FINAL REPORT | JUNE 2021

Joint 2020 Urban Water Management Plan

PREPARED FOR

City of Modesto
Modesto Irrigation District

PREPARED BY

WEST YOST
Water. Engineered.

Joint 2020 Urban Water Management Plan

Prepared for

City of Modesto
and
Modesto Irrigation District

Project No. 418-60-20-63

Project Manager: Amy Kwong, PE	6-23-21 Date
QA/QC Review: Elizabeth Drayer, PE	6-23-21 Date

WEST YOST
Water. Engineered.

FINAL REPORT | JUNE 2021

Errata Sheet for Minor Corrections to
City of Modesto/Modesto Irrigation District
Joint 2020 Urban Water Management Plan (UWMP)

This errata sheet logs minor content errors that were identified after final adoption of the City of Modesto and Modesto Irrigation District Joint 2020 UWMP. The Department of Water Resources (DWR) has determined that these corrections are minor and do not require the UWMP to be amended.

☒ These data errors have been corrected in the DWR UWMP database at https://wuedata.water.ca.gov/secure/

☒ This errata sheet has been filed with the UWMP in all locations where it is made publicly available, including the California State Library. Errata may be submitted to State Library via email to cslgps@library.ca.gov

Name and agency of the person filing errata sheet: Amy Kwong, West Yost

#	Description of Correction	Location	Rationale	Date Error Corrected
1	Table 8-1: Water Shortage Contingency Plan Levels: Updated Shortage Response Actions to clarify that MID will implement its water shortage allocation policies and Drought Management Plan as discussed in the 2020 Agricultural Water Management Plan Update	WUEdata Table 8-1	Table applies to MID because MID is providing water to the City of Modesto for urban retail use.	May 16, 2022
2	Table 8-2: Demand Reduction Actions: Added rows for all shortage levels 1-6 and added comment that MID will implement its water shortage allocation policies and Drought Management Plan as discussed in the 2020 Agricultural Water Management Plan Update	WUEdata Table 8-2	Table applies to MID because MID is providing water to the City of Modesto for urban retail use.	May 16, 2022
3	Table 8-3: Added rows for all shortage levels 1-6 and added comment that MID will implement its water shortage allocation policies and Drought Management Plan as discussed in the 2020 Agricultural Water Management Plan Update	WUEdata Table 8-3	Table applies to MID because MID is providing water to the City of Modesto for urban retail use.	May 16, 2022

Errata Sheet for Minor Corrections to
City of Modesto/Modesto Irrigation District
Joint 2020 Urban Water Management Plan (UWMP)

This errata sheet logs minor content errors that were identified after final adoption of the City of Modesto and Modesto Irrigation District Joint 2020 UWMP. The Department of Water Resources (DWR) has determined that these corrections are minor and do not require the UWMP to be amended.

☒ These data errors have been corrected in the DWR UWMP database at https://wuedata.water.ca.gov/secure/

☒ This errata sheet has been filed with the UWMP in all locations where it is made publicly available, including the California State Library. Errata may be submitted to State Library via email to cslgps@library.ca.gov

Name and agency of the person filing errata sheet: Roger Chu, West Yost Associates

#	Description of Correction	Location	Rationale	Date Error Corrected
1	Table 8-1: Water Shortage Contingency Plan Levels: Updated Shortage Response Actions to include Water Shortage Contingency Plan and WUEdata table numbers.	WUEdata Table 8-1	Shortage Response Actions in WUEdata Table 8-1 referenced WUEdata table numbers only.	November 9, 2021
2	Table 8-3: Supply Augmentation and Other Actions: Added rows for all shortage levels 1-4 and 6	WUEdata Table 8-3	Each shortage level needs at least one row, even if there is no augmentation or other action associated with that shortage level.	November 9, 2021

Table of Contents

EXECUTIVE SUMMARY ES-1

Introduction ES-1

California Water Code Requirements ES-1

City and MID Water Systems ES-2

Water Use by City Customers ES-2

City and MID Water Supplies ES-2

Conservation Target Compliance ES-3

City and MID Water Service Reliability ES-3

Water Shortage Contingency Plan ES-3

UWMP Preparation, Review, and Adoption ES-3

CHAPTER 1 Introduction 1-1

1.1 Introduction 1-1

1.2 Importance and Extent of Joint Water Management Planning Efforts 1-1

1.3 Changes from 2015 UWMP 1-1

1.4 Plan Organization 1-3

CHAPTER 2 Plan Preparation 2-1

2.1 Basis for Preparing a Plan 2-1

2.2 Regional Planning 2-2

2.3 Individual or Regional Planning and Compliance 2-2

2.4 Fiscal or Calendar Year and Units of Measure 2-2

2.5 Coordination and Outreach 2-3

2.5.1 Wholesale and Retail Coordination 2-3

2.5.2 Coordination with Other Agencies and the Community 2-4

2.5.3 Notice to Cities and Counties 2-5

CHAPTER 3 System Description 3-1

3.1 General Description 3-1

3.2 Service Area Description 3-1

3.2.1 Geographical Boundaries 3-1

3.2.1.1 City Service Area 3-1

3.2.1.2 MID Service Area 3-1

3.2.2 Water Supply Overview 3-1

3.2.3 Water System Facilities 3-5

3.2.3.1 Surface Water Supply 3-5

3.2.3.2 Groundwater Supply 3-5

3.2.3.3 Distribution System 3-6

Table of Contents

3.3 Service Area Climate 3-8
3.3.1 Historical Climate 3-8
3.3.2 Potential Effects of Climate Change 3-9
3.4 Service Area Population and Demographics 3-9
3.4.1 City of Modesto Population 3-9
3.4.2 MID Population 3-10
3.4.3 Other Social, Economic, and Demographic Factors 3-11
3.5 Land Uses within Service Area 3-11
3.5.1 Existing Land Uses within Service Area 3-12
3.5.2 Future Land Uses within Service Area 3-12
CHAPTER 4 Water Use Characterization 4-1
4.1 Non-Potable Versus Potable Water Use 4-1
4.2 Water Use by Sector 4-1
4.2.1 Historical Water Use 4-2
4.2.2 Current Water Use 4-3
4.2.3 Projected Water Use 4-4
4.2.3.1 25-Year Planning Horizon 4-4
4.2.3.2 Characteristic Five-Year Water Use 4-6
4.3 Distribution System Water Losses 4-7
4.4 Estimating Future Water Savings 4-8
4.5 Water Use for Lower Income Households 4-9
4.6 Climate Change Considerations 4-9
CHAPTER 5 SB X7-7 Baselines, Targets, and 2020 Compliance 5-1
5.1 Overview and Background 5-1
5.2 General Requirements for Baseline and Targets 5-2
5.3 Service Area Population 5-2
5.4 Gross Water Use 5-3
5.5 Baselines and Targets Summary 5-4
5.6 2020 Compliance Daily Per Capita Water Use 5-4
5.7 Regional Alliance 5-5
CHAPTER 6 Water Supply Characterization 6-1
6.1 Overview 6-1
6.2 Surface Water 6-2
6.2.1 Surface Water Supply for MID 6-2
6.2.2 Modesto Regional Water Treatment Plant 6-2
6.3 Purchased or Imported Water 6-3
6.3.1 Wholesale Supplies for the City 6-3

Table of Contents

6.4 Groundwater 6-4
6.4.1 Groundwater Supply for the City 6-4
6.4.1.1 Groundwater Basin Description 6-6
6.4.1.1.1 Groundwater Level Trends 6-7
6.4.1.1.2 Groundwater Quality 6-8
6.4.1.2 Preliminary Operational Yield Estimate 6-8
6.4.1.3 Groundwater Management 6-9
6.4.1.4 Groundwater Sustainability 6-10
6.4.1.5 Overdraft Conditions 6-11
6.4.1.6 Historical Groundwater Pumping 6-12
6.4.2 Groundwater Supply for MID 6-12

6.5 Stormwater 6-13

6.6 Wastewater and Recycled Water 6-13
6.6.1 Recycled Water Coordination 6-13
6.6.1.1 Recycled Water Planning for the City 6-13
6.6.1.2 Recycled Water Planning for MID 6-14
6.6.2 Wastewater Collection, Treatment, and Disposal 6-14
6.6.2.1 Wastewater Collected and Treated by the City 6-14
6.6.2.2 Wastewater Collected and Treated by Other Agencies 6-15
6.6.2.3 Wastewater in MID 6-17
6.6.3 Recycled Water System 6-17
6.6.4 Recycled Water Beneficial Uses 6-17
6.6.4.1 Water Sale to Agricultural Users 6-18
6.6.4.2 Environmental Use 6-18
6.6.4.3 Groundwater Recharge 6-18
6.6.5 Actions to Encourage and Optimize Future Recycled Water Use 6-19

6.7 Desalinated Water Opportunities 6-20

6.8 Exchanges or Transfers 6-20
6.8.1 Exchange or Transfer Opportunities for the City 6-20
6.8.2 Exchange or Transfer Opportunities for MID 6-20

6.9 Future Water Projects 6-21
6.9.1 Potential Additional Surface Water Supply Options 6-21
6.9.2 Future Groundwater Supply Considerations 6-21
6.9.2.1 Wellhead Treatment Evaluation 6-21
6.9.2.2 ASR Program 6-22

6.10 Summary of Existing and Planned Sources of Water 6-23
6.10.1 Existing and Planned Sources of Water for the City 6-23
6.10.2 Existing and Planned Sources of Water for MID 6-25

6.11 Climate Change Impacts to Supply 6-26

6.12 Energy Intensity 6-27

Table of Contents

CHAPTER 7 Water Service Reliability and Drought Risk Assessment 7-1

7.1 Water Service Reliability Assessment 7-1
7.1.1 Constraints on Water Sources 7-1
7.1.2 Year Type Characterization 7-2
7.1.2.1 Basis of Water Year Data for the City 7-2
7.1.2.2 Basis of Water Year Data for MID 7-5
7.1.3 Water Service Reliability 7-6
7.1.3.1 Water Service Reliability – Normal Year 7-6
7.1.3.1.1 City of Modesto 7-6
7.1.3.1.2 MID 7-6
7.1.3.2 Water Service Reliability – Single Dry Year 7-7
7.1.3.2.1 City of Modesto 7-7
7.1.3.2.2 MID 7-8
7.1.3.3 Water Service Reliability – Five Consecutive Dry Years 7-9
7.1.3.3.1 City of Modesto 7-9
7.1.3.3.2 MID 7-10
7.1.4 Water Management Tools and Options 7-12
7.1.4.1 City of Modesto 7-12
7.1.4.2 MID 7-12

7.2 Drought Risk Assessment 7-12
7.2.1 Data, Methods, and Basis for Water Shortage Condition 7-12
7.2.2 DRA Water Source Reliability 7-13
7.2.3 Total Water Supply and Use Comparison 7-14

CHAPTER 8 Water Shortage Contingency Plan 8-1

8.1 Water Shortage Contingency Planning Background 8-1

8.2 City Water Shortage Contingency Plan 8-1

8.3 Seismic Risk Assessment and Mitigation Plan 8-1

8.4 Water Shortage Contingency Plan Adoption, Submittal, and Availability 8-2

CHAPTER 9 Demand Management Measures 9-1

9.1 Background on Demand Management Measures 9-1

9.2 MID Water Conservation Program Overview 9-1

9.3 MID Demand Management Measures 9-1
9.3.1 Metering 9-2
9.3.2 Public Education and Outreach 9-2
9.3.3 Water Conservation Program Coordination and Staffing Support 9-2
9.3.4 Other Demand Management Measures 9-2
9.3.5 Asset Management 9-2
9.3.6 Wholesale Supplier Assistance Programs 9-3

9.4 City of Modesto Water Conservation Program Overview 9-3

9.5 City of Modesto Demand Management Measures 9-4

Table of Contents

9.5.1 Water Waste Prevention Ordinances 9-4
9.5.1.1 DMM Description 9-4
9.5.1.2 Implementation over the Past Five Years to Achieve Water Use Targets 9-4
9.5.1.3 Plans for Continued Implementation 9-6
9.5.2 Metering 9-6
9.5.2.1 DMM Description 9-6
9.5.2.2 Implementation over the Past Five Years to Achieve Water Use Targets 9-6
9.5.2.3 Plans for Continued Implementation 9-6
9.5.3 Conservation Pricing 9-6
9.5.3.1 DMM Description 9-6
9.5.3.2 Implementation over the Past Five Years to Achieve Water Use Targets 9-7
9.5.3.3 Plans for Continued Implementation 9-7
9.5.4 Public Education and Outreach 9-8
9.5.4.1 DMM Description 9-8
9.5.4.2 Implementation over the Past Five Years to Achieve Water Use Targets 9-8
9.5.4.3 Plans for Continued Implementation 9-9
9.5.5 Programs to Assess and Manage Distribution System Real Loss 9-9
9.5.5.1 DMM Description 9-9
9.5.5.2 Implementation over the Past Five Years to Achieve Water Use Targets 9-10
9.5.5.3 Plans for Continued Implementation 9-11
9.5.6 Water Conservation Program Coordination and Staffing Support 9-11
9.5.6.1 DMM Description 9-11
9.5.6.2 Implementation over the Past Five Years to Achieve Water Use Targets 9-12
9.5.6.3 Plans for Continued Implementation 9-12
9.5.7 Other Demand Management Measures 9-12
9.5.7.1 Residential Conservation Programs 9-12
9.5.7.1.1 DMM Description 9-12
9.5.7.1.2 Implementation over the Past Five Years to Achieve Water Use Targets 9-13
9.5.7.1.3 Plans for Continued Implementation 9-13
9.5.7.2 Commercial, Industrial, Institutional Customer Conservation Programs 9-13
9.5.7.2.1 DMM Description 9-13
9.5.7.2.2 Implementation over the Past Five Years to Achieve Water Use Targets 9-14
9.5.7.2.3 Plans for Continued Implementation 9-14
9.5.7.3 Large Landscape Irrigation Conservation Programs 9-14
9.5.7.3.1 DMM Description 9-14
9.5.7.3.2 Implementation over the Past Five Years to Achieve Water Use Targets 9-15
9.5.7.3.3 Plans for Continued Implementation 9-15
9.5.7.4 Rebate Programs 9-15
9.5.7.4.1 DMM Description 9-15
9.5.7.4.2 Implementation over the Past Five Years to Achieve Water Use Targets 9-15
9.5.7.4.3 Plans for Continued Implementation 9-15
9.5.7.5 One Water Modesto Program 9-16
9.6 Water Use Objectives (Future Requirements) 9-17

Table of Contents

CHAPTER 10 Plan Adoption, Submittal, and Implementation 10-1

10.1 Inclusion of All 2020 Data 10-1

10.2 Notice of Public Hearing 10-1
10.2.1 Notices to Cities and Counties 10-1
10.2.2 Notice to the Public 10-3

10.3 Public Hearing and Adoption 10-3
10.3.1 Public Hearing 10-3
10.3.2 Adoption 10-3

10.4 Plan Submittal 10-3

10.5 Public Availability 10-4

10.6 Amending an Adopted UWMP or Water Shortage Contingency Plan 10-4

LIST OF TABLES

Table 2-1. Public Water Systems (DWR Table 2-1 Retail) 2-1

Table 2-2. Plan Identification (DWR Table 2-2) 2-2

Table 2-3. Supplier Identification (DWR Table 2-3) 2-3

Table 2-4. Water Supplier Information Exchange (DWR Table 2-4 Retail) 2-4

Table 2-5. Water Supplier Information Exchange (DWR Table 2-4 Wholesale) 2-4

Table 3-1. Monthly Average Climate Data Summary 3-8

Table 3-2. Population – Current and Projected (DWR Table 3-1 Retail) 3-10

Table 3-3. Population – Current and Projected (DWR Table 3-1 Wholesale) 3-10

Table 4-1. Historical Water Use by Sector 4-2

Table 4-2. Demands for Potable and Non-Potable Water – Actual (DWR Table 4-1 Retail) 4-3

Table 4-3. Demands for Potable and Non-Potable Water – Actual (DWR Table 4-1 Wholesale) 4-4

Table 4-4. Use for Potable and Non-Potable Water – Projected (DWR Table 4-2 Retail) 4-5

Table 4-5. Total Gross Water Use (Potable and Non-Potable) (DWR Table 4-3 Retail) 4-5

Table of Contents

Table 4-6. Use for Potable and Raw Water – Projected (DWR Table 4-2 Wholesale) 4-6
Table 4-7. Total Water Use (Potable and Non-Potable) (DWR Table 4-3 Wholesale) 4-6
Table 4-8. Projected Water Demands for Drought Risk Assessment 4-7
Table 4-9. Last Five Years of Water Loss Audit Reporting (DWR Table 4-4 Retail) 4-8
Table 4-10. Last Five Years of Water Loss Audit Reporting (DWR Table 4-4 Wholesale) 4-8
Table 4-11. Inclusion in Water Use Projections (DWR Table 4-5 Retail) 4-9
Table 4-12. Projected Water Demands for Lower Income Households 4-9
Table 5-1. Method for 2020 Population Estimate (SB X7-7 Table 2) 5-3
Table 5-2. 2020 Service Area Population (SB X7-7 Table 3) 5-3
Table 5-3. Baseline and Targets Summary From SB X7-7 Verification Form (DWR Table 5-1 Retail) 5-4
Table 5-4. 2020 Compliance From SB X7-7 2020 Compliance Form (DWR Table 5-2 Retail) 5-5
Table 6-1. Groundwater Subbasin Characteristics and Service Areas 6-6
Table 6-2. Groundwater Subbasin Recharge and Extraction Estimates 6-7
Table 6-3. Preliminary Operational Yield Assumed for Each Subbasin 6-9
Table 6-4. Sustainable Groundwater Management Act Implementation Steps and Deadlines 6-10
Table 6-5. Groundwater Basin Prioritization for Sustainable Groundwater Management Act 6-11
Table 6-6. Groundwater Volume Pumped (DWR Table 6-1 Retail) 6-12
Table 6-7. Wastewater Collected Within Service Area in 2020 (DWR Table 6-2 Retail) 6-16
Table 6-8. Wastewater Treatment and Discharge Within Service Area in 2020 (DWR Table 6-3 Retail) 6-17
Table 6-9. Methods to Expand Future Recycled Water Use (DWR Table 6-6 Retail) 6-19
Table 6-10. Exchange or Transfer Opportunities for the City 6-20
Table 6-11. Exchange or Transfer Opportunities for MID 6-20
Table 6-12. Summary of Wellhead Treatment Recommendations by Contaminant Type 6-22
Table 6-13. Water Supplies – Actual (DWR Table 6-8 Retail) 6-24

Table of Contents

Table 6-14. Water Supplies – Projected (DWR Table 6-9 Retail) 6-24
Table 6-15. Water Supplies – Actual (DWR Table 6-8 Wholesale) 6-25
Table 6-16. Water Supplies – Projected (DWR Table 6-9 Wholesale) 6-25
Table 6-17. Recommended Energy Intensity for MID – Total Utility Approach (DWR Table O-1B) 6-28
Table 6-18. Recommended Energy Intensity for the City – Total Utility Approach (DWR Table O-1B) 6-29
Table 6-19. Recommended Energy Intensity – Wastewater & Recycled Water (DWR Table O-2) 6-29
Table 7-1. Basis of Water Year Data (Reliability Assessment) (DWR Table 7-1 Retail) 7-4
Table 7-2. Basis of Water Year Data (Reliability Assessment) (DWR Table 7-1 Wholesale) 7-5
Table 7-3. Normal Year Supply and Demand Comparison (DWR Table 7-2 Retail) 7-6
Table 7-4. Normal Year Supply and Demand Comparison (DWR Table 7-2 Wholesale) 7-7
Table 7-5. Single Dry Year Supply and Demand Comparison (DWR Table 7-3 Retail) 7-8
Table 7-6. Single Dry Year Supply and Demand Comparison (DWR Table 7-3 Wholesale) 7-9
Table 7-7. Multiple Dry Years Supply and Demand Comparison (DWR Table 7-4 Retail) 7-10
Table 7-8. Multiple Dry Years Supply and Demand Comparison (DWR Table 7-4 Wholesale) 7-11
Table 7-9. Projected Supplies for Drought Risk Assessment 7-13
Table 7-10. Five-Year Drought Risk Assessment Tables to Address Water Code Section 10635(b) (DWR Table 7-5) 7-14
Table 9-1. City of Modesto Actions in Response to Water Supply Conditions 9-5
Table 9-2. City of Modesto Current Water Rates and Charges 9-7
Table 9-3. City of Modesto Rebate Programs from 2016 to 2020 9-16
Table 10-1. Notification to Cities and Counties (DWR Table 10-1 Retail) 10-1
Table 10-2. Notification to Cities and Counties (DWR Table 10-1 Wholesale) 10-2

Table of Contents

LIST OF FIGURES

Figure 3-1. Modesto Vicinity Map 3-2
Figure 3-2. City of Modesto Water Service Areas 3-3
Figure 3-3. MID Water Service Area 3-4
Figure 3-4. City of Modesto Existing Water System Facilities 3-7
Figure 6-1. City of Modesto Groundwater Subbasins 6-5

LIST OF APPENDICES

Appendix A: Legislative Requirements
Appendix B: DWR 2020 UWMP Tables
Appendix C: DWR 2020 UWMP Checklist
Appendix D: Agency and Public Notices
Appendix E: Water Loss Audits
Appendix F: SB X7-7 Compliance Forms
Appendix G: Amended and Restated Treatment and Delivery Agreement Between Modesto Irrigation District and City of Modesto
Appendix H: Groundwater Information
Appendix I: Energy Intensity Calculation Tables and Supporting Information
Appendix J: Water Shortage Contingency Plan
Appendix K: Water Conservation Plan and Related Documents
Appendix L: UWMP and WSCP Adoption Resolutions

Table of Contents

LIST OF ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
Act	Urban Water Management Planning Act
AF	Acre-Feet
AFY	Acre-Feet Per Year
ag	Agriculture
AMI	Area Median Income
AMR	Automatic Meter Reading
ARTDA	Amended and Restated Treatment and Delivery Agreement
ASR	Aquifer Storage and Recovery
AWMP	Agricultural Water Management Plan
AWWA	American Water Works Association
BMP	Best Management Practice
ccf	Hundred Cubic Feet
CII	Commercial, Industrial, Institutional
CIMIS	California Irrigation Management Information System
City	City of Modesto
County	Stanislaus County
CVP	Central Valley Project
CWC	California Water Code
CWP	California Water Plan
DBCP	Dibromochloropropane
DDW	California Division of Drinking Water
DMC	Delta-Mendota Canal
DMMs	Demand Management Measures
DOF	California Department of Finance
DPWD	Del Puerto Water District
DRA	Drought Risk Assessment
DWR	California Department of Water Resources
DWR Guidebook	Urban Water Management Plan Guidebook 2020
EO	Executive Order
ESIRWMP	East Stanislaus Integrated Regional Water Management Plan
ESRWMP	East Stanislaus Regional Water Management Partnership
ET_o	Evapotranspiration
EWMPs	Efficient Water Management Practices
FERC	Federal Energy Regulatory Commission
ft msl	Feet Above Mean Sea Level
GHG	Greenhouse Gas
GIS	Geographical Information Systems

GPCD	Gallons Per Capita Per Day
GPS	Global Positioning Systems
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
IRWM	Integrated Regional Water Management
Joint 2020 UWMP	Joint 2020 Urban Water Management Plan
kWh	Kilowatt-Hours
LHMP	Local Hazard Mitigation Plan
M&I	Municipal and Industrial
MAF	Million Acre Feet
MCL	Maximum Contaminant Level
MG	Million Gallons
mg/L	Milligrams Per Liter
MGD	Million Gallons Per Day
MID, District	Modesto Irrigation District
MMC	Modesto Municipal Code
MRWTP	Modesto Regional Water Treatment Plant
MWELO	Model Water Efficient Landscape Ordinance
NAICS	North American Industry Classification System
NPDES	National Pollutant Discharge Elimination System
NVRRWP	North Valley Regional Recycled Water Program
PCE	Perchloroethylene
Project	Domestic Water Project
RMS	Resource Management Strategies
RO	Reverse Osmosis
RUWMP	Regional Urban Water Management Plan
RWQCF	Turlock Regional Water Quality Control Facility
SB	Senate Bill
SCADA	Supervisory Control and Data Acquisition
sf	Square Feet
SGMA	Sustainable Groundwater Management Act
SOI	Sphere of Influence
sq mi	Square Mile
SWRCB	State Water Resources Control Board
SWRP	Storm Water Resource Plan
TCE	Trichloroethylene
TCP	1,2,3-Trichloropropane
TDA	Treatment and Delivery Agreement

TDS	Total Dissolved Solids
TID	Turlock Irrigation District
TWPS	Treated Water Pump Station
USGS	United States Geological Survey
UV	Ultraviolet
UWMP	Urban Water Management Plan
WMP	Water Master Plan
WSCP	Water Shortage Contingency Plan
WUE	Water Use Efficiency
WWTP	Wastewater Treatment Plant

INTRODUCTION

An Urban Water Management Plan (UWMP) helps water suppliers assess the availability of their water supplies with current and projected water use to help ensure reliable water service under different conditions. This water supply planning is especially critical for California as climate change alters rainfall and snowfall patterns (impacting water supply availability) and development continues to occur statewide (increasing the need for reliable water supplies). The Urban Water Management Planning Act (Act) requires larger water suppliers that provide water to urban users (whether directly or indirectly) to develop UWMPs every five years. UWMPs evaluate conditions for the next 20 to 25 years, so these regular updates ensure continued, long-term water supply planning.

The Modesto Irrigation District (MID) sells treated water to the City of Modesto (City), who then sells and distributes it to individual water users (customers) (e.g., residents and businesses). In this arrangement, MID is a water wholesaler and the City is a water retailer. Because the City provides water to more than 3,000 customers, both the City and MID are required to prepare a UWMP. For the 2020 UWMP, the City and MID have elected to prepare their plan jointly (Joint 2020 UWMP).

This Executive Summary serves as a Lay Description of the City and MID's Joint 2020 UWMP, as required by California Water Code §10630.5.

CALIFORNIA WATER CODE REQUIREMENTS

The California Water Code documents specific requirements for California water suppliers. The Act is included in the California Water Code and specifies the required elements of a UWMP, including discussing an agency's water system and facilities, calculating how much water its customers use (i.e., water demand) and how much it can supply, and detailing how it would respond during a drought or other water supply shortage. Also, a UWMP must describe what specific coordination steps were taken to prepare, review, and adopt the plan.

The Act has been revised over the years. The Water Conservation Act of 2009 (also known as SB X7-7) required retail water agencies to establish water use targets for 2015 and 2020 that would result in statewide water savings of 20 percent by 2020. In 2020, retail water agencies are required to report on their compliance with SB X7-7.

The 2012 to 2016 drought led to further revisions to the Act to improve water supply planning for long-term reliability and resilience to drought and climate change. These revisions were formalized in the 2018 Water Conservation Legislation and include:

- Five Consecutive Dry-Year Water Reliability Assessment: Analyze water supply reliability for five consecutive dry years over the planning period of this plan (see Chapter 7).
- Drought Risk Assessment: Assess water supply reliability from 2021 to 2025 assuming they are dry years (see Chapter 7).
- Seismic Risk: Identify the seismic risk to the agency's water facilities and have a plan to address identified risks (see Chapter 8).
- Energy Use Information: If data is available, include reporting on the amount of electricity used to obtain, treat, and distribute water (see Chapter 6).

- Water Shortage Contingency Plan (WSCP): Update the agency's plan to include an annual process for assessing potential gaps between planned water supply and demands; conform with the State's standard water shortage levels (including a shortage level greater than 50 percent) for consistent messaging and reporting; and provide water shortage responses that are locally appropriate (see Chapter 8).
- Lay Description: Provide a lay description of the findings of the UWMP; this Executive Summary serves as the "Lay Description" for this plan.

Major components and findings of the City and MID's Joint 2020 UWMP are summarized below.

CITY AND MID WATER SYSTEMS

MID diverts water from the Tuolumne River (i.e., surface water) and treats it at the Modesto Regional Water Treatment Plant (MRWTP) before delivering it to the City. The MRWTP is owned and operated by MID, along with storage, pumping, and pipeline facilities.

In addition to receiving treated surface water from MID, the City has facilities to produce drinking (i.e., potable) water by pumping it from City-owned wells (groundwater) and treating it. The City also owns and operates storage reservoirs and an extensive network of pipelines and pumping facilities to deliver drinking water to its customers, which include residents and commercial customers in Modesto, Salida, portions of North Ceres, Empire, and other contiguous Stanislaus County areas. The City also serves Grayson, Del Rio, Ceres (Walnut Manor), and portions of Turlock.

WATER USE BY CITY CUSTOMERS

The City anticipates the potential for significant growth in the next 25 years, which would increase its demand for water. Thorough and accurate accounting of current and future water demands is critical for the City's planning efforts. To continue delivering safe and reliable drinking water, the City must know how much water its customers currently use and how much they expect to use in the future.

The City reviewed development and planning documents to estimate water demands through the year 2045. Overall, the City's water demand could potentially increase by approximately 55 percent (from 2020 levels) by 2045. MID's urban water demand consists only of sales to the City and is projected to increase along with City demand in accordance with the City and MID's treatment and delivery agreement.

CITY AND MID WATER SUPPLIES

The City's water supplies consist of purchases from MID (approximately 49 percent of supply in 2020) and groundwater pumped by the City (approximately 51 percent of supply in 2020). All of MID's supply to the City is surface water from the Tuolumne River, which is mainly fed by snowmelt from the central Sierra Nevada.

By utilizing both surface water and groundwater supplies, the City's overall water supply portfolio is more reliable. If dry conditions reduce MID's deliveries to the City, the City could compensate by increasing groundwater pumping. Because of this flexibility, the City's future water supplies are expected to keep pace with its water demands. Neither the City nor MID have included new water supply projects in this plan.

CONSERVATION TARGET COMPLIANCE

Wholesale water suppliers like MID are not required to comply with conservation targets, so this section focuses on the City only. In its 2015 UWMP, the City achieved its interim water use target and confirmed its 2020 water use target based on 2010 Census data. In 2020, the City achieved its 20 percent reduction target in accordance with SB X7-7. This was the result of continued water efficiency improvements by the City and conservation by its customers following the recent drought.

CITY AND MID WATER SERVICE RELIABILITY

The California Water Code asks agencies to evaluate their water service reliability by examining the impact of drought on their water supplies and comparing those reduced supplies to water demands. Specifically, agencies should calculate their water supplies during a single dry year and five consecutive dry years using historical records. For example, the City can estimate its supply during a single dry year by looking at how much treated surface water and groundwater was supplied during the driest year on record. If the historical "dry year" supply was reduced by 10 percent, then the City can conservatively assume a similar 10 percent reduction in its supplies during a future dry year.

The City and MID are well-positioned to withstand the effects of a single dry year and a five-year drought. Drought risk was specifically assessed between 2021 and 2025, assuming that these are dry years. In general, during dry years MID reduces its treated surface water deliveries to the City, and the City increases its groundwater pumping so that total supplies (MID deliveries plus groundwater) are sufficient to meet demands. The City expects to have enough water supplies to meet water demands for a five-year drought beginning in 2021. This remains true for one-year and five-year droughts beginning in 2025, 2030, 2035, 2040, and 2045. It is assumed that water conservation efforts would reduce the City's water demands during a multiple dry year drought condition to match available supplies. A demand reduction of up to 11 percent was required during extended droughts as demands increase in future planning years.

WATER SHORTAGE CONTINGENCY PLAN

A WSCP describes an agency's plan for preparing for and responding to water shortages. Only the City's WSCP is included in this Joint 2020 UWMP. Since MID is primarily an agricultural water supplier, its water shortage responses are included in its separate Agricultural Water Management Plan.

