen (1997) [3] of bicycle facility implementation found that each mile of bikeway per 100,000 residents increases bicycle commuting 0.075%, all else being equal.

Alternative Literature References:

- [1] Dill, Jennifer and Theresa Carr (2003). "Bicycle Commuting and Facilities in Major U.S. Cities: If You Build Them, Commuters Will Use Them – Another Look." *TRB 2003 Annual Meeting CD-ROM*.
- [2] Cambridge Systematics. *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*. Technical Appendices. Prepared for the Urban Land Institute.
http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendix%20B_Effectiveness_102209.pdf
- [3] Nelson, Arthur and David Allen (1997). "If You Build Them, Commuters Will Use Them; Cross-Sectional Analysis of Commuters and Bicycle Facilities." *Transportation Research Record 1578*.

Other Literature Reviewed:

None

Transportation

CEQA# MM T-1
MP# TR-4.1

SDT-6

**Neighborhood / Site
Enhancement**

3.2.6 Provide Bike Parking in Non-Residential Projects

Range of Effectiveness: Grouped strategy. [See LUT-9]

Measure Description:

A non-residential project will provide short-term and long-term bicycle parking facilities to meet peak season maximum demand. Refer to Improve Design of Development (LUT-9) strategy for overall effectiveness ranges. Bike Parking in Non-Residential Projects has minimal impacts as a standalone strategy and should be grouped with the Improve Design of Development strategy to encourage bicycling by providing strengthened street network characteristics and bicycle facilities.

Measure Applicability:

- Urban, suburban, and rural contexts
- Appropriate for retail, office, industrial, and mixed-use projects

Alternative Literature:

Alternate:

- 0.625% reduction in Vehicle Miles Traveled (VMT)

As a rule of thumb, the Center for Clean Air Policy (CCAP) guidebook [1] attributes a 1% to 5% reduction in VMT to the use of bicycles, which reflects the assumption that their use is typically for shorter trips. Based on the *CCAP Guidebook*, the TIAX report allots 2.5% reduction for all bicycle-related measures and a quarter of that for this bicycle parking alone. (This information is based on a TIAX review for Sacramento Metropolitan Air Quality Management District (SMAQMD).)

Alternate:

- 0.05 – 0.14% annual greenhouse gas (GHG) reduction
- 258 – 830% increase in bicycle community

Moving Cooler [2], based off of a national baseline, estimates 0.05% annual reduction in GHG emissions and 258% increase in bicycle commuting assuming 2 miles of bicycle lanes per square mile in areas with density > 2,000 persons per square mile. For 4 miles of bicycle lanes, *Moving Cooler* estimates 0.09% GHG reductions and 449% increase in bicycle commuting. For 8 miles of bicycle lanes, *Moving Cooler* estimates 0.14% GHG reductions and 830% increase in bicycle commuting. Companion strategies assumed include bicycle parking at commercial destinations, busses fitted with bicycle carriers, bike accessible rapid transit lines, education, bicycle stations, end-trip facilities, and signage.

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CEQA# MM T-1
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SDT-6

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Alternative Literature References:

- [1] Center For Clean Air Policy (CCAP) *Transportation Emission Guidebook*.
http://www.ccap.org/safe/guidebook/guide_complete.html; Based on results of
2005 literature search conducted by TIAX on behalf of SMAQMD.
- [2] Cambridge Systematics. *Moving Cooler: An Analysis of Transportation Strategies
for Reducing Greenhouse Gas Emissions*. Technical Appendices. Prepared for
the Urban Land Institute.
[http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendix%
20B_Effectiveness_102209.pdf](http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendix%20B_Effectiveness_102209.pdf)

Other Literature Reviewed:

None

Transportation

CEQA# MM T-3

MP# TR-4.1.2

SDT-7

Neighborhood / Site
Enhancement

3.2.7 Provide Bike Parking with Multi-Unit Residential Projects

Range of Effectiveness: Grouped strategy. [See LUT-9]

Measure Description:

Long-term bicycle parking will be provided at apartment complexes or condominiums without garages. Refer to Improve Design of Development (LUT-9) strategy for effectiveness ranges in this category. The benefits of Bike Parking with Multi-Unit Residential Projects have no quantified impacts and should be grouped with the Improve Design of Development strategy to encourage bicycling by providing strengthened street network characteristics and bicycle facilities.

Measure Applicability:

- Urban, suburban, or rural contexts
- Appropriate for residential projects

Alternative Literature:

No literature was identified that specifically looks at the quantitative impact of including bicycle parking at multi-unit residential sites.

Alternative Literature References:

None

Other Literature Reviewed:

None

Transportation

CEQA# MM T-17 & E-11
MP# TR-5.4

SDT-8

**Neighborhood / Site
Enhancement**

3.2.8 Provide Electric Vehicle Parking

Range of Effectiveness: Grouped strategy. [See SDT-3]

Measure Description:

This project will implement accessible electric vehicle parking. The project will provide conductive/inductive electric vehicle charging stations and signage prohibiting parking for non-electric vehicles. Refer to Neighborhood Electric Vehicle Network (SDT-3) strategy for effectiveness ranges in this category. The benefits of Electric Vehicle Parking may be quantified when grouped with the use of electric vehicles and or Neighborhood Electric Vehicle Network.

Measure Applicability:

- Urban or suburban contexts
- Appropriate for residential, retail, office, mixed use, and industrial projects

Alternative Literature:

No literature was identified that specifically looks at the quantitative impact of implementing electric vehicle parking.

Alternative Literature References:

None

Other Literature Reviewed:

None

Transportation

MP# TR-4.1

SDT-9

Neighborhood / Site
Enhancement

3.2.9 Dedicate Land for Bike Trails

Range of Effectiveness: Grouped strategy. [See LUT-9]

Measure Description:

Larger projects may be required to provide for, contribute to, or dedicate land for the provision of off-site bicycle trails linking the project to designated bicycle commuting routes in accordance with an adopted citywide or countywide bikeway plan.

Refer to Improve Design of Development (LUT-9) strategy for ranges of effectiveness in this category. The benefits of Land Dedication for Bike Trails have not been quantified and should be grouped with the Improve Design of Development strategy to strengthen street network characteristics and improve connectivity to off-site bicycle networks.

Measure Applicability:

- Urban, suburban, or rural contexts
- Appropriate for large residential, retail, office, mixed use, and industrial projects

Alternative Literature:

No literature was identified that specifically looks at the quantitative impact of implementing land dedication for bike trails.

Alternative Literature References:

None

Other Literature Reviewed:

None

Transportation

MP# LU-1.7 & LU-2.1.1.4

PDT-1

Parking Policy / Pricing

3.3 Parking Policy/Pricing

3.3.1 Limit Parking Supply

Range of Effectiveness: 5 – 12.5% vehicle miles travelled (VMT) reduction and therefore 5 – 12.5% reduction in GHG emissions.

Measure Description:

The project will change parking requirements and types of supply within the project site to encourage “smart growth” development and alternative transportation choices by project residents and employees. This will be accomplished in a multi-faceted strategy:

- Elimination (or reduction) of minimum parking requirements⁵²
- Creation of maximum parking requirements
- Provision of shared parking

Measure Applicability:

- Urban and suburban context
- Negligible in a rural context
- Appropriate for residential, retail, office, industrial and mixed-use projects
- Reduction can be counted only if spillover parking is controlled (via residential permits and on-street market rate parking) [See PPT-5 and PPT-7]

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$\text{CO}_2 = \text{VMT} \times \text{EF}_{\text{running}}$$

Where:

VMT = vehicle miles traveled

EF_{running} = emission factor for running emissions

Inputs:

The following information needs to be provided by the Project Applicant:

- ITE parking generation rate for project site
- Actual parking provision rate for project site

⁵² This may require changes to local ordinances and regulations.

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MP# LU-1.7 & LU-2.1.1.4

PDT-1

Parking Policy / Pricing

Mitigation Method:

$$\% \text{ VMT Reduction} = \frac{\text{Actual parking provision} - \text{ITE parking generation rate}}{\text{ITE parking generation rate}} \times 0.5$$

Assumptions:

Data based upon the following references:

[1] Nelson\Nygaard, 2005. Crediting Low-Traffic Developments (p. 16)
<http://www.montgomeryplanning.org/transportation/documents/TripGenerationAnalysisUsingURBEMIS.pdf>

All trips affected are assumed average trip lengths to convert from percentage vehicle trip reduction to VMT reduction (% vehicle trips = %VMT).

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁵³
CO ₂ e	5 – 12.5% of running
PM	5 – 12.5% of running
CO	5 – 12.5% of running
NO _x	5 – 12.5% of running
SO ₂	5 – 12.5% of running
ROG	3 – 7.5% of total

Discussion:

The literature suggests that a 50% reduction in conventional parking provision rates (per ITE rates) should serve as a typical ceiling for the reduction calculation. The upper range of VMT reduction will vary based on the size of the development (total number of spaces provided). ITE rates are used as baseline conditions to measure the effectiveness of this strategy.

Though not specifically documented in the literature, the degree of effectiveness of this measure will vary based on the level of urbanization of the project and surrounding areas, level of existing transit service, level of existing pedestrian and bicycle networks and other factors which would complement the shift away from single-occupant vehicle travel.

⁵³ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis.

Transportation

MP# LU-1.7 & LU-2.1.1.4

PDT-1

Parking Policy / Pricing

Example:

If the ITE parking generation rate for the project is 100 spaces, for a low range a 5% reduction in spaces is assumed. For a high range a 25% reduction in spaces is assumed.

- Low range % VMT Reduction = $[(100 - 95)/100] * 0.5 = 2.5\%$
- High range % VMT Reduction = $[(100 - 75)/100] * 0.5 = 12.5\%$

Preferred Literature:

To develop this model, Nelson\Nygaard [1] used the Institute of Transportation Engineers' *Parking Generation* handbook as the baseline figure for parking supply. This is assumed to be unconstrained demand. Trip reduction should only be credited if measures are implemented to control for spillover parking in and around the project, such as residential parking permits, metered parking, or time-limited parking.

Alternative Literature:

- 100% increase in transit ridership
- 100% increase in transit mode share

According to *TCRP Report 95, Chapter 18* [2], the central business district of Portland, Oregon implemented a maximum parking ratio of 1 space per 1,000 square feet of new buildings and implemented surface lot restrictions which limited conditions where buildings could be razed for parking. A "before and after" study was not conducted specifically for the maximum parking requirements and data comes from various surveys and published reports. Based on rough estimates the approximate parking ratio of 3.4 per 1,000 square feet in 1973 (for entire downtown) had been reduce to 1.5 by 1990. Transit mode share increased from 20% to 40%. The increases in transit ridership and mode share are not solely from maximum parking requirements. Other companion strategies, such as market parking pricing and high fuel costs, were in place.

Alternative Literature Sources:

[1] TCRP Report 95, Chapter 18: Parking Management and Supply: Traveler Response to *Transportation System Changes*. (p. 18-6)

http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_95c18.pdf

Other Literature Reviewed:

None

Transportation

MP# LU-1.7 **PDT-2** Parking Policy / Pricing

3.3.2 Unbundle Parking Costs from Property Cost

Range of Effectiveness: 2.6 – 13% vehicles miles traveled (VMT) reduction and therefore 2.6 – 13% reduction in GHG emissions.

Measure Description:

This project will unbundle parking costs from property costs. Unbundling separates parking from property costs, requiring those who wish to purchase parking spaces to do so at an additional cost from the property cost. This removes the burden from those who do not wish to utilize a parking space. Parking will be priced separately from home rents/purchase prices or office leases. An assumption is made that the parking costs are passed through to the vehicle owners/drivers utilizing the parking spaces.

Measure Applicability:

- Urban and suburban context
- Negligible impact in a rural context
- Appropriate for residential, retail, office, industrial and mixed-use projects
- Complementary strategy includes Workplace Parking Pricing. Though not required, implementing workplace parking pricing ensures the market signal from unbundling parking is transferred to the employee.

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$CO_2 = VMT \times EF_{\text{running}}$$

Where:

traveled VMT = vehicle miles

for running emissions EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Monthly parking cost for project site

Mitigation Method:

$$\% \text{ Reduction in VMT} = \text{Change in vehicle cost} * \text{elasticity} * A$$

Transportation

MP# LU-1.7 **PDT-2** Parking Policy / Pricing

Where:

- -0.4 = elasticity of vehicle ownership with respect to total vehicle costs (lower end per VTPI)
- Change in vehicle cost = monthly parking cost * (12 / \$4,000), with \$4,000 representing the annual vehicle cost per VTPI [1]
- A: 85% = adjustment from vehicle ownership to VMT (see Appendix C for detail)

Assumptions:

Data based upon the following references:

[1] Victoria Transport Policy Institute, *Parking Requirement Impacts on Housing Affordability*; <http://www.vtpi.org/park-hou.pdf>; January 2009; accessed March 2010. (Annual/monthly parking fees estimated by VTPI in 2009) (p. 8, Table 3)

- For the elasticity of vehicle ownership, VTPI cites Phil Goodwin, Joyce Dargay and Mark Hanly (2003), *Elasticities Of Road Traffic And Fuel Consumption With Respect To Price And Income: A Review*, ESRC Transport Studies Unit, University College London (www.transport.ucl.ac.uk), commissioned by the UK Department of the Environment, Transport and the Regions (now UK Department for Transport); J.O. Jansson (1989), "Car Demand Modeling and Forecasting," *Journal of Transport Economics and Policy*, May 1989, pp. 125-129; Stephen Glaister and Dan Graham (2000), *The Effect of Fuel Prices on Motorists*, AA Motoring Policy Unit (www.theaa.com) and the UK Petroleum Industry Association (http://195.167.162.28/policyviews/pdf/effect_fuel_prices.pdf); and Thomas F. Golob (1989), "The Casual Influences of Income and Car Ownership on Trip Generation by Mode", *Journal of Transportation Economics and Policy*, May 1989, pp. 141-162

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁵⁴
CO ₂ e	2.6 – 13% of running
PM	2.6 – 13% of running
CO	2.6 – 13% of running

⁵⁴ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

Transportation

MP# LU-1.7 **PDT-2** **Parking Policy / Pricing**

NOx	2.6 – 13% of running
SO ₂	2.6 – 13% of running
ROG	1.6 – 7.8% of total

Discussion:

As discussed in the preferred literature section, monthly parking costs typically range from \$25 to \$125. The lower end of the elasticity range provided by VTPI is used here to be conservative.

Example:

Sample calculations are provided below:

- Low Range % VMT Reduction = $\$25 * 12 / \$4000 * 0.4 * 85\% = 2.6\%$
- High Range % VMT Reduction = $\$125 * 12 / \$4000 * 0.4 * 85\% = 12.8\%$

Preferred Literature:

- -0.4 to -1.0 = elasticity of vehicle ownership with respect to total vehicle costs

The above elasticity comes from a synthesis of literature. As noted in the VTPI report [1], a 10% increase in total vehicle costs (operating costs, maintenance, fuel, parking, etc.) reduces vehicle ownership between 4% and 10%. The report, estimating \$4,000 in annual costs per vehicle, calculated vehicle ownership reductions from residential parking pricing.

Vehicle Ownership Reductions from Residential Parking Pricing

Annual (Monthly) Parking Fee	-0.4 Elasticity	-0.7 Elasticity	-1.0 Elasticity
\$300 (\$25)	4%	6%	8%
\$600 (\$50)	8%	11%	15%
\$900 (\$75)	11%	17%	23%
\$1,200 (\$100)	15%	23%	30%
\$1,500 (\$125)	19%	28%	38%

Alternative Literature:

None

Alternative Literature Notes:

None

Other Literature Reviewed:

None

Transportation

PDT-3 Parking Policy / Pricing

3.3.3 Implement Market Price Public Parking (On-Street)

Range of Effectiveness: 2.8 – 5.5% vehicle miles traveled (VMT) reduction and therefore 2.8 – 5.5% reduction in GHG emissions.

Measure Description:

This project and city in which it is located will implement a pricing strategy for parking by pricing all central business district/employment center/retail center on-street parking. It will be priced to encourage “park once” behavior. The benefit of this measure above that of paid parking at the project only is that it deters parking spillover from project-supplied parking to other public parking nearby, which undermine the vehicle miles traveled (VMT) benefits of project pricing. It may also generate sufficient area-wide mode shifts to justify increased transit service to the area.

Measure Applicability:

- Urban and suburban context
- Negligible impact in a rural context
- Appropriate for retail, office, and mixed-use projects
- Applicable in a specific or general plan context only
- Reduction can be counted only if spillover parking is controlled (via residential permits)
- Study conducted in a downtown area, and thus should be applied carefully if project is not in a central business/activity center

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$CO_2 = VMT \times EF_{\text{running}}$$

Where:

traveled

for running emissions

VMT = vehicle miles

EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Location of project site: low density suburb, suburban center, or urban location

Transportation

PDT-3 Parking Policy / Pricing

- Percent increase in on-street parking prices (minimum 25% needed)

Mitigation Method:

$$\% \text{ VMT Reduction} = \text{Park\$} * B$$

Where:

Park\$ = Percent increase in on-street parking prices (minimum of 25% increase [1])

B = Elasticity of VMT with respect to parking price (0.11, from [2])

Assumptions:

Data based upon the following references:

[1] Cambridge Systematics. *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*. Technical Appendices. Prepared for the Urban Land Institute. (p. B-10)
 Moving Cooler’s parking pricing analysis cited Victoria Transport Policy Institute, *How Prices and Other Factors Affect Travel Behavior* (http://www.vtpi.org/tdm/tdm11.htm#_Toc161022578). The VTPI paper summarized the elasticities found in the Hensher and King paper. David A. Hensher and Jenny King (2001), “Parking Demand and Responsiveness to Supply, Price and Location in Sydney Central Business District,” *Transportation Research A*, Vol. 35, No. 3 (www.elsevier.com/locate/tra), March 2001, pp. 177-196.

[2] J. Peter Clinch and J. Andrew Kelly (2003), *Temporal Variance Of Revealed Preference On-Street Parking Price Elasticity*, Department of Environmental Studies, University College Dublin (www.environmentaleconomics.net). (p. 2) <http://www.ucd.ie/gpep/research/workingpapers/2004/04-02.pdf> As referenced in VTPI: http://www.vtpi.org/tdm/tdm11.htm#_Toc161022578

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁵⁵
CO ₂ e	2.8 – 5.5% of running

⁵⁵ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

Transportation

PDT-3 Parking Policy / Pricing

PM	2.8 – 5.5% of running
CO	2.8 – 5.5% of running
NOx	2.8 – 5.5% of running
SO ₂	2.8 – 5.5% of running
ROG	1.7 – 3.3% of total

Discussion:

The range of parking price increases should be a minimum of 25% and a maximum of 50%. The minimum is based on Moving Cooler [1] discussions which state that a less than 25% increase would not be a sufficient amount to reduce VMT. The case study [2] looked at a 50% price increase, and thus no conclusions can be made on the elasticities above a 50% increase. This strategy may certainly be implemented at a higher price increase, but VMT reductions should be capped at results from a 50% increase to be conservative.

Example:

Assuming a baseline on-street parking price of \$1, sample calculations are provided below:

- Low Range % VMT Reduction (25% increase) = $(\$1.25 - \$1)/\$1 * 0.11 = 2.8\%$
- High Range % VMT Reduction (50% increase) = $(\$1.50 - \$1)/\$1 * 0.11 = 5.5\%$

Preferred Literature:

- -0.11 parking demand elasticity with respect to parking prices

The Clinch & Kelly study [2] of parking meters looked at the impacts of a 50% price increase in the cost of on-street parking. The case study location was a central on-street parking area with a 3-hour time limit and a mix of business and non-business uses. The study concluded the parking increases resulted in an estimated average price elasticity of demand of -0.11, while factoring in parking duration results in an elasticity of -0.2 (cost increases also affect the amount of time cars are parked).

Though this study is international (Dublin, Ireland), it represents a solid study of parking meter price increases and provides a conservative estimate of elasticity compared to the alternate literature.

Alternative Literature:

Alternate:

- -0.19 shopper parking elasticity with respect to parking price
- -0.48 commuter parking elasticity with respect to parking price

Transportation

PDT-3

Parking Policy / Pricing

The *TCRP 95 Chapter 13* [3] report looked at a case study of the city of San Francisco implementing a parking tax on all public and private off-street parking (in 1970). Based on the number of cars parked, the report estimated parking price elasticities of -0.19 to -0.48, an average over a three year period.

Alternate:

- -0.15 VMT elasticity with respect to parking prices (for low density regions)
- -0.47 VMT elasticity with respect to parking prices (for high density regions)

The Moving Cooler analysis assumes a 25 percent increase in on-street parking fees is a starting point sufficient to reduce VMT. Using the elasticities stated above, Moving Cooler estimates an annual percent VMT reduction from 0.42% - 1.14% for a range of regions from a large low density region to a small high density region. The calculations assume that pricing occurs at the urban central business district/employment center/retail center, one-fourth of all person trips are commute based trips, and approximately 15% of commute trips are to the CBD or regional activity centers.

Alternative Literature References:

[3] TCRP Report 95. *Chapter 13: Parking Pricing and Fees - Traveler Response to Transportation System Changes.*

http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_95c13.pdf. (p.13-42)

Other Literature Reviewed:

None

Transportation

PDT-4

Parking Policy / Pricing

3.3.4 Require Residential Area Parking Permits

Range of Effectiveness: Grouped strategy. (See PPT-1, PPT-2, and PPT-3)

Measure Description:

This project will require the purchase of residential parking permits (RPPs) for long-term use of on-street parking in residential areas. Permits reduce the impact of spillover parking in residential areas adjacent to commercial areas, transit stations, or other locations where parking may be limited and/or priced. Refer to Parking Supply Limitations (PPT-1), Unbundle Parking Costs from Property Cost (PPT-2), or Market Rate Parking Pricing (PPT-3) strategies for the ranges of effectiveness in these categories. The benefits of Residential Area Parking Permits strategy should be combined with any or all of the above mentioned strategies, as providing RPPs are a key complementary strategy to other parking strategies.

Measure Applicability:

- Urban context
- Appropriate for residential, retail, office, mixed use, and industrial projects

Alternative Literature:

- -0.45 = elasticity of vehicle miles traveled (VMT) with respect to price
- 0.08% greenhouse gas (GHG) reduction
- 0.09-0.36% VMT reduction

Moving Cooler [1] suggested residential parking permits of \$100-\$200 annually. This mitigation would impact home-based trips, which are reported to represent approximately 60% of all urban trips. The range of VMT reductions can be attributed to the type of urban area. VMT reductions for \$100 annual permits are 0.09% for large, high-density; 0.12% for large, low-density; 0.12% for medium, high-density; 0.18% for medium, low-density; 0.18% for small, high-density; and 0.12% for small, low-density. VMT reductions for \$200 annual permits are 0.18% for large, high-density; 0.24% for large, low-density; 0.24% for medium, high-density; 0.36% for medium, low-density; 0.36% for small, high-density; and 0.24% for small, low-density.

Alternative Literature References:

- [1] Cambridge Systematics. *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*. Technical Appendices. Prepared for the Urban Land Institute.
http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendix%20B_Effectiveness_102209.pdf

Transportation

TRT-1

Commute Trip Reduction

3.4 Commute Trip Reduction Programs

3.4.1 Implement Commute Trip Reduction Program - Voluntary

Commute Trip Reduction Program – Voluntary, is a multi-strategy program that encompasses a combination of individual measures described in sections 3.4.3 through 3.4.9. It is presented as a means of preventing double-counting of reductions for individual measures that are included in this strategy. It does so by setting a maximum level of reductions that should be permitted for a combined set of strategies within a voluntary program.

Range of Effectiveness: 1.0 – 6.2% commute vehicle miles traveled (VMT) Reduction and therefore 1.0 – 6.2% reduction in commute trip GHG emissions.

Measure Description:

The project will implement a voluntary Commute Trip Reduction (CTR) program with employers to discourage single-occupancy vehicle trips and encourage alternative modes of transportation such as carpooling, taking transit, walking, and biking. The main difference between a voluntary and a required program is:

- Monitoring and reporting is not required
- No established performance standards (i.e. no trip reduction requirements)

The CTR program will provide employees with assistance in using alternative modes of travel, and provide both “carrots” and “sticks” to encourage employees. The CTR program should include all of the following to apply the effectiveness reported by the literature:

- Carpooling encouragement
- Ride-matching assistance
- Preferential carpool parking
- Flexible work schedules for carpools
- Half time transportation coordinator
- Vanpool assistance
- Bicycle end-trip facilities (parking, showers and lockers)

Other strategies may also be included as part of a voluntary CTR program, though they are not included in the reductions estimation and thus are not incorporated in the estimated VMT reductions. These include: new employee orientation of trip reduction and alternative mode options, event promotions and publications, flexible work schedule for all employees, transit subsidies, parking cash-out or priced parking, shuttles, emergency ride home, and improved on-site amenities.

Transportation

TRT-1

Commute Trip Reduction

Measure Applicability:

- Urban and suburban context
- Negligible in a rural context, unless large employers exist, and suite of strategies implemented are relevant in rural settings
- Appropriate for retail, office, industrial and mixed-use projects

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$\text{CO}_2 = \text{VMT} \times \text{EF}_{\text{running}}$$

Where:

traveled

for running emissions

VMT = vehicle miles

EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Percentage of employees eligible
- Location of project site: low density suburb, suburban center, or urban location

Mitigation Method:

$$\% \text{ VMT Reduction} = A * B$$

Where

A = % reduction in commute VMT (from [1])

B = % employees eligible

Detail:

- A: 5.2% (low density suburb), 5.4% (suburban center), 6.2% (urban) annual reduction in commute VMT (from [1])

Assumptions:

Data based upon the following references:

Transportation

TRT-1 Commute Trip Reduction

- Cambridge Systematics. *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*. Technical Appendices. Prepared for the Urban Land Institute. (Table 5.13)
http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendix%20B_Effectiveness_102209.pdf

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁵⁶
CO ₂ e	1.0 – 6.2% of running
PM	1.0 – 6.2% of running
CO	1.0 – 6.2% of running
NO _x	1.0 – 6.2% of running
SO ₂	1.0 – 6.2% of running
ROG	0.6 –3.7% of total

Discussion:

This set of strategies typically serves as a complement to the more effective workplace CTR strategies such as pricing and parking cash out.

Example:

Sample calculations are provided below:

- Low Range % VMT Reduction (low density suburb and 20% eligible) = 5.2% * 0.2 = 1.0%
- High Range % VMT Reduction (urban and 100% eligible) = 6.2% * 1 = 6.2%

Preferred Literature:

- 5.2 - 6.2% commute VMT reduction

Moving Cooler assumes the employer support program will include: carpooling, ride-matching, preferential carpool parking, flexible work schedules for carpools, a half-time transportation coordinator, vanpool assistance, bicycle parking, showers, and locker facilities. The report assigns 5.2% reduction to large metropolitan areas, 5.4% to medium metropolitan areas, and 6.2% to small metropolitan areas.

⁵⁶ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

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TRT-1

Commute Trip Reduction

Alternative Literature:

Alternate:

- 15-19% reduction in commute vehicle trips

TCRP 95 Draft Chapter 19 [2] looked at a sample of 82 Transportation Demand Management (TDM) programs. Low support TDM programs had a 15% reduction, medium support programs 15.9%, and high support 19%. Low support programs had little employer effort. These programs may include rideshare matching, distribution of transit flyers, but have little employer involvement. With medium support programs, employers were involved with providing information regarding commute options and programs, a transportation coordinator (even if part-time), and assistance for ridesharing and transit pass purchases. With high support programs, the employer was providing most of the possible strategies. The sample of programs should not be construed as a random sample and probably represent above average results.

Alternate:

- 4.16 – 4.76% reduction in commute VMT

The Herzog study [3] compared a group of employees, who were eligible for comprehensive commuter benefits (with financial incentives, services such as guaranteed ride home and carpool matching, and informational campaigns) and general marketing information, to a reference group of employees not eligible for commuter benefits. The study showed a 4.79% reduction in VMT, assuming 75% of the carpoolers were traveling to the same worksite. There was a 4.16% reduction in VMT, assuming only 50% of carpoolers were traveling to the same worksite.

Alternate:

- 8.5% reduction in vehicle commute trips

Employer survey results [4] showed that employees at the surveyed companies made 8.5% fewer vehicle trips to work than had been found in the baseline surveys conducted by large employers under the area's trip reduction regulation (i.e. comparing voluntary program with a mandatory regulation). This implied that the 8.5% reduction is a conservative estimate as it is compared to another trip reduction strategy, rather than comparing to a baseline with no reduction strategies implemented. Another survey also showed that 68% of commuters drove alone to work when their employer did not encourage trip reduction. It revealed that with employer encouragement, the drive-alone rate fell 5 percentage points to 63%.

This strategy assumes a companion strategy of employer encouragement. The literature did not specify what commute options each employer provided as part of the program. Options provided may have ranged from simply providing public transit

Transportation

TRT-1

Commute Trip Reduction

information to implementing a full TDM program with parking cash out, flex hours, emergency ride home, etc. This San Francisco Bay Area survey worked to determine the extent and impact of the emissions saved through voluntary trip reduction efforts (www.cleanairpartnership.com). It identified 454 employment sites with voluntary trip reduction programs and conducted a selected random survey of the more than 400,000 employees at those sites. The study concluded that employer encouragement makes a significant difference in employees' commute choices.

Alternative Literature References:

[2] Pratt, Dick. Personal Communication Regarding the Draft of TCRP 95 Traveler Response to Transportation System Changes – Chapter 19 Employer and Institutional TDM Strategies.

[3] Herzog, Erik, Stacey Bricka, Lucie Audette, and Jeffra Rockwell. 2006. "Do Employee Commuter Benefits Reduce Vehicle Emissions and Fuel Consumption? Results of Fall 2004 Survey of Best Workplaces for Commuters." *Transportation Research Record* 1956, 34-41. (Table 8)

[4] Transportation Demand Management Institute of the Association for Commuter Transportation. *TDM Case Studies and Commuter Testimonials*. Prepared for the US EPA. 1997. (p. 25-28)
<http://www.epa.gov/OMS/stateresources/rellinks/docs/tmccases.pdf>

Other Literature Reviewed:

None

Transportation

CEQA# T-19
MP# MO-3.1

TRT-2

Commute Trip Reduction

3.4.2 Implement Commute Trip Reduction Program – Required Implementation/Monitoring

Commute Trip Reduction Program – Required, is a multi-strategy program that encompasses a combination of individual measures described in sections 3.4.3 through 3.4.9. It is presented as a means of preventing double-counting of reductions for individual measures that are included in this strategy. It does so by setting a maximum level of reduction that should be permitted for a combined set of strategies within a program that is contractually required of the development sponsors and managers and accompanied by a regular performance monitoring and reporting program.

Range of Effectiveness: 4.2 – 21.0% commute vehicle miles traveled (VMT) reduction and therefore 4.2 – 21.0% reduction in commute trip GHG emissions.

Measure Description:

The jurisdiction will implement a Commute Trip Reduction (CTR) ordinance. The intent of the ordinance will be to reduce drive-alone travel mode share and encourage alternative modes of travel. The critical components of this strategy are:

- Established performance standards (e.g. trip reduction requirements)
- Required implementation
- Regular monitoring and reporting

Regular monitoring and reporting will be required to assess the project's status in meeting the ordinance goals. The project should use existing ordinances, such as those in the cities of Tucson, Arizona and South San Francisco, California, as examples of successful CTR ordinance implementations. The City of Tucson requires employers with 100+ employees to participate in the program. An Alternative Mode Usage (AMU) goal and VMT reduction goal is established and each year the goal is increased. Employers persuade employees to commute via an alternative mode of transportation at least one day a week (including carpooling, vanpooling, transit, walking, bicycling, telecommuting, compressed work week, or alternatively fueled vehicle). The Transportation Demand Management (TDM) Ordinance in South San Francisco requires all non-residential developments that produce 100 average daily vehicle trips or more to meet a 35% non-drive-alone peak hour requirement with fees assessed for non-compliance. Employers have established significant CTR programs as a result.

Measure Applicability:

- Urban and suburban context
- Negligible in a rural context, unless large employers exist, and suite of strategies implemented are relevant in rural settings
- Jurisdiction level only
- Strategies in this case study calculations included:

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TRT-2

Commute Trip Reduction

- -
 - shuttles to transit station
 - servicing the Bay Area
 -
- Parking cash out
 - Employer sponsored
 - Employer sponsored bus
 - Transit subsidies

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$\text{CO}_2 = \text{VMT} \times \text{EF}_{\text{running}}$$

Where:

traveled

for running emissions

VMT = vehicle miles

EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Percentage of employees eligible

Mitigation Method:

$$\% \text{ VMT Reduction} = A * B$$

Where

A = % shift in vehicle mode share of commute trips (from [1])

B = % employees eligible

C = Adjustment from vehicle mode share to commute VMT

Detail:

- A: 21% reduction in vehicle mode share (from [1])
- C: 1.0 (see Appendix C for detail)

Transportation

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TRT-2

Commute Trip Reduction

Assumptions:

Data based upon the following references:

[1] Nelson/Nygaard (2008). *South San Francisco Mode Share and Parking Report for Genentech, Inc.*(p. 8)

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁵⁷
CO ₂ e	4.2 – 21.0% of running
PM	4.2 – 21.0% of running
CO	4.2 – 21.0% of running
NO _x	4.2 – 21.0% of running
SO ₂	4.2 – 21.0% of running
ROG	2.5 – 12.6% of total

Discussion:

Example:

Sample calculations are provided below:

- Low Range % VMT Reduction (20% eligibility) = 21% * 20% = 4.2%
- High Range % VMT Reduction (100% eligibility) = 21% * 100% = 21%

Preferred Literature:

- 21% reduction in vehicle mode share

Genentech, in South San Francisco [1], achieved a 34% non-single-occupancy vehicle (non-SOV) mode share (66% SOV) in 2008. Since 2006 when SOV mode share was 74% (26% non-SOV), there has been a reduction of over 10% in drive alone share. Carpool share was 12% in 2008, compared to 11.57% in 2006. Genentech has a significant TDM program including parking cash out (\$4/day), express GenenBus service around the Bay Area, free shuttles to Bay Area Rapid Transit (BART) and Caltrain, and transit subsidies. The Genentech campus surveyed for this study is a large, single-tenant campus. Taking an average transit mode share in a suburban development of 1.3% (NHTS,

⁵⁷ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

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Commute Trip Reduction

http://www.dot.ca.gov/hq/tsip/tab/documents/travelsurveys/Final2001_Stw_Travel_Survey_WkdayRpt.pdf (SCAG, SANDAG, Fresno County)), this is an estimated decrease from 98.7% to 78% vehicle mode share (66% SOV + 12% carpool), a 21% reduction in vehicle mode share.

Alternative Literature:

Alternate:

- 10.7% average annual increase in use of non-SOV commute modes

For the City of Tucson [2], use of alternative commute modes increased 64.3% between 1989 and 1995. Employers integrated several key activities into their TDM plans: disseminating information, developing company policies to support TDM, investing in facility enhancements, conducting promotional campaigns, and offering subsidies or incentives to encourage AMU.

Alternative Literature References:

[2] Transportation Demand Management Institute of the Association for Commuter Transportation. *TDM Case Studies and Commuter Testimonials*. Prepared for the US EPA. 1997. (p. 17-19)

<http://www.epa.gov/OMS/stateresources/rellinks/docs/tmccases.pdf>

Other Literature Reviewed:

None

Transportation

MP# MO-3.1 **TRT-3** Commute Trip Reduction

3.4.3 Provide Ride-Sharing Programs

Range of Effectiveness: 1 – 15% commute vehicle miles traveled (VMT) reduction and therefore 1 - 15% reduction in commute trip GHG emissions.

Measure Description:

Increasing the vehicle occupancy by ride sharing will result in fewer cars driving the same trip, and thus a decrease in VMT. The project will include a ride-sharing program as well as a permanent transportation management association membership and funding requirement. Funding may be provided by Community Facilities, District, or County Service Area, or other non-revocable funding mechanism. The project will promote ride-sharing programs through a multi-faceted approach such as:

- Designating a certain percentage of parking spaces for ride sharing vehicles
- Designating adequate passenger loading and unloading and waiting areas for ride-sharing vehicles
- Providing a web site or message board for coordinating rides

Measure Applicability:

- Urban and suburban context
- Negligible impact in many rural contexts, but can be effective when a large employer in a rural area draws from a workforce in an urban or suburban area, such as when a major employer moves from an urban location to a rural location.
- Appropriate for residential, retail, office, industrial, and mixed-use projects

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$CO_2 = VMT \times EF_{\text{running}}$$

Where:

traveled VMT = vehicle miles

for running emissions EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Percentage of employees eligible

Transportation

MP# MO-3.1 **TRT-3** **Commute Trip Reduction**

- Location of project site: low density suburb, suburban center, or urban location

Mitigation Method:

$$\% \text{ VMT Reduction} = \text{Commute} * \text{Employee}$$

Where

Commute = % reduction in commute VMT (from [1])

Employee = % employees eligible

Detail:

- Commute: 5% (low density suburb), 10% (suburban center), 15% (urban) annual reduction in commute VMT (from [1])

Assumptions:

Data based upon the following references:

[1] VTPI. *TDM Encyclopedia*. <http://www.vtpi.org/tdm/tdm34.htm>; Accessed 3/5/2010.

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁵⁸
CO ₂ e	1 – 15% of running
PM	1 – 15% of running
CO	1 – 15% of running
NO _x	1 – 15% of running
SO ₂	1 – 15% of running
ROG	0.6 – 9% of total

Discussion:

This strategy is often part of Commute Trip Reduction (CTR) Program, another strategy documented separately (see TRT-1 and TRT-2). The Project Applicant should take care not to double count the impacts.

Example:

Sample calculations are provided below:

⁵⁸ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

Transportation

MP# MO-3.1

TRT-3

Commute Trip Reduction

- Low Range % VMT Reduction (low density suburb and 20% eligible) = $5\% * 20\% = 1\%$
- High Range % VMT Reduction (urban and 100% eligible) = $15\% * 1 = 15\%$

Preferred Literature:

- 5 – 15% reduction of commute VMT

The *Transportation Demand Management (TDM) Encyclopedia* notes that because rideshare passengers tend to have relatively long commutes, mileage reductions can be relatively large with rideshare. If ridesharing reduces 5% of commute trips it may reduce 10% of vehicle miles because the trips that are reduced are twice as long as average. Rideshare programs can reduce up to 8.3% of commute VMT, up to 3.6% of total regional VMT, and up to 1.8% of regional vehicle trips (Apogee, 1994; TDM Resource Center, 1996). Another study notes that ridesharing programs typically attract 5-15% of commute trips if they offer only information and encouragement, and 10-30% if they also offer financial incentives such as parking cash out or vanpool subsidies (York and Fabricatore, 2001).

Alternative Literature:

- Up to 1% reduction in VMT (if combined with two other strategies)

Per the Nelson\Nygaard report [2], ride-sharing would fall under the category of a minor TDM program strategy. The report allows a 1% reduction in VMT for projects with at least three minor strategies.

Alternative Literature References:

[2] Nelson\Nygaard, 2005. *Crediting Low-Traffic Developments* (p.12).

<http://www.montgomeryplanning.org/transportation/documents/TripGenerationAnalysisUsingURBEMIS.pdf>

Criterion Planner/Engineers and Fehr & Peers Associates (2001). Index 4D Method. *A Quick-Response Method of Estimating Travel Impacts from Land-Use Changes*. Technical Memorandum prepared for US EPA, October 2001.

Other Literature Reviewed:

None

Transportation

MP# MO-3.1

TRT-4

Commute Trip Reduction

3.4.4 Implement Subsidized or Discounted Transit Program

Range of Effectiveness: 0.3 – 20.0% commute vehicle miles traveled (VMT) reduction and therefore a 0.3 – 20.0% reduction in commute trip GHG emissions.

Measure Description:

This project will provide subsidized/discounted daily or monthly public transit passes. The project may also provide free transfers between all shuttles and transit to participants. These passes can be partially or wholly subsidized by the employer, school, or development. Many entities use revenue from parking to offset the cost of such a project.

Measure Applicability:

- Urban and suburban context
- Negligible in a rural context
- Appropriate for residential, retail, office, industrial, and mixed-use projects

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$CO_2 = VMT \times EF_{\text{running}}$$

Where:

traveled

for running emissions

VMT = vehicle miles

EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Percentage of project employees eligible
- Transit subsidy amount
- Location of project site: low density suburb, suburban center, or urban location

Mitigation Method:

$$\% \text{ VMT Reduction} = A * B * C$$

Where

A = % reduction in commute vehicle trips (VT) (from [1])

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MP# MO-3.1 **TRT-4** Commute Trip Reduction

B = % employees eligible
 C = Adjustment from commute VT to commute VMT

Detail:

- A:

	Daily Transit Subsidy			
	\$0.75	\$1.49	\$2.98	\$5.96
Worksite Setting	% Reduction in Commute VT			
Low density suburb	1.5%	3.3%	7.9%	20.0%*
Suburban center	3.4%	7.3%	16.4%	20.0%*
Urban location	6.2%	12.9%	20.0%*	20.0%*
* Discounts greater than 20% will be capped, as they exceed levels recommended by TCRP 95 Draft Chapter 19 and other literature.				
- C: 1.0 (see Appendix C for detail)

Assumptions:

Data based upon the following references:

[1] Nelson\Nygaard, 2010. *City of Santa Monica Land Use and Circulation Element EIR Report, Appendix – Santa Monica Luce Trip Reduction Impacts Analysis* (p.401).

