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2010 Urban Water Management Plan

June 2011


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Inventing California's Future

2010 URBAN WATER MANAGEMENT PLAN

June 2011



Prepared By

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City of Merced
2010 Urban Water Management Plan
Contact Sheet

Date plan submitted to the Department of Water Resources: July 15, 2011

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The Water supplier is a: **City**

The Water supplier is a: **Retailer**

Utility services provided by the water supplier include: **Water, Wastewater**

Is This Agency a Bureau of Reclamation Contractor? **No**

Is This Agency a State Water Project Contractor? **No**

City of Merced

2010 URBAN WATER MANAGEMENT PLAN

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Table I-2 Urban Water Management Plan checklist, organized by subject

| No. | UWMP requirement ^a | Calif. Water Code reference | Additional clarification | UWMP location |
|-------------------------|--|-----------------------------|--------------------------|---------------------------|
| PLAN PREPARATION | | | | |
| 4 | Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable. | 10620(d)(2) | | Section 1.4 Appendix B |
| 6 | Notify, at least 60 days prior to the public hearing on the plan required by Section 10642, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. Any city or county receiving the notice may be consulted and provide comments. | 10621(b) | | Section 1.4 Appendix B |
| 7 | Provide supporting documentation that the UWMP or any amendments to, or changes in, have been adopted as described in Section 10640 et seq. | 10621(c) | | Appendix A |
| 54 | Provide supporting documentation that the urban water management plan has been or will be provided to any city or county within which it provides water, no later than 60 days after the submission of this urban water management plan. | 10635(b) | | Section 1.4 Appendix B |
| 55 | Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan. | 10642 | | Appendix B |
| 56 | Provide supporting documentation that the urban water supplier made the plan available for public inspection and held a public hearing about the plan. For public agencies, the hearing notice is to be provided pursuant to Section 6066 of the Government Code. The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water. Privately-owned water suppliers shall provide an equivalent notice within its service area. | 10642 | | Section 1.4 Appendix B |
| 57 | Provide supporting documentation that the plan has been adopted as prepared or modified. | 10642 | | Appendix A |
| 58 | Provide supporting documentation as to how the water supplier plans to implement its plan. | 10643 | | Section 6.1 |

| No. | UWMP requirement ^a | Calif. Water Code reference | Additional clarification | UWMP location |
|---------------------------|---|-----------------------------|---|---------------------------|
| 59 | Provide supporting documentation that, in addition to submittal to DWR, the urban water supplier has submitted this UWMP to the California State Library and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. This also includes amendments or changes. | 10644(a) | | Section 1.5 Appendix A |
| 60 | Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the urban water supplier has or will make the plan available for public review during normal business hours | 10645 | | Section 1.4 Appendix B |
| SYSTEM DESCRIPTION | | | | |
| 8 | Describe the water supplier service area. | 10631(a) | | Chapter 2 Figure 2.1 |
| 9 | Describe the climate and other demographic factors of the service area of the supplier | 10631(a) | | Sections 2.3 and 2.4 |
| 10 | Indicate the current population of the service area | 10631(a) | Provide the most recent population data possible. Use the method described in "Baseline Daily Per Capita Water Use." See Section M. | Section 2.4 |
| 11 | Provide population projections for 2015, 2020, 2025, and 2030, based on data from State, regional, or local service area population projections. | 10631(a) | 2035 and 2040 can also be provided to support consistency with Water Supply Assessments and Written Verification of Water Supply documents. | Section 2.4 |
| 12 | Describe other demographic factors affecting the supplier's water management planning. | 10631(a) | | Section 2.1 and 2.2 |
| SYSTEM DEMANDS | | | | |
| 1 | Provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data. | 10608.20(e) | | Section 3.2 |
| 2 | <i>Wholesalers:</i> Include an assessment of present and proposed future measures, programs, and policies to help achieve the water use reductions. <i>Retailers:</i> Conduct at least one public hearing that includes general discussion of the urban retail water supplier's implementation plan for complying with the Water Conservation Bill of 2009. | 10608.36 10608.26(a) | Retailers and wholesalers have slightly different requirements | Section 1.4 |

| No. | UWMP requirement ^a | Calif. Water Code reference | Additional clarification | UWMP location |
|------------------------|--|-----------------------------|--|--------------------------------|
| 3 | Report progress in meeting urban water use targets using the standardized form. | 10608.40 | | Not Applicable Until 2015 |
| 25 | Quantify past, current, and projected water use, identifying the uses among water use sectors, for the following: (A) single-family residential, (B) multifamily, (C) commercial, (D) industrial, (E) institutional and governmental, (F) landscape, (G) sales to other agencies, (H) saline water intrusion barriers, groundwater recharge, conjunctive use, and (I) agriculture. | 10631(e)(1) | Consider 'past' to be 2005, present to be 2010, and projected to be 2015, 2020, 2025, and 2030. Provide numbers for each category for each of these years. | Section 3.3 |
| 33 | Provide documentation that either the retail agency provided the wholesale agency with water use projections for at least 20 years, if the UWMP agency is a retail agency, OR, if a wholesale agency, it provided its urban retail customers with future planned and existing water source available to it from the wholesale agency during the required water-year types | 10631(k) | Average year, single dry year, multiple dry years for 2015, 2020, 2025, and 2030. | [To Be Included In Appendix B] |
| 34 | Include projected water use for single-family and multifamily residential housing needed for lower income households, as identified in the housing element of any city, county, or city and county in the service area of the supplier. | 10631.1(a) | | Table 3.15 |
| SYSTEM SUPPLIES | | | | |
| 13 | Identify and quantify the existing and planned sources of water available for 2015, 2020, 2025, and 2030. | 10631(b) | The 'existing' water sources should be for the same year as the "current population" in line 10. 2035 and 2040 can also be provided. | Section 4.1 |
| 14 | Indicate whether groundwater is an existing or planned source of water available to the supplier. If yes, then complete 15 through 21 of the UWMP Checklist. If no, then indicate "not applicable" in lines 15 through 21 under the UWMP location column. | 10631(b) | Source classifications are: surface water, groundwater, recycled water, storm water, desalinated sea water, desalinated brackish groundwater, and other. | Section 4.1 |
| 15 | Indicate whether a groundwater management plan been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization. | 10631(b)(1) | | Section 4.3 |
| 16 | Describe the groundwater basin. | 10631(b)(2) | | Section 4.3 |
| 17 | Indicate whether the groundwater basin is adjudicated? Include a copy of the court order or decree. | 10631(b)(2) | | Section 4.3 |

| No. | UWMP requirement ^a | Calif. Water Code reference | Additional clarification | UWMP location |
|-----|--|-----------------------------|---|--------------------------------|
| 18 | Describe the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. If the basin is not adjudicated, indicate “not applicable” in the UWMP location column. | 10631(b)(2) | | Section 4.3 Appendix C |
| 19 | For groundwater basins that are not adjudicated, provide information as to whether DWR has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition. If the basin is adjudicated, indicate “not applicable” in the UWMP location column. | 10631(b)(2) | | Section 4.3 |
| 20 | Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years | 10631(b)(3) | | Section 4.3 |
| 21 | Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped. | 10631(b)(4) | Provide projections for 2015, 2020, 2025, and 2030. | Section 4.4 |
| 24 | Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis. | 10631(d) | | Section 4.5 |
| 30 | Include a detailed description of all water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and multiple-dry years, excluding demand management programs addressed in (f)(1). Include specific projects, describe water supply impacts, and provide a timeline for each project. | 10631(h) | | Section 3.4 and Section 5.3 |
| 31 | Describe desalinated water project opportunities for long-term supply, including, but not limited to, ocean water, brackish water, and groundwater. | 10631(i) | | Section 3.4 |
| 44 | Provide information on recycled water and its potential for use as a water source in the service area of the urban water supplier. Coordinate with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area. | 10633 | | Section 4.7 |
| 45 | Describe the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal. | 10633(a) | | Section 4.7 |

| No. | UWMP requirement ^a | Calif. Water Code reference | Additional clarification | UWMP location |
|--|--|-----------------------------|--------------------------|--------------------------|
| 46 | Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project. | 10633(b) | | Section 4.7 |
| 47 | Describe the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use. | 10633(c) | | Section 4.7 |
| 48 | Describe and quantify the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses. | 10633(d) | | Section 4.7 |
| 49 | The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected. | 10633(e) | | Section 4.7 |
| 50 | Describe the actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year. | 10633(f) | | Section 4.7 |
| 51 | Provide a plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use. | 10633(g) | | Not Applicable |
| WATER SHORTAGE RELIABILITY AND WATER SHORTAGE CONTINGENCY PLANNING ^b | | | | |
| 5 | Describe water management tools and options to maximize resources and minimize the need to import water from other regions. | 10620(f) | | Section 4.7, 5.3 and 6.1 |
| 22 | Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage and provide data for (A) an average water year, (B) a single dry water year, and (C) multiple dry water years. | 10631(c)(1) | | Section 5.1 |
| 23 | For any water source that may not be available at a consistent level of use - given specific legal, environmental, water quality, or climatic factors - describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable. | 10631(c)(2) | | Section 5.1 |
| 35 | Provide an urban water shortage contingency analysis that specifies stages of action, including up to a 50-percent water supply reduction, and an outline of specific water supply conditions at each stage | 10632(a) | | Section 5.3 |

| No. | UWMP requirement ^a | Calif. Water Code reference | Additional clarification | UWMP location |
|-----|---|-----------------------------|--|-----------------------------|
| 36 | Provide an estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply. | 10632(b) | | Section 5.1.3 |
| 37 | Identify actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster. | 10632(c) | | Sections 5.3.4 |
| 38 | Identify additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning. | 10632(d) | | Section 5.3.2 |
| 39 | Specify consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply. | 10632(e) | | Section 5.2 |
| 40 | Indicated penalties or charges for excessive use, where applicable. | 10632(f) | | Section 5.3.2 |
| 41 | Provide an analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments. | 10632(g) | | Section 5.3.3 |
| 42 | Provide a draft water shortage contingency resolution or ordinance. | 10632(h) | | Section 5.3.1 Appendix E |
| 43 | Indicate a mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis. | 10632(i) | | Section 5.3.5 |
| 52 | Provide information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments, and the manner in which water quality affects water management strategies and supply reliability | 10634 | For years 2010, 2015, 2020, 2025, and 2030 | Section 5.2 |

| No. | UWMP requirement ^a | Calif. Water Code reference | Additional clarification | UWMP location |
|-----------------------------------|--|-----------------------------|---|----------------|
| 53 | Assess the water supply reliability during normal, dry, and multiple dry water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. Base the assessment on the information compiled under Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier. | 10635(a) | | Section 5.1.3 |
| DEMAND MANAGEMENT MEASURES | | | | |
| 26 | Describe how each water demand management measures is being implemented or scheduled for implementation. Use the list provided. | 10631(f)(1) | Discuss each DMM, even if it is not currently or planned for implementation. Provide any appropriate schedules. | Section 6.1 |
| 27 | Describe the methods the supplier uses to evaluate the effectiveness of DMMs implemented or described in the UWMP. | 10631(f)(3) | | Section 6.1 |
| 28 | Provide an estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the ability to further reduce demand. | 10631(f)(4) | | Section 6.1 |
| 29 | Evaluate each water demand management measure that is not currently being implemented or scheduled for implementation. The evaluation should include economic and non-economic factors, cost-benefit analysis, available funding, and the water suppliers' legal authority to implement the work. | 10631(g) | See 10631(g) for additional wording. | Appendix F |
| 32 | Include the annual reports submitted to meet the Section 6.2 requirements, if a member of the CUWCC and signer of the December 10, 2008 MOU. | 10631(j) | Signers of the MOU that submit the annual reports are deemed compliant with Items 28 and 29. | Not Applicable |

a The UWMP Requirement descriptions are general summaries of what is provided in the legislation. Urban water suppliers should review the exact legislative wording prior to submitting its UWMP.

b The Subject classification is provided for clarification only. It is aligned with the organization presented in Part I of this guidebook. A water supplier is free to address the UWMP Requirement anywhere with its UWMP, but is urged to provide clarification to DWR to facilitate review.

PLAN PREPARATION**1.1 PURPOSE**

The California Water Code requires urban water suppliers within the state to prepare and adopt Urban Water Management Plans (UWMPs) for submission to the California Department of Water Resources (DWR). The UWMPs, which must be filed every five years, must satisfy the requirements of the Urban Water Management Planning Act (UWMPA) of 1983 including amendments that have been made to the Act. The UWMPA requires urban water suppliers servicing 3,000 or more connections, or supplying more than 3,000 acre-feet (af) of water annually, to prepare an UWMP.

The purpose of the UWMP is to maintain efficient use of urban water supplies, continue to promote conservation programs and policies, ensure that sufficient water supplies are available for future beneficial use, and provide a mechanism for response during water drought conditions. This report, which was prepared in compliance with the California Water Code, and as set forth in the guidelines and format established by the DWR, constitutes the City of Merced (City) 2010 UWMP.

1.2 BACKGROUND**1.2.1 Urban Water Management Planning Act**

In 1983, State Assembly Bill 797 modified the California Water Code Division 6, by creating the UWMPA. Several amendments to the original UWMPA, which were introduced since 1983, have increased the data requirements and planning elements to be included in the 2005 and 2010 UWMPs.

Initial amendments to the UWMPA required that total projected water use be compared to water supply sources over the next 20 years, in 5-year increments. Recent DWR guidelines also suggest projecting through a 25-year planning horizon to maintain a 20-year timeframe until the next UWMP update has been completed.

Other amendments require that UWMPs include provisions for recycled water use, demand management measures (DMMs), and a water shortage contingency plan. The UWMPA requires inclusion of a water shortage contingency plan, which meets the specifications set forth therein. Recycled water was added in the reporting requirements for water usage and figures prominently in the requirements for evaluation of alternative water supplies, when future projections predict the need for additional water supplies. Each urban water purveyor must coordinate the preparation of the water shortage contingency plan with other urban water purveyors in the area, to the extent practicable. Each water supplier must also describe their water demand management measures that are being implemented, or scheduled for implementation.

Amendments Senate Bill (SB) 610 (Costa, 2001), and AB 901 (Daucher, 2001), which became effective beginning January 1, 2002, require counties and cities to consider information relating to the availability of water to supply new large developments.

Amendment SB 318 (Alpert, 2004) requires the UWMP to describe the opportunities for development of desalinated water, including but not limited to, ocean water, brackish water, and groundwater, as long-term supply. AB 105 (Wiggins, 2004) requires urban water suppliers to submit their UWMPs to the California State Library.

Recent amendments to the UWMPA affecting the preparation of 2010 UWMPs are the result of the enactment of Water Conservation Bill of 2009 and other legislation. The Water Conservation Bill of 2009 was enacted in November 2009 to increase water use efficiency, and requires urban water suppliers to reduce the statewide average per capita daily water consumption by 20 percent by December 31, 2020. Changes to the 2010 UWMP requirements primarily address water conservation and DMMs, but also affect notification, water use projections for lower income housing, grant and loan eligibility criteria, and the distribution of UWMPs.

1.2.2 Previous Urban Water Management Plan

Pursuant to the UWMPA, the City previously prepared an UWMP in 2005, which was approved and adopted by the City council on December 5, 2005. Following adoption, the 2005 UWMP was submitted to and formally approved by DWR.

This 2010 UWMP report serves as an update to the City's 2005 UWMP and builds substantially onto that document.

1.3 RESOURCE MAXIMIZATION/IMPORT MINIMIZATION

The City and cooperating agencies in the service area recognize the importance of maintaining sufficient groundwater levels and sustaining a high quality, reliable supply. The City is involved in joint efforts with the Merced Area Groundwater Pool Interests (MAGPI) association, including Merced Irrigation District (MID) and other water purveyors in the area to conserve the regional aquifer. The City has a memorandum of understanding (MOU) with MID and other water purveyors as a part of its membership in MAGPI. In addition, the City has worked with the University of California, Merced (UC Merced), the County of Merced (County), and the Merced County Association of Governments (MCAG). The Departments within the City, such as the Departments of Development Services and Public Works, work together and use water management tools to ensure efficient use of water supplies.

The following programs and documents were created from cooperative efforts of these agencies and departments and are used by the City to maximize their water resources and minimize the need to import water.

Merced Area Groundwater Pool Interests (MAGPI). The City is a member of this association, which was created between agencies in the Merced groundwater basin (MGWB) with shared interests in the Merced subbasin. MAGPI was formed pursuant to the 1993 Groundwater Management Act (AB 3030). In 2001, MAGPI entered into an MOU with DWR to support conjunctive water use management programs.

Previous Groundwater Management Plan. The Merced Irrigation District (MID) and the City of Merced prepared a final draft GWMP in 1997 to comply with legislative requirements of AB 3030. In December 1997, water purveyors within the Merced Groundwater Basin (MGWB) signed a Memorandum of Understanding (MOU) creating an association identified as the Merced Area Groundwater Pool Interest (MAGPI). MAGPI adopted the GWMP in December 1997. The 1997 GWMP served as the initial framework for management of groundwater resources within the MGWB.

In 2002, State SB 1938 (Groundwater Management Planning Act of 2002) and SB 1672 (Integrated Regional Water Management Planning Act of 2002) were signed into law. These bills required various changes and additions to existing basin-wide groundwater management plans. The most significant changes were the adoption of an integrated approach to basin-wide groundwater management, the development of management objectives, and a basin-wide monitoring program by stakeholders. The California Department of Water Resources (DWR) outlined the new requirements of SB 1938 in Appendix C of the 2003 update to Bulletin 118 "California's Groundwater" and suggested additional components that should be included in a GWMP.

Merced Water Supply Plan Update (MWSPU). The MWSPU was prepared for the City, MID, and UC Merced to develop a long-range water resources plan. The MWSPU recommended that groundwater elevations be stabilized with recharge from the Merced River.

Merced Groundwater Basin Groundwater Management Plan Update. This document was prepared for MAGPI to address the MGWB's physical characteristics, water quality conditions, and implementation of the groundwater management plan. The document supercedes the 1997 GWMP and incorporates new components and updates existing components to address the legislative requirements of SB 1938 and SB 1672. The update incorporates data collected since 1997 and reflects analysis performed subsequent to the preparation of the 1997 GWMP.

The lead agencies for the GWMP were the City and MID on behalf of the MAGPI. This report constitutes the City's groundwater management plan and describes methods to sustain groundwater reserves.

1.4 COORDINATION WITH APPROPRIATE AGENCIES

The UWMPA requires that the UWMP identify the water agency's coordination with appropriate nearby agencies.

Law

10620 (d) (2) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.

10621 (b). Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days prior to the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any city or county that receives notice pursuant to this subdivision.

10635 (b). The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.

10642. Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan.

10642. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area.

The City is the sole water supplier and water management agency for the area. For this reason, the City did not participate in an area, regional, watershed, or basin wide UWMP. While preparing the 2010 UWMP, however, the City coordinated its efforts with relevant agencies to ensure that the data and issues discussed in the plan are presented accurately. Table 1.1 summarizes how the UWMP preparation was coordinated with different agencies in the area.

| Table 1.1 Coordination with Appropriate Agencies (Guidebook Table 1) 2010 Urban Water Management Plan City of Merced | | | | | | | |
|---|--|-------------------------------|---------------------------------|-------------------------------------|--|--|-----------------------------------|
| Check at least one box on each row | Participated in Developing the Plan | Commented on the Draft | Attended Public Meetings | Was Contacted for Assistance | Was Sent a Copy of the Draft Plan | Was Sent a Notice of Intention to Adopt | Not Involved/ Not Informed |
| Merced Irrigation District (MID) | ✓ | | | ✓ | ✓ | ✓ | |
| University of California Merced (UC Merced) | | | | | | ✓ | |
| County of Merced (County) | | | | | ✓ | ✓ | |
| Merced County Association of Governments (MCAG) | | | | | ✓ | ✓ | |
| Merced Area Groundwater Pool Interests (MAGPI) | | | | ✓ | ✓ | ✓ | |
| Notes: (1) "Guidebook Table 1" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | | | | |

The City also provided formal written notification to Merced County, MID, and other appropriate agencies, that the City's UWMP was being updated for 2010. Copies of notification letters are included in Appendix B. In accordance with the UWMPA, this notification was provided to appropriate agencies at least 60 days prior to the public hearing of the plan. Copies of the final UWMP will be provided to Merced County and the MID no later than 30 days after its submission to DWR.

The City is committed to encourage the active involvement of diverse social, cultural, and economic elements of its citizenry. On May 9, 2011, the City placed a notice in the local newspaper stating that its UWMP was being updated and that a public hearing would be conducted to address comments and concerns from members of the community. A copy of this notification is included in Appendix B. The Draft 2010 UWMP was made available for public inspection at the City of Merced Public Works Department, located at 1776 Grogan Avenue. In addition, the City also posted a copy of the public review draft UWMP on its website (www.cityofmerced.org).

The City held a public workshop on May 25, 2011 in the Sam Pipes Room at the Civic Center, located at 678 West 18th Street. The workshop provided an opportunity for the

City's customers, residents, and employees to learn and ask questions about the current and future water supply of the City.

1.5 PLAN ADOPTION, SUBMITTAL AND IMPLEMENTATION

The UWMPA requires that the UWMP show the water agency solicited public participation.

Law

10621 (c). The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640)

10642. After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

10643. An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.

10644 (a). An urban water supplier shall submit to the department, the California State Library, and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be submitted to the department, the California State Library, and any city or county within which the supplier provides water supplies within 30 days after adoption.

10645. Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

In accordance with the UWMPA, the City held a public hearing and adopted the 2010 UWMP on June 20, 2011. A copy of the adopting resolution is included in Appendix A. The hearing provided an additional opportunity for the City's customers, residents, and employees to learn and ask questions about the current and future water supply of the City.

Two successive weeks prior to adoption; a notice of the public hearing was published in the local newspaper, notifying interested parties that the draft 2010 UWMP was available for review (Appendix B).

1.6 REPORT ORGANIZATION

The UWMP contains six chapters, followed by appendices that provide supporting documentation for the information presented in the report. The chapters are briefly described below:

Chapter 1 – Plan Preparation. This chapter presents the purpose of this UWMP, describes the efforts of the City to coordinate the preparation of the UWMP with appropriate nearby agencies, and discusses the measures used by the City to solicit public participation in the UWMP. This chapter also includes lists of abbreviations and references used in the report.