The City updated the WSCP to include its process for assessing potential gaps between planned water supply and demands for the current year and the next potentially dry year. The City also aligned its water shortage levels with the State's standard stages for consistent messaging and planned for locally appropriate water shortage responses. The WSCP may be used for foreseeable and unforeseeable events and is adopted concurrently with this plan by separate resolution to allow for updates as conditions change.

UWMP PREPARATION, REVIEW, AND ADOPTION

The City and MID developed this Joint 2020 UWMP in coordination with the public. While preparing this plan, the City and MID also notified other stakeholders (e.g., Stanislaus County, City of Turlock, City of Ceres, etc.) of its preparation, its availability for review, and the public hearing prior to adoption. The City and MID encouraged community participation in the development of the Joint 2020 UWMP using

newspaper advertisements and web-based communication. These public notices included the time and place of the public hearing, as well as where the plan would be available for public inspection.

The public hearing provided an opportunity for the City and MID's water users and the general public to become familiar with the Joint 2020 UWMP and ask questions about the City and MID's water supply, their continuing plans for providing a reliable, safe, high-quality water supply, and their plans to address potential water shortages. Following the public hearings, this Joint 2020 UWMP and WSCP were adopted by both the Modesto City Council and the MID Board of Directors at their respective meetings on June 8, 2021. A copy of the adopted UWMP was submitted to the Department of Water Resources and is available on the City and MID websites:

- City of Modesto Utilities Department (https://www.modestogov.com/860)
- MID (http://www.mid.org/water/uwmp)

CHAPTER 1
Introduction

This chapter provides an introduction and overview of the City of Modesto (City) and Modesto Irrigation District (MID) Joint 2020 Urban Water Management Plan (Joint 2020 UWMP), including the importance and extent of the City and MID's water management planning efforts, changes since the preparation of the City's 2015 UWMP, and organization of the Joint 2020 UWMP. This 2020 UWMP has been prepared jointly by City and MID staff and West Yost.

1.1 INTRODUCTION

The Urban Water Management Planning Act (Act) was originally established by Assembly Bill (AB) 797 on September 21, 1983. Passage of the Act was recognition by state legislators that water is a limited resource and a declaration that efficient water use and conservation would be actively pursued throughout the state. The primary objective of the Act is to direct "urban water suppliers" to develop a UWMP that provides a framework for long-term water supply planning and documents how urban water suppliers are carrying out their long-term resource planning responsibilities to ensure adequate water supplies are available to meet existing and future water demands. A copy of the current version of the Act, as incorporated in Sections 10610 through 10657 of the California Water Code (CWC), is provided in Appendix A of this plan.

1.2 IMPORTANCE AND EXTENT OF JOINT WATER MANAGEMENT PLANNING EFFORTS

The purpose of the UWMP is to provide a planning tool for the City and MID for developing, managing, and delivering municipal water supplies to the City's water service area. The City and MID have had a long history of providing a reliable water supply to their customers. To continue to meet the water needs of the community, the City and MID carefully manage their available water resources. This plan provides the City and MID with a comprehensive water management action plan for guidance as water demand and/or water supply conditions change.

It should be noted that MID is primarily an agricultural water supplier and has also prepared a 2020 Agricultural Water Management Plan (AWMP) Update in accordance with the requirements from the Water Conservation Act of 2009.

1.3 CHANGES FROM 2015 UWMP

The Act has been modified over the years in response to the State's water shortages, droughts, and other factors. A significant amendment was made in 2009, after the 2007 to 2009 drought, and as a result of the Governor's call for a statewide 20 percent reduction in urban water use by the year 2020. This was the Water Conservation Act of 2009, also known as Senate Bill Seven of the Senate's Seventh Extraordinary Session of 2009 (SB X7-7). The Water Conservation Act of 2009 required agencies to establish water use targets for 2015 and 2020 that would result in statewide water savings of 20 percent by 2020. The 2012 to 2016 drought led to further amendments to the California Water Code to improve water supply planning for long-term reliability and resilience to drought and climate change.

Summarized below are the major additions and changes to the California Water Code (CWC) since the City's 2015 UWMP was prepared:

- **Five Consecutive Dry-Year Water Reliability Assessment** [CWC §10635(a)]. The Legislature modified the dry-year water reliability planning from a "multi-year" time period to a "drought lasting five consecutive water years" designation. This statutory change requires the urban water supplier to analyze the reliability of its water supplies to meet its water use over an extended drought period. This requirement is addressed in the water use assessment presented in Chapter 4, the water supply analysis presented in Chapter 6, and the water service reliability determinations in Chapter 7 of this plan.
- **Drought Risk Assessment** [CWC §10635(b)]. The Legislature created a new UWMP requirement for drought planning because of the significant duration of recent California droughts and the predictions about hydrological variability attributable to climate change. The Drought Risk Assessment (DRA) requires the urban water supplier to assess water supply reliability over a five-year period from 2021 to 2025 that examines water supplies, water uses, and the resulting water supply reliability under a reasonable prediction for five consecutive dry years. The DRA is discussed in Chapter 7 based on the water use information in Chapter 4, the water supply analysis presented in Chapter 6, and the water service reliability determinations discussed in Chapter 7 of this plan.
- **Seismic Risk** [CWC §10632.5]. The CWC now requires urban water suppliers to specifically address seismic risk to various water system facilities and to have a mitigation plan. Water supply infrastructure planning is correlated with the regional hazard mitigation plan associated with the urban water supplier. The City's seismic risk is discussed in Chapter 8 of this plan.
- **Energy Use Information** [CWC §10631.2]. The CWC now requires urban water suppliers to include readily obtainable information on estimated amounts of energy used for their water supply extraction, treatment, distribution, storage, conveyance, and other water uses. The reporting of this information was voluntary in 2015. Energy use information is provided in Chapter 6 of this plan.
- **Water Loss Reporting for Five Years** [CWC §10608.34]. The CWC now requires urban water suppliers to include water loss reporting for the past five years. Water loss reporting is provided in Chapter 4 of this plan.
- **Water Shortage Contingency Plan** [CWC §10632]. In 2018, the Legislature modified the UWMP laws to require a Water Shortage Contingency Plan (WSCP) with specific elements. The WSCP is a document that provides the urban water supplier with an action plan for a drought or catastrophic water supply shortage. Although the new requirements are more prescriptive than previous versions, many of these elements have long been included in WSCPs, other sections of UWMPs, or as part of the urban water supplier's standard procedures and response actions. Many of these actions were implemented by the urban water suppliers during the last drought to successfully meet changing local water supply challenges. The WSCP is used by DWR, the State Water Resources Control Board, and the Legislature in addressing extreme drought conditions or statewide calamities that impact water supply availability. The City's WSCP is summarized in Chapter 8 and provided in Appendix J of this plan.

- **Groundwater Supplies Coordination** [CWC §10631(b)(4)]. In 2014, the Legislature enacted the Sustainable Groundwater Management Act to address groundwater conditions throughout California. The CWC now requires 2020 UWMPs to be consistent with Groundwater Sustainability Plans in areas where those plans have been completed by Groundwater Sustainability Agencies. This requirement is addressed in Chapter 6 of this plan.
- **Lay Description** [CWC §10630.5]. The Legislature included a new statutory requirement for the urban water supplier to include a lay description of the fundamental determinations of the UWMP, especially regarding water service reliability, challenges ahead, and strategies for managing reliability risks. This section of the UWMP could be viewed as a go-to synopsis for new staff, new governing members, customers, and the media, and it can ensure a consistent representation of the urban water supplier's detailed analysis. This requirement is addressed in the Executive Summary of this plan.
- **Water Loss Management** [CWC §10608.34(a)(1)]. The Legislature included a requirement for urban water suppliers to report on their plan to meet the water loss performance standards in their 2020 UWMPs. This requirement is addressed in the Demand Management Measures presented in Chapter 9 of this plan.

1.4 PLAN ORGANIZATION

This Joint 2020 UWMP contains the appropriate sections and tables required per CWC Division 6, Part 2.6 (Urban Water Management Planning Act), included in Appendix A of this plan, and has been prepared based on guidance provided by the California Department of Water Resources (DWR) in their "Urban Water Management Plan Guidebook 2020" (DWR Guidebook).

As described in this plan, the City currently receives treated surface water supplies from MID, and MID delivers treated surface water supplies exclusively to the City. Therefore, where applicable, separate descriptions have been included for the City and MID water systems. These sections reference each other extensively. Because this relationship is currently exclusive, much of the retail-wholesale information is interchangeable between these agencies. In addition, because MID does not have any direct urban customers, the City oversees demand management measures and other public outreach activities.

This Joint 2020 UWMP is organized into the following chapters:

- Chapter 1: Introduction
- Chapter 2: Plan Preparation
- Chapter 3: System Description
- Chapter 4: Water Use Characterization
- Chapter 5: SB X7-7 Baselines, Targets, and 2020 Compliance
- Chapter 6: Water Supply Characterization
- Chapter 7: Water Service Reliability and Drought Risk Assessment
- Chapter 8: Water Shortage Contingency Plan
- Chapter 9: Demand Management Measures
- Chapter 10: Plan Adoption, Submittal, and Implementation

This Joint 2020 UWMP also contains the following appendices of supplemental information and data:

- Appendix A: Legislative Requirements
- Appendix B: DWR 2020 UWMP Tables
- Appendix C: DWR 2020 UWMP Checklist
- Appendix D: Agency and Public Notices
- Appendix E: Water Loss Audits
- Appendix F: SB X7-7 Compliance Forms
- Appendix G: Amended and Restated Treatment and Delivery Agreement Between Modesto Irrigation District and City of Modesto
- Appendix H: Groundwater Information
- Appendix I: Energy Intensity Calculation Tables and Supporting Information
- Appendix J: Water Shortage Contingency Plan
- Appendix K: Water Conservation Plan and Related Documents
- Appendix L: UWMP and WSCP Adoption Resolutions

Furthermore, this Joint 2020 UWMP contains all the tables recommended in the DWR Guidebook, both embedded into the UWMP chapters where appropriate and included in Appendix B.

DWR's Urban Water Management Plan Checklist, as provided in the DWR Guidebook, has been completed by West Yost to demonstrate the plan's compliance with applicable requirements. A copy of the completed checklist is included in Appendix C.

CHAPTER 2
Plan Preparation

This chapter describes the preparation of the Joint 2020 UWMP and Water Shortage Contingency Plan, including the basis for the preparation of the plan, individual or regional planning, fiscal or calendar year reporting, units of measure, and plan coordination and outreach.

2.1 BASIS FOR PREPARING A PLAN

The Act requires every "urban water supplier" to prepare and adopt a UWMP, to periodically review its UWMP at least once every five years and make any amendments or changes which are identified by the review. An "urban water supplier" is defined as 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 per year (AFY).

As shown in Table 2-1, in 2020 the City provided water to 74,040 customer connections and supplied 53,104 acre-feet (AF) of water. Therefore, the City is required to prepare a UWMP. The City's last UWMP, the 2015 UWMP, was adopted by the City Council in June 2016.

Table 2-1. Public Water Systems[a, b] (DWR Table 2-1 Retail)

Public Water System Number	Public Water System Name	Number of Municipal Connections 2020	Volume of Water Supplied 2020 *
CA5010010[c]	City of Modesto	68,566	50,903
CA5010005	Salida	4,348	958
CA5010031[d]	Ceres (Walnut Manor)	52	46
CA5010033	Grayson	265	230
CA5010029	Del Rio (Hillcrest)	397	769
CA5010034	North Turlock	48	28
CA5010023	South Turlock	330	169
CA5010035[e]	Central Turlock	34	0
	TOTAL	74,040	53,104

**** Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES:
(a) Represents billed services as of the end of 2020. Does not include "available" services (i.e., installed but not active).
(b) Represents water production (in AF) except where otherwise noted.
(c) Includes contiguous unincorporated areas of the County and parts of the City of Ceres.
(d) Also known as "Payne" for the street where the well is located.
(e) No SCADA available for production because City of Turlock provides groundwater to this system via an interconnection with Turlock.

2.2 REGIONAL PLANNING

As described in Section 2.3 below, the City and MID have prepared this Joint 2020 UWMP on an individual reporting basis, not part of a regional planning process. However, the City and MID coordinate routinely with each other, and with the cities and service areas that they serve, to ensure that a safe and reliable water supply is delivered to existing customers and that plans for serving future customers are implemented as efficiently as possible.

2.3 INDIVIDUAL OR REGIONAL PLANNING AND COMPLIANCE

This Joint 2020 UWMP has been prepared on an individual reporting basis, covering only the City and MID's municipal water service area (see Table 2-2). The City does not participate in a regional alliance, and it has not prepared a Regional Urban Water Management Plan (RUWMP). As described below in Section 2.5, the City and MID have notified and coordinated planning and compliance with appropriate regional agencies and constituents.

Table 2-2. Plan Identification (DWR Table 2-2)

Select Only One	Type of Plan		Name of RUWMP or Regional Alliance *if applicable* (select from drop down list)
☑	**Individual UWMP**		
	☐	Water Supplier is also a member of a RUWMP	
	☐	Water Supplier is also a member of a Regional Alliance	
☐	**Regional Urban Water Management Plan (RUWMP)**		

2.4 FISCAL OR CALENDAR YEAR AND UNITS OF MEASURE

The City is a water retailer, and MID is the City's water wholesaler.

This Joint 2020 UWMP has been prepared on a calendar year basis, with the calendar year starting on January 1 and ending on December 31 of each year. Water use and planning data for the entire calendar year of 2020 has been included.

Water volumes in this Joint 2020 UWMP are reported in units of AF.

The City and MID's reporting methods for this Joint 2020 UWMP are summarized in Table 2-3.

Table 2-3. Supplier Identification (DWR Table 2-3)

Type of Supplier (select one or both)	
☑	Supplier is a wholesaler
☑	Supplier is a retailer
Fiscal or Calendar Year (select one)	
☑	UWMP Tables are in calendar years
☐	UWMP Tables are in fiscal years
If using fiscal years provide month and date that the fiscal year begins (mm/dd)	
Units of measure used in UWMP * (select from drop down)	
Unit	AF
**** Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.*	

2.5 COORDINATION AND OUTREACH

This section includes a discussion of the City and MID's inter-agency coordination and coordination with the general public. The Act requires the City and MID to coordinate the preparation of their plan with other appropriate agencies and all departments within the City, including other water suppliers that share a common source, water management agencies, and relevant public agencies. These agencies, as well as the public, participated in the coordination and preparation of this Joint 2020 UWMP and are summarized below.

2.5.1 Wholesale and Retail Coordination

The City is the primary domestic water purveyor in Stanislaus County, serving not only the City of Modesto but also the communities of Del Rio, Empire, Salida, Grayson, and parts of Ceres and Turlock.

In accordance with CWC Section 10631, the City and MID have informed each other of projected water use for the period from 2021 to 2045, as summarized in Table 2-4 and Table 2-5.

Table 2-4. Water Supplier Information Exchange (DWR Table 2-4 Retail)

The retail Supplier has informed the following wholesale supplier(s) of projected water use in accordance with Water Code Section 10631.
Wholesale Water Supplier Name
Modesto Irrigation District (MID)

Table 2-5. Water Supplier Information Exchange (DWR Table 2-4 Wholesale)

☐	Supplier has informed more than 10 other water suppliers of water supplies available in accordance with Water Code Section 10631. Completion of the table below is optional. If not completed, include a list of the water suppliers that were informed.
	Provide page number for location of the list.
☑	Supplier has informed 10 or fewer other water suppliers of water supplies available in accordance with Water Code Section 10631. **Complete the table below.**
Water Supplier Name	
City of Modesto	

2.5.2 Coordination with Other Agencies and the Community

The City and MID coordinated the preparation of this Joint 2020 UWMP with other agencies as discussed further in Chapter 10 of this plan.

The City and MID actively encourage community participation in water management activities and specific water-related projects.

The City's public participation program includes both active and passive means of obtaining input from the community, such as mailings, public meetings, and web-based communication. The City's website describes on-going projects and posts announcements of planned rate increases to fund these water projects.

MID provides educational videos on water to classrooms within the District free of charge. MID's website solicits public comment on water projects, as well as providing public information.

As part of the Joint 2020 UWMP development, the City and MID facilitated a public review period. Public noticing, pursuant to Section 6066 of the Government Code, was conducted prior to commencement of a public comment period. Public hearing notices are included in Appendix D of this plan. During the public comment period, the Draft Joint 2020 UWMP was made available at the City's Utilities Department and at the MID Board Secretary's Office, as well as on the City and MID websites.

The public hearings provided an opportunity for all water users and the general public to become familiar with the Joint 2020 UWMP and ask questions about the City and MID's water supply, in addition to their continuing plans for providing a reliable, safe, high-quality water supply.

2.5.3 Notice to Cities and Counties

CWC Section 10621 (b) requires agencies to notify the cities and counties to which they serve water at least 60 days in advance of the public hearing that the plan is being updated and reviewed. In November 2020, a notice of preparation was sent to the cities and counties served by the City and MID, and other stakeholders, to inform them of the UWMP update process and schedule, and to solicit input for the Joint 2020 UWMP. The notifications to cities and counties, the public hearing notifications, and the public hearing and adoption are discussed in Chapter 10 of this plan.

CHAPTER 3
System Description

This chapter provides a general description of the City and MID water service areas and includes a summary of water system facilities, climate, population associated with municipal water use, and land uses within the municipal water service area.

3.1 GENERAL DESCRIPTION

The City and MID are located in the heart of the San Joaquin Valley, approximately 90 miles southeast of the San Francisco Bay Area and 77 miles south of the City of Sacramento, as shown on Figure 3-1. The City and MID's water service areas are located in Stanislaus County. The City of Modesto is the largest incorporated city in Stanislaus County (County) and accounts for approximately 40 percent of the County's population.

3.2 SERVICE AREA DESCRIPTION

The following sections briefly describe the geographical service area boundaries, water supplies, and water system facilities for the City and MID water systems.

3.2.1 Geographical Boundaries

Jurisdictional water service area boundaries for the City and MID are shown on Figure 3-2 and Figure 3-3, respectively.

3.2.1.1 City Service Area

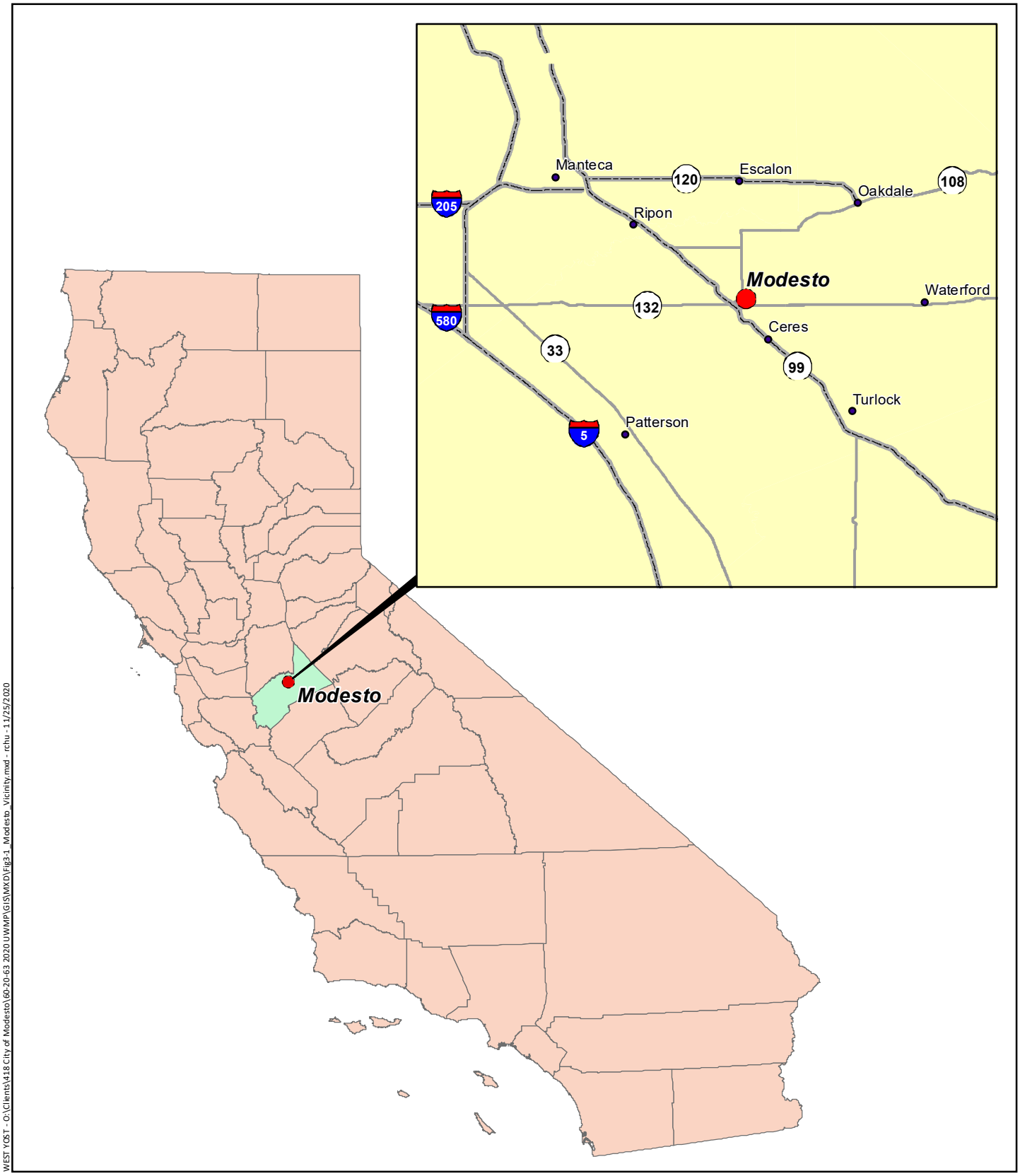
The City's service area consists of one large "contiguous" service area and several "outlying" non-contiguous service areas. The central contiguous service area is primarily defined by the City's current sphere of influence (SOI) and includes Modesto, Salida, portions of North Ceres, and several unincorporated Stanislaus County "islands." These County islands include Empire, Bret Harte, and West Modesto, among several others. The outlying service areas are not contiguous to the central service area and include Grayson, Del Rio, Ceres (Walnut Manor), and portions of Turlock. The City also serves potable water to the Jennings Wastewater Treatment Plant (WWTP) via a groundwater well located at the plant.

3.2.1.2 MID Service Area

MID is primarily an agricultural water supplier. Although treated water is provided to the City for urban delivery, MID does not directly serve any retail (municipal) water customers. The place of use for MID treated water is defined by the overlap of the MID water service area boundary with the City's service area north of the Tuolumne River. The common City and MID water service area excludes those areas served by the City of Modesto which lie outside the MID water service boundary; these excluded areas generally include the communities of Del Rio, Grayson, parts of Ceres and Turlock, and parts of the City's service area located south of the Tuolumne River.

3.2.2 Water Supply Overview

The City has been providing potable water service to its urban area since 1895 through the purchase and acquisition of several private water companies. Until 1995, the sole source of water supply to the City was groundwater pumped from the San Joaquin Valley Groundwater Basin. In the early 1990s, the City, MID, and the former Del Este Water Company formed a partnership to use a portion of MID's surface water supplies for municipal water use. This shift to surface water supply has allowed the City to stabilize groundwater pumping rates to allow for groundwater aquifer recovery.



WEST YOST - O:\Clients\418 City of Modesto\60-20-63 2020 UWMP\GIS\MXD\Fig3-1_Modesto_Vicinity.mxd - rchu - 11/25/2020

Legend

- Modesto
- Stanislaus County
- California Counties

N

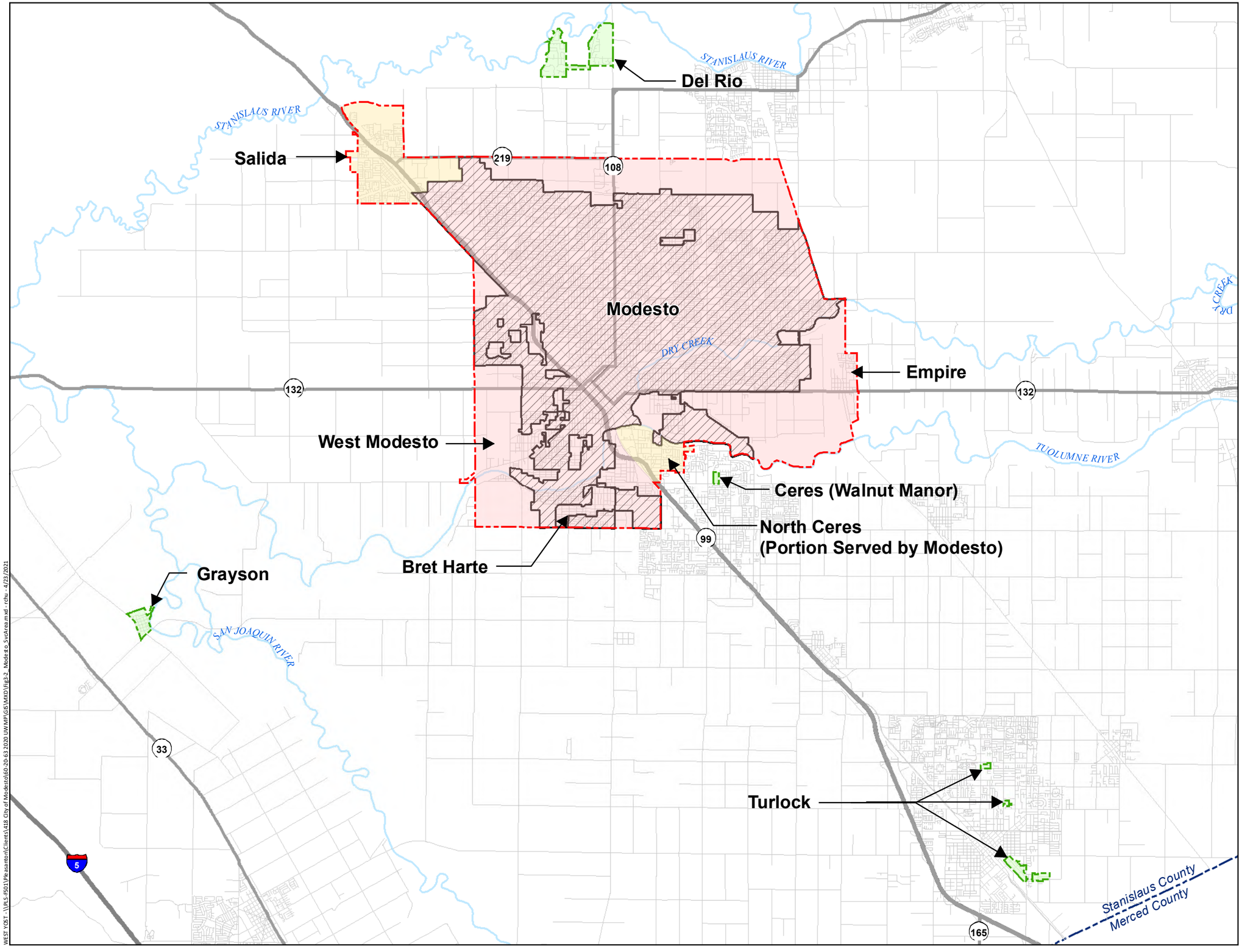
0 50 100

Scale in Miles

Figure 3-1

Modesto Vicinity Map

City of Modesto/MID
Joint 2020 UWMP



Notes:
1. Sphere of influence boundary obtained from the City on 11/6/2014.
2. The City's contiguous service area is co-terminus with the City's SOI boundary except for the Salida and North Ceres areas.
3. City limit boundary based on County GIS data downloaded on October 6, 2014.

WEST YOST - \\PLS-FS01\Pleasanton\Clients\418 City of Modesto\60-20-63 2020 UWMP\GIS\MXD\Fig3-2_Modesto_SvcAreas.mxd - rchu - 4/23/2021

MODESTO CALIFORNIA

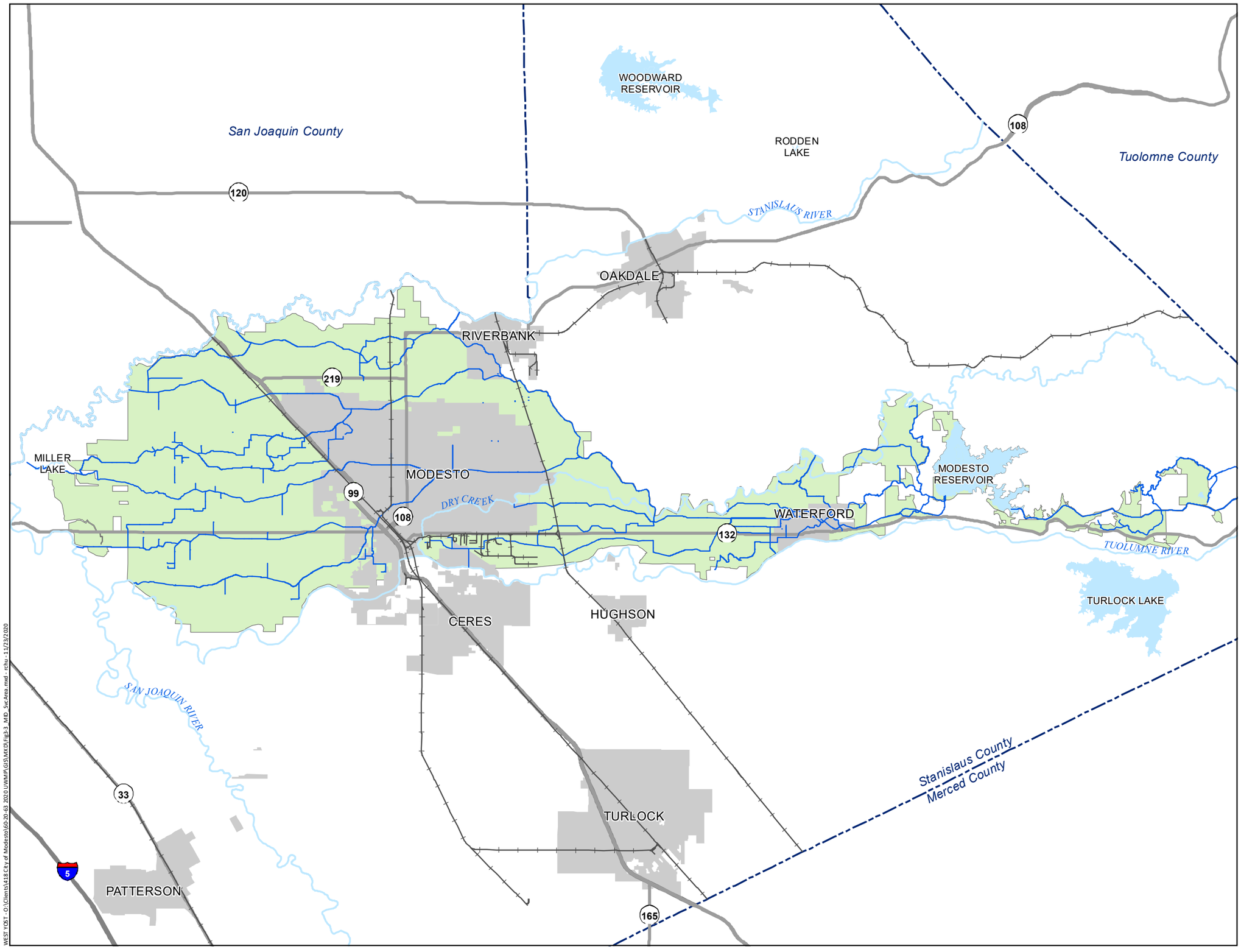
MID Modesto Irrigation District Water and Power

WEST YOST

Figure 3-2

City of Modesto Water Service Areas

City of Modesto/MID
Joint 2020 UWMP



Legend

- MID Service Boundary
- City
- MID Pipeline/Lateral/Crossing
- Railroad

Notes:
1. Source: Modesto Irrigation District.