[2] Nelson\Nygaard used the following literature sources: VTPI, Todd Litman, *Transportation Elasticities*, <http://www.vtpi.org/elasticities.pdf>. Comsis Corporation (1993), *Implementing Effective Travel Demand Management Measures: Inventory of Measures and Synthesis of Experience*, USDOT and Institute of Transportation Engineers (www.ite.org); www.bts.gov/ntl/DOCS/474.html.

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁵⁹
CO ₂ e	0.3 - 20% of running
PM	0.3 - 20% of running
CO	0.3 - 20% of running
NOx	0.3 - 20% of running
SO ₂	0.3 - 20% of running
ROG	0.18 - 12% of total

⁵⁹ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

Transportation

MP# MO-3.1 **TRT-4** **Commute Trip Reduction**

Discussion:

This strategy is often part of a Commute Trip Reduction (CTR), another strategy documented separately (see TRT-1 and TRT-2). The Project Applicant should take care not to double count the impacts.

The literature evaluates this strategy in relation to the employer, but keep in mind that this strategy can also be implemented by a school or the development as a whole.

Example:

Sample calculations are provided below:

- Low Range % VMT Reduction (\$0.75, low density suburb, 20% eligible) = 1.5% * 20% = 0.3%
- High Range % VMT Reduction (\$5.96, urban, 100% eligible) = 20% * 100% = 20%

Preferred Literature:

Commute Vehicle Trip Reduction	Daily Transit Subsidy			
	\$0.75	\$1.49	\$2.98	\$5.96
Worksite Setting				
Low density suburb, rideshare oriented	0.1%	0.2%	0.6%	1.9%
Low density suburb, mode neutral	1.5%	3.3%	7.9%	21.7%*
Low density suburb, transit oriented	2.0%	4.2%	9.9%	23.2%*
Activity center, rideshare oriented	1.1%	2.4%	5.8%	16.5%
Activity center, mode neutral	3.4%	7.3%	16.4%	38.7%*
Activity center, transit oriented	5.2%	10.9%	23.5%*	49.7%*
Regional CBD/Corridor, rideshare oriented	2.2%	4.7%	10.9%	28.3%*
Regional CBD/Corridor, mode neutral	6.2%	12.9%	26.9%*	54.3%*
Regional CBD/Corridor, transit oriented	9.1%	18.1%	35.5%*	64.0%*

* Discounts greater than 20% will be capped, as they exceed levels recommended by *TCRP 95 Draft Chapter 19* and other literature.

Nelson\Nygaard (2010) updated a commute trip reduction table from VTPI Transportation Elasticities to account for inflation since the data was compiled. Data regarding commute vehicle trip reductions was originally from a study conducted by Comsis Corporation and the Institute of Transportation Engineers (ITE).

Alternative Literature:

Alternate:

- 2.4-30.4% commute vehicle trip reduction (VTR)

Transportation

MP# MO-3.1

TRT-4

Commute Trip Reduction

TCRP 95 Draft Chapter 19 [2] indicates transit subsidies in areas with good transit and restricted parking have a commute VTR of 30.4%; good transit but free parking, a commute VTR of 7.6%; free parking and limited transit 2.4%. Programs with transit subsidies have an average commute VTR of 20.6% compared with an average commute VTR of 13.1% for sites with non-transit fare subsidies.

Alternate:

- 0.03-0.12% annual greenhouse gas (GHG) reduction

Moving Cooler [3] assumed price elasticities of -0.15, -0.2, and -0.3 for lower fares 25%, 33%, and 50%, respectively. *Moving Cooler* assumes average vehicle occupancy of 1.43 and a VMT/trip of 5.12.

Alternative Literature References:

[2] Pratt, Dick. Personal Communication Regarding the Draft of TCRP 95 Traveler Response to Transportation System Changes – Chapter 19 Employer and Institutional TDM Strategies.

[3] Cambridge Systematics. *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*. Technical Appendices. Prepared for the Urban Land Institute. (Table D.3)
http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendix%20B_Effectiveness_102209.pdf

Other Literature Reviewed:

None

Transportation

CEQA# MM T-2

MP# MO-3.2

TRT-5

Commute Trip Reduction

3.4.5 Provide End of Trip Facilities

Range of Effectiveness: Grouped strategy (see TRT-1 through TRT-3)

Measure Description:

Non-residential projects will provide "end-of-trip" facilities for bicycle riders including showers, secure bicycle lockers, and changing spaces. End-of-trip facilities encourage the use of bicycling as a viable form of travel to destinations, especially to work. End-of-trip facilities provide the added convenience and security needed to encourage bicycle commuting.

End-of-trip facilities have minimal impacts when implemented alone. This strategy's effectiveness in reducing vehicle miles traveled (VMT) depends heavily on the suite of other transit, pedestrian/bicycle, and demand management measures offered. End-of-trip facilities should be grouped with Commute Trip Reduction (CTR) Programs (TRT-1 through TRT-2).

Measure Applicability:

- Urban, suburban, and rural context
- Appropriate for residential, retail, office, industrial, and mixed-use projects

Alternative Literature:

Alternate:

- 22% increase in bicycle mode share

The bicycle study documents a multivariate analysis of UK National Travel Survey (Wardman et al. 2007) which found significant impacts on bicycling to work. Compared to base bicycle mode share of 5.8% for work trips, outdoor parking would raise the share to 6.3%, indoor secure parking to 6.6%, and indoor parking plus showers to 7.1%. This results in an estimate 22% increase in bicycle mode share $((7.1\% - 5.8\%) / 5.8\% = 22\%)$. This suggests that such end of trip facilities have an important impact on the decision to bicycle to work. However, these effects represent reductions in VMT no greater than 0.02% (see Appendix C for calculation detail).

Alternate:

- 2 - 5% reduction in commute vehicle trips

The *Transportation Demand Management (TDM) Encyclopedia*, citing Ewing (1993), documents Sacramento's TDM ordinance. The City allows developers to claim trip reduction credits for worksite showers and lockers of 5% in central business districts, 2% within 660 feet of a transit station, and 2% elsewhere.

Transportation

CEQA# MM T-2

MP# MO-3.2

TRT-5

Commute Trip Reduction

Alternate:

- 0.625% reduction in VMT

The *Center for Clean Air Policy (CCAP) Guidebook* attributes a 1% to 5% reduction associated with the use of bicycles, which reflects the assumption that their use is typically for shorter trips. Based on the *CCAP Guidebook*, a 2.5% reduction is allocated for all bicycle-related measures and a 1/4 of that for this measure alone. (This information is based on a TIAX review for SMAQMD).

Alternative Literature References:

- [1] Pucher J., Dill, J., and Handy, S. *Infrastructure, Programs and Policies to Increase Bicycling: An International Review*. February 2010. (Table 2, pg. S111)
http://policy.rutgers.edu/faculty/pucher/Pucher_Dill_Handy10.pdf
- [2] Victoria Transportation Policy Institute (VTPI). *TDM Encyclopedia*,
<http://www.vtpi.org/tdm/tdm9.htm>; accessed 3/4/2010; last update 1/25/2010).
 VTPI citing: Reid Ewing (1993), "TDM, Growth Management, and the Other Four Out of Five Trips," *Transportation Quarterly*, Vol. 47, No. 3, Summer 1993, pp. 343-366.
- [3] Center for Clean Air Policy (CCAP), *CCAP Transportation Emission Guidebook*.
http://www.ccap.org/safe/guidebook/guide_complete.html; TIAX Results of 2005 Literature Search Conducted by TIAX on behalf of SMAQMD

Other Literature Reviewed:

None

Transportation

MP# TR-3.5

TRT-6

Commute Trip Reduction

3.4.6 Encourage Telecommuting and Alternative Work Schedules

Range of Effectiveness: 0.07 – 5.50% commute vehicle miles traveled (VMT) reduction and therefore 0.07 – 5.50% reduction in commute trip GHG emissions.

Measure Description:

Encouraging telecommuting and alternative work schedules reduces the number of commute trips and therefore VMT traveled by employees. Alternative work schedules could take the form of staggered starting times, flexible schedules, or compressed work weeks.

Measure Applicability:

- Urban, suburban, and rural context
- Appropriate for retail, office, industrial, and mixed-use projects

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$CO_2 = VMT \times EF_{\text{running}}$$

Where:

traveled

VMT = vehicle miles

for running emissions

EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Percentage of employees participating (1 – 25%)
- Strategy implemented: 9-day/80-hour work week, 4-day/40-hour work week, or 1.5 days of telecommuting

Mitigation Method:

$$\% \text{ Commute VMT Reduction} = \text{Commute}$$

Where

Commute = % reduction in commute VMT (See table below)

Transportation

MP# TR-3.5 **TRT-6** Commute Trip Reduction

	Employee Participation				
	1%	3%	5%	10%	25%
	% Reduction in Commute VMT				
9-day/80-hour work week	0.07%	0.21%	0.35%	0.70%	1.75%
4-day/40-hour work week	0.15%	0.45%	0.75%	1.50%	3.75%
telecommuting 1.5 days	0.22%	0.66%	1.10%	2.20%	5.5%
Source: Moving Cooler Technical Appendices, Fehr & Peers					
Notes: The percentages from Moving Cooler incorporate a discount of 25% for rebound effects. The percentages beyond 1% employee participation are linearly extrapolated.					

Assumptions:

Data based upon the following references:

[1] Cambridge Systematics. *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*. Technical Appendices. Prepared for the Urban Land Institute. (p. B-54)
http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendix%20B_Effectiveness_102209.pdf

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁶⁰
CO ₂ e	0.07 – 5.50% of running
PM	0.07 – 5.50% of running
CO	0.07 – 5.50% of running
NOx	0.07 – 5.50% of running
SO ₂	0.07 – 5.50% of running
ROG	0.04 – 3.3% of total

Discussion:

This strategy is often part of a Commute Trip Reduction Program, another strategy documented separately (see TRT-1 and TRT-2). The Project Applicant should take care not to double count the impacts.

The employee participation rate should be capped at a maximum of 25%. *Moving Cooler* [1] notes that roughly 50% of a typical workforce could participate in alternative

⁶⁰ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

Transportation

MP# TR-3.5

TRT-6

Commute Trip Reduction

work schedules (based on job requirements) and roughly 50% of those would choose to participate.

The 25% discount for rebound effects is maintained to provide a conservative estimate and support the literature results. The project may consider removing this discount from their calculations if deemed appropriate.

Example:

N/A – no calculations are needed.

Preferred Literature:

- 0.07% - 0.22% reduction in commuting VMT

Moving Cooler [1] estimates that if 1% of employees were to participate in a 9 day/80 hour compressed work week, commuting VMT would be reduced by 0.07%. If 1% of employees were to participate in a 4 day/40 hour compressed work week, commuting VMT would reduce by 0.15%; and 1% of employees participating in telecommuting 1.5 days per week would reduce commuting VMT by 0.22%. These percentages incorporate a discounting of 25% to account for rebound effects (i.e., travel for other purposes during the day while not at the work site). The percentages beyond 1% employee participation are linearly extrapolated (see table above).

Alternative Literature:

Alternate:

- 9-10% reduction in VMT for participating employees

As documented in *TCRP 95 Draft Chapter 19* [2], a Denver federal employer's implementation of compressed work week resulted in a 14-15% reduction in VMT for participating employees. This is equivalent to the 0.15% reduction for each 1% participation cited in the preferred literature above. In the Denver example, there was a 65% participation rate out of a total of 9,000 employees. *TCRP 95* states that the compressed work week experiment has no adverse effect on ride-sharing or transit use. Flexible hours have been shown to work best in the presence of medium or low transit availability.

Alternate:

- 0.5 vehicle trips reduced per employee per week
- 13 – 20 VMT reduced per employee per week

Transportation

MP# TR-3.5

TRT-6**Commute Trip Reduction**

As documented in *TCRP 95 Draft Chapter 19* [2], a study of compressed work week for 2,600 Southern California employees resulted in an average reduction of 0.5 trips per week (per participating employee). Participating employees also reduced their VMT by 13-20 miles per week. This translates to a reduction of between 5% and 10% in commute VMT, and so is lower than the 15% reduction cited for Denver government employees.

Alternative Literature References:

[2] Pratt, Dick. Personal Communication Regarding the Draft of TCRP 95 Traveler Response to Transportation System Changes – Chapter 19 Employer and Institutional TDM Strategies.

Other Literature Reviewed:

None

Transportation

TRT-7

Commute Trip Reduction

3.4.7 Implement Commute Trip Reduction Marketing

Range of Effectiveness: 0.8 – 4.0% commute vehicle miles traveled (VMT) reduction and therefore 0.8 – 4.0% reduction in commute trip GHG emissions.

Measure Description:

The project will implement marketing strategies to reduce commute trips. Information sharing and marketing are important components to successful commute trip reduction strategies. Implementing commute trip reduction strategies without a complementary marketing strategy will result in lower VMT reductions. Marketing strategies may include:

- New employee orientation of trip reduction and alternative mode options
- Event promotions
- Publications

CTR marketing is often part of a CTR program, voluntary or mandatory. CTR marketing is discussed separately here to emphasize the importance of not only providing employees with the options and monetary incentives to use alternative forms of transportation, but to clearly and deliberately promote and educate employees of the various options. This will greatly improve the impact of the implemented trip reduction strategies.

Measure Applicability:

- Urban and suburban context
- Negligible in a rural context
- Appropriate for residential, retail, office, industrial and mixed-use projects

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$\text{CO}_2 = \text{VMT} \times \text{EF}_{\text{running}}$$

Where:

VMT = vehicle miles traveled

EF_{running} = emission factor for running emissions

Transportation

TRT-7

Commute Trip Reduction

Inputs:

The following information needs to be provided by the Project Applicant:

- Percentage of project employees eligible (i.e. percentage of employers choosing to participate)

Mitigation Method:

$$\% \text{ Commute VMT Reduction} = A * B * C$$

Where

A = % reduction in commute vehicle trips (from [1])

B = % employees eligible

C = Adjustment from commute VT to commute VMT

Detail:

- A: 4% (per [1])
- C: 1.0 (see Appendix C for detail)

Assumptions:

Data based upon the following references:

[1] Pratt, Dick. Personal communication regarding the *Draft of TCRP 95 Traveler Response to Transportation System Changes – Chapter 19 Employer and Institutional TDM Strategies*. Transit Cooperative Research Program.

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁶¹
CO ₂ e	0.8 – 4.0% of running
PM	0.8 – 4.0% of running
CO	0.8 – 4.0% of running
NO _x	0.8 – 4.0% of running
SO ₂	0.8 – 4.0% of running
ROG	0.5 – 2.4% of total

⁶¹ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

Transportation

TRT-7

Commute Trip Reduction

Discussion:

The effectiveness of commute trip reduction marketing in reducing VMT depends on which commute reduction strategies are being promoted. The effectiveness levels provided below should only be applied if other programs are offered concurrently, and represent the total effectiveness of the full suite of measures.

This strategy is often part of a CTR Program, another strategy documented separately (see strategy T# E1). Take care not to double count the impacts.

Example:

Sample calculations are provided below:

- Low Range % VMT Reduction (20% eligible) = $4\% * 20\% = 0.8\%$
- High Range % VMT Reduction (100% eligible) = $4\% * 100\% = 4.0\%$

Preferred Literature:

- 4-5% commute vehicle trips reduced with full-scale employer support

TCRP 95 Draft Chapter 19 notes the average empirically-based estimate of reductions in vehicle trips for full-scale, site-specific employer support programs alone is 4-5%. This effectiveness assumes there are alternative commute modes available which have on-going employer support. For a program to receive credit for such outreach and marketing efforts, it should contain guarantees that the program will be maintained permanently, with promotional events delivered regularly and with routine performance monitoring.

Alternative Literature:

- 5-15% reduction in commute vehicle trips
- 3% increase in effectiveness of marketed transportation demand management (TDM) strategies

VTPI [2] notes that providing information on alternative travel modes by employers was one of the most important factors contributing to mode shifting. One study (Shadoff, 1993) estimates that marketing increases the effectiveness of other TDM strategies by up to 3%. Given adequate resources, marketing programs may reduce vehicle trips by 5-15%. The 5 – 15% range comes from a variety of case studies across the world. U.S. specific case studies include: 9% reduction in vehicle trips with TravelSmart in Portland (12% reduction in VMT), 4-8% reduction in vehicle trips from four cities with individualized marketing pilot projects from the Federal Transit Administration (FTA). Averaged across the four pilot projects, there was a 6.75% reduction in VMT.

Transportation

TRT-7

Commute Trip Reduction

Alternative Literature References:

[2] VTPI, TDM Encyclopedia – TDM Marketing; <http://www.vtpi.org/tdm/tdm23.htm>;
accessed 3/5/2010. Table 7 (citing FTA, 2006)

Other Literature Reviewed:

None

Transportation

MP# TR-3.1

TRT-8

Commute Trip Reduction

3.4.8 Implement Preferential Parking Permit Program

Range of Effectiveness: Grouped strategy (see TRT-1 through TRT-3)

Measure Description:

The project will provide preferential parking in convenient locations (such as near public transportation or building front doors) in terms of free or reduced parking fees, priority parking, or reserved parking for commuters who carpool, vanpool, ride-share or use alternatively fueled vehicles. The project will provide wide parking spaces to accommodate vanpool vehicles.

The impact of preferential parking permit programs has not been quantified by the literature and is likely to have negligible impacts when implemented alone. This strategy should be grouped with Commute Trip Reduction (CTR) Programs (TRT-1 and TRT-2) as a complementary strategy for encouraging non-single occupant vehicle travel.

Measure Applicability:

- Urban, suburban context
- Appropriate for residential, retail, office, mixed use, and industrial projects

Alternative Literature:

No quantitative results are available. The case study in the literature implemented a preferential parking permit program as a companion strategy to a comprehensive TDM program. Employees who carpooled at least three times a week qualified to use the spaces.

Alternative Literature References:

[1] Transportation Demand Management Institute of the Association for Commuter Transportation. *TDM Case Studies and Commuter Testimonials*. Prepared for the US EPA. 1997.

<http://www.epa.gov/OMS/stateresources/rellinks/docs/tmccases.pdf>

Other Literature Reviewed:

None

Transportation

TRT-9

Commute Trip Reduction

3.4.9 Implement Car-Sharing Program

Range of Effectiveness: 0.4 – 0.7% vehicle miles traveled (VMT) reduction and therefore 0.4 – 0.7% reduction in GHG emissions.

Measure Description:

This project will implement a car-sharing project to allow people to have on-demand access to a shared fleet of vehicles on an as-needed basis. User costs are typically determined through mileage or hourly rates, with deposits and/or annual membership fees. The car-sharing program could be created through a local partnership or through one of many existing car-share companies. Car-sharing programs may be grouped into three general categories: residential- or citywide-based, employer-based, and transit station-based. Transit station-based programs focus on providing the “last-mile” solution and link transit with commuters’ final destinations. Residential-based programs work to substitute entire household based trips. Employer-based programs provide a means for business/day trips for alternative mode commuters and provide a guaranteed ride home option.

Measure Applicability:

- Urban and suburban context
- Negligible in a rural context
- Appropriate for residential, retail, office, industrial, and mixed-use projects

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$\text{CO}_2 = \text{VMT} \times \text{EF}_{\text{running}}$$

Where:

traveled
for running emissions

VMT = vehicle miles
EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Urban or suburban context

Transportation

TRT-9

Commute Trip Reduction

Mitigation Method:

$$\% \text{ VMT Reduction} = A * B / C$$

Where

A = % reduction in car-share member annual VMT (from the literature)

B = number of car share members per shared car (from the literature)

C = deployment level based on urban or suburban context

Detail:

- A: 37% (per [1])
- B: 20 (per [2])
- C:

Project setting	1 shared car per X population
Urban	1,000
Suburban	2,000
Source: <i>Moving Cooler</i>	

Assumptions:

Data based upon the following references:

- [1] Millard-Ball, Adam. "Car-Sharing: Where and How it Succeeds," (2005) Transit Cooperative Research Program (108). P. 4-22
- [2] Cambridge Systematics. *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*. Technical Appendices. Prepared for the Urban Land Institute. (p. B-52, Table D.3)
http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendices_Complete_102209.pdf

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁶²
CO ₂ e	0.4 – 0.7% of running
PM	0.4 – 0.7% of running
CO	0.4 – 0.7% of running
NO _x	0.4 – 0.7% of running
SO ₂	0.4 – 0.7% of running
ROG	0.24 – 0.42% of total

- ⁶² The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

Transportation

TRT-9

Commute Trip Reduction

Discussion:

Variable C in the mitigation method section represents suggested levels of deployment based on the literature. Levels of deployment may vary based on the characteristics of the project site and the needs of the project residents and employees. This variable should be adjusted accordingly.

The methodology for calculation of VMT reduction utilizes *Moving Cooler's* rule of thumb⁶³ for the estimated number of car share members per vehicle. An estimate of 50% reduction in car-share member annual VMT (from *Moving Cooler*) was high compared to other literature sources, and *TCRP 108's* 37% reduction was used in the calculations instead.

Example:

Sample calculations are provided below:

- Low Range % VMT Reduction (suburban) = $37\% * 20 / 2000 = 0.4\%$
- High Range % VMT Reduction (urban) = $37\% * 20 / 1000 = 0.7\%$

Preferred Literature:

- 37% reduction in car-share member VMT

The *TCRP 108* [1] report conducted a survey of car-share members in the United States and Canada in 2004. The results of the survey showed that respondents, on average, drove only 63% of the average mileage they previously drove when not car-share members.

Alternative Literature:

Alternate – Residential or Citywide Based:

- 0.05-0.27% reduction in GHG
- 0.33% reduction in VMT in urban areas

Moving Cooler [2] assumed an aggressive deployment of one car per 2,000 inhabitants of medium-density census tracts and of one car per 1,000 inhabitants of high-density census tracts. This strategy assumes providing a subsidy to a public, private, or nonprofit car-sharing organization and providing free or subsidized lease for usage of public street parking. *Moving Cooler* assumed 20 members per shared car and 50% reduction in VMT per equivalent car. The percent reduction calculated assumes a percentage of urban areas are low, medium, and high density, thus resulting in a lower

⁶³ See discussion in Alternative Literature section for "rule of thumb" detail.

Transportation

TRT-9

Commute Trip Reduction

than expected reduction in VMT assuming an aggressive deployment in medium and high density areas.

Alternate – Transit Station and Employer Based:

- 23-44% reduction in drive-alone mode share
- Average daily VMT reduction of 18 – 23 miles

TCRP 95 Draft Chapter 19 [3] looked at two demonstrations, CarLink I and CarLink II, in the San Francisco Bay Area. CarLink I ran from January to November 1999. It involved 54 individuals and 12 rental cars stationed at the Dublin-Pleasanton BART station. CarLink II ran from July 2001 to June 2002 and involved 107 individuals and 19 rental cars. CarLink II was based in Palo Alto in conjunction with Caltrain commuter rail service and several employers in the Stanford Research Park. Both CarLink demonstrations were primarily targeted for commuters. CarLink I had a 23% increase in rail mode share, a reduction in drive-alone mode share of 44%, and a decrease in Average Daily VMT of 18 miles. CarLink II had a VMT for round-trip commuters decrease of 23 miles per day and a mode share for drive alone decrease of 22.9%.

Alternate:

- 50% reduction in driving for car-share members

A UC Berkeley study of San Francisco's City CarShare [4] found that members drive nearly 50% less after joining. The study also found that when people joined the car-sharing organization, nearly 30% reduced their household vehicle ownership and two-thirds avoided purchasing another car. The UC Berkeley study found that almost 75% of vehicle trips made by car-sharing members were for social trips such as running errands and visiting friends. Only 25% of trips were for commuting to work or for recreation. Most trips were also made outside of peak periods. Therefore, car-sharing may generate limited impact on peak period traffic.

Alternative Literature References:

[3] Cambridge Systematics. *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*. Technical Appendices. Prepared for the Urban Land Institute. (p. B-52, Table D.3)

http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendices_Complete_102209.pdf

[4] Pratt, Dick. *Personal Communication Regarding the Draft of TCRP 95 Traveler Response to Transportation System Changes – Chapter 19 Employer and Institutional TDM Strategies*. Transit Cooperative Research Program.

Transportation

TRT-9

Commute Trip Reduction

Cervero, Robert and Yu-Hsin Tsai. *San Francisco City CarShare: Travel-Demand Trends and Second-Year Impacts*, 2005. (Figure 7, p. 35, Table 7, Table 12)
<http://escholarship.org/uc/item/4f39b7b4>

Other Literature Reviewed:

None

Transportation

TRT-10

Commute Trip Reduction

3.4.10 Implement a School Pool Program

Range of Effectiveness: 7.2 – 15.8% school vehicle miles traveled (VMT) Reduction and therefore 7.2 – 15.8% reduction in school trip GHG emissions.

Measure Description:

This project will create a ridesharing program for school children. Most school districts provide bussing services to public schools only. SchoolPool helps match parents to transport students to private schools, or to schools where students cannot walk or bike but do not meet the requirements for bussing.

Measure Applicability:

- Urban, suburban, and rural context
- Appropriate for residential and mixed-use projects

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$\text{CO}_2 = \text{VMT} \times \text{EF}_{\text{running}}$$

Where:

traveled

for running emissions

VMT = vehicle miles

EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Degree of implementation of SchoolPool Program(moderate to aggressive)

Mitigation Method:

$$\% \text{ VMT Reduction} = \text{Families} * B$$

Where

Families = % families that participate (from [1] and [2])

B = adjustments to convert from participation to daily VMT to annual school VMT

Transportation

TRT-10

Commute Trip Reduction

Detail:

- Families: 16% (moderate implementation), 35% (aggressive implementation), (from [1] and [2])
- B: 45% (see Appendix C for detail)

Assumptions:

Data based upon the following references:

- [1] Transportation Demand Management Institute of the Association for Commuter Transportation. *TDM Case Studies and Commuter Testimonials*. Prepared for the US EPA. 1997. (p. 10, 36-38)
<http://www.epa.gov/OMS/stateresources/rellinks/docs/tmccases.pdf>
- [2] Denver Regional Council of Governments (DRCOG). *Survey of Schoolpool Participants, April 2008*. <http://www.drcog.org/index.cfm?page=SchoolPool>.
 Obtained from Schoolpool Coordinator, Mia Bemelen.

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁶⁴
CO ₂ e	7.2 – 15.8% of running
PM	7.2 – 15.8% of running
CO	7.2 – 15.8% of running
NO _x	7.2 – 15.8% of running
SO ₂	7.2 – 15.8% of running
ROG	4.3 – 9.5% of total

Discussion:

This strategy reflects the findings from only one case study.

Example:

Sample calculations are provided below:

- Low Range % School VMT Reduction (moderate implementation) = 16% * 45% = 7.2%
- High Range % School VMT Reduction (aggressive implementation) = 35% * 45% = 15.8%

⁶⁴ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

Transportation

TRT-10

Commute Trip Reduction

Preferred Literature:

- 7,711 – 18,659 daily VMT reduction

As presented in the TDM Case Studies [1] compilation, the SchoolPool program in Denver saved 18,659 VMT per day in 1995, compared with 7,711 daily in 1994 – a 142% increase. The Denver Regional Council of Governments (DRCOG) [2] enrolled approximately 7,000 families and 32 private schools in the program. The DRCOG staff surveyed a school or interested families to collect home location and schedules of the students. The survey also identified prospective drivers. DRCOG then used carpool-matching software and GIS to match families. These match lists were sent to the parents for them to form their own school pools. 16% of families in the database formed carpools. The average carpool carried 3.1 students.

The SchoolPool program is still in effect and surveys are conducted every few years to monitor the effectiveness of the program. The latest survey report received was in 2008. The report showed that the participant database had increased to over 10,000 families, an 18% increase from 2005. 29% of participants used the list to form a school carpool. This percentage was lower than 35% in 2005 but higher than prior to 2005, at 24%. The average number of families in each carpool ranged from 2.1 prior to 2005 to 2.8 in 2008. The average number of carpool days per week was roughly 4.7. The number of school weeks per year was 39. Per discussions with the Schoolpool Coordinator, a main factor of success was establishing a large database. This was achieved by having parents opt-out of the database versus opting-in.

Alternative Literature:

None

Alternative Literature References:

None

Other Literature Reviewed:

None

Transportation

MP# MO-3.1 **TRT-11** Commute Trip Reduction

3.4.11 Provide Employer-Sponsored Vanpool/Shuttle

Range of Effectiveness: 0.3 – 13.4% commute vehicle miles traveled (VMT) reduction and therefore 0.3 – 13.4% reduction in commute trip GHG emissions.

Measure Description:

This project will implement an employer-sponsored vanpool or shuttle. A vanpool will usually service employees' commute to work while a shuttle will service nearby transit stations and surrounding commercial centers. Employer-sponsored vanpool programs entail an employer purchasing or leasing vans for employee use, and often subsidizing the cost of at least program administration, if not more. The driver usually receives personal use of the van, often for a mileage fee. Scheduling is within the employer's purview, and rider charges are normally set on the basis of vehicle and operating cost.

Measure Applicability:

- Urban, suburban, and rural context
- Appropriate for office, industrial, and mixed-use projects

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$CO_2 = VMT \times EF_{\text{running}}$$

Where:

VMT = vehicle miles traveled
EF_{running} = emission factor for running emissions

Inputs:

The following information needs to be provided by the Project Applicant:

- Percentage of employees eligible

Mitigation Method:

$$\% \text{ VMT Reduction} = A * B * C$$

Where

A = % shift in vanpool mode share of commute trips (from [1])

B = % employees eligible

C = adjustments from vanpool mode share to commute VMT

Transportation

MP# MO-3.1 **TRT-11** **Commute Trip Reduction**

Detail:

- A: 2-20% annual reduction in vehicle mode share (*from [1]*)
 - Low range: low degree of implementation, smaller employers
 - High range: high degree of implementation, larger employers
- C: 0.67 (See Appendix C for detail)

Assumptions:

Data based upon the following references:

[1] TCRP Report 95. *Chapter 5: Vanpools and Buspools - Traveler Response to Transportation System Changes.*
http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_95c5.pdf. (p.5-8)

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁶⁵
CO ₂ e	0.3 – 13.4% of running
PM	0.3 – 13.4% of running
CO	0.3 – 13.4% of running
NOx	0.3 – 13.4% of running
SO ₂	0.3 – 13.4% of running
ROG	0.18 – 8.0% of total

Discussion:

Vanpools are generally more successful with the largest of employers, as large employee counts create the best opportunities for employees to find a suitable number of travel companions to form a vanpool. In the San Francisco Bay Area several large companies (such as Google, Apple, and Genentech) provide regional bus transportation for their employees. No specific studies of these large buspools were identified in the literature. However, the GenenBus serves as a key element of the overall commute trip reduction (CTR) program for Genentech, as discussed in the CTR Program – Required strategy.

This strategy is often part of a CTR Program, another strategy documented separately (see strategy T# E1). Take care not to double count the impacts.

Example:

Sample calculations are provided below:

⁶⁵ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

Transportation

MP# MO-3.1

TRT-11

Commute Trip Reduction

- Low Range % VMT Reduction (low implementation/small employer, 20% eligible)
= $2\% * 20\% * 0.67 = 0.3\%$
- High Range % VMT Reduction (high implementation/large employer, 100% eligible) = $20\% * 100\% * 0.67 = 13.4\%$

Preferred Literature:

- 2-20% vanpool mode share

TCRP Report 95 [1] notes that vanpools can capture 2 to 20% mode share. This range can be attributed to differences in programs, access to high-occupancy vehicle (HOV) lanes, and geographic range. The *TCRP Report* highlights a case study of the 3M Corporation, which with the implementation of a vanpooling program saw drive alone mode share decrease by 10 percentage points and vanpooling mode share increase to 7.8 percent. The *TCRP Report* notes most vanpools programs do best where one-way trip lengths exceed 20 miles, where work schedules are fixed and regular, where employer size is sufficient to allow matching of 5 to 12 people from the same residential area, where public transit is inadequate, and where some congestion or parking problems exist.

Alternative Literature:

In *TDM Case Studies* [2], a case study of Kaiser Permanente Hospital has shown their employer-sponsored shuttle service eliminated 380,100 miles per month, or nearly 4 million miles of travel per year, and four tons of smog precursors annually.

Alternative Literature References:

[2] Transportation Demand Management Institute of the Association for Commuter Transportation. *TDM Case Studies and Commuter Testimonials*. Prepared for the US EPA. 1997.

<http://www.epa.gov/OMS/stateresources/rellinks/docs/tmccases.pdf>

Other Literature Reviewed:

None

Transportation

TRT-12

Commute Trip Reduction

3.4.12 Implement Bike-Sharing Programs

Range of Effectiveness: Grouped strategy (see SDT-5 and LUT-9)

Measure Description:

This project will establish a bike sharing program. Stations should be at regular intervals throughout the project site. The number of bike-share kiosks throughout the project area should vary depending on the density of the project and surrounding area. Paris' bike-share program places a station every few blocks throughout the city (approximately 28 bike stations/square mile). Bike-station density should increase around commercial and transit hubs.

Bike sharing programs have minimal impacts when implemented alone. This strategy's effectiveness is heavily dependent on the location and context. Bike-sharing programs have worked well in densely populated areas (examples in Barcelona, London, Lyon, and Paris) with existing infrastructure for bicycling. Bike sharing programs should be combined with **Bike Lane Street Design (SDT-5)** and **Improve Design of Development (LUT-9)**.

Taking evidence from the literature, a 135-300% increase in bicycling (of which roughly 7% are shifting from vehicle travel) results in a negligible impact (around 0.03% vehicle miles traveled (VMT) reduction (see Appendix C for calculations)).

Measure Applicability:

- Urban and suburban-center context only
- Negligible in a rural context
- Appropriate for residential, retail, office, industrial, and mixed-use projects

Alternative Literature:

Alternate:

The International Review [1] found bike mode share increases:

- from 0.75% in 2005 to 1.76% in 2007 in Barcelona (Romero, 2008) (135% increase)
- From 1% in 2001 to 2.5% in 2007 in Paris (Nadal, 2007; City of Paris, 2007) (150% increase)
- From 0.5% in 1995 to 2% in 2006 in Lyon (Bonnette, 2007; Velo'V, 2009) (300% increase)

London [2] is the only study that reports the breakdown of the prior mode In London: 6% of users reported shifting from driving, 34% from transit, 23% said they would not have

Transportation

TRT-12

Commute Trip Reduction

travelled (Noland and Ishaque, 2006). Additionally, 68% of the bike trips were for leisure or recreation. Companion strategies included concurrent improvements in bicycle facilities.

The London program was implemented west of Central London in a densely populated area, mainly residential, with several employment centers. A relatively well developed bike network existed, including over 1,000 bike racks. The program implemented 25 locker stations with 70 bikes total.

Alternate:

- 1/3 vehicle trip reduced per day per bicycle (1,000 vehicle trips reduced per day in Lyon)

The Bike Share Opportunities [3] report looks at two case studies of bike-sharing implementation in France. In Lyon, the 3,000 bike-share system shifts 1,000 car trips to bicycle each day. Surveys indicate that 7% of the bike share trips would have otherwise been made by car. Lyon saw a 44% increase in bicycle riding within the first year of their program while Paris saw a 70% increase in bicycle riding and a 5% reduction in car use and congestion within the first year and a half of their program. The Bike Share Opportunities report found that population density is an important part of a successful program. Paris' bike share subscription rates range between 6% and 9% of the total population. This equates to an average of 75,000 rentals per day. The effectiveness of bike share programs at sub-city scales are not addressed in the literature.

Alternative Literature References:

- [1] Pucher J., Dill, J., and Handy, S. Infrastructure, Programs and Policies to Increase Bicycling: An International Review. February 2010. (Table 4)
- [2] Noland, R.B., Ishaque, M.M., 2006. "Smart Bicycles in an urban area: Evaluation of a pilot scheme in London." *Journal of Public Transportation*. 9(5), 71-95.
<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.117.8173&rep=rep1&type=pdf#page=76>
- [3] NYC Department of City Planning, *Bike-Share Opportunities in New York City*, 2009. (p. 11, 14, 24, 68)
http://www.nyc.gov/html/dcp/html/transportation/td_bike_share.shtml

Other Literature Reviewed:

None

Transportation

MP# TR-3.4

TRT-13

Commute Trip Reduction

3.4.13 Implement School Bus Program

Measure Effectiveness Range: 38 – 63% School VMT Reduction and therefore 38 – 63% reduction in school trip GHG emissions⁶⁶

Measure Description:

The project will work with the school district to restore or expand school bus services in the project area and local community.

Measure Applicability:

- Urban, suburban, and rural context
- Appropriate for residential and mixed-use projects

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$CO_2 = VMT \times EF_{\text{running}}$$

Where:

traveled
for running emissions

VMT = vehicle miles
EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Percentage of families expected to use/using school bus program

Mitigation Method:

$$\% \text{ VMT Reduction} = A * B$$

Where

A = % families expected to use/using school bus program
B = adjustments to convert from participation to school day VMT to annual school VMT

⁶⁶ Transit vehicles may also result in increases in emissions that are associated with electricity production or fuel use. The Project Applicant should consider these potential additional emissions when estimating mitigation for these measures.

Transportation

MP# TR-3.4 **TRT-13** Commute Trip Reduction

Detail:

- A: a typical range of 50 – 84% (see discussion section)
- B: 75% (see Appendix C for detail)

Assumptions:

Data based upon the following references:

[1] JD Franz Research, Inc.; *Lamorinda School Bus Program, 2003 Parent Survey, Final Report*; January 2004; obtained from Juliet Hansen, Program Manager. (p. 5)

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁶⁷
CO _{2e}	38 – 63% of running
PM	38 – 63% of running
CO	38 – 63% of running
NO _x	38 – 63% of running
SO ₂	38 – 63% of running
ROG	23 – 38% of total

Discussion:

The literature presents a high range of effectiveness showing 84% participation by families. 50% is an estimated low range assuming the project has a minimum utilization goal. Note that the literature presents results from a single case study.

Example:

Sample calculations are provided below:

- Low Range % VMT Reduction (50% participation) = 50% * 75% = 38%
- High Range % VMT Reduction (85% participation) = 84% * 75% = 63%

Preferred Literature:

- 84% penetration rate
- 2,451 – 2,677 daily vehicle trips reduced
- 441,180 – 481,860 annual vehicle trips reduced

⁶⁷ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

Transportation

MP# TR-3.4

TRT-13**Commute Trip Reduction**

The Lamorinda School Bus Program was implemented to reduce traffic congestion in the communities of Lafayette, Orinda, and Moraga, California. In 2003, a parent survey was conducted to determine the extent to which the program diverted or eliminated vehicle trips. This survey covered a representative sample of all parents (not just those signed up for the school bus program). The range of morning trips prevented is 1,266 to 1,382; the range of afternoon trips prevented is 1,185 to 1,295. Annualized, the estimated total trip prevention is between 441,180 to 481,860. 83% of parents surveyed reported that their child usually rides the bus to school in the morning. 84% usually rode the bus back home in the afternoons. The data came from surveys and the results are unique to the location and extent of the program. The report did not indicate the number of school buses in operation during the time of the survey.

Alternative Literature:

None

Alternative Literature References:

None

Other Literature Reviewed:

None

Transportation

TRT-14

Commute Trip Reduction

3.4.14 Price Workplace Parking

Range of Effectiveness: 0.1 – 19.7% commute vehicle miles traveled (VMT) reduction and therefore 0.1 -19.7% reduction in commute trip GHG emissions.

Measure Description:

The project will implement workplace parking pricing at its employment centers. This may include: explicitly charging for parking for its employees, implementing above market rate pricing, validating parking only for invited guests, not providing employee parking and transportation allowances, and educating employees about available alternatives.

Though similar to the Employee Parking “Cash-Out” strategy, this strategy focuses on implementing market rate and above market rate pricing to provide a price signal for employees to consider alternative modes for their work commute.

Measure Applicability:

- Urban and suburban context
- Negligible impact in a rural context
- Appropriate for retail, office, industrial, and mixed-use projects
- Reductions applied only if complementary strategies are in place:
 - Residential parking permits and market rate public on-street parking - to prevent spill-over parking
 - Unbundled parking - is not required but provides a market signal to employers to transfer over the, now explicit, cost of parking to the employees. In addition, unbundling parking provides a price with which employers can utilize as a means of establishing workplace parking prices.

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$\text{CO}_2 = \text{VMT} \times \text{EF}_{\text{running}}$$

Where:

traveled VMT = vehicle miles

for running emissions EF_{running} = emission factor

Transportation

TRT-14

Commute Trip Reduction

Inputs:

The following information needs to be provided by the Project Applicant:

- Location of project site: low density suburb, suburban center, or urban location
- Daily parking charge (\$1 - \$6)
- Percentage of employees subject to priced parking

Mitigation Method:

$$\% \text{ VMT Reduction} = A * B$$

Where

A = Percentage reduction in commute VMT (from [1] and [2])

B = Percent of employees subject to priced parking

Detail:

Project Location	A: Daily Parking Charge			
	\$1	\$2	\$3	\$6
Low density suburb	0.5%	1.2%	1.9%	2.8%
Suburban center	1.8%	3.7%	5.4%	6.8%
Urban Location	6.9%	12.5%	16.8%	19.7%
Moving Cooler, VTPI, Fehr & Peers. Note: 2009 dollars.				

Assumptions:

Data based upon the following references:

[1] Cambridge Systematics. *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*. Technical Appendices. Prepared for the Urban Land Institute. (Table 5.13, Table D.3)

http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendices_Complete_102209.pdf

[2] VTPI, Todd Litman, *Transportation Elasticities*, (Table 15)

<http://www.vtpi.org/elasticities.pdf>.