Chapter 2 – System Description. This chapter presents a description of the City's water service area and various aspects of the area served including location, climate, population, and other demographic factors.

Chapter 3 – System Demands. This chapter presents the quantity of water supplied to the City's customers including a breakdown by user classification, demand projections, a calculation of the baseline and targets associated with the Water Conservation Bill of 2009, and a discussion of the City's required water conservation and plans for reduction of water use to comply with the requirements of the Water Conservation Bill of 2009.

Chapter 4 – System Supplies. This chapter presents a description of the agency's existing and future water supply sources for the next 20 years. The description of water supplies includes information on the groundwater usage such as water rights, determination if the basin is in overdraft, adjudication decree, and other relevant information.

Chapter 5 – Water Supply Reliability and Water Shortage Contingency Planning. In this chapter, the UWMP seeks to address the reliability of the agency's water supplies. This includes supplies that are vulnerable to seasonal or climatic variations. In addition, there is an analysis of supply availability in a single dry year and in multiple dry years. This chapter also includes an urban water shortage contingency analysis that includes stages of action to be undertaken in the event of water supply shortages; a discussion of the City's water shortage contingency ordinance; prohibitions, consumption reduction methods and penalties; an analysis of revenue and expenditure impacts and measures to overcome these impacts; actions to be taken during a catastrophic interruption; and a mechanism for measuring water use reduction.

Chapter 6 – Demand Management Measures. This chapter provides a description of the City's water Demand Management Measures (DMMs). This includes programs which are currently implemented or scheduled for implementation, water survey programs, water system audits, plumbing retrofits, conservation and water efficiency rebate programs and incentives, information and education programs, water pricing and other waste water prohibitions, and residential ultra low flush toilet replacement programs.

1.7 ACKNOWLEDGEMENTS

Carollo Engineers wishes to acknowledge and thank the following City staff:

| | |
|----------------------|---|
| John Bramble | City Manager |
| Michael Wegley, P.E. | Public Works Director - Director of Water Resources and Reclamation |
| Craig Guilliams | Water Manager |
| Ken Rozell | Assistant City Attorney |
| Daryl Jordan, P.E. | City Engineer |
| Kim Espinosa | Planning Manager |
| Frank Quintero | Interim Director of Economic Development |

| | |
|---------------|---|
| Teri Albrecht | Assistant Finance Director |
| Stan Murdock | Public Works Director – Operations |
| Leah Brown | Water Conservation Specialist |
| Bill Osmer | Public Works Manager - Wastewater Treatment Plant |

Their cooperation and courtesy in obtaining a variety of necessary information were valuable components in completing and producing this report.

The following staff of Carollo Engineers was involved in the preparation of this plan:

| | |
|----------------------|---------------------|
| Rick Chan, P.E. | Principal-in-Charge |
| Thomas Greci, P.E. | Project Manager |
| Ryan Orgill, P.E. | Project Engineer |
| Brian Brenhaug, P.E. | Staff Engineer |

1.8 ABBREVIATIONS AND DEFINITIONS

To conserve space and improve readability, the following abbreviations are used in this report. The abbreviations are spelled out in the text the first time the phrase or title is used in each chapter and subsequently identified by abbreviation only.

| Abbreviation | Description |
|---------------------|---|
| AB | Assembly Bill |
| ADD | Average Day Demand |
| af | Acre Feet |
| AFY | Acre Feet per Year |
| BMP | Best Management Practices |
| CDR | Center for Demographic Research |
| CIMIS | California Irrigation Management Information System |
| City | City of Merced |
| DMMs | Demand Management Measures |
| DOF | Department of Finance |
| DPH | Department of Public Health |
| du/ac | Dwelling Units per Acre |
| DWR | Department of Water Resources |
| DWSMP | Draft Water System Master Plan |
| ETo | Evapotranspiration |
| ft-MSL | Feet above Mean Sea Level |
| FY | Fiscal Year |
| FPLAA | Food Processing Land Application Area |
| Gpcd | Gallons per Capita per Day |
| Gpm | Gallons per Minute |
| GWMP | Groundwater Management Plan |
| HGL | Hydraulic Grade Line |
| HOA | Home Owners' Association |
| IRP | Integrated Resource Plan |
| MAGPI | Merced Area Groundwater Pool Interests |
| MCAG | Merced County Association of Governments |

| Abbreviation | Description |
|---------------------|---|
| MCL | Maximum Contaminant Level |
| MFR | Multi-Family Residential |
| MG | Million Gallons |
| MGWB | Merced Groundwater Basin |
| Mgd | Million Gallons per Day |
| mg/l | Milligrams per Liter |
| MID | Merced Irrigation District |
| MOU | Memorandum of Understanding |
| MTBE | methyl-tertiary-butyl-ether |
| NPDES | National Pollutant Discharge Elimination System |
| RUWMP | Regional Urban Water Management Plan |
| RW | Recycled Water |
| RWMP | Recycled Water Master Plan |
| RWQCB | Regional Water Quality Control Board |
| SB | Senate Bill |
| SDP | Seawater Desalination Project |
| SFR | Single Family Residential |
| SUDP | Specific Urban Development Plan |
| SWP | State Water Project |
| TDS | Total Dissolved Solids |
| UC | University of California |
| ULF | Ultra Low Flush |
| UWMP | Urban Water Management Plan |
| UWMPA | Urban Water Management Planning Act |
| WCS | Water Code Section |
| WMP | Water Master Plan |
| WRF | Water Reclamation Facility |
| WSDM | Water Surplus and Drought Management |
| WSRP | Water Shortage Response Plan |
| WWTF | Wastewater Treatment Facility |

1.9 REFERENCE MATERIAL

The following documents were referenced in the preparation of this UWMP:

- City of Merced 2005 Urban Water Management Plan, December 2005, Brown and Caldwell
- City of Merced Draft Water Master Plan, February 2009, AECOM
- MAGPI Merced Groundwater Basin Groundwater Management Plan Update, July 2008, AMEC Geomatrix, Inc.
- Merced Water Supply Plan Update, September 2001, CH2M HILL
- California Department of Water Resources. California Water Plan Update Bulletin 160-98.

SYSTEM DESCRIPTION

The UWMPA requires that the UWMP include a description of the water purveyor's service area and various aspects of the area served including climate, population, and other demographic factors.

Law

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

10631. (a) Describe the service area of the supplier, including current and projected population, climate, and other demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.

2.1 LOCATION

The City of Merced (City) is located in Merced County in the Central San Joaquin Valley of California. San Francisco is approximately 110 miles northwest of the City, and Los Angeles is 310 miles southwest (Figure 2.1). The City is located on Highway 99, the dominant north-south freeway in Central California linking southern California with the northern portions of the state, and is also served by Highways 140 and 59. Highway 140 to the east serves as one of the principal access points to Yosemite National Park and the Sierra recreation areas to the east. The Union Pacific and Burlington Northern Santa Fe railroads have main lines that pass through the City, including an Amtrak Station. The City also has a regional airport.

2.2 LAND USE

Located in the heart of California's agricultural Central Valley, the City is a hub in the region for education, culture, and business. The City is the largest incorporated city in Merced County and serves as the Merced County seat of government and a regional service center, providing a variety of retail goods and services, and health care services for the surrounding area. The community offers abundant shopping, pleasant neighborhoods and tree-lined streets. Bicycle paths along creeks link major City parks. The City's revitalized downtown is emerging as the entertainment center of the area. Annual events and festivals bring regional and even national recognition.

The City was founded as an agricultural community and is still an important agricultural center in the Central Valley.

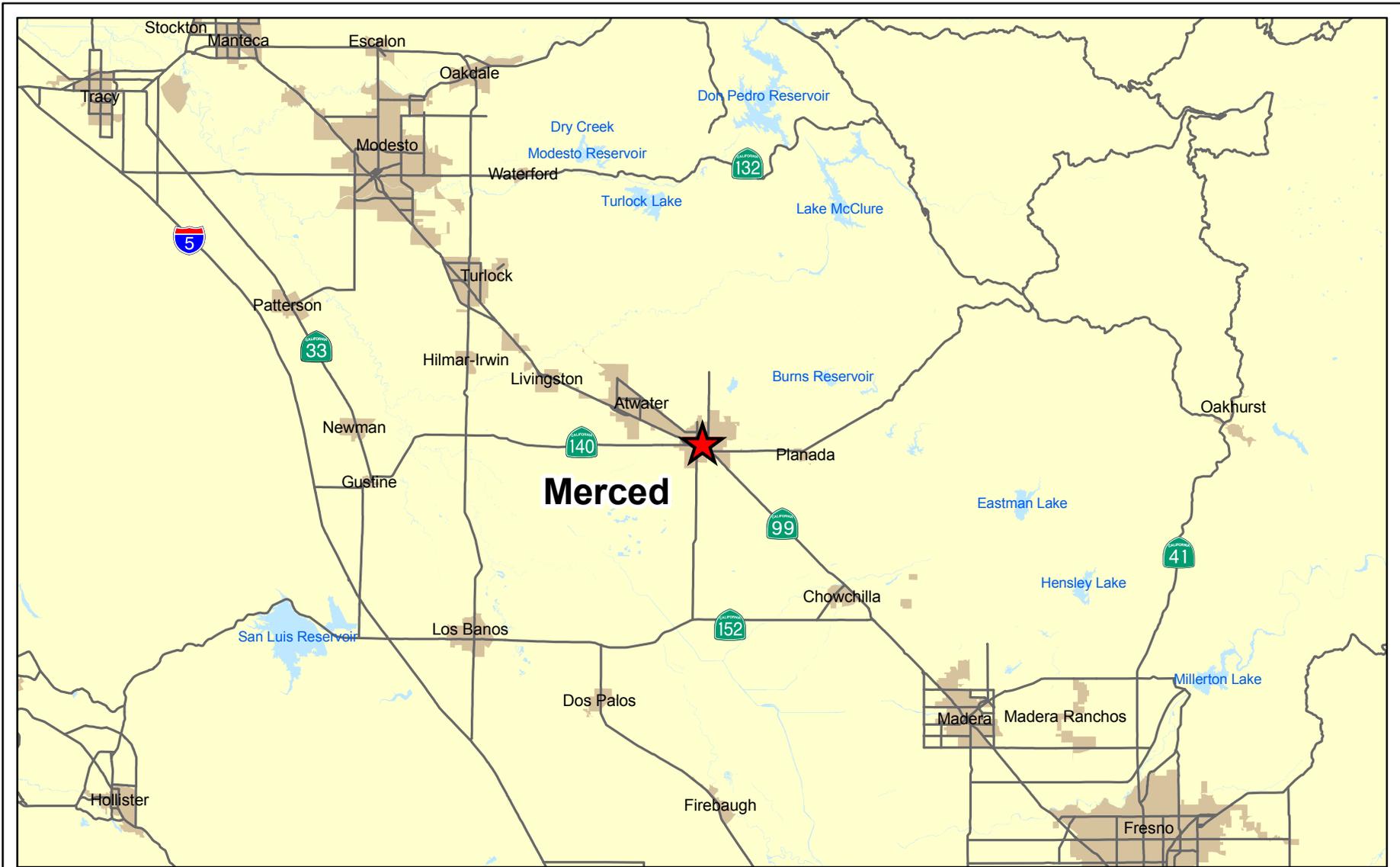


Figure 2.1
Regional Location Map
 Urban Water Management Plan
 City of Merced



Legend

-  City of Merced
-  Urban Areas
-  Hydrography
-  State of California
-  Major Roads

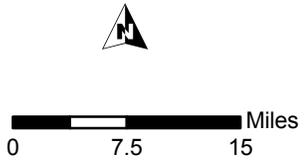


Table 2.1 summarizes the Draft 2030 General Plan land use categories along with associated area for each category.

| Table 2.1 Land Use Categories 2010 Urban Water Management Plan City of Merced | | |
|--|-------------------------|------------------------------------|
| Land Use | Area (acres) | Percentage of Total (%) |
| Single Family Residential | 5,600 | 44% |
| Multi-Family Residential | 917 | 7% |
| Industrial | 1,900 | 15% |
| Commercial ⁽³⁾ | 2,200 | 17% |
| Open Space ⁽⁴⁾ | 2,100 | 17% |
| Total | 12,717 | 100% |
| Notes: | | |
| (1) Source: Merced Vision Draft 2030 General Plan (2010). | | |
| (2) Based on a land use/zoning inventory performed in 2007. | | |
| (3) Includes office and business parks lands. | | |
| (4) Includes parks and other public uses. | | |

2.3 CLIMATE

The City's climate consists of cool, humid winters and hot, dry summers. Table 2.2 summarizes the standard monthly average evapotranspiration (ET_o) rates, rainfall, and temperature. The City's average monthly temperature ranges from 46 to 79 degrees Fahrenheit (°F), with an annual average temperature of 62°F. The daily extreme low and high temperatures have been measured to be 13°F and 114°F, respectively¹.

¹ Source: Western Regional Climate Center (WRCC) Station 045532 – Merced Municipal Airport (www.wrcc.dri.edu)

| Table 2.2 Climate Characteristics 2010 Urban Water Management Plan City of Merced | | | | | |
|---|--|--|---|----------------|----------------|
| Month | Standard Monthly Average ETo⁽¹⁾ (inches) | Monthly Average Rainfall⁽²⁾ (inches) | Monthly Average Temperature⁽²⁾ (°F) | | |
| | | | Average | Minimum | Maximum |
| January | 1.22 | 2.46 | 45.5 | 36.0 | 55.0 |
| February | 1.98 | 2.16 | 50.2 | 38.7 | 61.6 |
| March | 3.42 | 1.95 | 54.2 | 41.2 | 67.2 |
| April | 5.08 | 1.08 | 59.6 | 44.8 | 74.4 |
| May | 6.83 | 0.44 | 66.6 | 50.6 | 82.7 |
| June | 7.80 | 0.09 | 73.6 | 56.4 | 90.8 |
| July | 8.06 | 0.01 | 79.1 | 60.9 | 97.1 |
| August | 7.08 | 0.02 | 77.2 | 58.9 | 95.4 |
| September | 5.43 | 0.15 | 72.4 | 54.8 | 90.0 |
| October | 3.66 | 0.59 | 63.5 | 47.2 | 79.8 |
| November | 1.77 | 1.36 | 52.9 | 39.5 | 66.2 |
| December | 0.98 | 1.89 | 45.6 | 35.6 | 55.6 |
| Annual | 53.31 | 12.21 | 61.8 | 47.1 | 76.3 |
| Notes: | | | | | |
| (1) Source: California Irrigation Management Information System (CIMIS) Station 148 – Merced (www.cimis.water.ca.gov). Represents monthly average ETo from January 1998 to June 2010. | | | | | |
| (2) Source: Western Regional Climate Center (WRCC) Station 045532 – Merced Municipal Airport (www.wrcc.dri.edu). Represents monthly average data from June 1899 to December 2009. | | | | | |

As shown in Table 2.2, the historical annual average precipitation is approximately 12.2 inches. Records show that the monthly precipitation has been as high as 8.0 inches and as low as 0.0 inches. Most of the rainfall occurs during the period from November through April. The annual normal reference ETo is 53 inches.

2.4 POPULATION

The City was incorporated in 1889 and has historically relied upon agribusiness and the presence of Castle Air Force Base, which closed in September 1995. Over the past twenty years, more diversified industry has entered the area, including printing, food processing, warehousing and distribution, and packaging industries. The most notable change to the City is the recent establishment of the tenth University of California (UC) campus, UC Merced, which opened in the fall of 2005. The future of growth for the City will be linked to the continuing expansion of the university. This major educational institution will continue to draw students to the City from around the state. Another important impact on the City will be connection to the state's proposed future high-speed rail system. Upon completion, the

new rail system will link the City to major metropolitan areas in both the northern and southern portions of the state.

The City is a growing community with a population of approximately 83,400, as of January 1, 2010, according to the Merced County Association of Governments (MCAG). Population projections, shown in Table 2.3 and Figure 2.2, are used to forecast water requirements for the City.

| Table 2.3 Current and Projected Population (Guidebook Table 2) 2010 Urban Water Management Plan City of Merced | | | | | |
|---|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| | 2010⁽³⁾ | 2015⁽²⁾ | 2020⁽²⁾ | 2025⁽²⁾ | 2030⁽²⁾ |
| Current SUDP | 81,500 | 91,500 | 107,600 | 121,800 | 137,400 |
| UC Merced Community | 1,900 | 4,700 | 9,400 | 15,600 | 22,500 |
| Total | 83,400 | 96,200 | 117,000 | 137,400 | 159,900 |

Notes:
 (1) "Guidebook Table 2" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare of 2010 Urban Water Management Plan" by DWR.
 (2) Source: Merced County Association of Governments (MCAG) (2010).
 (3) Population estimate for 2010 based on historical DOF E-4 data

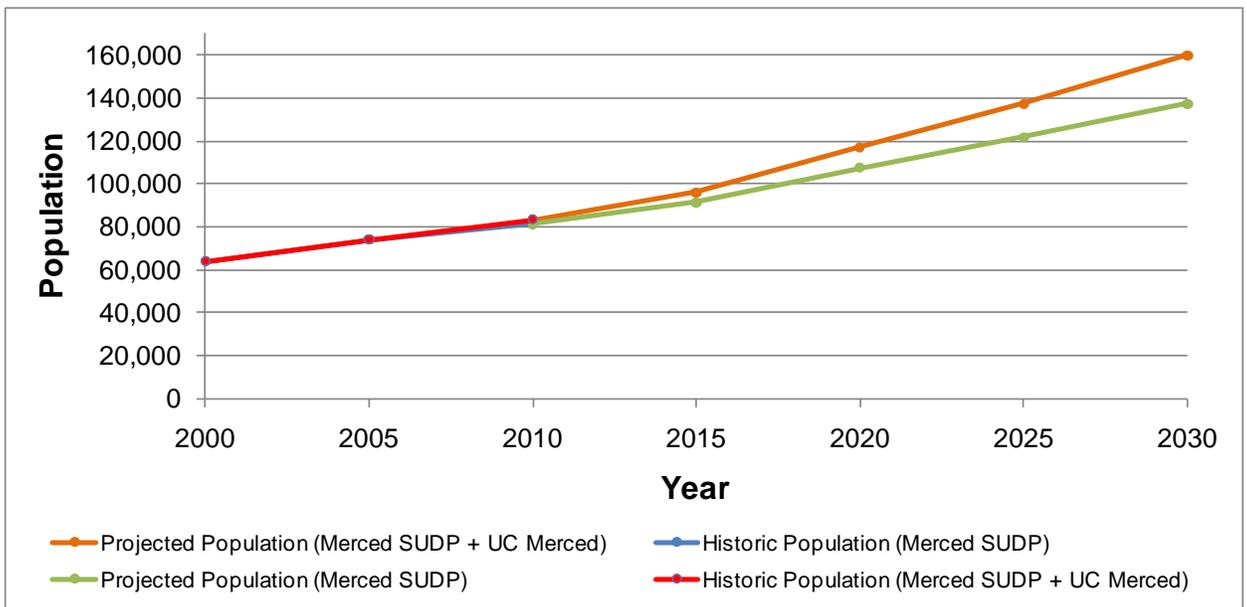


Figure 2.2 Historical and Projected Population

The population data is based on the current and anticipated future conditions within the City's growth area, also known as the Specific Urban Development Plan (SUDP). The new UC Merced campus receives water from the City's distribution system and lies inside the

City's Sphere of Influence (SOI), but currently falls outside the northeastern boundary of the SUDP. The boundary proposed by the Draft 2030 General Plan incorporates UC Merced into the SUDP.

As shown in Table 2.3, the projected population associated with UC Merced is listed separately from the population projections for Merced's current SUDP boundary. While the City's population within the current SUDP is anticipated to grow by about 20,600 between 2010 and 2030, the combined population is anticipated to grow from 83,400 in 2010 to 159,900 by 2030, an increase of about 90 percent over the 20 year planning period. The associated average annual growth rate is about 3.3 percent.

SYSTEM DEMANDS

The Urban Water Management Planning Act (UWMPA) requires that the Urban Water Management Plan (UWMP) identify the quantity of water supplied to the agency's customers including a breakdown by user classification.

Law

10631 (e) (1) Quantify, to the extent records are available, past and current water use, and projected water use (over the same five-year increments described in subdivision (a)), identifying the uses among water use sectors including, but not necessarily limited to, all of the following uses:

(A) Single-family residential; (B) Multifamily; (C) Commercial; (D) Industrial; (E) Institutional and governmental; (F) Landscape; (G) Sales to other agencies; (H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof; and (I) Agricultural.

(2) The water use projections shall be in the same 5-year increments to 20 years or as far as data is available.

3.1 HISTORICAL WATER USE

Water demands served by the City of Merced (City) are primarily residential, with commercial/institutional, industrial, and landscape irrigation comprising approximately 35.7 percent of total usage. As of 2009, the City maintains approximately 9,787 water meters, which represents approximately half of the total connections in the service area. The City classified these meters into the following categories: 6,797 single family residential, 1,519 multi-family residential, 1,144 commercial/institutional, 34 industrial, and 293 landscape irrigation.