WEST YOST - O:\Clients\418 City of Modesto\60-29-83 2020 UWMP\GIS\MXD\Fig3-3_MID_SvcArea.mxd - rchu - 11/23/2020

MODESTO CALIFORNIA

MID Modesto Irrigation District Water and Power

WEST YOST

Figure 3-3

MID
Water Service Area

City of Modesto/MID
Joint 2020 UWMP

MID was formed as the second irrigation district in California in 1887. Since that time, MID has developed numerous water rights and facilities to provide agricultural irrigation water from the Tuolumne River. MID has also developed groundwater supplies for agricultural uses. For the current and projected planning timeframe in this Joint 2020 UWMP, it is assumed that MID would only provide wholesale treated surface water to the City for municipal use within the City's contiguous service area located north of the Tuolumne River.

3.2.3 Water System Facilities

This section describes water facilities that supply and deliver urban water to the City's service area. As described above, MID is primarily an agricultural water supplier and operates extensive facilities to deliver agricultural water supplies. These facilities, although not described below, include a complex network of canals, pipelines, pumps, drainage features, and control structures.

3.2.3.1 Surface Water Supply

In the early 1990s, the City, MID, and the former Del Este Water Company (acquired by the City in 1995) formed the Modesto Domestic Water Partnership to use a portion of MID's surface water rights for municipal uses. This partnership entered into a Treatment and Delivery Agreement (TDA) to cover the design, construction, operation (i.e., governing delivery of treated surface water from MID to the City), and financing for the Initial Phase (Phase One) of the Modesto Regional Water Treatment Plant (MRWTP). This new surface water treatment plant, along with associated storage and delivery facilities, became operational in 1995, and the City has purchased wholesale treated surface water from MID since.

The MRWTP is owned and operated by MID and per the original TDA, delivers a total annual supply of up to 33,600 AFY to the City. This treated surface water supply from MID, coupled with the available groundwater supply (together termed a "conjunctive supply"), is used to meet the City's water supply needs for municipal customers in the contiguous service area located north of the Tuolumne River (this is the southern boundary of the MID service area).

The MRWTP Phase Two Expansion project was completed in 2016 and provides the City with the ability to receive a total annual supply of up to 67,200 AFY. It should be noted that the total supply (67,200 AFY) is based on normal and wet year annual averages. The delivery of Phase One and Phase Two treated surface water is governed by the October 2005 Amended and Restated TDA (ARTDA), which includes formulas to determine supply reductions during dry years.

3.2.3.2 Groundwater Supply

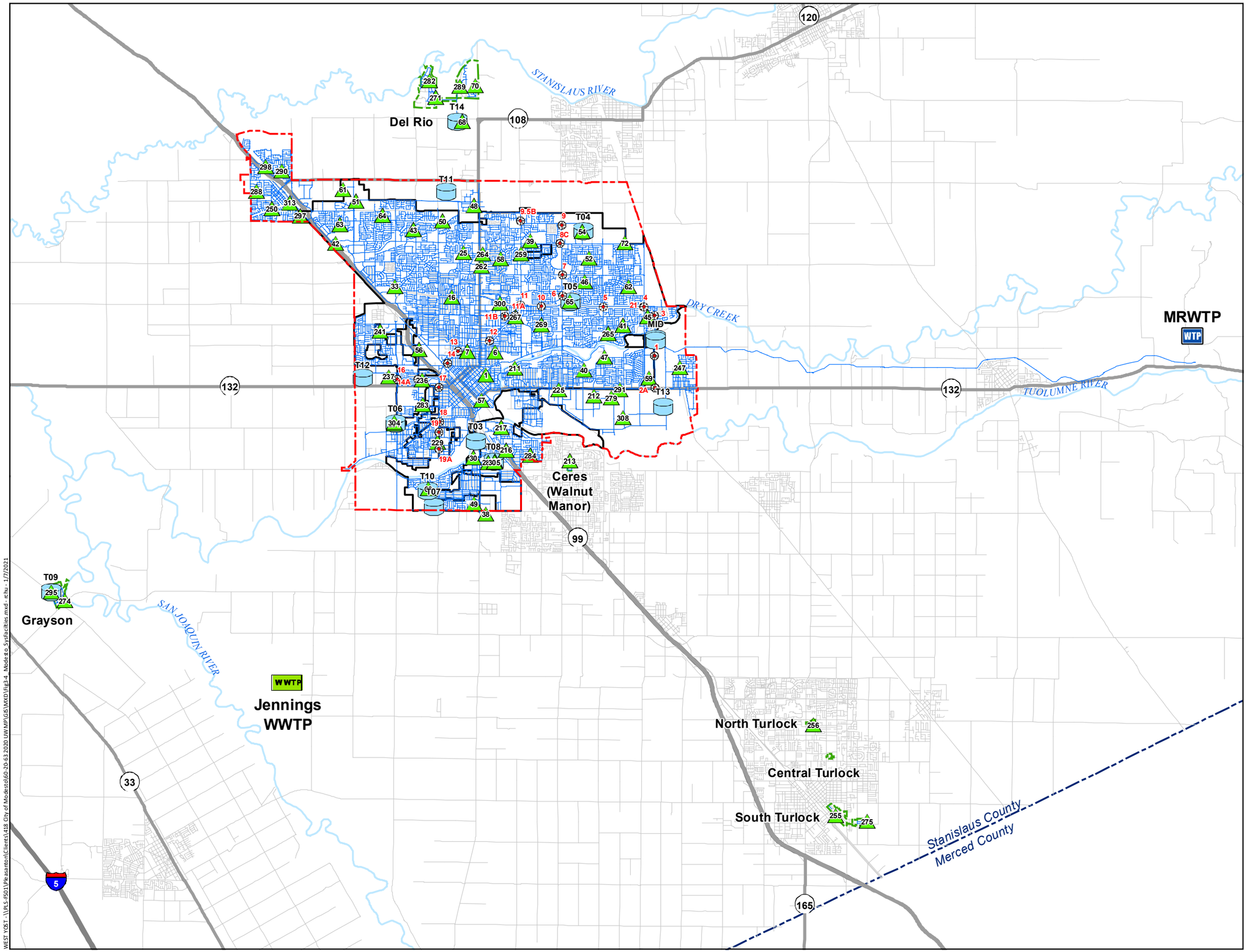
The City's groundwater supply wells are located throughout the contiguous and outlying service areas, but all are within the San Joaquin Valley Groundwater Basin (Modesto, Turlock, and Delta-Mendota subbasins). Residents within the contiguous service area north of the Tuolumne River (North Modesto, Salida, and Empire) generally rely on treated surface water supply from MID year-round and are supplemented with groundwater to meet increased water demands (primarily in the summer months). Water demands from the contiguous service area located south of the Tuolumne River (South Modesto) and the outlying service areas are met exclusively with groundwater supply year-round. The City currently has 89 active groundwater wells (including six wells for non-potable uses and two wells on standby) to serve both the contiguous and outlying service areas.

3.2.3.3 Distribution System

The major water distribution system facilities in the City's contiguous and outlying service areas are shown on Figure 3-4.

The City's contiguous service area consists of approximately 900 miles of transmission and distribution pipelines. MID owns and operates a portion of the transmission mains traversing the City, and these transmission mains provide treated surface water through a series of turnouts that can control water supply into the City's water distribution system. The contiguous system is served by the City's groundwater wells and ten at-grade storage tanks with a combined total storage capacity of 32.1 million gallons (MG). Each storage tank has a booster pump station to pump water from the tank into the distribution system. There are also two 5.0 MG MRWTP reservoirs (10.0 MG total) that are owned and operated by MID which deliver treated water from MID to downstream transmission mains.

The City's outlying service areas are served by groundwater wells located in each of the outlying service areas. The Grayson service area has an at-grade storage tank (0.16 MG of available storage) and booster pump station. Within the Del Rio service area, the City has also nearly completed construction of a new 0.25 MG tank and associated booster pump station, as well as new groundwater Wells 68 and 70. The other outlying service areas are served from existing groundwater wells or connections to neighboring agencies. As noted above, the City also serves potable groundwater to the Jennings WWTP.



0 1.125 2.25

Scale in Miles

Legend

- Modesto Regional Water Treament Plant (MRWTP)
- Jennings Wastewater Treatment Plant
- Active Well
- Tank and Booster Pump Station
- MID Turnout
- Existing Pipeline
- Contiguous Service Area
- Outlying Service Area
- City Limits

Notes:
1. Tier 1 and 2 MID turnouts are shown.
2. City limit boundary based on County GIS data downloaded on October 6, 2014.

MODESTO CALIFORNIA

MID Modesto Irrigation District Water and Power

WEST YOST

Figure 3-4

City of Modesto
Existing Water System Facilities

City of Modesto/MID
Joint 2020 UWMP

WEST YOST - \\PLS-FS01\Pleasanton\Clients\418 City of Modesto\60-20-63 2020 UWMP\GIS\MXD\Fig3-4_Modesto_SysFacilities.mxd - rchu - 1/7/2021

3.3 SERVICE AREA CLIMATE

The climate of the City and MID's service areas is best described as Mediterranean, characterized by hot, dry summers and cool winters. This section describes the historical climate and potential effects of climate change.

3.3.1 Historical Climate

Water use is dependent on various climate factors such as temperature, precipitation, and evapotranspiration (ET_o). Climate data, including temperature and precipitation estimates, were obtained for Modesto, California. The period of record was March 1, 1906 to June 9, 2016. ET_o includes plant transpiration and water lost through evaporation from the soil and surface-water bodies. In general, the reference ET_o is given for turf grass, which is then corrected for a specific crop type. Local ET_o data was obtained from California Irrigation Management Information System (CIMIS) monitoring station in West Modesto (Station #71).

The historical climate characteristics affecting water management in the City and MID's service areas are shown in Table 3-1. Precipitation in the area averages about 12.2 inches per year.

Table 3-1. Monthly Average Climate Data Summary

Month	Standard Monthly Average ET_o[(a)], inches	Average Total Rainfall[(b)], inches	Average Temperature[(b)], degrees Fahrenheit	
			Maximum	Minimum
January	1.12	2.44	53.8	37.6
February	1.95	2.07	60.9	40.8
March	3.63	1.93	66.9	43.5
April	5.27	1.03	73.3	46.8
May	6.96	0.46	81.2	51.8
June	7.93	0.13	88.3	56.6
July	7.99	0.02	94.3	60.0
August	6.93	0.04	92.3	58.8
September	5.14	0.17	87.7	56.0
October	3.46	0.63	77.9	49.6
November	1.74	1.24	64.6	41.7
December	1.12	2.05	54.4	37.7
Total	**53.2**	**12.2**	**74.6**	**48.4**

(a) Source: California Irrigation Management Information System (CIMIS) data for Station #71: Modesto (downloaded October 20, 2020).
(b) Source: Western Regional Climate Center data for DWR for Modesto, California (period of record: March 1, 1906 to June 9, 2016).

3.3.2 Potential Effects of Climate Change

The CWC now requires urban water suppliers to account for the impacts of climate change on water supplies and supply reliability. A discussion of the effects of climate change on water demands, supplies, and reliability can be found in Chapter 4 (Water Use Characterization), Chapter 6 (Water Supply Characterization), and Chapter 7 (Water Service Reliability) of this plan. This section summarizes those discussions.

In general, climate change is expected to increase water demand for irrigation and the year-to-year variability of demands. This is the result of increased temperatures (which increases ET_o) and more variability in precipitation (which impacts supply availability and reliability). Also, natural disasters such as wildfires, droughts, and floods are expected to increase in both frequency and intensity.

Responding to climate change generally takes two forms: mitigation and adaptation. Mitigation is taking steps to reduce the contribution to the causes of climate change by reducing greenhouse gas (GHG) emissions. Adaptation is the process of responding to the effects of climate change by modifying systems and behaviors to function in a warmer climate.

In the water sector, climate change mitigation is generally achieved by reducing energy use, increasing energy efficiency, and/or substituting fossil fuel-based energy sources for renewable energy sources where feasible. Because water requires energy to move, treat, use, and discharge, water conservation also results in energy conservation. Adaptation initiatives could include diversification of the City and MID's water supply portfolio, increased conjunctive use, and introduction or expansion of recycled water use. However, as discussed in Chapter 6, secondary treated effluent is either used to irrigate City-owned ranch lands or stored in on-site ponds, and the City delivers tertiary treated recycled water to Del Puerto Water District. Therefore, the City and MID do not have plans to develop recycled water systems within their respective water service boundaries in the future.

3.4 SERVICE AREA POPULATION AND DEMOGRAPHICS

3.4.1 City of Modesto Population

The City has historically been among the fastest growing areas in California. The City's population grew steadily from 1996 through 2004 (at an average rate of 1.8 percent per year). However, since 2005, growth within the City's service area has slowed significantly as a result of the national and statewide economic downturn. Growth from 2010 to 2020 has remained at about one percent per year.

Historical population estimates for the City's water service area are based on Census data from California Department of Finance (DOF) Report E-4, with the 2010 Census Benchmark, where available. Where DOF data are not available (e.g., Turlock and Ceres (Walnut Manor) areas), the population has been estimated based on a count of existing dwelling units served by the City (from aerial photographs and billing data), and an estimated housing density (people per dwelling unit) based on Census data for the surrounding communities.

Based on more recent data utilized by the City's Community and Economic Development Department, it is assumed that future growth in a significant portion of the contiguous service area will be at an annual rate of approximately one percent. The projected 2045 population for the City's contiguous and outlying service areas is estimated at approximately 343,900 people and represents about a 27 percent increase from the current (2020) population. The growth assumptions used to project the population for each portion of the City's water service area are summarized below:

- City of Modesto: Assume a one percent average annual growth rate
- Salida: Assume a one percent average annual growth rate
- Communities of Empire, North Ceres (Bystrom), and Bret Harte: Fully developed; no (or very little) additional growth anticipated
- Community of West Modesto: Assume a 1.7 percent average annual growth rate
- Del Rio: Assume a 2.75 percent average annual growth rate
- Grayson: Assume a 1.3 percent average annual growth rate
- Turlock: Fully developed; no additional growth anticipated
- Ceres (Walnut Manor): Fully developed; no additional growth anticipated

Table 3-2 summarizes the current and projected population for the City's contiguous and outlying service areas.

Table 3-2. Population – Current and Projected (DWR Table 3-1 Retail)

Population Served	2020	2025	2030	2035	2040	2045*(opt)*
	270,974	284,959	298,631	312,995	328,072	343,892
NOTES: Projected population (2025-2045) based on CA Department of Finance data for incorporated areas and estimates based on served housing units and housing occupancy from the US Census for other areas.						

3.4.2 MID Population

As stated previously, MID does not directly serve any municipal water customers, and does not plan to do so in the future, as summarized in Table 3-3.

Table 3-3. Population – Current and Projected (DWR Table 3-1 Wholesale)

Population Served	2020	2025	2030	2035	2040	2045*(opt)*
	0	0	0	0	0	0
NOTES: MID does not directly serve any urban water customers. The population served by MID wholesale water is included in the City's total service area population (see DWR Table 3-1 Retail).						

3.4.3 Other Social, Economic, and Demographic Factors

The State now requires the inclusion of service area socioeconomic information as part of the system description in UWMPs. However, differences in household water use across sociodemographic groups in the City have not been studied, nor does the City differentiate water management based on sociodemographic factors. To comply with the new regulation, the following social, economic, and demographic information from the US Census Bureau[1] is provided. Information is for the five-year period from 2014 to 2018:

- The average number of people per household was 2.89.
- The median household income was $57,233.
- The unemployment rate was 6.2 percent.
- The owner-occupied housing unit rate was 55.0 percent, with a median home value of $265,100.
- The median gross rent was $1,122 per month.
- The median age was 35.6 years.
- Of persons 25 years or older, 82.1 percent had earned at least a high school diploma or equivalent, and 18.9 percent had earned a bachelor's degree or higher.
- Of persons under 65 years of age, 10.1 percent had a disability and 7.8 percent did not have health insurance.
- Over 91 percent of households had a computer, and 84.2 percent had a broadband internet subscription.
- By race/ethnicity, 74.2 percent of people were White, 4.3 percent were Black, 0.9 percent were American Indian or Alaska Native, 7.3 percent were Asian, 1.2 percent were Hawaiian Native or Pacific Islander, 4.4 percent were two or more races, and 7.8 percent were some other race.
- Approximately 38.9 percent of people were Hispanic or Latino (i.e., of Hispanic origin), while 61.1 percent were not of Hispanic origin.
- 18 percent of residents were foreign born, and 36.3 percent of people age five years and older spoke a language other than English at home.

3.5 LAND USES WITHIN SERVICE AREA

Existing and future land uses within the City's water service area are currently specified in its Urban Area General Plan, which was adopted in 2019. A previous iteration of the General Plan land use diagram was used in the City's 2017 WMP to develop future water demand projections, which will be referenced throughout this Joint 2020 UWMP. The land use diagram in the current Urban Area General Plan is similar to the land use diagram used in the 2017 WMP.

[1] United States Census Bureau. American Community Survey, 2014-2018 ACS 5-Year Data Profile for Modesto, California.

3.5.1 Existing Land Uses within Service Area

Most of the City's existing water service area consists of residential land use, including most customers in Del Rio, Grayson, Ceres (Walnut Manor), and portions of Turlock. Industrial land use is concentrated in the southeast region of the contiguous service area, while commercial and mixed use land uses are spread throughout the contiguous service area.

3.5.2 Future Land Uses within Service Area

The 2017 WMP identifies approximately 11,000 acres of vacant parcels within the contiguous service area, with over 90 percent of the vacant acreage located in North Modesto and the remainder in South Modesto. Future water demands assume the development of these vacant parcels, whose General Plan land use designations are mostly Business Park, Village Residential, Residential, or Industrial.

For the outlying service areas, some residential development is expected in Del Rio, along with minimal residential and commercial development in Grayson. Ceres (Walnut Manor) and the portions of Turlock served by the City are fully developed.

CHAPTER 4
Water Use Characterization

This chapter describes and quantifies the City and MID's past, current, and projected water use. Water demand projections are based on the projected growth from new development within the City's water service area. Accurately tracking and reporting current water demands allows the City to properly analyze water use and better forecast future demands.

4.1 NON-POTABLE VERSUS POTABLE WATER USE

The City purchases potable water from MID and treats pumped groundwater to potable water standards. Potable water is water that is safe to drink and typically has had various levels of treatment and disinfection.

Non-potable water is not safe to drink and includes both recycled water and raw water. Recycled water is municipal wastewater that has been treated to a specified quality that allows for re-use. Raw water is untreated water that is used in its natural state or with minimal treatment. While the City does not deliver raw water to any customers in its water service area, the City currently uses cannery wastewater and/or secondary treated recycled water for agricultural irrigation of roughly 2,500 acres of fodder and feed crops on City-owned land.

Due to geographical and financial constraints to supply tertiary recycled water inside the City's water service area, the City has implemented the North Valley Regional Recycled Water Program to supply tertiary treated recycled water to the neighboring Del Puerto Water District. Therefore, the City does not currently use recycled water to offset potable water use in its water service area, nor does it anticipate doing so in the future.

4.2 WATER USE BY SECTOR

This section describes the City and MID's past, current, and projected water use by sector through the year 2045. The following classifications were used to analyze current consumption patterns among various types of customers. The City and MID use the same definitions for each sector as outlined in the DWR Guidebook:

- **Single-family residential**: A single-family dwelling unit. A lot with a free-standing building containing one dwelling unit that may include a detached secondary dwelling.
- **Multi-family residential**: Multiple dwelling units contained within one building or several buildings within one complex.
- **Commercial**: A water user that provides or distributes a product or service (CWC 10608.12(d)).
- **Industrial**: A water user that is primarily a manufacturer or processor of materials as defined by the North American Industry Classification System (NAICS) code sectors 31 to 33, inclusive, or an entity that is a water user primarily engaged in research and development (CWC 10608.12(h)).
- **Institutional (and Governmental)**: A water user dedicated to public service. This type of user includes, among other users, higher education institutions, schools, courts, churches, hospitals, government facilities, and nonprofit research institutions (CWC 10608.12(i)).
- **Landscape**: Water connections supplying water solely for landscape irrigation. Such landscapes may be associated with multi-family, commercial, industrial, or institutional/governmental sites but are considered a separate water use sector if the connection is solely for landscape irrigation.

- **Sales to other agencies**: Water sales made to another agency. Projected sales may be based on projected water demand provided by the receiving agency. There is inherent uncertainty in future demand projections, therefore, any projected sales reported in the UWMP are for planning purposes only and are not considered a commitment on the part of the seller.
- **Groundwater recharge**: The managed and intentional replenishment of natural groundwater supplies using man-made conveyances such as filtration basins or injection wells. This includes water used for groundwater banking or storage.
- **Saline water intrusion barriers**: Injection of water into a freshwater aquifer to prevent the intrusion of saltwater.
- **Agricultural**: Water used for commercial agricultural irrigation.
- **Other**: Any other water demand that is not adequately described by the water sectors defined above.
- **Distribution System Losses**: The difference between the actual volume of water treated and delivered into the distribution system and the actual metered consumption.

4.2.1 Historical Water Use

Table 4-1 summarizes the City and MID's past urban water use by sector and overall. These historical volumes are consistent with those presented in the 2015 UWMP.

Table 4-1. Historical Water Use by Sector

Water Use Sector	2015 Actual Volume, AFY	
	City[(a)]	MID[(b)]
Single Family	20,203	0
Multi-Family	4,710	0
Commercial	7,537	0
Industrial	2,728	0
Institutional/Governmental	1,486	0
Landscape	1,744	0
Sales to Other Agencies	0	15,401
Other – Unmetered Water Uses	4,305	0
Losses	4,746	31
Total	**47,459**	**15,432**

(a) Volumes do not include production from Hickman and Waterford service areas.

(b) MID does not directly serve municipal water users. The volumes reported above reflect deliveries to the City and losses identified in MID's 2015 Water Loss Audit.

4.2.2 Current Water Use

The City's actual potable water demands for the 2020 calendar year are reported in Table 4-2. Losses are estimated at ten percent of City production, which is consistent with the City's 2015 UWMP. There are no existing water uses for saline barriers, groundwater recharge or agriculture within the City's water service area.

Table 4-2. Demands for Potable and Non-Potable Water – Actual (DWR Table 4-1 Retail)

Use Type	2020 Actual		
Drop down list May select each use multiple times These are the only Use Types that will be recognized by the WUEdata online submittal tool	Additional Description (as needed)	Level of Treatment When Delivered Drop down list	Volume*
Single Family		Drinking Water	27,081
Multi-Family		Drinking Water	5,420
Commercial		Drinking Water	8,110
Industrial		Drinking Water	2,115
Institutional/Governmental		Drinking Water	1,933
Landscape		Drinking Water	2,520
Other Potable	Unmetered water uses	Drinking Water	615
Losses		Drinking Water	5,310
		TOTAL	53,104
**** Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.*			
NOTES: Volumes are in AF; volumes do not include demands from Hickman and Waterford.			

MID has never delivered potable, raw, or recycled water directly to urban customers and does not plan to do so. The actual volume of water MID sold to the City for the 2020 calendar year is reported in Table 4-3.

Table 4-3. Demands for Potable and Non-Potable Water – Actual (DWR Table 4-1 Wholesale)

Use Type	2020 Actual		
Drop down list May select each use multiple times These are the only use types that will be recognized by the WUE data online submittal tool	Additional Description (as needed)	Level of Treatment When Delivered Drop down list	Volume*
Sales to other agencies	City of Modesto	Drinking Water	26,053
Losses		Drinking Water	52
		TOTAL	26,105
**** Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.*			
NOTES: Volumes are in AF and from MID's 2020 Water Audit.			

4.2.3 Projected Water Use

This section presents water demand projections for the City's water service area in five-year increments through 2045 (i.e., a 25-year planning horizon) and annually from 2021 through 2025. Water demand projections in this plan are adapted from the City's 2017 WMP, which is based on developing remaining vacant land in the City's water service area by buildout. Since recent actual demands have been lower than the City's 2017 WMP projections, this plan has reduced the City's 2017 WMP projections by 15 percent to reflect more recent and projected water use trends.

4.2.3.1 25-Year Planning Horizon

Table 4-4 reports the City's projected potable water demands through the year 2045, while Table 4-5 summarizes the City's actual demands and projected water use, along with recycled water demands reported in Chapter 6. As noted previously, no recycled water demands are projected for the City's water service area. There are also no projected water uses for saline barriers, groundwater recharge or agriculture within the City's water service area.

Table 4-4. Use for Potable and Non-Potable Water – Projected (DWR Table 4-2 Retail)

Use Type Drop down list May select each use multiple times These are the only Use Types that will be recognized by the WUEdata online submittal tool	Additional Description (as needed)	Projected Water Use* *Report To the Extent that Records are Available*				
		2025	2030	2035	2040	2045 (opt)
Single Family		33,204	35,614	38,025	40,436	42,846
Multi-Family		6,498	6,970	7,442	7,913	8,385
Commercial		9,723	10,429	11,135	11,841	12,546
Industrial		2,536	2,720	2,904	3,088	3,273
Institutional/Governmental		2,318	2,486	2,654	2,822	2,991
Landscape		3,021	3,241	3,460	3,679	3,899
Losses		6,367	6,829	7,291	7,753	8,216
TOTAL		63,666	68,289	72,911	77,533	82,156

***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES: Volumes are in AF. Demand projections are from the City's 2017 Water Master Plan but have been reduced 15 percent to better align with recent actual demands.

Table 4-5. Total Gross Water Use (Potable and Non-Potable) (DWR Table 4-3 Retail)

	2020	2025	2030	2035	2040	2045 (opt)
Potable Water, Raw, Other Non-potable *From Tables 4-1R and 4-2 R*	53,104	63,666	68,289	72,911	77,533	82,156
Recycled Water Demand[1] *From Table 6-4*	0	0	0	0	0	0
Optional Deduction of Recycled Water Put Into Long-Term Storage[2]	0	0	0	0	0	0
TOTAL WATER USE	53,104	63,666	68,289	72,911	77,533	82,156

[1] Recycled water demand fields will be blank until Table 6-4 is complete

*[2] Long term storage means water placed into groundwater or surface storage that is not removed from storage in the same year. Supplier **may** deduct recycled water placed in long-term storage from their reported demand. This value is manually entered into Table 4-3.*

NOTES: Volumes are in AF.

MID's projected urban water demands (i.e., sales to the City) through the year 2045 are reported in Table 4-6. Table 4-7 summarizes the actual demands and projected water use. As noted previously, MID has never delivered recycled water directly to urban customers and does not plan to do so.

Table 4-6. Use for Potable and Raw Water – Projected (DWR Table 4-2 Wholesale)

Use Type	Additional Description (as needed)	Projected Water Use * Report To the Extent that Records are Available				
Drop down list May select each use multiple times These are the only Use Types that will be recognized by the WUEdata online submittal tool.		2025	2030	2035	2040	2045 (opt)
Sales to other agencies	City of Modesto	39,200	44,800	50,400	56,000	61,600
TOTAL		39,200	44,800	50,400	56,000	61,600
**** Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.*						
NOTES: Volumes are in AF. Assumes supply from MRWTP Phase Two Expansion will increase linearly between 2020 and 2050. Treated surface water supplies shown above are approximations based off of demand. Any and all treated surface water to be provided shall be in accordance with the ARTDA.						

Table 4-7. Total Water Use (Potable and Non-Potable) (DWR Table 4-3 Wholesale)

	2020	2025	2030	2035	2040	2045 (opt)
Potable and Raw Water From Tables 4-1W and 4-2W	26,105	39,200	44,800	50,400	56,000	61,600
Recycled Water Demand* From Table 6-4W	0	0	0	0	0	0
TOTAL WATER DEMAND	26,105	39,200	44,800	50,400	56,000	61,600
**Recycled water demand fields will be blank until Table 6-4 is complete.*						
NOTES: Volumes are in AF.						

4.2.3.2 Characteristic Five-Year Water Use

CWC Section 10635(b) requires urban suppliers to include a five-year Drought Risk Assessment (DRA) in their 2020 UWMP. A key component of the DRA is estimating demands for the next five years (2021-2025) without drought conditions (i.e., unconstrained demand). Chapter 7 details the DRA, but the five-year demand projections are summarized in Table 4-8 by water use sector. These projections were developed by linearly interpolating between actual 2020 demands and 2025 demand projections presented in Table 4-4.

Table 4-8. Projected Water Demands for Drought Risk Assessment

Water Use Sector	Water Demands[(a)], AFY				
	2021	2022	2023	2024	2025
Single Family	28,797	29,899	31,000	32,102	33,204
Multi-Family	5,636	5,851	6,067	6,282	6,498
Commercial	8,432	8,755	9,078	9,400	9,723
Industrial	2,200	2,284	2,368	2,452	2,536
Institutional/Governmental	2,010	2,087	2,164	2,241	2,318
Landscape	2,620	2,721	2,821	2,921	3,021
Losses	5,522	5,733	5,944	6,155	6,367
Total	**55,216**	**57,329**	**59,441**	**61,554**	**63,666**

(a) Demand projections for 2021-2024 are based on linear interpolation of actual 2020 demands presented in Table 4-2 and 2025 demand projections presented in Table 4-4.

4.3 DISTRIBUTION SYSTEM WATER LOSSES

System losses are the difference between the actual volume of water treated and delivered into the distribution system and the actual metered consumption. Such apparent losses are always present in a water system due to pipe leaks, unauthorized connections or use, faulty meters, unmetered services (e.g., fire protection and training), and system and street flushing.

New regulations require retail water suppliers to include potable distribution system water losses for the preceding five years (to the extent records are available). The City estimates its water losses on a fiscal year basis, with the fiscal year beginning July 1st and ending June 30th of the following year. For the City's water service area, the estimated system losses (i.e., the difference between the production and sales) for the preceding five fiscal years (2015/2016 through 2019/2020) are summarized in Table 4-9. Water loss reporting accuracy will be improved when the City finishes implementing metering citywide. The completion of the City's meter retrofit program is expected to be in 2022.

At the time of preparation of this plan, DWR and the State Water Resources Control Board were in the process of adopting water loss standards. This is discussed further in Chapter 9.

Table 4-9. Last Five Years of Water Loss Audit Reporting (DWR Table 4-4 Retail)

Reporting Period Start Date (mm/yyyy)	Volume of Water Loss [1,2]
07/2015	8,779
07/2016	7,519
07/2017	9,532
07/2018	8,313
07/2019	9,024
[1] Taken from the field "Water Losses" (a combination of apparent losses and real losses) from the AWWA worksheet. *[2] **Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*	
NOTES: Volumes are in AF. A copy of the City of Modesto's latest Water Audit is provided in Appendix E.	

MID does not directly serve any municipal water customers and therefore has no water distribution system losses. However, MID does have some losses within its transmission system, which are reflected in their water loss audit reporting, as shown in Table 4-10.

Table 4-10. Last Five Years of Water Loss Audit Reporting (DWR Table 4-4 Wholesale)

Reporting Period Start Date (mm/yyyy)	Volume of Water Loss [1,2]
01/2020	52
[1] Taken from the field "Water Losses" (a combination of apparent losses and real losses) from the AWWA worksheet. *[2] **Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*	
NOTES: Volumes are in AF. A copy of MID's 2020 Water Audit is provided in Appendix E.	

Copies of the City's and MID's most recent Water Loss Audit worksheets are provided in Appendix E.