Comsis Corporation (1993), *Implementing Effective Travel Demand Management Measures: Inventory of Measures and Synthesis of Experience*, USDOT and Institute of Transportation Engineers (www.ite.org);

www.bts.gov/ntl/DOCS/474.html.

Transportation

TRT-14

Commute Trip Reduction

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁶⁸
CO ₂ e	0.1 – 19.7% of running
PM	0.1 – 19.7% of running
CO	0.1 – 19.7% of running
NO _x	0.1 – 19.7% of running
SO ₂	0.1 – 19.7% of running
ROG	0.06 – 11.8% of total

Discussion:

Priced parking can result in parking spillover concerns. The highest VMT reductions should be given only with complementary strategies such as parking time limits or neighborhood parking permits are in place in surrounding areas.

Example:

Sample calculations are provided below:

- Low Range % Commute VMT Reduction (low density suburb, \$1/day, 20% priced) = $0.5\% * 20\% = 0.1\%$
- High Range % Commute VMT Reduction (urban, \$6/day, 100% priced) = $19.7\% * 100\% = 19.7\%$

Preferred Literature:

The table above (variable A) was calculated using the percent commute VMT reduction from *Moving Cooler* (0.5% - 6.9% reduction for \$1/day parking charge). The percentage reductions for \$2 - \$6 / day parking charges were extrapolated by multiplying the *Moving Cooler* percentages with the ratios from the VTPI table below (percentage increases). For example, to obtain a percent VMT reduction for a \$6/day parking charge for a low density suburb, $0.5\% * ((36.1\% - 6.5\%) / 6.5\%) = 2.3\%$. The methodology was utilized to capture the non-linear effect of parking charges on trip reduction (VTPI) while maintaining a conservative estimate of percent reductions (*Moving Cooler*).

Preferred:

- 0.5-6.9% reduction in commuting VMT
- 0.44-2.07% reduction in greenhouse gas (GHG) emissions

⁶⁸ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

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TRT-14

Commute Trip Reduction

Moving Cooler Technical Appendices indicate that increasing employee parking costs \$1 per day (\$0.50 per vehicle for carpool and free for vanpools) can reduce GHG between 0.44% and 2.07% and reduce commuting VMT between 0.5% and 6.9%. The reduction in GHG varies based on how extensive the implementation of the program is. The reduction in commuting VMT differs for type of urban area as shown in the table below. Please note that these numbers are independent of results for employee parking cash-out strategy (discussed in its own fact sheet).

Strategy	Description	Percent Change in Commuting VMT					
		Large Metropolitan (higher transit use)	Large Metropolitan (lower transit use)	Medium Metro (higher)	Medium Metro (lower)	Small Metro (higher)	Small Metro (lower)
Parking Charges	Parking charge of \$1/day	6.9%	0.9%	1.8%	0.5%	1.3%	0.5%
Source: <i>Moving Cooler</i>							

Preferred:

Commute Vehicle trip reduction	Daily Parking Charges			
	\$0.75	\$1.49	\$2.98	\$5.96
Worksite Setting				
Suburb	6.5%	15.1%	25.3%*	36.1%*
Suburban Center	12.3%	25.1%*	37.0%*	46.8%*
Central Business District	17.5%	31.8%*	42.6%*	50.0%*
Source: VTPI [2]				

* Discounts greater than 20% should be capped, as they exceed levels recommended by *TCRP 95* and other literature.

The reduction in commute trips varies by parking fee and worksite setting [2]. For daily parking fees between \$1.49 and \$5.96, worksites set in low-density suburbs could decrease vehicle trips by 6.5-36.1%, worksites set in activity centers could decrease vehicle trips by 12.3-46.8%, and worksites set in regional central business districts could decrease vehicles by 17.5-50%. (Note that adjusted parking fees (from 1993 dollars to 2009 dollars) were used. Adjustments were taken from the *Santa Monica General Plan EIR Report, Appendix, Nelson\Nygaard*).

Alternative Literature:

Alternate:

- 1 percentage point reduction in auto mode share
- 12.3% reduction in commute vehicle trips

TCRP 95 Draft Chapter 19 [4] found that an increase of \$8 per month in employee parking charges was necessary to decrease employee SOV mode split rates by one

Transportation

TRT-14

Commute Trip Reduction

percentage point. *TCRP 95* compared 82 sites with TDM programs and found that programs with parking fees have an average commute vehicle trip reduction of 24.6%, compared with 12.3% for sites with free parking.

Alternate:

- 1% reduction in VMT (\$1 per day charge)
- 2.6% reduction in VMT (\$3 per day charge)

The Deakin, et al. report [5] for the California Air Resources Board (CARB) analyzed transportation pricing measures for the Los Angeles, Bay Area, San Diego, and Sacramento metropolitan areas.

Alternative Literature References:

[4] Pratt, Dick. Personal Communication Regarding the Draft of TCRP 95 Traveler Response to Transportation System Changes – Chapter 19 Employer and Institutional TDM Strategies. (Table 19-9)

[5] Deakin, E., Harvey, G., Pozdena, R., and Yarema, G., 1996. *Transportation Pricing Strategies for California: An Assessment of Congestion, Emissions, Energy and Equity Impacts*. Final Report. Prepared for California Air Resources Board (CARB), Sacramento, CA (Table 7.2)

Other Literature Reviewed:

None

Transportation

CEQA# MM T-9

MP# TR-5.3

TRT-15

Commute Trip Reduction

3.4.15 Implement Employee Parking “Cash-Out”

Range of Effectiveness: 0.6 – 7.7% commute vehicle miles traveled (VMT) reduction and therefore 0.6 – 7.7% reduction in commute trip GHG emissions

Measure Description:

The project will require employers to offer employee parking “cash-out.” The term “cash-out” is used to describe the employer providing employees with a choice of forgoing their current subsidized/free parking for a cash payment equivalent to the cost of the parking space to the employer.

Measure Applicability:

- Urban and suburban context
- Not applicable in a rural context
- Appropriate for retail, office, industrial, and mixed-use projects
- Reductions applied only if complementary strategies are in place:
 - Residential parking permits and market rate public on-street parking -to prevent spill-over parking
 - Unbundled parking - is not required but provides a market signal to employers to forgo paying for parking spaces and “cash-out” the employee instead. In addition, unbundling parking provides a price with which employers can utilize as a means of establishing “cash-out” prices.

Baseline Method:

See introduction section.

Inputs:

The following information needs to be provided by the Project Applicant:

- Percentage of employees eligible
- Location of project site: low density suburb, suburban center, or urban location

Mitigation Method:

$$\% \text{ VMT Reduction} = A * B$$

Where

A = % reduction in commute VMT (from the literature)

B = % of employees eligible

Transportation

CEQA# MM T-9

TRT-15

Commute Trip Reduction

MP# TR-5.3

Detail:

- A: Change in Commute VMT: 3.0% (low density suburb), 4.5% (suburban center), 7.7% (urban) change in commute VMT (source: Moving Cooler)

Assumptions:

Data based upon the following references:

- Cambridge Systematics. *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*. Technical Appendices. Prepared for the Urban Land Institute. (Table 5.13, Table D.3)
http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendix%20B_Effectiveness_102209.pdf

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁶⁹
CO ₂ e	0.6 – 7.7% of running
PM	0.6 – 7.7% of running
CO	0.6 – 7.7% of running
NO _x	0.6 – 7.7% of running
SO ₂	0.6 – 7.7% of running
ROG	0.36 – 4.62% of running

Discussion:

Please note that these estimates are independent of results for workplace parking pricing strategy (see strategy number T# E5 for more information).

If work site parking is not unbundled, employers cannot utilize this unbundled price as a means of establishing “cash-out” prices. The table below shows typical costs for parking facilities in large urban and suburban areas in the US. This can be utilized as a reference point for establishing reasonable “cash-out” prices. Note that the table does not include external costs to parking such as added congestion, lost opportunity cost of land devoted to parking, and greenhouse gas (GHG) emissions.

	Structured (urban)	Surface (suburban)
Land (Annualized)	\$1,089	\$215
Construction (Annualized)	\$2,171	\$326

⁶⁹ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

Transportation

CEQA# MM T-9

TRT-15

Commuter Trip Reduction

MP# TR-5.3

O & M Costs	\$575	\$345
Annual Total	\$3,835	\$885
Monthly Costs	\$320	\$74
Source: VTPI, <i>Transportation Costs and Benefit Analysis II – Parking Costs</i> , April 2010 (p.5.4-10)		

Example:

Sample calculations are provided below:

- Low Range % VMT Reduction (low density suburb and 20% eligible) = $3\% * 0.2 = 0.6\%$
- High Range % VMT Reduction (urban and 100% eligible) = $7.7\% * 1 = 7.7\%$

Preferred Literature:

- 0.44% - 2.07% reduction in GHG emissions
- 3.0% - 7.7% reduction in commute VMT

Moving Cooler Technical Appendices indicate that reimbursing “cash-out” participants \$1/day can reduce GHG between 0.44% and 2.07% and reduce commuting VMT between 3.0% and 7.7%. The reduction in GHG varies based on how extensive the implementation of the program is. The reduction in commuting VMT differs for type of urban area is shown in the table below.

Strategy	Description	Percent Change in Commuting VMT					
		Large Metropolitan (higher transit use)	Large Metropolitan (lower transit use)	Medium Metro (higher)	Medium Metro (lower)	Small Metro (higher)	Small Metro (lower)
Parking Cash-Out	Subsidy of \$1/day	7.7%	3.7%	4.5%	3.0%	4.0%	3.0%

Alternative Literature:

Alternate:

- 2-6% reduction in vehicle trips

VTPI used synthesis data to determine parking cash out could reduce commute vehicle trips by 10-30%. VTPI estimates that the portion of vehicle travel affected by parking cash-out would be about 20% and therefore there would be only about a 2-6% total reduction in vehicle trips attributed to parking cash-out.

Alternate:

Transportation

CEQA# MM T-9

TRT-15

Commute Trip Reduction

MP# TR-5.3

- 12% reduction in VMT per year per employee
- 64% increase in carpooling
- 50% increase in transit mode share
- 39% increase in pedestrian/bike share

Shoup looked at eight California firms that complied with California's 1992 parking cash-out law, applicable to employers of 50 or more persons in regions that do not meet the state's clean air standards. To comply, a firm must offer commuters the option to choose a cash payment equal to any parking subsidy offered. Six of companies went beyond compliance and subsidized one or more alternatives to parking (more than the parking subsidy price). The eight companies ranged in size between 120 and 300 employees, and were located in downtown Los Angeles, Century City, Santa Monica, and West Hollywood. Shoup states that an average of 12% fewer VMT per year per employee is equivalent to removing one of every eight cars driven to work off the road.

Alternative Literature Notes:

Litman, T., 2009. "Win-Win Emission Reduction Strategies." Victoria Transport Policy Institute. Website: <http://www.vtpi.org/wwclimate.pdf>. Accessed March 2010. (p. 5)

Donald Shoup, "Evaluating the Effects of Cashing Out Employer-Paid Parking: Eight Case Studies." *Transport Policy*, Vol. 4, No. 4, October 1997, pp. 201-216. (Table 1, p. 204)

Other Literature Reviewed:

None

Transportation

CEQA# MS-G3

TST-1

Transit System
Improvements

3.5 Transit System Improvements

3.5.1 Provide a Bus Rapid Transit System

Range of Effectiveness: 0.02 – 3.2% vehicle miles traveled (VMT) reduction and therefore 0.02 – 3% reduction in GHG emissions.

Measure Description:

The project will provide a Bus Rapid Transit (BRT) system with design features for high quality and cost-effective transit service. These include:

- Grade-separated right-of-way, including bus only lanes (for buses, emergency vehicles, and sometimes taxis), and other Transit Priority measures. Some systems use guideways which automatically steer the bus on portions of the route.
- Frequent, high-capacity service
- High-quality vehicles that are easy to board, quiet, clean, and comfortable to ride.
- Pre-paid fare collection to minimize boarding delays.
- Integrated fare systems, allowing free or discounted transfers between routes and modes.
- Convenient user information and marketing programs.
- High quality bus stations with Transit Oriented Development in nearby areas.
- Modal integration, with BRT service coordinated with walking and cycling facilities, taxi services, intercity bus, rail transit, and other transportation services.

BRT systems vary significantly in the level of travel efficiency offered above and beyond “identity” features and BRT branding. The following effectiveness ranges represent general guidelines. Each proposed BRT should be evaluated specifically based on its characteristics in terms of time savings, cost, efficiency, and way-finding advantages. These types of features encourage people to use public transit and therefore reduce VMT.

Measure Applicability:

- Urban and suburban context
- Negligible in a rural context. Other measures are more appropriate to rural areas, such as express bus service to urban activity centers with park-and-ride lots at system-efficient rural access points.
- Appropriate for specific or general plans

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

Transportation

CEQA# **MS-G3** **TST-1** **Transit System Improvements**

$$CO_2 = VMT \times EF_{\text{running}}$$

Where:

traveled for running emissions

VMT = vehicle miles

EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Existing transit mode share
- Percentage of lines serving Project converting to BRT

The following are optional inputs. Average (default) values are included in the calculations but can be updated to project specificity if desired. Please see Appendix C for calculation detail:

- Average vehicle occupancy

Mitigation Method:

$$\% \text{ VMT Reduction} = \text{Riders} * \text{Mode} * \text{Lines} * D$$

Where

Riders = % increase in transit ridership on BRT line (28% from [1])

Mode mode share (see table below) = Existing transit

Lines serving project converting to BRT = Percentage of lines

D = Adjustments from transit ridership increase to VMT (0.67, see Appendix C)

Project setting	Transit mode share
Suburban	1.3%
Urban	4%
Urban Center	17%
Source: NHTS, 2001 http://www.dot.ca.gov/hq/tsip/tab/documents/travelsurveys/Final2001_StwTravelSurveyWkdayRpt.pdf (Urban – MTC, SACOG. Suburban – SCAG, SANDAG, Fresno County.) Urban Center from San Francisco County Transportation Authority Countywide Transportation Plan, 2000.	

Transportation

CEQA# MS-G3 **TST-1** **Transit System Improvements**

- D: 0.67 (see Appendix C for detail)

Assumptions:

Data based upon the following references:

[1] FTA, August 2005. “Las Vegas Metropolitan Area Express BRT Demonstration Project”, NTD, <http://www.ntdprogram.gov/ntdprogram/cs?action=showRegionAgencies®ion=9>

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁷⁰
CO ₂ e	0.02 – 3.2% of running
PM	0.02 – 3.2% of running
CO	0.02 – 3.2% of running
NO _x	0.02 – 3.2% of running
SO ₂	0.02 – 3.2% of running
ROG	0.012 – 1.9% of total

Discussion:

Increases in transit ridership due to shifts from other lines do not need to be addressed since it is already incorporated in the literature.

In general, transit operational strategies alone are not enough for a large modal shift [2], as evidenced by the low range in VMT reductions. Through case study analysis, the TCRP report [2] observed that strategies that focused solely on improving level of service or quality of transit were unsuccessful at achieving a significant shift. Strategies that reduce the attractiveness of vehicle travel should be implemented in combination to attract a larger shift in transit ridership. The three following factors directly impact the attractiveness of vehicle travel: urban expressway capacity, urban core density, and downtown parking availability.

Example:

Sample calculations are provided below:

- Low Range % VMT Reduction (suburban, 10% of lines) = 28% * 1.3% * 10% * 0.67 = 0.02%

⁷⁰ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

Transportation

CEQA# MS-G3

TST-1

Transit System
Improvements

- High Range % VMT Reduction (urban, 100% of lines) = $28\% * 17\% * 100\% * 0.67 = 3.2\%$

Preferred Literature:

- 28% increase in transit ridership in the existing corridor

The FTA study [1] looks at the implementation of the Las Vegas BRT system. The BRT supplemented an existing route along a 7.5 mile corridor. The existing route was scaled back. Total ridership on the corridor (both routes combined) increased 61,704 monthly riders, 28% increase on the existing corridor and 1.4% increase in system ridership. The route represented an increase in 2.1% of system service miles provided.

Alternative Literature:

Alternate:

- 27-84% increase in total transit ridership

Various bus rapid transit systems obtained the following total transit ridership growth: Vancouver 96B (30%), Las Vegas Max (35-40%), Boston Silver Line (84%), Los Angeles (27-42%), and Oakland (66%). VTPI [3] obtained the BRT data from BC Transit's unpublished research. The effectiveness of a BRT strategy depends largely on the land uses the BRT serves and their design and density.

Alternate:

- 50% increase in weekly transit ridership
- 60 – 80% shorter travel time compared to vehicle trip

The Martin Luther King, Jr. East Busway in Pennsylvania opened in 1983 as a separate roadway exclusively for public buses. The busway was 6.8 miles long with six stations. Ridership has grown from 20,000 to 30,000 weekday riders over 10 years. The busway saves commuters significant time compared with driving: 12 minutes versus 30-45 minutes in the AM or an hour in the PM [4].

Alternative Literature References:

[2] Transit Cooperative Research Program. TCRP 27 – Building Transit Ridership: An Exploration of Transit's Market Share and the Public Policies That Influence It (p.47-48). 1997. [cited in discussion section above]

[3] TDM Encyclopedia; Victoria Transport Policy Institute (2010). Bus Rapid Transit; (<http://www.vtpi.org/tdm/tdm120.htm>); updated 1/25/2010; accessed 3/3/2010.

Transportation

CEQA# **MS-G3** **TST-1** **Transit System Improvements**

[4] Transportation Demand Management Institute of the Association for Commuter Transportation. *TDM Case Studies and Commuter Testimonials*. Prepared for the US EPA. 1997. (p.55-56)
<http://www.epa.gov/OMS/stateresources/rellinks/docs/tmccases.pdf>

Transportation

MP# LU-3.4.3

TST-2

Transit System
Improvements

3.5.2 Implement Transit Access Improvements

Range of Effectiveness: Grouped strategy. [See TST-3 and TST-4]

Measure Description:

This project will improve access to transit facilities through sidewalk/ crosswalk safety enhancements and bus shelter improvements. The benefits of Transit Access Improvements alone have not been quantified and should be grouped with Transit Network Expansion (TST-3) and Transit Service Frequency and Speed (TST-4).

Measure Applicability:

- Urban, suburban context
- Appropriate for residential, retail, office, mixed use, and industrial projects

Alternative Literature:

No literature was identified that specifically looks at the quantitative impact of improving transit facilities as a standalone strategy.

Alternative Literature References:

None

Other Literature Reviewed:

None

Transportation

CEQA# MS-G3 **TST-3** **Transit System Improvements**

3.5.3 Expand Transit Network

Range of Effectiveness: 0.1 – 8.2% vehicle miles travelled (VMT) reduction and therefore 0.1 – 8.2% reduction in GHG emissions⁷¹

Measure Description:

The project will expand the local transit network by adding or modifying existing transit service to enhance the service near the project site. This will encourage the use of transit and therefore reduce VMT.

Measure Applicability:

- Urban and suburban context
- May be applicable in a rural context but no literature documentation available (effectiveness will be case specific and should be based on specific assessment of levels of services and origins/destinations served)
- Appropriate for specific or general plans

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$CO_2 = VMT \times EF_{\text{running}}$$

Where:

traveled
for running emissions

VMT = vehicle miles
EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Percentage increase transit network coverage
- Existing transit mode share
- Project location: urban center, urban, or suburban

⁷¹ Transit vehicles may also result in increases in emissions that are associated with electricity production or fuel use. The Project Applicant should consider these potential additional emissions when estimating mitigation for these measures.

Transportation

CEQA# MS-G3 **TST-3** **Transit System Improvements**

The following are optional inputs. Average (default) values are included in the calculations but can be updated to project specificity if desired. Please see Appendix C for calculation detail:

- Average vehicle occupancy

Mitigation Method:

$$\% \text{ VMT Reduction} = \text{Coverage} * B * \text{Mode} * D$$

Where

- Coverage = % increase in transit network coverage
- B = elasticity of transit ridership with respect to service coverage (see Table below)
- Mode = existing transit mode share
- D = adjustments from transit ridership increase to VMT (0.67, from Appendix C)

B:

Project setting	Elasticity
Suburban	1.01
Urban	0.72
Urban Center	0.65
Source: TCRP 95, Chapter 10	

Mode: Provide existing transit mode share for project or utilize the following averages

Project setting	Transit mode share
Suburban	1.3%
Urban	4%
Urban Center	17%
Source: NHTS, 2001 http://www.dot.ca.gov/hq/tsip/tab/documents/travelsurveys/Final2001_StwTravelSurveyWkdayRpt.pdf (Urban – MTC, SACOG. Suburban – SCAG, SANDAG, Fresno County.) Urban Center from San Francisco County Transportation Authority Countywide Transportation Plan, 2000.	

Assumptions:

Data based upon the following references:

Transportation

CEQA# MS-G3 **TST-3** **Transit System Improvements**

[1] Transit Cooperative Research Program. TCRP Report 95 Traveler Response to System Changes – Chapter 10: Bus Routing and Coverage. 2004. (p. 10-8 to 10-10)

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁷²
CO ₂ e	0.1 – 8.2% of running
PM	0.1 – 8.2% of running
CO	0.1 – 8.2% of running
NO _x	0.1 – 8.2% of running
SO ₂	0.1 – 8.2% of running
ROG	0.06 – 4.9% of total

Discussion:

In general, transit operational strategies alone are not enough for a large modal shift [2], as evidenced by the low range in VMT reductions. Through case study analysis, the TCRP report [2] observed that strategies that focused solely on improving level of service or quality of transit were unsuccessful at achieving a significant shift. Strategies that reduce the attractiveness of vehicle travel should be implemented in combination to attract a larger shift in transit ridership. The three following factors directly impact the attractiveness of vehicle travel: urban expressway capacity, urban core density, and downtown parking availability.

Example:

Sample calculations are provided below:

- Low Range % VMT Reduction (10% expansion, suburban) = 10% * 1.01 * 1.3% * .67 = 0.1%
- High Range % VMT Reduction (100% expansion, urban) = 100% * 0.72 * 17% * .67 = 8.2%

The low and high ranges are estimates and may vary based on the characteristics of the project.

⁷² The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

Transportation

CEQA# MS-G3

TST-3

Transit System
Improvements

Preferred Literature:

- 0.65 = elasticity of transit ridership with respect to service coverage/expansion (in radial routes to central business districts)
- 0.72 = elasticity of transit ridership with respect to service coverage/expansion (in central city routes)
- 1.01 = elasticity of transit ridership with respect to service coverage/expansion (in suburban routes)

TCRP 95 Chapter 10 [1] documents the results of system-wide service expansions in San Diego. The least sensitivity to service expansion came from central business districts while the largest impacts came from suburban routes. Suburban locations, with traditionally low transit service, tend to have greater ridership increases compared to urban locations which already have established transit systems. In general, there is greater opportunity in suburban locations.

Alternative Literature:

- -0.06 = elasticity of VMT with respect to transit revenue miles

Growing Cooler [3] modeled the impact of various urban variables (including transit revenue miles and transit passenger miles) on VMT, using data from 84 urban areas around the U.S.

Alternative Literature References:

- [2] Transit Cooperative Research Program. TCRP 27 – Building Transit Ridership: An Exploration of Transit's Market Share and the Public Policies That Influence It (p.47-48). 1997. [cited in discussion section above]
- [3] Ewing, et al, 2008. *Growing Cooler – The Evidence on Urban Development and Climate Change*. Urban Land Institute.

Transportation

CEQA# MS-G3 **TST-4** **Transit System Improvements**

The following are optional inputs. Average (default) values are included in the calculations but can be updated to project-specific values if desired. Please see Appendix C for calculation detail:

- Average vehicle occupancy

Mitigation Method:

$$\% \text{ VMT Reduction} = \text{Headway} * B * C * \text{Mode} * E$$

Where

- Headway = % reduction in headways
- B = elasticity of transit ridership with respect to increased frequency of service (from [1])
- C = adjustment for level of implementation
- Mode = existing transit mode share
- E = adjustments from transit ridership increase to VMT

Detail:

- Headway: reasonable ranges from 15 – 80%
- B:

Setting	Elasticity
Urban	0.32
Suburban	0.36
Source: TCRP Report 95 Chapter 9	

- C:

Level of implementation = number of lines improved / total number of lines serving project	Adjustment
<50%	50%
>=50%	85%
Fehr & Peers, 2010.	

- Mode: Provide existing transit mode share for project or utilize the following averages

Project setting	Transit mode share
Suburban	1.3%
Urban	4%
Urban Center	17%
Source: NHTS, 2001 http://www.dot.ca.gov/hq/tsip/tab/documents/travelsurveys/Final2001_StwTravelSurveyWkdayRpt.pdf (Urban – MTC, SACOG. Suburban – SCAG, SANDAG, Fresno County.)	

Transportation

CEQA# MS-G3

TST-4

Transit System Improvements

Urban Center from San Francisco County Transportation Authority
Countywide Transportation Plan, 2000.

- E: 0.67 (see Appendix C for detail)

Assumptions:

Data based upon the following references:

[1] Transit Cooperative Research Program. TCRP Report 95 Traveler Response to System Changes – Chapter 9: Transit Scheduling and Frequency (p. 9-14)

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁷⁴
CO ₂ e	0.02 – 2.5% % of running
PM	0.02 – 2.5% % of running
CO	0.02 – 2.5% % of running
NO _x	0.02 – 2.5% % of running
SO ₂	0.02 – 2.5% % of running
ROG	0.01 – 1.5% % of total

Discussion:

Reasonable ranges for reductions were calculated assuming existing 30-minute headways reduced to 25 minutes and 5 minutes to establish the estimated low and high reductions, respectively.

The level of implementation adjustment is used to take into account increases in transit ridership due to shifts from other lines. If increases in frequency are only applied to a percentage of the lines serving the project, then we conservatively estimate that 50% of the transit ridership increase is a shift from the existing lines. If frequency increases are applied to a majority of the lines serving the project, we conservatively assume at least some of the transit ridership (15%) comes from existing riders.

In general, transit operational strategies alone are not enough for a large modal shift [2], as evidenced by the low range in VMT reductions. Through case study analysis, the TCRP report [2] observed that strategies that focused solely on improving level of service or quality of transit were unsuccessful at achieving a significant shift. Strategies that reduce the attractiveness of vehicle travel should be implemented in combination to attract a larger shift in transit ridership. The three following factors directly impact the

⁷⁴ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

Transportation

CEQA# MS-G3

TST-4

Transit System
Improvements

attractiveness of vehicle travel: urban expressway capacity, urban core density, and downtown parking availability.

Example:

Sample calculations are provided below:

- Low Range % VMT Reduction (15% reduction in headways, suburban, <50% implementation) = $15\% * 0.36 * 50\% * 1.3\% * 0.67 = 0.02\%$
- High Range % VMT Reduction (80% reduction in headways, urban, >50% implementation) = $80\% * 0.32 * 85\% * 17\% * 0.67 = 2.5\%$

Preferred Literature:

- 0.32 = elasticity of transit ridership with respect to transit service (urban)
- 0.36 – 0.38 = elasticity of transit ridership with respect to transit service (suburban)

TCRP 95 Chapter 9 [1] documents the results of frequency changes in Dallas. Increases in frequency are more sensitive in a suburban environment. Suburban locations, with traditionally low transit service, tend to have greater ridership increases compared to urban locations which already have established transit systems. In general, there is greater opportunity in suburban locations

Alternative Literature:

- 0.5 = elasticity of transit ridership with respect to increased frequency of service
- 1.5 to 2.3% increase in annual transit trips due to increased frequency of service
- 0.4-0.5 = elasticity of ridership with respect to increased operational speed
- 4% - 15% increase in annual transit trips due to increased operational speed
- 0.03-0.09% annual GHG reduction (for bus service expansion, increased frequency, and increased operational speed)

For increased frequency of service strategy, *Moving Cooler* [3] looked at three levels of service increases, 3%, 3.5% and 4.67% increases in service, resulting in a 1.5 – 2.3% increase in annual transit trips. For increased speed and reliability, *Moving Cooler* looked at three levels of speed/reliability increases. Improving travel speed by 10% assumed implementing signal prioritization, limited stop service, etc. over 5 years. Improving travel speed by 15% assumed all above strategies plus signal synchronization and intersection reconfiguration over 5 years. Improving travel speed by 30% assumed all above strategies and an improved reliability by 40%, integrated fare system, and implementation of BRT where appropriate. *Moving Cooler* calculates estimated 0.04-0.14% annual GHG reductions in combination with bus service expansion strategy.

Transportation

CEQA# MS-G3

TST-4

Transit System
Improvements

Alternative Literature References:

- [2] Transit Cooperative Research Program. TCRP 27 – Building Transit Ridership: An Exploration of Transit's Market Share and the Public Policies That Influence It (p.47-48). 1997. [cited in discussion section]
- [3] Cambridge Systematics. *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*. Technical Appendices. Prepared for the Urban Land Institute. (p B-32, B-33, Table D.3)
http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendices_Complete_102209.pdf

Transportation

MP# TR-4.1.4

TST-5

Transit System
Improvements

3.5.5 Provide Bike Parking Near Transit

Range of Effectiveness: Grouped strategy. [See TST-3 and TST-4]

Measure Description:

Provide short-term and long-term bicycle parking near rail stations, transit stops, and freeway access points. The benefits of Station Bike Parking have no quantified impacts as a standalone strategy and should be grouped with Transit Network Expansion (TST-3) and Increase Transit Service Frequency and Speed (TST-4) to encourage multi-modal use in the area and provide ease of access to nearby transit for bicyclists.

Measure Applicability:

- Urban, suburban context
- Appropriate for residential, retail, office, mixed use, and industrial projects

Alternative Literature:

No literature was identified that specifically looks at the quantitative impact of including transit station bike parking.

Alternative Literature References:

None

Other Literature Reviewed:

None

Transportation

TST-6

Transit System Improvements

3.5.6 Provide Local Shuttles

Range of Effectiveness: Grouped strategy. [See TST-4 and TST-5]

Measure Description:

The project will provide local shuttle service through coordination with the local transit operator or private contractor. The local shuttles will provide service to transit hubs, commercial centers, and residential areas. The benefits of Local Shuttles alone have not been quantified and should be grouped with Transit Network Expansion (TST-4) and Transit Service Frequency and Speed (TST-5) to solve the “first mile/last mile” problem. In addition, many of the CommuteTrip Reduction Programs (Section 2.4, TRP 1-13) also included local shuttles.

Measure Applicability:

- Urban, suburban context
- Appropriate for large residential, retail, office, mixed use, and industrial projects

Alternative Literature:

No literature was identified to support the effectiveness of this strategy alone.

Alternative Literature References:

None

Other Literature Reviewed:

None

Transportation

MP# TR-3.6 **RPT-1** Road Pricing Management

3.6 Road Pricing/Management

3.6.1 Implement Area or Cordon Pricing

Range of Effectiveness: 7.9 – 22.0% vehicle miles traveled (VMT) reduction and therefore 7.9 – 22.0% reduction in GHG emissions.

Measure Description:

This project will implement a cordon pricing scheme. The pricing scheme will set a cordon (boundary) around a specified area to charge a toll to enter the area by vehicle. The cordon location is usually the boundary of a central business district (CBD) or urban center, but could also apply to substantial development projects with limited points of access, such as the proposed Treasure Island development in San Francisco. The cordon toll may be static/constant, applied only during peak periods, or be variable, with higher prices during congested peak periods. The toll price can be based on a fixed schedule or be dynamic, responding to real-time congestion levels. It is critical to have an existing, high quality transit infrastructure for the implementation of this strategy to reach a significant level of effectiveness. The pricing signals will only cause mode shifts if alternative modes of travel are available and reliable.

Measure Applicability:

- Central business district or urban center only

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$CO_2 = VMT \times EF_{\text{running}}$$

Where:

traveled	VMT	= vehicle miles
for running emissions	EF _{running}	= emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Percentage increase in pricing for passenger vehicles to cross cordon
- Peak period variable price or static all-day pricing (London scheme)

Transportation

MP# TR-3.6 **RPT-1** Road Pricing Management

The following are optional inputs. Average (default) values are included in the calculations but can be updated to project-specific values if desired. Please see Appendix C for calculation detail:

- % (due to pricing) route shift, time-of-day shift, HOV shift, trip reduction, shift to transit/walk/bike

Mitigation Method:

$$\% \text{ VMT Reduction} = \text{Cordon\$} * B * C$$

Where

- Cordon\$ = % increase in pricing for passenger vehicles to cross cordon
- B = Elasticity of VMT with respect to price (from [1])
- C = Adjustment for % of VMT impacted by congestion pricing and mode shifts

Detail:

- Cordon\$: reasonable range of 100 – 500% (See Appendix C for detail)
- B: 0.45 [1]
- C:

Cordon pricing scheme	Adjustment
Peak-period variable pricing	8.8%
Static all-day pricing	21%
Source: See Appendix C for detail	

Assumptions:

Data based upon the following references:

[1] Cambridge Systematics. *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*. Technical Appendices. Prepared for the Urban Land Institute. (p. B-13, B-14)
http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendix%20B_Effectiveness_102209.pdf

- Referencing: VTPI, *Transportation Elasticities: How Prices and Other Factors Affect Travel Behavior*. July 2008. www.vtpi.org

Transportation

MP# TR-3.6
RPT-1
Road Pricing Management

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁷⁵
CO ₂ e	7.9 - 22.0% of running
PM	7.9 - 22.0% of running
CO	7.9 - 22.0% of running
NOx	7.9 - 22.0% of running
SO ₂	7.9 - 22.0% of running
ROG	4.7 – 13.2% of total

Discussion:

The amount of pricing will vary on a case-by-case basis. The 100 – 500% increase is an estimated range of increases and should be adjusted to reflect the specificities of the pricing scheme implemented. Take care in calculating the percentage increase in price if baseline is \$0.00. An upper limit of 500% may be a good check point. If baseline is zero, the Project Applicant may want to conduct calculations with a low baseline such as \$1.00.

These calculations assume that the project is within the area cordon, essentially assuming that 100% of project trips will be affected. See Appendix C to make appropriate adjustments.

Example:

Sample calculations are provided below:

- Low Range % VMT Reduction (100% increase in price, peak period pricing) = $100\% * 0.45 * 8.8\% = 4.0\%$
- High Range % VMT Reduction (500% increase in price, all-day pricing) = $500\% * 0.45 * 21\% = 47.3\% = 22\%$ (established maximum based on literature)

Preferred Literature:

- -0.45 VMT elasticity with regard to pricing
- 0.04-0.08% greenhouse gas (GHG) reduction

Moving Cooler [1] assumes an average of 3% of regional VMT would cross the CBD cordon. A VMT reduction of 20% was estimated to require an average of 65 cents/mile applied to all congested VMT in the CBD, major employment, and retail centers. The

⁷⁵ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis. ROG emissions have been adjusted to reflect a ratio of 40% evaporative and 60% exhaust emissions based on a statewide EMFAC run of all vehicles.

Transportation

MP# TR-3.6

RPT-1

Road Pricing Management

range in GHG reductions is attributed to the range of implementation and start date. *Moving Cooler* reports an elasticity range from -0.15 to -0.47 from VTPI. *Moving Cooler* utilizes a stronger elasticity (0.45) to represent greater impact cordon pricing will have on users compared to other pricing strategies.

Alternative Literature:

- 6.5-14.0% reduction in carbon emissions
- 16-22% reduction in vehicles
- 6-9% increase in transit use

The Center for Clean Air Policy (CCAP) [2] cites two case studies in Europe, one in London and one in Stockholm, which show vehicle reductions of 16% and 22%, respectively. London's fee reduced CO₂ by 6.5%. Stockholm's program reduced injuries by 10%, increased transit use by 6-9%, and reduced carbon emissions by 14% in the central city within months of implementation.

Alternative Literature References:

[2] Center for Clean Air Policy (CCAP), *Short-term Efficiency Measures*. (p. 1)

<http://www.ccap.org/docs/resources/715/Short-Term%20Travel%20Efficiency%20Measures%20cut%20GHGs%209%2009%20final.pdf>

CCAP cites Transport for London. *Central London Congestion Charging: Impacts Monitoring, Sixth Annual Report*. July 2008 <http://www.tfl.gov.uk/assets/downloads/sixth-annual-impacts-monitoring-report-2008-07.pdf> (p. 6) and Leslie Abboud and Jenny Clevstrom, "Stockholm's Syndrome," August 29, 2006, *Wall Street Journal*. http://transportation.northwestern.edu/mahmassani/Media/WSJ_8.06.pdf (p. 2)

Other Literature Reviewed:

None

Transportation

MP# TR-2.1 & TR-2.2

RPT-2

Road Pricing Management

3.6.2 Improve Traffic Flow

Range of Effectiveness: 0 - 45% reduction in GHG emissions

Measure Description:

The project will implement improvements to smooth traffic flow, reduce idling, eliminate bottlenecks, and management speed. Strategies may include signalization improvements to reduce delay, incident management to increase response time to breakdowns and collisions, Intelligent Transportation Systems (ITS) to provide real-time information regarding road conditions and directions, and speed management to reduce high free-flow speeds.

This measure does not take credit for any reduction in GHG emissions associated with changes to non-project traffic VMT. If Project Applicant wants to take credit for this benefit, the non-project traffic VMT would also need to be covered in the baseline conditions.

Measure Applicability:

- Urban, suburban, and rural context

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$CO_2 = VMT \times EF_{\text{running}}$$

Where:

traveled VMT = vehicle miles

for running emissions EF_{running} = emission factor

Inputs:

The following information needs to be provided by the Project Applicant:

- Average base-year travel speed (miles per hour (mph)) on implemented roads (congested⁷⁶ condition)

⁷⁶ A roadway is considered “congested” if operating at Level of Service (LOS) E or F

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- Future travel speed (mph) on implemented roads for both a) congested and b) free-flow⁷⁷ condition
- Total vehicle miles traveled (VMT) on implemented roadways
- Total project-generated VMT

Mitigation Method:

$$\% \text{ CO}_2 \text{ Emissions Reduction} = 1 - \frac{\text{Project GHG Emission}_{\text{post strategy}}}{\text{Project GHG emission}_{\text{baseline}}}$$

Where

Project GHG emission_{post strategy} = EF_{running} after strategy implementation * project VMT

Project GHG emission_{baseline} = EF_{running} before strategy implementation * project VMT

EF_{running} = emission factor for running emissions [from table presented under “Detail” below]

Detail:

mph	Grams of CO ₂ / mile	
	congested	Free-flow
5	1,110	823
10	715	512
15	524	368
20	424	297
25	371	262
30	343	247
35	330	244
40	324	249
45	323	259
50	325	273
55	328	289
60	332	306
65	339	325
70	353	347
75	377	375
80	420	416
85	497	478

Source: Barth, 2008, Fehr & Peers [1]

⁷⁷ A roadway is considered “free flow” if operating at LOS D or better

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NOx	0 - 45% of running
SO ₂	0 - 45% of running
ROG	0 - 27% of total

Discussion:

Care must be taken when estimating effectiveness since significantly improving traffic flow essentially lowers the cost and delay involved in travel, which under certain circumstances may induce additional VMT. [See Appendix C for a discussion on induced travel.]

The range of effectiveness presented above is a very rough estimate as emissions reductions will be highly dependent on the level of implementation and degree of congestion on the existing roadways. In addition, the low range of effectiveness was stated at 0% to highlight the potential of induced travel negating benefits achieved from this strategy.

Example:

Sample calculations are provided below:

- Signal timing coordination implementation:
 - Existing congested speeds of 25 mph
 - Conditions post-implementation: would improve to 25 mph free flow speed
 - Proposed project daily traffic generation is 200,000 VMT
 - Project CO₂ Emissions_{baseline} = (371 g CO₂/mile) * (200,000 VMT daily) * (1 MT / 1 x 10⁶ g) = 74 MT of CO₂ daily
 - Project CO₂ Emissions_{post strategy} = (262 g CO₂/mile) * (200,000 VMT daily) * (1 MT / 1 x 10⁶ g) = 52.4 MT of CO₂ daily
 - Percent CO₂emissions reduction = 1 - (52.4 MT/ 74 MT) = 29%
- Speed management technique:
 - Existing free-flow speeds of 75 mph
 - Conditions post-implementation: reduce to 55 mph free flow speed
 - Proposed project daily traffic generation is 200,000 VMT
 - Project CO₂ Emissions_{baseline} = (375 g CO₂/mile) * (200,000 VMT daily) * (1 MT / 1 x 10⁶ g) = 75 MT of CO₂ daily
 - Project CO₂ Emissions_{post strategy} = (289 g CO₂/mile) * (200,000 VMT daily) * (1 MT / 1 x 10⁶ g) = 58 MT of CO₂ daily
 - Percent CO₂emissions reduction= 1 – (58 tons/ 75 tons) = 23%

Preferred Literature:

- 7 – 12% reduction in CO₂ emissions

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This study [1] examined traffic conditions in Southern California using energy and emissions modeling and calculated the impacts of 1) congestion mitigation strategies to smooth traffic flow, 2) speed management techniques to reduce high free-flow speeds, and 3) suppression techniques to eliminate acceleration/deceleration associated with stop-and-go traffic. Using typical conditions on Southern California freeways, the strategies could reduce emissions by 7 to 12 percent.

The table (in the mitigation method section) was calculated using the CO₂ emissions equation from the report:

$$\ln(y) = b_0 + b_1 * x + b_2 * x^2 + b_3 * x^3 + b_4 * x^4$$

where

y = CO₂ emission in grams / mile

x = average trip speed in miles per hour (mph)

The coefficients for b_i were based off of Table 1 of the report, which then provides an equation for both congested conditions (real-world) and free-flow (steady-state) conditions.