In 2009, the City supplied 7.6 billion gallons of water, or 23,306 acre-feet per year (AFY), which is equivalent to 20.8 million gallons per day (mgd) of water serving a population of just under 86,000. Table 3.1 lists historical water production values from 1978 to 2009. Table 3.2 lists the annual water demands from 2005 to 2009 by customer type, while Table 3.3 lists the number of customer accounts from 2005 to 2009 by customer type. Table 3.2 and Table 3.3 also include a breakdown of metered versus unmetered accounts.

| Table 3.1 Historical Water Use 2010 Urban Water Management Plan City of Merced | | | |
|---|-----------------------------------|---------------|-----------------------------------|
| Year | Potable Water Demand (AFY) | Year | Potable Water Demand (AFY) |
| 1978 | 11,500 | 1994 | 18,000 |
| 1979 | 13,500 | 1995 | 18,494 |
| 1980 | 14,000 | 1996 | 20,649 |
| 1981 | 15,500 | 1997 | 22,689 |
| 1982 | 17,000 | 1998 | 20,990 |
| 1983 | 17,000 | 1999 | 23,906 |
| 1984 | 19,500 | 2000 | 22,213 |
| 1985 | 17,500 | 2001 | 23,637 |
| 1986 | 17,000 | 2002 | 23,657 |
| 1987 | 15,000 | 2003 | 22,429 |
| 1988 | 16,000 | 2004 | 23,979 |
| 1989 | 16,500 | 2005 | 22,540 |
| 1990 | 16,500 | 2006 | 22,171 |
| 1991 | 14,500 | 2007 | 24,398 |
| 1992 | 16,000 | 2008 | 24,166 |
| 1993 | 16,500 | 2009 | 23,306 |
| Average (1978 – 2009) | | 19,085 | |
| Notes: | | | |
| (1) Historic production data from 2005 UWMP. | | | |

As shown in Table 3.1, water production has gradually increased from approximately 11,000 af in 1978 to over 23,000 af in 2009, corresponding to an average annual increase of 2.3 percent. A more thorough breakdown in terms of account type, per-capita demand, and future projections are discussed on the following page.

| Table 3.2 Current and Historical Water Use (Guidebook Table 3/4) 2010 Urban Water Management Plan City of Merced | | | | | |
|---|---------------------|---------------|---------------|---------------|---------------|
| Customer Type | Demand (AFY) | | | | |
| | 2005 | 2006 | 2007 | 2008 | 2009 |
| Single Family Residential | 2,975 | 3,718 | 4,341 | 4,363 | 4,092 |
| Multi-Family Residential | 4,482 | 3,371 | 3,415 | 3,401 | 3,390 |
| Commercial/Institutional | 2,931 | 2,700 | 2,428 | 2,932 | 2,940 |
| Industrial | 871 | 495 | 805 | 402 | 363 |
| Landscape Irrigation | 428 | 534 | 768 | 1,064 | 1,179 |
| Total Metered | 11,687 | 10,818 | 11,757 | 12,162 | 11,964 |
| Total Unmetered | 10,853 | 11,353 | 12,641 | 12,004 | 11,342 |
| Total | 22,540 | 22,171 | 24,398 | 24,166 | 23,306 |
| Notes: | | | | | |
| (1) "Guidebook Table 3/4" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | | |
| (2) Source: 2005 through 2009 DWR Public Water System Statistics. | | | | | |

As shown in Table 3.2, the City's demands have increased only slightly since the last UWMP. Though some growth of about 2,000 AFY was seen between 2005 and 2007, reductions in demands are seen in 2008 and 2009.

| Table 3.3 Current and Historical Customer Accounts (Guidebook Table 3/4) 2010 Urban Water Management Plan City of Merced | | | | | | |
|---|------------------|---------------------------|---------------|---------------|---------------|---------------|
| Customer Type | | Number of Accounts | | | | |
| | | 2005 | 2006 | 2007 | 2008 | 2009 |
| Single Family Residential | Metered | 5,108 | 6,123 | 6,677 | 6,860 | 6,797 |
| | Unmetered | 11,014 | 10,895 | 10,768 | 10,738 | 10,736 |
| | Subtotal | 16,122 | 17,018 | 17,445 | 17,598 | 17,533 |
| Multi-Family Residential ⁽³⁾ | Metered | 1,399 | 1,376 | 1,386 | 1,377 | 1,519 |
| | Unmetered | 3 | 3 | 4 | 2 | 5 |
| | Subtotal | 1,402 | 1,379 | 1,390 | 1,379 | 1,524 |
| Commercial/Institutional | Metered | 1,028 | 1,056 | 1,096 | 1,082 | 1,144 |
| | Unmetered | 93 | 91 | 87 | 76 | 34 |
| | Subtotal | 1,121 | 1,147 | 1,183 | 1,158 | 1,178 |
| Industrial | Metered | 35 | 33 | 36 | 36 | 34 |
| | Unmetered | -- | -- | -- | -- | -- |
| | Subtotal | 35 | 33 | 36 | 36 | 34 |
| Landscape Irrigation | Metered | 124 | 159 | 208 | 267 | 293 |
| | Unmetered | -- | -- | -- | -- | -- |
| | Subtotal | 124 | 159 | 208 | 267 | 293 |
| All Customer Types | Metered | 7,694 | 8,747 | 9,403 | 9,622 | 9,787 |
| | Unmetered | 11,110 | 10,989 | 10,859 | 10,816 | 10,775 |
| | Total | 18,804 | 19,736 | 20,262 | 20,438 | 20,562 |
| Notes: | | | | | | |
| (1) "Guidebook Table 3/4" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | | | |
| (2) Source: 2005 through 2009 DWR Public Water System Statistics. | | | | | | |
| (3) Multifamily meters are for buildings of 3 or more dwelling units (DU). Duplexes are still single family. | | | | | | |

The single-family connections are presented in two categories: unmetered (flat-rate) and metered connections.

The City instituted water metering for all public parks and all multi-family dwelling units. The City provides metered irrigation for approximately 80 percent of its parks and street medians. A few unmetered parks and medians remain and will be converted. Metered connections are required for all new single family dwelling units built after 1992. In 2005 when the previous UWMP was completed, just over 5,000 single family dwelling units or approximately 31 percent were metered, and the number of unmetered residential customers was approximately 11,150. As shown in Table 3.3, the number of metered connections of all types grew to 9,787 by 2009, which represents approximately 48 percent of all connections.

3.2 BASELINE AND TARGETS

The UWMPA requires that the UWMP identify the baseline water demand, urban water use target, and interim urban water use target for the City.

Law

10608.20 (e) (1) An urban retail water supplier shall include in its urban water management plan...due in 2010 the baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.

The base daily per capita use is the first step in determining the City's various urban water use targets over the 20-year planning horizon. The current per capita use sets the "baseline" on which the urban and interim water use targets are determined. These targets are necessary to judge compliance with the 2020 use reductions set forth in the Water Conservation Bill of 2009.

3.2.1 Baseline

The first step in developing the baseline water use for the City is determining the applicable range and years for which the baseline average will be calculated. The UWMPA stipulates an agency may use either a 10 or 15-year average to determine their baseline. If over ten percent of total water deliveries in 2008 were from recycled water, then the agency can use a 15-year average baseline. Since the City had no recycled water deliveries in 2008, a 10-year average was used for baseline determination. In addition to the 10-year baseline, a 5-year baseline is also calculated, which will be used to establish the minimum criteria for the City's use reduction targets. A summary of the 2008 total and recycled water deliveries, 10-year baseline range, and 5-year baseline range is included in Table 3.4.

| Table 3.4 Base Period Ranges (Guidebook Table 13) 2010 Urban Water Management Plan City of Merced | | | |
|--|--|--------------|--------------|
| Base | Parameter | Value | Units |
| 10 to 15- Year Base Period | 2008 total water deliveries | 24,166 | AFY |
| | 2008 total volume of delivered recycled water | 0 | AFY |
| | 2008 recycled water as a percent of total deliveries | 0 | Percent |
| | Number of years in base period | 10 | Years |
| | Year beginning base period range | 1996 | |
| | Year ending base period range | 2005 | |
| 5-Year Base Period | Number of years in base period | 5 | Years |
| | Year beginning base period range | 2003 | |
| | Year ending base period range | 2007 | |
| Notes: | | | |
| (1) "Guidebook Table 13" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | |

The data used to calculate the 10-year baseline is included in Table 3.5. The UWMPA requires a continuous range with the end of the range ending between December 31, 2004 and December 31, 2010 be used for baseline determination.

| Table 3.5 Base Daily Per Capita Water use – 10-Year Range (Guidebook Table 14) 2010 Urban Water Management Plan City of Merced | | | | |
|--|----------------------|--|---|---|
| Base Period Year | | City of Merced Population⁽²⁾ | Daily System Water Use (mgd) | Annual Daily Per Capita Water Use (gpcd) |
| Sequence | Calendar Year | | | |
| 1 | 1996 | 61,314 | 18.4 | 301 |
| 2 | 1997 | 61,485 | 20.3 | 329 |
| 3 | 1998 | 62,120 | 18.7 | 302 |
| 4 | 1999 | 62,969 | 21.3 | 339 |
| 5 | 2000 | 63,893 | 19.8 | 310 |
| 6 | 2001 | 64,732 | 21.1 | 326 |
| 7 | 2002 | 66,685 | 21.1 | 317 |
| 8 | 2003 | 68,237 | 20.0 | 293 |
| 9 | 2004 | 70,245 | 21.4 | 305 |
| 10 | 2005 | 73,512 | 20.1 | 274 |
| 10-Year Average | | | | 310 |
| Notes: | | | | |
| (1) "Guidebook Table 14" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | |
| (2) Source: California Department of Finance (DOF) E-4 Population Estimates for City of Merced. | | | | |

The data used to calculate the 5-year baseline is included in Table 3.6. The UWMPA requires a continuous range with the end of the range ending between December 31, 2007 and December 31, 2010 be used for baseline determination.

| Table 3.6 Base Daily Per Capita Water use – 5-Year Range (Guidebook Table 15) 2010 Urban Water Management Plan City of Merced | | | | |
|--|----------------------|--|---|---|
| Base Period Year | | City of Merced Population⁽²⁾ | Daily System Water Use (mgd) | Annual Daily Per Capita Water Use (gpcd) |
| Sequence | Calendar Year | | | |
| 1 | 2003 | 68,237 | 20.0 | 293 |
| 2 | 2004 | 70,245 | 21.4 | 305 |
| 3 | 2005 | 73,512 | 20.1 | 273 |
| 4 | 2006 | 75,685 | 19.8 | 262 |
| 5 | 2007 | 79,259 | 21.8 | 275 |
| 5-Year Average | | | | 282 |
| Notes: | | | | |
| (1) "Guidebook Table 15" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | |
| (2) Source: 2003 through 2007 DWR Public Water System Statistics. | | | | |

3.2.2 Targets

The UWMPA requires urban water suppliers to determine the urban and interim water use targets for 2020 and 2015 respectively. Four target methods have been developed, and identify the specific steps water suppliers shall follow to establish these targets. A brief description of each method, as well as the water use calculated using each methodology is included below.

3.2.2.1 Method 1 – 80 Percent

Method 1 requires an urban water supplier to first determine the base daily per capita use. In order to determine the target using Method 1, 80 percent of the base daily per capita use is calculated. Based on the daily per capita use of 310 gpcd determined previously (Table 3.4), the target use for Method 1 is 248 gpcd.

3.2.2.2 Method 2 – Performance Standards

Method 2 requires water suppliers to use baseline commercial, industrial, institutional, indoor residential, and landscaped area water use to calculate a water use target. Based on the nature of the data required to determine a target using Method 2, it is not feasible for the City to use this methodology. Specifically, the City lacks the detailed landscaped area estimates to calculate the landscaped area water use.

3.2.2.3 Method 3 – 95 Percent of Hydrologic Region Target

Method 3 requires water suppliers to use the hydrologic region target¹ to calculate a water use target for 2020. In order to determine the target using Method 3, 95 percent of the region-specific conservation goal is calculated. Based on a target of 174 gpcd for the San Joaquin River region, the Method 3 target is 165 gpcd.

3.2.2.4 Provisional Method 4

Development of Method 4 by DWR began in February 2010. The draft method was released on January 24, 2011. The draft method must be presented to several agencies including the California Water Commission before being adopted in mid-February 2011 and being released along with DWR's final 2010 guidebook. DWR has stated that this is a provisional method, subject to later revisions during the 2015 UWMP cycle.

The methodology for the provisional draft method relies on the base daily per capita use in 2000 and reduction in the three urban use sectors:

- Residential indoor;
- Commercial, industrial, and institutional (CII); and
- Landscape use and water loss.

A discussion of each of these components, and the calculated savings in each of these sectors is included below.

3.2.2.4.1 Residential Indoor Savings

Since indoor and outdoor water use is delivered through a single meter, an assumption of 70 gpcd has been provided by DWR for standard residential indoor water use. To determine indoor residential savings, the draft provisional method outlines two methodologies. First, a best management practices (BMP) calculator has been developed to sum the savings for three conservation elements including single and multi-family residential housing toilets, residential washers, and showerheads. Due to insufficient data on the implementation of these water-saving measures, it will not be discussed further or used to assess indoor residential savings for the City. Therefore, the City will use what has been termed the "default option" to determine these savings. Based on the draft provisional method, this default value is 15 gpcd.

3.2.2.4.2 Commercial, Industrial, and Institutional Savings

Baseline CII water can be easily established for the City since all commercial, industrial, and institutional connections were metered in 2000. The calculated baseline for CII use (over the same 1996 through 2005 period) was 51.9 gpcd.

¹ April 30, 2009, draft 20x2020 Water Conservation Plan

The draft provisional method estimates a default value for CII savings of 10 percent. The CII water savings are therefore 5.2 gpcd.

3.2.2.4.3 *Landscape and Water Loss Savings*

The landscape and water loss water use is determined by subtracting the default indoor water use of 70.0 gpcd and CII water use of 51.9 gpcd from the calculated base line per capita use. Based on calculated baseline per capita water use, the landscape and water loss use is 188 gpcd.

The draft provisional method estimates a default value for landscape and water loss savings of 21.6 percent. The landscape and water loss savings are therefore 40.6 gpcd.

3.2.2.4.4 *Metered Savings*

Metered savings are considered in addition to the savings attributed to the three sectors previously discussed. Based on the provisional method, a meter savings of 20 percent is applied to the average delivery per unmetered connection in the midpoint of the baseline period. Using the assumed savings outlined in the provisional method of 20 percent, savings from metering is calculated as 35.8 gpcd.

3.2.2.4.5 *Summary*

Based on the steps above, the total water savings is estimated at 97 gpcd. When compared with the baseline demand of 310 gpcd, this would result in a water conservation target of 213 gpcd. A summary of baseline water use by sector and individual savings calculated using Method 4 is included in Table 3.7.

| Table 3.7 Method 4 Target Determination Summary 2010 Urban Water Management Plan City of Merced | | | | | | | | |
|--|--------------------------|----------------------------------|--------------|--|--------------------------|----------------------------|------------------------------|---------------|
| Baseline Water Use (gpcd) | | | | Water Savings (gpcd) | | | | Target |
| Residential Indoor⁽¹⁾ | CII⁽²⁾ | Landscape/ Water Loss | Total | Residential /Indoor⁽³⁾ | CII⁽⁴⁾ | Landscape Water | Metered⁽⁶⁾ | Total |
| 70 | 52 | 188 | 310 | -15.0 | -5.2 | -40.6 | -35.8 | 213 |
| Notes: | | | | | | | | |
| (1) Assumed value based on guidelines in draft provisional Method 4. | | | | | | | | |
| (2) Source: 2000 DWR Public Water System Statistics. | | | | | | | | |
| (3) Assumed value based on guidelines in draft provisional Method 4. | | | | | | | | |
| (4) CII water savings of 10 percent based on guidelines in draft provisional Method 4. | | | | | | | | |
| (5) Landscape and water loss savings of 21.6 percent based on guidelines in draft provisional Method 4. | | | | | | | | |
| (6) Metered savings of 20 percent based on guidelines in draft provisional Method 4. | | | | | | | | |

3.2.2.5 Minimum Water Use Reduction Requirement

The final step in determining the applicability of the water use target for the City is to confirm the water use targets meet the minimum reduction requirements as defined by DWR.

To confirm the target, the 5-year average baseline previously determined (Table 3.5) is used. In order to meet the minimum criteria, the chosen use target must fall below 95 percent of the 5-year baseline, which for the City is 268 gpcd.

3.2.3 Summary of Baselines and Targets

Based on the water use targets calculated using the developed methodologies, the City's water use target for 2020 is 248 gpcd. Based on the 10-year baseline of 310 gpcd, the 2015 interim water use target is 279 gpcd. This target was determined using Method 1, which corresponds to 80 percent of the 10-year baseline. According to the DWR guidelines, this target is valid since it is less than the target confirmation criteria of 268 gpcd. A summary of the various baselines, use target determined based on various methodologies, and the final use target and interim target are summarized in Table 3.8.

| Table 3.8 Baseline and Targets Summary 2010 Urban Water Management Plan City of Merced | | | | | | | | |
|---|----------------------------------|--|------------------------|------------------------|------------------------|---|--|--|
| Baselines (gpcd) | | Target Determination Methods (gpcd) | | | | Target Confirmation⁽⁷⁾ (gpcd) | Target⁽⁸⁾ (gpcd) | Interim Target⁽⁹⁾ (gpcd) |
| 10-Year⁽¹⁾ | 5- Year⁽²⁾ | 1⁽³⁾ | 2⁽⁴⁾ | 3⁽⁵⁾ | 4⁽⁶⁾ | | | |
| 310 | 282 | 248 | NA | 165 | 213 | 268 | 248 | 279 |
| Notes: (1) Source: 2000 through 2009 DWR Public Water System Statistics and DOF E-4 Population Estimates. (2) Source: 2003 through 2007 DWR Public Water System Statistics and DOF E-4 Population Estimates. (3) Method 1 – 80 percent of the 10-year base daily per capita water use (0.80*310 gpcd). (4) Method 2 – Performance Standards. Insufficient landscaped area data is available to determine an Urban Water Use Target using Method 2. (5) Method 3 – 95 percent of the Regional Target (0.95*174 gpcd). (6) Method 4 –provisional method through reduction by sector. (7) Minimum criterion for the Urban Water Use Target is defined as 95% of the 5-year base daily per capita water use (0.95*282 gpcd). (8) Urban Water Use Target determined using Method 1. (9) Interim Urban Water Use Target defined as the average of the 10-year base per capita water use and Urban Water Use Target. | | | | | | | | |

As shown in Table 3.8, it is recommended that the City use Method 1 to establish its water conservation target, resulting in a 2015 interim target of 279 gpcd and a 2020 target of 248 gpcd.

3.3 FUTURE WATER DEMANDS

Population data developed by the Merced Council of Governments (MCAG) was used to develop estimates of future City water use. The demographic projections are based on the SUDP growth area boundary outlined in the Draft 2030 General Plan with population figures generated by MCAG (MCAG, 2010). According to the Draft 2030 General Plan, the UC Merced Community lies within the SUDP boundary and will annex to the City in the future.

Since the UC Merced Community lies within the proposed SUDP boundary, and is supplied water by the City, population projections developed by MCAG encompass the water demand attributed to the UC Merced Community. Unlike the 2005 UWMP, no specific demand projections were completed for the UC Merced Community.

It is estimated that the 2010 population in the SUDP was approximately 81,500 people². The SUDP population within the current SUDP boundary is expected to reach 137,400 by 2030. MCAG estimates indicate that with UC Merced incorporated into the SUDP, the 2030 population is projected to reach 159,900. Based on the increase presented by MCAG, the population within the SUDP is expected to grow at an annual average growth rate of about three percent during the twenty-year planning period.

The projected connections and water demands for each sector from years 2010 to 2030 are summarized in Table 3.9 through Table 3.15. Table 3.9 provides historical connections and water demands for 2010 (with annual demand estimated from 2009), Table 3.10 through Table 3.13 provide a breakdown for each of the planning years 2015 through 2030, while Table 3.14 provides a summary of the demand projections over the 20-year planning period.

The demand projections are estimated based on the conservation targets developed in Section 3.2.3 and thus incorporates water conservation associated with the Water Conservation Bill of 2009.

Distribution of demand among water use sectors is calculated using average water use by sector data from 2005 through 2009. To project the number of connections per sector, it was assumed that the number of connections would grow consistently with population. The distribution of the number of connections for each water use sector is calculated using average number of connection data by sector from 2005 through 2009.

It should be noted that water loss, or unaccounted for water, is implicitly included in the demand associated with unmetered connection and is not tabulated separately.

² Merced Council of Governments (2010)

| Table 3.9 2010 Current Water Deliveries (Guidebook Table 4) 2010 Urban Water Management Plan City of Merced | | |
|---|--------------------|-----------------------------------|
| Customer Types | Total | |
| | Connections | Volume⁽²⁾ (AFY) |
| Single Family Residential | 17,536 | 15,631 |
| Multi-Family Residential | 1,514 | 3,634 |
| Commercial/ Institutional | 1,156 | 2,803 |
| Industrial | 33 | 591 |
| Landscape Irrigation | 294 | 799 |
| UC Merced Community | 1 | 202 |
| Total | 20,534 | 23,661 |
| Notes: | | |
| (1) "Guidebook Table 4" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | |
| (2) Based 2010 demand data and January 2011 account data | | |

| Table 3.10 2015 Projected Water Deliveries (Guidebook Table 5) 2010 Urban Water Management Plan City of Merced | | |
|---|--------------------|---------------------|
| Customer Types | Total | |
| | Connections | Volume (AFY) |
| Single Family Residential | 21,105 | 19,700 |
| Multi-Family Residential | 1,822 | 4,580 |
| Commercial/ Institutional | 1,391 | 3,533 |
| Industrial | 40 | 745 |
| Landscape Irrigation | 354 | 1,008 |
| UC Merced Community ⁽³⁾ | -- | 500 |
| Total | 24,712 | 30,064 |
| Notes: | | |
| (1) "Guidebook Table 5" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | |
| (2) Based on a projected population of 96,200 in 2015 (MCAG, 2010). Incorporates water conservation associated with the Water Conservation Bill of 2009. | | |
| (3) UC Merced demand calculated separately based on a projected population of 4,700 and a per-capita demand of 95 gpcd. | | |

**Table 3.11 2020 Projected Water Deliveries (Guidebook Table 6)
2010 Urban Water Management Plan
City of Merced**

| Customer Types | Total | |
|------------------------------------|---------------|---------------|
| | Connections | Volume (AFY) |
| Single Family Residential | 25,668 | 20,991 |
| Multi-Family Residential | 2,216 | 4,880 |
| Commercial/ Institutional | 1,692 | 3,764 |
| Industrial | 48 | 793 |
| Landscape Irrigation | 430 | 1,074 |
| UC Merced Community ⁽³⁾ | -- | 1,000 |
| Total | 30,055 | 32,502 |

Notes:

- (1) "Guidebook Table 6" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR.
- (2) Based on a projected population of 107,600 in 2020 (MCAG, 2010). Incorporates water conservation associated with the Water Conservation Bill of 2009.
- (3) UC Merced Community demand calculated separately based on a projected population of 9,400 and a per-capita demand of 95 gpcd.