4.4 ESTIMATING FUTURE WATER SAVINGS

The water use projections presented in Table 4-5 are based on land use projections within the City's water service area (2019 Urban Area General Plan) and are described further in the City's 2017 WMP. Additional water savings from codes, standards, ordinances, or transportation and land use plans, also known as passive savings, can decrease the water use for new and future customers. However, as shown in Table 4-11 below, these potential passive savings have not been included in the City's water demand projections.

Table 4-11 also indicates that lower income residential demands are included in the City's water demand projections. This is detailed in Section 4.5.

Table 4-11. Inclusion in Water Use Projections (DWR Table 4-5 Retail)

Are Future Water Savings Included in Projections? (Refer to Appendix K of UWMP Guidebook) *Drop down list (y/n)*	No
If "Yes" to above, state the section or page number, in the cell to the right, where citations of the codes, ordinances, or otherwise are utilized in demand projections are found.	
Are Lower Income Residential Demands Included In Projections? *Drop down list (y/n)*	Yes

4.5 WATER USE FOR LOWER INCOME HOUSEHOLDS

SB 1087 (2006) requires that water providers develop written policies prioritizing development that includes affordable housing to low income households (Government Code Section 65589.7). The City passed Resolution 2006-508 on August 8, 2006, adopting written procedures to uphold this legislation.

The projected water demands shown in Table 4-4 include water use for single family and multi-family residential housing needed for low-income households, as identified in the City's Housing Element. A lower income household is defined as a household that has an income below 80 percent of the Area Median Income (AMI), adjusted for family size. According to the City's Housing Element (2015-2023), in 2013 approximately 38 percent of the City's households had incomes below 80 percent of the AMI.

Therefore, it is estimated that approximately 38 percent of the City's water demands are attributed to low income households. Table 4-12 presents the projected water demands for low income single family and multi-family residential households.

Table 4-12. Projected Water Demands for Lower Income Households

Water Use Sector	Water Demands for Low Income Households[(a)], AFY				
	2025	2030	2035	2040	2045
Single Family	12,617	13,533	14,450	15,366	16,282
Multi-Family	2,469	2,649	2,828	3,007	3,186
Total	**15,087**	**16,182**	**17,277**	**18,373**	**19,468**

(a) Based on data from the City's Housing Element indicating that approximately 38 percent of households in the City's water service area are classified as low income.

4.6 CLIMATE CHANGE CONSIDERATIONS

The City's water demand and use patterns may be impacted by climate change. Warmer temperatures are expected to increase irrigation demand and lengthen the growing season. In addition, climate change may increase the frequency and intensity of wildfires, which would increase the fire industry's water demands.

A general discussion regarding the potential impacts of climate change on the City and MID's water supplies is provided in Chapter 6.

CHAPTER 5
SB X7-7 Baselines, Targets, and 2020 Compliance

In November 2009, Senate Bill X7-7 (SB X7-7), also known as the Water Conservation Act of 2009, was signed into law as part of a comprehensive water legislation package. This legislation addressed both urban and agricultural water conservation and set a goal of achieving a 20 percent statewide reduction in urban per capita water use by December 31, 2020 (i.e., "20 by 2020"). To meet the urban water use target requirement, each retail supplier was required to determine its baseline water use, as well as its target water use for the year 2020. Water use is measured in gallons per capita per day (GPCD).

Wholesale water suppliers are not required to establish and meet baselines and targets for daily per capita water use, nor are wholesalers required to complete the SB X7-7 Compliance Form. However, wholesale agencies are required to provide an assessment of present and proposed programs and policies that will help the retail water supplier achieve their SB X7-7 water use reduction targets. A discussion of MID's programs and policies for water conservation is provided in Chapter 9 of this plan. Therefore, the remainder of this chapter will only focus on SB X7-7 baselines and targets for the City's retail water service area.

This chapter provides a review of the methodology the City used to calculate its 2020 Urban Water Use Target (2020 Target), its baseline, and how the baseline was calculated. The City calculated baselines and targets on an individual reporting basis in accordance with SB X7-7 legislation requirements and DWR's *Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use* (2016) (DWR's Methodologies).

This chapter demonstrates that the City has achieved and exceeded its 2020 Target. Compliance with the urban water use target requirement is verified in the SB X7-7 2020 Compliance Form, which is included as Appendix F in this plan.

5.1 OVERVIEW AND BACKGROUND

The City's compliance with SB X7-7 was first addressed in the City's 2010 UWMP, in which the City determined its baseline per capita water use and established and adopted its urban water use targets for 2015 and 2020. Actual water use data and DOF population estimates were used to calculate GPCD water use.

SB X7-7 included a provision that an urban water supplier may update its 2020 Target in its 2015 UWMP and may use a different target method than was used in 2010. Also, the SB X7-7 methodologies developed by DWR in 2011 noted that water suppliers may revise population estimates for baseline years when the 2010 Census information became available.

The 2010 Census data was not finalized until 2012. In its 2015 UWMP, the City updated its population, baselines, and targets to reflect 2010 Census data and to remove historical data for Hickman and Waterford, which the City stopped serving in 2015. The City demonstrated that it successfully achieved its 2015 interim target and confirmed its 2020 Target in its 2015 UWMP.

In this plan, the City verifies that it achieved its 2020 target per capita water use.

5.2 GENERAL REQUIREMENTS FOR BASELINE AND TARGETS

SB X7-7 required each urban water retailer to determine its baseline daily per capita water use over a 10-year or 15-year baseline period. The 10-year baseline period is defined as a continuous 10-year period ending no earlier than December 31, 2004 and no later than December 31, 2010. SB X7-7 also defined that urban water retailers that met at least 10 percent of their 2008 water demand using recycled water could extend the baseline GPCD calculation for a maximum of a continuous 15-year baseline period, ending no earlier than December 31, 2004 and no later than December 31, 2010. The City delivered no recycled water in 2008; therefore, the City's baseline GPCD was calculated over a 10-year period. In its 2015 UWMP, the City selected the 10-year baseline period from 1999 through 2008. This is the same 10-year baseline period reported in the City's 2010 UWMP.

SB X7-7 and DWR provided four different methods for calculating an urban water retailer's 2020 Target. Three of these methods are defined in CWC Section 10608.20(a)(1), and the fourth method was developed by DWR. The 2020 Target may be calculated using one of the following four methods:

- **Method 1**: 80 percent of the City's base daily per capita water use;
- **Method 2**: Per capita daily water use estimated using the sum of performance standards applied to indoor residential use; landscaped area water use; and commercial, industrial, and institutional uses;
- **Method 3**: 95 percent of the applicable State hydrologic region target as stated in the State's April 30, 2009, Draft 20x2020 Water Conservation Plan; or
- **Method 4**: An approach that considers the water conservation potential from: 1) indoor residential savings, 2) metering savings, 3) commercial, industrial and institutional savings, and 4) landscape and water loss savings.

The City selected Method 1 to calculate its 2020 Target in its 2015 UWMP.

Daily average water use is divided by the service area population to determine baseline and target GPCD. In the 2015 UWMP, the City adjusted its baseline and target GPCD to reflect its updated population estimates based on 2010 Census results. To calculate the City's compliance year GPCD and compare it to the 2020 Target, the population is updated to reflect population estimates for 2020.

Details of determining the 2020 service area population and gross water use are provided in Sections 5.3 and 5.4, respectively. The City's baselines and targets are summarized in Section 5.5. The City's 2020 compliance water use is provided in Section 5.6.

5.3 SERVICE AREA POPULATION

To correctly calculate its compliance year GPCD, the City must determine the population that it served in 2020. At the time of preparation of this plan, the 2020 Census results were unavailable. However, the potential difference between the estimates provided here and the eventual final 2020 Census results is not believed to impact the fundamental conclusions of meeting SB X7-7 requirements.

The method used to estimate the service area population is shown in Table 5-1. The DOF uses U.S. Census data, combined with changes to the housing stock, estimated occupancy of housing units, and the number of persons per household to estimate annual population within jurisdictional boundaries. Where DOF data are not available (e.g., Turlock and Ceres (Walnut Manor)), the population was estimated based on a count of existing dwelling units served by the City and an estimated housing density (people per dwelling unit)

based on Census data from surrounding communities. An estimate of the 2020 population in the City's service area is shown in Table 5-2.

Table 5-1. Method for 2020 Population Estimate (SB X7-7 Table 2)

Method Used to Determine 2020 Population (may check more than one)	
☑	**1. Department of Finance** (DOF) or **American Community Survey** (ACS)
☑	**2. Persons-per-Connection Method**
☐	**3. DWR Population Tool**
☐	**4. Other** DWR recommends pre-review
NOTES: Where DOF data are not available (e.g., Turlock and Ceres (Walnut Manor)), the population has been estimated based on a count of existing dwelling units served by the City (from aerial photographs) and an estimated housing density (people per dwelling unit) (based on Census data for the surrounding communities).	

Table 5-2. 2020 Service Area Population (SB X7-7 Table 3)

2020 Compliance Year Population	
2020	270,974
NOTES: Population from Hickman and Waterford are excluded, as these areas are no longer served by the City of Modesto.	

5.4 GROSS WATER USE

As defined in CWC Section 10608.12 (h), annual gross water use is the water that enters the City's distribution system over a 12-month period (calendar year), with certain exclusions. This section presents the City's annual gross water use in 2020, in accordance with DWR's Methodologies document.

The City's gross water use is based on the metered quantity of water purchased from MID and the groundwater produced by the City's municipal wells. Annual gross water use for the baseline periods are provided in the City's 2015 UWMP. The City's actual gross water use for 2020 was 53,104 AF, as presented in Chapter 4 of this plan.

5.5 BASELINES AND TARGETS SUMMARY

Annual gross water use is divided by annual service area population to calculate the annual per capita water use for each year in the baseline periods. As discussed in Section 5.1, the City updated its population data, adjusted its baseline, and confirmed its 2020 Target in its 2015 UWMP. This update also included removing historical data for Hickman and Waterford from the City's population, baseline, and target calculations. The City's 10-year base daily per capita water use is 285 GPCD. Using Method 1 for 2020 Target calculation as described in Section 5.2, the City's confirmed 2020 compliance target is 228 GPCD. The City's baseline and 2020 Target are summarized in Table 5-3.

Table 5-3. Baseline and Targets Summary From SB X7-7 Verification Form (DWR Table 5-1 Retail)

Baseline Period	Start Year *	End Year *	Average Baseline GPCD*	Confirmed 2020 Target*
10-15 year	1999	2008	285	228
5 Year	2003	2007	279	
**All cells in this table should be populated manually from the supplier's SBX7-7 Verification Form and reported in Gallons per Capita per Day (GPCD)*				
NOTES: Historical per capita use from Hickman and Waterford are excluded in calculations.				

5.6 2020 COMPLIANCE DAILY PER CAPITA WATER USE

Sections 5.3 and 5.4 presented the City's 2020 population and gross water use, respectively. The City calculated its actual daily per capita water use for the 2020 calendar year in accordance with DWR's Methodologies document. As shown in Table 5-4, the City's urban per capita water use in 2020 was 175 GPCD, which is well below the confirmed 2020 Target of 228 GPCD. Therefore, the City has met its 2020 final water use target. The complete set of SB X7-7 compliance tables is included in Appendix F.

Table 5-4. 2020 Compliance From SB X7-7 2020 Compliance Form (DWR Table 5-2 Retail)

2020 GPCD			2020 Confirmed Target GPCD*	Did Supplier Achieve Targeted Reduction for 2020? Y/N
Actual 2020 GPCD*	2020 TOTAL Adjustments*	Adjusted 2020 GPCD* *(Adjusted if applicable)*		
175	0	175	228	Yes
**All cells in this table should be populated manually from the supplier's SBX7-7 2020 Compliance Form and reported in Gallons per Capita per Day (GPCD)*				
NOTES: Historical per capita use from Hickman and Waterford are excluded in calculations.				

As detailed in DWR's Methodologies document, adjustments are allowed that can be made to an agency's gross water use in 2020 for unusual weather, land use changes, or extraordinary institutional water use. The City has elected not to make the adjustments allowed by CWC Section 10608.24 because these exceptions are not needed to demonstrate compliance with SB X7-7 for 2020. When compared to baseline years, 2020 water use in the City's service area shows a significant reduction as a result of metering and continued water conservation efforts by the City and its customers.

5.7 REGIONAL ALLIANCE

The City has chosen to comply with the requirements of SB X7-7 on an individual basis. The City has elected not to participate in a regional alliance.

CHAPTER 6
Water Supply Characterization

This chapter describes and reviews the sources of water that may be available to the City and MID. Supply sources such as surface water, supplies from other agencies, groundwater, stormwater, wastewater and recycled water, desalinated water, and exchanges or transfers are discussed below. The origin of the water supply, water quality, and quantity, as well as the anticipated actions to meet future demands for each water source are discussed.

The City currently uses a conjunctive water use strategy with two primary water sources to meet potable water demands within the City's service area. These include:

- Surface water from the Tuolumne River via Modesto Reservoir and treated at MID's MRWTP, which is purchased on a wholesale basis from MID
- Local groundwater pumped from City wells located throughout the City's service area

City residents within the contiguous service area north of the Tuolumne River (including North Modesto, Salida, and Empire) generally rely on treated surface water supply from MID year-round, supplemented with groundwater as needed. Water demands for the contiguous service area located south of the Tuolumne River (South Modesto) and the City's outlying service areas are met entirely with groundwater supply year-round.

6.1 OVERVIEW

Prior to 1995, all municipal and industrial (M&I) water demands in the City were met from groundwater pumping. Beginning in the 1940s, increased water demands resulting from growth, along with periodic drought conditions, contributed to a reduction in groundwater levels and created a cone of depression under the City. This cone of depression, combined with increasingly stringent federal and state water quality requirements, prompted a 1983 study of the City's groundwater supply. This study recommended a conjunctive water use program that would supplement the City's M&I groundwater supply with treated surface water from the Tuolumne River. Following the recommendations from the study, the City, MID and the former Del Este Water Company[2] formed a partnership to use a portion of MID's surface water supplies for municipal water use. In 1995, treated surface water deliveries to the City began from the Phase One MRWTP, which has a treatment capacity of 30 million gallons per day (MGD).

The following sections describe the anticipated availability of the City and MID's water supplies under a normal water year and discuss in detail the surface water supply for MID and the purchased water and groundwater supply for the City, as well as the management of each supply in correlation with other supplies. The availability of the City and MID's water supplies under a single dry year and a drought lasting five years, as well as more frequent and severe periods of drought, are described in detail in Chapter 7 of this plan, along with the basis of those estimates.

[2] In 1995, the City acquired the Del Este Water Company.

6.2 SURFACE WATER

This section describes the treatment and delivery of MID's surface water supply to the City. The City does not have a separate surface water supply and currently relies on treated surface water purchased from MID on a wholesale basis. A discussion of the wholesale water supply to the City, including the agreements governing the treated surface water deliveries from MID, is provided in Section 6.3.

6.2.1 Surface Water Supply for MID

MID is primarily an agricultural water supplier that provides irrigation water to approximately 3,400 irrigation accounts. MID serves a gross irrigation service area of approximately 103,733 acres; however, MID's irrigated acreage may vary in any given year. In 2020, approximately 62,223 acres (66,421 acres, less 4,198 idle acres) were irrigated with surface water, MID groundwater, and private groundwater.[3] In addition to its irrigation accounts, MID also provides treated surface water to the City's contiguous service area north of the Tuolumne River (North Modesto, Salida, and Empire).

Together with the Turlock Irrigation District (TID), MID holds senior rights to water from the Tuolumne River. The 1,880-square mile (sq mi) Tuolumne River watershed extends to the high Sierra Nevada Mountains, and the river flows to its confluence with the San Joaquin River approximately ten miles west of Modesto. Most of the water in the Tuolumne River comes from snowmelt, with peak runoff flows occurring from April through July during which time over 60 percent of the annual flow takes place. Within the lower Tuolumne River watershed, MID and TID operate the Don Pedro Reservoir with a maximum storage capacity of 2,030,000 AF. MID's annual diversion from the Tuolumne River was approximately 258,000 AF of water (average from 2011 to 2020). Of that amount, approximately 26,780 AF (average from 2011 to 2020) was delivered to the MRWTP for treatment and delivery to the City.

Snowmelt from the central Sierra Nevada is of excellent quality. Surface water diverted from the Tuolumne River at La Grange has a Total Dissolved Solids (TDS) concentration of only about 36 milligrams per liter (mg/L). Other water quality constituents that impact agricultural and domestic water use are also very low or negligible. Also, the quality of the river water is fairly consistent from year to year. As runoff from agricultural and developed land is introduced into the lower part of the river, the overall water quality degrades somewhat but remains good.

6.2.2 Modesto Regional Water Treatment Plant

The original Phase One MRWTP is a 30 MGD conventional treatment facility owned and operated by MID, which provides flocculation, sedimentation, and filtration, along with ozonation for primary disinfection. Treated surface water from the MRWTP is delivered to the City via MID's terminal reservoir facilities (a booster pump station and two 5 MG storage tanks located on the east side of the City) through a series of turnouts that have the ability to control water supply from the MID transmission mains at various points within the City's water distribution system. Phase One of the MRWTP has a maximum functional capacity of 42.5 MGD that helps meet the maximum day and peak hour demands but has been permitted by the State to produce up to 45 MGD.

[3] Source: Modesto Irrigation District, 2020 Agricultural Water Management Plan Update, March 2021.

In October 2005, MID and the City approved the ARTDA, which set forth the MRWTP Phase Two Expansion project that would allow MID to deliver up to 67,200 AFY of treated water to the City for municipal use. The MRWTP Phase Two Expansion project included the construction of a new parallel treatment process consisting of low-pressure membranes, ozone disinfection system, a dissolved air flotation thickener and a new Supervisory Control and Data Acquisition (SCADA) system. Substantial completion of the MRWTP Phase Two Expansion project was reached in October 2015, and the project was accepted as complete by the MID Board of Directors in May 2016. The supply available from the MRWTP Phase Two Expansion project is projected to increase along with demand within both the City's contiguous service area and MID's treated water "place of use." Any and all treated surface water to be provided shall be in accordance with the ARTDA. The total treatment capacity of the MRWTP Phase Two Expansion project is 30 MGD.

The total capacity available at the MRWTP with the completion of the MRWTP Phase Two Expansion project is 60 MGD with a maximum annual supply of up to 67,200 AFY.

6.3 PURCHASED OR IMPORTED WATER

The treated surface water supply that the City purchases from MID is described below. MID does not purchase wholesale water supplies, and a discussion of MID's water supply was provided in Section 6.2 above. Historically, annual treated surface water deliveries to the City have been relatively consistent, with groundwater pumping varying as needed to meet water demands. However, during the most recent drought, MID reduced surface water deliveries to both its agricultural customers and to the City.

Section 6.1 of the ARTDA provides in part that "In designing, constructing, operating and maintaining the First Expansion Facilities, [MID] also shall comply with applicable provisions of the [Subsequent Environmental Impact Report on the First Expansion Facilities], the related mitigation monitoring plan, and Urban Water Management Plan." The ARTDA also defines the UWMP to be "as the same may be adopted by the parties from time to time." Notwithstanding any statement directly or arguably to the contrary in this plan, the 67,204.2 AF of water to be provided to the City by MID pursuant to the ARTDA is not altered, reduced or limited by the provisions of this plan.

6.3.1 Wholesale Supplies for the City

The original TDA, enacted in 1992, established the delivery of treated surface water to the City's contiguous service area north of the Tuolumne River. It obligated MID to deliver up to 33,600 AFY of treated surface water to the City, commencing on May 1 and ending the following April 30 during normal years. In 1995, the City purchased the Del Este Water Company and, along with it, their proportional share of treated surface water as defined in the TDA[4].

As discussed above, MID and the City approved the ARTDA in October 2005. This agreement supersedes the original TDA and sets forth, among other things, the terms and conditions for the delivery of up to 67,200 AFY of treated water to the City from the expanded MRWTP. The increased water treatment capacity provided by the MRWTP Phase Two Expansion project would allow the City to serve more surface water, thereby reducing its long-term dependence on groundwater.

[4] In 1995, the City purchased the Del Este Water Company water systems in Empire, Salida, Waterford, Hickman, Grayson, Del Rio, and portions of Ceres and Turlock. In 2015, the City subsequently sold the Waterford and Hickman water systems to the City of Waterford.

The ARTDA includes a formula to reduce deliveries in drier than average years based on the number of inches allocated to MID's agricultural customers. The ARTDA specifies a maximum delivery of 42 inches of water, or the amount calculated as (**y**/42) times 67,204.2 AFY[5], whichever is less (where **y** is the actual number of inches of water allocated by MID to agricultural water users for the Domestic Water Year[6]). The allocation formula is as follows:

$$\frac{y}{42} \times 67{,}204.2 = x$$

where

y is the number of inches of water allocated to MID's agricultural customers

x is the calculated amount of water to be delivered to the City in that particular year in AF

Although the ARTDA specifies a formula for water allocations during shortages, the reduction in supply is not determined until the time of the shortage (ARTDA, Section 17.2 Formula for Water Allocation). Although the formula is based on the total capacity available with the completion of the MRWTP Phase Two Expansion, the actual supply quantity will be based on the City's increase in demand and will need to conform to requirements of the ARTDA. A copy of the ARTDA is provided in Appendix G.

The ARTDA also provides the opportunity for the City to purchase additional water from MID (at a higher rate) or to exchange groundwater meeting the requirements of the ARTDA for agricultural use for treated surface water during drought years if such supplemental water supplies are available. Additional discussion regarding the availability and reliability of treated surface water supply from MID in dry years is provided in Chapter 7.

6.4 GROUNDWATER

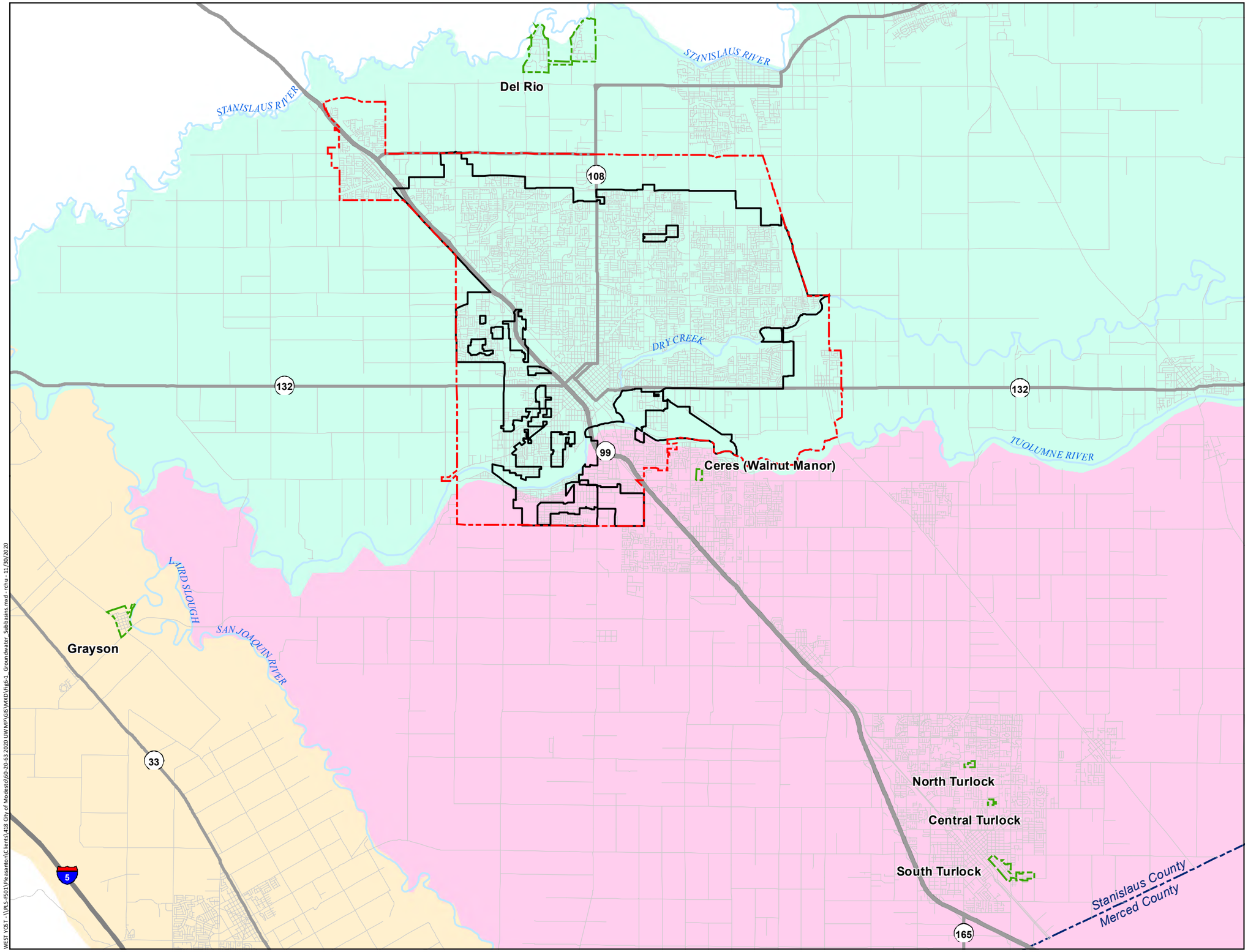
The City relied exclusively on groundwater to meet water demands until the introduction of treated surface water in 1995. The City currently has 89 active groundwater wells in both the contiguous and outlying service areas. MID currently pumps groundwater only to supplement water supplies to agricultural customers and does not pump and deliver groundwater supply to urban suppliers. The City and MID's groundwater supplies are discussed separately below.

6.4.1 Groundwater Supply for the City

The City has historically relied on groundwater pumped from the San Joaquin Valley Groundwater Basin as a major source of supply. The City's service area spans three subbasins: the Modesto Subbasin north of the Tuolumne River, the Turlock Subbasin south of the Tuolumne River, and the Delta-Mendota Subbasin west of the San Joaquin River that provides groundwater to the Grayson service area. Figure 6-1 illustrates the location of the City's water service areas in relation to the boundaries of the three underlying groundwater subbasins.

[5] As described in the ARTDA, upon completion of MRWTP Phase Two Expansion, the treated water quantity shall be changed from 33,602.1 AFY to 67,204.2 AFY. These are the exact contractual supply volumes and are rounded to 33,600 AFY and 67,200 AFY, respectively, throughout this plan.

[6] The Domestic Water Year is defined in the ARTDA (Section 4.22) to be May 1 through April 30 (e.g., the 2020/2021 Domestic Water Year extends from May 1, 2020 through April 30, 2021).



N

0 1 2

Scale in Miles

Legend

Groundwater Subbasins

- Modesto Subbasin
- Turlock Subbasin
- Delta-Mendota Subbasin
- Contiguous Service Area
- Outlying Service Area
- City Limits

Notes:

1. Sphere of influence boundary obtained from the City on 11/6/2014.
2. City limit boundary based on County GIS data downloaded on October 6, 2014.

MODESTO CALIFORNIA

MID Modesto Irrigation District Water and Power

WEST YOST

Figure 6-1

City of Modesto Groundwater Subbasins

City of Modesto/MID
Joint 2020 UWMP

WEST YOST - \\Pl.5.f501\Pleasanton\Clients\418 City of Modesto\60-20-63 2020 UWMP\GIS\MXD\Fig6-1_Groundwater_Subbasins.mxd - rchu - 11/30/2020

The residents within the City's contiguous service area north of the Tuolumne River generally rely on treated surface water supply from MID year-round and are supplemented with groundwater to meet increased water demands primarily in the summer months. Water demands from the City's contiguous service area located south of the Tuolumne River (South Modesto) and the outlying service areas are met with groundwater supply year-round.

The following sections further describe the City's groundwater resource, including a description of the groundwater basin and subbasins, estimated groundwater operational yield, groundwater management activities, and historical groundwater use.

6.4.1.1 Groundwater Basin Description

The City's service area relies on groundwater pumped from three of the nine subbasins within the San Joaquin Valley Groundwater Basin. Key characteristics of these groundwater subbasins are summarized in Table 6-1. Subbasin descriptions provided below are taken from DWR Bulletin 118 Groundwater Basin Descriptions, which are provided in Appendix H.

Table 6-1. Groundwater Subbasin Characteristics and Service Areas[a]

Subbasin Name	DWR Subbasin No.	General Location	Surface Area	City Water Service Areas[b]
Modesto	5-22.02	North of Tuolumne River	247,000 acres (385 sq mi)	North Modesto South Modesto[c] Salida Empire Del Rio
Turlock	5-22.03	South of Tuolumne River	347,000 acres (542 sq mi)	South Modesto Turlock North Ceres Ceres (Walnut Manor)
Delta-Mendota	5-22.07	West of the San Joaquin River	747,000 acres (1,170 sq mi)	Grayson

(a) Based on information published in DWR Bulletin 118 Groundwater Subbasin Descriptions:
- Modesto Subbasin (last updated February 27, 2004)
- Turlock Subbasin (last updated January 20, 2006)
- Delta-Mendota Subbasin (last updated January 20, 2006)

(b) See Figure 6-1 for locations of the City water service areas in relation to the groundwater subbasin boundaries.

(c) The City's water distribution system in the contiguous service area is interconnected between North and South Modesto areas; groundwater produced in the Modesto Subbasin (North Modesto) can be delivered to South Modesto.

sq mi = square miles

Groundwater in the Modesto Subbasin occurs under unconfined, semi-confined, and confined conditions. The unconfined water body occurs in the unconsolidated deposits above and east of the Corcoran Clay, which underlies the southwestern portion of the subbasin at depths ranging from 150 to 250 feet. Where clay lenses restrict the downward flow of groundwater, semi-confined conditions occur. The confined water body occurs in the unconsolidated deposits below the Corcoran Clay and extends downward to the base of fresh water. The estimated average specific yield of this subbasin is 8.8 percent.

There are three groundwater bodies in the Turlock Subbasin: the unconfined water body; the semi-confined and confined water body in the consolidated rock fractures; and the confined water body beneath the E-clay in the western subbasin. The estimated average specific yield of the subbasin is 10.1 percent.

Groundwater in the Delta-Mendota Subbasin occurs in three water-bearing zones. These include the lower zone, which contains confined fresh water in the lower section of the Tulare Formation, an upper zone which contains confined, semi-confined, and unconfined water in the upper section of the Tulare Formation and younger deposits, and a shallow zone which contains unconfined water within about 25 feet of the land surface. The estimated specific yield of this subbasin is 11.8 percent. Land subsidence up to about 16 feet has occurred in the southern portion of the basin due to artesian head decline and consolidation of fine-grained materials.

The primary sources of groundwater recharge in all three subbasins are from deep percolation of applied irrigation water and from canals and stream/river seepage. Lesser groundwater recharge occurs from percolation from small streams and direct percolation of precipitation. As detailed in Section 6.5, the City also contributes to recharge efforts via stormwater percolation (i.e., rock wells, infiltration basins, and other recharge facilities). Table 6-2 provides a summary of estimated natural and applied water recharge and groundwater extraction in each of the three subbasins under the City's service area.