Alternative Literature:

- 4 - 13% reduction in fuel consumption

The FHWA study [2] looks at various case studies of traffic flow improvements. In Los Angeles, a new traffic control signal system was estimated to reduce signal delays by 44%, vehicle stops by 41%, and fuel consumption by 13%. In Virginia, a study of retiming signal systems estimated reductions of stops by 25%, travel time by 10%, and fuel consumption by 4%. In California, optimization of 3,172 traffic signals through 1988 (through California's Fuel Efficient Traffic Signal Management program) documented an average reduction in vehicle stops of 16% and in fuel use of 8.6%. The 4-13% reduction in fuel consumption applies only to that vehicular travel directly benefited by the traffic flow improvements, specifically the VMT within the corridor in which the ITS is implemented and only during the times of day that would otherwise be congested without ITS. For example, signal coordination along an arterial normally congested in peak commute hours would produce a 4-13% reduction in fuel consumption only for the VMT occurring along that arterial during weekday commute hours.

Alternate:

- Up to 0.02% increase in greenhouse gas (GHG) emissions

Moving Cooler [3] estimates that bottleneck relief will result in an increase in GHG emissions during the 40-year period, 2010 to 2050. In the short term, however,

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improved roadway conditions may improve congestion and delay, and thus reduce fuel consumption. VMT and GHG emissions are projected to increase after 2030 as induced demand begins to consume the roadway capacity. The study estimates a maximum increase of 0.02% in GHG emissions.

Alternative Literature References:

[2] FHWA, *Strategies to Reduce Greenhouse Gas Emissions from Transportation Sources*. http://www.fhwa.dot.gov/environment/glob_c5.pdf.

[3] Cambridge Systematics. *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*. Technical Appendices. Prepared for the Urban Land Institute.

http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendix%20B_Effectiveness_102209.pdf

Other Literature Reviewed:

None

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Road Pricing Management

3.6.3 Required Project Contributions to Transportation Infrastructure Improvement Projects

Range of Effectiveness: Grouped strategy. [See RPT-2 and TST-1 through 7]

Measure Description:

The project should contribute to traffic-flow improvements or other multi-modal infrastructure projects that reduce emissions and are not considered as substantially growth inducing. The local transportation agency should be consulted for specific needs.

Larger projects may be required to contribute a proportionate share to the development and/or continuation of a regional transit system. Contributions may consist of dedicated right-of-way, capital improvements, easements, etc. The local transportation agency should be consulted for specific needs.

Refer to Traffic Flow Improvements (RPT-2) or the Transit System Improvements (TST-1 through 7) strategies for a range of effectiveness in these categories. The benefits of Required Contributions may only be quantified when grouped with related improvements.

Measure Applicability:

- Urban, suburban, and rural context
- Appropriate for residential, retail, office, mixed use, and industrial projects

Alternative Literature:

Although no literature discusses project contributions as a standalone measure, this strategy is a supporting strategy for most operations and infrastructure projects listed in this report.

Other Literature Reviewed:

None

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3.6.4 Install Park-and-Ride Lots

Range of Effectiveness: Grouped strategy. [See RPT-1, TRT-11, TRT-3, and TST-1 through 6]

Measure Description:

This project will install park-and-ride lots near transit stops and High Occupancy Vehicle (HOV) lanes. Park-and-ride lots also facilitate car- and vanpooling. Refer to Implement Area or Cordon Pricing (RPT-1), Employer-Sponsored Vanpool/Shuttle (TRT-11), Ride Share Program (TRT-3), or the Transit System Improvement strategies (TST-1 through 6) for ranges of effectiveness within these categories. The benefits of Park-and-Ride Lots are minimal as a stand-alone strategy and should be grouped with any or all of the above listed strategies to encourage carpooling, vanpooling, ride-sharing, and transit usage.

Measure Applicability:

- Suburban and rural context
- Appropriate for residential, retail, office, mixed use, and industrial projects

Alternative Literature:

Alternate:

- 0.1 – 0.5% vehicle miles traveled (VMT) reduction

A 2005 FHWA [1] study found that regional VMT in metropolitan areas may be reduced between 0.1 to 0.5% (citing Apogee Research, Inc., 1994). The reduction potential of this strategy may be limited because it reduces the trip length but not vehicle trips.

Alternate:

- 0.50% VMT reduction per day

Washington State Department of Transportation (WSDOT) [2] notes the above number applies to countywide interstates and arterials.

Alternative Literature References:

[1] FHWA. Transportation and Global Climate Change: A Review and Analysis of the Literature – Chapter 5: Strategies to Reduce Greenhouse Gas Emissions from Transportation Sources.

http://www.fhwa.dot.gov/environment/glob_c5.pdf

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RPT-4

Road Pricing Management

[2] Washington State Department of Transportation. *Cost Effectiveness of Park-and-Ride Lots in the Puget Sound Area.*

<http://www.wsdot.wa.gov/research/reports/fullreports/094.1.pdf>

Other Literature Reviewed:

None

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MP# TR-6 **VT-1** Vehicles

3.7 Vehicles

3.7.1 Electrify Loading Docks and/or Require Idling-Reduction Systems

Range of Effectiveness: 26-71% reduction in TRU idling GHG emissions

Measure Description:

Heavy-duty trucks transporting produce or other refrigerated goods will idle at truck loading docks and during layovers or rest periods so that the truck engine can continue to power the cab cooling elements. Idling requires fuel use and results in GHG emissions.

The Project Applicant should implement an enforcement and education program that will ensure compliance with this measure. This includes posting signs regarding idling restrictions as well as recording engine meter times upon entering and exiting the facility.

Measure Applicability:

- Truck refrigeration units (TRU)

Inputs:

The following information needs to be provided by the Project Applicant:

- Electricity provider for the Project
- Horsepower of TRU
- Hours of operation

Baseline Method:

$$GHG\ emission = \frac{CO_2\ Exhaust}{Activity \times AvgHP \times LF} \times Hp \times Hr \times C \times LF$$

Where:

GHG emission = MT CO₂e

CO₂ Exhaust = Statewide daily CO₂ emission from TRU for the relevant horsepower tier (tons/day). Obtained from OFFROAD2007.

Activity = Statewide daily average TRU operating hours for the relevant horsepower tier (hours/day). Obtained from OFFROAD2007.

AvgHP = Average TRU horsepower for the relevant horsepower tier (HP). Obtained from OFFROAD2007.

Hp = Horsepower of TRU.

Hr = Hours of operation.

C = Unit conversion factor

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LF = Load factor of TRU for the relevant horsepower tier (dimensionless).
 Obtained from OFFROAD 2007.

Note that this method assumes the load factor of the TRU is same as the default in OFFROAD2007.

Mitigation Method:

Electrify loading docks

TRUs will be plugged into electric loading dock instead of left idling. The indirect GHG emission from electricity generation is:

$$\text{GHG emission} = \text{Utility} \times \text{Hp} \times \text{LF} \times \text{Hr} \times \text{C}$$

Where:

- GHG emissions = MT CO₂e
- Utility = Carbon intensity of Local Utility (CO₂e/kWh)
- Hp = Horsepower of TRU.
- LF = Load factor of TRU for the relevant horsepower tier (dimensionless).
 Obtained from OFFROAD2007.
- Hr = Hours of operation.
- C = Unit conversion factor

$$\text{GHG Reduction \%}^{79} = 1 - \frac{\text{Utility} \times \text{C}}{\text{EF} \times 10^{-6}}$$

Idling Reduction

Emissions from reduced TRU idling periods are calculated using the same methodology for the baseline scenario, but with the shorter hours of operation.

$$\text{GHG Reduction \%} = 1 - \frac{\text{time}_{\text{mitigated}}}{\text{time}_{\text{baseline}}}$$

Electrify loading docks

Power Utility	TRU Horsepower (HP)	Idling Emission Reductions ⁸⁰
LADW&P	< 15	26.3%
	< 25	26.3%
	< 50	35.8%

⁷⁹ This assumes energy from engine losses are the same.

⁸⁰ This reduction percentage applies to all GHG and criteria pollutant idling emissions.

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PG&E	< 15	72.9%
	< 25	72.9%
	< 50	76.3%
SCE	< 15	61.8%
	< 25	61.8%
	< 50	66.7%
SDGE	< 15	53.5%
	< 25	53.5%
	< 50	59.5%
SMUD	< 15	67.0%
	< 25	67.0%
	< 50	71.2%

Idling Reduction

Emission reduction from shorter idling period is same as the percentage reduction in idling time.

Discussion:

The output from OFFROAD2007 shows the same emissions within each horsepower tier regardless of the year modeled. Therefore, the emission reduction is dependent on the location of the Project and horsepower of the TRU only.

Assumptions:

Data based upon the following references:

- California Air Resources Board. Off-road Emissions Inventory. OFFROAD2007. Available online at: <http://www.arb.ca.gov/msei/offroad/offroad.htm>
- California Climate Action Registry Reporting Online Tool. 2006 PUP Reports. Available online at: <https://www.climateregistry.org/CARROT/public/reports.aspx>

Preferred Literature:

The electrification of truck loading docks can allow properly equipped trucks to take advantage of external power and completely eliminate the need for idling. Trucks would need to be equipped with internal wiring, inverter, system, and a heating, ventilation, and air conditioning (HVAC) system. Under this mitigation measure, the direct emissions from fuel combustion are completely displaced by indirect emissions from the CO₂ generated during electricity production. The amount of electricity required depends on the type of truck and refrigeration elements; this data could be determined from manufacturer specifications. The total kilowatt-hours required should be multiplied by the carbon-intensity factor of the local utility provider in order to calculate the amount of indirect CO₂ emissions. To take credit for this mitigation measure, the Project Applicant

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would need to provide detailed evidence supporting a calculation of the emissions reductions.

Alternative Literature:

None

Other Literature Reviewed:

1. USEPA. 2002. Green Transport Partnership, A Glance at Clean Freight Strategies: Idle Reduction. Available online at: <http://nepis.epa.gov/Adobe/PDF/P1000S9K.PDF>
2. ATRI. 2009. Research Results: Demonstration of Integrated Mobile Idle Reduction Solutions. Available online at: <http://www.atrionline.org/research/results/ATRI1pagesummaryMIRTDemo.pdf>

None

Transportation

CEQA# MM T-21 **VT-2** **Vehicles**

3.7.2 Utilize Alternative Fueled Vehicles

Range of Effectiveness: Reduction in GHG emissions varies depending on vehicle type, year, and associated fuel economy.

Measure Description:

When construction equipment is powered by alternative fuels such as biodiesel (B20), liquefied natural gas (LNG), or compressed natural gas (CNG) rather than conventional petroleum diesel or gasoline, GHG emissions from fuel combustion may be reduced.

Measure Applicability:

- Vehicles

Inputs:

The following information needs to be provided by the Project Applicant:

- Vehicle category
- Traveling speed (mph)
- Number of trips and trip length, or Vehicle Miles Traveled (VMT)
- Fuel economy (mpg) or Fuel consumption

Baseline Method:

$$\text{Baseline CO}_2 \text{ Emission} = \text{EF} \times \frac{1}{\text{FE}} \times \text{VMT} \times \text{C}$$

Where:

- Baseline CO₂ Emission = MT of CO₂
- EF = CO₂ emission factor, from CCAR General Reporting Protocol (g/gallon)
- VMT = Vehicle miles traveled (VMT) = T x L
- FE = Fuel economy (mpg)
- C = Unit conversion factor

$$\text{Baseline N}_2\text{O /CH}_4 \text{ Emission} = \text{EF} \times \text{VMT} \times \text{C}$$

Where:

- Baseline N₂O/CH₄ Emission = MT of N₂O or CH₄
- EF = N₂O or CH₄ emission factor, from CCAR General Reporting Protocol (g/mile)
- VMT = Vehicle miles traveled (VMT) = T x L
- T = Number of one-way trips
- L = One-way trip length
- FC = Fuel consumption (gallon) = VMT/FE

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FE = Fuel economy (mpg)
 C = Unit conversion factor

The total baseline GHG emission is the sum of the emissions of CO₂, N₂O and CH₄, adjusted by their global warming potentials (GWP):

Baseline GHG Emission
 = Baseline CO₂ Emission + Baseline N₂O Emission × 310 + Baseline CH₄ Emission × 21

Where:

Baseline GHG Emission = MT of CO₂e
 310 = GWP of N₂O
 21 = GWP of CH₄

Mitigation Method:

Mitigated emissions from using alternative fuel is calculated using the same methodology before, but using emission factors for the alternative fuel, and fuel consumption calculated as follows:

$$GHG_{emissions} = \frac{1}{FE} \times ER \times VMT \times EF_{CO_2} + VMT \times EF_{N_2O} + VMT \times EF_{CH_4}$$

Where:

- ER = Energy ratio from US Department of Energy (see table below)
- EF = Emission Factor for pollutant
- VMT = Vehicle miles traveled (VMT)
- FE = Fuel economy (mpg)

Fuel	Energy Ratio: Amount of fuel needed to provide same energy as			
	1 gallon of Gasoline		1 gallon of Diesel	
Gasoline	1	gal	1.13	gal
#2 Diesel	0.88	gal	1	gal
B20	0.92	gal	1.01	gal
CNG	126. 67	ft ³	143.14	ft ³
LNG	1.56	gal	1.77	gal
LPC	1.37	gal	1.55	gal

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Emission reductions can be calculated as:

$$\text{Reduction} = 1 - \frac{\text{Mitigated Emission}}{\text{Running Emission}}$$

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions
CO ₂ e	Range Not Quantified ⁸¹
PM	Range Not Quantified
CO	Range Not Quantified
NO _x	Range Not Quantified
SO ₂	Range Not Quantified
ROG	Range Not Quantified

Discussion:

Using the methodology described above, only the running emission is considered. A hypothetical scenario for a gasoline fueled light duty automobile in 2015 is illustrated below. The CO₂ emission factor from motor gasoline in CCAR 2009 is 8.81 kg/gallon. Assuming the automobile makes two trips of 60 mile each per day, and using the current passenger car fuel economy of 27.5 mpg under the CAFE standards, then the annual baseline CO₂ emission from the automobile is:

$$8.81 \times \frac{2 \times 60 \times 365}{27.5} \times 10^{-3} = 14.0 \text{ MT/year}$$

Where 10⁻³ is the conversion factor from kilograms to MT.

Using the most recent N₂O emission factor of 0.0079 g/mile in CCAR 2009 for gasoline passenger cars, the annual baseline N₂O emission from the automobile is:

$$0.0079 \times 2 \times 365 \times 60 \times 10^{-6} = 0.000346 \text{ MT/year}$$

⁸¹ The emissions reductions varies and depends on vehicle type, year, and the associated fuel economy. The methodology above describes how to calculate the expected GHG emissions reduction assuming the required input parameters are known.

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Similarly, using the same formula with the most recent CH₄ emission factor of 0.0147 g/mile in CCAR 2009 for gasoline passenger cars, the annual baseline CH₄ emission from the automobile is calculated to be 0.000644 MT/year.

Thus, the total baseline GHG emission for the automobile is:

$$14.0 + 0.000346 \times 310 + 0.000644 \times 21 = 14.1 \text{ MT/year}$$

If compressed natural gas (CNG) is used as alternative fuel, the CNG consumption for the same VMT is:

$$\frac{2 \times 60 \times 365}{27.5} \times 126.67 = 201,751 \text{ ft}^3$$

Using the same formula as for the baseline scenario but with emission factors of CNG and the CNG consumption, the mitigated GHG emission can be calculated as shown in the table below

Pollutant	Emission (MT/yr)
CO ₂	11.0
N ₂ O	0.0022
CH ₄	0.0323
CO ₂ e	12.4

Therefore, the emission reduction is:

$$1 - \frac{12.4}{14.0} = 11.4\%$$

Notice that in the baseline scenario, N₂O and CH₄ only make up <1% of the total GHG emissions, but actually increase for the mitigated scenario and contribute to >10% of total GHG emissions.

Assumptions:

Data based upon the following references:

- California Climate Action Registry (CCAR). 2009. General Reporting Protocol. Version 3.1. Available online at: <http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html>

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- US Department of Energy. 2010. Alternative and Advanced Fuels – Fuel Properties. Available online at: <http://www.afdc.energy.gov/afdc/fuels/properties.html>

Preferred Literature:

The amount of emissions avoided from using alternative fuel vehicles can be calculated using emission factors from the California Climate Action Registry (CCAR) General Reporting Protocol [1]. Multiplying this factor by the fuel consumption or vehicle miles traveled (VMT) gives the direct emissions of CO₂ and N₂O /CH₄, respectively. Fuel consumption and VMT can be calculated interchangeably with the fuel economy (mpg). The total GHG emission is the sum of the emissions from the three chemicals multiplied by their respective global warming potential (GWP).

Assuming the same VMT, the amount of alternative fuel required to run the same vehicle fleet can be calculated by multiplying gasoline/diesel fuel consumption by the equivalent-energy ratio obtained from the US Department of Energy [2]. Using the alternative fuel consumption and the emission factors for the alternative fuel from CCAR, the mitigated GHG emissions can be calculated. The GHG emissions reduction associated with this mitigation measure is therefore the difference in emissions from these two scenarios.

Alternative Literature:

None

Notes:

[1] California Climate Action Registry (CCAR). 2009. General Reporting Protocol. Version 3.1. Available online at:

<http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html>

[2] US Department of Energy. 2010. Alternative and Advanced Fuels – Fuel Properties.

Available online at: <http://www.afdc.energy.gov/afdc/fuels/properties.html>

Other Literature Reviewed:

None

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CEQA# MM T-20 **VT-3** Vehicles

3.7.3 Utilize Electric or Hybrid Vehicles

Range of Effectiveness: 0.4 - 20.3% reduction in GHG emissions

Measure Description:

When vehicles are powered by grid electricity rather than fossil fuel, direct GHG emissions from fuel combustion are replaced with indirect GHG emissions associated with the electricity used to power the vehicles. When vehicles are powered by hybrid-electric drives, GHG emissions from fuel combustion are reduced.

Measure Applicability:

- Vehicles

Inputs:

The following information needs to be provided by the Project Applicant:

- Vehicle category
- Traveling speed (mph)
- Number of trips and trip length, or Vehicle Miles Traveled (VMT)
- Fuel economy (mpg)

Baseline Method:

$$\text{Baseline Emission} = \text{EF} \times (1 - \text{R}) \times \text{VMT} \times \text{C}$$

Where:

- Baseline Emission = MT of Pollutant
- EF = Running emission factor for pollutant at traveling speed, from EMFAC.
- VMT = Vehicle miles traveled (VMT)
- R = Additional reduction in EF due to regulation (see Table 1)
- C = Unit conversion factor

Mitigation Method:

Fully Electric Vehicle

Vehicle will run solely on electricity. The indirect GHG emission from electricity generation is:

$$\text{Mitigated Emission} = \text{Utility} \times \frac{1}{\text{FE}} \times \text{VMT} \times \text{ER} \times \text{C}$$

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Where:

- Mitigated Emission = MT of CO₂e
- Utility = Carbon intensity of Local Utility (CO₂e/kWh)
- VMT = Vehicle miles traveled (VMT)
- ER = Energy Ratio = 33.4 kWh/gallon-gasoline or 37.7 kWh/gallon-diesel
- FE = Fuel Economy (mpg)
- C = Unit conversion factor

Power Utility	Carbon-Intensity (lbs CO ₂ e/MWh)
LADW&P	1,238
PG&E	456
SCE	641
SDGE	781
SMUD	555

Criteria pollutant emissions will be 100% reduced for equipment running solely on electricity.

Hybrid-Electric Vehicle

The Project Applicant has to determine the fuel consumption reduced from using the hybrid-electric vehicle. The emission reductions for all pollutants are the same as the fuel reduction.

Emission reductions can be calculated as:

$$\text{GHG Reduction\%} = 1 - \frac{\text{Mitigated Emission}}{\text{RunningEmission}}$$

Emission Reduction Ranges and Variables:

See Table VT-3.1 below.

Discussion:

Using the methodology described above, only the running emission is considered. A hypothetical scenario for a gasoline fueled light duty automobile with catalytic converter in 2015 is illustrated below. The running CO₂ emission factor at 30 mph from an EMFAC run of the Sacramento county with temperature of 60F and relative humidity of 45% is 336.1 g/mile. From Table VT-3.1, there will be an additional reduction of 9.1% for the emission factor in 2015 due to Pavley standard. Assuming the automobile makes two trips of 60 mile each per day, then annual baseline emission from the automobile is:

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$$336.1 \times (100\% - 9.1\%) \times 2 \times 365 \times 60 \times 10^{-6} = 13.4 \text{ MT/year}$$

Where 10^{-6} is the conversion factor from grams to MT. Assuming the current passenger car fuel economy of 27.5 mpg under the CAFE standards, and using the carbon-intensity factor for PG&E, the electric provider for the Sacramento region, the mitigated emission from replacing the automobile described above with electric vehicle would be:

$$\left(456 \times \frac{2 \times 365 \times 60}{27.5} \times 33.4 \times \frac{1}{2,204 \times 10^3} \right) = 11.0 \text{ MT/year}$$

Therefore, the emission reduction is:

$$1 - \frac{11.0}{13.4} = 17.9\%$$

Assumptions:

Data based upon the following references:

- California Air Resources Board. EMFAC2007. Available online at: http://www.arb.ca.gov/msei/onroad/latest_version.htm
- California Climate Action Registry (CCAR). 2009. General Reporting Protocol. Version 3.1. Available online at: <http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html>
- California Climate Action Registry Reporting Online Tool. 2006 PUP Reports. Available online at: <https://www.climateregistry.org/CARROT/public/reports.aspx>
- US Department of Energy. 2010. Alternative and Advanced Fuels – Fuel Properties. Available online at: <http://www.afdc.energy.gov/afdc/fuels/properties.html>

Preferred Literature:

The amount of emissions avoided from using electric and hybrid vehicles can be calculated using CARB's EMFAC model, which provides state-wide and regional running emission factors for a variety of on-road vehicles in units of grams per mile [1]. Multiplying this factor by the vehicle miles traveled (VMT) gives the direct emissions. For criteria pollutant, emissions can be assumed to be 100% reduced from running on electricity. For GHG, assuming the same VMT, the electricity required to run the same vehicle fleet can be calculated by dividing by the fuel economy (mpg) and multiplying the gasoline-electric energy ratio obtained from the US Department of Energy [2]. Multiplying this value by the carbon-intensity factor of the local utility gives the amount of indirect GHG emissions associated with electric vehicles. The GHG emissions

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reduction associated with this mitigation measure is therefore the difference in emissions from these two scenarios.

Alternative Literature:

None

Notes:

[1] California Air Resources Board. EMFAC2007. Available online at:

http://www.arb.ca.gov/msei/onroad/latest_version.htm

[2] US Department of Energy. 2010. Alternative and Advanced Fuels – Fuel Properties.

Available online at: <http://www.afdc.energy.gov/afdc/fuels/properties.html>

Other Literature Reviewed:

None

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Table VT-3.1
Reduction in EMFAC Running Emission Factor from New Regulations

Year	Vehicle Class	Reduction	Pollutant	Regulation
2010	LDA/LDT/MDV	0.4%	CO ₂	Pavley Standard
2011	LDA/LDT/MDV	1.6%	CO ₂	Pavley Standard
2012	LDA/LDT/MDV	3.5%	CO ₂	Pavley Standard
2013	LDA/LDT/MDV	5.3%	CO ₂	Pavley Standard
2014	LDA/LDT/MDV	7.1%	CO ₂	Pavley Standard
2015	LDA/LDT/MDV	9.1%	CO ₂	Pavley Standard
2016	LDA/LDT/MDV	11.0%	CO ₂	Pavley Standard
2017	LDA/LDT/MDV	13.1%	CO ₂	Pavley Standard
2018	LDA/LDT/MDV	15.5%	CO ₂	Pavley Standard
2019	LDA/LDT/MDV	17.9%	CO ₂	Pavley Standard
2020	LDA/LDT/MDV	20.3%	CO ₂	Pavley Standard
2011	Other Buses	21.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	School Bus	19.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	MHDDT Agriculture	17.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	MHDDT CA International Registration Plan	4.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	MHDDT Instate	6.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	MHDDT Out-of-state	4.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	HHDDT Agriculture	23.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	HHDDT CA International Registration Plan	1.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	HHDDT Non-neighboring Out-of-state	0.5%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	HHDDT Neighboring Out-of-state	2.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	HHDDT Singleunit	10.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	HHDDT Tractor	9.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	Other Buses	25.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	Power Take Off	28.4%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	School Bus	45.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	MHDDT Agriculture	20.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	MHDDT CA International Registration Plan	12.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	MHDDT Instate	11.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles

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Year	Vehicle Class	Reduction	Pollutant	Regulation
				Regulation
2012	MHDDT Out-of-state	12.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	HHDDT Agriculture	29.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	HHDDT CA International Registration Plan	8.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	HHDDT Non-neighboring Out-of-state	15.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	HHDDT Neighboring Out-of-state	15.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	HHDDT Drayage at Other Facilities	9.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	HHDDT Drayage in Bay Area	9.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	HHDDT Drayage near South Coast	7.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	HHDDT Singleunit	14.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	HHDDT Tractor	13.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	Other Buses	45.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	Power Take Off	57.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	School Bus	68.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	MHDDT Agriculture	31.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	MHDDT CA International Registration Plan	55.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	MHDDT Instate	64.5%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	MHDDT Out-of-state	55.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	HHDDT Agriculture	48.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	HHDDT CA International Registration Plan	60.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	HHDDT Non-neighboring Out-of-state	50.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	HHDDT Neighboring Out-of-state	63.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	HHDDT Drayage at Other Facilities	67.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	HHDDT Drayage in Bay Area	65.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	HHDDT Drayage near South Coast	51.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation

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Year	Vehicle Class	Reduction	Pollutant	Regulation
2013	HHDDT Singleunit	66.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	HHDDT Tractor	69.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	Other Buses	53.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	Power Take Off	63.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	School Bus	71.4%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	MHDDT Agriculture	33.4%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	MHDDT CA International Registration Plan	65.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	MHDDT Instate	77.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	MHDDT Out-of-state	65.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	MHDDT Utility	0.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	HHDDT Agriculture	52.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	HHDDT CA International Registration Plan	63.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	HHDDT Non-neighboring Out-of-state	46.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	HHDDT Neighboring Out-of-state	64.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	HHDDT Singleunit	79.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	HHDDT Tractor	79.4%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	HHDDT Utility	4.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	Other Buses	49.5%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	Power Take Off	61.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	School Bus	71.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	MHDDT Agriculture	34.5%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	MHDDT CA International Registration Plan	60.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	MHDDT Instate	74.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	MHDDT Out-of-state	60.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	MHDDT Utility	0.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation

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Year	Vehicle Class	Reduction	Pollutant	Regulation
2015	HHDDT Agriculture	53.5%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	HHDDT CA International Registration Plan	55.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	HHDDT Non-neighboring Out-of-state	37.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	HHDDT Neighboring Out-of-state	55.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	HHDDT Singleunit	77.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	HHDDT Tractor	76.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	HHDDT Utility	4.4%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	Other Buses	43.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	Power Take Off	75.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	School Bus	70.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	MHDDT Agriculture	32.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	MHDDT CA International Registration Plan	56.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	MHDDT Instate	73.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	MHDDT Out-of-state	56.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	MHDDT Utility	0.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	HHDDT Agriculture	51.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	HHDDT CA International Registration Plan	45.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	HHDDT Non-neighboring Out-of-state	27.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	HHDDT Neighboring Out-of-state	46.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	HHDDT Singleunit	75.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	HHDDT Tractor	73.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	HHDDT Utility	4.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	Other Buses	36.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	Power Take Off	71.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	School Bus	67.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation

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Year	Vehicle Class	Reduction	Pollutant	Regulation
2017	MHDDT Agriculture	55.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	MHDDT CA International Registration Plan	52.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	MHDDT Instate	70.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	MHDDT Out-of-state	52.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	MHDDT Utility	0.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	HHDDT Agriculture	58.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	HHDDT CA International Registration Plan	37.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	HHDDT Non-neighboring Out-of-state	18.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	HHDDT Neighboring Out-of-state	37.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	HHDDT Singleunit	73.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	HHDDT Tractor	70.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	HHDDT Utility	3.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	Other Buses	31.4%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	Power Take Off	67.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	School Bus	74.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	MHDDT Agriculture	53.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	MHDDT CA International Registration Plan	47.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	MHDDT Instate	68.5%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	MHDDT Out-of-state	47.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	MHDDT Utility	0.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	HHDDT Agriculture	55.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	HHDDT CA International Registration Plan	30.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	HHDDT Non-neighboring Out-of-state	11.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	HHDDT Neighboring Out-of-state	30.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	HHDDT Singleunit	72.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation

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Year	Vehicle Class	Reduction	Pollutant	Regulation
2018	HHDDT Tractor	67.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	HHDDT Utility	3.5%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	Other Buses	27.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	Power Take Off	76.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	School Bus	73.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	MHDDT Agriculture	53.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	MHDDT CA International Registration Plan	42.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	MHDDT Instate	65.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	MHDDT Out-of-state	42.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	MHDDT Utility	0.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	HHDDT Agriculture	54.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	HHDDT CA International Registration Plan	24.5%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	HHDDT Non-neighboring Out-of-state	5.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	HHDDT Neighboring Out-of-state	24.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	HHDDT Singleunit	69.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	HHDDT Tractor	64.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	HHDDT Utility	3.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	Other Buses	23.5%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	Power Take Off	74.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	School Bus	71.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	MHDDT Agriculture	52.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	MHDDT CA International Registration Plan	37.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	MHDDT Instate	60.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	MHDDT Out-of-state	37.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	MHDDT Utility	0.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation

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Year	Vehicle Class	Reduction	Pollutant	Regulation
2020	HHDDT Agriculture	52.4%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	HHDDT CA International Registration Plan	19.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	HHDDT Non-neighboring Out-of-state	3.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	HHDDT Neighboring Out-of-state	20.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	HHDDT Singleunit	66.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	HHDDT Tractor	61.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	HHDDT Utility	2.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	Other Buses	21.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	Power Take Off	79.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	School Bus	68.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	MHDDT Agriculture	51.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	MHDDT CA International Registration Plan	33.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	MHDDT Instate	57.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	MHDDT Out-of-state	33.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	MHDDT Utility	5.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Agriculture	50.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT CA International Registration Plan	16.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Non-neighboring Out-of-state	3.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Neighboring Out-of-state	16.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Drayage at Other Facilities	10.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Drayage in Bay Area	9.4%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Drayage near South Coast	9.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Singleunit	64.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Tractor	59.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Utility	5.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation

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Year	Vehicle Class	Reduction	Pollutant	Regulation
2022	Other Buses	20.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	Power Take Off	79.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	School Bus	66.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	MHDDT Agriculture	50.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	MHDDT CA International Registration Plan	28.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	MHDDT Instate	53.5%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	MHDDT Out-of-state	28.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	MHDDT Utility	6.4%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Agriculture	49.4%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT CA International Registration Plan	13.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Non-neighboring Out-of-state	1.5%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Neighboring Out-of-state	14.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Drayage at Other Facilities	10.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Drayage in Bay Area	8.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Drayage near South Coast	8.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Singleunit	61.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Tractor	55.5%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Utility	5.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	Other Buses	18.5%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	Power Take Off	74.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	School Bus	64.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	MHDDT Agriculture	79.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	MHDDT CA International Registration Plan	23.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	MHDDT Instate	48.4%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	MHDDT Out-of-state	23.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation

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Year	Vehicle Class	Reduction	Pollutant	Regulation
2023	MHDDT Utility	7.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Agriculture	68.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT CA International Registration Plan	11.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Non-neighboring Out-of-state	1.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Neighboring Out-of-state	11.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Drayage at Other Facilities	9.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Drayage in Bay Area	8.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Drayage near South Coast	8.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Singleunit	56.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Tractor	51.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Utility	4.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	Other Buses	15.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	Power Take Off	68.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	School Bus	61.4%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	MHDDT Agriculture	77.4%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	MHDDT CA International Registration Plan	20.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	MHDDT Instate	43.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	MHDDT Out-of-state	20.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	MHDDT Utility	5.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT Agriculture	65.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT CA International Registration Plan	9.1%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT Non-neighboring Out-of-state	0.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT Neighboring Out-of-state	9.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT Drayage at Other Facilities	9.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT Drayage in Bay Area	7.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation

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Year	Vehicle Class	Reduction	Pollutant	Regulation
2024	HHDDT Drayage near South Coast	7.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT Singleunit	50.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT Tractor	46.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT Utility	3.4%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	Other Buses	13.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	Power Take Off	62.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	School Bus	58.2%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	MHDDT Agriculture	75.4%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	MHDDT CA International Registration Plan	15.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	MHDDT Instate	37.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	MHDDT Out-of-state	15.3%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	MHDDT Utility	3.4%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Agriculture	62.7%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT CA International Registration Plan	6.8%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Non-neighboring Out-of-state	0.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Neighboring Out-of-state	7.0%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Drayage at Other Facilities	8.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Drayage in Bay Area	7.5%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Drayage near South Coast	7.6%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Singleunit	44.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Tractor	42.9%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Utility	2.4%	PM2.5	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	MHDDT CA International Registration Plan	1.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	MHDDT Instate	2.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	MHDDT Out-of-state	1.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation

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Year	Vehicle Class	Reduction	Pollutant	Regulation
2011	HHDDT CA International Registration Plan	0.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	HHDDT Non-neighboring Out-of-state	0.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	HHDDT Neighboring Out-of-state	1.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	HHDDT Singleunit	4.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2011	HHDDT Tractor	3.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	Power Take Off	13.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	School Bus	2.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	MHDDT CA International Registration Plan	1.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	MHDDT Instate	2.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	MHDDT Out-of-state	1.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	HHDDT CA International Registration Plan	0.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	HHDDT Non-neighboring Out-of-state	0.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	HHDDT Neighboring Out-of-state	0.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	HHDDT Singleunit	3.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2012	HHDDT Tractor	3.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	Other Buses	18.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	Power Take Off	34.0%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	School Bus	4.4%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	MHDDT Agriculture	5.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	MHDDT CA International Registration Plan	12.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	MHDDT Instate	25.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	MHDDT Out-of-state	12.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	HHDDT Agriculture	10.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	HHDDT CA International Registration Plan	8.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	HHDDT Non-neighboring Out-of-state	1.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation

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Year	Vehicle Class	Reduction	Pollutant	Regulation
2013	HHDDT Neighboring Out-of-state	8.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	HHDDT Singleunit	33.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2013	HHDDT Tractor	28.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	Other Buses	40.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	Power Take Off	37.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	School Bus	6.4%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	MHDDT Agriculture	9.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	MHDDT CA International Registration Plan	22.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	MHDDT Instate	34.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	MHDDT Out-of-state	22.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	MHDDT Utility	0.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	HHDDT Agriculture	17.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	HHDDT CA International Registration Plan	13.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	HHDDT Non-neighboring Out-of-state	4.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	HHDDT Neighboring Out-of-state	14.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	HHDDT Singleunit	45.4%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	HHDDT Tractor	36.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2014	HHDDT Utility	1.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	Other Buses	52.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	Power Take Off	33.0%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	School Bus	6.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	MHDDT Agriculture	18.4%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	MHDDT CA International Registration Plan	20.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	MHDDT Instate	31.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	MHDDT Out-of-state	20.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation

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Year	Vehicle Class	Reduction	Pollutant	Regulation
2015	MHDDT Utility	0.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	HHDDT Agriculture	27.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	HHDDT CA International Registration Plan	11.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	HHDDT Non-neighboring Out-of-state	2.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	HHDDT Neighboring Out-of-state	12.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	HHDDT Singleunit	42.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	HHDDT Tractor	34.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2015	HHDDT Utility	1.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	Other Buses	54.4%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	Power Take Off	43.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	School Bus	4.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	MHDDT Agriculture	19.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	MHDDT CA International Registration Plan	22.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	MHDDT Instate	32.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	MHDDT Out-of-state	22.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	MHDDT Utility	0.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	HHDDT Agriculture	29.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	HHDDT CA International Registration Plan	11.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	HHDDT Non-neighboring Out-of-state	3.4%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	HHDDT Neighboring Out-of-state	13.0%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	HHDDT Singleunit	43.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	HHDDT Tractor	35.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2016	HHDDT Utility	1.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	Other Buses	59.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	Power Take Off	38.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation

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Year	Vehicle Class	Reduction	Pollutant	Regulation
2017	MHDDT Agriculture	43.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	MHDDT CA International Registration Plan	27.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	MHDDT Instate	35.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	MHDDT Out-of-state	27.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	MHDDT Utility	1.0%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	HHDDT Agriculture	45.0%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	HHDDT CA International Registration Plan	14.4%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	HHDDT Non-neighboring Out-of-state	7.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	HHDDT Neighboring Out-of-state	17.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	HHDDT Singleunit	46.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	HHDDT Tractor	38.0%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2017	HHDDT Utility	1.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	Other Buses	56.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	Power Take Off	32.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	School Bus	7.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	MHDDT Agriculture	41.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	MHDDT CA International Registration Plan	26.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	MHDDT Instate	41.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	MHDDT Out-of-state	26.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	MHDDT Utility	1.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	HHDDT Agriculture	42.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	HHDDT CA International Registration Plan	15.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	HHDDT Non-neighboring Out-of-state	4.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	HHDDT Neighboring Out-of-state	16.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	HHDDT Singleunit	51.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation

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Year	Vehicle Class	Reduction	Pollutant	Regulation
2018	HHDDT Tractor	43.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2018	HHDDT Utility	1.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	Other Buses	52.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	Power Take Off	38.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	School Bus	6.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	MHDDT Agriculture	40.0%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	MHDDT CA International Registration Plan	22.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	MHDDT Instate	38.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	MHDDT Out-of-state	22.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	MHDDT Utility	1.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	HHDDT Agriculture	40.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	HHDDT CA International Registration Plan	12.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	HHDDT Non-neighboring Out-of-state	2.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	HHDDT Neighboring Out-of-state	13.0%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	HHDDT Singleunit	48.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	HHDDT Tractor	41.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2019	HHDDT Utility	1.4%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	Other Buses	49.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	Power Take Off	41.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	School Bus	5.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	MHDDT Agriculture	38.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	MHDDT CA International Registration Plan	19.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	MHDDT Instate	34.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	MHDDT Out-of-state	19.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	MHDDT Utility	1.4%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation

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Year	Vehicle Class	Reduction	Pollutant	Regulation
2020	HHDDT Agriculture	38.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	HHDDT CA International Registration Plan	9.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	HHDDT Non-neighboring Out-of-state	1.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	HHDDT Neighboring Out-of-state	10.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	HHDDT Singleunit	45.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	HHDDT Tractor	39.0%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2020	HHDDT Utility	1.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	Other Buses	48.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	Power Take Off	51.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	School Bus	4.4%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	MHDDT Agriculture	38.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	MHDDT CA International Registration Plan	21.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	MHDDT Instate	41.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	MHDDT Out-of-state	21.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	MHDDT Utility	33.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Agriculture	37.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT CA International Registration Plan	9.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Non-neighboring Out-of-state	1.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Neighboring Out-of-state	9.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Drayage at Other Facilities	40.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Drayage in Bay Area	41.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Drayage near South Coast	39.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Singleunit	54.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Tractor	45.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2021	HHDDT Utility	21.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation

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Year	Vehicle Class	Reduction	Pollutant	Regulation
2022	Other Buses	48.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	Power Take Off	60.0%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	School Bus	3.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	MHDDT Agriculture	40.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	MHDDT CA International Registration Plan	20.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	MHDDT Instate	41.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	MHDDT Out-of-state	20.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	MHDDT Utility	28.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Agriculture	40.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT CA International Registration Plan	8.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Non-neighboring Out-of-state	1.4%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Neighboring Out-of-state	9.0%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Drayage at Other Facilities	39.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Drayage in Bay Area	40.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Drayage near South Coast	39.0%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Singleunit	54.4%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Tractor	45.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2022	HHDDT Utility	18.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	Other Buses	47.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	Power Take Off	54.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	School Bus	2.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	MHDDT Agriculture	65.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	MHDDT CA International Registration Plan	18.4%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	MHDDT Instate	39.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	MHDDT Out-of-state	18.4%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation

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Vehicles

Year	Vehicle Class	Reduction	Pollutant	Regulation
2023	MHDDT Utility	25.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Agriculture	59.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT CA International Registration Plan	7.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Non-neighboring Out-of-state	1.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Neighboring Out-of-state	8.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Drayage at Other Facilities	38.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Drayage in Bay Area	39.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Drayage near South Coast	38.4%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Singleunit	52.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Tractor	44.0%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2023	HHDDT Utility	16.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	Other Buses	43.4%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	Power Take Off	47.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	School Bus	1.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	MHDDT Agriculture	63.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	MHDDT CA International Registration Plan	15.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	MHDDT Instate	33.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	MHDDT Out-of-state	15.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	MHDDT Utility	19.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT Agriculture	56.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT CA International Registration Plan	6.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT Non-neighboring Out-of-state	0.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT Neighboring Out-of-state	6.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT Drayage at Other Facilities	38.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT Drayage in Bay Area	39.4%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation

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Year	Vehicle Class	Reduction	Pollutant	Regulation
2024	HHDDT Drayage near South Coast	37.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT Singleunit	47.2%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT Tractor	39.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2024	HHDDT Utility	13.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	Other Buses	39.0%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	Power Take Off	39.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	School Bus	1.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	MHDDT Agriculture	61.1%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	MHDDT CA International Registration Plan	11.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	MHDDT Instate	28.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	MHDDT Out-of-state	11.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	MHDDT Utility	13.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Agriculture	53.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT CA International Registration Plan	4.6%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Non-neighboring Out-of-state	0.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Neighboring Out-of-state	4.8%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Drayage at Other Facilities	37.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Drayage in Bay Area	38.9%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Drayage near South Coast	37.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Singleunit	41.5%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Tractor	35.7%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation
2025	HHDDT Utility	10.3%	NOx	On-Road Heavy-Duty Diesel Vehicles Regulation

Appendix A

List of Acronyms and Glossary of Terms

Appendix A

List of Acronyms

ACM	alternative calculation method
AF	acre feet
B20	biodiesel (20%)
BOD	biochemical oxygen demand
BMP	best management practice
C	carbon
CAFE	corporate average fuel economy
CAPCOA	California Air Pollution Control Officers Association
CAR	Climate Action Registry
CARB	California Air Resources Board
CCAR	California Climate Action Registry
CDWR	California Department of Water Resources
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CEUS	California Commercial End-Use Survey
CGBSC	California Green Building Standards Code
CH ₄	methane
CHP	combined heat and power
CIWMB	California Integrated Waste Management Board
CNG	compressed natural gas
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalent
DE	destruction efficiency
DEIR	Draft Environmental Impact Report
DU	dwelling unit
EF	emission factor
EIA	United States Energy Information Administration
EIR	Environmental Impact Report
EMFAC	on-road vehicle emission factors model
ET ₀	reference evapotranspiration
ETWU	estimated total water use
FCZ	forecasting climate zone
GHG	greenhouse gas
GP	General Plan
GRP	General Reporting Protocol
GWP	global warming potential
HA	hydrozone area
HHV	higher heating value
hp	horsepower
HVAC	heating, ventilating, and air conditioning
IE	irrigation efficiency
IPCC	Intergovernmental Panel on Climate Change
ITE	Institute of Transportation Engineers
ITS	intelligent transportation systems
kBTU	thousand British thermal units
kW	kilowatt
kWh	kilowatt-hour
kWh/yr	kilowatt-hours/year
lbs	pounds

LA	landscape area
LADWP	Los Angeles Department of Water and Power
LCA	life cycle assessment
LDA	light-duty auto
LDT	light-duty truck
LED	light-emitting diode
LFM	landfill methane
LNG	liquefied natural gas
LPG	liquefied petroleum gas
MAWA	maximum applied water allowance
MMBTU	million British thermal units
MSW	mixed solid waste
MTCE	metric tonnes carbon equivalent
N ₂ O	nitrous oxide
NO _x	nitrogen oxides
NRDC	Natural Resources Defense Council
NREL	National Renewable Energy Laboratory
OLED	organic light-emitting diode
OFFROAD	off-road vehicle emission factors model
PF	plant factor
PG&E	Pacific Gas and Electric
PM	particulate matter
PUP	Power/Utility Protocol
RASS	Residential Appliance Saturation Survey
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SDGE	San Diego Gas and Electric
SLA	special landscape area
SMAQMD	Sacramento Metropolitan Air Quality Management District
SMUD	Sacramento Municipal Utility District
scf	standard cubic feet
SHP	separate heat and power
SO ₂	sulfur dioxide
sqft	square feet
TDM	transportation demand management
TDV	time dependent valuation
TOD	transit-oriented development
tonnes	metric tonnes; 1,000 kilograms
TRU	truck refrigeration unit
URBEMIS	Urban Emissions Model
US	United States
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
VCAPCD	Ventura County Air Pollution Control District
VTPI	Victoria Transport Policy Institute
VMT	vehicle miles traveled
VTR	vehicle trip reduction
WARM	Waste Reduction Model
WMO	World Meteorological Organization
yr	year

Glossary of Terms

Alternative Calculation Method

Software used to demonstrate compliance with the California Building Energy Efficiency Standards (Title 24). The software must comply with the requirements listed in the Alternative Calculation Method Approval Manual.