**Table 3.12 2025 Projected Water Deliveries (Guidebook Table 7)
2010 Urban Water Management Plan
City of Merced**

| Customer Types | Total | |
|------------------------------------|---------------|---------------|
| | Connections | Volume (AFY) |
| Single Family Residential | 30,144 | 24,327 |
| Multi-Family Residential | 2,603 | 5,655 |
| Commercial/ Institutional | 1,987 | 4,363 |
| Industrial | 57 | 919 |
| Landscape Irrigation | 505 | 1,244 |
| UC Merced Community ⁽³⁾ | -- | 1,660 |
| Total | 35,295 | 38,169 |

Notes:

- (1) "Guidebook Table 5" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR.
- (2) Based on a projected population of 121,800 in 2025 (MCAG, 2010). Incorporates water conservation associated with the Water Conservation Bill of 2009.
- (3) UC Merced Community demand calculated separately based on a projected population of 15,600 and a per-capita demand of 95 gpcd.

**Table 3.13 2030 Projected Water Deliveries (Guidebook Table 7)
2010 Urban Water Management Plan
City of Merced**

| Customer Types | Total | |
|------------------------------------|---------------|---------------|
| | Connections | Volume (AFY) |
| Single Family Residential | 35,080 | 28,003 |
| Multi-Family Residential | 3,029 | 6,510 |
| Commercial/ Institutional | 2,313 | 5,022 |
| Industrial | 66 | 1,058 |
| Landscape Irrigation | 588 | 1,432 |
| UC Merced Community ⁽³⁾ | -- | 2,394 |
| Total | 41,075 | 44,420 |

Notes:

- (1) "Guidebook Table 5" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR.
- (2) Based on a projected population of 137,400 in 2030 (MCAG, 2010). Incorporates water conservation associated with the Water Conservation Bill of 2009.
- (3) UC Merced Community demand calculated separately based on a projected population of 22,500 and a per-capita demand of 95 gpcd.

| Table 3.14 Total Water Use Projections (Guidebook Table 11) 2010 Urban Water Management Plan City of Merced | | | | |
|--|---------------|---------------|---------------|---------------|
| Water Use (AFY) | | | | |
| Water Use | 2015 | 2020 | 2025 | 2030 |
| Single Family Residential | 19,700 | 20,991 | 24,327 | 28,003 |
| Multi-Family Residential | 4,580 | 4,880 | 5,655 | 6,510 |
| Commercial/ Institutional | 3,533 | 3,764 | 4,363 | 5,022 |
| Industrial | 745 | 793 | 919 | 1,058 |
| Landscape Irrigation | 1,008 | 1,074 | 1,244 | 1,432 |
| UC Merced Community | 500 | 1,000 | 1,660 | 2,394 |
| Total⁽⁴⁾ | 30,064 | 32,502 | 38,169 | 44,420 |
| Percent of Year 2010 | 127% | 137% | 161% | 188% |
| 2005 Plan Projections⁽³⁾ | 41,919 | 48,821 | 55,677 | -- |
| <u>Notes:</u> | | | | |
| (1) "Guidebook Table 11" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | |
| (2) Unaccounted-for water is assumed to be 10 percent of the total water production. | | | | |
| (4) Source: City of Merced 2005 UWMP, July 2006. | | | | |
| (5) Incorporates water conservation associated with the Water Conservation Bill of 2009. | | | | |

As shown in Table 3.14, the City's water demands are anticipated to grow from the 2010 water demand of 23,661 AFY to 44,420 AFY, an increase of about 188 percent.

3.4 PLANNED DEVELOPMENT

The UWMPA requires that the UWMP identify the major developments within the agency's service area that would require water supply planning.

Law

10910. (a) Any city or county that determines that a project, as defined in section 10912, is subject to the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) under Section 21080 of the Public Resources Code shall comply with this part.

10912. For the purpose of this part, the following terms have the following meanings:

10912 (a) "Project" means any of the following:

- (1) A proposed residential development of more than 500 dwelling units.
- (2) A proposed shopping center or business establishment employing more than 1,000 persons or having more than 500,000 square feet of floor space.
- (3) A proposed commercial office building employing more than 1,000 persons or having more than 250,000 square feet of floor space.
- (4) A proposed hotel or motel, or both, having more than 500 rooms.
- (5) A proposed industrial, manufacturing or processing plant, or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,000 square feet of floor area.
- (6) A mixed-use project that includes one or more of the projects specified in this subdivision.
- (7) A project that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project.

The City currently has plans for a Wal-Mart Distribution Center, which is planned to be 1.1 million square feet on 230 acres at Gerard/Kibby; approved by City Council in September 2009 and further scheduling is pending current litigation.

3.4.1 Low Income Projected Water Demands

The Merced 2015 General Plan provides information on Regional Housing Needs Allocation Progress (RHNA). This Housing Element of the General Plan update identify the need to construct a total of 459 extremely low income, 459 very low income, and 574 low income housing units between 2006 and 2014.

Assuming the 1,492 dwelling units reflect an average of 3.3 people per dwelling unit per the Draft 2030 General Plan and the projected 2020 per capita water usage of 248 gpcd, the total demands of 2,516 AFY for low income housing water consumption will be realized by 2015.

| | Demand (AFY) | | | | |
|--|--------------|-------|-------|-------|-------|
| | 2015 | 2020 | 2025 | 2030 | 2035 |
| Low Income Housing | 1,368 | 1,368 | 1,368 | 1,368 | 1,368 |
| Notes: | | | | | |
| (1) Based on planned low income housing needs as described in the Draft 2030 General Plan. The Draft 2030 General Plan projects housing needs through 2014. It is assumed that the projection of housing needs through 2014 will be applicable through 2035. | | | | | |

This demand is assumed for all years beyond 2015. The Draft 2030 General Plan does not provide information on single family versus multi-family low income dwelling units, so the average number of people per dwelling unit was assumed to be 3.3.

3.5 WATER USE REDUCTION PLAN

The conservation targets discussed in Section 3.2 will represent a significant effort to reach. In order to calculate the required water conservation, demand projections not incorporating the City’s water conservation targets were prepared. Table 3.16 presents the demand projections without water conservation and provides a comparison with the demand projections incorporating the conservation targets.

| Table 3.16 Total Water Use Projections with Water Conservation 2010 Urban Water Management Plan City of Merced | | | | |
|---|-------------|-------------|-------------|-------------|
| Water Use (AFY) | | | | |
| Demand Projection | 2015 | 2020 | 2025 | 2030 |
| Population | 96,200 | 117,000 | 137,400 | 159,900 |
| Demand Projection without Water Conservation ⁽¹⁾ | 33,405 | 40,628 | 47,711 | 55,524 |
| Demand Projection with Water Conservation | 30,064 | 32,502 | 38,169 | 44,420 |
| Difference | -3,340 | -8,126 | -9,542 | -11,105 |

As will be discussed in Chapter 6, the savings associated with the DMMs, which the City is currently implementing, is not directly quantifiable. Thus, further efforts will need to be made to reach the 2020 water conservation target. Figure 3.1 presents the two sets of demand projections graphically.

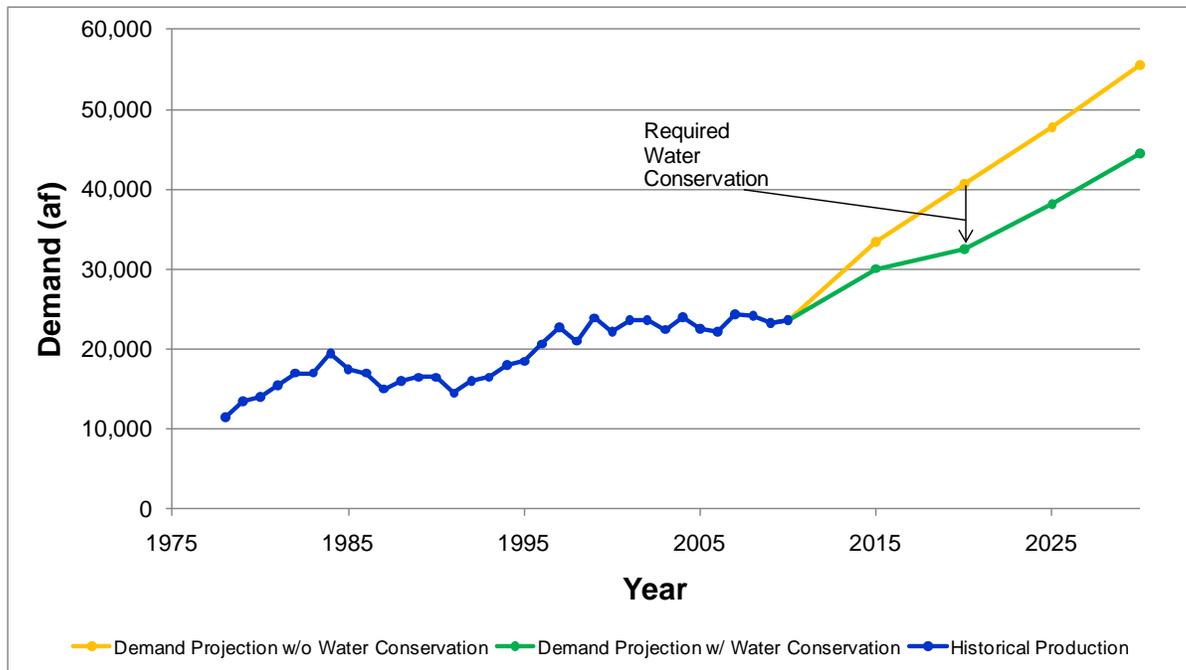


Figure 3.1 Projected Water Demands with and without Conservation

As shown in Figure 3.1, the City does not have a quantifiable water savings associated with its current DMMs. The conservation and non-conservation projections diverge rapidly after 2010, revealing the conservation that the City will need to account for 8,126 AFY of conservation savings by year 2020. The two projections are simply the product of MCAG population estimates combined with conservation (248 gpcd) versus non conservation (310 gpcd) consumption estimates.

To achieve the necessary amount of projected water conservation, the City should prioritize its efforts towards implementing DMM programs to result in large conservation gains. Implementations of residential retrofits may be necessary because of the City's largely residential customer base. Finally, although some of the DMMs the City is currently implementing do not result in as tangible of conservation savings, school, and public education programs will provide much needed support as the City strives to meet its 2020 conservation target.

In addition, the City is in discussions with the Merced Irrigation District (MID) regarding potential surface water transfers or exchanges from MID to the City. The potential transfers or exchanges, which are discussed in further detail in Chapter 4, provide the benefit of reduced groundwater pumping, which could help the City achieve its conservation target.

SYSTEM SUPPLIES

The Urban Water Management Planning Act (UWMPA) requires that the Urban Water Management Plan (UWMP) include a description of the agency's existing and future water supply sources for the next 20 years. The description of water supplies must include detailed information on the groundwater basin such as water rights, determination if the basin is in overdraft, adjudication decree, and other information from the groundwater management plan.

Law

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

10631 (b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a) [to 20 years or as far as data is available]. If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:

10631 (b) (1) A copy of any groundwater management plan adopted by the urban water supplier...

10631 (b) (2) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For those basins for which a court or board has adjudicated the rights to pump groundwater...For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted...

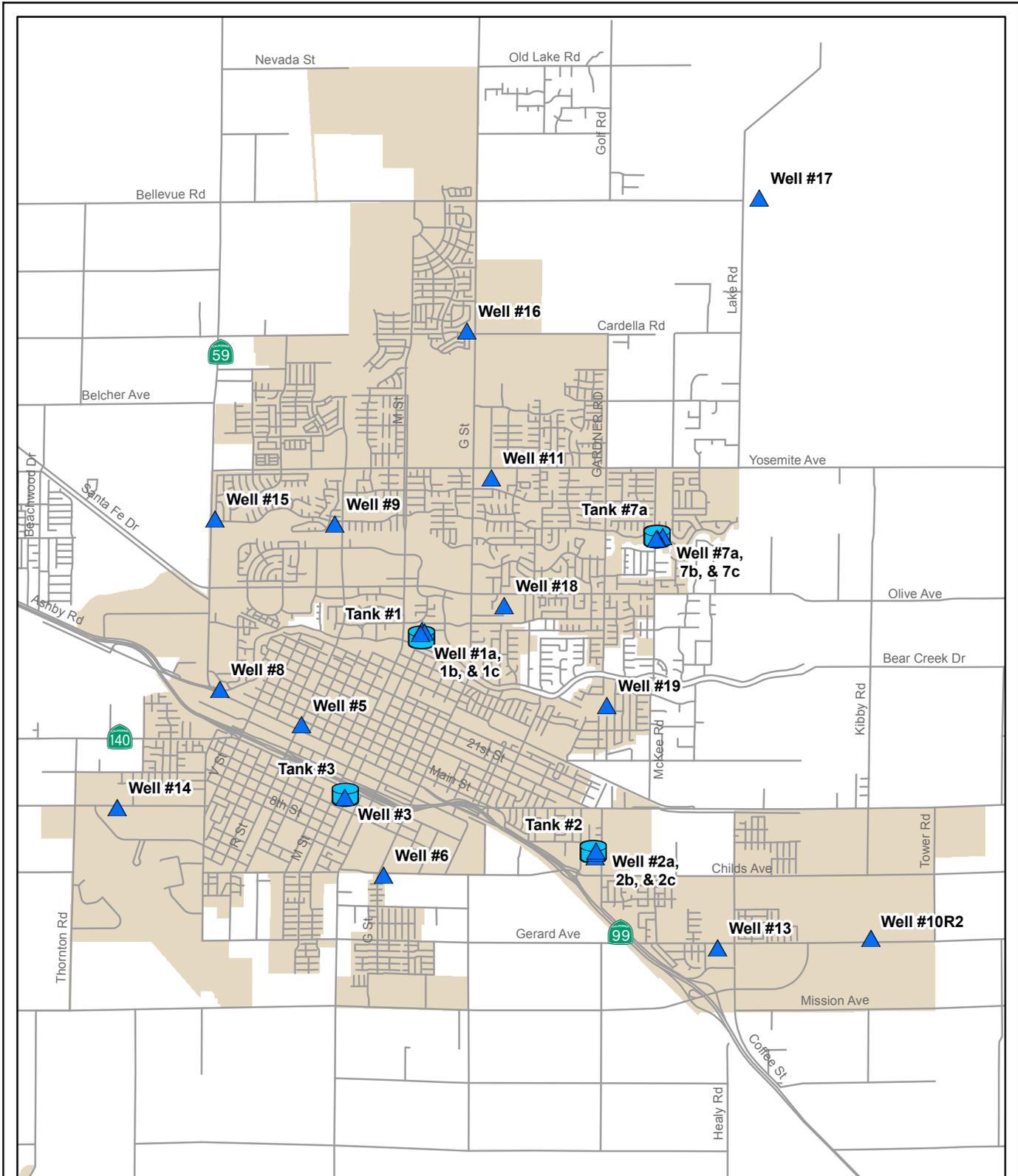
10631 (b) (3) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic records.

10631 (b) (4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonable available, including, but not limited to, historic use records.

4.1 WATER SUPPLY FACILITIES

The City of Merced (City) currently utilizes local groundwater as the sole source of supply to its customers. The City's municipal water system extracts its water supply from underground aquifers via 22 active groundwater wells, with one additional well under construction. The wells are scattered throughout the water service area are shown on Figure 4.1. The pumped water level in the wells generally ranges from 60 to 230 feet¹. The pumping capacities of the City wells range from 1,200 to 4,000 gallons per minute (gpm), as shown on Table 4.1.

¹ Source: City of Merced Draft Water System Master Plan, February 2009.



Legend

-  Groundwater Well
-  Elevated Storage Tank
-  Roads
-  City Limits

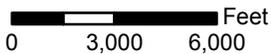


Figure 4.1
Water Supply Facilities
 Urban Water Management Plan
 City of Merced



**Table 4.1 Water Supply Wells
2010 Urban Water Management Plan
City of Merced**

| Pump Station No. | Address | Well No. | Pump Type | Rated Capacity (gpm) |
|-------------------------|-------------------------|-----------------|------------------|-----------------------------|
| 1 | 477 St. Lawrence Dr | 1A | VFD | 2,200 |
| | | 1B | VFD | 2,200 |
| | | 1C | VFD | 2,200 |
| 2 | 1201 S. Parsons Ave | 2A | VFD | 2,200 |
| | | 2B | VFD | 2,200 |
| | | 2C | VFD | 2,500 |
| 3 | 511 W. 12 St | 3C | VFD | 3,000 |
| 5 | 1632 R St | 5B | VFD | 3,000 |
| 6 | 32 E. Childs Ave | 6 | Constant | 1,200 |
| 7 | 3362 McKee Rd | 7A | VFD | 2,500 |
| | | 7B | VFD | 2,500 |
| | | 7C | VFD | 2,800 |
| 8 | 1520 W.N. Bear Creek Dr | 8 | VFD | 2,000 |
| 9 ⁽²⁾ | 3391 R St | 9 | Constant | 1,800 |
| 10 | 4250 E. Gerard Ave | 10R2 | VFD | 3,000 |
| 11 | 346 E. Yosemite Ave | 11 | VFD | 3,000 |
| 13 | 2890 E. Gerard Ave | 13 | VFD | 3,000 |
| 14 | 2110 Wardrobe Ave | 14 | VFD | 4,000 |
| 15 | 1855 Buena Vista Dr | 15 | VFD | 3,500 |
| 16 | 125 Cardella Rd | 16 | VFD | 3,500 |
| 17 | 5010 Lake Rd | 17 | VFD | 2,500 |
| 18 | 420 E. Olive Avenue | 18 | VFD | 3,000 |
| 19 ⁽³⁾ | 2065 Parsons Avenue | 19 | VFD | 3,000 |

| | | | | |
|--------------|--|--|--|---------------|
| Total | | | | 57,800 |
|--------------|--|--|--|---------------|

Notes:

- (1) Source: City of Merced Draft Water System Master Plan (February 2009).
- (2) In the process of being converted from VFD to Constant.
- (3) Currently under construction and not included in the total well capacity.

As noted in the Draft Water System Master Plan (DWSMP), a few of the City wells have water quality issues. Wells 2A and 2B are blended with Well 2C using the onsite elevated tank to produce water within current standards. Well 2C cannot supply water if either Well 2A or Well 2B is offline because Well 2C has historically produced water with arsenic

concentrations in excess of the maximum contaminant level (MCL). According to City staff a plume of methyl-tertiary-butyl-ether (MTBE) is in the shallow groundwater directly over the aquifer of well 5B. Because Wells 7A and 7B have historically produced water with nitrate concentrations in excess of the MCL, their water is blended with Well 7C in the onsite tank before being discharged into the distribution system.

| Table 4.2 Current and Projected Water Supplies (Guidebook Table 16) 2010 Urban Water Management Plan City of Merced | | | | | |
|---|-----------------------------------|---------------|---------------|---------------|---------------|
| Water Supply Sources | Projected Supply (AFY) | | | | |
| | 2010 | 2015 | 2020 | 2025 | 2030 |
| Wholesaler-Supplied Water | - | - | - | - | - |
| Supplier-Produced Groundwater ⁽²⁾ | 23,661 | 30,054 | 32,444 | 38,064 | 44,267 |
| Supplier Surface Diversions | - | - | - | - | - |
| Transfers In ⁽³⁾ | 0 | 10 | 58 | 105 | 153 |
| Exchanges In | - | - | - | - | - |
| Recycled Water | - | - | - | - | - |
| Desalinated Water | - | - | - | - | - |
| Other | - | - | - | - | - |
| Total | 23,661 | 30,064 | 32,502 | 38,169 | 44,420 |
| Notes: | | | | | |
| (1) "Guidebook Table 16" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | | |
| (2) Water supply estimates based on projected water demands. Assumed groundwater supply can be sufficiently increased to meet water demands. Incorporates water conservation associated with Water Conservation Bill of 2009. | | | | | |
| (3) City and MID plan to phase in use of surface water from MID for landscape irrigation. | | | | | |

As shown in Table 4.2, the City anticipates supplying its demands primarily through groundwater pumped by the City's wells. The City anticipates utilizing surface water from Merced Irrigation District (MID) to supply up to 153 acre-feet per year (AFY) of demands associated with landscape irrigation. This is indicated as a transfer in Table 4.2.

4.2 DISTRIBUTION SYSTEM AND STORAGE

The City's water distribution system consists of a single pressure zone with approximately 280 miles of pipelines ranging in size from 4 to 16-inches in diameter. The City currently maintains four elevated storage tanks with a total volume of 1.5 million gallons (MG), as summarized in Table 4.3. Although it is not considered part of the City's distribution system, UC Merced maintains a 250,000 gallon ground level storage tank that receives City water.

Water from this tank is pumped into the UC Merced distribution system, which is not operated by the City.

| Table 4.3 Storage Tank Summary 2010 Urban Water Management Plan City of Merced | | |
|---|--------------------------------|------------------------|
| Tank No. | Address | Volume (MG) |
| 1 | 477 St. Lawrence Street | 0.3 |
| 2 | 1201 S. Parsons Avenue | 0.4 |
| 3 | 511 W. 12 th Street | 0.3 |
| 4 | 3362 McKee Road | 0.5 |
| Total | | 1.5 |
| <u>Notes:</u> | | |
| (1) Source: City of Merced Draft Water System Master Plan, February 2009. | | |

4.3 GROUNDWATER BASIN

The City is located within the geomorphical province known as the Central Valley, which is divided into the Sacramento Valley and the San Joaquin Valley. The groundwater underlying the City is part of the larger San Joaquin Valley Groundwater Basin within the San Joaquin River Hydrologic Region. The San Joaquin Valley Groundwater Basin is further subdivided into nine subbasins, including the Merced subbasin. The City lies entirely within the Merced subbasin (subbasin 5-22.04), as shown on Figure 4.2.

4.3.1 Groundwater Management Plan

Pursuant to the 1993 Groundwater Management Act (AB 3030), the Merced Area Groundwater Pool Interests (MAGPI) entered into a memorandum of understanding (MOU) with the California Department of Water Resources (DWR) to support water management programs. In 1997, MAGPI published a groundwater management plan update (GWMP update) that describes the Merced subbasin's physical characteristics, water quality conditions, and methods to sustain groundwater.

MAGPI recently published an update to the GWMP update in 2008 to incorporate new components and update existing components to address the legislative requirements of SB 1938 and SB 1672. The 2008 GWMP update is included in Appendix C for reference.