Table 6-2. Groundwater Subbasin Recharge and Extraction Estimates[(a)]

Subbasin Name	Natural Recharge, AFY	Applied Water Recharge, AFY	Groundwater Extraction, AFY
Modesto	86,000	92,000	81,000 (urban) 145,000 (ag)
Turlock	33,000	313,000	65,000 (urban) 387,000 (ag)
Delta-Mendota	8,000	74,000	17,000 (urban) 491,000 (ag)

(a) Based on information published in DWR Bulletin 118 Groundwater Subbasin Descriptions:

- Modesto Subbasin (last updated February 27, 2004)
- Turlock Subbasin (last updated January 20, 2006)
- Delta-Mendota Subbasin (last updated January 20, 2006)

ag = agriculture

6.4.1.1.1 Groundwater Level Trends

Groundwater levels in the Modesto Subbasin declined on average nearly 15 feet between 1970 and 2000. However, since augmenting the City's groundwater supply with treated surface water from the MRWTP beginning in 1995, the City has observed that groundwater levels have started to rise, particularly in the Modesto Subbasin, as a result of reduced groundwater pumping. From 1996 to 2000, groundwater levels in the Modesto Subbasin rose approximately 5 feet. Water levels in the Turlock Subbasin, similarly, rebounded about 8 feet from 1994 to 2000, bringing them to approximately 7 feet below the 1970 levels. Water levels in the Delta-Mendota Subbasin increased by an average of 2.2 feet from 1970 through 2000. The rising water levels suggest that the current level of pumping in each subbasin is less than the previously assumed "safe yields".

6.4.1.1.2 Groundwater Quality

The City has historically experienced some issues related to groundwater quality. Concentration levels of arsenic, uranium, perchloroethylene (PCE), trichloroethylene (TCE), dibromochloropropane (DBCP), 1,2,3-Trichloropropane (TCP) or nitrate in excess of drinking water regulatory maximum contaminant levels (MCLs) have resulted in production wells being taken out of service. These well outages have reduced the City's groundwater pumping capacity.

In general, the groundwater from the Turlock Subbasin, from which the South Modesto wells draw their water, is of relatively poor quality. In the South Modesto area, the City has a total of 13 wells, of which:

- Five are active wells that pump directly into the distribution system;
- Seven are blending wells that produce water of potable quality but do not meet all secondary MCL criteria for aesthetics. Water pumped from these blending wells is either blended on-site or pumped into storage tanks for blending with higher quality water so that the water quality of these blended supplies meets all applicable California Division of Drinking Water (DDW) primary and secondary MCL requirements); and
- One is inactive due to high trichloropropane concentrations.

To minimize the City's vulnerability to groundwater quality issues, the City has developed strategies to maintain and enhance its groundwater extraction capacity through a combination of well monitoring for early detection, well rehabilitation, wellhead treatment, and blending. Through the well monitoring and capital improvement programs, the City expects to maintain sufficient well capacity to meet future water demands. Potential wellhead treatment options to address contaminants in the City's wells are discussed in Section 6.9.

6.4.1.2 Preliminary Operational Yield Estimate

In 2007, the City estimated that their preliminary operational yield from the three groundwater subbasins underlying the City's service area is approximately 53,500 AFY. This preliminary operational yield was estimated based on historical groundwater pumpage by the City from the Modesto, Turlock, and Delta-Mendota subbasins and was developed by City staff to maintain a minimum average groundwater elevation of 40 feet above mean sea level (ft msl). A copy of the City's 2007 Technical Memorandum (titled "Discussion on Operational Yield for the 2005 Urban Water Management Plan") documents this preliminary operational yield and is provided in Appendix H.

The general conclusion of the City's evaluation was that if the total, long-term average groundwater pumpage quantity is held at or below 53,500 AFY, then stable groundwater levels will result at around 40 ft msl within and near the City's contiguous service area. If groundwater pumpage is significantly less than 53,500 AFY, groundwater levels will probably rise. This "in-lieu" groundwater banking allows for later use in dry periods and/or to meet future demands. Alternatively, if more than 53,500 AFY is extracted (e.g., during dry years), groundwater levels will probably decline. Actual annual groundwater pumpage is expected to be less during normal or wet years and higher during dry years. Table 6-3 summarizes the long-term preliminary operational yield assumed for each subbasin.

Table 6-3. Preliminary Operational Yield Assumed for Each Subbasin[(a)]

Groundwater Subbasin	Allocation, AFY
Modesto	48,286
Turlock	4,900
Delta-Mendota	314
Total	**53,500[(b)]**

(a) As documented in the City's Technical Memorandum titled "Discussion on Operational Yield for the 2005 Urban Water Management Plan" (see Appendix H).

(b) Reduced to 51,500 AFY for this plan to account for removal of Hickman and Waterford's groundwater production.

This preliminary operational yield was developed when the City was still serving the Hickman and Waterford areas. Since that is no longer the case, the operational yield available for the City's current service area has been updated to account for the groundwater pumped by Hickman and Waterford. The average combined groundwater production for Hickman and Waterford from 2000 through 2013 was approximately 2,000 AFY. Therefore, the groundwater supply available to the City is assumed to be 51,500 AFY (i.e., reduced by 2,000 AFY to account for removal of Hickman and Waterford's groundwater production).

6.4.1.3 Groundwater Management

Groundwater Management Plans have been prepared for the Modesto, Turlock, and Delta-Mendota subbasins. Links to these groundwater management plans are provided in Appendix H.

The City and MID participated in groundwater management studies initiated by the 1992 California State Assembly Bill 3030 (AB 3030). The goal of this bill, also referred to as the Groundwater Management Act, is to maximize the total groundwater supply while protecting the quality of the groundwater basin. The Stanislaus and Tuolumne Rivers Groundwater Basin Association completed the Integrated Regional Groundwater Management Plan for the Modesto Subbasin in 2005 in compliance with the Groundwater Management Planning Act of 2002 (SB 1938) and the Integrated Regional Water Management Planning Act of 2002 (SB 1672). The Stanislaus and Tuolumne Rivers Groundwater Basin Association is made up of the following agencies: City of Modesto, MID, City of Oakdale, Oakdale Irrigation District, City of Riverbank, City of Waterford[7], and Stanislaus County.

The City also participated in the preparation of the Turlock Groundwater Basin Management Plan, which was prepared by the Turlock Groundwater Basin Association and was completed in 2008. The agencies involved in this association include the City of Modesto, City of Turlock, TID, City of Ceres, City of Hughson, Merced Irrigation District, Eastside Water District, Delhi County Water District, Ballico Community Services District, Ballico-Cortez Water District, Hillmar Water District, Denair Community Services District, the Keyes Community Water District, Stanislaus County, and Merced County.

The City did not participate in the preparation of the *Groundwater Management Plan for the Northern Agencies in the Delta-Mendota Canal Service Area*, which was prepared by the San Luis & Delta-Mendota Water Authority and was completed in 2011 and discusses the Tracy and Delta-Mendota subbasins.

[7] In 2015, the Memorandum of Understanding was revised to include the City of Waterford.

The Modesto, Turlock, and Delta-Mendota subbasins are not adjudicated. This means that there is no court-appointed "watermaster" to resolve groundwater pumping issues, and there are no current specific limits on the amount of groundwater that individuals and agencies may extract from the basins. However, on September 16, 2014, Governor Jerry Brown signed into law a three-bill legislative package, composed of AB 1739 (Dickinson), SB 1168 (Pavley), and SB 1319 (Pavley), collectively known as the Sustainable Groundwater Management Act of 2014 (SGMA). The SGMA empowers local agencies to manage groundwater basins in a sustainable manner over the long term. Further discussion on the SGMA and its implications for future management of the groundwater subbasins underlying the City's service areas is provided below.

6.4.1.4 Groundwater Sustainability

As discussed above, the SGMA legislation provides a framework for sustainable management of groundwater supplies by local authorities, with a limited role for state intervention when necessary to protect the resource. The legislation lays out a process and a timeline for local authorities to achieve sustainable management of their groundwater basins. For local agencies involved in implementation of the SGMA, the requirements are significant and can be expected to take years to accomplish. The State Water Resources Control Board may intervene if local agencies do not form a Groundwater Sustainability Agency (GSA) and/or fail to adopt and implement a Groundwater Sustainability Plan (GSP). The SGMA implementation steps and deadlines are summarized in Table 6-4.

Table 6-4. Sustainable Groundwater Management Act Implementation Steps and Deadlines

Implementation Step	Implementation Measure	Deadline(s)
Step One	Local agencies must form local Groundwater Sustainability Agencies (GSAs) within two years	• June 30, 2017
Step Two	Agencies in basins deemed high- or medium-priority must adopt Groundwater Sustainability Plans (GSPs) within five to seven years, depending on whether a basin is in critical overdraft	• January 31, 2020 for critically overdrafted basins • January 31, 2022 for high- and medium-priority basins not currently in overdraft
Step Three	Once GSPs are in place, local agencies have 20 years to fully implement them and achieve the sustainability goal	• January 31, 2040 for critically overdrafted basins • January 31, 2042 for high- and medium-priority basins not currently in overdraft

The SGMA applies to basins or subbasins designated by the DWR as high- or medium-priority basins based on a statewide ranking that uses criteria including population and extent of irrigated agriculture dependent on groundwater. The final September 2019 Basin Prioritization results indicate that 94 of California's 515 groundwater basins and subbasins are high- and medium-priority basins. The final priorities assigned to the groundwater subbasins underlying the City's service areas are shown in Table 6-5. As shown, all three of the City's underlying groundwater subbasins have been designated as high-priority basins, and the Delta-Mendota Subbasin has also been identified as critically overdrafted.

Table 6-5. Groundwater Basin Prioritization for Sustainable Groundwater Management Act[(a)]

Basin Number	Subbasin Name	Priority Points	Overall Basin Priority
5-22.02	Modesto	24.5	High
5-22.03	Turlock	26	High
5-22.07	Delta-Mendota	40	High; Critically Overdrafted Basin

(a) CASGEM Groundwater Basin Prioritization Dashboard, run version January 20, 2021.

The Stanislaus and Tuolumne Rivers Groundwater Basin Association GSA and the Tuolumne County GSA are the only GSAs for the Modesto Subbasin and are currently developing a GSP for adoption by January 31, 2022. The Turlock Subbasin contains two GSAs: West Turlock Subbasin and East Turlock Subbasin. The City is a member of the West Turlock Subbasin GSA. The West Turlock Subbasin GSA and East Turlock Subbasin GSA are jointly developing a single GSP for adoption by January 31, 2022. The Delta-Mendota Subbasin contains 24 GSAs. The Grayson water system is located within the West Stanislaus Irrigation District GSA, which developed the Northern and Central Delta-Mendota Regions GSP[8] along with seven other GSAs in November 2019. Although the City is not a member of the West Stanislaus Irrigation District GSA, it coordinates directly with Stanislaus County, which is a member of the West Stanislaus Irrigation District GSA.

6.4.1.5 Overdraft Conditions

A groundwater basin's sustainable or "safe" yield is defined as the average annual amount of groundwater that can be extracted from the basin while maintaining a non-overdraft condition. DWR has not identified the Modesto and Turlock subbasins being critically overdrafted; however, the Delta-Mendota Subbasin has been recently identified as critically overdrafted. In DWR Bulletin 118, the Delta-Mendota Subbasin was not previously identified as critically overdrafted; however, per the requirements of the SGMA (described above), DWR was directed to review and evaluate groundwater conditions from 1989 to 2009 and revise its list of critically overdraft basins. Conditions from 2011 to 2015 were not considered, as the SGMA legislation requires that drought period to be excluded from the evaluation. Based on this more recent evaluation, the Delta-Mendota Subbasin was added to the list of critically overdrafted basins.

The City currently maximizes the use of its treated surface water supply from MID in normal and wetter years. The use of this treated surface water supply provides the City with flexibility to preserve its groundwater supplies through in-lieu banking. Additional treated surface water supplies provided from the MRWTP Phase Two Expansion project will allow the City to further utilize available surface water to meet water demands in lieu of using groundwater in the Modesto Subbasin.

The City will address overdraft conditions in accordance with the SGMA through the GSPs developed for the groundwater subbasins underlying the City's water service area. The GSPs will identify the activities required for the City to monitor and manage groundwater levels, water quality, groundwater quality degradation, and inelastic land surface subsidence.

[8] The GSP is available at this website: Northern & Central Delta-Mendota Region GSP – Delta-Mendota SGMA, and is incorporated herein by reference.

6.4.1.6 Historical Groundwater Pumping

The City's historical groundwater pumpage from 2016 through 2020, is summarized in Table 6-6. Average annual groundwater pumpage over the past five years has been approximately 22,546 AFY, which is below the City's groundwater operational yield of 51,500 AFY (discussed in Section 6.4.1.2). The City's historical groundwater supply was of sufficient quality and quantity to meet the City's water demands.

Groundwater pumpage decreased from 2016-2018, likely due to continued water conservation by the City's water customers in response to the recent drought conditions, in addition to the City's installation of water meters. In 2019, the City and MID discussed that the City would increase groundwater pumpage and reduce treated surface water deliveries to address some minor operational constraints. In 2020, treated surface water supplies were further reduced due to the City and MID making operational adjustments to address additional constraints[9], and groundwater was used to supply approximately half of the City's annual water supply.

Table 6-6. Groundwater Volume Pumped (DWR Table 6-1 Retail)

☐	Supplier does not pump groundwater. The supplier will not complete the table below.					
☐	All or part of the groundwater described below is desalinated.					
Groundwater Type ***Drop Down List*** *May use each category multiple times*	Location or Basin Name	2016*	2017*	2018*	2019*	2020*
Alluvial Basin	San Joaquin Valley Groundwater Basin	23,514	21,941	19,876	20,279	27,121
	TOTAL	23,514	21,941	19,876	20,279	27,121
**** Units of measure (AF, CCF, MG)*** *must remain consistent throughout the UWMP as reported in Table 2-3.*						
NOTES: Volumes are in AF.						

6.4.2 Groundwater Supply for MID

MID maintains 93 groundwater wells that are used to supplement the surface water supply during dry years for use by MID's agricultural customers. MID does not currently pump and deliver groundwater supply to urban suppliers, nor does it have plans to do so in future years. Therefore, MID is not required to complete DWR Table 6-1 (Wholesale).

[9] One major constraint occurred during the summer of 2020 when CO2 supply was interrupted for several months. This event led to corrosion control concerns which reduced treated surface supply availability.

6.5 STORMWATER

In 1989, Congress passed amendments to the Clean Water Act requiring states to address the increasing problem of stormwater pollution entering storm drains. California requires a National Pollutant Discharge Elimination System (NPDES) permit to regulate stormwater discharges.

The City's storm drain system has approximately 170 miles of storm drain lines and 25 pump stations. Stormwater discharges from the City drain to detention/retention basins, approximately 18 major outfalls to receiving waters (Tuolumne River or Dry Creek), MID laterals/drains, or rock wells (approximately 11,000). Approximately 40 percent of stormwater discharges to detention/retention basins, 20 percent to receiving waters (Tuolumne River or Dry Creek), 10 percent to MID laterals/drains, and 30 percent to rock wells.

Stormwater can be beneficially reused to meet local water demands. Beneficial reuses include blending with other water supplies for groundwater recharge, redirection into constructed wetlands or landscaping, and diversion to a treatment facility for subsequent reuse. The City currently recharges some of its stormwater via rock wells, infiltration basins, and newly developed underground storage and recharge facilities, with plans to further develop passive recharge opportunities. The City also partnered with the County and other public agencies to develop the Stanislaus County Multi-Agency Regional Storm Water Resource Plan (SWRP), which evaluates beneficial stormwater uses, specifically those that can augment groundwater supplies. The SWRP was completed in August 2019 and adopted by the City in January 2020.

6.6 WASTEWATER AND RECYCLED WATER

6.6.1 Recycled Water Coordination

6.6.1.1 Recycled Water Planning for the City

The cities of Modesto, Turlock, and Ceres have historically worked together to identify regional opportunities for wastewater treatment and recycled water production. A feasibility study was completed in 2005 to analyze opportunities for recycled water use in the region (Northern San Joaquin Valley Water Reclamation Project Feasibility Study (RMC, 2005). This feasibility study assessed recycled water markets, reviewed regulatory requirements, and developed and evaluated alternatives for regional wastewater treatment and recycled water use. As part of the study, stakeholder workshops were conducted to discuss and gain input on recycled water opportunities. Seventeen local communities and agencies were invited to participate in the workshops and nine cities and agencies participated.

This work has been further refined with completion of additional feasibility, alignment, and other studies in 2013 and 2015. Ultimately, the North Valley Regional Recycled Water Program (NVRRWP) was selected for implementation to regionalize recycled water use in Stanislaus County.[10] The NVRRWP provides supply to the Del Puerto Water District (DPWD). Since the 1990s, DPWD has experienced a reduction in Central Valley Project (CVP) deliveries due to drought conditions and regulatory restrictions imposed on CVP operations. The geographic proximity of DPWD to the City's wastewater treatment facilities provides an opportunity for recycled water to supplement DPWD's existing water supply and improve water supply

[10] North Valley Regional Recycled Water Program Final Report, prepared by RMC and Carollo, May 2015.

reliability. The source of recycled water for the NVRRWP includes treated wastewater from the cities of Modesto and Turlock, which will be delivered directly into the Delta-Mendota Canal (DMC). The DMC would be used to convey the blended canal-recycled water to users in the west side of Stanislaus County.

The first phase of the NVRRWP was completed in 2018 and delivers approximately 14,000 AFY of disinfected tertiary treated recycled water to DPWD. Per the City's agreement with DPWD, the NVRRWP could produce and deliver up to 16,800 AFY (15 MGD) of disinfected tertiary treated recycled water. The NVRRWP projected deliveries of up to 59,900 AFY of tertiary treated recycled water by 2045 to western Stanislaus County; however, actual quantities will be dependent on wastewater generated by the cities of Modesto and Turlock.

Although the NVRRWP would not provide a potable water offset directly to the City's service area, the treated wastewater would be used beneficially and would provide water supply reliability, public safety, enhanced property values, and increased educational opportunities.

6.6.1.2 Recycled Water Planning for MID

MID is not directly involved with the treatment of wastewater or the distribution of recycled water and does not have plans to do so in the future.

6.6.2 Wastewater Collection, Treatment, and Disposal

The City's wastewater service area is smaller than the City's water service area. The City of Modesto's wastewater treatment facilities serve the City's wastewater service area and a small northern portion of the City of Ceres (including Ceres (Walnut Manor)). The following sections discuss the wastewater collected and treated within the City's water service area either by the City or by other agencies.

6.6.2.1 Wastewater Collected and Treated by the City

Influent to the City's wastewater treatment facilities consists primarily of domestic, commercial, industrial, food processing, and winery waste. Treatment of the City's raw wastewater occurs at two locations: Sutter Avenue Primary Treatment Plant (located within the City's water service area) and Jennings Road Treatment Plant (located outside the City's water service area). The Sutter Avenue Primary Treatment Plant provides pumping, screening, grit removal, flow measurement, primary clarification, and sludge digestion. The primary effluent is then pumped approximately seven miles to the secondary treatment plant (the Jennings Road Treatment Plant) for further treatment.

The Jennings Road Treatment Plant includes both secondary and tertiary treatment facilities. Secondary treatment includes biological treatment with fixed film reactors, recirculation, aerated recirculation, and oxidation ponds. Pursuant to NPDES Permit No. CA0079103, the City currently disposes of the secondary treated effluent and cannery waste[11] via irrigation of approximately 2,500 acres of City-owned ranch lands. When physical or regulatory constraints prevent land application, the effluent is stored on-site.

[11] Historically, about 20 MGD of cannery wastewater with high concentrations of organic vegetable solids were sent to the primary treatment plant, causing the treatment plant to operate inefficiently. To address this problem, the Cannery Segregation Project was implemented in the late 1990s such that up to 40 MGD of wastewater from seasonal canneries is segregated and bypasses treatment. These cannery discharges are applied directly to City-owned ranch lands as a soil supplement.

Discharge of secondary effluent to City-owned ranch lands is limited by organic loading limitations of the NPDES permit and available acreage.

In 2010, the Jennings Road Treatment Plant phased in tertiary treatment with the completion of Phase 1A of its Tertiary Treatment Project, providing up to 2.3 MGD of tertiary treated water. The tertiary treatment process includes oxidation, de-nitrification, membrane filtration, and ultraviolet disinfection facilities. Phase 2 of the Tertiary Treatment Project was completed in 2018 and added another 12.6 MGD of tertiary treatment capacity, bringing the facility in compliance with the City's NPDES Permits for year-round discharge to the DMC (i.e., DPWD) and the San Joaquin River.

6.6.2.2 Wastewater Collected and Treated by Other Agencies

The City's water service areas that do not receive wastewater services from the City of Modesto include Salida, Grayson, Del Rio, and portions of Turlock. The wastewater collected and treated by other wastewater agencies are described below.

The Salida Sanitary District provides wastewater collection, treatment, and disposal for the unincorporated community of Salida and various customers located outside its boundaries, including BMC West Lumber Company, the former Modesto Tobacco and Candy, Vella Middle School, Flory Industries, the former Shell Lab site, and Gregori High School. The Salida Sanitary District's operates its wastewater treatment plant on the northern edge of Stanislaus County, just south of the Stanislaus River (6200 Pirrone Road, Salida). The Salida Sanitary District's Wastewater Treatment Plant currently processes approximately 1.1 MGD, approximately half of the plant's total capacity of 2.4 MGD.

The Grayson Community Services District provides street lighting and wastewater (sewer) services to the community of Grayson. The Grayson Community Services District's wastewater collection and treatment system has a designed flow capacity of 100,000 gallons per day. Any growth in the area would require significant upgrades to the system to increase the treatment capacity.

Wastewater collection and treatment in Del Rio is provided by both private septic systems and small packaged wastewater treatment plants. Generally, the newer areas on the east and northwest as well as the Country Club and nearby condominiums are likely to be served by packaged plants, while the older larger homes are served by private septic systems.

The Turlock Regional Water Quality Control Facility (RWQCF) receives wastewater from the City of Turlock, the community service districts of Keyes and Denair, and up to 2 MGD of primary treated wastewater from the City of Ceres. The RWQCF is designed to treat an average of 20 MGD and is currently treating an average influent flow of 8.5 MGD. The raw wastewater received at the Turlock RWQCF is a combination of domestic and industrial wastewater flows. The RWQCF produces disinfected tertiary treated water that meets Title 22 standards for unrestricted use. Final effluent from the RWQCF is discharged to the DMC as supply for DPWD under the NVRRWP.

Table 6-7 summarizes the information on the collection of wastewater generated within the City's water service area in 2020.

Table 6-7. Wastewater Collected Within Service Area in 2020 (DWR Table 6-2 Retail)

☐	There is no wastewater collection system. The supplier will not complete the table below.
	Percentage of 2015 service area covered by wastewater collection system *(optional)*
	Percentage of 2015 service area population covered by wastewater collection system *(optional)*

Wastewater Collection			Recipient of Collected Wastewater			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated? *Drop Down List*	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? *Drop Down List*	Is WWTP Operation Contracted to a Third Party? *(optional)* *Drop Down List*
City of Modesto	Metered	20,815	City of Modesto	Sutter Avenue Primary Treatment Plant	Yes	
City of Modesto	Metered	23,587	City of Modesto	Jennings Road Treatment Plant	No	
Salida Sanitary Sewer District	Metered	1,234	Salida Sanitary Sewer District	Salida Sanitary Treatment Plant	No	
Grayson Community Services District	Estimated	107	Grayson Community Services District	Grayson WWTP	No	
Del Rio	Estimated	153	Del Rio Community Services Corporation	N/A - septic systems and packaged plants	No	
City of Turlock	Estimated	129	City of Turlock	Turlock Regional Water Quality Control Facility	No	
Total Wastewater Collected from Service Area in 2020:		46,026				

**** Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3* **.**

NOTES: Volumes are in AF.

Table 6-8 identifies the wastewater treated and disposed of within the City's water service area in 2020. As discussed above, the City's Sutter Avenue Primary Treatment Plant is located within the City's water service area and provides primary treatment only. The primary effluent from the Sutter Avenue Primary Treatment Plant is pumped to the Jennings Road Treatment Plant, which is located outside the City's water service area. Wastewater in Del Rio is treated and disposed of within the City's water service area.

Table 6-8. Wastewater Treatment and Discharge Within Service Area in 2020 (DWR Table 6-3 Retail)

☐	**No wastewater is treated or disposed of within the UWMP service area.** The supplier will not complete the table below.										
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number *(optional)* [2]	Method of Disposal *Drop down list*	Does This Plant Treat Wastewater Generated Outside the Service Area? *Drop down list*	Treatment Level *Drop down list*	2020 volumes [1]				
							Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area [3]	Recycled Outside of Service Area	Instream Flow Permit Requirement
City of Modesto Sutter Avenue Primary Treatment Plant	N/A	N/A		Other	No	Secondary, Undisinfected	20,815	0	0	0	0
Del Rio septic systems and packaged plants	N/A	N/A		Other	No	Secondary, Undisinfected	153	0	0	0	0
						Total	20,969	0	0	0	0

[1] **Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.
[2] If the **Wastewater Discharge ID Number** is not available to the UWMP preparer, access the SWRCB CIWQS regulated facility website at https://ciwqs.waterboards.ca.gov/ciwqs/readOnly/CiwqsReportServlet?inCommand=reset&reportName=RegulatedFacility

NOTES: Volumes are in AF. The Sutter Avenue Primary Treatment Plant provides primary treatment only. All primary effluent from the Sutter Avenue Primary Treatment Plant is sent to the Jennings Road Treatment plant (located outside the City's service area).

6.6.2.3 Wastewater in MID

MID is not directly involved with the treatment and discharge of wastewater and is therefore not required to complete DWR Table 6-3 (Wholesale).

6.6.3 Recycled Water System

As discussed above, the City does not currently operate a recycled water system. Secondary treated effluent is either used to irrigate City-owned ranch lands or stored in on-site ponds. The City delivers tertiary treated recycled water to DPWD as part of the NVRRWP. MID also does not operate a recycled water system. In the future, the City and MID do not have plans to develop recycled water systems within their respective water service boundaries.

6.6.4 Recycled Water Beneficial Uses

Recycled water is recognized as a beneficial water supply due to its many advantages including:

- Providing a reliable water source that is consistently available regardless of droughts or climate change
- Offsetting potable water for other uses
- Diversifying agencies' and cities' water supply portfolios

As discussed above, the City currently uses recycled water (secondary treated effluent) for agricultural irrigation on City-owned ranch lands located outside of its water service area and delivers tertiary treated recycled water as part of the NVRRWP, which is also outside of its water service area. Therefore, there is no existing or planned beneficial use of recycled water within the City's water service area, and the City is not required to complete DWR Table 6-4 (Retail).

The City's 2015 UWMP did not project any recycled water use in 2020, and no recycled water was used within the City's water service area in 2020. Therefore, the City is not required to complete DWR Table 6-5 (Retail).

MID is not directly involved with the distribution of recycled water, does not plan to do so in the future, and is therefore not required to complete DWR Table 6-4 (Wholesale) or DWR Table 6-5 (Wholesale).

Other potential beneficial uses of recycled water in the City's water service area include the following:

- Water sale to agricultural users
- Environmental use
- Groundwater recharge

These beneficial uses have significant implementation constraints, as discussed below.

6.6.4.1 Water Sale to Agricultural Users

The City does not expect to expand recycled water use for agricultural irrigation within its water service area primarily due to the high cost of delivering recycled water to the area and the relatively few agricultural users that would benefit.

6.6.4.2 Environmental Use

Potential opportunities for environmental uses include stream flow augmentation, wildlife habitat restoration, wetland enhancement, and other related environmental purposes. One potential environmental use is augmentation of summer flow in the San Joaquin River with disinfected tertiary treated recycled water. This could enhance habitat in the San Joaquin River and the Delta during the summer months. Environmental uses of recycled water would require evaluation in future studies to assess the potential impacts to local groundwater supplies, agricultural lands, and other environmental habitats.

Through an agreement with DPWD, recycled water transported via the DMC is currently used to enhance a wetland area. This beneficial use could be expanded to develop additional wetlands that provide habitat for endangered species and other wildlife. Constructing/developing wetlands in the Modesto area would probably require conversion of agricultural land or modification of other land uses.

Recycled water quality is a significant consideration for environmental use since pharmaceuticals, trace elements, pesticides, and other constituents could potentially result in adverse impacts to aquatic and other wetland species. The quality of recycled water required for environmental use is dependent on the specific uses of the water (i.e., treatment wetlands have different needs than stream flow augmentation projects). Treatment requirements and water quality goals should be evaluated in the future as specific environmental projects are identified.

6.6.4.3 Groundwater Recharge

Using municipal recycled water as a recharge source for groundwater subbasins used for M&I water supply purposes is an approved practice in California. Water Factory 21 in Orange County and the Montebello Forebay project operated by the Los Angeles County Sanitation District have been in operation since the late 1970s, recharging over 50,000 AFY to the local groundwater subbasins. However, advanced treatment technologies (reverse osmosis (RO), ultraviolet (UV) disinfection, etc.) are necessary to remove pathogens, organics, trace elements, and other impurities prior to recharge. These

technologies are expensive to construct and operate and typically reduce the project yield by as much as 25 percent (due to residuals and brine byproduct). Brine byproduct disposal would be an additional challenge for a groundwater recharge project. It is unlikely that the brine byproduct would be an allowable discharge to any inland surface water. Evaporation/crystallization process, blending and use for irrigation, or some other disposal process would need to be implemented in conjunction with the RO facilities.

Groundwater recharge using recycled water can be accomplished by percolation or direct injection. Recharge could be practiced year-round or seasonally and could be implemented with other potential recycled water uses. With recharge, recycled water would commingle with groundwater and be transported via the aquifer system to existing wells. Percolation basins would be located in areas with high recharge potential. Injection wells could also be constructed but would need to be spaced to reduce groundwater mounding and would require a distribution header system.

Groundwater is a major potable water supply component for the City and surrounding communities. A groundwater recharge project could supplement and increase the annual groundwater basin operational yield. Water quality constituents of concern in any domestic groundwater supply include salinity, nitrates, certain trace elements, hardness, iron, and manganese. Such groundwater contaminants would need to be considered with any Aquifer Storage and Recovery Program in terms of how the source water would impact groundwater chemistry.

Regulatory requirements governing groundwater recharge differ based on factors such as method of recharge, effluent quality, groundwater depth, soil percolation capacity, and groundwater basin volume. All these variables would need to be defined before a recharge project could be considered for implementation. The coliform concentration of the City's secondary treated recycled water exceeds the maximum concentration allowed to recharge through settling basins. Tertiary treated recycled water would be necessary for direct groundwater injection. Therefore, groundwater recharge using recycled water is not included in the planning horizon of this plan.

6.6.5 Actions to Encourage and Optimize Future Recycled Water Use

Although public education of the benefits of recycled water use and beautification of areas using recycled water supplies are important components to develop positive public perception surrounding recycled water and encourage widespread recycled water usage, the qualitative nature of these measures precludes projecting their impact on recycled water usage.

On a long-term basis, the City will continue to explore regional wastewater treatment and recycled water use opportunities. As noted above, although the City's recycled water delivered through the NVRRWP is a beneficial use, it does not provide a direct potable water offset in the City's water service area and is therefore not accounted for in Table 6-9.

Table 6-9. Methods to Expand Future Recycled Water Use (DWR Table 6-6 Retail)

☑	Supplier does not plan to expand recycled water use in the future. Supplier will not complete the table below but will provide narrative explanation.
6-18	Provide page location of narrative in UWMP

6.7 DESALINATED WATER OPPORTUNITIES

Due to the significant infrastructure investment required to convey seawater for desalination, the lack of proximate brackish supply sources and the depth to saline groundwater, desalination is not currently a viable water supply option for the City or MID.

6.8 EXCHANGES OR TRANSFERS

This section describes the City and MID's opportunities for exchanges or transfers of water on a short-term or long-term basis. Water exchanges are typically water delivered by one water user to another water user, with the receiving user providing water in return at a specified time or when the conditions of the parties' agreements are met. The CWC defines water transfers as a temporary or long-term change in the point of diversion, place of use, or purpose of use due to transfer, sale, lease, or exchange of water or water rights. Temporary water transfers have a duration of one year or less, and long-term water transfers have a duration of more than one year.