Additionality^a

The reduction in emissions by sources or enhancement of removals by sinks that is additional to any that would occur in the absence of the project. The project should not subsidize or take credit for emissions reductions which would have occurred regardless of the project.

Albedo^a

The fraction of solar radiation reflected by a surface or object, often expressed as a ratio or fraction. Snow covered surfaces have a high albedo; the albedo of soils ranges from high to low; vegetation covered surfaces and oceans have a low albedo. The Earth's albedo varies mainly through varying cloudiness, snow, ice, leaf area, and land cover changes. Paved surfaces with high albedos reflect solar radiation and can help reduce the urban heat island effect.

Below Market Rate Housing

Housing rented at rates lower than the market rate. Below market rate housing is designed to assist lower-income families. When below market rate housing is provided near job centers or transit, it provides lower income families with desirable job/housing match or greater opportunities for commuting to work through public transit.

Biochemical Oxygen Demand

Represents the amount of oxygen that would be required to completely consume the organic matter contained in wastewater through aerobic decomposition processes. Under the same conditions, wastewater with higher biochemical oxygen demand (BOD) concentrations will generally yield more methane than wastewater with lower BOD concentrations. BOD₅ is a measure of BOD after five days of decomposition.

Biogenic Emissions^b

Carbon dioxide emissions produced from combusting a variety of biofuels, such as biodiesel, ethanol, wood, wood waste and landfill gas.

Carbon Dioxide Equivalent

A measure for comparing carbon dioxide with other greenhouse gases. Tonnes carbon dioxide equivalent is calculated by multiplying the tonnes of a greenhouse gas by its associated global warming potential.

California Environmental Quality Act

A statute passed in 1970 that requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible.

Carbon Neutral Power

A power generation system which has net zero carbon emissions. Examples of existing carbon neutral power systems are photovoltaics, wind turbines, and hydropower systems.

Carbon Sink

Any process or mechanism that removes carbon dioxide from the atmosphere. A forest is an example of a carbon sink, because it sequesters carbon dioxide from the atmosphere.

“Carrot”

The purpose of a carrot is to provide an incentive which encourages a particular action. Parking cash-out would be considered a “carrot” since the employee receives a monetary incentive for not driving to work, but is not punished for maintaining status quo.

Combined Heat and Power

Also known as cogeneration. Combined heat and power is the generation of both heat and electricity from the same process, such as combustion of fuel, with the purpose of utilizing or selling both simultaneously. In combined heat and power systems, the thermal energy byproducts of a process are captured and used, where they would be wasted in a separate heat and power system. Examples of combined heat and power systems include gas turbines, reciprocating engines, and fuel cells.

Compact Infill

A Project which is located within or contiguous with the central city. Examples may include redevelopment areas, abandoned sites, or underutilized older buildings/sites.

Climate Zone

Geographic area of similar climatic characteristics, including temperature, weather, and other factors which affect building energy use. The California Energy Commission identified 16 Forecasting Climate Zones (FCZs) for use in the CEUS and RASS analyses. The designation of these FCZs was based in part on the utility service area.

Cordon Pricing

Tolls charged for entering a particular area (a “cordon”), such as a downtown.

Density

The amount of persons, jobs, or dwellings per unit of land area. This is an important metric for determining traffic-related parameters.

Destination Accessibility

A measure of the number of jobs or other attractions reachable within a given travel time. Destination accessibility tends to be highest at central locations and lowest at peripheral ones.

Efficacy

The capacity to produce a desired effect.

ENERGY STAR

A joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy which sets national standards for energy efficient consumer products. ENERGY STAR certified products are guaranteed to meet the efficiency standards specified by the program.

Elasticity

The percentage change of one variable in response to a percentage change in another variable. Elasticity = percent change in variable A / percent change in variable B (where the

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change in B leads to the change in A). For example, if the elasticity of VMT with respect to density is -0.12, this means a 100% increase in density leads to a 12% decrease in VMT.

Evapotranspiration^c

The loss of water from the soil both by evaporation and by transpiration from the plants growing in the soil.

General Plan

A set of long-term goals and policies that guide local land use decisions. The 2003 *General Plan Guidelines* developed by the California Office of Planning and Research provides advice on how to write a general plan that expresses a community's long-term vision, fulfills statutory requirements, and contributes to creating a great community.

Global Warming Potential^b

The ratio of radiative forcing that would result from the emission of one kilogram of a greenhouse gas to that from the emission of one kilogram of carbon dioxide over a fixed period of time.

Graywater

Non-drinkable water that can be collected and reused onsite for irrigation, flushing toilets, and other purposes. This water has not been processed through a waste water treatment plant.

Greenhouse Gas

For the purposes of this report, greenhouse gases are the six gases identified in the Kyoto Protocol: carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆).

Headway

The amount of time (in minutes) that elapses between two public transit vehicles servicing a given route and given line. Headways for buses and rail are generally shorter during peak periods and longer during off-peak periods. Headway is the inverse of frequency (headway = 1/frequency), where frequency is the number of arrivals over a given time period (i.e. buses per hour).

Intelligent Transportation System

A broad range of communications-based information and electronics technologies integrated into transportation system infrastructure and vehicles to relieve congestion and improve travel safety.

Job Center

An area with a high degree and density of employment.

Kilowatt Hour

A unit of energy. In the U.S., the kilowatt hour is the unit of measure used by utilities to bill consumers for energy use.

Land Use Index

Measures the degree of land use mix of a development. An index of 0 indicates a single land use while 1 indicates a full mix of uses.

Lumen

A unit of luminous flux. A measure of the brilliance of a source of visible light, or the power of light perceived by the human eye.

Master Planned Community

Large communities developed specifically incorporating housing, office parks, recreational area, and commercial centers within the community. Master planned communities tend to encompass a large land area with the intent of being self-sustaining. Many master planned communities may have lakes, golf courses, and large parks.

Mixed Use

A development that incorporates more than one type of land use. For example, a small mixed use development may have buildings with ground-floor retail and housing on the floors above. A larger mixed use development will locate a variety of land uses within a short proximity of each other. This may include integrating office space, shopping, parks, and schools with residential development. The mixed-use development should encourage walking and other non-auto modes of transport from residential to office/commercial/institutional locations (and vice versa).

Ordinance

A local law usually found in municipal code.

Parking Spillover

A term used to describe the effects of implementing a parking management strategy in a sub-area that has unintended consequences of impacting the surrounding areas. For example, assume parking meters are installed on all streets in a commercial/retail block with no other parking strategies implemented. Customers will no longer park in the metered spots and will instead “spillover” to the surrounding residential neighborhoods where parking is still unrestricted.

Photovoltaic^c

A system that converts sunlight directly into electricity using cells made of silicon or other conductive materials (solar cells). When sunlight hits the cells, a chemical reaction occurs, resulting in the release of electricity.

Recycled Water

Non-drinkable water that can be reused for irrigation, flushing toilets, and other purposes. It has been processed through a wastewater treatment plant and often needs to be redistributed.

Ride Sharing

Any form of carpooling or vanpooling where additional passengers are carried on the trip. Ride-sharing can be casual and formed independently or be part of an employer program where assistance is provided to employees to match up commuters who live in close proximity of one another.

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Renewable Energy^a

Energy sources that are, within a short time frame relative to the Earth's natural cycles, sustainable, and include non-carbon technologies such as solar energy, hydropower, and wind, as well as carbon-neutral technologies such as biomass.

Self Selection

When an individual selects himself into a group.

Separate Heat and Power

The typical system for acquiring heat and power. Thermal energy and electricity are generated and used separately. For example, heat is generated from a boiler while electricity is acquired from the local utility. Separate heat and power systems are used as the baseline of comparison for combined heat and power systems.

Sequestration^a

The process of increasing the carbon content of a carbon reservoir other than the atmosphere. Biological approaches to sequestration include direct removal of carbon dioxide from the atmosphere through afforestation, reforestation, and practices that enhance soil carbon in agriculture. Physical approaches include separation and disposal of carbon dioxide from flue gases or from processing fossil fuels to produce hydrogen- and carbon dioxide-rich fractions and longterm storage in underground in depleted oil and gas reservoirs, coal seams, and saline aquifers.

“Stick”

The purpose of a stick is to establish a penalty for a status quo action. Workplace parking pricing would be considered a “stick” since the employee is now monetarily penalized for driving to work.

Suburban

An area characterized by dispersed, low-density, single-use, automobile dependent land use patterns, usually outside of the central city (a suburb).

Suburban Center

The suburban center serves the population of the suburb with office, retail and housing which is denser than the surrounding suburb.

Title 24

Title 24 Part 6 is also known as the California Building Energy Efficiency Standard, which regulates building energy efficiency standards. Regulated energy uses include space heating and cooling, ventilation, domestic hot water heating, and some hard-wired lighting. Title 24 determines compliance by comparing the modeled energy use of a ‘proposed home’ to that of a minimally Title 24 compliant ‘standard home’ of equal dimensions. Title 24 focuses on building energy efficiency per square foot; it places no limits upon the size of the house or the actual energy used per dwelling unit. The current Title 24 standards were published in 2008.

Transit-Oriented Development

A development located near and specifically designed around a rail or bus station. Proximity alone does not characterize a development as transit-oriented. The development and surrounding neighborhood should be designed for walking and bicycling and parking management strategies should be implemented. The development should be located within a short walking distance to a high-quality, high frequency, and reliable bus or rail service.

Transportation Demand Management

Any transportation strategy which has an intent to increase the transportation system efficiency and reduce demand on the system by discouraging single-occupancy vehicle travel and encouraging more efficient travel patterns, alternative modes of transportation such as walking, bicycling, public transit, and ridesharing. TDM measures should also shift travel patterns from peak to off-peak hours and shift travel from further to closer destinations.

Transit Ridership

The number of passengers who ride in a public transportation system, such as buses and subways.

Tree and Grid Network

Describes the layout of streets within and surrounding a project. Streets that are characterized as a tree network actually look like a tree and its branches. Streets are not laid out in any uniform pattern, intersection density is low, and the streets are less connected. In a grid network, streets are laid out in a perpendicular and parallel grid pattern. Streets tend to intersect more frequently, intersection density is higher, and the streets are more connected.

Urban

An area which is located within the central city with higher density of land uses than you would find in the suburbs. It may be characterized by multi-family housing and located near office and retail.

Urban Heat Island Effect

The phenomenon in which a metropolitan area is warmer than its surrounding rural areas due to increased land surface which retains heat, such as concrete, asphalt, metal, and other materials found in buildings and pavements.

Vehicle Miles Traveled

The number of miles driven by vehicles. This is an important traffic parameter and the basis for most traffic-related greenhouse gas emissions calculations.

Vehicle Occupancy

The number of persons in a vehicle during a trip, including the driver and passengers.

Notes:

- ^a Definition adapted from: IPCC. 2001. Third Assessment Report: Climate Change 2001 (TAR). Annex B: Glossary of Terms. Available online at: <http://www.ipcc.ch/pdf/glossary/tar-ipcc-terms-en.pdf>
- ^b Definition adapted from: CCAR. 2009. General Reporting Protocol, Version 3.1. Available online at: http://www.climateregistry.org/resources/docs/protocols/grp/GRP_3.1_January2009.pdf
- ^c Definition adapted from: USEPA. 2010. Greening EPA Glossary. Available online at: <http://www.epa.gov/oaintrnt/glossary.htm>



Appendix B

Greenhouse Gas Mitigation Measures Task 0: Standard Approach to Calculate Unmitigated Emissions



Greenhouse Gas Mitigation Measures Task 0: Standard Approach to Calculate Unmitigated Emissions

Prepared for:
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1 Introduction

ENVIRON International Corporation (ENVIRON) and Fehr & Peers worked with the California Air Pollution Control Officers Association (CAPCOA) to quantify reductions associated with greenhouse gas (GHG) mitigation measures that can be applied to California Environmental Quality Act (CEQA) Environmental Impact Report (EIR) analyses. The first part of this overall task defines a standard approach to calculate the baseline emissions before mitigation. This report contains the recommendations for methodologies and approaches to assess the baseline GHG emissions.

This report and its methodologies form the basis for the subsequent tasks associated with quantification of GHG mitigation measures. To the extent possible, default values are included with this report and in the mitigation measure Fact Sheets.

This report presents methods to be used to calculate short-term and one-time emissions sources as well as emissions that will occur annually after construction (operational emissions). The one-time emission sources include changes in carbon sequestration due to vegetation changes and emissions associated with construction. The annual operational emissions include the emissions associated with building energy use including natural gas and electricity, emissions associated with mobile sources, emissions associated with water use and wastewater treatment, emissions associated with area sources such as natural gas fired hearths, landscape maintenance equipment, swimming pools, and golf courses.

2 GHG Equivalent Emissions

The term “GHGs” includes gases that contribute to the greenhouse effect, such as carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), as well as gases that are only man-made and that are emitted through the use of modern industrial products, such as hydrofluorocarbons (HFCs), chlorinated fluorocarbons (CFCs), and sulfurhexafluoride (SF₆). These last three families of gases, while not naturally present in the atmosphere, have properties that also cause them to trap infrared radiation when they are present in the atmosphere, thus making them GHGs. These six gases comprise the major GHGs that are recognized by the Kyoto Accords (water is not included).¹ There are other GHGs that are not recognized by the Kyoto Accords, due either to the smaller role that they play in climate change or the uncertainties surrounding their effects. Atmospheric water vapor is not recognized by the Kyoto Accords because there is not an obvious correlation between water concentrations and specific human activities. Water appears to act in a positive feedback manner; higher temperatures lead to higher water vapor concentrations in the atmosphere, which in turn can cause more global warming.² California has recently recognized nitrogen trifluoride as another regulated greenhouse gas.

¹ This Kyoto Protocol sets legally binding targets and timetables for cutting the greenhouse gas emissions of industrialized countries. The US has not approved the Kyoto treaty.

² From the IPCC Third Assessment Report: http://www.grida.no/climate/ipcc_tar/wg1/143.htm and http://www.grida.no/climate/ipcc_tar/wg1/268.htm

Residents and the employees and patrons of commercial and municipal buildings and services use electricity, heating, water, and are transported by motor vehicles. These activities directly or indirectly emit GHGs. The most significant GHG emissions resulting from such residential and commercial developments are emissions of carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). GHG emissions are typically measured in terms of MT of CO₂ equivalents (CO₂e), calculated as the product of the mass emitted of a given GHG and its specific global warming potential (GWP).

The effect that each of these gases can have on global warming is a combination of the mass of their emissions and their global warming potential (GWP). GWP indicates, on a MT for MT basis, how much a gas is predicted to contribute to global warming relative to how much warming would be predicted to be caused by the same mass of CO₂. CH₄ and N₂O are substantially more potent GHGs than CO₂, with GWPs of 21 and 310, respectively according to the IPCC's Second Assessment Report (SAR).³ In emissions inventories, GHG emissions are typically reported in terms of pounds (lbs) or MT⁴ of CO₂ equivalents (CO₂e). CO₂e are calculated as the product of the mass emitted of a given GHG and its specific GWP. While CH₄ and N₂O have much higher GWPs than CO₂, CO₂ is emitted in such vastly higher quantities that it accounts for the majority of GHG emissions in CO₂e, both from developments and human activity in general. Since most regulatory agencies and protocols use the SAR GWP values as a basis, this assessment will also use SAR GWP values even though more recent values exist. However, SAR did not consider nitrogen trifluoride, however there are no sources of nitrogen trifluoride that would typically need to be quantified.

3 Units of measurement: MT of CO₂ and CO₂e

In many sections of this report, including the final summary sections, emissions are presented in units of CO₂e either because the GWPs of CH₄ and N₂O were accounted for explicitly, or the CH₄ and N₂O are assumed to contribute a negligible amount of GWP when compared to the CO₂ emissions from that particular emissions category.

Emissions and reductions are calculated in terms of metric tons. As such, "MT" will be used to refer to metric tons (1,000 kilograms). "Tons" will be used to refer to short tons (2,000 pounds [lbs]).

4 Indirect GHG Emissions from Electricity Use

As noted above, indirect GHG emissions are created as a result of electricity use. When electricity is used in a building, the electricity generation typically takes place offsite at the power plant; electricity use in a building generally causes emissions in an indirect manner. The project should use information specific for each local utility provider for different parts of

³ GWP values from IPCC's Second Assessment Report (SAR, 1996) are still used by international convention and are used in this protocol, even though more recent (and slightly different) GWP values were developed in the IPCC's Fourth Assessment Report (FAR, 2007)

⁴ In this report, "MT" will be used to refer to metric MT (1,000 kilograms). "Tons" will be used to refer to short tons (2,000 pounds).

California. Accordingly, indirect GHG emissions from electricity usage are calculated using the utility specific carbon-intensity factor based Power/Utility Protocol (PUP) report from California Climate Action Registry (CCAR)⁵ for the 2006 baseline year. ENVIRON does not recommend using the 2004 PUP reports since this year was one of the first year’s utilities reported emissions, as such, the data is likely less accurate than subsequent years since utilities had a chance to refine data collection methods for the later years. Furthermore, a large coal burning power plant in Mojave was going offline in 2005 which was factored into the Scoping Plan analysis. Therefore, ENVIRON suggests using the 2006 PUP reports since it likely represents a more accurate dataset year. This emission factor takes into account the baseline year’s mix of energy sources used to generate electricity for a specific utility and the relative carbon intensities of these sources. The emission factor will be determined as a CO₂e incorporating the CO₂, CH₄, and N₂O emissions.

Power Utility	Carbon-Intensity (lbs CO ₂ e/MWh)
LADW&P	1,238
PG&E	456
SCE	641
SDGE	781
SMUD	555

5 Short-Term Emissions

Short-term or one-time emissions from the development of a Project are associated with vegetation removal and re-vegetation on the Project site and construction-related activities.

5.1 Construction Activities

Construction activities occur during the early stage of a project. Construction activities include any demolition, site grading, building construction, and paving. These construction activities have several main sources of GHG emissions. Off-road construction equipment such as dozers, pavers, and backhoes are used on-site during construction. These pieces of equipment typically are diesel fueled although other fuels are occasionally used. Besides the off-road construction, there are on-road vehicles. These vehicles are used for worker commuting, delivering of material to the site, and hauling material away from the site. The methodology to calculate these sources of emissions is described in the next sections.

5.1.1 Estimating GHG Emissions from Off-Road Construction Equipment

This section describes how emissions from off-road equipment used during demolition, site grading, building construction and paving are calculated. This section can be used for any fuel

⁵ California Climate Action Registry (CCAR) Database. PUP Report.

burning equipment such as diesel, gasoline, or compressed natural gas (CNG). For electric equipment please see the method in the next section.

First, the number and type of equipment that will be used in the construction, as well as the duration of the entire construction project, is needed. Absent other data, ENVIRON recommends that each piece of equipment will operate for 8 hours a day, five days a week throughout the construction duration. An equipment hour is defined as one hour of a piece of equipment being used. Specifications for each type of construction equipment (horsepower, load factor, and GHG emission factor) are provided by OFFROAD2007⁶. CO₂ and CH₄ emissions for each type of construction equipment are calculated as follows:

$$\text{Equipment Emissions [grams]} = \frac{\text{Total equipment hours}}{\text{hours}} \times \frac{\text{emission factor [grams per brake horsepower-hour]}}{\text{horsepower}} \times \text{equipment horsepower} \times \text{load factor}^7$$

The grams of CO₂ and CH₄ are multiplied by their respective GWP and then the two emissions are summed to derive the final CO₂e emissions from the piece of off-road equipment. Since OFFROAD2007 does not provide an emission factor for N₂O which is a minor subset of nitrogen oxides (NO_x) emissions and the contribution to the overall GHG emissions is likely small, it is therefore not included in calculations that used OFFROAD2007. These were accounted for with alternative fuels since they have a larger proportion of N₂O and CH₄.

5.1.2 Estimating GHG emissions from Electric Off-Road Construction Equipment

In order to estimate the indirect GHG emissions associated with electricity consumption of electrical powered equipment, the following inputs are required. First, the total operating hours of the electrical piece of equipment is needed. Secondly, the amount of kilowatts the equipment uses per time is needed. These two pieces are used along with the carbon intensity factor for the local utility provider as follows:

$$\text{Equipment Emissions} = \frac{\text{Total equipment hours}}{\text{equipment hours}} \times \text{average power draw (kW/hr)} \times \text{Utility EF (g CO}_2\text{e per kWhr)}$$

5.1.3 GHG Emissions from On-Road Vehicles Associated with Construction

Emissions from on-road vehicles associated with construction include workers commuting to the site, vendors delivering materials, and hauling away of materials. GHGs are emitted from these vehicles in two ways: running emissions, produced by driving the vehicle, and startup emissions, produced by turning the vehicle on. Idling emissions will not be considered since

⁶ OFFROAD2007 is a model developed by the Air Resources Board which contains emission factors for off-road equipment. It is available at : <http://www.arb.ca.gov/msei/offroad/offroad.htm>

⁷ Load factor is the percentage of the maximum horsepower rating at which the equipment normally operates.

regulations exist which limit idling⁸ and they would represent a small contribution to the GHG emissions. The majority of these on-road vehicle emissions are running emissions.

Running emissions are calculated using the same method for all trip types. The total Vehicle Miles Traveled (VMT) for the trip type category is estimated, and then multiplied by the representative GHG emission factors for the vehicles expected to be driven. The total VMT for a given trip type is calculated as follows:

$$VMT = \text{Number of round trips} \times \text{average round trip length (miles)}$$

The number of trips should be based on project specific information. Default values associated with each land use type can be obtained construction cost estimators or default values in emission estimator programs. Average round trip length should be based on project specific information or county specific default values. After total VMT is calculated, GHG emissions for on-road vehicles associated with construction can be calculated from the following equation:

$$CO_2 \text{ emissions} = VMT \times EF_{\text{running}}$$

Where:

VMT = vehicle miles traveled

EF_{running} = running emission factor for vehicle fleet for trip type

The CO₂ calculation involves the following assumptions:

- a. Vehicle Fleet Defaults:
 - a. Workers commute half with light duty trucks (LDTs) and half commute in light duty autos (LDAs). Half of the LDTs are type 1 and the other half type 2.
 - b. Vendors are all heavy-heavy duty vehicles.
 - c. Hauling is all heavy-heavy duty vehicles.
- b. The emission factor depends upon the speed of the vehicle. A default value of 35 miles per hour will be used.
- c. EMFAC emission factors from the construction year will be used for EF_{running} .

⁸ The Air Resources Board adopted in 2004 and modified in 2005 an Air Toxic Control Measure that limits idling in diesel vehicles to 5-minutes. <http://www.arb.ca.gov/msprog/truck-idling/truck-idling.htm>

The emissions associated with CH₄ and N₂O are calculated in a similar manner or assumed to represent 5% of the total CO₂e emissions. They are then converted to CO₂e by multiplying by their respective global warming potential.

Startup emissions are CO₂ emitted from starting a vehicle. For the various trips during all phases, the startup emissions are calculated using the following assumptions:

- a. The same vehicle fleet assumptions as used in running emissions.
- b. Two engine startups per day with a 12 hour wait before each startup.⁹

The USEPA recommends assuming that CH₄, N₂O, and HFCs account for 5% of GHG emissions from on-road vehicles, taking into account their GWPs.¹⁰ To incorporate these additional GHGs into the calculations, the total GHG footprint is calculated by dividing the CO₂ emissions by 0.95.

5.2 Vegetation Change

ENVIRON suggests following the IPCC protocol for vegetation since it has default values that work well with the information typically available for development projects. This method is similar to the CCAR Forest Protocol¹¹ and the Center for Urban Forest Research Tree Carbon Calculator¹², but it has more general default values available that will generally applicable to all areas of California without requiring detailed site-specific information¹³.

5.2.1 Quantifying the One-Time Release by Changes in Carbon Sequestration Capacity

The one-time release of GHGs due to permanent changes in carbon sequestration capacity is calculated using the following four steps:¹⁴

1. *Identify and quantify the change in area of various land types due to the development (i.e. alluvial scrub, non-native grassland, agricultural, etc.).* These area changes include not only the area of land that will be converted to buildings, but also areas disrupted by the construction of utility corridors, water tank sites, and associated borrow and grading areas.

⁹ The emission factor grows with the length of time the engine is off before each ignition.

¹⁰ USEPA. 2005. *Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle*. Office of Transportation and Air Quality. February.

¹¹ CCAR. 2007. Forest Sector Protocol Version 2.1. September. Available at: http://www.climateregistry.org/resources/docs/protocols/industry/forest/forest_sector_protocol_version_2.1_sept2007.pdf

¹² Available at: <http://www.fs.fed.us/ccrc/topics/urban-forests/ctcc/>

¹³ The CCAR Forest Protocol and Urban Forest Research Tree Carbon Calculator are not used since their main focus is annual emissions for carbon offset considerations. As such they are designed to work with very specific details of the vegetation that is not available at a CEQA level of analysis.

¹⁴ This section follows the IPCC guidelines, but has been adapted for ease of use for these types of Projects.

Areas temporarily disturbed that will eventually recover to become vegetated will not be counted as vegetation removed as there is no net change in vegetation or land use.¹⁵

2. *Estimate the biomass associated with each land type.* For the purposes of this report, ENVIRON suggests using the available general vegetation types found in the IPCC publication Guidelines for National Greenhouse Gas Inventories (IPCC Guidelines).¹⁶

California vegetation is heavily dominated by scrub and chaparral vegetation which may not be accurately characterized by default forest land properties. Consequently, ecological zones and biomass based subdivisions identified in the IPCC Guidelines were used to sub-categorize the vegetation as scrub dominated. These subcategories should be used to determine the CO₂ emissions resulting from land use impacts.

3. *Calculate CO₂ emissions from the net change of vegetation.* When vegetation is removed, it may undergo biodegradation,¹⁷ or it may be combusted. Either pathway results in the carbon (C) present in the plants being combined with oxygen (O₂) to form CO₂. To estimate the mass of carbon present in the biomass, biomass weight is multiplied by the mass carbon fraction, 0.5.¹⁸ The mass of carbon is multiplied by 3.67¹⁹ to calculate the final mass of CO₂, assuming all of this carbon is converted into CO₂.
4. Calculate the overall change in sequestered CO₂. – For all types of land that change from one type of land to another,²⁰ initial and final values of sequestered CO₂ are calculated using the equation below.

Overall Change in Sequestered CO₂ [MT CO₂]

$$= \sum_i (SeqCO_2)_i \times (area)_i - \sum_j (SeqCO_2)_j \times (area)_j$$

Where:

SeqCO ₂	=	mass of sequestered CO ₂ per unit area [MT CO ₂ /acre]
area	=	area of land for specific land use type [acre]
i	=	index for final land use type
j	=	index for initial land use type

¹⁵ This assumption facilitates the calculation as a yearly growth rate and CO₂ removal rate does not have to be calculated. As long as the disturbed land will indeed return to its original state, this assumption is valid for time periods over 20 years.

¹⁶ Available online at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.htm>

¹⁷ Cleared vegetation may also be deposited in a landfill or compost area, where some anaerobic degradation which will generate CH₄ may take place. However, for the purposes of this section, we are assuming that only aerobic biodegradation will take place which will result in CO₂ emissions only.

¹⁸ The fraction of the biomass weight that is carbon. Here, a carbon fraction of 0.5 is used for all vegetation types from CCAR Forest Sector Protocol.

¹⁹ The ratio of the molecular mass of CO₂ to the molecular mass of carbon is 44/12 or 3.67.

²⁰ For example from forestland to grassland, or from cropland to permanently developed.

5.2.2 Calculating CO₂ Sequestration by Trees

Planting individual trees will sequester CO₂. Changing vegetation as described above results in a one-time carbon-stock change. Planting trees is also considered to result in a one-time carbon-stock change. Default annual CO₂ sequestration rates on a per tree basis, based on values provided by the IPCC are used²¹. An average of 0.035 MT CO₂ per year per tree can be used for trees planted, if the tree type is not known.

Urban trees are only net carbon sinks when they are actively growing. The IPCC assumes an active growing period of 20 years. Thereafter, the accumulation of carbon in biomass slows with age, and will be completely offset by losses from clipping, pruning, and occasional death. Actual active growing periods are subject to, among other things, species, climate regime, and planting density. In this report, the IPCC default value of 20 years is recommended. For large tree sequestration projects, the Project may consider using the Forest or Urban tree planting protocols developed by Climate Action Registry (CAR). These protocols have slightly different assumptions regarding steady state, tree growth, and replacement of trees..

5.3 Built Environment

The amount of energy used, and the associated GHG emissions emitted per square foot of available space vary with the type of building. For example, food stores are far more energy intensive than warehouses, which have little climate-conditioned space. Therefore, this analysis is specific to the type of building.

GHGs are emitted as a result of activities in buildings for which electricity and natural gas are used as energy sources. Combustion of any type of fuel emits CO₂ and other GHGs directly into the atmosphere; when this occurs within a building (such as by natural gas consumption) this is a direct emission source²² associated with that building. GHGs are also emitted during the generation of electricity from fossil fuels. When electricity is used in a building, the electricity generation typically takes place offsite at the power plant; electricity use in a building generally causes emissions in an indirect manner.

Energy use in buildings is divided into energy consumed by the built environment and energy consumed by uses that are independent of the construction of the building such as plug-in appliances. In California, Title 24 part 6 governs energy consumed by the built environment, mechanical systems, and some fixed lighting. This includes the space heating, space cooling, water heating, and ventilation systems. Non-building energy use, or “plug-in” energy use can be further subdivided by specific end-use (refrigeration, cooking, office equipment, etc.). The following two steps are performed to quantify the energy use due to buildings:

²¹ The Center for Urban Forest Research Tree Carbon Calculator is not suggested since it requires knowledge on specific tree species to estimate carbon sequestered. This information is typically not available during the preparation of CEQA documents.

²² California Climate Action Registry (CCAR) General Reporting Protocol (GRP), Version 3.1 (January). Available at: http://www.climateactionregistry.org/resources/docs/protocols/grp/GRP_3.1_January2009.pdf, Chapter 8

1. Calculate energy use from systems covered by Title 24²³ (HVAC system, water heating system, and the lighting system).
2. Calculate energy use from office equipment, plug-in lighting, and other sources not covered by Title 24.

The resulting energy use quantities are then converted to GHG emissions by multiplying by the appropriate emission factors obtained by incorporating information on local electricity providers for electricity, and by natural gas emission factors for natural gas combustion.

ENVIRON recommends using default values for Title 24 and non-Title 24 energy use for various building types. These will take into account the building size and climate zone. There are several sources of information that can be used to obtain building energy intensity. Each is described briefly below.

The *California Commercial Energy Use Survey (CEUS)* data is provided by the California Energy Commission (CEC). It is based on a survey conducted in 2002 for existing commercial buildings in various climate zones. Electricity and natural gas use per square foot for each end use in each building type and climate zone is extracted from the CEUS data. Since the data is provided by end use, it is straightforward to calculate the Title 24 and non-Title 24 regulated energy intensity for each building type.

Commercial Buildings Energy Consumption Survey (CBECS) is a survey of non-residential buildings that was conducted in 2003 by the Energy Information Administration (EIA). Electricity and natural gas use per square foot can be extracted from this data. The energy use estimates are assumed to represent 2001 Title 24 compliant buildings. Using CBECS, the percent of electricity and natural gas used for each end use can be calculated. It is then straightforward to calculate the Title 24 and non-Title 24 electricity and natural gas intensity for each building type. Similar surveys exist for manufacturing and residential energy use.

The *Residential Appliance Saturation Survey (RASS)* refers to the California Energy Commission Consultant Report entitled "California Statewide Residential Appliance Saturday Study". Data from RASS is used to calculate the total electricity and natural gas use for residential buildings on a per dwelling unit. The RASS study estimates the unit energy consumption (UEC) values for individual households surveyed and also provides the saturation number for each type of end use. The saturation number indicates the proportion of households that have a demand for each type of end-use category. As the data is provided by end use, it is straightforward to calculate the Title 24 and non-Title 24 electricity and natural gas intensity for each building type.

Alternative Calculation Method (ACM) software is available that makes estimates of the energy consumption by a model Title 24 compliant building. These programs provide

²³ Title 24, Part 6, of the California Code of Regulations: California's Energy Efficiency Standards for Residential and Nonresidential Buildings. <http://www.energy.ca.gov/title24/>

annual energy use for the heating, ventilation, and air conditioning (HVAC) system in each building; therefore, estimates from ACM software represent Title 24-regulated energy use. These do not calculate the non-Title 24 energy use for the buildings.

The Department of Energy produced the *Building America Research Benchmark Definition* (BARBD) technical manual, which presents empirical equations for electricity and natural gas usage. As the data is provided by end use, it is straightforward to calculate the Title 24 and non-Title 24 electricity and natural gas intensity for each building type.

Literature surveys may also be used for building and land use types not well represented by the above sources.

ENVIRON suggests using the CEUS and RASS datasets for these calculations since the data is available for several land use categories in different climate zones in California.

The Title 24 standards have been updated twice (in 2005 and 2008) since some of these data were compiled. CEC has published reports estimating the percentage deductions in energy use resulting from these new standards. Based on CEC's discussion on average savings for Title 24 improvements, these CEC savings percentages by end use can be used to account for reductions in electricity use due to updates to Title 24. Since energy use for each different system type (ie, heating, cooling, water heating, and ventilation) as well as appliances is defined, this method will easily allow for application of mitigation measures aimed at reducing the energy use of these devices in a prescriptive manner.

Based on the electricity intensity, CO₂e intensity values (CO₂e emissions per square foot or dwelling unit, as applicable, per year) for each building type can be calculated. Electricity intensity data is multiplied by an electricity emission factor to generate CO₂e intensity values. The total CO₂e emissions from each building type are calculated by multiplying the CO₂e intensity values by the appropriate metric (building square footage for non-residential buildings or number of dwelling units for residential buildings). Summing the CO₂e emissions from all building types gives the total CO₂e emissions from electricity use in Title 24 and non-Title 24 sources in buildings.

Based on the natural gas intensity, CO₂e intensity values (CO₂e emissions per square foot or dwelling unit, as applicable, per year) for each building type can be calculated. Natural gas intensity data is multiplied by a natural gas emission factor to generate CO₂e intensity values. The total CO₂e emissions from each building type are calculated by multiplying the CO₂ intensity values by the appropriate metric (building square footage for non-residential buildings or number of dwelling units for residential buildings). Summing the CO₂e emissions from all building types gives the total CO₂e emissions from natural gas use in Title 24 and non-Title 24 sources in buildings.

5.3.1 Natural Gas Boilers

GHG emissions from the combustion of natural gas are calculated as the product of natural gas consumption, natural gas heat content, and carbon-intensity factor. The Project Applicant has

to determine the natural gas consumption, while the heat content and carbon-intensity factor can be obtained from the CCAR General Reporting Protocol.

5.4 Area Sources

Area sources are local combustion of fuel. The area sources covered in this section include natural gas fireplaces/stoves and landscape maintenance equipment. Natural gas usage from the primary building heating is not included in this category since it is already included with building energy use. Each of these area sources is discussed further.

5.4.1 Natural Gas Fireplaces/Stoves

GHG emissions associated with natural gas fired fireplaces are calculated using emission factors from CCAR. The average BTU per hour for fireplaces in homes needs to be specified. Default values for annual fireplace usage varies for each County. Natural gas is assumed to have 1,020 BTU per standard cubic foot²⁴.

5.4.2 Landscape Maintenance

Landscape maintenance includes fuel combustion emissions from equipment such as lawn mowers, roto tillers, shredders/grinders, blowers, trimmers, chain saws, and hedge trimmers, as well as air compressors, generators, and pumps.

Similar to construction off-road equipment, emission factors are based on the OFFROAD2007 model. These are combined with the hours of operation for each equipment piece as well as the horsepower and load factors. The GHG emissions will be calculated based on the emission factors for the equipment and fuel reported from OFFROAD2007 and the appropriate GWP. Default usages (hours of operation) should be determined for the landscape equipment based on the Project needs.

5.5 Water

Delivering and treating water for use at the project site requires energy. This embodied energy associated with the distribution of water to the end user is associated with the electricity to pump and treat the water. GHG emissions due to water use are related to the energy used to convey, treat and distribute water. Thus, these emissions are indirect emissions from the production of electricity to power these systems.

The amount of electricity required to treat and supply water depends on the volume of water involved. Three processes are necessary to supply water to users: (1) supply and conveyance of the water from the source; (2) treatment of the water to potable standards; and (3) distribution of the water to individual users.

²⁴ USEPA. 1998. AP-42 Emission Factors. Chapter 1.4 Natural Gas Combustion.

Therefore, to quantify the GHG emissions associated with the distribution of water to an end user, the carbon intensity of electricity is used along with the amount of electricity used in pumping and treating the water. Since consumption of water varies greatly for each land use type, default values need to be determined with several listed in the mitigation measure fact sheets. Since buildings may have different percentages of water associated with indoor and outdoor water usage, the water usage is quantified separately. In addition since mitigation measures associated with water use may be directed separately toward indoor and outdoor water usage, this will be beneficial for this task.

5.5.1 Indoor

Indirect emissions resulting from electricity use are determined by multiplying electricity use by the CO₂e emission factor provided by the local electricity supplier. Energy use per unit of water for different aspects of water treatment (e.g. source water pumping and conveyance, water treatment, distribution to users) is determined using the stated volumes of water and energy intensities values (i.e., energy use per unit volume of water) provided by reports from the California Energy Commission (CEC) on energy use for California's water systems.²⁵ The CEC report estimates the electricity required to extract and convey one million gallons of water. Using this energy intensity factor, the expected indoor water demand, and the utility-specific carbon-intensity factor, GHG emissions from indoor water supply and conveyance may be calculated.