4.3.2 Groundwater Basin Description

The Merced subbasin is located in the San Joaquin Valley, which is surrounded on the west by the Coast Ranges, on the south by the San Emigdio and Tehachapi Mountains, on the east by the Sierra Nevada and on the north by the Sacramento-San Joaquin Delta and

Sacramento Valley. The northern portion of the San Joaquin Valley drains toward the Delta by the San Joaquin River and its tributaries, the Fresno, Merced, Tuolumne, and Stanislaus Rivers. The southern portion of the valley is internally drained by the Kings, Kaweah, Tule, and Kern Rivers that flow into the Tulare drainage basin including the beds of the former Tulare, Buena Vista, and Kern Lakes².

The Merced subbasin lies on the eastern side of the San Joaquin Valley, entirely within Merced County and is generally described as the eastern half of Merced County. For the GWMP update, the study area was modified to include lands south of the Merced River between the San Joaquin River on the west and the crystalline basement rock of the Sierra Nevada foothills on the east.

The Merced subbasin boundary on the south stretches westerly along the Madera-Merced County line (Chowchilla River) to the northern boundary of the Sierra Water District, which is followed westerly to the San Joaquin River. Although this modified study area for the GWMP update is about 54 square miles larger than the Merced subbasin as described in DWR Bulletin 118, it is felt to be more consistent with natural hydraulic boundaries surrounding the basin³.

The Merced subbasin is not an adjudicated groundwater basin, as defined by DWR⁴. Therefore, there are no defined legal pumping rights for the City. There are no legal constraints on groundwater pumping. In California, the State is not authorized by the Water Code to manage groundwater. California landowners have a correlative right to extract groundwater for beneficial use. As a municipal water supplier, the City acts on behalf of the overlying landowners, who rescind their water rights to the City when the landowner develops the land.

4.3.3 Groundwater Levels and Historical Trends

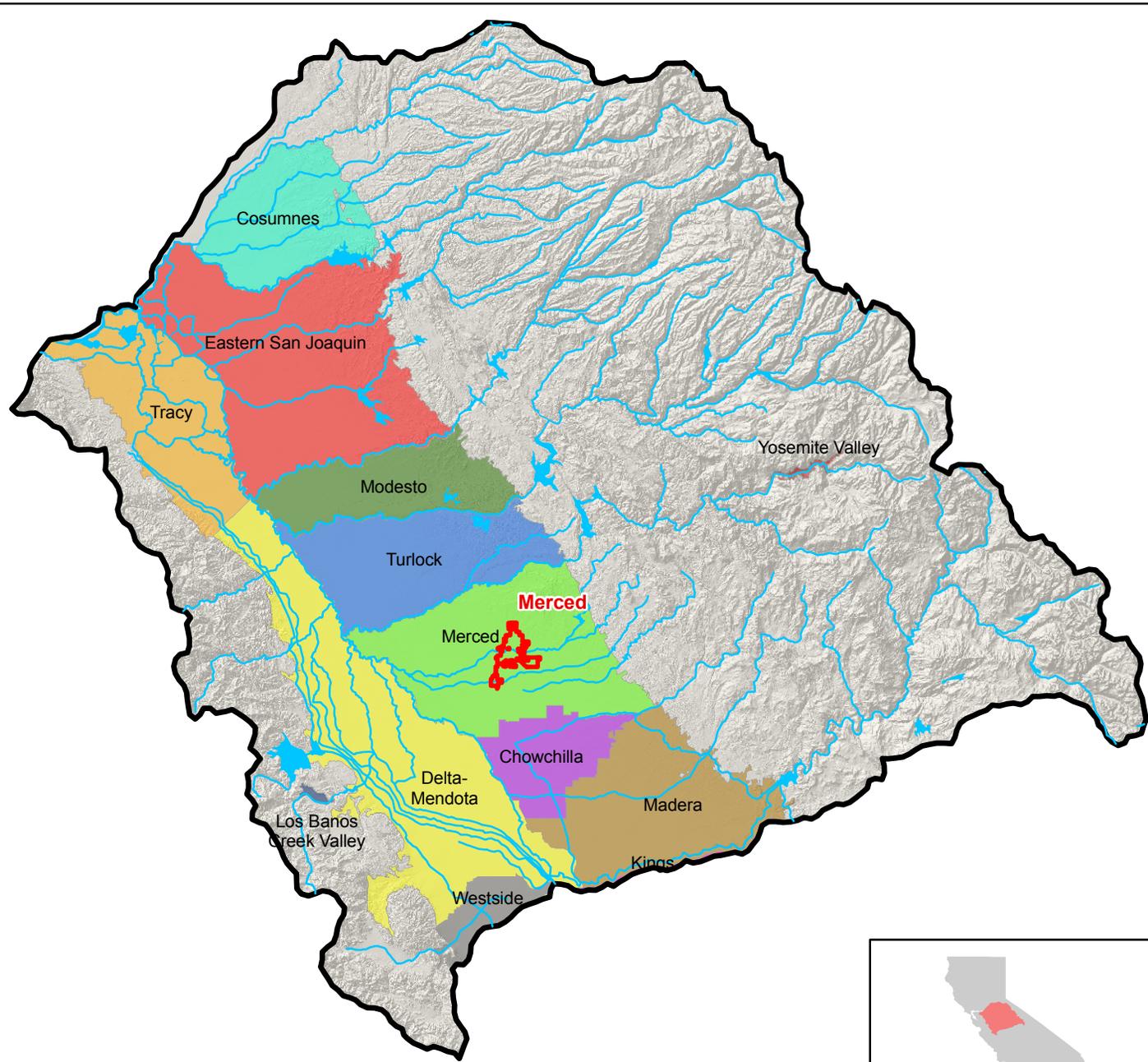
According to the 2008 GWMP update, groundwater elevations in water supply and monitoring wells have been monitored by DWR, MID, and other entities since the 1950s. The municipalities within the Merced subbasin also monitor groundwater levels frequently in their water supply wells. The City monitors water levels in more than 120 monitoring wells on a quarterly basis.

Long-term hydrographs prepared for selected wells in the Merced subbasin show that throughout most of the subbasin, groundwater elevations are declining with time. Since 1980, average groundwater levels beneath the Merced subbasin have declined approximately 14 feet. Most of this decline occurred between 1980 and 1996. The notable exception is beneath the El Nido area, where groundwater levels have shown a substantial

² Source: DWR "California's Groundwater" Bulletin 118, 2003

³ Source: MAGPI Groundwater Management Plan Update, July 2008

⁴ Source: http://www.water.ca.gov/groundwater/gwmanagement/court_adjudications.cfm



- Legend**
- City of Merced
 - San Joaquin River Hydrologic Region
 - Hydrology
- Groundwater Basins**
- San Joaquin Valley (5-22)**
- Eastern San Joaquin (5-22.01)
 - Modesto (5-22.02)
 - Turlock (5-22.03)
 - Merced (5-22.04)
 - Chowchilla (5-22.05)
 - Madera (5-22.06)
 - Delta-Mendota (5-22.07)
 - Kings (5-22.08)
 - Westside (5-22.09)
 - Tracy (5-22.15)
 - Cosumnes (5-22.16)
- Other**
- Yosemite Valley (5-69)
 - Los Banos Creek Valley (5-70)



Figure 4.2
San Joaquin River
Hydrologic Region
 Urban Water Management Plan
 City of Merced



increase since 1980 in response to increased delivery of surface water by MID. More detailed information concerning groundwater trends for specific wells are provided in the 2008 GWMP update (Appendix C).

In 2006, groundwater in the City was at approximately 120 feet above mean sea level (ft-MSL) as shown in Figure 4.3. Figure 4.3 also shows the groundwater elevation in 1999 as a comparison.

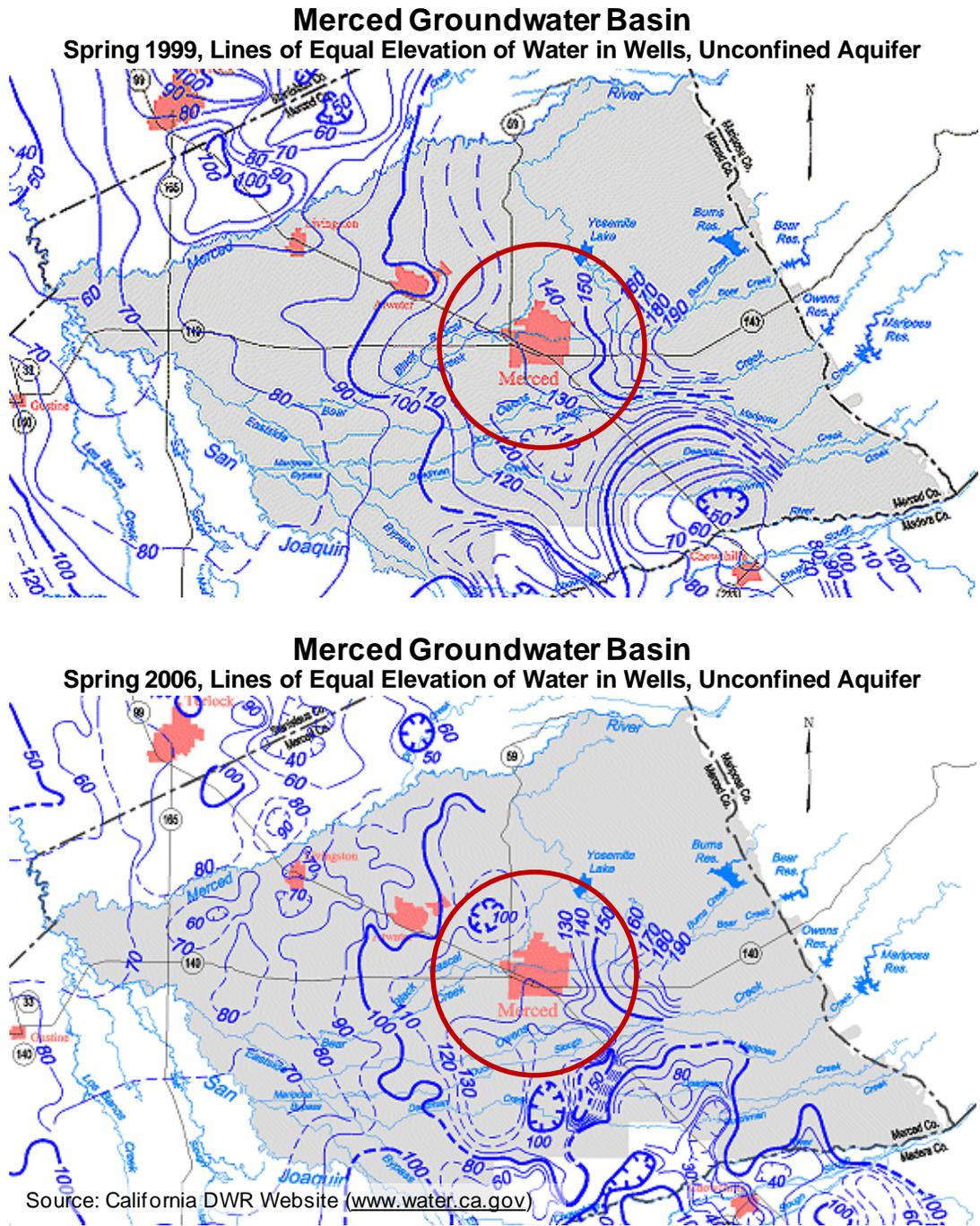


Figure 4.3 Groundwater Elevation Contours - Spring 1999 and 2006

4.3.4 Sources of Recharge and Discharge

According to the 2008 GWMP update, the groundwater elevations relative to the elevations of the major rivers and the interaction of the cones of depression with the rivers suggest that some reaches of the rivers lose water to groundwater while others gain water from groundwater discharge. Comparison of Chowchilla River elevations with groundwater levels indicates that the river is higher than the groundwater. Consequently, the river probably contributes some recharge to groundwater along the reach south of the study area. The pumping depressions near the Chowchilla River do not appear to be affected by the presence of the river.

The groundwater elevation data indicate that there is groundwater discharge along the San Joaquin River. There is a trough in the water table elevations that follow the San Joaquin River. Groundwater inflow to the river and surrounding areas occurs from both sides of the San Joaquin Valley. This river and the surrounding areas are the primary groundwater discharge area for the valley.

On the north side of the Merced subbasin west of State Highway 99, the lower reaches of the Merced River appear to be a groundwater discharge area. East of the highway, the river may be acting as a constant head source and supplying water to the large cone of depression centered approximately 17 miles northwest of Merced, east of Oakdale Road (Township 5 South, Range 12 East, Section 36), the river is higher than the groundwater and probably provides some recharge to the groundwater.

4.3.5 Basin Overdraft

Overdraft is the extraction of groundwater from a basin in excess of the basin's perennial yield. When a groundwater basin is in balance, recharge to the groundwater basin will tend to exceed withdrawals from the basin in wet years, while, in dry years, withdrawals will tend to exceed recharge. "By definition, overdraft is not a measure of these annual fluctuations in groundwater storage volume. Instead, overdraft is a measure of the long-term trend associated with these annual fluctuations." (CH2M HILL, 2001a; DWR, 1998).

DWR's Bulletin 160-98 estimated a 160-thousand acre-foot (taf) increase groundwater overdraft between 1990 and 1995. According to DWR, most of this overdraft increase occurred in the San Joaquin and Tulare Lake regions (DWR, 2003).

Although groundwater has provided the City a reliable water supply for many years, historical rapid growth motivated the City to evaluate its groundwater supply. In 1992, the City and MID entered into an MOU to develop a long-range water resources plan (CH2M HILL, 2001 a). In response, the Merced Water Supply Plan was completed in 1995, which included goals for managing groundwater resources and to provide high quality, reliable supply for cities. In September 2001, the Merced Water Supply Plan Update, Final Status Report, was prepared for the City, MID, and UC Merced (CH2M HILL, 2001 a). The 1995 Merced Water Supply Plan and the 2001 Merced Water Supply Plan Update, Final Status Report identified the factors contributing to groundwater overdraft and recommended

actions to restore the aquifer. These studies also recommended that groundwater elevations be stabilized at the 1999 levels by recharging the groundwater basin with surface water from the Merced River. The City and MID are working cooperatively to implement the water supply plan (City of Merced and MID, 2005).

The declining groundwater basin is a result of the groundwater extraction by all groundwater users in the area. This includes groundwater pumping by other stakeholders including cities, private water companies, private well owners, MID, and by the City. The City anticipates some increase in groundwater use by agricultural users, as well as by the UC Merced Community, which places further demands on the groundwater basin. The groundwater recharge program will determine the location of groundwater recharge facilities, the agency or agencies which will operate and maintain recharge facilities, and cost sharing. Currently, studies are being conducted on a pilot groundwater recharge basin. However, more investigation is needed on the feasibility and effectiveness of utilizing spreading basins or deep aquifer injection wells (City of Merced and MID, 2005). MID has undertaken a strong effort to encourage surface water use by agricultural users (City of Merced, 1997). The City is undertaking projects to convert park irrigation to surface water.

The cooperating agencies of the Merced Water Supply Plan, the City, UC Merced, and MID, have recognized the importance of maintaining sufficient water levels and have agreed on developing a strategy to maintain groundwater levels at 1999 levels, which is approximately 160 feet above mean sea level. Figure 4.3 illustrates Merced subbasin groundwater contour maps from Spring 1999 and Spring 2006 developed by DWR.

As part of the 2001 Merced Water Supply Plan Update, Final Status Report, a groundwater model and a land use model were developed for use in planning. The groundwater model provided simulations of aquifer level changes and the amount of recharge required to stabilize groundwater levels. Development of a new model is needed for implementation level decisions (City of Merced and MID, 2005).

Water conservation measures are currently in place as a result of the overdraft situation in the Merced subbasin. These measures are discussed in more detail in Chapter 6.

4.4 EXISTING AND PROJECTED GROUNDWATER PUMPING

The City's current sole source of supply is groundwater, which is extracted from underground aquifers via 22 active groundwater wells, with one additional well under construction (Figure 4.1). The historical volume of groundwater pumped by the City over the past five years is provided in Table 4.4.

| Table 4.4 Historic Groundwater Pumping (Guidebook Table 18) 2010 Urban Water Management Plan City of Merced | | | | | | |
|--|--------------|---|---------------|---------------|---------------|---------------|
| Basin Name | | Historic Pumping Rates (AFY) | | | | |
| | | 2005 | 2006 | 2007 | 2008 | 2009 |
| San Joaquin Valley ⁽²⁾ | Metered | 11,688 | 10,817 | 11,756 | 12,162 | 11,964 |
| | Unmetered | 10,853 | 11,353 | 12,641 | 12,004 | 11,342 |
| | Total | 22,541 | 22,171 | 24,397 | 24,166 | 23,306 |
| Groundwater as percent of total water supply | | 100% | 100% | 100% | 100% | 100% |
| Notes: | | | | | | |
| (1) "Guidebook Table 18" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | | | |
| (2) The SUDP receives its groundwater from the Merced subbasin of the San Joaquin Valley Groundwater Basin. | | | | | | |

As shown in Table 4.4, the City's water supplies are entirely obtained from the San Joaquin Valley groundwater basin. The projected amount of groundwater anticipated to be pumped through year 2030 is included in Table 4.5. Note that the groundwater anticipated to be pumped does not include water conservation associated with the Water Conservation Act of 2009 discussed in Chapter 3.

| Table 4.5 Projected Groundwater Pumping (Guidebook Table 19) 2010 Urban Water Management Plan City of Merced | | | | | |
|---|--|--|-------------|-------------|-------------|
| Basin Name | | Projected Pumping Rates (AFY) | | | |
| | | 2015 | 2020 | 2025 | 2030 |
| San Joaquin Valley ⁽²⁾ | | 28,967 | 29,836 | 34,966 | 40,097 |
| Groundwater as percent of total water supply | | 99% | 99% | 99% | 99% |
| Notes: | | | | | |
| (1) "Guidebook Table 19" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | | |
| (2) The SUDP receives its groundwater from the Merced Subbasin of the San Joaquin Valley Groundwater Basin. Note that the anticipated amount of water to be pumped from the groundwater basin is based on the demand projections from Chapter 3 and incorporates water conservation associated with SBx7-7. | | | | | |

As shown in Table 4.5, the City anticipates to supply all of its water demands from the San Joaquin Valley groundwater basin through the planning horizon. The percentage decreased

slightly (by about 1 percent) with the planned landscape irrigation with surface water through a transfer of about 200 AFY from MID (as will be discussed in Section 4.5).

4.5 TRANSFER AND EXCHANGE OPPORTUNITIES

The UWMPA requires the UWMP to address the opportunities for development of short or long-term transfer or exchange opportunities.

Law

10631 (d). Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

4.5.1 Transfer Opportunities

During preparation of the 2005 UWMP, the City and Merced Irrigation District (MID) were considering a long-term transfer agreement. Under this scenario, the City would use surface water from the Merced River to irrigate City parks. The City’s dominant water supply source (i.e. groundwater) has sufficient capacity for the 20-year planning horizon. Therefore, the use of surface water is not necessary to augment supply, but rather reduce the demands on the groundwater basin. The transfer was originally planned to start in 2005, but has not been finalized. For the purpose of this report, the deliveries identified in the 2005 UWMP will be followed with a total of 58 AFY anticipated in 2015. The transfer opportunities identified over the 20-year planning horizon are summarized in Table 4.6. MID is currently charging \$1,000 per acre to connect parks and schools to MID canal water.

| Table 4.6 Transfer Opportunities (Guidebook Table 20) 2010 Urban Water Management Plan City of Merced | | | |
|--|-----------------------------|--------------------------------|---------------------|
| Transfer Agency | Transfer or Exchange | Short-Term or Long-Term | Volume (AFY) |
| Merced Irrigation District ⁽²⁾ | Transfer | Long-term | 200 |
| Notes: | | | |
| (1) “Guidebook Table 20” refers to a specific table in the “Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan” by DWR. | | | |
| (2) Source: 2005 UWMP, July 2006. | | | |

4.5.2 Exchange Opportunities

During the preparation of the 2010 UWMP, the City and MID were in early discussions about establishing an updated memorandum of understanding (MOU) for the exchange of tertiary treated wastewater effluent for MID canal water (surface water). The canal water could then be used to irrigate City parks and provide a reduction of the groundwater demands. This 2010 UWMP recommends that the City and MID continue to pursue the update of this MOU.

4.6 DESALINATED WATER OPPORTUNITIES

The UWMPA requires that the UWMP address the opportunities for development of desalinated water, including ocean water, brackish water and groundwater.

Law

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

10631 (i) Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long term supply.

4.6.1 Brackish Water and/or Groundwater Desalination

As summarized in Table 4.7 the groundwater that underlies the City is not brackish in nature and does not require desalination. However, the City could provide financial assistance to other purveyors in exchange for water supplies. Should the need arise; the City may consider this option.

| Table 4.7 Opportunities for Desalinated Water 2010 Urban Water Management Plan City of Merced | |
|--|--|
| Sources of Water | Opportunities for Desalinated Water |
| Ocean Water | None |
| Brackish Ocean Water | None |
| Brackish Groundwater | None |
| Other | None |

4.6.2 Seawater Desalination

Because the City is not located in a coastal area, it is not practical nor economically feasible to implement a seawater desalination program (Table 4.7). However, the City could provide financial assistance to other purveyors in exchange for water supplies. Should the need arise; the City may consider this option.

4.7 RECYCLED WATER OPPORTUNITIES

The UWMPA requires that the UWMP address the opportunities for development of recycled water, including the description of existing recycled water applications, quantities of wastewater currently being treated to recycled water standards, limitations on the use of available recycled water, an estimate of projected recycled water use, the feasibility of said projected uses, and practices to encourage the use of recycled water.

Law

10633. Provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.

The City is the sole agency responsible for the collection, treatment, and disposal of wastewater in the SUDP.

4.7.1 Wastewater Treatment

The City collects, treats, and recycles both municipal and process wastewater. Municipal wastewater is generated from a combination of residential, commercial, and industrial sources. It is collected and treated at the City's wastewater treatment facility (WWTF) and the treated effluent is discharged to Hartley Slough, Food Processing Land Application Area (FPLAA), and a wildlife management wetland for reuse.

Treated effluent from the WWTF is currently discharged to Hartley Slough for agricultural use, and is required to meet the City's National Pollutant Discharge Elimination System (NPDES) permit limitations. Construction is currently underway on the tertiary treatment upgrade of the WWTF, and is slated for completion in 2011. After completion of these improvements, the entire wastewater flow will meet unrestricted reuse standards in accordance with Title 22.