6.8.1 Exchange or Transfer Opportunities for the City

During supply shortage years, MID's treated surface water supply deliveries to the City may be reduced in equal proportion to deliveries for agricultural customers. Although never utilized, the City has the option of delivering groundwater to MID's irrigation canal system in exchange for an equal amount of raw surface water to be treated at the MRWTP during dry years. The City's exchange or transfer opportunities are shown in Table 6-10.

Table 6-10. Exchange or Transfer Opportunities for the City

Transfer Agency	Transfer or Exchange	Short-term	Proposed Quantities	Long-term	Proposed Quantities
MID	Transfer or Exchange	Yes	TBD	No	N/A
Total	-	-	**TBD**	-	**N/A**

6.8.2 Exchange or Transfer Opportunities for MID

During supply shortage years, MID surface water supplies may be reduced. MID may execute exchange agreements with the City, which would allow the City to deliver groundwater to MID's irrigation canal system in exchange for an equal amount of raw surface water to be treated at the MRWTP during dry years. In general, MID has not sought exchange or transfer opportunities. MID's exchange or transfer opportunities are summarized in Table 6-11.

Table 6-11. Exchange or Transfer Opportunities for MID

Transfer Agency	Transfer or Exchange	Short-term	Proposed Quantities	Long-term	Proposed Quantities
City of Modesto	Exchange	Yes	TBD	No	N/A
Total	-	-	**TBD**	-	**N/A**

6.9 FUTURE WATER PROJECTS

The City's treated surface water supply from MID and the City's groundwater supply are the key components of the City's water supply portfolio. This section describes potential future water supply projects that the City and MID may implement to increase water supply for average, single-dry, and multiple dry years. Because the City is projected to have sufficient supplies to meet future water demands as documented in the City's 2017 Water Master Plan, the need for and timing of potential water supply projects have not been determined. Therefore, these potential future water supply projects are not currently included in the City and MID's future water supply portfolio, and DWR Table 6-7 (Retail) and Table 6-7 (Wholesale) have not been completed.

6.9.1 Potential Additional Surface Water Supply Options

Treated surface water purchased from MID is a key component of the City's existing water supply portfolio. A MRWTP Phase Three Expansion Project may be possible in the future if an available surface water supply is identified in the future. However, at this time, this project is speculative, and the need for and timing of this project has not yet been determined.

6.9.2 Future Groundwater Supply Considerations

Groundwater is a key component of the City's existing water supply portfolio. The following sections describe key future groundwater supply options, including:

- Wellhead treatment systems
- Aquifer Storage and Recovery (ASR) Program consisting of injecting, storing, and recovering treated surface water from the groundwater aquifer beneath the City

6.9.2.1 Wellhead Treatment Evaluation

To help address the City's vulnerability to groundwater quality issues, a wellhead treatment evaluation was performed as part of the 2017 Water Master Plan project to: (1) evaluate the range of wellhead treatment options available for removal of several specific contaminants of concern (hexavalent chromium, nitrate, manganese, strontium and uranium); and (2) recommend which processes would best suit wellhead treatment applications at the City's wells. The best technology for wellhead treatment depends upon both the target contaminant and the ambient water quality of the groundwater. A series of recommended treatment approaches were developed and are summarized in Table 6-12.

Table 6-12. Summary of Wellhead Treatment Recommendations by Contaminant Type[(a)]

Contaminant	Recommended Process(es)	Rationale	Additional Notes
Hexavalent Chromium (with low nitrate)	Strong base anion (SBA) exchange	Advances in brine minimization have greatly reduced waste management costs for at least one technology	If SBA or biological treatment cannot be used alone, biofiltration followed by SBA may be warranted to minimize expensive ion exchange brine disposal requirements.
Hexavalent Chromium (with high nitrate)	Biological treatment (if proven), anion exchange if not	Biological treatment is proven at bench scale, pilot testing in progress	
Manganese	Greensand filtration	Simple to operate, low cost alternative	Permanganate is a more effective oxidant but use of free chlorine may be simpler as it can also serve as a disinfectant residual post treatment.
Nitrate	Biological filtration	Lowest cost, simple operation, eco friendly	A comparatively new technology but conditionally approved by DDW and does not produce a brine waste.
Uranium	Anion exchange with off-site regeneration	Long operating life if the nitrate concentration is low, no technically enhanced naturally occurring radioactive material waste production on-site	If nitrate is relatively high (so violation of the MCL is likely at breakthrough), pretreatment with biofiltration should be considered.
Strontium	Cation exchange and/or lime softening	Both proven efficacious	Dataset is limited. Cations like calcium can be a big problem for strontium removal with ion exchange so pretreatment may be warranted.

(a) Source: Chapter 5, 2017 Water Master Plan.

As the City moves forward with treatment at one or more of its groundwater wells, site-specific details like water quality, available footprint, and access to waste disposal options may shift the preferred technology choice. Also, as technologies develop, new (and/or better-proven) options may become available that warrant further consideration.

6.9.2.2 ASR Program

The 2017 Water Master Plan project also included a conceptual level evaluation for ASR within the groundwater basin underlying the City's contiguous water service area. The focus of this evaluation was to review existing data on the City's wells and groundwater basin hydrogeologic and geochemical characteristics and determine the conceptual feasibility of injecting, storing, and recovering treated surface water within the groundwater aquifer beneath the City.

ASR is a form of managed aquifer recharge that involves the seasonal banking of water in an aquifer during times when excess water is available (typically winter and spring) and subsequent recovery of the water from the aquifer when needed (typically fall and summer, and/or during drought periods). ASR utilizes dual purpose injection/recovery wells for the injection of treated, potable water for storage, and the

subsequent recovery of this previously stored water by pumping. The advantage of ASR technology is that it allows recharge to be applied in those geographic areas or aquifer zones with the most need, or where available groundwater storage space is the greatest. In addition, ASR sites require minimal land use area, so they can be more easily located than spreading basins or other recharge facilities.

Conceptually, treated surface water purchased on a wholesale basis from MID could be used when seasonally available surplus supply is available to develop an ASR program for the City. The ASR program, if determined to be feasible, could provide the City with the following benefits: system peaking, enhanced groundwater operational yield, and improved groundwater quality. A pilot study would be needed to confirm that the water quality of the groundwater pumped for distribution meets standards for potable water use.

The overall conclusion based on what has been analyzed to date is that an ASR Program could be viable in the groundwater basin underlying the City. It is recommended that the City move forward with additional necessary ASR-related studies to empirically verify the conclusions of the initial study and to develop site specific data regarding the effectiveness, impacts, and economics of ASR. These test program data would then serve as the basis for evaluating, planning, and permitting a full-scale ASR Program within the City.

6.10 SUMMARY OF EXISTING AND PLANNED SOURCES OF WATER

6.10.1 Existing and Planned Sources of Water for the City

Total annual water production has generally decreased since the mid-2000s, a direct result of decreased water demands resulting from the recent economic downturn, water conservation in response to recent drought conditions, the City's installation of water meters, and reduced leakage losses. Water production in both 2014 and 2015 was particularly low in response to increased water conservation due to severe drought conditions. Following the drought, water production has rebounded but remains below pre-drought levels.

Overall, annual surface water deliveries to the City have been relatively consistent, with groundwater pumpage varying as needed to meet demands. In 2014 and 2015, there were significant reductions in treated surface water deliveries from MID, and the City increased its groundwater supply to meet water demands. Annual surface water deliveries have increased since 2016, allowing the City to reduce groundwater pumpage.

The City's annual treated surface water purchases from MID and groundwater pumpage in 2020 to serve the City's contiguous and outlying service areas are summarized in Table 6-13.

Table 6-13. Water Supplies – Actual (DWR Table 6-8 Retail)

Water Supply	Additional Detail on Water Supply	2020		
Drop down list May use each category multiple times.These are the only water supply categories that will be recognized by the WUEdata online submittal tool		Actual Volume*	Water Quality Drop Down List	Total Right or Safe Yield* (optional)
Purchased or Imported Water	Purchases from MID	25,983	Drinking Water	
Groundwater (not desalinated)		27,121	Drinking Water	
Total		53,104		0
Units of measure (AF, CCF, MG) *must remain consistent throughout the UWMP as reported in Table 2-3.*				
NOTES: Volumes are in AF.				

Table 6-14 summarizes the future projected water supplies for the City. The City plans to maximize the use of available treated surface water supplies purchased from MID including the MRWTP Phase Two Expansion and supplement with its available groundwater supply to meet projected water demands.

Table 6-14. Water Supplies – Projected (DWR Table 6-9 Retail)

Water Supply	Additional Detail on Water Supply	Projected Water Supply * Report To the Extent Practicable				
Drop down list May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool		**2025**	**2030**	**2035**	**2040**	**2045** (opt)
		Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume
Purchased or Imported Water	Purchases from MID	39,200	44,800	50,400	56,000	61,600
Groundwater (not desalinated)		24,466	23,489	22,511	21,533	20,556
Total		63,666	68,289	72,911	77,533	82,156
Units of measure (AF, CCF, MG) *must remain consistent throughout the UWMP as reported in Table 2-3.*						
NOTES: Volumes are in AF. Assumes supply from MRWTP Phase Two Expansion will increase linearly between 2020 and 2050; any increase in supply will need to conform to requirements of the ARTDA. Groundwater makes up the difference between MID supplies and projected demands. Since the City no longer serves Hickman and Waterford, the City's groundwater safe yield was reduced by 2,000 AFY (estimate based on historical use for Hickman and Waterford).						

6.10.2 Existing and Planned Sources of Water for MID

MID's annual treated surface water supplies delivered to the City in 2020 are summarized in Table 6-15.

Table 6-15. Water Supplies – Actual (DWR Table 6-8 Wholesale)

Water Supply	Additional Detail on Water Supply	2020		
Drop down list May use each category multiple times.These are the only water supply categories that will be recognized by the WUEdata online submittal tool		Actual Volume*	Water Quality Drop Down List	Total Right or Safe Yield* (optional)
Surface water (not desalinated)	Tuolumne River	25,983	Drinking Water	
	Total	25,983		0
***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*				
NOTES: Volumes are in AF.				

Table 6-16 summarizes the future projected water supplies for MID. As discussed above, the MRWTP Phase Two Expansion project can provide up to an additional 30 MGD of treatment capacity, for a total annual supply of up to 67,200 AFY.

Table 6-16. Water Supplies – Projected (DWR Table 6-9 Wholesale)

Water Supply	Additional Detail on Water Supply	Projected Water Supply* Report To the Extent Practicable				
		2025	**2030**	**2035**	**2040**	**2045** (opt)
Drop down list May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool		Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume
Surface water (not desalinated)	Tuolumne River	39,200	44,800	50,400	56,000	61,600
	Total	39,200	44,800	50,400	56,000	61,600
***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*						
NOTES: Volumes are in AF. Assumes supply from MRWTP Phase Two Expansion will increase linearly between 2020 and 2050. Treated surface water supplies shown above are approximations based off of demand. Any and all treated surface water to be provided shall be in accordance with the ARTDA.						

6.11 CLIMATE CHANGE IMPACTS TO SUPPLY

An extensive evaluation of the impacts of climate change is included the East Stanislaus Integrated Regional Water Management Plan (ESIRWMP) Update (February 2018). The City is included in the East Stanislaus Regional Water Management Partnership (ESRWMP), the official Regional Water Management Group for the region, along with the cities of Hughson, Ceres, Turlock, Waterford, and Stanislaus County. Key findings from the climate change evaluation in the ESIRWMP Update are summarized below.

There is mounting scientific evidence that global climate conditions are changing and will continue to change as a result of the continued build-up of GHGs in the Earth's atmosphere and other issues. Changes in climate can affect municipal water supplies through modifications in the timing, amount, and form of precipitation, as well as water demands and the quality of surface runoff. These changes can affect all elements of water supply systems, from watersheds to reservoirs, conveyance systems, and treatment plants. Planning for and adapting to the anticipated changes in climate will be essential to ensure water supply reliability for all users and to protect sensitive infrastructure against potentially more frequent and extreme precipitation and wildfire events.

The ESIRWMP planning region lies within the San Joaquin River Hydrologic Region and contains the Stanislaus, Tuolumne, Merced and San Joaquin Rivers, and Dry Creek. The Stanislaus, Tuolumne and Merced Rivers are all tributaries to the San Joaquin River, with the Tuolumne River having the largest watershed in the San Joaquin River system. At present, all major tributaries to the San Joaquin River are being studied with respect to anticipated impacts from climate change. Studies currently underway include:

- Changes in snow cover patterns in the Sierra Nevada (University of Washington)
- The role of atmospheric rivers in extreme events in the Sierra Nevada (United States Geological Survey [USGS])
- Impacts of climate changes on soil properties and habitats in the Sierra Nevada (UC-Merced and USGS)
- Study of the effects of climate change on hydrology and stream temperatures in the Merced and Tuolumne River watersheds (Santa Clara University)

In general, these studies are multi-year endeavors and are either in progress or have yielded data that are currently being evaluated. While preliminary study results appear to support other climate change impact observations and modeling simulations, the final published conclusions of these studies are, for the most part, not currently available.

Climate change is adding new uncertainties to already existing challenges in water resources planning within the ESIRWMP planning region because the water supply portfolio in the region is not widely diversified. Water supplies are derived from multiple subbasins of the San Joaquin Valley Groundwater Basin and primarily from the Tuolumne River. Climate change will impact groundwater and surface water differently, but the region's vulnerabilities are the same regardless of the source:

- Reduced surface water availability
- Reduced water supply reliability as a result of reduced groundwater recharge and runoff
- Potential increase in groundwater overdraft
- Declining water quality

- Loss of riparian habitat, wetlands and other sensitive natural communities
- Reduced hydroelectric generation capacity

Considering the amount of uncertainty associated with climate change projections, a prudent approach to addressing climate change incorporates a combination of adaptation and mitigation strategies. Climate adaptation includes strategies (policies, programs or other actions) that bolster community resilience in the face of unavoidable climate impacts, where mitigation strategies include best management practices (BMPs) or other measures that are taken to reduce GHG emissions.

The Proposition 84 Integrated Regional Water Management (IRWM) Guidelines require consideration of the California Water Plan (CWP) resource management strategies (RMS) in identifying projects and water management approaches for the region. RMS are being considered in the ESIRWMP planning process to meet the region's objectives. Application of various RMS diversifies water management approaches, and many of the RMS apply to climate change adaptation and mitigation. Categories of applicable RMS include:

- Reduce Water Demand
- Improve Operational Efficiency and Transfers
- Increase Water Supply
- Improve Water Quality
- People and Water
- Practice Resource Stewardship
- Improve Flood Management
- Other Strategies

For the City, the implementation of its overall water conservation program, particularly the completion of the residential metering program, will help to reduce water demands, and also conserve energy as a result of decreased water treatment, conveyance and pumping requirements. The City's compliance with SB X7-7 and its per capita water use targets will also ensure continued water conservation and energy conservation in the future.

As described in MID's 2020 Agricultural Water Management Plan Update, MID is committed to (1) monitoring key indicators of climate change that affect the hydrology of the Tuolumne River watershed and the growing conditions in MID's irrigation service area, and (2) adapting its water management practices to respond to changes as they become evident. In addition to adaptive management, implementation of the water conservation initiatives currently underway at MID will help MID and its agricultural water users prepare for the potential impacts of climate change by improving operational control. Improving operational control will enable MID to exercise adaptive management measures should they become necessary.

6.12 ENERGY INTENSITY

In accordance with CWC Section 10631.2(a), the energy intensity to provide water service to the City's customers over a one-year period is presented in this section to the extent that the information is available. The amount of energy to divert, pump, treat, and distribute the City and MID's water supply within the systems they own and operate are included.

Water energy intensity is the total amount of energy, calculated on a whole-system basis, used to deliver water to the City's customers for use. Energy intensity is the total amount of energy in kilowatt-hours (kWh) expended per acre-foot to take water from its source to its point of delivery. For MID, this means the energy required to treat surface water and deliver potable water to the City. For the City, this means pumping and treating groundwater and delivering potable water to its customers. Understanding the whole-system energy intensity would allow the City and MID to develop the following water supply management and system operation strategies:

- Identify energy saving opportunities, as energy consumption is often a large portion of the cost of delivering water
- Calculate energy savings and GHG emission reductions associated with water conservation programs
- Identify potential opportunities to obtain energy efficiency funding for water conservation programs
- Inform climate change mitigation strategies
- Benchmark energy use at each water extraction, treatment, and delivery step and comparing energy use among similar agencies

Table 6-17 and Table 6-18 calculate the energy intensity of the MID's and the City's water system, respectively, for 2019, a typical year's energy use. In 2020, shelter-in-place orders and business restrictions related to the COVID-19 pandemic may have altered typical water use patterns. The total energy intensity for MID's water system is approximately 297 kWh/AF, while the City's water service energy intensity is approximately 318 kWh/AF.

Table 6-17. Recommended Energy Intensity for MID – Total Utility Approach (DWR Table O-1B)

Enter Start Date for Reporting Period	1/1/2019	**Urban Water Supplier Operational Control**		
End Date	12/31/2019			
☐ Is upstream embedded in the values reported?		**Sum of All Water Management Processes**	**Non-Consequential Hydropower**	
Water Volume Units Used	*AF*	Total Utility	Hydropower	Net Utility
Volume of Water Entering Process (volume unit)		*29,604*	*0*	*29,604*
Energy Consumed (kWh)		*8,787,000*	*0*	*8,787,000*
Energy Intensity (kWh/volume)		*296.8*	*0.0*	*296.8*

Table 6-18. Recommended Energy Intensity for the City – Total Utility Approach (DWR Table O-1B)

Enter Start Date for Reporting Period	1/1/2019	Urban Water Supplier Operational Control		
End Date	12/31/2019			
☐ Is upstream embedded in the values reported?		Sum of All Water Management Processes	Non-Consequential Hydropower	
Water Volume Units Used	*AF*	Total Utility	Hydropower	Net Utility
Volume of Water Entering Process (volume unit)		*49,883*	*0*	*49,883*
Energy Consumed (kWh)		*15,844,410*	*0*	*15,844,410*
Energy Intensity (kWh/volume)		*317.6*	*0.0*	*317.6*

As discussed in Section 6.6.2, the City collects, treats, and discharges wastewater. The energy intensity associated with the City's wastewater systems for 2019 is provided in Table 6-19. The City provided combined energy use information for treatment and discharge/distribution, so Table 6-19 presents their combined energy use under the "Treatment" process. The total energy intensity for the City's wastewater service is approximately 941 kWh/AF for 2019. Since neither MID nor the City distribute recycled water, energy intensity for recycled water is not included.

The City's and MID's energy intensity tables and associated narratives are provided in Appendix I.

Table 6-19. Recommended Energy Intensity – Wastewater & Recycled Water (DWR Table O-2)

Enter Start Date for Reporting Period	1/1/2019	Urban Water Supplier Operational Control			
End Date	12/31/2019	Water Management Process			
☐ Is upstream embedded in the values reported?		Collection / Conveyance	Treatment	Discharge / Distribution	Total
Volume of Water Units Used	AF				
Volume of Wastewater Entering Process (volume units selected above)		*0*	*23,797*	*0*	*23,797*
Wastewater Energy Consumed (kWh)		*921,963*	*21,472,485*	*0*	*22,394,448*
Wastewater Energy Intensity (kWh/volume)		*0.0*	*902.3*	*0.0*	*941.1*

CHAPTER 7
Water Service Reliability and Drought Risk Assessment

This chapter describes the City and MID's water service reliability under various hydrologic conditions, including a severe drought for the next five years. The City and MID's current and proposed water management tools to address the reliability of water supplies are also discussed. Responses to actual water shortage conditions are addressed in Chapter 8.

7.1 WATER SERVICE RELIABILITY ASSESSMENT

This section presents the constraints on the City and MID's existing and planned water sources and describes the historical basis for projecting available supplies in various hydrologic conditions (i.e., normal year, single dry year, and five consecutive dry years). The City and MID's water service reliability is then presented in five-year increments through 2045 based on previous analysis of water use (discussed in Chapter 4) and supply (Chapter 6). Finally, this section discusses the City and MID's water management tools and options to promote regional supply reliability and minimize the need to import water from other regions.

7.1.1 Constraints on Water Sources

As described in Chapter 6, the City relies on two primary sources of water supplies: wholesale treated Tuolumne River surface water deliveries from MID and local groundwater pumping. Following is a general discussion regarding the constraints on the City and MID's water supplies and the associated management strategies that have been employed to address these constraints.

In general, the City and MID's water supplies are most vulnerable to climatic variability and chemical contamination (due to natural and/or man-made constituents).

While drought conditions can significantly reduce available surface water supplies, the effect is less pronounced for groundwater. Droughts immediately and directly reduce surface water supplies, but the impact on groundwater is delayed because droughts only reduce the primary sources of groundwater recharge (e.g., precipitation and river flows as well as deep percolation of applied water). Extended droughts can reduce available groundwater supplies by reducing available recharge, but the City's conjunctive use water supply strategy allows for flexibility. The City does not expect to reduce groundwater pumping during dry years.

By using treated surface water in-lieu of groundwater in normal years, the City will bank groundwater supplies for use in meeting dry year and peak period water demands. The City's future water supply planning incorporates sufficient surface water supplies to allow the City to meet demands primarily through the use of surface water, allowing the in-lieu banking of groundwater for future use and protecting the groundwater basin from overdraft and water quality degradation. For the City's water service area south of the Tuolumne River, groundwater will continue to serve as the only source of supply.

In contrast to surface supply reliability, reliability of local groundwater supplies is threatened by poor water quality. In the past, contamination from arsenic, uranium, PCE, TCE, DBCP, TCP, and nitrate has resulted in the need for wellhead treatment to keep wells from being taken out of service. The City has developed a strategy to keep existing wells online and bring selected out of service wells back online through a combination of wellhead treatment, blending, and aggressive monitoring. As a result, the City does not anticipate groundwater quality to threaten the City's ability to pump and deliver groundwater supplies as needed to supplement its treated surface water supply and meet current and future water demands.

Legal issues, including place of use and water rights issues, are not anticipated to limit supply reliability for the City and MID's water supplies in future years. Environmental factors can potentially limit the reliability of surface water supplies, such as during a drought when dry year supply cutbacks are necessary to maintain the health of aquatic species and the environment in general. Although environmental factors have not been a limiting factor in available water supplies to the City and MID to date, the regulatory process under Federal Energy Regulatory Commission (FERC) relicensing may introduce potential uncertainties in the future.

It should be noted that MID has supported a package of voluntary agreements that were submitted to the State Water Resources Control Board (SWRCB) in March 2019. This package of voluntary agreements is offered as an alternative to the unimpaired flow paradigm adopted by the SWRCB in the December 2018 Bay-Delta Plan. While significant work remains, this package represents an important step forward in bringing together diverse California water interests.

The sections below discuss the vulnerability of MID's wholesale supplies and the City's local groundwater supplies to the aforementioned constraints and the management strategies for addressing these vulnerabilities.

7.1.2 Year Type Characterization

Water supplies can vary year to year depending on hydrologic conditions. Historical data, where available, were used to develop a projected yield for each water supply source under three conditions: (1) normal water year, (2) single dry water year, and (3) five consecutive dry water years. In accordance with the DWR Guidebook, each condition is defined as follows:

- **Normal Water Year**: The year or averaged range of years in the historical sequence most closely representing average water supply.
- **Single Dry Water Year**: The year with the lowest water supply in the historical sequence.
- **Five-Consecutive-Year Drought**: The driest five-year historical sequence.

The following sections describe the historical calendar years selected to represent each of the above conditions for the City and MID.

7.1.2.1 Basis of Water Year Data for the City

Under normal/wet water year supply conditions, it is assumed that the City will receive its full allotment of their MID treated surface water delivery. The 1984 year represents normal conditions for the area based on the characterization of the year as an above normal year using the San Joaquin Valley Water Year Type Index. This index characterizes water year type based on the unimpaired flow at the following four locations: Stanislaus River below Goodwin Reservoir, Tuolumne River below La Grange, Merced River below Merced Falls, and San Joaquin River inflow to Millerton Lake. The unimpaired runoff for 1984 was 3.69 million AF (MAF). Above normal flow is characterized as flows greater than 3.1 MAF and less than 3.8 MAF.

As discussed in Chapter 6, the ARTDA between MID and the City includes a formula to reduce deliveries in drier than average years based on the number of inches allocated to MID's agricultural customers. In 2014 and 2015, the available supply from MID was reduced significantly due to drought conditions:

- In 2014, the available supply was 24 inches of the total 42-inch allocation (a 43 percent reduction), resulting in a treated water supply delivery to the City of approximately 19,200 AF for the 2014/2015 water year (May 1, 2014 through April 30, 2015); and
- In 2015, the available supply was 16 inches of the total 42-inch allocation (equivalent to a 62 percent reduction), resulting in a treated water supply delivery to the City of approximately 12,800 AF for the 2015/16 water year (May 1, 2015 through April 30, 2016).

For a single dry water year, it was assumed that MID delivery cutbacks would equal those experienced in 2015 (i.e., a reduction of 26/42 inches, or 61.9 percent). In dry years, the City plans to supplement reduced surface water supplies with banked groundwater supplies, as necessary, to meet water demands.

To estimate supply reductions during a five-year drought, MID delivery cutbacks were based on the 2015 water supply condition. It was assumed that 2015 was the fifth year of a five-year drought with equally proportioned shortages for the five years (or a 26-inch reduction/5 years for a 5.2-inch effective reduction per year). Therefore, for planning purposes, the MID delivery cutbacks experienced in each successive drought year are assumed as follows:

- First year cutback: 5.2/42 inches (12.4 percent)
- Second year cutback: 10.4/42 inches (24.8 percent)
- Third year cutback: 15.6/42 inches (37.1 percent)
- Fourth year cutback: 20.8/42 inches (49.5 percent)
- Fifth year cutback: 26.0/42 inches (61.9 percent)

When available, the City can also purchase additional water from MID (at a higher rate) or exchange groundwater for agricultural use for treated surface water during drought years. However, the City did not purchase additional treated surface water supplies in 2014 or 2015. Instead, the City chose to increase groundwater production and implement an aggressive water conservation program to help reduce water demands to match available supplies.

Water conservation measures included both voluntary actions implemented by the City's water customers and mandatory measures implemented by the City in response to the drought conditions and as mandated by the Governor's Executive Order calling for a statewide reduction in urban water use of 25 percent (as compared to 2013). Each urban water supplier in California was assigned a conservation standard (a percent reduction as compared to 2013 water use) to achieve the statewide water conservation goal. The City's conservation standard was a reduction of 36 percent (as compared to 2013 water use)[12]. From June 2015 to October 2015, the City achieved a cumulative savings of 29.1 percent (as compared to the same months in 2013). Though less than the 36 percent conservation standard set for the City, this was still a very significant water demand reduction. The success of these recent water

[12] Effective March 1, 2016, the Urban Water Supplier Water Conservation Standard for the City of Modesto was reduced to 33 percent.

conservation measures has shown that the City can reduce water demands in response to water supply shortages.

The City's increased groundwater production in response to the treated surface water supply shortage remained within the operational yield estimates for the Modesto and Turlock Subbasins and is not anticipated to have any adverse effects on the underlying groundwater subbasins or resources. In the future, if the City were to implement an ASR Program (as discussed in Chapter 6), the City may be able to inject surplus treated surface water supplies available in normal or wet years into the underlying groundwater subbasins and bank it for later extraction during dry years and/or use during seasonal demand peaking. Such a program would provide the City with added supply reliability during dry years.

Table 7-1 shows the City's historical supply reliability during the water years described above. The available supplies columns specify the volume and percentage of the City's total water supply expected if the hydrology from that type of year were to repeat. Based on the operational yield estimates for the Modesto and Turlock Subbasins, it was assumed that groundwater supplies (53,500 AFY) would not be reduced in dry years. It should be noted that the City was not purchasing water supplies from MID in the base average/normal water year shown (deliveries from MID to the City began in 1995 with the completion of the MRWTP); therefore, the quantity shown is based on what the available supply would have been during the given hydrologic condition.

Table 7-1. Basis of Water Year Data (Reliability Assessment) (DWR Table 7-1 Retail)

Year Type	Base Year If not using a calendar year, type in the last year of the fiscal, water year, or range of years, for example, water year 2019-2020, use 2020	Available Supplies if Year Type Repeats	
		☐ Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP. Location _____	
		☑ Quantification of available supplies is provided in this table as either volume only, percent only, or both.	
		Volume Available *	% of Average Supply
Average Year	1984	87,100	100%
Single-Dry Year	2015	66,300	76%
Consecutive Dry Years 1st Year	2011	82,900	95%
Consecutive Dry Years 2nd Year	2012	78,800	90%
Consecutive Dry Years 3rd Year	2013	74,600	86%
Consecutive Dry Years 4th Year	2014	70,500	81%
Consecutive Dry Years 5th Year	2015	66,300	76%

Supplier may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If a Supplier uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.

***Units of measure (AF, CCF, MG**) must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES: Volumes available are rounded to nearest hundred AF. Includes both purchased water from MID and groundwater supplies. Volume of MID supply for the fifth multiple dry year based on the supply reduction that actually occurred in 2015. 2011 through 2014 MID supply volumes are estimated based on the actual 2015 MID cutback spread equally over five years (2011 to 2015). Assumes total groundwater supply is available (53,500 AFY) and will not be reduced in dry years. During dry years, the City may have the opportunity to purchase additional water from MID (at a higher rate) or to exchange groundwater for agricultural use for treated surface water from MID.

7.1.2.2 Basis of Water Year Data for MID

As described above, MID surface water supplies are subject to cutbacks based on climatic variability. Table 7-2 shows the historical supply reliability for MID's wholesale treated surface water deliveries to the City during the same base years as in Table 7-1. Since MID was not delivering treated surface water supply to the City in the base average/normal water year, the quantity shown is what the available supply would have been during the given hydrologic condition.

Table 7-2. Basis of Water Year Data (Reliability Assessment) (DWR Table 7-1 Wholesale)

Year Type	Base Year If not using a calendar year, type in the last year of the fiscal, water year, or range of years, for example, water year 1999-2000, use 2000	Available Supplies if Year Type Repeats	
		☐ Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP. Location _____	
		☑ Quantification of available supplies is provided in this table as either volume only, percent only, or both.	
		Volume Available *	**% of Average Supply**
Average Year	1984	33,600	100%
Single-Dry Year	2015	12,800	38%
Consecutive Dry Years 1st Year	2011	29,400	88%
Consecutive Dry Years 2nd Year	2012	25,300	75%
Consecutive Dry Years 3rd Year	2013	21,100	63%
Consecutive Dry Years 4th Year	2014	17,000	51%
Consecutive Dry Years 5th Year	2015	12,800	38%

Supplier may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If a supplier uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table. Suppliers may create an additional worksheet for the additional tables.

***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES: Volumes available are rounded to nearest hundred AF. Volume for the fifth multiple dry year based on the supply reduction that actually occurred in 2015. 2011 through 2014 volumes are estimated based on the actual 2015 MID cutback spread equally over five years (2011 to 2015). During dry years, the City may have the opportunity to purchase additional water from MID (at a higher rate) or to exchange groundwater for agricultural use for treated surface water from MID.

7.1.3 Water Service Reliability

This section evaluates the City and MID's water supply reliability for normal, single dry, and five consecutive dry years.

7.1.3.1 Water Service Reliability – Normal Year

7.1.3.1.1 City of Modesto

The City's normal water year supplies include:

- MRWTP Phase One supply of 33,600 AFY;
- MRWTP Phase Two Expansion supply, assumed to be 5,600 AFY in 2025 and increasing linearly as additional development occurs[13] within the City's contiguous water service area up to an additional total supply of 33,600 AFY in 2050; and
- Groundwater pumping from City's local groundwater basins (up to 51,500 AFY) is assumed to provide 100 percent of the City's remaining water demand.