The amount of electricity required to treat and distribute one million gallon of potable water is estimated in the CEC report. Based on the estimated indoor water demand, these energy intensity factors, and the utility-specific carbon intensity factor, GHG emissions from indoor water treatment and distribution may be calculated.

The sum of emissions due to supplying, conveying, treating, and distributing indoor water gives the total emissions due to indoor water use.

5.5.2 Outdoor

Indirect emissions resulting from electricity use are determined by multiplying electricity use by the CO₂ emission factor provided by the local electricity supplier. Energy use per unit of water for different aspects of water treatment (e.g. source water pumping and conveyance, water treatment, distribution to users) is determined using the stated volumes of water and energy intensities values (i.e., energy use per unit volume of water) provided by reports from the California Energy Commission (CEC) on energy use for California's water systems.²⁶ The

²⁵ CEC 2005. California's Water-Energy Relationship. Final Staff Report. CEC-700-2005-011-SF, CEC 2006. Refining Estimates of Water-Related Energy Use in California. PIER Final Project Report. Prepared by Navigant Consulting, Inc. CEC-500-2006-118. December.

²⁶ CEC 2005. California's Water-Energy Relationship. Final Staff Report. CEC-700-2005-011-SF, CEC 2006. Refining Estimates of Water-Related Energy Use in California. PIER Final Project Report. Prepared by Navigant Consulting, Inc. CEC-500-2006-118. December.

energy needed to supply and convey the water will be used to pump this water from the sources and distribute it throughout the development. The CEC report estimates the electricity required to extract and convey one million gallons of water. Using this energy intensity factor, the expected outdoor water demand, and the utility-specific carbon-intensity factor, GHG emissions from outdoor water supply and conveyance may be calculated.

The amount of electricity required to treat and distribute one million gallon of potable water (see recycled water for non-potable water) is estimated in the CEC report. Based on the estimated outdoor water demand, these energy intensity factors, and the utility-specific carbon intensity factor, GHG emissions from outdoor water treatment and distribution may be calculated.

The sum of emissions due to supplying, conveying, treating, and distributing outdoor water gives the total emissions due to outdoor water use.

5.5.2.1 Landscape Watering – Turf Grass

The amount of outdoor water used in the landscape watering of turf grass is calculated based on the California Department of Water Resources (CDWR) 2009 Model Water Efficient Landscape Ordinance²⁷ and the CDWR 2000 report “A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California: The Landscape Coefficient Method and WUCOLS III.”²⁸ Using this methodology, the amount of water required to support the baseline turf water demand ($Water_{baseline}$) is calculated as follows:

$$ETC = Kc \times ET_0$$

Where:

- ETC = Crop Evapotranspiration, the total amount of water the baseline turf loses during a specific time period due to evapotranspiration²⁹ (inches water/day)
- KC = Crop Coefficient, factor determined from field research, which compares the amount of water lost by the crop (e.g. turf) to the amount of water lost by a reference crop (unitless).
Species-specific; provided in CDWR 2000
- ET₀ = Reference Evapotranspiration, the amount of water lost by a reference crop (inches water/day)
Region-specific; provided in Appendix A of CDWR 2009

²⁷ California Department of Water Resources. 2009. Model Water Efficient Landscape Ordinance. Available online at: <http://www.water.ca.gov/wateruseefficiency/docs/MWEL09-10-09.pdf>

²⁸ California Department of Water Resources. 2000. A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California: The Landscape Coefficient Method and WUCOLS III. Available online at: http://www.water.ca.gov/pubs/conservation/a_guide_to_estimating_irrigation_water_needs_of_landscape_plantings_in_california_wucols/wucols00.pdf

²⁹ Evapotranspiration is water lost to the atmosphere due to evaporation from soil and transpiration from plant leaves. For a more detailed definition, see this California Irrigation Management Information System (CIMIS) website: <http://www.cimis.water.ca.gov/cimis/infoEtoOverview.jsp;jsessionid=91682943559928B8A9A243D2A2665E19>

Then:

$$\text{Water}_{\text{baseline}} = \text{ETC} \times \text{Area}_{\text{baseline}} \times 0.62 \times 365$$

Where:

- $\text{Water}_{\text{baseline}}$ = Volume of water required to support the baseline turf (gallons/year)
- $\text{Area}_{\text{baseline}}$ = Area of existing or standard turf (square feet)
- 0.62 = conversion factor (gallons/squarefoot.inches water)
- 365 = conversion factor (days/year)

Based on the estimated outdoor water demand for watering turf grass, the outdoor water energy intensity factors described above, and the utility-specific carbon intensity factor, GHG emissions from watering turf grass in lawns may be calculated.

5.5.2.2 Landscape Watering – General

The amount of outdoor water used in the landscape watering of landscapes and lawns is calculated based on the California Department of Water Resources (CDWR) 2009 Model Water Efficient Landscape Ordinance.³⁰ Using this methodology, the amount of water required to support the baseline lawn water demand ($\text{Water}_{\text{baseline}}$) is defined as the Maximum Applied Water Allowance (MAWA) and is calculated as follows:

$$\text{Water}_{\text{baseline}} = \text{MAWA} = \text{ET}_0 \times 0.62 \times [(0.7 \times \text{LA}) + (0.3 \times \text{SLA})]$$

Where:

- $\text{Water}_{\text{baseline}}$ = Volume of water required to support the baseline lawn (gallons/year)
- MAWA = Maximum Applied Water Allowance (gallons/year)
- ET_0 = Annual Reference Evapotranspiration³¹ from Appendix A of CDWR 2009 (inches per year)
- 0.7 = ET Adjustment Factor (ETAF)
- LA = Landscape Area³² includes Special Landscape Area³³ (square feet)

³⁰ California Department of Water Resources. 2009. Model Water Efficient Landscape Ordinance. Available online at: <http://www.water.ca.gov/wateruseefficiency/docs/MWEL09-10-09.pdf>

³¹ Evapotranspiration is water lost to the atmosphere due to evaporation from soil and transpiration from plant leaves. For a more detailed definition, see this California Irrigation Management Information System (CIMIS) website: <http://www.cimis.water.ca.gov/cimis/infoEtoOverview.jsp;jsessionid=91682943559928B8A9A243D2A2665E19>

³² § 491 Definitions in CDWR 2009: “Landscape Area (LA) means all the planting areas, turf areas, and water features in a landscape design plan subject to the Maximum Applied Water Allowance calculation. The landscape area does not include footprints of buildings or structures, sidewalks, driveways, parking lots, decks, patios, gravel or stone walks, other pervious or non-pervious hardscapes, and other non-irrigated areas designed for non-development (e.g., open spaces and existing native vegetation).”

³³ § 491 Definitions in CDWR 2009: “Special Landscape Area (SLA) means an area of the landscape dedicated

0.62	=	Conversion factor (to gallons per square foot)
SLA	=	Portion of the landscape area identified as Special Landscape Area (square feet)
0.3	=	the additional ETAF for Special Landscape Area

Based on the estimated outdoor water demand for watering lawns, the outdoor water energy intensity factors described above, and the utility-specific carbon intensity factor, GHG emissions from watering lawns may be calculated.

5.5.3 Recycled Water

After use, wastewater is treated and reused as reclaimed water. Any reclaimed water produced is generally redistributed to users via pumping. An estimate of the non-potable water demand to be met through the distribution of recycled water is needed. Estimates of the amount of energy needed to redistribute and, if necessary, treat reclaimed water is 400 kW-hr per acre foot.³⁴ Based on the estimated demand for reclaimed water, the estimated electricity demand and the utility-specific carbon-intensity factor, non-potable reclaimed water redistribution emissions are calculated.

5.5.4 Process

Industrial land uses can use a large amount of water for their processes. The water used for this will not be quantified since there is not sufficient water use data for this type of land use for the development of a default value. Water use is highly dependent on the specific industry..

5.6 Wastewater

Emissions associated with wastewater treatment include indirect emissions necessary to power the treatment process and direct emissions from degradation of organic material in the wastewater.

5.6.1 Direct Emissions

Direct emissions from wastewater treatment include emissions of CH₄ and biogenic CO₂. The method described by the Local Government Operations Protocol developed by the California Air Resources Board is suggested with default values assigned since detailed plant specific data will typically not be available.³⁵ The assumed daily 5-day carbonaceous biological oxygen

solely to edible plants, areas irrigated with recycled water, water features using recycled water and areas dedicated to active play such as parks, sports fields, golf courses, and where turf provides a playing surface.”

³⁴ CEC 2005. California’s Water-Energy Relationship. Final Staff Report. CEC-700-2005-011-SF.

³⁵ California Air Resources Board. 2008. *Local Government Operations Protocol - for the quantification and reporting of greenhouse gas emissions inventories*. Version 1.0. September 2008. Developed in partnership by California Air Resources Board, California Climate Action Registry, ICLEI - Local Governments for Sustainability, The Climate Registry

demand (BOD₅) of 200 mg/L-wastewater is multiplied by the protocol defaults for maximum CH₄-producing capacity (0.6 kg-CH₄/kg-BOD₅) and other default values to obtain the direct CH₄ emission. The amount of digester gas produced per volume of wastewater, and amount of N₂O per volume of wastewater needs to be determined. These values are then multiplied by the Global Warming Potential factor³⁶ of 21 for CH₄ or 310 for the GWP of N₂O that would be generated otherwise to obtain the annual CO₂ equivalent emissions.

5.6.2 Indirect Emissions

Indirect GHG emissions result from the electricity necessary to power the wastewater treatment process. The electricity required to operate a wastewater treatment plant is estimated to be 1,911 kW-hr per million gallons.³⁷ Based on the expected amount of wastewater requiring treatment, which will be assumed to be equal to the indoor potable water demand absent other data, the energy intensity factor and the utility-specific carbon-intensity factor, indirect emissions due to wastewater treatment are calculated.

5.7 Public Lighting

Lighting sources contribute to GHG emissions indirectly, via the production of the electricity that powers these lights. Lighting sources considered in this source category include streetlights, traffic lights, and parking lot lights. The annual electricity use may be estimated using the number of heads, the power requirements of each head, and the assumption that they operate for 12 hours a day on average for 365 days per year or 24 hours for traffic lights. The emission factor for public lighting is the utility-specific carbon-intensity factor. Multiplying the electricity usage by the emission factor gives an estimate of annual CO₂e emissions from public lighting.

5.8 Municipal Vehicles

GHG emissions from municipal vehicles are due to direct emissions from the burning of fossil fuels. Municipal vehicles considered in this source category include vehicles such as police cars, fire trucks, and garbage trucks. Data from reports by Medford, MA; Duluth, MN; Northampton, MA; and Santa Rosa, California³⁸ show that the CO₂ emissions from municipal

³⁶ Intergovernmental Panel on Climate Change. IPCC Second Assessment - Climate Change 1995.

³⁷ CEC 2006. Refining Estimates of Water-Related Energy Use in California. PIER Final Project Report. Prepared by Navigant Consulting, Inc. CEC-500-2006-118. December.

³⁸ City of Medford. 2001. Climate Action Plan. October. <http://www.massclimateaction.org/pdf/MedfordPlan2001.pdf>
 City of Northampton. 2006. Greenhouse Gas Emissions Inventory. Cities for Climate Protection Campaign. June. <http://www.northamptonma.gov/uploads/listWidget/3208/NorthamptonInventoryClimateProtection.pdf>
 City of Santa Rosa. Cities for Climate Protection: Santa Rosa. http://ci.santa-rosa.ca.us/City_Hall/City_Manager/CCPFinalReport.pdf
 Skoog., C. 2001. Greenhouse Gas Inventory and Forecast Report. City of Duluth Facilities Management and The International Council for Local Environmental Initiatives. October. <http://www.ci.duluth.mn.us/city/information/ccp/GHGEmissions.pdf>

vehicles would be approximately³⁹ 0.05 MT per capita per year. Using these studies and the expected population, emissions from municipal vehicles may be calculated.

5.9 On-Road Mobile Sources

This section estimates GHG emissions from on-road mobile sources. The on-road mobile source emissions considered a project will be from the typical daily operation of motor vehicles by project residents and non-residents. The GHG emissions based upon all vehicle miles traveled associated with residential and non-residential trips regardless of internal or external destinations or purpose of trip are estimated. Traffic patterns, trip rates, and trip lengths are based upon the methods discussed below.

The CCAR GRP⁴⁰ recommends estimating GHG emissions from mobile sources at an individual vehicle level, assuming knowledge of the fuel consumption rate for each vehicle as well as the miles traveled per car. Since these parameters are not known for a future development, the CCAR guidance can not be used as recommended.

Estimating Trip Rates

The majority of transportation impact analysis conducted for CEQA documents in California apply trip generation rates provided by the Institute of Transportation Engineers (ITE) in their regularly updated report *Trip Generation*. The report is based on traffic counts data collected over four decades at built developments throughout the United States. This data is typically based on single-use developments, in suburban locations with ample free parking and with minimal transit service and demand management strategies in place. As a result, the ITE trip generation rates represent upper bound trip generation rates for an individual land use type. This represents a good basis against which to measure the trip-reducing effects of any one or more of the mitigation strategies that will be quantified in subsequent tasks. Therefore, we recommend ITE trip rates as the baseline condition against which the effectiveness of CAPCOA's mitigation measures is applied.

There are some CEQA traffic studies that use data other than ITE trip generation rates. Below we briefly discuss the possible use of these alternative datasets. These traffic studies typically use trip generation data from one of the following sources:

SANDAG Traffic Generators. In the San Diego region, most studies use data from the SANDAG *Traffic Generators* report. This report is similar to the ITE *Trip Generation* in that it uses primarily suburban, single use developments, except that this dataset is based on traffic counts conducted in the San Diego region rather than throughout the United States. In studies where the SANDAG data is used, CAPCOA reviewers should apply the trip reduction estimates presented in subsequent tasks directly to the SANDAG trip generation rates.

³⁹ In an effort to be conservative, the largest per capita number from these four reports was used.

⁴⁰ California Climate Action Registry (CCAR). 2009. *General Reporting Protocol*. Version 3.1. January.

Travel Forecast Models. For some large development projects or general plans, the local or regional travel model is used to estimate the number of trips generated as well as trip lengths and vehicle speeds at which the individual trips occur. These models account for whether the trip segment occurs on a freeway or local streets as well as the degree of congestion. The values for trip generation rates and trip lengths using ITE and average trip lengths can be used to assess the model estimates of vehicle trip generation and VMT. These comparisons should recognize that the travel models explicitly account for various factors that reduce trip-making and VMT, including the demographic characteristics of the site occupants, location and accessibility of the development site relative to other destinations in the region, the mix of land uses within the site and its surrounding area, and possibly the availability of effective transit service. When performing a comparison using the ITE trip rates and average trip lengths, the reviewer should take into consideration that these factors have already been accounted for in the modeling. Therefore, we recommend applying ITE trip rates and lengths along with the adjustments recommended elsewhere in this document (accounting for site location, design and demographics) as a means of reality-checking transportation model results.

Traffic counts at comparable developments. Some traffic assessments elect to conduct traffic counts at existing developments that are similar to the proposed development. When reviewing impact assessments produced using such information, the reviewer should take into account the extent to which the surveyed development(s) already contain trip generation and trip length reducing measures. Care needs to be used to avoid double-counting reductions.

Estimating VMT from Mobile Sources

Data on average trip lengths are used to translate trip generation rates into vehicle miles of travel (VMT). These trip lengths should be obtained from published sources of average trip lengths for different types of trip types (i.e., commute trips, shopping trips, and others) for each region within the state. Vehicle miles traveled (VMT) are calculated by multiplying ITE trip rates by the typical trip lengths.

Some mechanisms that reduce trip generation rates and trip lengths below these standard ITE-trip rates and current average trip lengths might be considered to be intrinsic parts of the development proposal rather than mitigation measures, such as project location (e.g., infill or transit oriented development [TOD]), density, mix of uses, and urban design. These are not considered part of the baseline condition, but are recognized and quantified as project design features (PDFs). This approach has the following advantages: 1) it creates a consistent basis of analysis for all development projects regardless of location and self-mitigating features already included in the project proposal, and 2) it highlights all elements of a project that reduce trip generation rates and vehicle miles traveled.

Other Factors Influencing Mobile Source GHG Emissions

Beyond trip generation, trip length and VMT, other factors that affect GHG emissions include traffic flow, vehicle fuel consumption rates, and fuel type.

Traffic speed and efficiency profiles are largely influenced by: a) the project location and degree of prevailing congestion in its vicinity, b) the degree to which the project implements traffic level-

of-service mitigation measures often triggered by CEQA review, and c) actions taken by local, regional governments and Caltrans to reduce corridor or area-wide congestion.

The simplified mitigation assessment methods developed for this study use several categories of emissions factors per VMT that account for a) the generalized project location (core infill, inner ring suburbs, outer suburbs, rural), and b) and region-specific fleet and emissions rate if available.

While it is beyond the scope of this document to provide CAPCOA the ability to perform traffic speed and efficiency analysis, the study report advises CAPCOA on the type of analysis to expect to see in CEQA documents on development projects. CEQA impact and mitigation assessment methods should continue to perform air quality analysis using tools such as EMFAC that reference prevailing traffic speed profiles, especially for infill development and congested corridors, while applying appropriate credit for congestion reducing measures included in the project mitigation requirements, funded capital improvements plans, and fiscally constrained Regional Transportation Plans (RTPs.)

5.9.1 Estimating GHG Emissions from Mobile Sources

The CO₂ emissions from mobile sources were calculated with the trip rates, trip lengths and emission factors for running and starting emissions from EMFAC2007 as follows:

$$CO_2 \text{ emissions} = VMT \times EF_{\text{running}}$$

Where:

VMT = vehicle miles traveled
 EF_{running} = emission factor for running emissions

The CO₂e calculation involves the following assumptions:

- The emission factor depends upon the speed of the vehicle.
- EMFAC emission factors from the baseline year will be used for EF_{running} based on County specific fleet mix for different trip types and adjusted to account for applicable regulations that are not currently incorporated yet into EMFAC.

Startup emissions are CO₂ emitted from starting a vehicle. Startup emissions are calculated using the following assumptions:

- The number of starts is equal to the number of trips made annually.
- The breakdown in vehicles is EMFAC fleet mix for County specific fleet mix.
- The emission factor for startup is calculated based on a weighted average of time between starts for each trip type (commute trips versus all other types).

Fleet distribution types will be based on EMFAC2007 or the most recent EMFAC version available. For mobile sources, the USEPA recommends assuming that CH₄, N₂O, and HFCs

account for 5% of GHG emissions from on-road vehicles, taking into account their GWPs.⁴¹ To incorporate these additional GHGs into the calculations, the total GHG footprint is calculated by dividing the CO₂ emissions by 0.95.

Emission factors for alternative fuel can be obtained from the CCAR General Reporting Protocol. For comparison with alternative fuel, N₂O and CH₄ emissions should be calculated separately as their emissions from alternative fuel are generally higher than from gasoline or diesel.

Low-emission-vehicle programs, such as neighborhood electric vehicles (NEV) or car sharing programs, will only be considered in accounting for GHG reductions if included in project-specific design or mitigation measures.

5.10 GHG Emissions from Specialized Land Uses

Below are methods to quantify GHG emissions from some additional land use categories that may be commonly found in development projects. These include golf courses and swimming pools. The methods proposed to determine GHG emissions associated with these sources is discussed in the following sections. The GHG emissions will typically fall into other categories such as landscape maintenance, water usage, and buildings, but since the data sources are different, they are explicitly described.

5.10.1 Golf Courses

Emission flux resulting from the construction of the golf course is not discussed, nor is the sequestration of CO₂ into the turf, trees, or lakes of the golf course. Operational CO₂ emissions were calculated for three areas: irrigation, maintenance (mowing), and on-site buildings' energy use. All three components are discussed in this section.

5.10.2 Calculating CO₂ Emissions from Irrigation of the Golf Course

The release of GHGs due to irrigation practices was calculated in two steps:

1. Identify the quantity of water needed.
2. Calculate the emissions associated with pumping the water.

1. *Identify the quantity of water needed.* Standard water use for an 18-hole golf course ranges from 250 to 450 acre-ft yearly. A survey of golf course superintendents conducted in the summer of 2003 by the Northern and Southern California Golf Associations revealed an annual average California usage of 345 acre-ft.⁴² Numerous factors will affect the actual water usage

⁴¹ USEPA. 2005. *Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle*. Office of Transportation and Air Quality. February.

⁴² Northern California Golf Association. *Improving California Golf Course Water Efficiency*, pg 14. <http://www.owue.water.ca.gov/docs/2004Apps/2004-079.pdf>

of a specific golf course, and it is likely to vary by year. ENVIRON recommends using the average usage of 345 acre-ft per year annually.

2. *Calculate the associated emissions.* Using the information identified above, ENVIRON calculates total emissions from irrigation of an 18-hole golf course as follows:

Estimate total dynamic head: This is the combination of lift (300 feet) and desired pressure. Standard athletic field sprinklers require a base pressure of approximately 65 psi.⁴³

$$\begin{aligned}
 60 \text{ psi} \times 2.31 \text{ ft/psi}^{44} &= 139 \text{ ft} \\
 + \text{ lift} &= 300 \text{ ft} \\
 \hline
 \text{Total dynamic head} &= 439 \text{ ft}
 \end{aligned}$$

Identify fuel unit and multiply by head: Possible pumping fuels include electricity, natural gas, diesel, and propane. In these calculations, ENVIRON assumes that all pumps will use electricity. Based on the literature, ENVIRON recommends using a pumping energy use of 1.551 kW-hr/acre-ft/ft.⁴⁵

$$1.551 \text{ kW-hr/acre-ft/ft} \times 439 \text{ ft} = 681 \text{ kW-hr/acre-foot}$$

Multiply energy demand by emission factor and convert to MT: The energy demand per acre-ft calculated above is multiplied by the emission factor for the electricity generation source and converted to MT.

$$\frac{681 \text{ kW-hr/acre-ft} \times 0.666 \text{ lbs CO}_2/\text{kW-hr}}{2204.62 \text{ lbs/ton}} = 0.21 \text{ MT CO}_2/\text{acre-ft}$$

The anticipated annual water demand will be multiplied by these values and then combined this with the calculated emission factor yields total annual emissions from irrigation of the golf course. Other outdoor land uses that require irrigation can follow a similar procedure.

5.10.3 Calculating CO₂ Emissions from Maintenance of the Golf Course

Maintenance emissions include the emissions resulting from the mowing of turf grass. The release of GHGs due to mowing was calculated in three steps:

1. Identify the area of turf and frequency of mowing.
2. Identify the efficiency of a typical mower.

⁴³ Full Coverage Irrigation. Partial List of Customers Using FCI Nozzles. <http://www.fcinozzles.com/clients.asp>.

⁴⁴ Conversion factor: 1 psi = 2.31 feet of head. Kele & Associates Technical Reference: Liquid Level Measurement. <http://www.kele.com/tech/monitor/Pressure/LiqLevMs.pdf>

⁴⁵ Kansas State University Irrigation Management Series. Comparing Irrigation Energy Costs. Table 4. <http://www.oznet.ksu.edu/library/ageng2/mf2360.pdf>

3. Calculate the emissions associated with mowing.

1. *Identify the area of turf and frequency of mowing:* An Arizona State economic analysis of golf courses reports that on average 2/3 of the land within a golf course is maintained.⁴⁶ ENVIRON suggests assuming that the course will be mowed twice weekly, although high maintenance areas such as greens will be mowed more frequently.⁴⁷ ENVIRON recommends a growing season of 52 weeks/year.⁴⁸

2. *Identify the efficiency of a typical mower.* Typical mower calculations are based on the specifications for a lightweight fairway mower (model 3235C) reported by John Deere’s Golf & Turf division.⁴⁹ A typical mower will use one tank (18 gallons) of diesel per day (assumed to be 8 hours). Given the size specifications of the mower and assuming an average speed of 5.5 mph, such a mower can cover 44 acres on 18 gallons of diesel.

3. *Calculate the emissions associated with mowing.* Using the information collected above and a CO₂ emission factor for diesel combustion⁵⁰, ENVIRON calculates the emission factor for mowing the golf course:

$$2 \text{ mowings/week} \times 52 \text{ weeks/year} \times \frac{18 \text{ gallons diesel/}}{44 \text{ acre-mowing}} \times \frac{22.4 \text{ lbs CO}_2/\text{gallon diesel}}{2204 \text{ lbs/ton}} = \frac{0.43 \text{ MT CO}_2/\text{acre-year}}$$

5.10.4 Calculating CO₂ Emissions from Building Energy Use at the Golf Course

Any of the non-residential building energy use data sources described in the Buildings section may be used to estimate energy intensity at the golf course.

5.11 Pools

Recreation centers may include various pools, spas, and restroom buildings; ENVIRON assumes that pools are the main consumers of energy in recreation centers. This section describes the methods used to estimate the GHGs associated with pools in recreation centers.

The energy used to heat and maintain a swimming pool depends on several factors, including (but not limited to): whether the pool is indoors or outdoors, size of the pool (surface area and depth), water temperature, and energy efficiency of pool pump and water heater, and whether

⁴⁶ Total acreage divided by total acreage maintained. Arizona State University, Dr. Troy Schmitz. Economic Impacts and Environmental Aspects of the Arizona Golf Course Industry. <http://agb.poly.asu.edu/workingpapers/0501.pdf>.

⁴⁷ Based on Best Practices video. <http://buckeyeturf.osu.edu/podcast/?p=51>

⁴⁸ Based on 95% of Southern California Survey respondents report an irrigation season greater than 9-10 months. <http://www.owue.water.ca.gov/docs/2004Apps/2004-079.pdf>

⁴⁹ John Deere Product Specifications. 3235C Lightweight Fairway Mower. http://www.deere.com/en_US/ProductCatalog/GT/series/gt_lwfm_c_series.html

⁵⁰ EIA. Fuel and Energy Source Codes and Emission Coefficients. <http://www.eia.doe.gov/oiaf/1605/factors.html>

solar heating is used. By making assumptions for these parameters and using known or predicted values for energy use, ENVIRON estimates the electricity and natural gas use of an outdoor pool.

5.11.1 Recreation Center Characterization

In the calculations described below, ENVIRON assumes that the proposed pools will be outdoor pools with dimensions 50 meters by 22.9 meters (a typical, competition-size pool). ENVIRON bases electricity calculations on a pool that ran its standard water filter for 24 hours per day, 365 days per year. As there is little data publicly available on the energy use of commercial swimming pools, ENVIRON extrapolates energy consumption from information obtained from two sources: 1) Data on electricity used by pool pumps from Pacific Gas and Electric (PG&E),⁵¹ and 2) Data on the annual cost to heat a commercial pool located in Carlsbad, CA.⁵²

5.11.2 Electricity Use of Pools

A PG&E study on energy efficiency of a pool pump at the Lyons Pool in Oakland, CA, found an annual electricity use of 110,400 kilowatt hours per year (kWh per yr).⁵³ The study pool is smaller than the assumed size of the proposed pool (actual size of the Lyons Pool is 35 yards by 16 yards). Accordingly, ENVIRON scales the electricity use to reflect the larger size of the proposed pool.

5.11.3 Natural Gas Use of Pools

The estimated annual cost of heating a standard competition-size pool is \$184,400 (or 72% of the total cost of pool operations).⁵⁴ ENVIRON used the average PG&E commercial rate for natural gas of \$0.95 per therm to convert this cost into annual natural gas use (hundred cubic feet per year [ccf/year]).⁵⁵ The commercial rate averages the variable cost due to energy usage and time of year. This corresponds to approximately 184,400 ccf per year.⁵⁶

This value is comparable to that obtained from the pool industry.⁵⁷ The estimated cost of heating a residential pool using a natural gas heater is about one dollar per square foot of water

⁵¹ PG&E. 2006. Energy Efficient Commercial Pool Program, Preliminary Facility Report. Lyons Pool, "City of Oakland/Oakland Unified School District." October.

⁵² Mendioroz, R. 2006. Fueling Change: A Number of Design Schemes and Alternative-Energy Strategies Can Help Operators Beat the Price of Natural Gas. Athletic Business. March.

⁵³ PG&E. 2006. Energy Efficient Commercial Pool Program, Preliminary Facility Report. Lyons Pool, "City of Oakland/Oakland Unified School District." October.

⁵⁴ Mendioroz, R. 2006. Fueling Change: A Number of Design Schemes and Alternative-Energy Strategies Can Help Operators Beat the Price of Natural Gas. Athletic Business. March.

⁵⁵ Pacific Gas and Electric (PG&E). 2007. Gas Rate Finder. Vol 36-G, No. 9. September.
<http://www.pge.com/tariffs/GRF0907.pdf>

⁵⁶ At the commercial rate given 1 ccf costs \$1.

⁵⁷ SolarCraft Services Inc. 2007. Phone conversation with Chris Bumaz on September 18, 2007. Novato, CA
<http://www.solarcraft.com/>

surface area per month (\$/sqft-month) in residential therms.⁵⁸ Applying this value to a competition-size pool yields an annual natural gas use of 147,600 ccf/year.

5.11.4 Conversion of Electricity and Natural Gas Use to Greenhouse Gas Emissions

ENVIRON used utility-specific electricity and natural gas emission factors to calculate the total CO₂ emissions for each pool. A summary of the calculations is shown below:

$$\text{Emissions from Electricity} \left(\frac{\text{Tonnes CO}_2 / \text{yr}}{1,000 \text{ sqft}} \right) = \frac{\text{Energy Use (ccf / yr)} \times \text{Emission Factor (lbs CO}_2\text{e / ccf)} \times \text{Conversion Factor (tonne / 2205 lbs)}}{\text{Surface Area of Pool (1,000 sqft)}}$$

$$\text{Emissions from Natural Gas} \left(\frac{\text{Tonnes CO}_2 / \text{yr}}{1,000 \text{ sqft}} \right) = \frac{\text{Energy Use (ccf / yr)} \times \text{Emission Factor (lbs CO}_2\text{e / ccf)} \times \text{Conversion Factor (tonne / 2205 lbs)}}{\text{Surface Area of Pool (1,000 sqft)}}$$

⁵⁸ The residential price for one therm of natural gas.



Appendix C

Transportation Appendices

Appendix C.1
Transportation Calculations

Appendix C.1 – Transportation Calculations

Table C-1 provides further detail into the calculations of percent reduction in vehicle miles traveled (VMT) for each of the fact sheets (that have references to the appendix). Many of the strategies in the table below do not provide the full equations for percent reduction in vehicle miles traveled. Only the equations or variables which require further detail are outlined here. The table also provides detail on any assumptions which are made to perform the calculations and the basis of such assumptions. An additional section below Table C-1 provides a detailed discussion of the calculations made for the transit accessibility strategy.

Table C-1 Transportation Calculations					
Strategy	T#	Equation	Variable	Value	Source/Notes
Increase Density (Land Use/Location)	A2	A = Percentage increase in housing units per acre = (number of housing units per acre – number of housing units per acre for typical ITE development) / (number of housing units per acre for typical ITE development)	number of housing units per acre for typical ITE development	7.6 = blended average density of residential development in the US in 2003	A.C. Nelson. "Leadership in a New Era." <i>Journal of the American Planning Association</i> , Vol. 72, Issue 4, 2006, pp. 393-407 – as cited in <i>Growing Cooler</i>
		A = Percentage increase in jobs per job acre = (number of jobs per job acre – number of jobs per job acre for typical ITE development) / (number of jobs per job acre for typical ITE development)	number of jobs per job acre for typical ITE development	20 = average jobs per job acre	Year 2005 Land Use, Sacramento County Travel Demand Model, 2008
Improve Design of Development (Land Use/Location)	A3	A = Percentage increase in intersections versus a typical ITE suburban development = (intersections per square mile of project – intersections per square mile of typical ITE suburban development) / (intersections per square mile of typical ITE suburban development)	intersections per square mile of typical ITE suburban development	36 = ITE site average intersection density	Based on Fehr & Peers methodology for analysis in the report: <i>Proposed Trip Generation, Distribution, and Transit Mode Split Forecasts for the Bayview Waterfront Project Transportation Study</i> , Fehr & Peers, 2009

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Table C-1 Transportation Calculations					
Strategy	T#	Equation	Variable	Value	Source/Notes
Increase Diversity (Mixed Use) (Land Use/Location)	A5	A = Percentage increase in land use index versus single use development = (project land use index – single land use index) / single land use index	single land use index	$0.15 = - [1*(\ln 1) + 0.01*(\ln 0.01)+...+0.01*(\ln 0.01)] / \ln(6)$	--
Increase Destination Accessibility (Land Use/Location)	A6	A = Percentage decrease in distance to downtown or major job center = (distance to downtown/job center for typical ITE development – distance to downtown/job center for project) / (distance to downtown/job center for typical ITE development)	distance to downtown/job center for typical ITE development	12 miles (average work trip length from NHTS)	2000-2001 California Statewide Travel Survey, 2001 NHTS Summary of Travel Trends, p.15 (Table 5)
Increase Transit Accessibility (Land Use/Location)	A7	A = Increase in transit mode share = % transit mode share for project - % transit mode share for typical ITE development	% transit mode share for typical ITE development	1.3%	NHTS, 2001 http://www.dot.ca.gov/hq/tsip/tab/documents/travelsurveys/Final2001_StwTravelSurveyWkdayRpt.pdf , p.150 (Suburban – SCAG, SANDAG, Fresno County.)
		B = Adjustment from transit mode share to VMT = 1 / average vehicle occupancy * conversion from VT to VMT = 0.67	Divide by average vehicle occupancy to translate to VT	1 / average vehicle occupancy = 1 / 1.5 = 0.67	NHTS, http://www.dot.ca.gov/hq/tsip/tab/documents/travelsurveys/2000_Household_Survey.pdf , p.iii
			conversion from VT to VMT	1	Assume all trip lengths are equal (vehicle trips to VMT) ¹

¹ To convert to vehicle miles traveled, we assume that all vehicle trips will average out to typical trip length (“assume all trip lengths are equal”). Thus, we can assume that a percentage reduction in vehicle trips will equal the same percentage reduction in vehicle miles traveled.

**Table C-1
Transportation Calculations**

Strategy	T#	Equation	Variable	Value	Source/Notes
Unbundle Parking Cost from Property Cost (Parking Pricing/Policy)	C3	A = Adjustment from Vehicle Ownership to VMT = average trips per 2 vehicles * 1 vehicle per average trips =(9.8 trips/ 2 vehicles) * (1 vehicle / 5.7 trips) = 0.85	Average trips per X vehicles	Households with 2 vehicles take 9.8 trips while households with 1 vehicle take 5.7 trips per day	i.e. A reduction of 1 vehicle leads to an 0.85 reduction in vehicle trips http://www.dot.ca.gov/hq/tsip/tab/documents/travel_surveys/2000_Household_Survey.pdf , table 8.7
Expand Transit Network (Transit System Improvements)	D2	D = Adjustment for Transit Ridership Increase to VMT	--	0.67	see Increase Transit Accessibility
Enhance Transit Service Frequency/Speed (Transit System Improvements)	D3	E = Adjustment for Transit Ridership Increase to VMT	--	0.67	see Increase Transit Accessibility
Implement Bus Rapid Transit (Transit System Improvements)	D4	D = Adjustment for Transit Ridership Increase to VMT	--	0.67	see Increase Transit Accessibility
Implement Required Trip Reduction Programs (Trip Reduction Programs)	E2	C = Adjustment from vehicle mode share to commute VMT	--	1	Assume all trip lengths are equal (vehicle mode share to vehicle trips to VMT) ⁱ
Provide a Transit Fare Subsidy (Trip Reduction Programs)	E3	C = Adjustment from commute VT to commute VMT	--	1	Assume all trip lengths are equal (vehicle trips to VMT) ⁱ
Implement Commute Trip Reduction Marketing (Trip Reduction Programs)	E7	C = Adjustment from commute VT to commute VMT	--	1	Assume all trip lengths are equal (vehicle trips to VMT) ⁱ

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Table C-1 Transportation Calculations					
Strategy	T#	Equation	Variable	Value	Source/Notes
Provide Employer-Sponsored Vanpool/Shuttle (Trip Reduction Programs)	E8	C = Adjustment from vanpool mode share to commute VMT	--	0.67	see Increase Transit Accessibility
Implement Bike-Sharing Programs (Trip Reduction Programs)	E10	% VMT Reduction = A * B * C = 2% * 7% * 20% = 0.03%	--	--	--
		A = 2% = Net new bicycle mode share = (existing mode share * % increase in bicycle mode share) – existing mode share	Existing mode share	Estimate at 1%	Pucher et al., 2010
			% increase in bicycle mode share	135 – 300%	Pucher et al., 2010, Table 4 (see fact sheet for calculations)
		B = % of new bicycle trips shifting from vehicles (from literature)	--	6-7%	Pucher et al., 2010 and Bike-Share in NYC, 2009, Table 4, p.45
			adjustments to convert from vehicle mode share to VMT	1	Assume all trip lengths are equal (vehicle mode share to vehicle trips to VMT) ⁱ
	C = adjustments to convert from vehicle mode share to VMT * adjustment for shorter than average trip lengths = 1*20%	adjustment for shorter than average trip lengths	1.94/9.9 = 20%	Adjustment to reflect ratio of bike trip length to average trip length (this strategy will only replace the shorter vehicle trips that can be reasonably replaced by a bicycle). [1.94 miles (average bike trip length from Moving Cooler Appendices B-28 referencing NHTS) / 9.9 miles (average household trip length from NHTS Transferability, 2001 NHTS, http://nhts-gis.ornl.gov/transferability/Default.aspx)]	

Table C-1 Transportation Calculations					
Strategy	T#	Equation	Variable	Value	Source/Notes
Provide End of Trip Facilities (Trip Reduction Programs)	E11	*utilizing the same equation in bike sharing program section, set A = 1.3% = (7.1% - 5.8%) % VMT Reduction = A * B * C = 1.3% * 7% * 20% = 0.02%	--	--	--
Establish Schoolpool (Trip Reduction Programs)	E13	B = Adjustments to convert from participation to daily VMT to annual school VMT = [(avg # of families per carpool - 1) / avg # of families per carpool] *% of school days	avg # of families per carpool	2.5	TDM Case Studies, DRCOG, p.13
			% of school days	75% = 39 school weeks/ 52 weeks	TDM Case Studies, DRCOG, p.13
Provide School Buses (Trip Reduction Programs)	E14	B = Adjustments to convert from participation to daily VMT to annual school VMT = % of school days	% of school days	75% = 39 school weeks/ 52 weeks	TDM Case Studies, DRCOG, p.13
Cordon Pricing (Road Pricing Management)	F2	A = % increase in pricing for passenger vehicles to cross cordon	--	100 – 500%	<i>Moving Cooler</i> uses peak hour price per mile instead of crossing price. The percentage change can still be calculated to provide a general estimate for a high range % change. Assuming a baseline of \$0.10, calculated percentage increase to \$0.49 - \$0.65 (<i>Moving Cooler</i>) and adjusted with rounding
		C = % of VMT Impacted by Cordon Pricing and Mode Shift Adjustments = %VMT impacted by congestion pricing * Mode shift adjustment = 8.8% (peak period) and 21% (all day)	--	--	--

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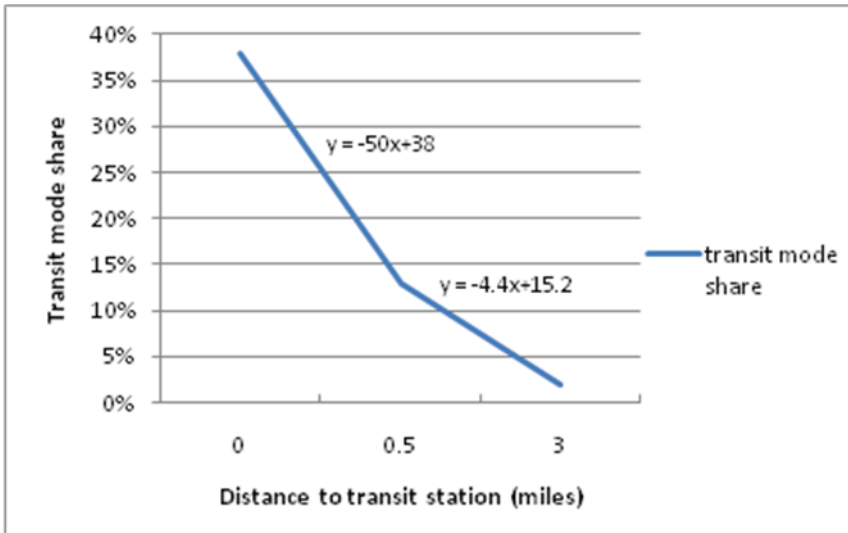
Table C-1 Transportation Calculations					
Strategy	T#	Equation	Variable	Value	Source/Notes
		Peak period = 25% * 35% = 8%	%VMT impacted by congestion pricing	25%	20% of trips are work trips (NHTS Transferability, 2001 NHTS, http://nhts-gis.ornl.gov/transferability/Default.aspx) and round up assuming other trips travel during peak periods
			Mode shift adjustment	35% = 20% + 30%/2	Of the estimated trips affected to the increase in price, assume 50% is either a time of day shift/route shift/no change, 30% convert to HOV trips (with average 2 ppl per HOV), and 20% are trip reductions/shift to transit, walk or bike
		Static all day price (London) = 60% * 35% = 21%	% VMT impacted by congestion pricing	60%	Conservatively assume 60% of trips fall in the peak periods and mid-day
			Mode shift adjustment	35%= 20% + 30%/2	Of the estimated reduced trips due to the increase in price, assume 50% is either a time of day shift/route shift/no change, 30% convert to HOV trips (with average 2 people per HOV), and 20% are trip reductions/shift to transit, walk or bike

Increase Transit Accessibility (Land Use/Location)

Distance to transit	Transit mode share calculation equation (where x = distance of project to transit)
0 – 0.5 miles	-50*x + 38

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0.5 to 3 miles	$-4.4 * x + 15.2$
> 3 miles	no impact
Source: Lund et al, 2004; Fehr & Peers 2010	



Data was taken from Table 5-25 of Lund et al, 2004. The table provided transit commute mode shares for those living with 1/2 mile of a rail station for 5 sites surveyed within California. Removing the extreme low and high percentages, this provided a range of transit commute mode share of 13% to 38%. A simple linear extrapolation was conducted to provide a relationship for distance to transit (between 0 and 1/2 mile) to transit mode share, via the equation: transit mode share = $-50 * \text{distance to transit} + 38$. The table also provided transit mode shares for those living from 1/2 to 3 miles from a station, a range from 2% to 13%. Using the same methodology, a relationship for distance to transit (between 1/2 mile and 3 miles) to transit mode share is provided via the equation: transit mode share = $-4.4x + 15.2$.