4.7.1.1 Municipal Wastewater Treatment

The City owns, operates, and maintains the wastewater system that serves the community. The sewer system consists of gravity sewers up to 54-inches in diameter, lift stations, and force mains to collect wastewater from residential, industrial, and commercial connections. The wastewater is collected and discharged to trunk sewers and interceptors that convey the wastewater to the City's WWTF for treatment.

The City-owned and operated WWTF is located two miles south of the Merced Regional Airport and provides service to the City and UC Merced Community. Currently, the City generates tertiary treated and disinfected effluent. Secondary treatment is accomplished by conventional activated sludge and the disinfection facilities include chlorination and dechlorination. The WWTF has a current design capacity of 12 mgd.

4.7.1.2 Food Processing Land Application Area

The FPLAA site is owned by the City. This land application provides water for agricultural crops, which are harvested by the City. The FPLAA utilizes recycled industrial wastewater generated in the City.

4.7.2 Municipal Wastewater Generation

A summary of the projected wastewater generation is included in Table 4.8. The quantity of effluent that meets or will meet recycled water standards (Title 22) is also included in this

table based on the assumption that the City's entire wastewater flow will be treated to tertiary treatment standards after tertiary treatment upgrade of the City's WWTF.

| Table 4.8 Wastewater Characteristics (Guidebook Table 21) 2010 Urban Water Management Plan City of Merced | | | | | | |
|--|---------------------------------------|---------------------------|---------------------------|---------------|---------------|---------------------------|
| Type of Wastewater | Volume⁽²⁾ (AFY) | | | | | |
| | 2005 | 2010⁽²⁾ | 2015⁽³⁾ | 2020 | 2025 | 2030⁽³⁾ |
| Collected and treated based on population | 7,047 | 7,422 | 9,470 | 10,978 | 12,866 | 14,754 |
| UC Merced | 157 | 678 | 1,019 | 1,330 | 1,676 | 1,676 |
| Total Collected and treated in SUDP | 7,204 | 8,100 | 10,489 | 12,308 | 14,542 | 16,430 |
| Meets recycled water standards | - | - | 10,489 | 12,308 | 14,542 | 16,430 |
| Notes: | | | | | | |
| (1) "Guidebook Table 21" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | | | |
| (2) With the exception of 2010, wastewater and recycled water volumes based on updated population projections, criteria outlined in 2001 Merced Water Reuse Strategic Plan, and UC Merced projections listed in 2005 UMWP. 2010 values based on historical use data of 8,100 af collected and treated. UC Merced collection and use of 678 af subtracted from the 8,100 to yield remaining collection and treatment for the system (7,422 af). | | | | | | |
| (3) UC Merced growth estimates linear until 2025; assumed to remain constant after 2025. | | | | | | |

The wastewater projections shown in Table 4.9 are based on the population projections from Table 2.3. The 2001 Merced Water Reuse Strategic Plan developed wastewater projections based on a wastewater generation rate of 100 gpcd for populations up to 70,000 and 85 gpcd beyond 70,000 population. Wastewater projections for UC Merced were then added separately (the same totals are shown in Table 4.9). The wastewater flow projections from the 2005 UWMP were updated based on the updated population projections.

As shown in Table 4.9, the City's wastewater flows are anticipated to increase from 8,100 AFY in 2010 to 16,430 AFY in 2030. After the tertiary treatment expansion is brought online all of the City's wastewater is anticipated to meet tertiary treatment standards.

4.7.3 Current Recycled Water Use

Treated effluent from the WWTF is discharged to a gravity channel that conveys the treated effluent to Hartley Slough, the FPLAA site, and a wildlife management area wetland. The primary source of water for Hartley Slough is treated effluent from the WWTF. Water from the slough is subsequently used for agricultural irrigation. Approximately 1.2 mgd (1,344 AFY) of treated effluent is pumped from the gravity channel to an adjacent 380-acre

wildlife management area wetland to create a series of percolation and evaporation ponds. Most of the treated effluent from the WWTF is recycled for irrigation.

While the 2005 UWMP projected 11,875 AFY of recycled water use by 2010, the tertiary treatment expansion has not yet been completed. Consequently, the actual recycled water use consists of the 2,284 AFY of treated effluent discussed above.

| Table 4.9 2005 UWMP Recycled Water Use Comparison (Guidebook Table 24) 2010 Urban Water Management Plan City of Merced | | | |
|--|------------------------|---------------------|---|
| User Type | Treatment Level | Volume (AFY) | |
| | | 2010 Actual | 2005 Projection for 2010⁽²⁾ |
| Agricultural Irrigation | Screening | 331 ⁽³⁾ | 331 |
| | Secondary | 654 | 10,200 |
| Landscape Irrigation | Tertiary | | - |
| Commercial Irrigation | Tertiary | | - |
| Golf Course Irrigation | Tertiary | | - |
| Wildlife Habitat | Secondary | 1,299 | 1,344 |
| Wetlands | Secondary | | - |
| Industrial Reuse | Tertiary | | - |
| Groundwater Recharge | Tertiary | | - |
| Seawater Barrier | Tertiary | | - |
| Geothermal Energy | Tertiary | | - |
| Indirect Potable Reuse | Secondary | | - |
| Total | | 2,284 | 11,875 |
| Notes: | | | |
| (1) "Guidebook Table 24" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | |
| (2) Source: 2005 UWMP, July 2006. | | | |
| (3) Estimated WWTP Landscape Irrigation Use. | | | |

4.7.4 Projected Recycled Water Use

The 2001 Merced Water Reuse Strategic Plan identified reuse alternatives for the WWTF to accommodate future flows based on secondary and tertiary treatment of wastewater. Secondary treatment reuse alternatives included limited agricultural reuse (some crops), discharge to a private wetland or duck club, and continued discharge to the wildlife management area wetland and Hartley Slough. Tertiary treatment reuse alternatives included unlimited agricultural reuse (all crops), urban landscape irrigation (with centralized and satellite treatment), industrial reuse, and discharge to a public access wildlife refuge.

The Stakeholders Advisory Group, consisting of community members representing agriculture, land development, wildlife and environmental, industry, commerce, and wastewater customers, recommended continued discharge of treated effluent to the City's wetland and Hartley Slough and increasing the treatment capacity of the WWTF to 12 mgd. Because the WWTF has had treatment performance and reliability issues since 1995, the selection of this alternative was based on it being the most expeditious to implement as well as the least expensive. Since this alternative provides for essentially 100 percent agricultural reuse and provides an alternative to groundwater pumping, it was also considered of maximum benefit to the environment.

The City recently completed the first of two construction phases (initial secondary and first tertiary expansion) at the WWTF to implement tertiary treatment and increase capacity. This increased the capacity of the WWTF to 12 mgd. In the short term, the treated effluent will continue to be used for agricultural irrigation and discharged to the wildlife management area. With the completion of the tertiary treatment, the effluent will be available for urban landscape irrigation in the future, though there are currently no plans to do so. For the purposes of this report, no recycled water for urban use within the City's service area is assumed for the next 20 years. The future use of recycled water within the City is still being evaluated, and this assumption may change in the future.

Table 4.10 shows the projected future use of recycled water for the planning period. Other future uses of reclaimed water include water exchange with MID, as well as opportunities to incorporate recycled water use on the UC Merced Community. As the UC Merced Community begins to develop, the UC Merced long-range plan is to maximize recycled water generated on-campus. Specifically, the potential uses of recycled water include toilet flushing, cooling tower use, or landscape irrigation.

| Table 4.10 Potential Recycled Use (Guidebook Table 23) 2010 Urban Water Management Plan City of Merced | | | | | | |
|--|--------------------|------------------------|---------------------|---------------|---------------|---------------|
| User Type | Description | Treatment Level | Volume (AFY) | | | |
| | | | 2015 | 2020 | 2025 | 2030 |
| Agricultural Irrigation | City-owned land | Screening | 331 | 331 | 331 | 331 |
| | Hartley Slough | Tertiary | 11,469 | 12,702 | 13,864 | 16,016 |
| Landscape Irrigation ⁽²⁾ | - | - | - | - | - | - |
| Commercial Irrigation | - | - | - | - | - | - |
| Golf Course Irrigation | - | - | - | - | - | - |
| Wildlife Habitat and Wetlands | - | Tertiary | 1,344 | 1,344 | 1,344 | 1,344 |
| Industrial Reuse ⁽²⁾ | - | - | - | - | - | - |
| Groundwater Recharge | - | - | - | - | - | - |
| Seawater Barrier | - | - | - | - | - | - |
| Geothermal Energy | - | - | - | - | - | - |
| Indirect Potable Reuse | - | - | - | - | - | - |
| Total | - | - | 13,144 | 14,377 | 15,539 | 17,691 |
| Notes: | | | | | | |
| (1) "Guidebook Table 23" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | | | |
| (2) The City is exploring opportunities for industrial and parks irrigation using a water exchange with MID | | | | | | |

4.7.5 Optimizing Recycled Water Use

The City supports use of reclaimed water in the service area where economically feasible, though there are no current plans to do so. The City however, has taken steps to promote and expand the use of reclaimed water and promote awareness among City stakeholders. The majority of the potential use of recycled water consists of agricultural demands and

none are planned for urban reuse. The City does not provide or maintain incentives to use reclaimed water as shown in Table 4.11.

| Table 4.11 Methods to Encourage Recycled Water Use (Guidebook Table 25) 2010 Urban Water Management Plan City of Merced | | | | | |
|--|-----------------------------------|-------------|-------------|-------------|-------------|
| Actions | Projected Volume (AFY) | | | | |
| | 2010 | 2015 | 2020 | 2025 | 2030 |
| Financial Incentives | 0 | 0 | 0 | 0 | 0 |
| Other | 0 | 0 | 0 | 0 | 0 |
| Notes: | | | | | |
| (1) "Guidebook Table 25" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | | |

WATER SUPPLY RELIABILITY AND WATER SHORTAGE CONTINGENCY PLANNING

The UWMPA requires that the UWMP address the reliability of the agency's water supplies. This includes supplies that are vulnerable to seasonal or climatic variations. In addition, an analysis must be included to address supply availability in a single dry year and in multiple dry years.

Law

10631 (f) An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions."

10631 (c) (2) For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to replace that source with alternative sources or water demand management measures, to the extent practicable.

5.1 WATER SUPPLY RELIABILITY

There are two aspects of supply reliability that can be considered. The first relates to immediate service needs and is primarily a function of the availability and adequacy of the supply facilities. The second aspect is climate-related, and involves the availability of water during mild or severe drought periods. This chapter considers the City of Merced's (City's) water supply reliability during three water scenarios: normal water year, single dry water year, and multiple dry water years. These scenarios are defined as follows:

- **Normal Year:** The normal year is a year in the historical sequence that most closely represents median runoff levels and patterns. The supply quantities for this condition are derived from historical average yields.
- **Single Dry Year:** This is defined as the year with the minimum useable supply. The supply quantities for this condition are derived from the minimum historical annual yield.
- **Multiple Dry Years:** This is defined as the three consecutive years with the minimum useable supply. Water systems are more vulnerable to these droughts of long duration, because they deplete water storage reserves in local and state reservoirs and in groundwater basins. The supply quantities for this condition are derived from the minimum of historical three-year running average yields.

Historically, the City's water supply has consisted solely of groundwater. However, the City is anticipating use of surface water supplies within the planning period (as discussed in Chapter 4). While it is assumed that surface water supplies from MID would be obtained from the Merced River, flow data for the Merced River from California Department of Water Resources' (DWR) California Data Exchange Center (CDEC) was only available from 1999

through 2010. In order to calculate the basis of hydrologic years, presented in Table 5.1, data was used from the San Joaquin Valley, within which the Merced watershed falls. Data was obtained from DWR's Chronological Reconstructed Sacramento and San Joaquin Valley Water Year Hydrologic Classification Indices 1901 to 1910 (WSIHIST) for the San Joaquin Valley from 1901 through 2010.

| Table 5.1 Basis of Water Year Data 2005 Urban Water Management Plan City of Merced | |
|--|---------------------|
| Water Year Type | Base Year(s) |
| Average Water Year | 1921 |
| Single Dry Water Year | 1977 |
| Multiple Dry Water Years | 1929 - 1931 |
| Notes: Source: DWR Chronological Reconstructed Sacramento and San Joaquin Valley Water Year Hydrologic Classification Indices (WSIHIST) 1901 to 2010. | |

As shown in Table 5.1, the year closest to the average runoff over the period evaluated was 1921. The lowest runoff year was 1977 and the lowest multiple-year period (of three years or greater) was the three year period between 1929 and 1931.

Table 5.2 presents calculations showing the percentage of supply available for the hydrologic years shown in Table 5.1.

| Table 5.2 Supply Reliability – Historical Conditions 2005 Urban Water Management Plan City of Merced | | | | | |
|--|---------------------|------------------------|---------------------------|-------------|-------------|
| Surface Water Source | Average Year | Single Dry Year | Multiple Dry Years | | |
| | (1921) | (1977) | 1929 | 1930 | 1931 |
| San Joaquin Valley Runoff (maf) | 5.90 | 1.05 | 2.84 | 3.25 | 1.66 |
| % of Normal | 100% | 18% | 48% | 55% | 28% |
| Notes: Source: DWR Chronological Reconstructed Sacramento and San Joaquin Valley Water Year Hydrologic Classification Indices (WSIHIST) 1901 to 2010. | | | | | |

As shown in Table 5.2, the anticipated supply available from surface water sources was 18 percent during the single dry year of 1977 and between 28 and 55 percent during the multiple dry year stretch between 1929 and 1931. Note that although the surface water supplies are anticipated to be obtained from the Merced River, the San Joaquin Valley watershed is assumed to be representative of drought conditions in the area. Also, it should be noted that the City is currently fully dependent on groundwater and is projecting to be primarily dependent on groundwater over the planning period. The hydrologic impacts to supply reliability shown in Table 5.1 and Table 5.2 are thus reflective of surface water supplies only. Anticipated supply reliability for each of the City's water sources will be presented for each supply reliability condition (normal, single dry year, and multiple dry year).

During drought years, water use patterns will typically change. Outdoor water use will typically increase as irrigation is used as a replacement for decreased rainfall. To determine the impact of drought years on the City’s annual demands, the City’s historical per capita water usage was evaluated. By normalizing water consumption with population and thus expressing consumption in gpcd, the increase in demands due to growth is eliminated. The historical per capita consumption in the period 1978 through 2009 is shown in Figure 5.1.

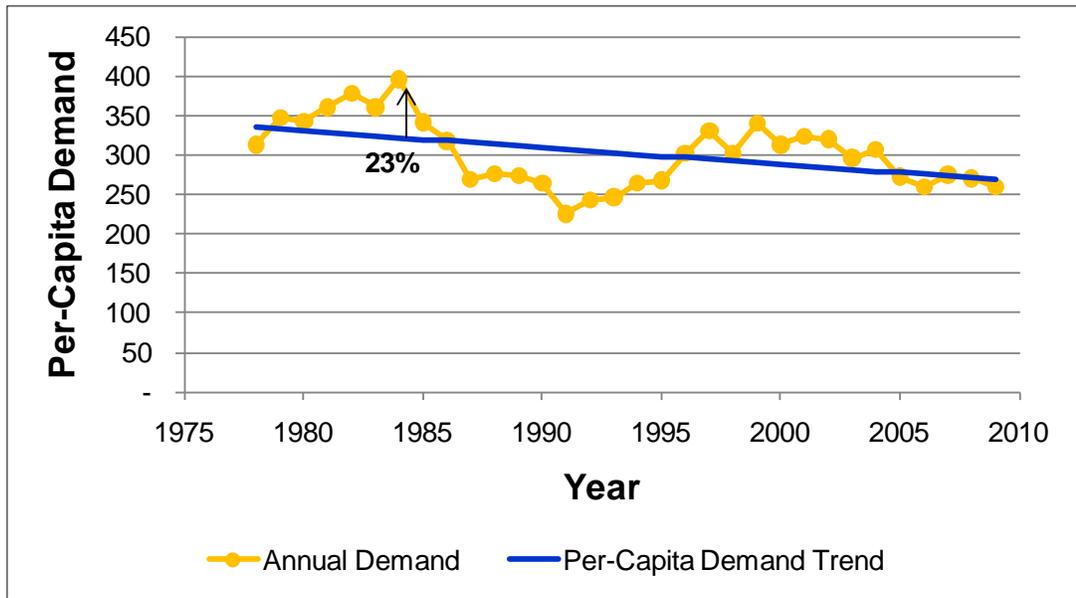


Figure 5.1 Historical Per-Capita Consumption Variation

As shown in Figure 5.1, the per-capita demand has trended downward, likely due to the City’s conservation efforts. To account for this downward trend, a linear fit was used as the average to which the annual consumption was compared. For each year, the annual consumption was compared to the linear regression to obtain a percentage above average water use. As shown, the per capita consumption in 1984 was about 23 percent above the linear trend. While 1984 does not represent a significant drought year, it is indicative of the potential variation in water demands on an annual basis. For conservative planning purposes, the demands will be increased by this percentage for the single-dry hydrologic year.

5.1.1 Projected Normal Water Year Demands

The normal year water demands through 2030 are estimated based on the historical daily use criteria and populations projections for the Specific Urban Development Plan (SUDP) included in the City’s General Plan. A discussion of the derivation of the demands is included in Chapter 3 and the actual demand projections for 2015, 2020, 2025, and 2030 are included in Tables 3.9 through 3.12. The projected normal water year demands are repeated in Table 5.3 for comparison.

| Table 5.3 Normal Year Water Use Projections 2010 Urban Water Management Plan City of Merced | | | | | |
|--|-------------|-------------|-------------|-------------|-------------|
| Water Use (AFY) | | | | | |
| Water Use | 2010 | 2015 | 2020 | 2025 | 2030 |
| Projected Annual Demand ⁽¹⁾ | 23,661 | 30,064 | 32,502 | 38,169 | 44,420 |
| Notes: | | | | | |
| (1) Based on historic demand from Table 3.9 (2010) and demand projections provided in Table 3.10 through 3.13 (2015 through 2030). Incorporates water conservation associated with SBx7-7. | | | | | |

As shown in Table 5.3, the City's demands under normal year conditions are anticipated to increase from 23,661 afy in 2010 to 44,420 afy in 2030. The City's projected supplies under normal year water supply conditions are presented in Table 5.4.

| Table 5.4 Normal Year Water Supply Projections (Guidebook Table 31) 2010 Urban Water Management Plan City of Merced | | | | | |
|--|-------------|-------------|-------------|-------------|-------------|
| Water Supply (AFY) | | | | | |
| Supply Source | 2010 | 2015 | 2020 | 2025 | 2030 |
| Groundwater ⁽²⁾ | 23,661 | 30,064 | 32,502 | 38,169 | 44,420 |
| % of Normal | 100% | 100% | 100% | 100% | 100% |
| Transfers In ⁽³⁾ | 0 | 58 | 105 | 153 | 200 |
| % of Normal | 100% | 100% | 100% | 100% | 100% |
| Supply Total | 23,661 | 30,006 | 32,397 | 38,016 | 44,220 |
| % of Normal | 100% | 100% | 100% | 100% | 100% |
| Notes: | | | | | |
| (1) "Guidebook Table 31" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | | |
| (2) Water supply estimates based on projected water demands. Assumed groundwater supply can be sufficiently increased to meet water demands. | | | | | |
| (3) City and MID plan to phase in use of surface water from MID for landscape irrigation. | | | | | |

As shown in Table 5.4, the City's projected water supplies are primarily through groundwater. Note that only the anticipated quantity of groundwater to be pumped is included as a supply in Table 5.4. Table 5.5 provides a comparison of demands and supplies for each planning year.

| Table 5.5 Normal Year Supply and Demand Comparison (Guidebook Table 32) 2010 Urban Water Management Plan City of Merced | | | | | |
|--|-------------|-------------|-------------|-------------|-------------|
| Water Supply (AFY) | | | | | |
| Supply Source | 2010 | 2015 | 2020 | 2025 | 2030 |
| Supply total | 23,661 | 30,064 | 32,502 | 38,169 | 44,420 |
| Demand total | 23,661 | 30,064 | 32,502 | 38,169 | 44,420 |
| Difference | 0 | 0 | 0 | 0 | 0 |
| Difference as a % of Supply | 0% | 0% | 0% | 0% | 0% |
| Difference as a % of Demand | 0% | 0% | 0% | 0% | 0% |
| Notes: | | | | | |
| (1) "Guidebook Table 32" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | | |
| (2) Water supply estimates based on projected water demands. Assumed groundwater supply can be sufficiently increased to meet water demands. | | | | | |
| (3) City and MID plan to phase in use of surface water from MID for landscape irrigation. | | | | | |

As shown in Table 5.5, since the groundwater supplies in Table 5.4 are based on the anticipated demands, there is no difference between demand and supply for each planning year.