As described in Chapter 4, the City's normal water year demands have been projected based on remaining vacant land assumed to be developed by buildout in the City's water service area. Additional details are available in the City's 2017 Water Master Plan.

Table 7-3 shows that in normal water years, the City's supplies are adequate to meet projected demands.

Table 7-3. Normal Year Supply and Demand Comparison (DWR Table 7-2 Retail)

	2025	2030	2035	2040	2045 *(Opt)*
Supply totals *(autofill from Table 6-9)*	63,666	68,289	72,911	77,533	82,156
Demand totals *(autofill from Table 4-3)*	63,666	68,289	72,911	77,533	82,156
Difference	0	0	0	0	0
NOTES: Volumes are in AF.					

7.1.3.1.2 MID

MID's total urban supply to meet expected City demands is assumed to be approximately 39,200 AFY in 2025 and is planned to increase (up to 67,200 AFY in 2050) along with growth in the City's contiguous water service area. Any increase in supply will need to conform to requirements of the ARTDA. The City's

[13] Treated surface water supplies are approximations based off of demand. Any and all treated surface water to be provided shall be in accordance with the ARTDA.

water demand to be met by MID supplies is projected to match MID's available supply because the City plans to maximize the use of treated surface water supply. Table 7-4 shows that in normal water years, MID's supply is adequate to meet projected demands.

Table 7-4. Normal Year Supply and Demand Comparison (DWR Table 7-2 Wholesale)

	2025	2030	2035	2040	2045 *(Opt)*
Supply totals *(autofill from Table 6-9)*	39,200	44,800	50,400	56,000	61,600
Demand totals *(autofill from Table 4-3)*	39,200	44,800	50,400	56,000	61,600
Difference	0	0	0	0	0
NOTES: Volumes are in AF. Treated surface water supplies shown above are approximations based off of demand. Any and all treated surface water to be provided shall be in accordance with the ARTDA.					

7.1.3.2 Water Service Reliability – Single Dry Year

7.1.3.2.1 City of Modesto

The City's single dry year supplies include:

- Projected base purchased surface water supplies from MRWTP Phase One and the MRWTP Phase Two Expansion (with a 61.9 percent reduction from normal year MID supplies)[14]; and
- Groundwater pumping from City's local groundwater basins (up to 51,500 AFY).

It is assumed that water conservation efforts can reduce the City's "single dry year" demands as needed to match available supplies. As discussed above, the City significantly reduced water demands during 2014 and 2015 and can implement similar water conservation measures to respond to future water supply shortages.

Table 7-5 shows that in single dry years, the City's supplies are adequate to meet projected demands with conservation.

[14] If available, the City can purchase additional water from MID (at a higher rate) or exchange groundwater for agricultural use for treated surface water from MID. For planning purposes, it is conservatively assumed that supplemental treated surface water supply is not available during a single dry year.

Table 7-5. Single Dry Year Supply and Demand Comparison (DWR Table 7-3 Retail)

	2025	2030	2035	2040	2045 (Opt)
Supply totals*	63,666	68,289	70,700	72,833	74,967
Demand totals*	63,666	68,289	70,700	72,833	74,967
Difference	0	0	0	0	0

***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES: Volumes are in AF. For planning purposes, a conservative supply condition assuming a 61.9 percent reduction in MID treated water supply during a single dry year is used here. Available groundwater supply assumed to be 51,500 AFY. The following demand reductions were required to match available supplies during a single dry year condition:

2025 - 0%
2030 - 0%
2035 - 3%
2040 - 6%
2045 - 9%

7.1.3.2.2 MID

In single dry years, the MID base urban supply is projected to be reduced by approximately 61.9 percent (because of reduced surface water deliveries). If available, the difference between dry year base supply and normal year supply will be available as an allocation on an optional basis at additional cost to the retail supplier (i.e., the City). For planning purposes, it is conservatively assumed that this supplemental allocation is unavailable.

Table 7-6 shows that in single dry years, MID's maximum available supply will be used to meet projected water demands. The City's water demand to be met by MID supplies is projected to match MID's available supply because the City plans to maximize the use of treated surface water supply.

Table 7-6. Single Dry Year Supply and Demand Comparison (DWR Table 7-3 Wholesale)

	2025	2030	2035	2040	2045 (Opt)
Supply totals*	14,933	17,067	19,200	21,333	23,467
Demand totals*	14,933	17,067	19,200	21,333	23,467
Difference	0	0	0	0	0
***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*					
NOTES: Volumes are in AF. During dry years, the City may have the opportunity to purchase additional water from MID (at a higher rate) or to exchange groundwater for agricultural use for treated surface water from MID. For planning purposes, it is conservatively assumed that the supplemental purchase and exchange options are unavailable.					

7.1.3.3 Water Service Reliability – Five Consecutive Dry Years

7.1.3.3.1 City of Modesto

The City's multiple dry year supplies include:

- Projected base purchased surface water supplies from MRWTP Phase One and the MRWTP Phase Two Expansion (with a 12.4 percent reduction from normal year MID supplies during the first dry year and an additional 12.4 percent reduction in each successive dry year)[15]; and
- Groundwater pumping from City's local groundwater basins (up to 51,500 AFY).

As shown in Table 7-7, during multiple dry years the City's supplies are adequate to meet projected demands with water conservation. It is assumed that water conservation efforts can reduce the City's "multiple dry year" demands as needed to match available supplies. As discussed above, the City significantly reduced water demands during 2014 and 2015 and can implement similar water conservation measures to respond to future water supply shortages.

[15] If available, the City can purchase additional water from MID (at a higher rate) or exchange groundwater for agricultural use for treated surface water from MID. For planning purposes, it is conservatively assumed that supplemental treated surface water supply is not available during multiple dry years.

Table 7-7. Multiple Dry Years Supply and Demand Comparison (DWR Table 7-4 Retail)

		2025*	2030*	2035*	2040*	2045* (Opt)
First year	Supply totals	63,666	68,289	72,911	77,533	82,156
	Demand totals	63,666	68,289	72,911	77,533	82,156
	Difference	0	0	0	0	0
Second year	Supply totals	64,591	69,213	73,836	78,458	83,080
	Demand totals	64,591	69,213	73,836	78,458	83,080
	Difference	0	0	0	0	0
Third year	Supply totals	65,515	70,138	74,760	79,382	84,005
	Demand totals	65,515	70,138	74,760	79,382	84,005
	Difference	0	0	0	0	0
Fourth year	Supply totals	66,440	71,062	75,685	80,307	84,310
	Demand totals	66,440	71,062	75,685	80,307	84,310
	Difference	0	0	0	0	0
Fifth year	Supply totals	67,364	70,281	72,414	74,548	76,681
	Demand totals	67,364	70,281	72,414	74,548	76,681
	Difference	0	0	0	0	0

***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES: Volumes are in AF. Projected demand based on the 2017 Water Master Plan (reduced by 15 percent to better align with recent actual demands). For planning purposes, a conservative supply condition assuming a 12.4, 24.8, 37.1, 49.5, and 61.9 percent reduction in MID treated water supply during consecutive dry years is used here. Available groundwater supply assumed to be 51,500 AFY. Demand reductions between 1 and 11 percent were required to match available supplies during the fourth and fifth years.

7.1.3.3.2 MID

During multiple dry years, the MID base urban supply is projected to be reduced by approximately 12.4 percent during the first year with an additional 12.4 percent reduction in successive years (up to a total reduction of 61.9 percent in the fifth consecutive dry year). If available, the difference between dry year base supply and normal year supply will be available as an allocation on an optional basis at additional cost to the retail supplier (i.e., the City). For planning purposes, it is conservatively assumed that this supplemental allocation is unavailable.

As shown in Table 7-8, during multiple dry years MID's maximum available supply will be used to meet projected demands. The City's water demand to be met by MID supplies is projected to match MID's available supply because the City plans to maximize the use of treated surface water supply.

Table 7-8. Multiple Dry Years Supply and Demand Comparison (DWR Table 7-4 Wholesale)

		2025*	2030*	2035*	2040*	2045* (Opt)
First year	Supply totals	34,347	39,253	44,160	49,067	53,973
	Demand totals	34,347	39,253	44,160	49,067	53,973
	Difference	0	0	0	0	0
Second year	Supply totals	30,321	34,534	38,748	42,961	47,174
	Demand totals	30,321	34,534	38,748	42,961	47,174
	Difference	0	0	0	0	0
Third year	Supply totals	26,023	29,543	33,063	36,583	40,103
	Demand totals	26,023	29,543	33,063	36,583	40,103
	Difference	0	0	0	0	0
Fourth year	Supply totals	21,503	24,330	27,156	29,983	32,810
	Demand totals	21,503	24,330	27,156	29,983	32,810
	Difference	0	0	0	0	0
Fifth year	Supply totals	16,648	18,781	20,914	23,048	25,181
	Demand totals	16,648	18,781	20,914	23,048	25,181
	Difference	0	0	0	0	0

***Units of measure (AF, CCF, MG)** must remain consistent throughout the UWMP as reported in Table 2-3.*

NOTES: Volumes are in AF. During dry years, the City may have the opportunity to purchase additional water from MID (at a higher rate) or to exchange groundwater for agricultural use for treated surface water from MID. For planning purposes, it is conservatively assumed that supplemental purchase and exchange options are unavailable and that multiple dry year reductions are used (Year 1 = 12.4%, Year 2 = 24.8%, Year 3 = 37.1%, Year 4 = 49.5%, and Year 5 = 61.9%).

7.1.4 Water Management Tools and Options

This section reviews the City and MID's water management tools and options that would maximize the use of local water resources and minimize the need to import water from other regions.

7.1.4.1 City of Modesto

The City's current water supply portfolio of local Tuolumne River water from MID and groundwater provides considerable flexibility in maximizing local resources. Supply from MID is treated at the MRWTP, whose operating permit only allows treatment of water from the Modesto Reservoir, which is fed by the Tuolumne River. Design of specific treatment methods at the plant are also based on the water chemistry of that local source.

The City currently maximizes the use of its surface water supply from MID in normal and wetter years. Using surface water supplies provides the City with the flexibility to preserve its available groundwater supplies through in-lieu banking.

To minimize the City's vulnerability to groundwater quality issues, the City has also developed strategies to maintain and enhance its groundwater extraction capacity through a combination of well monitoring for early detection, well rehabilitation, wellhead treatment, and blending.

With these available management tools, the City does not currently foresee a need to import water from other regions.

7.1.4.2 MID

MID is primarily an agricultural water supplier, and it can reduce agricultural deliveries in drought years when surface water supplies are limited. MID also has 93 groundwater wells that it owns and maintains that are used to supplement surface water supplies during drought conditions. These groundwater wells are used for agricultural supply only and are not used for drinking water purposes. MID does not currently foresee a need to import water from other regions.

7.2 DROUGHT RISK ASSESSMENT

In accordance with CWC Section 10612, urban water suppliers must conduct a DRA, which evaluates the risk of a severe drought occurring for the next five consecutive years (2021-2025). Supply conditions for the DRA are based on the five driest consecutive years on record, with adjustments to consider plausible changes in climate, regulations, and other locally applicable criteria.

This section reviews the data and methods used to define the DRA water shortage condition and evaluates each water source's reliability under the proposed drought condition. Finally, total water supplies during the five-year drought are compared to projected demands, accounting for any applicable supply augmentation or demand reduction measures available to the City and MID.

7.2.1 Data, Methods, and Basis for Water Shortage Condition

The water shortage condition for the DRA is the same as the five-year drought described in Section 7.1.2. Since the DRA can be updated outside of the UWMP five-year plan cycle, the narrative description of the data and basis for the water shortage condition is repeated in this section.

As discussed in Chapter 6, the ARTDA between MID and the City includes a formula to reduce deliveries in drier than average years based on the number of inches allocated to MID's agricultural customers. MID delivery cutbacks were based on 2015 water supply conditions, when the available supply was 16 inches of the total 42-inch allocation (a 62 percent reduction). To estimate supplies during a five-year drought, it was assumed that 2015 was the fifth year of a five-year drought, with equally proportioned shortages for each year (or a 26-inch reduction/5 years for a 5.2-inch effective reduction per year). Therefore, for planning purposes, the MID delivery cutbacks experienced in each successive drought year are assumed as follows:

- First year cutback: 5.2/42 inches (12.4 percent)
- Second year cutback: 10.4/42 inches (24.8 percent)
- Third year cutback: 15.6/42 inches (37.1 percent)
- Fourth year cutback: 20.8/42 inches (49.5 percent)
- Fifth year cutback: 26.0/42 inches (61.9 percent)

In contrast, it was assumed that groundwater supplies would not be reduced in dry years. Based on the operational yield estimates for the Modesto and Turlock Subbasins, it was assumed that groundwater supplies would remain at 51,500 AFY throughout a five-year drought.

7.2.2 DRA Water Source Reliability

The City's multiple dry year supplies include:

- Projected base purchased surface water supplies from MRWTP Phase One and the MRWTP Phase Two Expansion (with a 12.4 percent reduction from normal year MID supplies during the first dry year and an additional 12.4 percent reduction in each successive dry year)[16]; and
- Groundwater pumping from City's local groundwater basins (up to 51,500 AFY).

Table 7-9 summarizes the available supplies for each year of the DRA.

Table 7-9. Projected Supplies for Drought Risk Assessment

Supply Source	Available Supply, AFY				
	2021	2022	2023	2024	2025
MID[(a)]	30,404	26,935	23,257	19,231	14,933
Groundwater[(b)]	51,500	51,500	51,500	51,500	51,500
Total	**81,904**	**78,435**	**74,757**	**70,731**	**66,433**

(a) Projected supplies from MID are reduced 12.4 percent from normal in the first dry year and an additional 12.4 percent in subsequent dry years. The percentage reduction in deliveries in the fifth consecutive dry year is assumed to equal 61.9 percent, MID's actual supply reduction to the City in 2015.

(b) Based on operational yield estimates for the Modesto and Turlock Subbasins and it is assumed the groundwater supply will not be reduced in dry years. The total groundwater supply (53,500 AFY) has been reduced by 2,000 AFY to account for Hickman and Waterford areas, which are no longer served by the City but still pump groundwater.

[16] If available, the City can purchase additional water from MID (at a higher rate) or exchange groundwater for agricultural use for treated surface water from MID. For planning purposes, it is conservatively assumed that supplemental treated surface water supply is not available during multiple dry years.

7.2.3 Total Water Supply and Use Comparison

As shown in Table 7-10, during a five-year drought beginning in 2021, the City's supplies are adequate to meet projected demands through 2025, even without water conservation.

Table 7-10. Five-Year Drought Risk Assessment Tables to Address Water Code Section 10635(b) (DWR Table 7-5)

2021	Total
Total Water Use	55,216
Total Supplies	81,904
Surplus/Shortfall w/o WSCP Action	26,687
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	
WSCP - use reduction savings benefit	
Revised Surplus/(shortfall)	26,687
Resulting % Use Reduction from WSCP action	0%

2022	Total
Total Water Use	57,329
Total Supplies	78,435
Surplus/Shortfall w/o WSCP Action	21,106
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	
WSCP - use reduction savings benefit	
Revised Surplus/(shortfall)	21,106
Resulting % Use Reduction from WSCP action	0%

2023	Total
Total Water Use	59,441
Total Supplies	74,757
Surplus/Shortfall w/o WSCP Action	15,316
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	
WSCP - use reduction savings benefit	
Revised Surplus/(shortfall)	15,316
Resulting % Use Reduction from WSCP action	0%

2024	Total
Total Water Use	61,554
Total Supplies	70,731
Surplus/Shortfall w/o WSCP Action	9,178
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	
WSCP - use reduction savings benefit	
Revised Surplus/(shortfall)	9,178
Resulting % Use Reduction from WSCP action	0%

2025	Total
Total Water Use	63,666
Total Supplies	66,433
Surplus/Shortfall w/o WSCP Action	2,767
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	
WSCP - use reduction savings benefit	
Revised Surplus/(shortfall)	2,767
Resulting % Use Reduction from WSCP action	0%

CHAPTER 8
Water Shortage Contingency Plan

This chapter discusses the City's Water Shortage Contingency Plan (WSCP), seismic risk to City and MID facilities, and WSCP adoption procedures. To allow for WSCP updates to be made outside of the UWMP preparation process, the City's WSCP is included in this plan as Appendix J. While the City and MID jointly prepared this plan, the WSCP focuses on the City only as an urban water supplier. MID is primarily an agricultural supplier and has prepared a separate 2020 Agricultural Water Management Plan, which includes its water shortage allocation policies and drought plan.

8.1 WATER SHORTAGE CONTINGENCY PLANNING BACKGROUND

Water shortages occur whenever the available water supply cannot meet the normally expected customer water use. This can be due to several reasons, including climate change, drought, and catastrophic events. Drought, regulatory action constraints, and natural and manmade disasters may occur at any time. A WSCP presents how an urban water supplier plans to respond to a water shortage condition and helps prevent catastrophic service disruptions.

In 2018, the California State Legislature enacted two policy bills, (SB 606 (Hertzberg) and AB 1668 (Friedman)) (2018 Water Conservation Legislation), to establish a new foundation for long-term improvements in water conservation and drought planning to adapt to climate change and the resulting longer and more intense droughts in California. The 2018 Water Conservation Legislation set new requirements for water shortage contingency planning; the City's WSCP has been updated to be consistent with these requirements.

8.2 CITY WATER SHORTAGE CONTINGENCY PLAN

Section 11-1.14 of the Modesto Municipal Code (MMC) supports the City's WSCP, which describes the City's strategic plan for preparing and responding to water shortages. The WSCP includes water shortage stages and associated shortage response actions, as well as the City's legal authorities, communication protocols, compliance and enforcement, and monitoring and reporting.

The City intends for its WSCP to be dynamic, so that it may assess response action effectiveness and adapt to foreseeable and unforeseeable events. Therefore, the City's WSCP is included in this plan as Appendix J to allow for updates to be made outside of the UWMP preparation process. When an update to the WSCP is proposed, the revised WSCP will undergo the process described in Section 8.4.

8.3 SEISMIC RISK ASSESSMENT AND MITIGATION PLAN

CWC Section 10632.5(a) requires that UWMPs include a seismic risk assessment and mitigation plan to assess and mitigate a water system's seismic vulnerabilities. A Local Hazard Mitigation Plan (LHMP) can be incorporated in this plan to meet this requirement if it addresses seismic risk. The Stanislaus County LHMP (County LHMP, updated in 2017) addressed seismic risk and is incorporated into this plan by reference. Details of the City's seismic risk assessment and mitigation plan are provided in Appendix J, Section 4.6.

8.4 WATER SHORTAGE CONTINGENCY PLAN ADOPTION, SUBMITTAL, AND AVAILABILITY

The City's WSCP (Appendix J) is adopted concurrently with this plan, by separate resolution. Prior to adoption, a duly noticed public hearing was conducted. An electronic copy of the WSCP will be submitted to DWR within 30 days of adoption.

No later than 30 days after adoption, a copy of this WSCP will be available at the City's offices. A copy will also be provided to Stanislaus County, City of Ceres, and City of Turlock. An electronic copy of the WSCP will also be available for public review and download on the City's website.

The City's WSCP is an adaptive management plan and is subject to refinements as needed to ensure that the City's shortage response actions and mitigation strategies are effective and produce the desired results. When a revised WSCP is proposed, the revised WSCP will undergo the process described above for adoption by City Council and distribution to Stanislaus County, MID, City of Ceres, City of Turlock, the City's customers, and the general public.

CHAPTER 9
Demand Management Measures

This chapter describes the MID and City's historical and existing water conservation efforts, status of implementation of Demand Management Measures (DMMs), and projected future water conservation implementation.

9.1 BACKGROUND ON DEMAND MANAGEMENT MEASURES

Water conservation measures are a vital part of the MID and City's overall plan to provide reliable, high-quality, and cost-effective water supply for its customers. MID and the City implement Demand Management Measures to sustainably manage the region's water resources. If not mitigated, an increase in water demand and/or changes in water supplies due to climate change and other factors can reduce water service reliability. The implementation of DMMs improves water service reliability and helps the MID, City, and State meet water conservation goals.

In previous UWMPs, a substantial amount of data was required to document a water supplier's progress in implementing specific DMMs. In 2014, AB 2067 simplified, clarified, and updated reporting requirements for DMMs. Focus turned away from detailed descriptions of each of the DMMs and turned to key water conservation measures that are being implemented to achieve SB X7-7 water use targets. For wholesale agencies, the number of DMMs was reduced to three specific measures (plus an "other" category), as well as a requirement for a narrative description of asset management and wholesale supplier assistance programs. For retail agencies, the number of DMMs was reduced to six specific measures (plus an "other" category). A narrative description of the status of the DMMs and how the DMMs help the water supplier achieve its water efficiency goals are required. Detailed data are not required.

The following sections discuss current and planned implementation efforts for the various DMMs by MID and the City.

9.2 MID WATER CONSERVATION PROGRAM OVERVIEW

As noted previously, although MID is a wholesale water supplier to the City of Modesto, MID is primarily an agricultural water supplier and has also prepared a 2020 Agricultural Water Management Plan Update which describes Efficient Water Management Practices (EWMPs) being implemented in conjunction with its agricultural water system. As described further below, although MID is not directly involved in the City's implementation of urban water conservation measures, MID supports the City's water conservation efforts.

9.3 MID DEMAND MANAGEMENT MEASURES

As discussed in Chapter 6, MID provides treated surface water supply to the City on a wholesale basis. As a wholesale agency, MID is required to discuss the following DMMs:

- Metering
- Public Education and Outreach
- Water Conservation Program Coordination and Staffing Support
- Other Demand Management Measures

In addition, a narrative of asset management and wholesale supplier assistance programs are also required.

For each of the above DMMs, the current program is described, followed by a description of how the DMM was implemented over the previous five years.

9.3.1 Metering

Treated water supplies provided to the City by MID are metered by MID at the Terminal Reservoir Pump Station when in flow-through mode and at the Treated Water Pump Station (TWPS) when in bypass mode. The meters are calibrated annually.

Metering was maintained from 2016 to 2020 and implementation of this DMM is ongoing. This DMM allows MID and the City to make informed decisions in managing their water resources.

9.3.2 Public Education and Outreach

Although MID does not directly provide public education and outreach for urban water use and conservation, MID has previously contributed funds to the City's Save Our Water campaign advertising and plans to assist the City in school educational programs described in Section 9.5.4 below.

While MID has not contributed funds to the City's public education and outreach efforts since 2014, it has internally discussed recommitting to these programs. Implementing this DMM allows MID to maximize its water supply for beneficial use.

9.3.3 Water Conservation Program Coordination and Staffing Support

MID is primarily an agricultural water supplier and has developed a Conservation Program to encourage landowners, through financial incentives, to invest in physical improvements and management practices that conserve water. The long-term goal of the Conservation Program is to improve water management within MID. As described in MID's 2020 AWMP, MID has designated their Assistant General Manager, Water Operations, as their Water Conservation Coordinator.

MID's Water Conservation Coordinator does not focus on urban water conservation, as the City is responsible for implementing and managing the urban water conservation programs. However, MID staff coordinate regularly with City staff in support of the City's urban water conservation efforts.

Between 2016 and 2020, MID maintained coordination with City staff, and implementation of this DMM is ongoing. This DMM provides for consistent water conservation messaging between MID and the City.

9.3.4 Other Demand Management Measures

MID does not implement any additional approaches to demand management for urban water use.

9.3.5 Asset Management

MID uses a Maintenance Management Program to help manage and coordinate maintenance activities at its facilities. Routine preventive maintenance work, non-routine service, and work orders are tracked such that MID's Maintenance Supervisor can identify equipment issues that are starting to be problematic and proactively plan for replacement. MID generally does not replace equipment based on a manufacturer or industry recommended schedule, as they have found that through an aggressive preventive maintenance program, the service life of most equipment can be significantly extended.

This program was maintained by MID between 2016 and 2020, and implementation is ongoing. Implementation of this program minimizes water loss and improves efficiency in maintaining MID's water system.

9.3.6 Wholesale Supplier Assistance Programs

Although MID is not directly involved with urban water demand reduction, MID strongly supports the City's efforts through ongoing and continuous coordination between MID and the City, support of public outreach for water conservation through the City, and through the water use provisions contained in the October 2005 ARTDA between the City and MID.

MID maintains a Domestic Water Policy Committee with the City to oversee the management and operation of MRWTP. There are two advisory committees—the Policy Committee and the Technical Committee—that were formed to assist the Project Manager with the implementation of the Domestic Water Project (Project). The Policy Committee consists of two City Council members and two MID Board members and meets at least twice a year. Responsibilities of the Policy Committee include following MID's Project budget and advising on major decisions and Project design changes. The Technical Committee, which meets monthly, is comprised of MID and City staff. The main purpose of the Technical Committee is to keep the City informed of MRWTP performance, scheduled maintenance, and any potential impacts to delivery.

MID has maintained its assistance for the City between 2016 and 2020, and this program is ongoing. Implementation of this program helps MID and the City in continuing water conservation efforts.

9.4 CITY OF MODESTO WATER CONSERVATION PROGRAM OVERVIEW

The City has acknowledged the importance of water conservation and management and has implemented significant water conservation efforts during the drought years of 1976-1977, 1987-1992, and 2012-2016. In March 1990, the City Council approved a Water Conservation Program (Section 11-1.14 of Title 11 of the MMC) which combined a strong education program with watering restrictions and prohibition of water waste. The City, with support from MID, has continued its Water Conservation Program and is committed to implementing water conservation measures for all of its customer sectors.

In 2017, the City updated their Water Conservation Plan, building upon the DMMs and conservation strategies identified and documented in the 2015 UWMP. The overall goal of the Water Conservation Plan is to develop a system-wide water conservation plan containing acceptable water efficiency measures and an implementation plan which will decrease water use and water loss while using the most cost-effective methods. The City is currently in the process of developing an updated Water Conservation Plan, with the intent to better define the City's Water Conservation Program and to plan for implementation in the future. The City plans to conserve water through public relations, education, customer service, and enforcement. The City strives to meet this challenge by working in a friendly, respectful and positive manner with homeowners, businesses, and property managers. A copy of the City's 2017 Water Conservation Plan is provided in Appendix K.

As the City moves forward with its Water Conservation Plan, it has also implemented its One Water Modesto program to communicate the value of the City's water resources in all forms within the City. This program is described in Section 9.5.7 below.

The City's SB X7-7 per capita water use target for 2020 was 228 GPCD. The DMMs that the City implemented have allowed it to meet its target. In 2020, the City's overall per capita water use was 175 GPCD, as presented in Chapter 5. The City anticipates continuing and expanding its Water Conservation Program to meet new legislative and upcoming regulatory requirements that may require water use objectives less than the established SB X7-7 target.

9.5 CITY OF MODESTO DEMAND MANAGEMENT MEASURES

Retail water agencies are required to provide a description of the DMMs associated with the following:

- Water waste prevention ordinances
- Metering
- Conservation pricing
- Public education and outreach
- Programs to assess and manage distribution system real loss
- Water conservation program coordination and staffing support

The City is also required to describe any other DMMs that it has implemented that have had significant impact on water use.

This section provides a description of the DMMs that are currently implemented and those planned to be implemented in the future. For each DMM, the current program is described, followed by a description of how the DMM was implemented over the previous five years and future implementation plans.

9.5.1 Water Waste Prevention Ordinances

9.5.1.1 DMM Description

The City prohibits water waste within its service area. Since 2002, the City has implemented the water waste prevention measures defined in Stage I of the City's Drought Contingency Plan (Appendix K). MMC Section 11-1.14 (Appendix K), includes rules and regulations requiring compliance to the Drought Contingency Plan and provides for enforcement. The City Council may revise the Drought Contingency Plan by resolution and amend the MMC by ordinance. Over time, the City has amended the Drought Contingency Plan and MMC Section 11-1.14 to meet its water use objectives.

The City Council, by resolution, can declare the existence of a water shortage and adopt revised or additional water use prohibitions and consumption reduction methods while the water shortage remains in effect. As described in the next section, the City has implemented this DMM in response to varying water supply conditions over the past five years.

9.5.1.2 Implementation over the Past Five Years to Achieve Water Use Targets

The City has maintained and enforced basic water conservation measures and varying degrees of water waste prevention since 1990, when it adopted a Drought Contingency Plan. The Drought Contingency Plan has been amended over time to reflect the current plan provided in Appendix K. Because of the 2012-2016 statewide drought conditions, the State required the City to reduce its water use significantly (by 36 percent) in 2015.

In response, the City adopted a resolution in November 2015 to enact Stage IIA requirements that restricted outdoor watering to one day a week. Any violations of the rules and regulations established as part of Stage IIA of the Drought Contingency Plan are considered water waste. These requirements continued into 2016. In 2016 and 2017, the City took actions in response to varying water supply conditions as shown on Table 9-1.

Table 9-1. City of Modesto Actions in Response to Water Supply Conditions

Date	Events/Description	Stage	Effective Dates	City Action
2016				
April 26	Enact Stage II requirements of the Drought Contingency Plan that restrict outdoor watering to two days per week.	II	5/1/16 - 10/31/16	Resolution 2016-178
May 9	"Stress Test" adopted by the State allowed local utilities to drop conservation mandates if they could demonstrate they had three years of drought-resilient supplies. Percent Reduction Required - State Executive Order (EO) B-37-16 - minimum 20% reduction (May 9, 2016) Percent Reduction Required - 25% (November 2016 - March 2017)			
October 4	Enact Stage IIA requirements of the Drought Contingency Plan to restrict outdoor watering to one day a week and revising the phasing criteria of the plan to be consistent with the U.S. Drought Monitor.	IIA	11/1/16 - 3/31/17	Resolution 2016-395
2017				
April 7	Governor Brown terminates EO B-40-17 to rescind portions of regulations but continue prohibitions on wasteful water use. End of drought declared.			
May 23	Enact Stage II requirements of the Drought Contingency Plan and approve Outdoor Water Use Regulations for water customers served by the Modesto Subbasin groundwater supply or surface water.	II	4/1/17 - 5/31/17	Following Drought Monitor
May 23	Enact Stage I requirements of the Drought Contingency Plan and approve Outdoor Water Use Regulations for June through September 2017 to three days per week.	I	6/1/17 - 10/31/17	Resolution 2017-206
October 10	Approve two days a week outdoor water use for contiguous water customers from November 1, 2017 through March 31, 2018 and three days a week watering schedule April 1, 2018 through October 31, 2018 and continuing these schedules year around. Approve two days a week outdoor water use for all non-contiguous water customers (Del Rio, Grayson, Turlock, and Ceres - Walnut Manor), effective November 1, 2017, and continuing this schedule year around.	I and II	11/1/17 - Present	Resolution 2017-406

Since 2017, the City has maintained Stages I and II of the Drought Contingency Plan. A copy of the most recent resolution is included in Appendix K for reference.

9.5.1.3 Plans for Continued Implementation

The City will continue to enforce its rules and regulations associated with water waste by having the Utilities Department perform site visits. The effectiveness of this program will be evaluated based on the number of violations observed, as well as the overall demand reduction associated with invoking drought restrictions. Presently, the City's Utilities Department employs four part-time water patrols. They patrol during the summer months enforcing outdoor water restrictions.

Implementation of this DMM is ongoing and expected to help the City achieve its water use targets by minimizing the nonessential uses of water so that water is available to be used for human consumption, sanitation, and fire protection.

9.5.2 Metering

9.5.2.1 DMM Description

In 2004, the California Legislature passed AB 2572, requiring all water suppliers to install water meters on all customer connections by January 1, 2025.

The City's water system is not yet fully metered. The City has been installing meters on new homes since the City Council enacted the MMC 11-1 on May 14, 1991[17], and in 2005 the City changed its water rate structure to include a volumetric rate charge. All new development in the City since 1991 has had meters installed.