Appendix C.2

Trip Adjustment Factors

Appendix C.2 – Trip Adjustment Factors

The trip adjustment factors are not explicitly used for calculations of reduction in vehicle miles traveled (VMT) but serve as an added resource point for users of this document. For example, we report all commute trip reduction (CTR) program strategies as a percentage reduction in commute VMT. If the user would like to translate this to project level VMT (assuming the project is NOT an office park), and the user does not have statistics about the project area readily available, then the trip adjustment factors table can be utilized.

Example: Assume the user is providing a 15% reduction in commute VMT for a implementation of a ride share program. To calculate an estimated reduction in project level VMT, the user can multiple 15% by 20% (NHTS average % of work trips) and again multiply by 12.0 / 9.9 (average work trip length/average trip length) to adjust for both the portion of trips which are work related and that work trips tend to be longer than average trips.

TABLE C-2. TRIP ADJUSTMENT FACTORS				
	NHTS ¹	Sacramento Region ²	San Diego Region ³	Rural (Kings County, CA) ⁴
Average Work Trip Length (vehicle)	12.0	10.4	8.4	-
Average Trip Length (vehicle)	9.9	6.8	6.9	8.7
Average % of Work Trips	20%	20%	-	12%
Average % of School Trips	9.8%	-	-	-
Average Length of School Trips (Vehicle)	6.0	-	4.2	-
Average Vehicle Occupancy (All Trips)	1.5	1.4	1.5	-
Source: 1. 2000-2001 California Statewide Travel Survey, 2001 NHTS Summary of Travel Trends 2. SACMET model, Fehr & Peers, 2010. 3. SANDAG Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region (April 2002) 4. NHTS Transferability, 2001 NHTS, http://nhts-gis.ornl.gov/transferability/Default.aspx				

Appendix C

Appendix C.3
Induced Travel Memo

MEMORANDUM

Date: February 3, 2010

To: CAPCOA Team

From: Tien-Tien Chan, Jerry Walters, and Meghan Mitman

Subject: Induced Travel Material

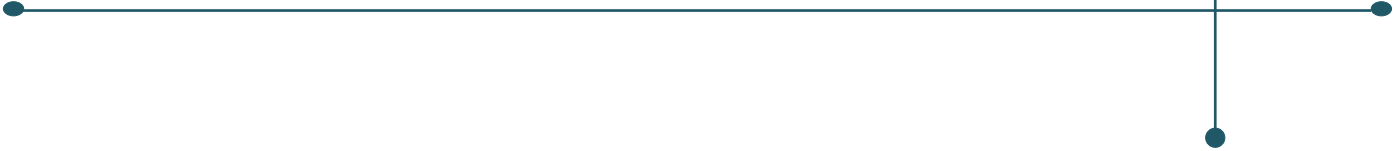
SF10-0475

Induced travel is a term used to describe how travel demand responds to roadway capacity expansion and roadway improvements. Consistent with the theory of supply and demand, the general topic of research concerning induced travel is that reducing the cost of travel (i.e., reduced travel time due to a new road improvement) will increase the amount of travel. In other words, road improvements alone can prompt traffic increases. To what degree and under what circumstances these increases occur is a matter of debate and the key subject of most induced travel research. We have attached the following documents which represent research on induced travel effects:

- *Comparative Evaluations on the Elasticity of Travel Demand* – study conducted for the Utah DOT which included national literature review of induced travel studies
- *Are Induced-Travel Studies Inducing Bad Investments?* – article by Cervero in Access Magazine: Transportation Research at the University of California
- *Road Expansion, Urban Growth, Growth, and Induced Travel: A Path Analysis* – APA Journal paper by Cervero, also discusses the impacts of induced growth and induced investments

The reader should be aware that conditions may vary considerably and the extent of induced travel depends on a variety of factors, including: the degree of prior congestion in the corridor, its duration over hours of the day, its extent over lane miles of the corridor, the degree to which unserved traffic diverts to local streets and the degree of congestion on those routes, the availability of alternate modes within the corridor, whether corridor is radial and oriented toward downtown with high parking cost and limited availability or circumferential, planned level of growth in the corridor, whether the corridor is interstate or interregional, whether it is a truck route, and other factors.

GHG reduction strategies such as transportation system management (e.g. signal coordination, adaptive signal control) may also have the potential for inducing travel. For such strategies, if the estimated improvement exceeds 10% benefit in travel time reduction, we recommend conducting project specific analysis on induced travel prior to establishing GHG reduction benefits.



Appendix D

Building Mitigation Measure Quantification Methods

This Appendix summarizes the steps and assumptions used in two of the mitigation strategies – exceed Title 24 energy efficiency standards (BE-1) and installing energy efficient appliances (BE-4).

Background

GHGs are emitted as a result of activities in residential and commercial buildings when electricity and natural gas are used as energy sources. New California buildings must be designed to meet the building energy efficiency standards of Title 24, also known as the California Building Standards Code. Title 24 Part 6 regulates energy uses including space heating and cooling, hot water heating, ventilation, and hard-wired lighting. By committing to a percent improvement over Title 24, a development reduces its energy use and resulting GHG emissions.

The Title 24 standards have been updated twice (in 2005 and 2008)¹ since some of these data used to estimate energy use were compiled. California Energy Commission (CEC) has published reports estimating the percentage deductions in energy use resulting from these new standards. Based on CEC’s discussion on average savings for Title 24 improvements, these CEC savings percentages by end use can be used to account for reductions in electricity and natural gas use due to the two most recent updates to Title 24. Since energy use for each different system type (ie, heating, cooling, water heating, and ventilation) as well as appliances is defined in this survey, the use of survey data with updates for Title 24 will easily allow for application of mitigation measures aimed at reducing the energy use of these devices in a prescriptive manner.

Another mitigation measure to reduce a building’s energy consumption as well as the associated GHG emissions from natural gas combustion and electricity production is to use energy-efficient appliances. For residential dwellings, typical builder-supplied appliances include refrigerators and dishwashers. Clothes washers and ceiling fans would be applicable if the builder supplied them. For commercial land uses, only energy-efficient refrigerators have been evaluated for grocery stores.

¹ California Energy Commission. 2003. Impact Analysis: 2005 Update to the California Energy Efficiency Standards for Residential and Nonresidential Buildings. Available at: http://www.energy.ca.gov/title24/2005standards/archive/rulemaking/documents/2003-07-11_400-03-014.PDF
 California Energy Commission. 2006. California Commercial End-Use Survey. Prepared by Itron Inc. Available at: <http://www.energy.ca.gov/ceus/>

Methodology

Datasets

The Residential Appliance Saturation Survey (RASS)² and California Commercial Energy Use Survey (CEUS)³ datasets were used to estimate the energy intensities of residential and non-residential buildings, respectively, since the data is available for several land use categories in different climate zones in California. The RASS dataset further differentiates the energy use intensities between single-family, multi-family and townhome residences.

The Energy Star and Other Climate Protection Partnerships 2008 Annual Report⁴ and subsequent Annual Reports were reviewed for typical reductions for energy-efficient appliances. ENERGY STAR residential refrigerators, clothes washers, dishwashers, and ceiling fans use 15%, 25%, 40%, and 50% less electricity than standard appliances, respectively. ENERGY STAR commercial refrigerators use 35% less electricity than standard appliances.

Calculations

Exceeding Title 24 Energy Efficiency Standards (BE-1)

RASS and CEUS datasets were used to obtain the energy intensities of different end use categories for different building types in different climate zones. Energy intensities from CEUS are given per square foot per year and used as presented. RASS presents Unit Energy Consumption (UEC) per dwelling unit per year and saturation values; the energy intensities used in this analysis are products of the UEC and saturation values.

Data for some climate zones is not presented in the CEUS and RASS studies. However, data from adjacent climate zones is assumed to be representative and substituted as follows:

For non-residential building types:

- Climate Zone 11 used Climate Zone 9 data.
- Climate Zone 12 used Climate Zone 9 data.
- Climate Zone 14 used Climate Zone 1 data.
- Climate Zone 15 used Climate Zone 10 data.

For residential building types:

- Climate Zone 6 used Climate Zone 2 data.
- Climate Zone 14 used Climate Zone 1 data.
- Climate Zone 15 used Climate Zone 10 data.

RASS and CEUS data are based on 2002 consumption data. Because older buildings tend to be less energy efficient, and the majority of the buildings in the survey were likely constructed

² California Statewide Residential Appliance Saturation Study Reporting Center. Available at:

<http://websafe.kemainc.com/RASSWEB/DesktopDefault.aspx>

³ California Energy Commission. 2006. California Commercial End-Use Survey. Prepared by Itron Inc. Available at:

<http://www.energy.ca.gov/ceus/>

⁴ United States Environmental Protection Agency 2009. ENERGY STAR and Other Climate Protection Partnerships: 2008 Annual Report. Available at: <http://www.epa.gov/cpd/pdf/2008AnnualReportFinal.pdf>

Appendix D

before 2001, the RASS and CEUS data likely overestimate energy use for a 2001 Title 24-compliant building.

To account for updates since the 2001 Title 24 standards, percentage reductions for each end use category taken directly from the CEC's "Impact Analysis for 2005 Energy Efficiency Standards" and "Impact Analysis 2008 Update to the California Energy Efficiency Standards for Residential and Nonresidential Buildings" reports were applied to the CEUS and RASS datasets for improvements from 2001 to 2005, and 2005 to 2008, respectively (see Tables D-1 and D-2). For the CEUS data, exterior lighting was assumed to be covered by Title 24 lighting and therefore has the full percentage reductions taken. Interior lighting was assumed to be 50% Title 24 and 50% non-Title 24 uses. Therefore only half of the reduction for lighting was applied. The resulting 2008 numbers were then used as baseline energy intensities for this mitigation strategy. The total baseline energy intensities are calculated as follows:

$$\text{Baseline} = \sum [T24_{2001} \times (1 - R_{2001-2005}) \times (1 - R_{2005-2008})] + \sum NT24$$

Where:

- Baseline = Total baseline energy intensities of building category
- T24₂₀₀₁ = Energy intensities of Title 24 regulated end use from RASS or CEUS
- R₂₀₀₁₋₂₀₀₅ = Reduction from 2001 to 2005
- R₂₀₀₅₋₂₀₀₈ = Reduction from 2005 to 2008
- NT24 = Non-Title 24 regulated end use energy intensities

Table D-1
Reduction in Title 24 Regulated End Use for Non-Residential Buildings

Energy Source	End Use	Reduction from 2001 to 2005	Reduction from 2005 to 2008
Electricity	Heating	4.9%	37.2%
	Ventilation	5.0%	1.5%
	Refrigeration	0.0%	0.0%
	Process	0.0%	0.0%
	Office Equipment	0.0%	0.0%
	Motors	0.0%	0.0%
	Miscellaneous	0.0%	0.0%
	Interior Lighting	4.9%	5.9%
	Water Heating	0.0%	0.0%
	Cooking	0.0%	0.0%
	Air Compressors	0.0%	0.0%
	Cooling	6.7%	8.3%
	Exterior Lighting	9.8%	11.7%
Natural Gas	Cooking	0.0%	0.0%
	Cooling	10.4%	9.3%
	Heating	3.1%	15.9%
	Water Heating	0.0%	0.0%
	Process	0.0%	0.0%
	Miscellaneous	0.0%	0.0%

Table D-2
Reduction in Title 24 Regulated End Use for Residential Buildings

Energy Source	End Use (As presented in RASS Dataset)	Reduction from 2001 to 2005			Reduction from 2005 to 2008		
		Multi-family	Single family	Town home	Multi-family	Single family	Town home
Electricity	Conv. Electric heat	24.3%	19.8%	24.3%	19.7%	22.7%	19.7%
	HP Eheat	24.3%	19.8%	24.3%	19.7%	22.7%	19.7%
	Aux Eheat	24.3%	19.8%	24.3%	19.7%	22.7%	19.7%
	Furnace Fan	24.3%	19.8%	24.3%	19.7%	22.7%	19.7%
	Central A/C	24.3%	19.8%	24.3%	19.7%	22.7%	19.7%
	Room A/C	24.3%	19.8%	24.3%	19.7%	22.7%	19.7%
	Evap Cooling	24.3%	19.8%	24.3%	19.7%	22.7%	19.7%
	Water Heat	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Solar Water Heater	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Dryer	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Clothes Washer	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Dish Washer	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	First Refrigerator	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Second Refrigerator	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Freezer	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Pool Pump	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Spa	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Outdoor Lighting	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Range/Oven	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	TV	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Spa Electric Heat	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Microwave	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Home Office	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	PC	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Water Bed	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Well Pump	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Miscellaneous	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Natural Gas	Primary Heat	15.7%	6.7%	15.7%	7.0%	10.0%	7.0%
	Auxiliary Heat	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Conv. Gas Water Heat	15.7%	6.7%	15.7%	7.0%	10.0%	7.0%
	Solar Water Heat w/Gas Backup	15.7%	6.7%	15.7%	7.0%	10.0%	7.0%
	Dryer	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Range/Oven	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Pool Heat	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Spa Heat	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Miscellaneous	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

The same approach was used to quantify GHGs emission reduction from exceeding Title 24 energy efficiency standards by 1%. The 1% reduction was applied to only energy use intensities for Title 24 regulated end use categories. For the CEUS data, the reduction was not applied to any portion of interior lighting. The reduced energy use intensities were added to the unadjusted energy use intensities for non-Title 24 regulated end use categories to obtain the total energy use intensities for exceeding Title 24 energy efficiency standards by 1% for each building category. These were then compared to the baseline line energy intensities for the overall percentage reduction as follows:

$$\text{Percentage Reduction} = 1 - \frac{\sum [T24_{2001} \times (1 - R_{2001-2005}) \times (1 - R_{2005-2008}) \times 99\%] + \sum \text{NT24}}{\text{Baseline}}$$

Where:

- Baseline = Total baseline energy intensities of building category
- T24₂₀₀₁ = Energy intensities of Title 24 regulated end use from RASS or CEUS
- R₂₀₀₁₋₂₀₀₅ = Reduction from 2001 to 2005
- R₂₀₀₅₋₂₀₀₈ = Reduction from 2005 to 2008
- NT24 = Non-Title 24 regulated end use energy intensities

Installing Energy Efficient Appliances

The same baseline line energy use intensities from the Exceeding Title 24 Energy Efficiency Standards mitigation were used for this mitigation strategy. For all appliances except ceiling fan, the reductions as presented in the ENERGY STAR 2008 annual report were applied to the energy use intensities of the corresponding energy end use categories. All other end use categories were kept unadjusted. The percentage reductions were calculated as follows:

$$\text{Percentage Reduction} = 1 - \frac{\text{Appliance Intensity} \times (1 - \text{ESR}) + \sum \text{Other End Use}}{\text{Baseline}}$$

Where:

- Baseline = Total baseline energy intensities of building category
- Appliance Intensity = 2008 baseline energy intensity of appliance in consideration
- ESR = Reduction from ENERGY STAR appliance
- Other End Use = 2008 baseline energy intensity of all other end uses

RASS does not specify a ceiling fan end-use; rather, electricity use from ceiling fans is accounted for in the “Miscellaneous” category which includes interior lighting, attic fans, and other miscellaneous plug-in loads. Since the electricity usage of ceiling fans alone is not

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specified, a value from the National Renewable Energy Laboratory (NREL) Building America Research Benchmark Definition (BARBD)⁵ was used. BARBD reported that the average energy use per ceiling fan is 84.1 kWh per year. In this mitigation measure, it was assumed that each multi-family, single-family, and townhome residence has one ceiling fan. Therefore, the 50% reduction from ENERGY STAR for ceiling fan was applied to 84.1 kWh of the electricity attributed to the Miscellaneous RASS category. In other words, 42.05 kWh was subtracted from the electricity end use intensities of the “Miscellaneous RASS” category in evaluating the GHGs emission reduction from installing energy efficient ceiling fans.

The total energy use intensities with reduction from each appliance in consideration were then compared to the baseline line energy intensities for the overall percentage reduction as follows:

$$\text{Percentage Reduction} = 1 - \frac{(\text{Misc} - 42.05) + \sum \text{Other End Use}}{\text{Baseline}}$$

Where:

- Baseline = Total baseline energy intensities of building category
- Misc = 2008 energy intensity in Miscellaneous category for electricity
- Other End Use = 2008 baseline energy intensity of all other end uses

5 NREL. 2010. Building America Research Benchmark Definition. Available online at: <http://www.nrel.gov/docs/fy10osti/47246.pdf>

Attachment E: SANDAG Mitigation Measures



Mobility Management VMT Reduction Calculator Tool – Design Document

June 2019

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Introduction

This report documents the design of the Mobility Management VMT Reduction Calculator Tool. The Microsoft Excel-based Tool produces estimates of the percent reduction in vehicle miles traveled (VMT) resulting from the application of mobility management strategies. The Tool is intended to act as a resource for evaluating and quantifying the impacts of mobility management strategies as part of the development review and transportation analysis process. The Tool supports the goals of Senate Bill 743 (Steinberg, 2013) (SB 743) by providing jurisdictions and developers with a resource to quantify VMT reductions resulting from implementation of a variety of mitigation strategies at various scales.

This report describes the user inputs, constants assumptions, formulas, and outputs for each strategy included in the Tool. Most of this information is available in the Tool itself, although this document provides some additional explanation of data sources and calculation methods.

The report is organized similarly to the Tool itself. The first four sections describe the Main page, FAQs page, Project-Level Results page, and Community-Level Results page. The remaining sections describe the 22 strategies included in the Tool, grouped into the following five categories:

- **Employer Commute Programs**
- **Land Use Strategies**
- **Parking Management**
- **Neighborhood Enhancements**
- **Transit Strategies**

Main Page

MOBILITY MANAGEMENT VMT REDUCTION CALCULATOR TOOL



Users of the Tool should begin on the Main page. The Main page is organized around the following five boxes:

Overview

Describes the Tool and its purpose.

Instructions

Describes how to use the Tool in a series of six steps.

Legend

Describes the formatting for cells used in the VMT-reduction calculations for each strategy.

Project Information

The user can enter the following optional information:

- Project Name (optional):
- Project Address (optional):
- Project Type (optional):

The user should enter the following information:

- Scale of Analysis:
 - Project/site *or*
 - City/community
- Analysis Location:
 - Using a drop-down menu, the user should select the city in which the analysis is located
- Community Plan Area (CPA), if applicable:
 - If the user selects San Diego or Unincorporated San Diego County, using the drop-down menu the user should select the CPA in which the analysis is located

Mobility Management Strategies

The user will see a list of the 22 strategies included in the Tool, shown below. Each strategy name is a hyperlinked, and clicking on a name will take the user to that strategy. The color scheme in these tables is intended to match that used in the Guidebook. These tables also contain links to the Project-Level Results and Community-Level Results pages.

Project/Site-Level Strategies	
Project-Level Results	
Employer Commute Programs	
Strategies implemented by employers that encourage workers to commute by modes other than auto	
1A	Voluntary Employer Commute Program
1B	Mandatory Employer Commute Program
1C	Employer Carpool Program
1D	Employer Transit Pass Subsidy
1E	Employer Vanpool Program
1F	Employer Telework Program
Land Use Strategies	
Strategies that modify the location or characteristics of development projects to encourage non-auto travel modes	
2A	Transit Oriented Development
2B	Mixed Use Development
Parking Management	
Strategies that discourage auto travel by modifying the price or supply of vehicle parking	
3A	Parking Pricing
3B	Parking Cash Out

Community/City-Level Strategies	
Community-Level Results	
Neighborhood Enhancements	
Strategies that improve or encourage neighborhood-level bicycle, pedestrian, and other multimodal travel options	
4A	Street Connectivity Improvement
4B	Pedestrian Facility Improvement
4C	Bikeway Network Expansion
4D	Bike Facility Improvement
4E	Bikeshare
4F	Carshare
4G	Community-Based Travel Planning
Transit Strategies	
Strategies that improve transit service and cause a mode shift from auto to transit	
5A	Transit Service Expansion
5B	Transit Frequency Improvements
5C	Transit-Supportive Treatments
5D	Transit Fare Reduction
5E	Microtransit NEV Shuttle

FAQs Page

This page contains frequently asked questions and associated answers.

1. What does this tool do?

The SANDAG VMT Reduction Calculator Tool can be used to estimate the percent reduction in VMT from various mobility management strategies. The tool operates at two geographic scales: project/site-level and community/city-level. The tool user must provide simple input information about a strategy in order to produce a VMT-reduction estimate. The tool is intended to act as a resource for evaluating and quantifying the impacts of mobility management strategies as part of the development review and transportation analysis process. The tool supports the goals of SB 743 by providing jurisdictions and developers with a resource to quantify VMT reductions resulting from implementation of a variety of mitigation strategies.

2. How do I enter strategy information?

Tool users enter information about a strategy of interest in the orange-colored cells found on each strategy page. Users cannot enter information in any other cells.

3. How do I see if the strategy has a VMT impact?

Each strategy page has a row labeled “Change in VMT.” A negative value in this row indicates a reduction in VMT; a positive value indicates an increase in VMT (denoted with a red outline of the cell).

4. What VMT reduction strategies are included in the tool?

The 22 strategies are listed on the Main page of this tool. Users can also review the Mobility Management Strategy Guidebook that serves as a companion resource to this tool for more information.

5. How do I select VMT reduction strategies?

From the Main page or the Results page, the user can click on a strategy hyperlink of interest. On the Strategy page, entering input values in all of the orange-colored cells will activate that strategy. If the user does not want the VMT-reduction results of a given strategy to be included in the summary results, either delete the Strategy page inputs in the orange-colored cells or click “Exclude from results” on the Strategy page.

6. Where can I learn more about how the reductions are calculated?

Each strategy page lists the references that were used to develop the VMT reduction estimates. Users can also review the Mobility Management Strategy Guidebook that serves as a companion resource to this tool for more information.

7. How is the total percent change in VMT adjusted when I select multiple strategies?

If only one strategy is selected, the user will see on the Results page (a) the percent change in VMT associated with that strategy and (b) the percent change in VMT (total) from all strategies. In this case, the values are the same. If more than one strategy is selected, the tool uses “multiplicative dampening” to adjust the sum of VMT reduction. Multiplicative dampening accounts for the diminished percent change in VMT that a strategy will have if other strategies are also selected. The total is calculated with the following formula:

$$\text{Total} = \{[100\% - (\text{Strategy A \% change in VMT})] \times [100\% - (\text{Strategy B \% change in VMT})] \times \dots \times [100\% - (\text{Strategy Z \% change in VMT})]\} - 100\%$$

8. How are the mode share, trip length, and VMT per capita data derived?

The mode share, trip length, and VMT per capita data found in this tool reflect travel by residents of the San Diego region only. The data are parsed by jurisdiction and, for the City of San Diego and the Unincorporated County of San Diego, by CPA. The data reflect the home origin of residents during an average 24-hour weekday. The analysis includes all trip purposes (all activities assigned to the home location). The data do not reflect travel for which the home origin is located outside of the San Diego region or by visitors to the San Diego region. It does not include travel made by heavy-duty trucks or travel for commercial purposes.

9. Can I calculate the total percent change in VMT from multiple strategies if the scales of analysis from my chosen strategies are not the same?

The tool safeguards against accidentally calculating the total percent change in VMT from strategies of different scales of analysis by graying out cells through conditional formatting and creating separate Print pages for the project/site-level results and the community/city-level results. While it may be possible that a user's project involves strategies that affect VMT at both scales, it is likely that combining the percentage VMT reduction from strategies of different scales would not be valid. If a user's project involves strategies that affect VMT at both scales, the user should use the tool as follows:

- a. Input project information on Main page
- b. Calculate VMT reductions from all applicable project/site-level strategies
- c. Print the project/site-level VMT results
- d. Open a clean version of the tool with no user inputs entered
- e. Repeat steps a through c for the community/city-level strategies

10. Why are there two totals displayed on the Results pages?

As discussed above in Question 7, the total percent change in VMT can be calculated when multiple strategies are selected. However, if the selected strategies reduce VMT from different types of trips (i.e., employee commute trips and all project-generated trips), it may not be valid to combine the total percent change in VMT. For example, parking pricing at a commercial facility affects VMT from all project-generated trips, while an employee vanpool program only affects VMT from the facility's employee commute trips. Of the ten project-level strategies, seven reduce VMT from employee commute trips and three reduce VMT from all project-generated trips (including non-commute trips). The seven are summed to an Employee Commute Trips Total using multiplicative dampening (see Question 7), and the three are separately summed to a Project-Generated Trips Total in the same way. This similarly occurs on the Community-Level Results page, where, of the 12 strategies, 11 reduce VMT from all city/CPA trips and one (4D Bike Facility Improvement) reduces VMT from trips on the roadway affected by a bikeway addition.

11. Can the tool be used to analyze strategies in rural areas?

There is little empirical research to support the estimation of VMT reduction in rural areas. Strategies that are likely to be most effective in rural areas include employer vanpool and telecommute programs. Many of the

strategies included in this tool will have little to no effectiveness in rural areas. Because of the lack of relevant research, analysis of strategies applied in a rural context should be done on a case-by-case basis and should generally not rely on the relationships contained in this tool.

12. How is the maximum VMT reduction calculated for each strategy?

On each strategy page below the “Type of VMT affected,” the “Max VMT reduction” is listed. Sometimes a strategy’s maximum VMT reduction is dependent only on user inputs, other times it is capped at a certain percentage, and other times it is based on regional parameters (e.g., mode share) specific to each city/CPA. Furthermore, the max VMT reduction can also be changed by optional user inputs that override default data. The max VMT reduction listed on each strategy page is meant to provide the user with a general estimate of the reduction potential for each strategy. The values listed were derived from the tool using the City of San Diego Downtown/City Centre CPA as the analysis location with all default data. The user may achieve a max VMT reduction that is different than the Max VMT reduction listed based on the differences in regional parameters of the selected city/CPA and any additional user overrides.

13. How is each place type defined?

Low-density suburb: Dispersed, low-density, single-use, automobile-dependent land use patterns, usually outside of the central city. Other characteristics may include: 20+ miles from regional central business district; more housing than jobs; buildings are one to two stories; curvilinear (cul-de-sac) street patterns; parking between street and office or retail and large-lot residential parking is common; ample parking and largely surface lot-based; no parking prices; limited bus service with peak headways 30+ minutes.

Suburban center: Cluster of multi-use development within dispersed, low-density, automobile-dependent land use patterns. Serves the population of a suburb with office, retail, and housing that is denser than the surrounding suburb. Other characteristics may include: 20+ miles from regional central business district; balanced jobs/housing ratio; buildings are two stories; grid street pattern; 0–20-foot setbacks; somewhat constrained parking supply on street and ample off-street; low to no parking prices; bus service at 20–30-minute headways; and/or a commuter rail station.

Urban: Located within a central city with multi-family housing and nearby office and retail. Other characteristics may include: within or less than five miles from the central business district; jobs/housing ratio > 1.5; buildings are at least six stories; grid street pattern; minimal setbacks; constrained parking supply; high parking prices; and high-quality rail service and/or comprehensive bus service.

14. There is text in a locked cell that is cut off, and I cannot click into the cell to read the remainder of the text. How can I read the cell text?

The margins of all cells have been adjusted so that at Excel’s 100% zoom level, all the text can be seen. Adjust your zoom level to 100% if you see that a cell’s text is cut off. This also applies to any text in comment bubbles.

15. What does “percent of employees eligible” mean, as used in strategies 1A through 1D?

This refers to the percentage of employees that would be able to participate in the strategy’s program if they desired to. This will usually be 100%. Employees who might not be able to participate could include those who work nighttime hours when transit and rideshare services are not available or employees who are required to drive to work as part of their job duties. This input does not refer to the percentage of employees who actually participate in the program.

Project-Level Results Page

This page lists all the project-level strategies and displays the percentage reduction in VMT calculated for each strategy that the user analyzes. In the default state of the Tool, all strategies are “inactive,” so no VMT reduction results are initially shown on this page. As the user “activates” an individual strategy by providing inputs, the tool calculates the percentage reduction in VMT for the strategy, displaying the results on the individual strategy page and this results summary page.

The bottom of this page displays the total percentage reduction in VMT for multiple project-level strategies selected. The total VMT reduction formula applies multiplicative dampening so as not to double-count VMT impacts. For example, if one strategy reduces VMT by 10%, then only 90% of VMT remains to be affected by subsequent strategies. If a second strategy is applied that also reduces VMT by 10%, the combined resulting VMT would be 81% (10% reduction of 90% of VMT). Thus, the VMT reduction impact of both strategies is 19% rather than 20% if the impacts were purely additive. The following is the formula used to calculate the total VMT reduction if multiple strategies are selected:

$$\text{Total} = \{[100\% - (\text{Strategy A \% change in VMT})] \times [100\% - (\text{Strategy B \% change in VMT})] \times \dots \times [100\% - (\text{Strategy Z \% change in VMT})]\} - 100\%$$

The page shows two rows for total VMT reduction – one for strategies that affect employee commute trips and one for project strategies that affect all project-generated trips. This is because it may not be valid to combine VMT reductions for the two types. For example, parking pricing at a commercial facility affects VMT from all project-generated trips, while an employee vanpool program only affects VMT from the facility’s employee commute trips. Of the ten project-level strategies, seven reduce VMT from employee commute trips, and three reduce VMT from all project-generated trips (including non-commute trips). The seven are summed to an Employee Commute Trips Total using multiplicative dampening, and the three are separately summed to a Project-Generated Trips Total in the same way.

Community-Level Results Page

This page lists all the community-level strategies and displays the percentage reduction in VMT calculated for each strategy that the user analyzes. The functionality of this page is similar to the Project-Level Results Page.

Like the Project-Level Results page, this page shows two total rows. Of the 12 strategies, 11 reduce VMT from all city/CPA trips and one (4D Bike Facility Improvement) reduces VMT from trips on the roadway affected by a bikeway addition. These should not be combined.

Employer Commute Program Strategies

Strategies implemented by employers that encourage workers to commute by modes other than autos.

1A. Voluntary Employer Commute Program

Description: Employer offers a voluntary employer commute trip-reduction program. The program may include a carpool or vanpool program, subsidized or discounted transit passes, bike amenities, commute trip-reduction marketing, and preferential parking permit program. This strategy encompasses strategies 1C (Employer Carpool Program), 1D (Employer Transit Pass Subsidy), and 1E (Employer Vanpool Program) and cannot be analyzed in combination with these strategies. Unlike strategy 1B (Mandatory Employer Commute Program), this strategy does not require monitoring, reporting, or performance standards. If this strategy is selected, strategy 1B cannot be analyzed as part of the total VMT reduction.

Formula: % change in VMT = % of employees eligible × % change in commute VMT

User Inputs:

- Is the program contractually required of the developer or property owner and accompanied by a regular performance monitoring and reporting program? [Yes/No]
 - If Yes, must use Strategy 1B
 - If No, use Strategy 1A
- Place type of project/site
 - Low-density suburb
 - Suburban center
 - Urban
- Percent of employees eligible
 - Refers to percentage of employees that would be able to participate in the strategy’s program if they desired to. This will usually be 100%. Employees who might not be able to participate could include those who work nighttime hours when transit and rideshare services are not available or employees who are required to drive to work as part of their job duties. This input does not refer to the percentage of employees who actually participate in the program.

Constants and Assumptions:

- Percent change in commute VMT:
 - Low-density suburb: –6.2%
 - Suburban center: –5.4%
 - Urban: –5.2%
- Strategy cannot be used in combination with 1B.
- Strategy encompasses strategies 1C, 1D, and 1E and cannot be analyzed in combination with these strategies.

SANDAG Data:

None.

Sources:

- California Air Pollution Control Officers Association. 2010. “Quantifying Greenhouse Gas Mitigation Measures.” capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf
- Cambridge Systematics. 2009. “Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions.” Technical Appendices. Prepared for the Urban Land Institute. reconnectingamerica.org/assets/Uploads/2009movingcoolerexecsumandappend.pdf
- Boarnet, Marlon G., Hsin-Ping Hsu, and Susan Handy. 2014. “Impacts of Employer-Based Trip Reduction Programs and Vanpools on Passenger Vehicle Use and Greenhouse Gas Emissions: Policy Brief.” arb.ca.gov/cc/sb375/policies/ebtr/ebtr_brief.pdf

1B. Mandatory Employer Commute Program

Description: Employer offers a mandatory employer commute trip-reduction program. The program may include a carpool or vanpool program, subsidized or discounted transit passes, bike amenities, encouragement for telecommuting and alternative work schedules, commute trip-reduction marketing, and preferential parking permit program. This strategy encompasses strategies 1C, 1D, and 1E and cannot be analyzed in combination with these strategies. Unlike strategy 1A (Voluntary Employer Commute Program), this strategy would be contractually required of the developer or property owner and is accompanied by a regular performance-monitoring and reporting program. If this strategy is selected, strategy 1A cannot be analyzed as part of the total VMT reduction.

Formula: % change in VMT = % of employees eligible × % change in commute VMT

User Inputs:

- Is the program contractually required of the developer or property owner and accompanied by a regular performance-monitoring and reporting program? [Yes/No]
 - If Yes, use Strategy 1B
 - If No, must use Strategy 1A
- Percent of employees eligible
 - Refers to percentage of employees that would be able to participate in the strategy’s program if they desired to. This will usually be 100%. Employees who might not be able to participate could include those who work nighttime hours when transit and rideshare services are not available or employees who are required to drive to work as part of their job duties. This input does not refer to the percentage of employees who actually participate in the program.

Constants and Assumptions:

- Percent change in commute VMT is –26%
- Strategy cannot be used in combination with 1A.
- Strategy encompasses strategies 1C, 1D, and 1E and cannot be analyzed in combination with these strategies.

SANDAG Data:

None.

Sources:

- California Air Pollution Control Officers Association. 2010. “Quantifying Greenhouse Gas Mitigation Measures.” capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf
- City of South San Francisco. 2015. “2015 Genentech Annual Report.” ci-ssf-ca.granicus.com/MetaViewer.php?view_id=2&clip_id=859&meta_id=62028
- Cambridge Systematics. 2009. “Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions.” Technical Appendices. Prepared for the Urban Land Institute. reconnectingamerica.org/assets/Uploads/2009movingcoolerexecsumandappend.pdf

1C. Employer Carpool Program

Description: Employers can encourage carpooling by providing ridematching assistance to employees, providing priority parking for carshare vehicles, and providing incentives for carpooling.

Formula: % change in VMT = % of employees eligible × % change in commute VMT

User Inputs:

- Place type of project/site
 - Low-density suburb
 - Suburban center
 - Urban
- Percent of employees eligible
 - Refers to percentage of employees that would be able to participate in the strategy’s program if they desired to. This will usually be 100%. Employees who might not be able to participate could include those who work nighttime hours when transit and rideshare services are not available or employees who are required to drive to work as part of their job duties. This input does not refer to the percentage of employees who actually participate in the program.

Constants and Assumptions:

- Percent change in commute VMT:
 - Low-density suburb: –3%
 - Suburban center: –5%
 - Urban: –8%
- Strategy encompassed by strategies 1A and 1B and cannot be analyzed in combination with these strategies.

SANDAG Data:

None.

Sources:

- Ewing, R. 1993. “TDM, Growth Management and the Other Four out of Five Trips.” Transportation Quarterly, Vol. 48, No. 3.

- Victoria Transport Policy Institute. “Ridesharing: Carpooling and Vanpooling.” TDM Encyclopedia. vtpi.org/tdm/tdm34.htm
- California Air Pollution Control Officers Association. 2010. “Quantifying Greenhouse Gas Mitigation Measures.” capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf
- New York State Department of Transportation. 2019. Data from 511NYRideshare program participants.

1D. Employer Transit Pass Subsidy

Description: Employers can encourage employees to take transit by providing subsidized or discounted daily or monthly public transit passes to employees.

Formula: % change in VMT = % of employees eligible × % change in commute VMT

Where % change in commute VMT differs by place type (low-density suburb, suburban center, or urban) and level of daily transit subsidy (\$1 to \$4)

User Inputs:

- Place type of project/site
 - Urban
 - Suburban center
 - Low-density suburb
- Transit subsidy per day
 - \$1
 - \$2
 - \$3
 - \$4
- Percent of employees eligible
 - Refers to percentage of employees that would be able to participate in the strategy’s program if they desired to. This will usually be 100%. Employees who might not be able to participate could include those who work nighttime hours when transit and rideshare services are not available or employees who are required to drive to work as part of their job duties. This input does not refer to the percentage of employees who actually participate in the program.

Constants and Assumptions:

- Percent change in commute VMT

Place Type	Subsidy Level per Day			
	\$1.00	\$2.00	\$3.00	\$4.00
Low-Density Suburb	-0.1%	-0.2%	-0.4%	-0.6%
Suburban Center	-1.1%	-2.4%	-4.1%	-5.8%
Urban	-2.2%	-4.7%	-7.8%	-10.9%

- Estimated based on Nelson Nygaard (2010) and TCRP (2010). Subsidy levels in Nelson Nygaard were updated to reflect inflation. Also considers maximum VMT reductions suggested in Boarnet et al. (2014).
- Strategy encompassed by strategies 1A and 1B and cannot be analyzed in combination with these strategies.

SANDAG Data:

None.

Sources:

- Nelson Nygaard. 2010. "Santa Monica LUCE Trip Reduction Impacts Analysis." City of Santa Monica Land Use and Circulation Element, Final EIR. smgov.net/Departments/PCD/Plans/2010-Land-Use-and-Circulation-Element/
- Transportation Research Board. 2010. "TCRP Report 95 Chapter 19: Employer and Institutional TDM Strategies." trb.org/Publications/TCRPReport95.aspx
- Boarnet, Marlon G., Hsin-Ping Hsu, and Susan Handy. 2014. "Impacts of Employer-Based Trip Reduction Programs and Vanpools on Passenger Vehicle Use and Greenhouse Gas Emissions: Policy Brief." arb.ca.gov/cc/sb375/policies/ebtr/ebtr_brief.pdf

1E. Employer Vanpool Program

Description: Vanpooling is a flexible form of public transportation that provides groups of 5–15 people with a cost-effective and convenient rideshare option for commuting. An employer can encourage ridesharing by subsidizing vanpooling for employees who have a similar origin and destination and by providing priority parking for employees who vanpool.

The SANDAG Vanpool Program provides a subsidy of up to \$400 per month to offset the vehicle lease cost.

Formula: % change in VMT = $(M_A \times L_A + M_V \times L_V / O_V) / (M_A \times L_A + M_V \times L_V) - 1$

Where:

M_A = auto (non-vanpool) mode share

M_V = vanpool/long trip mode share

L_A = length of average auto commute trip

L_V = length of vanpool/long commute trip

O_V = average vanpool occupancy

User Inputs:

- Does the employer sponsor a vanpool program? [Yes/No]
 - If No, strategy does not apply to project and no change in VMT.
- Percentage of employees who participate in vanpool (optional override of regional default)
- One-way length of average auto commute (optional override of regional default)
- One-way length of long (vanpool) commute (optional override of regional default)

Constants and Assumptions:

- If the user override of vanpool participation rate exceeds maximum of 15%, the default value will be used. This maximum is based on TCRP Report 95, Chapter 5 and ICF’s experience implementing the 511NYRideshare program, the nation’s largest regional TDM program.
- Strategy encompassed by strategies 1A and 1B and cannot be analyzed in combination with these strategies.

SANDAG Data:

- Percentage of employees who participate in vanpool is 2.7%.
- Average one-way commute trip length is 12.71 miles.
- Average one-way vanpool trip length is 42 miles.
- Average vanpool occupancy (including driver) is 6.25 persons.

Sources:

- SANDAG. 2018. Commute Behavior Survey.
- SANDAG. Activity Based Model. 2016. (v14.0.1, scenario ID 232)
- SANDAG. 2018. SANDAG Vanpool Program
- Transportation Research Board. 2005. “TCRP Report 95 Chapter 5 Buspools and Vanpools.” trb.org/Publications/TCRPReport95.aspx
- New York State Department of Transportation. 2019. Data from 511NYRideshare program participants.

1F. Employer Telecommute Program

Description: A telework program enables employees to work from home or a remote location one or more days per week. Depending on the nature of the work, schedules can range from full-time, specific days of the week, or as-needed. The VMT impacts of telework are similar to a flexible work schedule program, which enables employees to work long hours in exchange for one day off every week or two.