5.1.2 Projected Single Dry Water Year

The single dry year water demands through 2030 are estimated based on the normal year demands, the anticipated demand increase, and the anticipated decrease in supplies. The projected single dry year water demands are presented in Table 5.6.

| Table 5.6 Single Dry Year Water Use Projections 2010 Urban Water Management Plan City of Merced | | | | | |
|--|-------------|-------------|-------------|-------------|-------------|
| Water Use (AFY) | | | | | |
| Water Use | 2010 | 2015 | 2020 | 2025 | 2030 |
| Projected Annual Demand ⁽¹⁾ | 29,110 | 36,988 | 39,987 | 46,959 | 54,649 |
| Notes: | | | | | |
| (1) Based on historic demand from Table 3.3 (2010) and demand projections provided in Table 3.8 (2015 through 2030) increased by 23 percent. | | | | | |

As shown in Table 5.6, the City's demands under single dry year conditions are anticipated to increase from 29,110 afy in 2010 to 54,649 afy in 2030. The City's projected supplies under single dry year water supply conditions are presented in Table 5.7.

| Table 5.7 Single Dry Year Water Supply Projections (Guidebook Table 31) 2010 Urban Water Management Plan City of Merced | | | | | |
|--|---------------------------|-------------|-------------|-------------|-------------|
| Supply Source | Water Supply (AFY) | | | | |
| | 2010 | 2015 | 2020 | 2025 | 2030 |
| Total Required Supply Estimates | 29,110 | 36,988 | 39,987 | 46,959 | 54,649 |
| Surface Water % of Normal | 18% | 18% | 18% | 18% | 18% |
| Surface water (Transfers In ⁽³⁾) | 2 | 10 | 19 | 27 | 36 |
| Balance from Groundwater ^(2,4) | 29,108 | 36,978 | 39,968 | 46,932 | 54,613 |
| Notes: | | | | | |
| (1) "Guidebook Table 31" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | | |
| (2) Water supply based on projected water demands. | | | | | |
| (3) City and MID plan to phase in use of surface water from MID for landscape irrigation. | | | | | |
| (4) Total Required Supply minus surface water input. Assumed groundwater supply can be sufficiently increased to meet water demands. | | | | | |

As shown in Table 5.7, the City's projected water supplies are primarily through groundwater. Note that only the anticipated quantity of groundwater to be pumped is included as a supply in Table 5.7. Table 5.8 provides a comparison of demands and supplies for each planning year.

| Table 5.8 Single Dry Year Supply and Demand Comparison (Guidebook Table 33) 2010 Urban Water Management Plan City of Merced | | | | | |
|--|---------------------------|-------------|-------------|-------------|-------------|
| Supply Source | Water Supply (AFY) | | | | |
| | 2010 | 2015 | 2020 | 2025 | 2030 |
| Supply total | 29,110 | 36,988 | 39,987 | 46,959 | 54,649 |
| Demand total | 29,110 | 36,988 | 39,987 | 46,959 | 54,649 |
| Difference | 0 | 0 | 0 | 0 | 0 |
| Difference as a % of Supply | 0% | 0% | 0% | 0% | 0% |
| Difference as a % of Demand | 0% | 0% | 0% | 0% | 0% |
| Notes: | | | | | |
| (1) "Guidebook Table 33" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | | |
| (2) Water supply estimates based on projected water demands. Assumed groundwater supply can be sufficiently increased to meet water demands. | | | | | |
| (3) City and MID plan to phase in use of surface water from MID for landscape irrigation. | | | | | |

As shown in Table 5.8, since the groundwater supplies in Table 5.7 are based on the anticipated demands, there is no difference between demand and supply for each planning year.

5.1.3 Projected Multiple Dry Water Years

The multiple dry year water demands through 2030 are estimated based on the normal year demands, the anticipated demand increase, and the anticipated decrease in supplies. The projected multiple dry water year demands are presented in Table 5.9.

| Table 5.9 Multiple Dry Year Water Use Projections 2010 Urban Water Management Plan City of Merced | | | | | |
|--|------------------------|-------------|-------------|-------------|-------------|
| Water Use | Water Use (AFY) | | | | |
| | 2010 | 2015 | 2020 | 2025 | 2030 |
| Year 1 | 29,110 | 36,988 | 39,987 | 46,959 | 54,649 |
| Year 2 | 29,110 | 36,988 | 39,987 | 46,959 | 54,649 |
| Year 3 | 29,110 | 36,988 | 39,987 | 46,959 | 54,649 |
| Notes: | | | | | |
| (1) Based on historic demand from Table 3.3 (2010) and demand projections provided in Table 3.8 (2015 through 2030) increased by 23 percent. | | | | | |

As shown in Table 5.9, the City's demands under each of the multiple dry years is anticipated to be similar to the demand increase during single dry year conditions. The City's projected supplies under multiple dry year water supply conditions are presented in Table 5.10 through Table 5.12.

| Table 5.10 Multiple Dry Year Water Supply Projection- Year 1 (Guidebook Table 31) 2010 Urban Water Management Plan City of Merced | | | | | |
|--|---------------------------|-------------|-------------|-------------|-------------|
| Supply Source | Water Supply (AFY) | | | | |
| | 2010 | 2015 | 2020 | 2025 | 2030 |
| Total Required Supply Estimates | 29,110 | 36,988 | 39,987 | 46,959 | 54,649 |
| Surface Water % of Normal | 48% | 48% | 48% | 48% | 48% |
| Surface water (Transfers In ⁽³⁾) | 5 | 28 | 51 | 74 | 96 |
| Balance from Groundwater ^(2,4) | 29,105 | 36,960 | 39,936 | 46,885 | 54,553 |
| Notes: | | | | | |
| (1) "Guidebook Table 31" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | | |
| (2) Water supply based on projected water demands. | | | | | |
| (3) City and MID plan to phase in use of surface water from MID for landscape irrigation. | | | | | |
| (4) Total Required Supply minus surface water input. Assumed groundwater supply can be sufficiently increased to meet water demands. | | | | | |

| Table 5.11 Multiple Dry Year Water Supply Projections Year 2 (Guidebook Table 31) 2010 Urban Water Management Plan City of Merced | | | | | |
|--|-------------|-------------|-------------|-------------|-------------|
| Water Supply (AFY) | | | | | |
| Supply Source | 2010 | 2015 | 2020 | 2025 | 2030 |
| Total Required Supply Estimates | 29,110 | 36,988 | 39,987 | 46,959 | 54,649 |
| Surface Water % of Normal | 55% | 55% | 55% | 55% | 55% |
| Surface water (Transfers In ⁽³⁾) | 6 | 32 | 58 | 84 | 110 |
| Balance from Groundwater ^(2,4) | 29,104 | 36,956 | 39,929 | 46,875 | 54,539 |
| Notes: | | | | | |
| (1) "Guidebook Table 31" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | | |
| (2) Water supply based on projected water demands. | | | | | |
| (3) City and MID plan to phase in use of surface water from MID for landscape irrigation. | | | | | |
| (4) Total Required Supply minus surface water input. Assumed groundwater supply can be sufficiently increased to meet water demands. | | | | | |

| Table 5.12 Multiple Dry Year Water Supply Projections Year 3 (Guidebook Table 31) 2010 Urban Water Management Plan City of Merced | | | | | |
|--|-------------|-------------|-------------|-------------|-------------|
| Water Supply (AFY) | | | | | |
| Supply Source | 2010 | 2015 | 2020 | 2025 | 2030 |
| Total Required Supply Estimates | 29,110 | 36,988 | 39,987 | 46,959 | 54,649 |
| Surface Water % of Normal | 28% | 28% | 28% | 28% | 28% |
| Surface water (Transfers In ⁽³⁾) | 3 | 16 | 30 | 43 | 56 |
| Balance from Groundwater ^(2,4) | 29,107 | 36,972 | 39,957 | 46,916 | 54,593 |
| Notes: | | | | | |
| (1) "Guidebook Table 31" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR. | | | | | |
| (2) Water supply based on projected water demands. | | | | | |
| (3) City and MID plan to phase in use of surface water from MID for landscape irrigation. | | | | | |
| (4) Total Required Supply minus surface water input. Assumed groundwater supply can be sufficiently increased to meet water demands. | | | | | |

As shown in Table 5.10 through Table 5.12, the City’s projected water supplies are primarily through groundwater. Note that only the anticipated quantity of groundwater to be pumped is included as a supply in Table 5.10 through Table 5.12. **Error! Reference source not found.** Table 5.13 provides a comparison of demands and supplies for each planning year.

| Table 5.13 Multiple Dry Year Supply and Demand Comparison (Guidebook Table 33) 2010 Urban Water Management Plan City of Merced | | | | | |
|--|---------------------------|-------------|-------------|-------------|-------------|
| Supply Source | Water Supply (AFY) | | | | |
| | 2010 | 2015 | 2020 | 2025 | 2030 |
| Year 1 - Supply total | 29,110 | 36,988 | 39,987 | 46,959 | 54,649 |
| Year 1 - Demand total | 29,110 | 36,988 | 39,987 | 46,959 | 54,649 |
| Year 2 - Supply total | 29,110 | 36,988 | 39,987 | 46,959 | 54,649 |
| Year 2 - Demand total | 29,110 | 36,988 | 39,987 | 46,959 | 54,649 |
| Year 3 - Supply total | 29,110 | 36,988 | 39,987 | 46,959 | 54,649 |
| Year 3 - Demand total | 29,110 | 36,988 | 39,987 | 46,959 | 54,649 |
| Difference | 0 | 0 | 0 | 0 | 0 |
| Difference as a % of Supply | 0% | 0% | 0% | 0% | 0% |
| Difference as a % of Demand | 0% | 0% | 0% | 0% | 0% |
| Notes: | | | | | |
| (1) “Guidebook Table 33” refers to a specific table in the “Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan” by DWR. | | | | | |
| (2) Water supply estimates based on projected water demands. Assumed groundwater supply can be sufficiently increased to meet water demands. | | | | | |
| (3) City and MID plan to phase in use of surface water from MID for landscape irrigation. | | | | | |

As shown in Table 5.13, since the groundwater supplies in Table 5.9 are based on the anticipated demands, there is no difference between demand and supply for each planning year under years 1, 2, or 3 of the multiple dry year condition.

5.1.4 Factors Affecting Supply Reliability

There are a variety of factors that can impact water supply reliability. Factors impacting the City’s supply sources are indicated with an “X” in Table 5.14. A brief discussion on each of these factors is provided below.

**Table 5.14 Factors Resulting in Inconsistency of Supply (Guidebook Table 29)
2010 Urban Water Management Plan
City of Merced**

| Water Supply Sources | Specific Source Name | Limitation Quantification | Legal | Environmental | Water Quality | Climatic | Additional Information |
|-----------------------------|-----------------------------|----------------------------------|--------------|----------------------|----------------------|-----------------|-------------------------------|
| Groundwater | Merced subbasin | - | - | - | - | - | - |
| Surface Water | MID | - | - | X | - | - | - |

5.1.5 Environmental

Given the fragile state of many of California’s ecosystems, environmental concerns inevitably arise during the water planning process. The delicacy of these systems can, in turn, cause a lack of supply due to the enforcement of environmental legislation. The recent legal actions involving the Endangered Species Act in the Delta are an example of the clash between environmental concerns and water supply. Since the City’s anticipated surface water supplies are planned to be a fairly minimal portion of the City’s overall supply mix, it is anticipated that they can be replaced with groundwater during periods of shortfall.

Of a more significant concern is the overdraft of the groundwater basin. For the purposes of this study, this is considered a long-term issue rather than a supply inconsistency. The Merced Area Groundwater Pool Interests (MAGPI) Groundwater Management Plan (GWMP), included in Appendix C, discusses overdraft and the plans for reduction of overdraft in detail.

5.1.6 Water Quality

The GWMP identifies several groundwater constituents, which lead to groundwater quality concerns in the area. Contaminants in the area include groundwater salinity, nitrate, iron, manganese, arsenic, radio-nucleotides, bacteria, petroleum hydrocarbons, pesticides, trichloroethylene and perchloroethylene. The 2010 Merced Water Quality Report indicates that no substances exceed regulation concentration levels (GMP, 2008).

Salinity levees within the Merced subbasin range from 90 to greater than 1,250 milligrams per liter (mg/L), as measured by total dissolved solids (TDS). Groundwater salinity is generally lowest in the easterly portion of the Merced subbasin and in the adjoining Merced Irrigation District (MID). While the City measures a total of 24.6 ppm in the 2010 Water Quality Report, this falls below the 33 ppm maximum range. While salinity levels are high, it is an unregulated substance.

Another groundwater concern is nitrate levels from man-made sources, which is wide spread through the San Joaquin Valley. While nitrate in irrigation water is not a major

concern for most crops, high concentrations of nitrate in groundwater are primarily a concern for potable water supplies. The MCL for nitrate in public drinking water supplies is 45 mg/L. In their 2010 Water Quality Report, the City indicates finding Nitrate levels of 15.5 ppm in 2008. This is well within a safe range, and should not pose a problem in the near future.

5.1.7 Climatic

Climate change may add many new uncertainties to the challenges of planning, and irrespective of the debate associated with the sources and cause of increasing concentrations of greenhouse gasses, changes in weather could significantly affect water supply planning. Since climatic pressures could potentially affect supply reliability, continual attention to this issue will be necessary in the future.

5.2 WATER QUALITY IMPACTS ON SUPPLY

The UWMPA requires that the UWMP include a discussion of water quality impacts on the reliability of an agency’s water supplies.

Law

10634. The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631 and the manner in which water quality affects management strategies and supply reliability.

As discussed in Section 5.1.6, the City has worked to manage the groundwater water quality issues to avoid inconsistencies in supply. It is anticipated that the City will continue to depend on groundwater as a reliable water supply source and work to mitigate any identified water quality concerns. Through these efforts, water supply changes due to water quality are not expected, as shown in Table 5.15.

| Table 5.15 Current and Projected Water Supply Changes Due to Water Quality (Guidebook Table 39) 2005 Urban Water Management Plan City of Merced | | | | | |
|---|--|-------------|-------------|-------------|-------------|
| Water Source | Anticipated Supply Changes Due to Water Quality (%) | | | | |
| | 2010 | 2015 | 2020 | 2025 | 2030 |
| Surface Water | 0 | 0 | 0 | 0 | 0 |
| Groundwater | 0 | 0 | 0 | 0 | 0 |
| Notes: | | | | | |
| (1) "Guidebook Table 39" refers to a specific table in the "Guidebook to Assist Water Suppliers in the Preparation of a 2010 Urban Water Management Plan" by DWR. | | | | | |

5.3 WATER SHORTAGE CONTINGENCY PLAN

The UWMPA requires that the UWMP include an urban water shortage contingency analysis that addresses specified issues.

Law

10632. The plan shall provide an urban water shortage contingency analysis, which includes each of the following elements, which are within the authority of the urban water supplier:

10632 (a) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply and an outline of specific water supply conditions which are applicable to each stage.

5.3.1 Water Shortage Stages and Reduction Objectives

The City adopted in 1993 a resolution for a program of mandatory prohibitions related to water conservation. The City adopted this ordinance in response to the water shortage emergency associated with the drought of 1987 through 1991. The regulations associated with this ordinance were revised in 2000, but have remained in force due to the overdraft of the Merced subbasin.

Currently, Chapter 15.42 of the City Municipal Code, implemented through Ordinance 1842 (included in Appendix E), comprises the City's water shortage contingency plan. Since the ordinance was a declaration of a water emergency, stages of action are not defined and the water shortage contingency plan is currently active.

| Stage | Description | Conditions | Percent Shortage |
|--------------|---------------------|--|-------------------------|
| 1 | Normal Water Supply | Supplies available to meet demands | 0 |
| 2 | Water Emergency | Major failure of a supply, storage or distribution system [overdraft condition of groundwater basin] | Not Determined |

As shown in Table 5.16, the water shortage stages include two stages. The City is currently in the second stage, Water Emergency.

5.3.2 PROHIBITIONS, CONSUMPTION REDUCTION METHODS, AND PENALTIES

The UWMPA requires that the UWMP include an urban water shortage contingency analysis that addresses methods to reduce consumption.

Law

10632. The plan shall provide an urban water shortage contingency analysis, which includes each of the following elements, which are within the authority of the urban water supplier:

10632 (d) Additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.

10632 (e) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.

10632 (f) Penalties or charges for excessive use, where applicable.

Mandatory Prohibitions on Water Wasting

The City's ordinance prohibits the waste of water through prohibition of the following activities:

- Washing of sidewalks, driveways, and other outdoor surfaces
- Washing of external building or trailer walls
- Non-recirculating fountains
- Use of water from the City's distribution system for non-domestic purposes when another adequate source of water is available
- Waste of water for reasons not stated without reasonable purpose.

The ordinance also includes mandatory conservation measures consisting of prohibitions on non-essential water uses, including replacement of broken plumbing fixtures and sprinklers, limited irrigation hours, and restriction of outdoor irrigation by day of week (based on odd and even street address).

Water Reduction Stage Triggering Mechanisms

The City's water reduction stages are triggered through declaration of a water shortage emergency. The potential reasons for which the City may declare a water shortage emergency include major failure of a supply or distribution system. The City is currently in the emergency stage due to the overdraft condition of groundwater basin.

Excessive Use Penalties

The City's ordinance states that violators of the water conservation prohibitions can be penalized through the following penalties:

- Disconnection from the City's water distribution system
- Installation of a meter at the violator's expense.

For non-essential uses, the City's ordinance outlines that the director may issue a Cease and Desist Order and order the violator to comply with stated provisions or exceptions. If the violation continues after the order, the City may assess a penalty to the violator's account of:

- \$25 for the first violation
- \$50 for the second violation
- \$100 for any subsequent violations

5.3.3 REVENUE AND EXPENDITURE IMPACTS/MEASURES TO OVERCOME IMPACTS

According to the UWMPA, the UWMP is required to include an urban water shortage contingency analysis that addresses the financial impacts from reduced water sales.

Law

10632. The plan shall provide an urban water shortage contingency analysis, which includes each of the following elements, which are within the authority of the urban water supplier:

10632 (g) An analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.

10632 (g) An analysis of the impacts of each of the proposed measures to overcome those revenue and expenditure impacts, such as the development of reserves and rate adjustments.

It is anticipated that water shortages would result in a reduction in revenue. However, the majority of the City's single-family residential accounts consist of unmetered connections. Since the unmetered connections are charged a flat rate, revenue impacts would not result from reduced supplies for unmetered accounts. As planned in the 2005 UWMP, the City plans to determine the extent of any revenue and expenditure imbalance as well as proposed measures to overcome impacts to City revenues and expenditure imbalances at the time the water shortage has started.

5.3.4 ACTIONS DURING A CATASTROPHIC INTERRUPTION

The UWMPA requires that the UWMP include an urban water shortage contingency analysis that addresses a catastrophic interruption of water supplies.

Law

10632. The plan shall provide an urban water shortage contingency analysis, which includes each of the following elements, which are within the authority of the urban water supplier:

10632 (c) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.

The City has a Water System Emergency Response Plan, which prepares for an interruption in the drinking water supply and potential consequences to water system integrity and public health. This plan was prepared in June 2004 and updated in January 2008.

The City's use of groundwater as its primary water source creates redundancy to limit dependence of a geographic area on a single water supply source (i.e., areas are served by multiple groundwater wells). The City maintains redundant power supplies for each of its well sites through the use of emergency power generators. Emergency actions are implemented by the Public Works Department and Utilities Division.

5.3.5 REDUCTION MEASURING MECHANISM

The UWMPA requires that the UWMP include a means to determine the actual water use reduction in the event of a water shortage.

Law

10632. The plan shall provide an urban water shortage contingency analysis, which includes each of the following elements, which are within the authority of the urban water supplier:

10632 (i) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.

The City's water system currently has water meters on all production sources. The City will use the production meters to determine actual water use reductions. The City will monitor City water consumption during a shortage more closely by reviewing water production records on a frequent basis to determine if water use is actually being reduced.

DEMAND MANAGEMENT MEASURES

The Urban Water Management Planning Act (UWMPA) requires that the Urban Water Management Plan (UWMP) demonstrate that sufficient water supplies will be available to meet the next 20 years of projected water demands.

UWMPA:

- 10631 (f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:*
- (1) A description of each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures, including, but not limited to, all of the following:*
- (A) Water survey programs for single-family residential and multifamily residential customers.*
 - (B) Residential plumbing retrofit.*
 - (C) System water audits, leak detection, and repair.*
 - (D) Metering with commodity rates for all new connections and retrofit of existing connections.*
 - (E) Large landscape conservation programs and incentives.*
 - (F) High-efficiency washing machine rebate programs.*
 - (G) Public information programs.*
 - (H) School education programs.*
 - (I) Conservation programs for commercial, industrial, and institutional accounts.*
 - (J) Wholesale agency programs.*
 - (K) Conservation pricing.*
 - (L) Water conservation coordinator.*
 - (M) Water waste prohibitions*
 - (N) Residential ultra-low-flush toilet replacement program*

6.1 WATER DEMAND MANAGEMENT MEASURES

In 1991, a Memorandum of Understanding (MOU) regarding urban water conservation in California formed the California Urban Water Conservation Council (CUWCC). Council members can submit their most recent Best Management Practices (BMP) reports with their UWMP to address the urban water conservation issues in the UWMPA.

However, the City is not currently a signatory of the MOU and is therefore not a member of CUWCC. The City realizes the importance of the BMPs to ensure a reliable future water supply and is committed to implementing water conservation and water recycling programs to maximize sustainability in meeting future water needs for its customers. The City enacted a water conservation ordinance in 1993 and has a continuing water conservation program.

The City's previous Urban Water Management Plan (2005 Plan) provided information regarding the City's conservation measures already in place and those that would improve the efficiency of water use within the City.

The California Department of Water Resources (DWR) has assigned an enhanced terminology to the BMPs. Accordingly; this chapter will refer to them as Demand Management Measures (DMMs). The current implementation status of the City's DMMs is summarized in Table 6.1. As shown, the City has started the implementation of seven DMMs and is planning potential implementation of two more (DMM 5 and 11). Cost effective analysis has been completed for the remaining four DMMs and is included in Appendix F. A detailed description of each DMM and the City's efforts is provided in the following paragraphs.

6.1.1 DMM 1 - WATER SURVEY PROGRAMS

This program consists of offering water audits to single-family and multi-family residential customers. Audits include reviewing water usage history with the customer, identifying leaks inside and outside the home, and recommending improvements.

The City is not currently implementing this BMP. An economic analysis of the cost effectiveness of this DMM is provided in Appendix F.

6.1.2 DMM 2 - RESIDENTIAL PLUMBING RETROFIT

This program consists of installing physical devices to reduce the amount of water used or to limit the amount of water that can be served to the customer. In accordance with State law, low-flow fixtures have been required on all new construction since 1978. In addition, State legislation enacted in 1990 requires all new buildings after January 1, 1992 to install Ultra-Low-Flush Toilets (ULFT).

Several studies suggest that water use savings resulting from miscellaneous interior retrofit fixtures can range between 25 and 65 gpd per housing unit. The studies also suggest that installation of retrofit fixtures in older single-family homes tend to produce more savings, while newer multi-family homes tend to produce fewer saving per housing unit.