9.5.2.2 Implementation over the Past Five Years to Achieve Water Use Targets

The City monitored its metering program by tracking the number of retrofits installed per year. As of 2020, approximately 97 percent of the residential metering program is complete. All but one of the City's non-residential services are metered. The City plans to complete the conversion of all unmetered accounts within the City's water system to metered accounts by 2022 to meet the 2025 deadline set by AB 2572.

9.5.2.3 Plans for Continued Implementation

The City will require all future connections to be metered and billed based on the volume of water used, as discussed in further detail under Section 9.5.3. The City will monitor water usage characteristics of its customers and focus water conservation efforts on high water users.

9.5.3 Conservation Pricing

9.5.3.1 DMM Description

The City's water rate structure encourages conserving behavior by incorporating a volumetric charge in addition to the fixed meter charge. Consequently, water usage reductions directly reduce cost to the metered customer, while excessive water use results in increased costs.

[17] Though the City did start installing meters in 1991, these meters were not read for volumetric billing purposes and these homes remained on a flat rate billing method until 2005 when, as a result of AB 2572 mandating all homes to be metered by 2025, the City started installing meters on existing homes and changed its rate structure to bill metered homes on a volumetric basis.

As described above, not all of the City's residential customers are currently metered. Unmetered residential customers are billed based on a flat rate based on lot size. As customers become metered, they are converted from the flat rate charge to the metered charge.

9.5.3.2 Implementation over the Past Five Years to Achieve Water Use Targets

The City's current water rate structure is shown in Table 9-2. The City has implemented a uniform volumetric charge to cover its costs for providing water service to its customers. The uniform volumetric charge currently in effect is based on non-drought supply conditions. During a drought, the volumetric rate would increase to $2.10 per hundred cubic feet (ccf). The City did not implement drought rates from 2016 through 2020.

Table 9-2. City of Modesto Current Water Rates and Charges

Customer Class	Rate[a]
Flat Rate Residential – Monthly Service Charges[b]	
0 – 5,000 sq. ft. lot	$56.11
5,001 – 7,000 sq. ft. lot	$64.23
7,001 – 11,000 sq. ft. lot	$80.26
11,001 – 17,000 sq. ft. lot	$104.22
Over 17,000 sq. ft. lot	$116.30
Metered Charges (Residential & Commercial)	
Volumetric Charge ($/ccf)[c]	$1.98
Fixed Meter Charges	
5/8" – 3/4"	$24.94
1"	$36.11
1 ½"	$64.04
2"	$97.55
3"	$203.66
4"	$360.04
6"	$734.22
8"	$1,348.56
10"	$2,130.44
12"	$2,800.62

(a) City of Modesto Current Water Rate (as of April 1, 2020) from City of Modesto website.
(b) Flat rates shown include tax.
(c) Non-drought rate per hundred cubic feet (ccf).

9.5.3.3 Plans for Continued Implementation

Implementation of this DMM is expected to help the City achieve its water use objectives. As required, the City will evaluate the need to readjust rates and/or rate structures in order to ensure continued service to its customers while encouraging water efficiency. The City will evaluate the effectiveness of its rates by tracking changes in unit water use resulting from rate increases.

9.5.4 Public Education and Outreach

9.5.4.1 DMM Description

To promote water conservation, the City seeks to foster sustainable changes in behavior, not just temporary responses to drought. The purpose of the City's water conservation program is to promote indoor and outdoor water conservation, as well as landscape ideas incorporating the use of drought tolerant landscaping and irrigation systems. Water conservation information is distributed to the public through a variety of methods including personal contact, brochures, radio and television public service announcements, a dedicated conservation website, bill inserts, exhibits at community events, school presentations and videos. A water conservation telephone line is available to provide residents with any additional information they might request regarding water conservation.

The City also coordinates with the media to better inform the public. Media coverage of the City's water conservation program is provided through public service announcements on television and radio in both English and Spanish, live interviews and recorded cable television. Recorded video content on water conservation and efficient landscaping practices are available from the Utilities Department, Water Services Division for use by the public. Copies of these videos have been donated to the Stanislaus County Library and several landscape nurseries in the City. The City also works with its local newspaper, the *Modesto Bee*, to provide frequent and extensive coverage of current water conditions within the Modesto area.

9.5.4.2 Implementation over the Past Five Years to Achieve Water Use Targets

Over the past five years, the City has attended and promoted water conservation at the Stanislaus County Home and Garden Show, Modesto Home Improvement Show, Earth Day in the Park, Public Works Day, and the Modesto Marathon. At these events, the City promotes its water rebates, hands out water-saving items (e.g., shut-off nozzles, smart irrigation controllers, dye tablets), offers leak checks for residential customers, and provides conservation kits for both children and adults. There are three conservation kits the City distributes for different purposes. These include:

- Child Water Conservation Kit
  - A Water Wise bag
  - BE WATER WISE coloring book with crayons and stickers
  - A NIAGARA water conservation "showering Coach" timer
  - Water conservation website links for parents
- Use Water Wisely Kit
  - Five Tips to Save Water bag
  - A Use Water Wise Wheel
  - Our World of Water activity book
  - 6" Use Water Wisely ruler
  - Water conservation website links
- Adult Water Conservation Kit
  - 15 Ways to Use Water Wisely bag
  - Leak detection dye tablets

- Water Conservation slide guide
- Use Water Wisely note pad
- Water Conservation Brochures
- Water conservation website links

On May 18, 2016, the cities of Modesto, Ceres, Turlock, Manteca, and the UC Davis California Center of Urban Agriculture organized a landscape workshop in Modesto on how to maintain landscapes and reduce water waste through water management and system efficiency. At the workshop, attendees received indoor presentations and outdoor demonstrations on the following topics:

- Understanding precipitation rates to mitigate water and pesticide runoff
- Improving sprinkler distribution uniformity to reduce water use
- Improving controller programs to reduce and manage water use
- Determining application rates and precipitation rates of drop/micro irrigation
- Understanding and reading water meters to improve irrigation efficiency

In addition, each year City staff give presentations to students at elementary schools in Modesto's service area. During these presentations, students are taught about the water cycle and water conservation and receive Water Conservation Kits. The Water Conservation Coordinator has also met with school district principals to encourage participation in the program, as it focuses on water conservation while incorporating state content standards. Two American Water Works Association (AWWA) publications, "Splash" and the "Story of Water," as well as the video "Water Follies," are used in conjunction with school programs and other community events. Elementary school students are particularly receptive to the conservation message, and they share that message with their parents. Though school presentations are designed for fifth graders, similar presentations are given to junior and high school students upon request.

9.5.4.3 Plans for Continued Implementation

The City and MID will continue to implement the public education and outreach strategies as described above. Implementation of this DMM is expected to help the City achieve its water use targets by educating water users about the value of water, the importance of improving water use efficiency and avoiding water waste.

9.5.5 Programs to Assess and Manage Distribution System Real Loss

9.5.5.1 DMM Description

A water audit is a process of accounting for water use throughout a water system in order to quantify the unaccounted-for water. Unaccounted-for water is the difference between metered production and metered consumption on a system-wide basis. A leak detection program typically consists of both visual inspection as well as audible inspection. Visual inspection includes the inspection of distribution system appurtenances (e.g., fire hydrants, valves, meters, etc.) to identify obvious signs of leakage. To perform audible leak detection, specialized electronic listening equipment is used to detect the sounds associated with distribution system leakage. This process allows the agency to pinpoint the location of suspected leaks.

The City performs an annual water audit that conforms to the AWWA Manual M36. The City's most current Water Loss Audit is included in Appendix E and summarized in Chapter 4.

9.5.5.2 Implementation over the Past Five Years to Achieve Water Use Targets

Repair and maintenance of the water distribution system are priorities for the City. The City has Capital Improvement Projects that provide for maintenance programs that maximize efficiency of water distribution system operations and minimize water losses. These programs include using SCADA systems to monitor groundwater and surface water production, quick responses to water main leak detection and repair, recalibration of each well meter every four years, annual pump efficiency testing, and water quality efforts including main flushing and water quality testing.

Daily water production from the City's wells and the MRWTP is recorded and used to monitor water use. Additionally, the City maintains records of main breaks which are used to identify mains to be replaced and estimate system water loss. The City's finance system contains leak detection code that will flag continuous water use. Work orders are created for these "leak code" accounts so the City can investigate and repair any leaks within the City's right-of-way. Customers are notified of possible leaks on their property and must repair confirmed leaks within 24 hours of notification. Failure to comply with the 24-hour repair window results in fees.

Water Line workers (four servicemen and one supervisor) are also responsible for identifying system leaks, in addition to excessive water waste and standing water. At the customer's request, City staff will investigate and, where appropriate, repair leaks within the City's right-of-way. In addition, staff conducts repairs of water line leaks and replaces or repairs meters. A crew will repair leaks in areas where leak detection equipment has pinpointed hidden leaks.

Each year, 25 percent of well sites are serviced and meters are recalibrated as routine maintenance. Pump efficiency tests are completed annually. Repairs are promptly made on pumps showing decreased efficiency, and well meters found to be inaccurate or exhibiting signs of wear are promptly replaced. Well efficiency is consistently tracked through the City's SCADA system.

A Maintenance Avoidance Program was implemented in 1995 to analyze motor well vibration using a probe and recorder. This program was continued between 2016 and 2020. It allows the City to schedule maintenance on motors and pumps based on predictive trends calculated by the vibration analysis instruments. As a result, motors and pumps can be repaired or parts replaced before their complete failure, extending their useful life.

The City's Water Services Division uses Geographical Information Systems (GIS) and Global Positioning Systems (GPS) to record fire hydrant locations, valves, water meters, and map water lines. The GIS data is organized in a database of the water system. In conjunction with the data assembled through SCADA, the database aids in hydraulic modeling of the water system. The City uses CassWorks, a maintenance management system, to improve the efficiency of completing work orders, managing imported records and scheduling maintenance. In addition, the City's metered customers are able to use automatic meter reading (AMR) technology to help them detect leaks themselves. Leak reports and repairs are also logged in GIS to document and track the frequency of issues by location and to aid in identifying, planning, and prioritizing which areas need to be budgeted for water main and service line replacements. These programs are effective tools for providing customers with an efficiently operated and dependable water distribution system.

The City's Annual Pipe Replacement Program has City Engineering staff working with City Operations crews to identify old pipelines that are leaking, and provide follow-up in replacing those lines. The City's work on its Annual Pipe Replacement Program has allowed them to identify areas within its service area that are problematic with high percentages of leaking and repair frequency. A schedule and budget have been developed to systematically replace the pipes in these identified areas. The implementation of the Annual Pipe Replacement Program has resulted in the replacement of approximately 14 miles of water mains over the last five years.

9.5.5.3 Plans for Continued Implementation

Implementation of this DMM is ongoing and is a vital element of the City's Water Conservation Plan. This effort will help the City achieve its water use objectives (i.e., 25 percent reduction in losses compared to 2013) by quickly identifying sources of water loss so repairs can be conducted and losses minimized.

9.5.6 Water Conservation Program Coordination and Staffing Support

9.5.6.1 DMM Description

The City maintains a full-time water conservation coordinator, also known as the "Water Conservation Specialist," as part of its Water Services Division in the Utilities Department. The Water Conservation Coordinator's role is to develop, implement and manage the City's water conservation program and to coordinate with ongoing conservation programs in other departments and other agencies, including MID. Specifically, the Water Conservation Coordinator performs the following tasks:

- Runs school education outreach programs
- Trains and directs activities of other staff assigned to water conservation functions
- Provides conservation information to residents and commercial businesses and coordinates the development of uniform conservation policies and enforcement
- Develops, recommends and maintains various media sources for providing conservation information to both internal and external customers
- Plans, coordinates and administers various day-to-day activities pertaining to the City's Water Conservation Program
- Promotes the efficient use of the City's water supply by residential, irrigation, industrial, commercial, public agencies, and other customers to ensure sufficient pressure throughout the system for fire protection and other essential City services
- Investigates and identifies compliance issues and communicates with regulatory agencies as required

The Water Conservation Coordinator also has an administrative office assistant and four to six temporary (seasonal) employees to help with the water conservation program. The administrative office assistant helps with phone calls, answers questions, and assists with the workflow of the temporary-seasonal employees. The seasonal employees help with water waste enforcement and public education. In addition, there are other staff members of the City's Water Quality Division that help with conservation program tasks. However, these staff members are not specifically designated to the water conservation program.

9.5.6.2 Implementation over the Past Five Years to Achieve Water Use Targets

Over the past five years, the City has maintained the Water Conservation Coordinator position and the water conservation program team to execute the DMMs described in this chapter.

9.5.6.3 Plans for Continued Implementation

The City plans to continue maintaining the position of the Water Conservation Coordinator. The effectiveness of this program will be evaluated through the development of effective working relationships between conservation programs. Implementation of this DMM is ongoing and expected to help the City achieve its water use targets by making water conservation and implementation of the City's water conservation program a priority among City employees.

9.5.7 Other Demand Management Measures

In addition to the six DMMs described above, the City implements the following programs:

- Residential conservation programs
- Commercial, industrial, institutional (CII) customer conservation programs
- Large landscape irrigation conservation programs
- Rebate programs

Furthermore, the City has started the One Water Modesto program, an initiative to align internal staff from various departments to communicate the value of water resources within the City.

9.5.7.1 Residential Conservation Programs

9.5.7.1.1 DMM Description

The City offers several water conservation services to its residential users as described below. These services are complemented by the City's rebate programs, described in Section 9.5.7.4. The City offers these services upon request at no cost to customers.

- **Water Surveys**: Water surveys for residential users help raise awareness of water conservation in the home and help conserve water during everyday use. Surveys are offered via mailers, bill inserts and/or the City's website. Further, the City identifies the high residential water users in its service and focus on those users.

  Service technicians and/or City interns visit the residential users to provide leak detection assistance by performing surveys that include both indoor and outdoor investigations and offer suggestions for both single family and multi-family residences to improve water use efficiency. They identify water efficiency rebates, discussed in Section 9.5.7.4, for which the resident may qualify. Lawn watering guides are also distributed. The water savings from using lawn watering guides is estimated to be 20 percent per household with automatic sprinklers and 10 percent for manual systems.
- **Sprinkler Timer Programming**: Upon request, water conservation staff members are available to set sprinkler timers, adjust sprinkler heads, and provide minor advice on sprinkler systems. Staff members agree that the small amount of extra time spent assisting

customers creates goodwill, ultimately reducing the likelihood of enforcement staff having to return in the future.

- **Water Conservation Kits**: The City distributes Water Conservation Kits through its Water Conservation Program. Conservation kits are also distributed after each water conservation presentation to both adults and children. Each kit contains one toilet displacement bag, dye tablets to detect toilet leaks, general conservation information, and installation instructions. When using the displacement bag in a standard toilet, approximately one gallon of water is saved with each flush. It is estimated that 20 percent of all toilets leak, and that the average leak wastes nearly 47 gallons a day. Using the dye tablet will help citizens detect those leaks.

9.5.7.1.2 Implementation over the Past Five Years to Achieve Water Use Targets

The effectiveness of residential water survey program is measured by monitoring the number of completed water survey assistance requests. Between 2016 and 2020, City staff completed 21,797 water survey assistance requests in total (i.e., residential and CII combined). Between 2016 and 2020, City staff distributed 39,838 water conservation kits.

9.5.7.1.3 Plans for Continued Implementation

The City plans to continue the above residential conservation programs to meet future water use objectives.

9.5.7.2 Commercial, Industrial, Institutional Customer Conservation Programs

9.5.7.2.1 DMM Description

The City has adopted the Commercial Green Building Code for its CII customers. The Commercial Green Building Code requires higher water use efficiency standards. Furthermore, the City offers water conservation survey services to new and existing CII users as described below. The City offers these services upon request at no cost to customers.

- **New CII Users**: During the building permitting process, wastewater and water system connection fees are estimated for applicants based on anticipated water use. The applicant/incoming customer may potentially achieve cost savings in fees by finding ways to reduce their projected water consumption. The City encourages applicants to conduct a self-audit of their operations and equipment and determine how water efficiency may be achieved. The City has developed tools and information sources to inform incoming CII customers of these potential savings.
- **Existing CII Users**: The City implemented a similar effort to inform existing CII users of potential financial savings through self-audits. The City developed a formal survey program for CII accounts that consist of water use surveys (performed upon request) and evaluations of operations and equipment. Recommended efficiency measures are provided, along with water efficiency rebate information, described in Section 9.5.7.4, for which the users may qualify.

The City's Environmental Compliance Division, who handles wastewater discharge permits among other regulatory tasks, is instrumental in assisting larger CII users with determining water savings measures to reduce wastewater discharge impacts. The City estimates that the combined cost savings from both water and wastewater charges offset the cost of the self-audit.

9.5.7.2.2 Implementation over the Past Five Years to Achieve Water Use Targets

The effectiveness of the CII water survey program is measured by monitoring the number of completed water survey assistance requests. Between 2016 and 2020, City staff completed 21,797 water survey assistance requests in total (i.e., residential and CII combined).

9.5.7.2.3 Plans for Continued Implementation

The City plans to continue the above CII conservation programs to meet future water use objectives. The City encourages staff to attend training that would increase their knowledge of water saving measures.

9.5.7.3 Large Landscape Irrigation Conservation Programs

9.5.7.3.1 DMM Description

The City strongly supports water efficiency for outdoor water use and has adopted the State's 2015 Model Water Efficient Landscape Ordinance (MWELO) for new and retrofitted landscapes. Further, the City has implemented several conservation programs internally and for its customers to improve water efficiency for large landscape irrigation.

- **ET_o-Based Irrigation System at Parks**: The Utilities Department, Water Services Division has implemented efficient ET_o-based irrigation systems at many City parks. ET_o-based irrigation systems adjust irrigation schedules based on weather forecasts and evapotranspiration data. Recently, the system has expanded to include more parks and public land. The City has 10 staff who, in addition to other tasks, serve as landscape auditors to oversee landscaping maintenance of the City's parks and golf courses.
- **Match Water Quality with Use**: The landscape irrigation for approximately 10 percent of the City's parks have been converted to use shallow groundwater instead of treated surface water and groundwater. The shallower aquifers in the area are generally not tapped for potable water uses due to the presence of contaminants that require treatment. This strategy serves as both a cost savings to the Parks Department and as a means by which available potable water supply sources can be conserved for potable uses. Park irrigation still utilizes conservation measures, regardless of water source, but these shallow, water-bearing aquifer zones would otherwise go unused in urban areas.
- **Large Landscape Surveys**: The City formally offers surveys to large landscape accounts. Under this program, City staff visit customers' sites and recommend site-specific efficient irrigation schedule and improvements. City staff provides each customer with an ET_o-based water use budget equal to no more than an average of 70 percent of the annual average local ET_o per square foot of landscape area. Recreational areas, such as parks, may require additional water than allotted in the budget, but their use still may not exceed 100 percent of ET_o on an annual basis.
- **Landscape and Irrigation Plans**: All commercial and residential projects that get a building permit and have more than 500 square feet (sf) of landscaping are required to submit a landscape and irrigation plan, which is reviewed by the Parks Planning and Development Division to ensure that MWELO requirements are followed. In addition, during construction of any commercial or residential projects, Parks Planning and Development Division staff perform inspections to ensure that the project is being constructed according to plans and in accordance to the MWELO requirements.

- **Tracking Customers with Water Use Budgets:** The City provides notices each billing cycle to the accounts with water use budgets showing a comparison between the budget and actual water consumption. For customers that are 20 percent over budget, the City offers further technical assistance and encourages participation in the smart irrigation controller rebate program, described in Section 9.5.7.4.

9.5.7.3.2 Implementation over the Past Five Years to Achieve Water Use Targets

The City does not separately track the number of large landscape surveys completed, however they are included in the 21,797 total surveys completed between 2016 and 2020.

9.5.7.3.3 Plans for Continued Implementation

The City anticipates achieving the highest water conservation per customer by offering assistance to large landscape customers. The City plans to continue the above conservation programs to meet future water use objectives.

9.5.7.4 Rebate Programs

9.5.7.4.1 DMM Description

The City maintains rebate programs for residential and CII customers. The rebates are intended to encourage customers to replace or improve existing appliances, equipment, or facilities to improve water efficiency. These rebates are promoted on the City's website and offered when City staff provides water conservation surveys for customers.

Customers are reimbursed for a portion of the cost in making water efficient improvements. The rebates are subject to water conservation staff inspections and the terms and conditions provided on the City's water conservation website. The rebates are provided to the customers upon confirmation that the replacement or improvement is complete. The City's rebate programs are summarized in Table 9-3, along with the rebate amount.

9.5.7.4.2 Implementation over the Past Five Years to Achieve Water Use Targets

The City's rebate programs had active customer participation between 2016 and 2020. The number of units replaced or installed under each program is listed in Table 9-3. From Fiscal Year 2015-2016 through Fiscal Year 2019-2020 participation, the City saved approximately 1.34 billion gallons of cumulative water use through its toilet, clothes washer, turf, smart irrigation controller, and drip irrigation rebate programs.

The Turf Replacement program has proven to be popular; in 2020, rebate funds for turf replacements were fully committed and the City had to stop accepting applications. The Rain Barrel and High Efficiency Sprinkler Nozzle programs had minimal participation; thus, the City ended those programs on June 30, 2020.

9.5.7.4.3 Plans for Continued Implementation

The City anticipates continuing many of these rebate programs, depending on customer participation and funding availability, to achieve its future water use objectives.

Table 9-3. City of Modesto Rebate Programs from 2016 to 2020[a]

Program	Rebate Incentive	Number of Replaced/ Installed Units
Turf Replacement	$2 per sf (maximum $3,000 per account)	409,713 sf
High Efficiency Clothes Washer	$200 maximum per account	262 clothes washers
High Efficiency Toilet	$100 maximum per toilet	1,135 toilets
Rain Barrel[b,c]	$50 per 50-gallon barrel ($100 maximum per account)	35 barrels
High Efficiency Sprinkler Nozzle[b,c]	$2 per nozzle (maximum $60 per account)	290 nozzles
Drip Irrigation[c]	$0.50 per sf (maximum $1,000 per account)	78,900 sf[d]
Smart Irrigation Controller[c]	$75 per account	150 controllers

Source: Data from City's Water Conservation Specialist, January 2021.

(a) Fiscal Years Ending 2016-2020.
(b) Offer ended June 30, 2020.
(c) Program started Fiscal Year Ending 2017.
(d) Estimated area at $0.50/sf based on rebate expended ($39,450).
sf = square feet

9.5.7.5 One Water Modesto Program

Over the past five years, the City developed the One Water Modesto program, an initiative to internally align staff from various departments to communicate the value of the City's water resources. Through One Water Modesto, the City takes a holistic approach to its water resources, including potable water, storm water, groundwater, surface water, wastewater, and recycled water. By providing consistent messaging from staff, the City seeks to improve awareness of water resources and infrastructure through public outreach and engagement. Goals of the One Water Modesto program include:

- Stimulating economic development;
- Developing public and private partnerships;
- Improving water resource management and policies;
- Promoting civic pride;
- Ensuring regulatory compliance; and
- Fostering confidence in the City's utilities.

The One Water Modesto program is ongoing. The City continues to integrate this program in its operational practices and messaging with its staff and customers. Implementation of this program helps the City staff and its customers elevate their mindset on the value of water, protecting water sources, and the environment. This program is anticipated to help the City attain its water use objectives and maintain the reliability of its water supplies.

9.6 WATER USE OBJECTIVES (FUTURE REQUIREMENTS)

In 2018, the Legislature enacted two policy bills, (SB 606 (Hertzberg) and AB 1668 (Friedman)), to establish a new foundation for long-term water conservation and drought planning to adapt to climate change and the associated longer and more intense droughts in California. These two policy bills build on SB X7-7 and expands authorities and requirements for urban water use efficiency. The legislation sets standards for indoor residential water use and requires the SWRCB, in coordination with DWR, to adopt efficiency standards for outdoor residential water use, CII outdoor water use with dedicated irrigation meters, and water loss. At the time of preparation of this plan, DWR and the SWRCB are in the process of developing new standards for water loss, indoor (non-residential) water use, and outdoor water use. These standards will require urban water retailers to develop agency-wide water use objectives, provide annual reports, and update their UWMP.

The Legislature established indoor residential water use standards as 55 GPCD until January 2025, 52.5 GPCD from 2025 to 2029, and 50 GPCD in January 2030, or a greater standard recommended by DWR and the SWRCB. By June 30, 2022, the SWRCB is anticipated to adopt an outdoor residential water use standard, a standard for CII outdoor water use with dedicated irrigation meters, and performance measures for CII water uses. At that time, the SWRCB will adopt guidelines and methodologies for calculating the water use objectives. In accordance with CWC Section 10609.20(c), the water use objectives for urban water retailers will be based on the estimated efficient indoor and outdoor residential water use, efficient outdoor irrigation of CII landscaped areas, estimated water losses, and estimated water use for variances approved by the SWRCB aggregated across the population in its water service area.

By November 1, 2023, and November 1 of every year thereafter, the City will need to calculate its urban water use objectives and actual water use and provide an annual report to the State. By January 1, 2024, the City will need to prepare an UWMP supplement incorporating DMMs and other water efficiency standards that it plans to implement to achieve its water use objectives by January 1, 2027.

CHAPTER 10
Plan Adoption, Submittal, and Implementation

This chapter provides information regarding the notification, public hearing, adoption, and submittal of the City and MID's Joint 2020 UWMP. It also includes discussion on plan implementation and the process of amending the UWMP and the WSCP.

10.1 INCLUSION OF ALL 2020 DATA

Because 2020 is the final compliance year for SB X7-7, the 2020 UWMPs must contain data through the end of 2020. If a water supplier bases its accounting on a fiscal year (July through June), the data must be presented through the end of the 2020 fiscal year (June 2020). If the water supplier bases its accounting on a calendar year, the data must be presented through the end of the 2020 calendar year (December 2020).

As indicated in Section 2.4 of this plan, the City and MID use a calendar year for urban water supply and demand accounting, and therefore this plan includes data through December 2020.

10.2 NOTICE OF PUBLIC HEARING

In accordance with the Act, the City and MID must provide an opportunity for the public to provide input on this Joint 2020 UWMP. The City and MID must consider all public input prior to its adoption. There are two audiences to be notified for the public hearing: cities/counties and the public.

10.2.1 Notices to Cities and Counties

The City and MID provided 60-day notices of the preparation of the Joint 2020 UWMP and WSCP, and notices of the public hearings to the cities and counties listed in Table 10-1 and Table 10-2.

Table 10-1. Notification to Cities and Counties (DWR Table 10-1 Retail)

City Name	60 Day Notice	Notice of Public Hearing
City of Turlock	Yes	Yes
City of Ceres	Yes	Yes
City of Modesto	Yes	Yes
County Name *Drop Down List*	60 Day Notice	Notice of Public Hearing
Stanislaus County	Yes	Yes

Table 10-2. Notification to Cities and Counties (DWR Table 10-1 Wholesale)

☐	Supplier has notified more than 10 cities or counties in accordance with Water Code Sections 10621 (b) and 10642. **Completion of the table below is not required. Provide a separate list of the cities and counties that were notified.**	
	Provide the page or location of this list in the UWMP.	
☑	Supplier has notified 10 or fewer cities or counties. **Complete the table below.**	
City Name	60 Day Notice	Notice of Public Hearing
City of Turlock	Yes	Yes
City of Ceres	Yes	Yes
City of Modesto	Yes	Yes
County Name *Drop Down List*	60 Day Notice	Notice of Public Hearing
Stanislaus County	Yes	Yes

In addition, the City and MID also provided notices to the following adjacent agencies, cities, and stakeholders:

- City of Oakdale
- City of Riverbank
- City of Waterford
- Community of Grayson
- Community of Empire
- Community of Riverdale
- South Modesto Municipal Advisory Council
- Turlock Irrigation District
- Oakdale Irrigation District
- Stanislaus County Farm Bureau
- Stanislaus and Tuolumne Rivers Groundwater Basin Association GSA
- West Turlock GSA
- East Turlock GSA
- Northwestern Delta-Mendota GSA

Copies of the notice of preparation are included as Appendix D. Upon substantial completion of the plan, the City and MID provided the agencies listed above a notice of public hearing, which is also included in Appendix D.

10.2.2 Notice to the Public

The City and MID issued a notice of public hearing to the public and provided a public review period following the notice and prior to adoption of the Joint 2020 UWMP and WSCP to allow ample time for public comments to be prepared and received.

A notice of public hearing was issued in accordance with Government Code Section 6066 and was published in the City's local newspaper to notify all customers and local governments of the public hearing. In addition, the notice was posted on the City and MID websites. A copy of the published Notice of Public Hearing is included in Appendix D.

10.3 PUBLIC HEARING AND ADOPTION

The City and MID encouraged community participation in the development of this plan, including its WSCP, using public notices and web-based communication. Notices included the time and place of the public hearing, as well as the location where the plan is available for public inspection.

The public hearing provided an opportunity for all City and MID water customers and the general public to become familiar with the Joint 2020 UWMP and ask questions about the City and MID's continued plans for providing a reliable, safe, high-quality water supply and mitigating potential water shortage conditions. Copies of the Draft Joint 2020 UWMP were made available for public inspection at the City's Utilities Department, the MID Board Secretary's office, and on the City and MID websites.

10.3.1 Public Hearing

The City and MID each held public hearings for the Joint 2020 UWMP on June 8, 2021. As part of the public hearings, the City and MID provided a report on the City's compliance with the Water Conservation Act of 2009. The report included information on the City's baseline water use, water use targets and their economic impact, compliance, WSCP, and implementation of the UWMP. The Joint 2020 UWMP will also be the source document for any SB 610 Water Supply Assessments or SB 221 Water Supply Verifications required for any proposed projects in the City's water service area between 2021 and 2025 that are subject to the California Environmental Quality Act and would demand an amount of water equivalent to or greater than the amount of water required by a 500 dwelling unit project.

10.3.2 Adoption

Subsequent to the public hearings, this Joint 2020 UWMP and WSCP were adopted by both the Modesto City Council and the MID Board of Directors at their respective meetings on June 8, 2021. Copies of the adopted resolutions are included in Appendix L.

10.4 PLAN SUBMITTAL

This 2020 UWMP will be submitted to DWR within 30 days of adoption and by July 1, 2021. The adopted 2020 UWMP will be submitted electronically to DWR using the Water Use Efficiency (WUE) data submittal tool. A CD or hardcopy of the adopted 2020 UWMP will also be submitted to the California State Library.

No later than 30 days after adoption, a copy of the adopted 2020 UWMP, including the WSCP, will be provided to the cities and counties to which the City provides water.

10.5 PUBLIC AVAILABILITY

No later than 30 days after submittal to DWR, copies of this plan, including the adopted WSCP, will be available to the public during normal business hours at the following locations:

- City of Modesto, Utilities Department, 1010 Tenth Street, 4th Floor, Modesto; and
- MID Board Secretary's Office, 1231 Eleventh Street, Modesto.

An electronic copy of the adopted Joint 2020 UWMP will also be available on the City and MID websites:

- City of Modesto Utilities Department (https://www.modestogov.com/860)
- MID (http://www.mid.org/water/uwmp)

10.6 AMENDING AN ADOPTED UWMP OR WATER SHORTAGE CONTINGENCY PLAN

The City and MID may amend the Joint 2020 UWMP and WSCP jointly or separately. If the City and MID amend one or both documents, the City and MID will follow the notification, public hearing, adoption, and submittal process described in Sections 10.2 through 10.4 above. In addition to submitting amendments to DWR through the WUE data portal, copies of amendments or changes to the plans will be submitted to the California State Library, as well as any city or county within which the supplier provides water, within 30 days after adoption.