Formula: % change in VMT = % of employees who participate × % change in commute VMT for 1% of employees telecommuting X days/week

Where X = 1, 2, or 3

User Inputs:

- Percentage of employees who participate
- Days per week the average employee telecommutes

Constants and Assumptions:

- Percent change in commute VMT for 1% of employees telecommuting at X days/week:
 - 1: -0.15%
 - 2: -0.29%
 - 3: -0.44%

SANDAG Data:

None.

Sources:

- Cambridge Systematics. 2009. "Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions." Technical Appendices. Prepared for the Urban Land Institute. reconnectingamerica.org/assets/Uploads/2009movingcoolerexecsumandappend.pdf
- California Air Pollution Control Officers Association. 2010. "Quantifying Greenhouse Gas Mitigation Measures." capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

Land Use Strategies

Strategies that modify the location or characteristics of development projects to encourage non-auto travel modes.

2A. Transit-Oriented Development

Description: Transit-Oriented Development (TOD) refers to projects built in compact, walkable areas that have easy access to public transit, ideally in a location with a mix of uses, including housing, retail, offices, and community facilities. TODs generally are described as places within a ten-minute walk of a high-frequency rail transit station (e.g., SPRINTER, COASTER, Trolley). They should, at a minimum, incorporate adequate bike and pedestrian access to transit, thereby encouraging transit use and reducing vehicle travel.

Formula: % change in VMT = difference in transit mode share with strategy × mode shift factor

User Inputs:

- Is the project within 0.5 mile of a rail transit station (e.g., SPRINTER, COASTER, Trolley)? [Yes/No]
 - If No, strategy cannot be used
- Existing transit mode share (optional override of city/CPA default)

Constants and Assumptions:

- Ratio of transit mode share for TOD area compared to transit mode share for surrounding city/CPA is 4.9.
- Maximum transit mode share is 27%, per Lund (2004).
- Mode shift factor is 0.70. Calculated as (1/average vehicle occupancy) or (1/1.42). Mode shift factor is an adjustment to reflect the reduction in vehicle trips associated with a reduction in person trips, since some vehicles carry more than one person.

SANDAG Data:

- Default transit mode share (all trips), by City/CPA

Sources:

- Tal, G., et al. 2013. “Technical Background Document on the Impacts of Transit Access (Distance to Transit) Based on a Review of the Empirical Literature.” arb.ca.gov/cc/sb375/policies/transitservice/transit_brief.pdf
- SANDAG. Activity Based Model. 2016. (v14.0.1, scenario ID 232)
- Lund, H., et al. 2004. “Travel Characteristics of Transit-Oriented Development in California.” bart.gov/sites/default/files/docs/Travel_of_TOD.pdf

2B. Mixed Use Development

Description: Mixed use projects incorporate a range of complementary land uses that provide a more balanced development approach relative to the surrounding neighborhood and encourage transportation alternatives. This could include co-location residential development, office space, retail shops, and others. Land use mix is measured using an entropy index. An index of 0 indicates a single land use while an index of 1 indicates equal distribution of all land uses. For ease of use, the strategy is calculated using only two land use types - residential (number of residents) and commercial (number of jobs).

Formula: % change in VMT = % change in land use index × elasticity

Where:

land use index = $-A / (\ln[2])$

$A = (b1/a) \times \ln(b1/a) + (b2/a) \times \ln(b2/a)$

a = residents + jobs

b1 = residents

b2 = jobs

User Inputs:

- Existing land use index (optional override of city/CPA default)
- Residents added with project
- Jobs added with project

Constants and Assumptions:

- Elasticity of VMT with respect to land use index is -0.09 , per Ewing and Cervero (2010).
- Percent change in land use index with strategy is capped at 500%, per CAPCOA (2010).
- Percent change in VMT is capped at -30% , per CAPCOA (2010).

SANDAG Data:

- Default land use index, by city/CPA, is calculated based on SANDAG-provided data on population and jobs.

Sources:

- SANDAG Land Use Inventory (SPACECORE). 2016.
- Ewing, R., and Cervero, R. 2010. "Travel and the Built Environment – A Meta-Analysis." Journal of the American Planning Association.

Parking Management Strategies

Strategies that discourage auto travel by modifying the price or supply of vehicle parking.

3A. Parking Pricing

Description: Priced parking can be implemented on- or off-street and helps to effectively manage the parking supply. Priced parking works best in areas where on-street parking is managed (e.g., priced parking, residential permit programs, time limits, etc.) to reduce unintended consequences of parking in adjacent neighborhoods.

Formula: % change in VMT = % change in parking price × elasticity

User Inputs:

- Parking price unit. User selects one of these options:
 - \$/hour
 - \$/day
 - \$/month
 - \$/year
- Existing parking price
- Parking price with project

Constants and Assumptions:

- Elasticity of vehicle trips with respect to parking price is –0.15.
- Change in vehicle trips assumed to equal change in VMT.
- A minimum 25% parking price change is needed to affect VMT.
- Change in parking price is capped at a minimum of –50% and a maximum of 50%.

SANDAG Data:

None.

Sources:

- Transportation Research Board. 2009. TCRP Report 95, Chapter 13, Parking Pricing and Fees. p13-4. trb.org/Publications/TCRPReport95.aspx
- Cambridge Systematics. 2009. “Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions.” Technical Appendices. Prepared for the Urban Land Institute. reconnectingamerica.org/resource-center/browse-research/2009/moving-cooler-an-analysis-of-transportation-strategies-for-reducing-greenhouse-gas-emissions/

3B. Parking Cash Out

Description: Employers can offer employees who are provided free parking the option to take the cash value of the space in lieu of the space itself. California state law (Assembly Bill 2109 [Katz, 1992]) requires that

certain employers who provide subsidized parking for their employees offer a cash allowance in lieu of a parking space. This strategy is only applicable where employers pay for or rent parking for their employees.

Parking cash-out is most successful when paired with incentives or programs that encourage the use of transportation alternatives.

Formula: % change in VMT = % of employees who participate × % change in commute VMT among participants

User Inputs:

- Percentage of employees who participate

Constants and Assumptions:

- 12% reduction in commute VMT among participants.

SANDAG Data:

None.

Sources:

- California Air Resources Board. 2009. "California's Parking Cash-Out Program: An Informational Guide for Employers." arb.ca.gov/planning/tsaq/cashout/cashout_guide_0809.pdf
- Shoup, Donald C. 2005. "Parking Cash Out." Planners Advisory Service, American Planning Association. shoup.bol.ucla.edu/ParkingCashOut.pdf

Neighborhood Enhancement Strategies

Strategies that improve or encourage neighborhood-level bicycle, pedestrian, and other multimodal travel options.

4A. Street Connectivity Improvement

Description: A connected and complete street network improves accessibility, safety, and livability of the community. Traditional grid street patterns with short blocks offer a high degree of connectivity compared to street networks with curvilinear designs and cul-de-sacs. This strategy uses intersection density as a proxy for street connectivity improvements, which helps facilitate a greater number of short trips. Example projects that increase intersection density would be building a new street network in a subdivision or retrofitting an existing street network to improve connectivity (e.g., cul-de-sacs converted to grid streets).

Formula: % change in VMT = % change in intersection density × elasticity

User Inputs:

- Existing intersection density (intersections per square mile) (optional override of city/CPA default)
- Intersection density with strategy (intersections per square mile)

Constants and Assumptions:

- Elasticity of VMT with respect to intersection density is -0.12.
- Change in intersection density capped at a minimum of -50% and a maximum of 50%.

SANDAG Data:

- Default intersection density, by city/CPA, is provided by SanGIS (2016).

Sources:

- San Diego Geographic Information Source (SanGIS). 2016. "Roads_All." San Diego Geographic Information Source – JPA. sangis.org/download/index.html. Downloaded: May 1, 2019.
- Ewing, R., and Cervero, R. 2010. "Travel and the Built Environment – A Meta-Analysis." Journal of the American Planning Association.
- Handy, Susan, et al, 2014. "Impacts of Network Connectivity on Passenger Vehicle Use and Greenhouse Gas Emissions: Policy Brief." arb.ca.gov/cc/sb375/policies/connectivity/network_connectivity_brief.pdf

4B. Pedestrian Facility Improvement

Description: Enhancing pedestrian facilities (e.g., streetscape and pedestrian crossing improvements) within the jurisdiction or community helps encourage walking and reduce the reliance on the single-occupancy vehicle. This strategy applies to sidewalk enhancements that improve the existing streetscape and is not inclusive of greenfield developments with new roadways.

Formula: % change in VMT = % change in ratio of sidewalk length to street length × elasticity

User Inputs:

- Existing sidewalk length in city/CPA (miles)

- Existing street length in city/CPA (miles)
- Sidewalk length in city/CPA with project (miles)

Constants and Assumptions:

- Street length is assumed to remain constant, since the strategy involves adding sidewalks to the existing street network, not modifying street networks. Assuming a constant street length simplifies the user inputs and prevents users from erroneously entering unreasonable values.
- Elasticity of VMT with respect to sidewalk coverage ratio is –0.05.
- VMT change is capped at 1.4%, which is based on the following assumptions:
 - 10% of auto trips are short trips that could shift to walking (average 0.83 mile in length, per SANDAG)
 - 90% of auto trips are longer trips that cannot shift to walking (average 6.5 miles in length, per SANDAG)
 - So maximum VMT change = $(10\% \times 0.83) / (90\% \times 6.5) = 1.4\%$

SANDAG Data:

- Regional average one-way walk trip length is 0.83 miles.
- Regional average one-way auto trip length is 6.5 miles.

Sources:

- Frank, L., Greenwald, M., Kavage, S. and Devlin, A. 2011. “An Assessment of Urban Form and Pedestrian and Transit Improvements as an Integrated GHG Reduction Strategy.” WSDOT Research Report WA-RD 765.1, Washington State Department of Transportation. wsdot.wa.gov/research/reports/fullreports/765.1.pdf
- Handy, Susan, et al, 2014. “Impacts of Pedestrian Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions: Policy Brief.” arb.ca.gov/cc/sb375/policies/ped/walking_brief.pdf

4C. Bikeway Network Expansion

Description: A bikeway network includes an interconnected system of bike lanes, bike paths, and cycle tracks (Class I, Class II, and Class IV facilities). Bike facilities may share the roadway with vehicles or provide a dedicated pathway that separates bikes from cars or pedestrians. Increasing the network of bike facilities helps encourage biking as a safe and convenient alternative to driving. If this strategy is selected, strategy 4D (Bike Facility Improvement) cannot be analyzed as part of the total VMT reduction.

Formula: $\% \text{ change in VMT} = (-1) \times \% \text{ change in bikeway miles} \times \text{elasticity} \times \text{existing bike mode share} \times \text{bike trip length} / (\text{existing auto mode share} \times \text{auto trip length})$

Derivation of Formula:

$$\begin{aligned} \% \text{ change in VMT} &= [\text{change in auto VMT}] / [\text{current auto VMT}] \\ &= (-1) \times [\text{change in bicycle miles traveled}] / [\text{current auto VMT}] \\ &= (-1) \times [\text{total trips in city/CPA} \times \text{bike mode share} \times \text{bike trip length} \times \% \text{ change in} \\ &\quad \text{bikeway density} \times \text{elasticity}] / [\text{total trips in city/CPA} \times \text{auto mode share} \times \text{auto trip} \\ &\quad \text{length}] \end{aligned}$$

User Inputs:

- Would the project expand a network of bikeways or add a single bikeway? [Network of bikeways/ Single bikeway]
 - If Network of bikeways, use Strategy 4C
 - If Single bikeway, must use Strategy 4D
- Existing bicycle mode share (optional override of city/CPA default)
- Existing auto mode share (optional override of city/CPA default)
- Are any of the current or proposed bikeways in the city/CPA classified as Class III? [Yes/No]
 - If Yes, Class III bike lane miles should be left out of the bikeway mile user inputs.
- Existing bikeway miles in city/CPA
- Additional bikeway miles in city/CPA with project
- One-way bicycle trip length (optional override of regional default)
- One-way auto trip length (optional override of regional default)

Constants and Assumptions:

- Elasticity of bike trips with respect to bikeway miles per 10,000 population is 0.25.
- Maximum VMT change capped at 5.0%, which is based on the following assumptions:
 - 10% of auto trips are short trips that could shift to bicycling (average 2.9 mile in length, per SANDAG)
 - 90% of auto trips are longer trips that cannot shift to walking (average 6.5 miles in length, per SANDAG)
 - So maximum VMT change = $(10\% \times 2.9) / (90\% \times 6.5) = 5.0\%$

SANDAG Data:

- Default auto mode share, by city/CPA
- Default bicycle mode share, by city/CPA
- Regional average one-way bicycle trip length is 2.9 miles.
- Regional average one-way auto trip length is 6.5 miles.

Sources:

- SANDAG. 2016. Activity Based Model. (v14.0.1, scenario ID 232)
- Pucher, J. and R. Buehler, 2011. “Analysis of Bicycling Trends and Policies in Large North American Cities: Lessons for New York.” Report for U. S. Department of Transportation, Research and Innovative Technology Administration, Washington, D.C. and UTRC II New York.

4D. Bike Facility Improvement

Description: If a comprehensive bikeway network expansion (strategy 4C) is not feasible, the addition of a single bike lane (Class II), bike path (Class I), or protected bikeway (Class IV) to an existing bikeway network helps improve biking conditions within an area. Class I facilities are bike paths that are physically separated from motor vehicle traffic. Class II facilities are striped bicycle lanes that provide exclusive use to bicycles on a roadway. Class IV facilities are protected on-street bikeways, also called cycle tracks. Consider local or state

bike width standards when implementing facility improvements. If this strategy is selected, strategy 4C (Bikeway Network Expansion) cannot be analyzed as part of the total VMT reduction.

Formula: $\% \text{ change in VMT} = -1 \times (\text{auto trips reduced by strategy}) \times (\text{bike trip length}) / (\text{existing auto trips on roadway}) \times (\text{auto trip length})$

Where auto trips reduced by strategy = $\text{AADT} \times (\text{A} + \text{C})$

AADT = Existing average annual daily traffic volume on roadway affected by strategy

A = AADT adjustment factor

C = Credit for Activity Centers near project

User Inputs:

- Would the project expand a network of bikeways or add a single bikeway? [Network of bikeways/ Single bikeway]
 - If Network of bikeways, must use Strategy 4C
 - If Single bikeway, use Strategy 4D
- One-way bicycle trip length (optional override of regional default)
- One-way auto trip length (optional override of regional default)
- Existing Annual Average Daily Traffic (AADT) on roadway parallel to bicycle project
- Length of bike project (only Class I, II, or IV) in one direction (miles)
 - ≤ 1
 - > 1 and ≤ 2
 - > 2
- Activity Centers near project
 - 3 within 0.5 mile
 - 4–6 within 0.5 mile
 - 7 or more within 0.5 mile
 - 3 within 0.25 mile
 - 4–6 within 0.25 mile
 - 8 or more within 0.25 mile

Constants and Assumptions:

- Adjustment factor (A) of AADT for auto trips replaced by bike trips due to strategy

Average Daily Traffic	Bike Project Length (miles)	Adjustment Factor
0 – 12,000	≤ 1	0.0019
	> 1 and ≤ 2	0.0029
	> 2	0.0038
12,001 – 24,000	≤ 1	0.0014
	> 1 and ≤ 2	0.002
	> 2	0.0027
24,001 – 30,000	≤ 1	0.001
	> 1 and ≤ 2	0.0014
	> 2	0.0019

- Estimated based on California Air Resources Board (CARB) (2005). Based on assumption that at all municipalities would be either cities with a population greater than or equal to 250,000 or a non-university town with a population less than 250,000.
- Credit for activity centers based on number and distance
 - If 3 within 0.5 mile, 0.0005 credits
 - If 4–6 within 0.5 mile, 0.001 credits
 - If 7 or more within 0.5 mile, 0.0015 credits
 - If 3 within 0.25 mile, 0.001 credits
 - If 4–6 within 0.25 mile, 0.002 credits
 - If 8 or more within 0.25 mile, 0.003 credits
- Existing Annual Average Daily Traffic on roadway parallel to bicycle project (two-way traffic volume in trips/day on road parallel to proposed bike lane) cannot exceed 30,000, per CARB (2005).

SANDAG Data:

- Regional average one-way bicycle trip length is 2.9 miles.
- Regional average one-way auto trip length is 6.5 miles.

Sources:

- SANDAG. 2016. Activity Based Model. (v14.0.1, scenario ID 232)
- California Air Resources Board. 2005. “Methods to Find the Cost-Effectiveness of Funding Air Quality Projects.” arb.ca.gov/planning/tsaq/eval/mv_fees_cost-effectiveness_methods_may05.doc

4E. Bikeshare

Description: Bikeshare programs help to reduce traffic congestion and demand for parking by providing users with on-demand access to bikes for short-term rental. Bikeshare systems that feature electrified vehicles (scooters, e-bikes) help increase the range of the bike trip, making these services convenient and attractive to users. Providing discounted bikeshare memberships or dedicated bikeshare parking can encourage users and improve the user experience.

Formula: % change in VMT = $-1 \times [\text{change in \% of population with access} \times \text{daily bike share trips per person} \times \text{auto substitution rate} \times \text{bike share trip length}] / [\text{average daily auto trips per person} \times \text{auto trip length}]$

Derivation of Formula:

$$\begin{aligned} \text{\% change in VMT} &= [\text{change in VMT}] / [\text{total VMT}] \\ &= -1 \times [\text{total population} \times \text{change in \% with access to bikeshare} \times \text{daily bikeshare trips per person} \times \text{auto substitution rate} \times \text{bikeshare trip length}] / [\text{total population} \times \text{daily auto trips per person} \times \text{auto trip length}] \\ &= -1 \times [\text{change in \% with access to bikeshare} \times \text{daily bikeshare trips per person} \times \text{auto substitution rate} \times \text{bikeshare trip length}] / [\text{daily auto trips per person} \times \text{auto trip length}] \end{aligned}$$

User Inputs:

- Major Statistical Area (MSA) of program expansion
 - Central
 - North City
 - South Suburban
 - East Suburban
 - North County West
 - North County East
 - East County
- Percentage of population in target community that will have access to the expanded bikeshare system
- One-way auto trip length (optional override of regional default)

Constants and Assumptions:

- Bikeshare daily one-way trips per 1,000 residents based on MSA
 - If Central, 23
 - If North City, 23
 - If South Suburban, 6
 - If East Suburban, 6
 - If North County West, 6
 - If North County East, 6
 - If East County, 6

- Percentage of e-bike share trips replacing auto trips is 37%.

SANDAG Data:

- Regional average one-way auto trip length is 6.5 miles.
- Average daily one-way auto trips per adult, city/CPA.
- Average one-way e-bike trip length is 1.7 miles.

Sources:

- WSP. 2019. “Draft TDM Off-Model Methodology—March 2019 Revision.” Memo to SANDAG.
- MacArthur, J., M. Harpool, D. Scheppke. 2018. “North American survey of electric bike owners.” National Institute for Transportation and Communities: Washington D.C.
- SANDAG. 2016. Activity Based Model. (v14.0.1, scenario ID 232)
- SANDAG. 2018. Anonymized and aggregated data from bikeshare operators in San Diego.

4F. Carshare

Description: Carsharing offers people with convenient access to a vehicle for personal or commuting purposes. Carsharing helps to encourage transportation alternatives by reducing vehicle ownership. Roundtrip carshare providers require members to return the vehicle to a designated location. One-way carshare (i.e., free-floating) providers allow members to pick up the vehicle in one place and end their trip in another. Discounted carshare memberships and priority parking for carsharing vehicles help encourage use of carsharing services.

Formula: $\% \text{ change in VMT} = -1 \times (\text{increase in \% of adults with access to carshare} \times \% \text{ of adults with access who become members} \times \text{VMT reduction per member}) / (\text{trips per day} \times \text{average auto trip length})$

Derivation of Formula:

$$\begin{aligned} \% \text{ change in VMT} &= [\text{change in VMT}] / [\text{total VMT}] \\ &= -1 \times [\text{total population} \times \text{change in \% of population with access to carshare} \\ &\quad \times \% \text{ of adults with access who become members} \times \text{VMT reduction per member}] / \\ &\quad [\text{total population} \times \text{trips per day} \times \text{average auto trip length}] \\ &= -1 \times [\text{change in \% with access to carshare} \times \% \text{ of adults with access who become} \\ &\quad \text{members} \times \text{VMT reduction per member}] / [\text{trips per day} \times \text{average auto trip length}] \end{aligned}$$

User Inputs:

- Percentage of cars providing round-trip carshare (vs. one-way carshare)
 - Represents the number of round-trip carshare cars divided by total carshare cars, where total cars includes both roundtrip and one-way providers. If all round-trip, enter 100.
- Percentage of adults in city/CPA with existing carshare access
 - Carshare access defined as at least one carshare pod within 0.5 mile of residence
- Percentage of adults in city/CPA with carshare access with strategy
- One-way auto trip length (optional override of regional default)

Constants and Assumptions:

- Percentage of adults with carshare access who become members is 2%, per WSP (2019).
- VMT reduction per day per carshare member is 7 for roundtrip carshare (Cervero 2007) and 1.1 for one-way carshare (Martin 2016). Formula calculates a weighted average based on user input for percent round-trip.

SANDAG Data:

- Average daily one-way auto trips per adult, by city/CPA.
- Regional average one-way auto trip length is 6.5 miles.

Sources:

- WSP. 2019. “Draft TDM Off-Model Methodology—March 2019 Revision.” Memo to SANDAG.
- Cervero, Robert, Golub, Aaron, Nee, Brendan. 2007. “City CarShare: Longer-Term Travel Demand and Car Ownership Impacts.” Transportation Research Record: Journal of the Transportation Research Board, 1992, pp 70–80.
- Martin, E., and Shaheen, S. 2016. “The Impacts of Car2go on Vehicle Ownership, Modal Shift, Vehicle Miles Traveled, and Greenhouse Gas Emissions: An Analysis of Five North American Cities.” innovativemobility.org/wp-content/uploads/2016/07/Impactsofcar2go_FiveCities_2016.pdf
- SANDAG. 2016. Activity Based Model. (v14.0.1, scenario ID 232)

4G. Community-Based Travel Planning

Description: Community-based travel planning is a residential-based approach to outreach that provides households with customized information, incentives, and support to encourage the use of transportation alternatives. The approach involves a team of trained Travel Advisors engaging residents at home or in their communities to offer information, incentives, and advice about how members of households can travel in alternative ways that meet their needs. Teams of trained Travel Advisors visit all households within a targeted geographic area, have tailored conversations about residents’ travel needs, and educate residents about the various transportation options available to them. Due to the personalized outreach method, communities are typically targeted in phases.

Formula: % change in VMT = $-1 \times$ % of households in community that are targeted \times % of targeted households that participate \times % reduction in single-occupancy vehicle trips among participating households

User Inputs:

- Households in city/CPA that are targeted

Constants and Assumptions:

- Percentage of targeted households that participate is 17%.
- Percentage of single-occupancy vehicle trip reduction among participating households is 12%.

SANDAG Data:

- Households, by CPA/city

Sources:

- SANDAG. 2016. Land Use Inventory (SPACECORE).
- Results from program evaluations including King County Metro Transit. 2014, 2015, 2017; North Coast Corridor Program. 2014; Portland Bureau of Transportation. 2010; Community Transit. n.d. Curb @ Home.
- WSP. 2019. "Draft TDM Off-Model Methodology—March 2019 Revision." Memo to SANDAG.

Transit Strategies

Strategies that improve transit service and cause a mode shift from auto to transit.

5A. Transit Service Expansion

Description: Expanding the transit network increases the transit system’s ability to accommodate existing and future travel demand, particularly for peak-period commute trips. This strategy provides an effective alternative to congested freeways and roadways for travelers and can reduce vehicle miles traveled by increasing transit ridership. Transit network service improvements should be coordinated closely with the operating transit agency.

Formula: $\% \text{ change in VMT} = -1 \times (\text{existing transit mode share} \times \% \text{ change in network coverage} \times \text{elasticity} \times \text{mode shift factor}) / (\text{existing auto mode share})$

Derivation of Formula:

$$\begin{aligned} \% \text{ change in VMT} &= [\text{change in auto VMT}] / [\text{current auto VMT}] \\ &= -[\text{change in transit passenger miles} \times \text{mode shift factor}] / [\text{current auto VMT}] \\ &= -[\text{total trips} \times \text{transit mode share} \times \text{trip length} \times \% \text{ change in network coverage} \\ &\quad \times \text{elasticity of transit ridership with respect to network coverage} \times \text{mode shift factor}] \\ &\quad / [\text{total trips} \times \text{auto mode share} \times \text{trip length}] \\ &= -[\text{transit mode share} \times \% \text{ change in network coverage} \times \text{elasticity} \times \text{mode shift} \\ &\quad \text{factor}] / [\text{auto mode share}] \end{aligned}$$

User Inputs:

- Existing bus transit route length in city/CPA (miles)
- Bus transit route length in city/CPA with expansion (miles)
- Existing transit mode share (optional override of city/CPA default)
- Existing auto mode share (optional override of city/CPA default)

Constants and Assumptions:

- Elasticity of transit ridership with respect to service coverage is 0.72.
- Percent change in bus network coverage is capped at 100%.
- If the user override of existing transit mode share exceeds maximum of 25%, the default value will be used.
- If the user override of existing auto mode share falls below minimum of 50%, the default value will be used.

SANDAG Data:

- Default auto mode share, by city/CPA (all trips)
- Default transit mode share, by city/CPA (all trips)
- Mode shift factor is 0.70. Calculated as (1/average vehicle occupancy) or (1/1.42). Mode shift factor is an adjustment to reflect the reduction in vehicle trips associated with a reduction in person trips, since some vehicles carry more than one person.

Sources:

- SANDAG. 2016. Activity Based Model. (v14.0.1, scenario ID 232)
- Transportation Research Board. 2004. “TCRP Report 95 Chapter 10 Bus Routing and Coverage.” trb.org/Publications/TCRPReport95.aspx

5B. Transit Frequency Improvements

Description: Transit frequency improvements can be implemented systemwide or on individual routes. Frequency improvements increase transit ridership by reducing travel times, which improves the user experience and increases the attractiveness of transit service. Transit network service improvements should be coordinated closely with the operating transit agency.

Formula: % change in VMT = $-1 \times (\text{existing transit mode share} \times \% \text{ change in transit frequency} \times \text{elasticity} \times \text{mode shift factor} \times \text{implementation adjustment}) / (\text{existing auto mode share})$

Derivation of Formula:

$$\begin{aligned}
 \% \text{ change in VMT} &= ([\text{change in auto VMT}] / [\text{current auto VMT}]) \times \text{implementation adjustment} \\
 &= (-1 \times [\text{change in transit passenger miles} \times \text{mode shift factor}] / [\text{current auto VMT}]) \times \text{implementation adjustment} \\
 &= (-1 \times [\text{total trips} \times \text{transit mode share} \times \text{trip length} \times \% \text{ change in transit frequency} \times \text{elasticity of transit ridership with respect to frequency} \times \text{mode shift factor}] / [\text{total trips} \times \text{auto mode share} \times \text{trip length}]) \times \text{implementation adjustment} \\
 &= (-1 \times [\text{transit mode share} \times \% \text{ change in transit frequency} \times \text{elasticity} \times \text{mode shift factor}] / [\text{auto mode share}]) \times \text{implementation adjustment}
 \end{aligned}$$

User Inputs:

- Existing peak period headway (minutes)
- Peak period headway with strategy (minutes)
- Existing total transit routes serving city/CPA
- Transit routes serving city/CPA that are improved
- Existing transit mode share (optional override of city/CPA default)
- Existing auto mode share (optional override of city/CPA default)

Constants and Assumptions:

- Elasticity of transit ridership with respect to frequency of service is 0.33.
- The percent change in transit frequency (arrivals per hour) is capped at a 300% increase or a 75% decrease.
- If the user override of existing transit mode share exceeds maximum of 25%, the default value will be used.
- If the user override of existing auto mode share falls below minimum of 50%, the default value will be used.

SANDAG Data:

- Default transit mode share, by city/CPA
- Default auto mode share, by city/CPA
- Mode shift factor is 0.70. Calculated as (1/average vehicle occupancy) or (1/1.42). Mode shift factor is an adjustment to reflect the reduction in vehicle trips associated with a reduction in person trips, since some vehicles carry more than one person.

Sources:

- SANDAG. 2016. Activity Based Model. (v14.0.1, scenario ID 232)
- Transportation Research Board. 2004. “TCRP Report 95 Chapter 9, Transit Scheduling and Frequency.” trb.org/Publications/TCRPReport95.aspx

5C. Transit-Supportive Treatments

Description: Apply roadway infrastructure and/or traffic signal modifications to improve transit travel times and reliability, leading to mode shift to transit. Treatments can include transit signal priority, bus-only signal phases, queue jumps, curb extensions to speed passenger loading, and dedicated bus lanes. Transit-supportive treatments should be coordinated closely with the operating transit agency.

Formula: $\% \text{ change in VMT} = -1 \times (\text{existing transit mode share} \times \% \text{ change in transit travel time} \times \text{elasticity} \times \text{mode shift factor}) / \text{existing auto mode share}$

Derivation of Formula:

$$\begin{aligned} \% \text{ change in VMT} &= [\text{change in auto VMT}] / [\text{current auto VMT}] \\ &= -1 \times [\text{change in transit passenger miles} \times \text{mode shift factor}] / [\text{current auto VMT}] \\ &= -1 \times [\text{total trips} \times \text{transit mode share} \times \text{trip length} \times \% \text{ change in transit travel} \\ &\quad \text{time} \times \text{elasticity of transit ridership with respect to travel time} \times \text{mode shift factor}] / \\ &\quad [\text{total trips} \times \text{auto mode share} \times \text{trip length}] \\ &= -1 \times [\text{transit mode share} \times \% \text{ change in transit travel time} \times \text{elasticity} \times \text{mode} \\ &\quad \text{shift factor}] / [\text{auto mode share}] \end{aligned}$$

User Inputs:

- Percentage of community transit routes that receive treatments with project
- Percent change in transit travel time due to treatments (optional override of default)
- Existing transit mode share (optional override of city/CPA default)
- Existing auto mode share (optional override of city/CPA default)

Constants and Assumptions:

- Default percent change in transit travel time due to treatments is –12%.
- Elasticity of transit ridership with respect to transit travel time is –0.4.
- If the user override of default percent change in transit travel time due to treatments value falls below minimum of –20% or exceeds maximum of 0%, the default value will be used.

- If the user override of existing transit mode share exceeds maximum of 25%, the default value will be used.
- If the user override of existing auto mode share falls below minimum of 50%, the default value will be used.

SANDAG Data:

- Mode shift factor is 0.70. Calculated as (1/average vehicle occupancy) or (1/1.42). Mode shift factor is an adjustment to reflect the reduction in vehicle trips associated with a reduction in person trips, since some vehicles carry more than one person.
- Default auto mode share, by city/CPA
- Default transit mode share, by city/CPA

Sources:

- Transportation Research Board. 2016. "TCRP Report 183: A Guidebook on Transit-Supportive Roadway Strategies." trb.org/Main/Blurbs/173932.aspx
- SANDAG. 2016. Activity Based Model. (v14.0.1, scenario ID 232)
- Transportation Research Board. 2007. "TCRP Report 118: Bus Rapid Transit Practitioners Guide." trb.org/Publications/Blurbs/158960.aspx

5D. Transit Fare Reduction

Description: Transit pricing strategies are designed to reduce the costs associated with using transit, thereby creating incentives for people to shift from other traveling modes. Fare reductions can be implemented systemwide or in specific fare-free or reduced fare zones. This strategy varies from Employer Transit Pass Subsidy (Strategy 1D), which can be offered through employer-based benefits programs in which the employer fully or partially pays the employee’s cost of transit.

Formula: $\% \text{ change in VMT} = -1 \times (\text{existing transit mode share} \times \% \text{ change in transit fare} \times \text{elasticity} \times \text{mode shift factor}) / (\text{existing auto mode share})$

Derivation of Formula:

$$\begin{aligned} \% \text{ change in VMT} &= [\text{change in auto VMT}] / [\text{current auto VMT}] \\ &= -1 \times [\text{change in transit passenger miles} \times \text{mode shift factor}] / [\text{current auto VMT}] \\ &= -1 \times [\text{total trips} \times \text{transit mode share} \times \text{trip length} \times \% \text{ change in transit fare} \\ &\quad \times \text{elasticity of transit ridership with respect to fare} \times \text{mode shift factor}] / [\text{total trips} \\ &\quad \times \text{auto mode share} \times \text{trip length}] \\ &= -1 \times [\text{transit mode share} \times \% \text{ change in transit fare} \times \text{elasticity} \times \text{mode shift} \\ &\quad \text{factor}] / [\text{auto mode share}] \end{aligned}$$

User Inputs:

- Transit fare unit
 - \$/trip
 - \$/hour
 - \$/day

- \$/month
- \$/year
- Existing regular transit fare
- Regular transit fare with project
- Existing transit mode share (optional override of city/CPA default)
- Existing auto mode share (optional override of city/CPA default)

Constants and Assumptions:

- Elasticity of transit ridership with respect to transit fare is –0.3.

SANDAG Data:

- Default auto mode share, by city/CPA
- Default transit mode share, by city/CPA
- Mode shift factor is 0.70. Calculated as (1/average vehicle occupancy) or (1/1.42). Mode shift factor is an adjustment to reflect the reduction in vehicle trips associated with a reduction in person trips, since some vehicles carry more than one person.
- Percent change in transit fare is capped at 50%.
- If the user override of existing transit mode share exceeds maximum of 25%, the default value will be used.
- If the user override of existing auto mode share falls below minimum of 50%, the default value will be used.

Sources:

- SANDAG. 2016. Activity Based Model. (v14.0.1, scenario ID 232)
- California Air Resources Board. 2013. “Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emission.” arb.ca.gov/cc/sb375/policies/transitservice/transit_bkgd.pdf

5E. Microtransit NEV Shuttle

Description: Microtransit services utilize real-time ride-hailing, mobile tracking, and app-based payment to provide demand-based service to users. Microtransit services are flexible and can be designed to fulfill the mobility needs of a community. Neighborhood electric vehicles (NEVs) are a type of microtransit service that operate within a defined service area and fulfill trips that are short-distance in nature, typically less than two miles long. NEVs help to facilitate connections to and from transit stations and provide users with an alternative to driving for short trips.

Formula: % change in VMT = $-1 \times (\% \text{ of city/CPA covered by new microtransit service} \times \text{microtransit share of person trips} \times \text{auto substitution rate} \times \text{average microtransit trip length}) / (\text{auto mode share} \times \text{average auto trip length})$

Derivation of Formula:

$$\begin{aligned}
 \% \text{ change in VMT} &= [\text{change in VMT}] / [\text{total VMT}] \\
 &= -1 \times [\text{total daily person trips} \times \text{microtransit share of person trips} \times \text{change in \% with access to microtransit} \times \text{auto substitution rate} \times \text{average microtransit trip length}] / [\text{total daily person trips} \times \text{auto mode share} \times \text{auto trip length}] \\
 &= -1 \times [\text{microtransit share of person trips} \times \text{change in \% with access to microtransit} \times \text{auto substitution rate} \times \text{average microtransit trip length}] / [\text{auto mode share} \times \text{auto trip length}]
 \end{aligned}$$

User Inputs:

- Percentage of city/CPA covered by new microtransit service
- One-way microtransit trip length (optional override of regional default)
- One-way auto trip length (optional override of regional default)
- Existing auto mode share (optional override of city/CPA default)

Constants and Assumptions:

- Microtransit share of all person trips is 0.41%.
- Auto trip substitution rate is 0.33.
- Average length of one-way microtransit trip is one mile.
- If the user override of existing auto mode share value falls below minimum of 50%, the default value will be used.

SANDAG Data:

- Default existing auto mode share, by city/CPA
- Regional average one-way auto trip length is 6.5 miles.

Sources:

- WSP. 2019. "Draft TDM Off-Model Methodology—March 2019 Revision." Memo to SANDAG.
- SANDAG. Activity Based Model. 2016. (v14.0.1, scenario ID 232)

Attachment F: Local Transportation Analysis Report Format

LOCAL TRANSPORTATION ANALYSIS REPORT FORMAT

COVER PAGE

1. Project address
2. Project name (if applicable)
3. Prepared for
4. Date (month/day/year)
5. Consultant contact information including a contact name
6. Consultant job number (if applicable)
7. Entitlement Number (i.e. Tract or CUP Number)
8. City Planner Name (if known)
9. Stamp and/or signature of qualified engineer or authorized owner/principal of firm stating the study was prepared and reviewed under their supervision and direction.

TABLE OF CONTENTS LIST OF FIGURES LIST OF TABLES

EXECUTIVE SUMMARY

Provide summary of the LTA, project location and size, intersections analyzed, study scenarios, impacts, mitigation and recommendations in a figure and table. Methodology used to analyze the impacts does not need to be included in the executive summary. Document results of LOS analysis, intersections and roadway segments Provide summary of site access and circulation. Results of LOS analysis should be summarized in a table form as follows for both existing and cumulative scenarios:

Summary of Intersection Level of Service

<i>Intersection</i>	<i>Existing</i>		<i>Existing plus Proposed Project</i>		<i>Existing plus Approved and Pending plus Proposed Project</i>	
	<i>Delay</i>	<i>LOS</i>	<i>Delay</i>	<i>LOS</i>	<i>Delay</i>	<i>LOS</i>
<i> </i>	<i> </i>	<i> </i>	<i> </i>	<i> </i>	<i> </i>	<i> </i>

INTRODUCTION

Provide description of the project, location, size and proposed primary access. A vicinity map showing the site location and the study area relative to other transportation systems along with study intersections and roadway segments should be provided. Document study intersections, roadway segments and study scenarios providing brief explanation on each study scenarios. Describe the methodology used to analyze the impacts of the study and the thresholds for determining an impact.

EXISTING CONDITIONS

Provide a description of existing streets and roadways within the project site (if any) and in the surrounding area. Include information on the roadway classifications (per the

Clovis General Plan Circulation Element), the number of lanes, posted speed limits, divided/undivided and bike lanes.

Existing daily directional and peak-hour through and turning traffic volumes on the roadways surrounding and/or logically associated with the project site, including major highways and freeways. Local streets affected by the project should also be shown. Each report shall include appendices providing count data used in the preparation of the report. The source and date of the traffic volume information shall be indicated. A figure illustrating the peak hour traffic volumes, lane configurations, and traffic control at the study intersections and roadway segments should be provided.

All assumed roadways and intersections or any other transportation circulation improvements must be identified and discussed. The discussion should include the scope and the status of the assumed improvements including the construction schedule and financing plan.

In addition, any transit facilities within 1,300 feet of the project or study intersections/roadways segments, including the service provider(s), routes, frequency and location/amenities of existing bus stops should be provided.

Existing and planned bicycle and pedestrian facilities adjacent to the project site, utilized by the project, connected to by the project, or impacted by the project should be identified and described in detail.

Results of LOS analysis should be summarized in table (in a format illustrated above) and discussed. If any of the study intersections or roadway segments are operating at unacceptable levels, mitigation measures should be identified.

EXISTING PLUS PROPOSED PROJECT CONDITIONS

This scenario is required by CEQA to show the impacts of the proposed project on the existing conditions. It should include a project description, trip generation and distribution, level of service analysis, and appropriate tables, figures, and recommendations/mitigation as described below.

Project Description

A description of the project, including factors which quantify traffic generators, e.g., dwelling units, square feet of office space, persons to be employed, restaurant seats, acres of raw land, etc. Provide site plan including access, project-only trips at the access points, circulation, parking, and loading as applicable.

Trip Generation and Trip Distribution

Provide trip generation and trip distribution. Provide any relevant information, discussion if applicable.

Level of Service Analysis

Provide a figure illustrating peak hour traffic volumes at the study intersections and roadway segments for Existing plus Proposed Project Conditions. Results of LOS analysis should be summarized in table and discussed. If any of the study intersections or roadway segments are projected to operate at unacceptable levels, mitigation measures should be identified.

Site Access and Circulation

Provide site access and circulation analysis and discussion as per the "SITE ACCESS AND CIRCULATION" Section of this document. Provide a figure showing on site and circulation recommendations.

NEAR-TERM ANALYSIS (EXISTING PLUS APPROVED AND PENDING PROJECT PLUS PROPOSED PROJECT CONDITIONS)

Approved and pending projects located within the vicinity of project, (projects that would impact study intersections and/or roadway segments or as determined by Traffic Engineering Manager), that can reasonably be expected to be in place by the project's construction year along with the trip generation should be summarized in a table. A figure illustrating the Existing plus Approved and Pending Projects Plus Proposed Project peak hour traffic volumes should be provided.

Results of LOS analysis should be summarized in table and discussed. If any of the study intersections or roadway segments are projected to operate at unacceptable levels, mitigation measures should be identified.

CUMULATIVE 20-YEAR AND CUMULATIVE 20-YEAR PLUS PROJECT CONDITIONS

Provide similar information for both scenarios as above referenced scenarios. Please discuss in detail how the traffic volume forecasts were developed using the Fresno COG model. This information should be easy to follow and reproducible by a peer consultant.

QUEUING

Discuss and provide recommendations to mitigate unacceptable queues at study intersections under appropriate scenarios as applicable.

SIGNAL WARRANTS

Provide signal warrants analysis and discuss results of the analysis under appropriate scenarios as applicable.

CONCLUSION

MITIGATIONS & RECOMMENDATIONS

Provide objective recommendations in a table or figure and discuss the timing and funding of recommendations.

APPENDIX

Traffic Counts

Fresno COG Model Runs and Turning Movement Forecast outputs

Signal Warrants

References and Bibliography Level Service Calculation Sheets