The City offers free low-flow shower heads and other types of low flow retrofit kits to customers at public outreach events and at the Finance and Public Works counters upon request. The City is investigating ways to enhance the effectiveness of their existing residential plumbing retrofit program.

| Table 6.1 Demand Management Measures 2010 Urban Water Management Plan City of Merced | | | | |
|---|--------------------|-----------------------------------|--|-----------------------|
| Demand Management Measure | Implemented | Planned for Implementation | Cost Effective Analysis Completed | Not Applicable |
| DMM 1 - Water Survey Programs | | | ✓ | |
| DMM 2 - Residential Plumbing Retrofit | ✓ | | | |
| DMM 3 - Water System Audits | ✓ | | | |
| DMM 4 - Metering with Commodity Rates | ✓ | | | |
| DMM 5 - Landscape Irrigation Programs | | ✓ | | |
| DMM 6 - Washing Machine Rebate Program | | | ✓ | |
| DMM 7 - Public Information Program | ✓ | | | |
| DMM 8 - School Education Program | ✓ | | | |
| DMM 9 - Commercial, Industrial, and Institutional Conservation Programs | | | ✓ | |
| DMM 10 - Wholesale Agency Programs | | | | ✓ |
| DMM 11 - Conservation Pricing | | ✓ | | |
| DMM 12 - Water Conservation Coordinator | ✓ | | | |
| DMM 13 - Water Waste Prohibition | ✓ | | | |
| DMM 14 - Ultra Low Flush Toilet Replacement | | | ✓ | |

6.1.3 DMM 3 - SYSTEM WATER AUDITS, LEAK DETECTION, AND REPAIR

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 usage on a system-wide basis.

The City's program involves leak detection and repair, focusing primarily on areas with a high probability for leakage. The program does not involve an annual system-wide audit at

this time and the City has no knowledge of when the last system-wide water audit was conducted.

The water distribution system consists of approximately 280 miles of pipe. The City repairs approximately 100 leaks per year, although this number was as high as 800 leaks per year while the City transitioned from polybutylene service lines to copper. Since the 2005 UWMP, the City has completed a program to replace all polybutylene service connections with copper connections. As part of the replacement program, pipelines nearby to the failing polybutylene service connections were also surveyed and repaired as needed.

Leaks are repaired in a timely manner, whether they are service line or main-line leaks. The City's distribution system also contains some sand-cast water mains which City operations staff plan for replacement in coordination with street upgrades. As the City is not fully metered, a system-wide audit has not yet been performed.

6.1.4 DMM 4 - METERING WITH COMMODITY RATES

This DMM requires that water meters be installed for all new connections to allow billing by volume of use. This program also applies to retrofitting any existing unmetered connections.

Since 1992, the City has required meters on all new service connections. Almost all multi-family residential dwelling units are metered as well as all public parks.

Most of the City's unmetered connections are to single family residential (SFR) homes. Since the 2005 UWMP, the City has increased the number of metered single-family residential connections from 5,108, or about 31 percent of all SFR meters, to 6,799, or about 39 percent of all SFR meters.

At the time of the 2005 UWMP, the City was evaluating two options for retrofitting existing unmetered connections. The first option was a program to replace all unmetered connections and the second was an ordinance to require retrofit upon title transfer.

6.1.5 DMM 5 - LARGE LANDSCAPE CONSERVATION PROGRAMS

This program consists of assigning reference evapotranspiration (ET_o) -based water budgets to accounts with dedicated irrigation meters and providing water-use audits to accounts with mixed-use meters. The City is currently working on an irrigation control system that considers weather and ET_o conditions to reduce water consumption for large landscaped areas such as parks and landscaped medians.

6.1.6 DMM 6 - HIGH-EFFICIENCY WASHING MACHINE REBATE PROGRAM

This program provides financial incentives, typically in the form of rebate offers, to qualifying customers who install high-efficiency washing machines in their homes.

Merced Irrigation District (MID), within whose service area the City's service area falls, operates a high efficiency washing machine rebate program for their electricity customers. The program offers a \$75 rebate for purchase of an energy saving clothes washing machine or dishwasher. While the program is a part of MID's energy conservation rebate program, MID estimates the washing machines provide a water conservations savings of 40 percent when compared to conventional clothes washing machines.

In addition, PG&E offers a similar rebate to its customers in the area. The program offers a \$50 rebate for purchasing a high efficiency clothes washer, and up to \$125 on qualifying clothes washers. All clothes washers much meet specific PG&E efficiency requirements.

While clothes washer rebates are available through other local utility providers, the City is not currently implementing this BMP. An economic analysis of the cost effectiveness of this DMM is provided in Appendix F.

6.1.7 DMM 7 - PUBLIC INFORMATION PROGRAMS

This program consists of distributing information to the public through a variety of methods including brochures included with utility bills, press releases via radio and newspaper, school curriculum, educational flyers, commercials on television and in theatres, water conservation suggestions and videos on its webpage, and providing economical water conservation kits. The City also staffs a water conservation booth with their water conservation specialist for many public events.

The City has committed to its public information program as an ongoing effort. However, it is not possible to directly quantify the associated water conservation savings.

6.1.8 DMM 8 - SCHOOL EDUCATION PROGRAM

This DMM requires water suppliers to implement a school education program that includes providing educational materials and instructional assistance.

The City's school education program consists of speaking engagements at the City's grade schools and presence at Career Days at local middle schools, high schools, and colleges. As discussed in DMM 7, the City also supplies local schools and colleges with materials illustrating water conservation tips and techniques.

The City has committed to its public information program as an ongoing effort. However, it is not possible to directly quantify the associated water conservation savings.

6.1.9 DMM 9 - CONSERVATION PROGRAMS FOR CII ACCOUNTS

This program typically consists of ultra low flush toilet (ULFT) replacements in commercial, institutional, and industrial (CII) facilities and either surveys of water use for CII accounts or performance targets for CII accounts. Additional CII related conservation programs may involve turf fields, smart irrigation timers, and industrial process water use reductions.

The City is not currently implementing this BMP. An economic analysis of the cost effectiveness of this DMM is provided in Appendix F.

6.1.10 DMM 10 - WHOLESALE AGENCY PROGRAMS

This DMM applies to wholesale agencies and defines a wholesaler's role in terms of financial, technical, and programmatic assistance to its retail agencies implementing DMMs.

The City is not a wholesale agency, so this DMM does not apply.

6.1.11 DMM 11 - CONSERVATION PRICING

While the City implements commodity metering for all commercial, industrial, and multi-family customers, the City's rate structure does not currently implement a tiered rate structure. The City plans to consider a tiered rate structure during its upcoming rate study.

6.1.12 DMM 12 - WATER CONSERVATION COORDINATOR

The City currently employs a Water Conservation Specialist who serves as the City's Conservation Coordinator. This position is responsible for coordinating water conservation activities as well as issuing informational handouts, notices, and citations to customers for violating the City's water conservation ordinances.

6.1.13 DMM 13 - WATER WASTE PROHIBITION

The City implemented Ordinance 1842 on January 18, 1993, which prohibited the waste of water through prohibition of the following activities:

- Washing of sidewalks, driveways, and other outdoor surfaces
- Washing of external building or trailer walls
- Non-recirculating fountains
- Use of water from the City's distribution system for non-domestic purposes when another adequate source of water is available

The ordinance also includes mandatory conservation measures, including replacement of broken plumbing fixtures and sprinklers, limited irrigation hours, and restriction of outdoor irrigation by day of week (based on odd and even street address).

The ordinance also included a prohibition on waste of water for reasons not stated without reasonable purpose.

Violators of the water conservation prohibitions can be penalized through disconnection or metering at the violator's expense. Further details on prohibitions and penalties are explored in Chapter 5.

The waste water prohibition is an ongoing effort. However, it is not possible to directly quantify the associated water conservation savings.

6.1.14 DMM 14 - RESIDENTIAL ULTRA-LOW-FLUSH TOILET REPLACEMENT PROGRAMS

This program provides incentives or ordinances requiring the replacement of existing toilets with ULFTs. State legislation requires the installation of efficient plumbing in new construction and, effective in 1994, requires that only ultra low flow toilets (ULFTs) be sold in California.

The City is not currently implementing this BMP. An economic analysis of the cost effectiveness of this DMM is provided in Appendix F.

This appendix contains the adopting resolution for the 2010 UWMP.

CITY OF MERCED

"Gateway to Yosemite"



CITY CLERK'S CERTIFICATE

I, JOHN M. BRAMBLE, City Clerk of the City of Merced, California, do hereby certify that the attached document, entitled:

RESOLUTION 2011-41

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MERCED, CALIFORNIA, APPROVING AND ADOPTING THE 2010 URBAN WATER MANAGEMENT PLAN FOR THE CITY OF MERCED.

is a true and correct copy of the original on file in the Office of the Merced City Clerk, Merced, California.

DATED: June 21, 2011

JOHN M. BRAMBLE, CITY CLERK



BY:

A handwritten signature in blue ink, which appears to read "Jamie Fanconi", is written over a horizontal line.

JAMIE FANCONI
Deputy City Clerk

RESOLUTION NO. 2011- 41

**A RESOLUTION OF THE CITY COUNCIL OF
THE CITY OF MERCED, CALIFORNIA,
APPROVING AND ADOPTING THE 2010 URBAN
WATER MANAGEMENT PLAN FOR THE CITY
OF MERCED**

WHEREAS, The California State Legislature has authorized the City of Merced and other qualifying local public entities to develop a groundwater management plan pursuant to Water Code Section 10750, *et seq.*; and,

WHEREAS, Pursuant to the Urban Water Management Planning Act, the City Council of the City of Merced has authorized development of the 2010 Urban Water Management Plan for the City of Merced; and,

WHEREAS, Staff has developed the 2010 Urban Water Management Plan for the City of Merced; and,

WHEREAS, Notice of the public hearing on whether or not the City Council of the City of Merced should adopt the 2010 Urban Water Management Plan was duly published, the matter was presented for public hearing at the time, date and place set forth in the notice, all persons desiring to be heard were permitted to present their views orally and in writing to the City Council, and all such comments were duly considered by the City Council.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF MERCED DOES HEREBY RESOLVE, DETERMINE, FIND, AND ORDER AS FOLLOWS:

SECTION 1. The City Council of the City of Merced hereby adopts the 2010 Urban Water Management Plan for the City of Merced as presented and on file with the City Clerk, and implements the 2010 Urban Water Management Program presented therein.

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PASSED AND ADOPTED by the City Council of the City of Merced at a regular meeting held on the 20th day of June 2011, by the following vote:

AYES: Council Members: CARLISLE, PEDROZO, RAWLING, GABRIAUET-ACOSTA, BLAKE, LOR, SPRIGGS

NOES: Council Members: NONE

ABSENT: Council Members: NONE

ABSTAIN: Council Members: NONE

APPROVED:



Mayor

ATTEST:
JOHN M. BRAMBLE, CITY CLERK

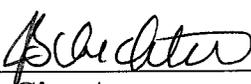
BY: 

Assistant/Deputy City Clerk

(SEAL)



APPROVED AS TO FORM:



City Attorney 6/6/11
Date

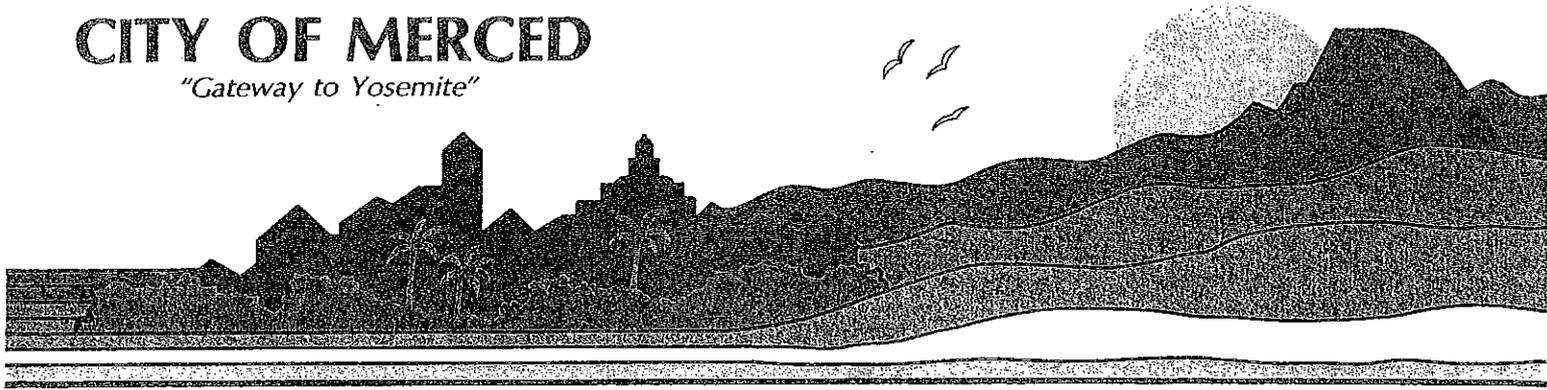
This appendix contains information regarding the notification of public hearing and public review. This information includes:

Formal Notification Letters

Notice of Public Hearing

CITY OF MERCED

"Gateway to Yosemite"



April 19, 2011

Merced Irrigation District
P.O. Box 2288
Merced, CA 95344

Attention: Mr. John Sweigard

Subject: **Notice of Preparation of the 2010 City of Merced Urban Water Management Plan (UWMP)**

Dear Mr. Sweigard:

This letter is intended to notify your agency that the City of Merced is in the process of preparing the 2010 Urban Water Management Plan (UWMP). The City expects to have a draft document available for review in the first week of May 2011 and conduct a public workshop at 6:00 p.m. on May 25, 2011, at the Civic Center in the Sam Pipes Room, 678 West 18th Street, Merced, CA. Comments can be submitted prior to or at the public hearing (intent to adopt) for the 2010 UWMP which will take place on June 20, 2011.

Pursuant to the requirements of the California Water Code, Division 6, Part 2.6, Section 10621 (b), every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days prior to the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.

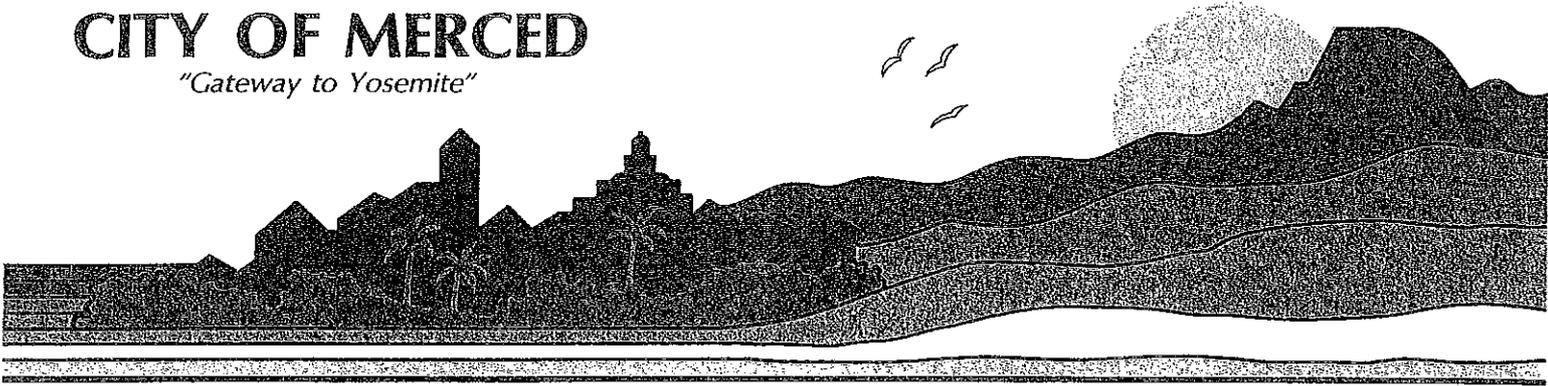
The UWMP, last updated in 2005, promotes management measures, water conservation programs and policies to maintain an adequate water supply for future beneficial uses. For more information about the UWMP, please contact us at (209) 385-6800.

Sincerely,

Michael Wegley
Public Works Director - Water Resources
and Reclamation

CITY OF MERCED

"Gateway to Yosemite"



April 19, 2011

Merced Irrigation District
P.O. Box 2288
Merced, CA 95344

Attention: Mr. Hicham Eltal

Subject: **Notice of Preparation of the 2010 City of Merced Urban Water Management Plan (UWMP)**

Dear Mr. Eltal:

This letter is intended to notify your agency that the City of Merced is in the process of preparing the 2010 Urban Water Management Plan (UWMP). The City expects to have a draft document available for review in the first week of May 2011 and conduct a public workshop at 6:00 p.m. on May 25, 2011, at the Civic Center in the Sam Pipes Room, 678 West 18th Street, Merced, CA. Comments can be submitted prior to or at the public hearing (intent to adopt) for the 2010 UWMP which will take place on June 20, 2011.

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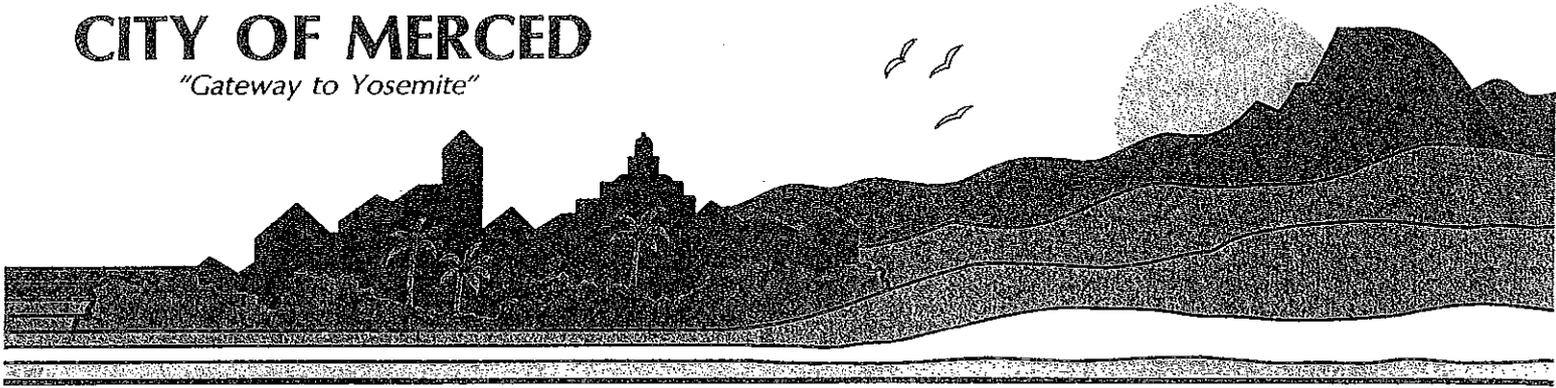
The UWMP, last updated in 2005, promotes management measures, water conservation programs and policies to maintain an adequate water supply for future beneficial uses. For more information about the UWMP, please contact us at (209) 385-6800.

Sincerely,

Michael Wegley
Public Works Director - Water Resources
and Reclamation

CITY OF MERCED

"Gateway to Yosemite"



April 19, 2011

Office of Environment, Health and Safety
University of California, Merced
5200 North Lake Road
Merced, CA 93103

Attention: Mr. Kevin Creed

Subject: **Notice of Preparation of the 2010 City of Merced Urban Water Management Plan (UWMP)**

Dear Mr. Creed:

This letter is intended to notify your agency that the City of Merced is in the process of preparing the 2010 Urban Water Management Plan (UWMP). The City expects to have a draft document available for review in the first week of May 2011 and conduct a public workshop at 6:00 p.m. on May 25, 2011, at the Civic Center in the Sam Pipes Room, 678 West 18th Street, Merced, CA. Comments can be submitted prior to or at the public hearing (intent to adopt) for the 2010 UWMP which will take place on June 20, 2011.

Pursuant to the requirements of the California Water Code, Division 6, Part 2.6, Section 10621 (b), every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days prior to the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.

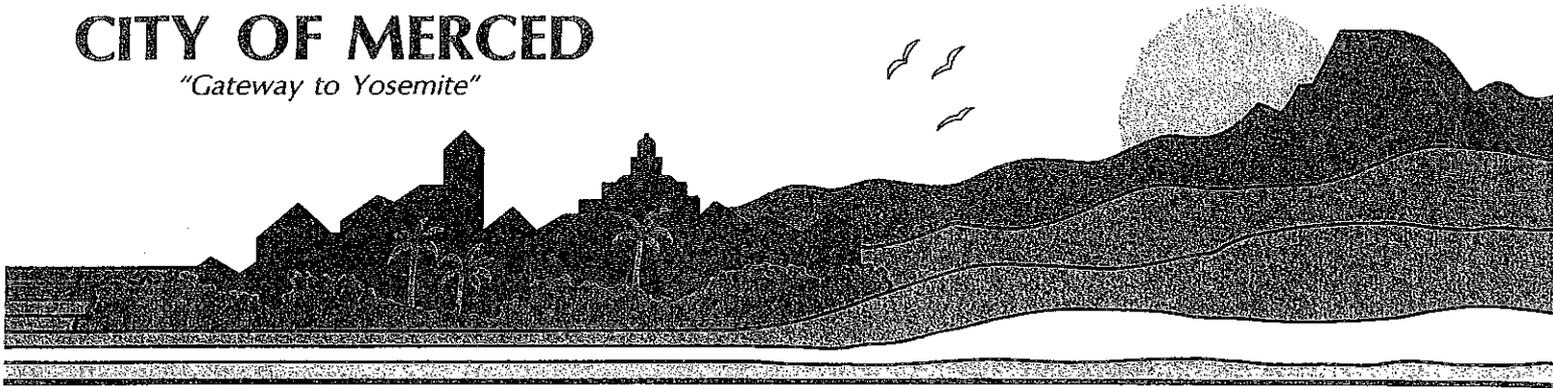
The UWMP, last updated in 2005, promotes management measures, water conservation programs and policies to maintain an adequate water supply for future beneficial uses. For more information about the UWMP, please contact us at (209) 385-6800.

Sincerely,

Michael Wegley
Public Works Director - Water Resources
and Reclamation

CITY OF MERCED

"Gateway to Yosemite"



April 19, 2011

Merced County Association of Governments
369 West 18th Street
Merced, CA 95340

Attention: Mr. Jesse Brown

Subject: **Notice of Preparation of the 2010 City of Merced Urban Water Management Plan (UWMP)**

Dear Mr. Brown:

This letter is intended to notify your agency that the City of Merced is in the process of preparing the 2010 Urban Water Management Plan (UWMP). The City expects to have a draft document available for review in the first week of May 2011 and conduct a public workshop at 6:00 p.m. on May 25, 2011, at the Civic Center in the Sam Pipes Room, 678 West 18th Street, Merced, CA. Comments can be submitted prior to or at the public hearing (intent to adopt) for the 2010 UWMP which will take place on June 20, 2011.

Pursuant to the requirements of the California Water Code, Division 6, Part 2.6, Section 10621 (b), every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days prior to the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.

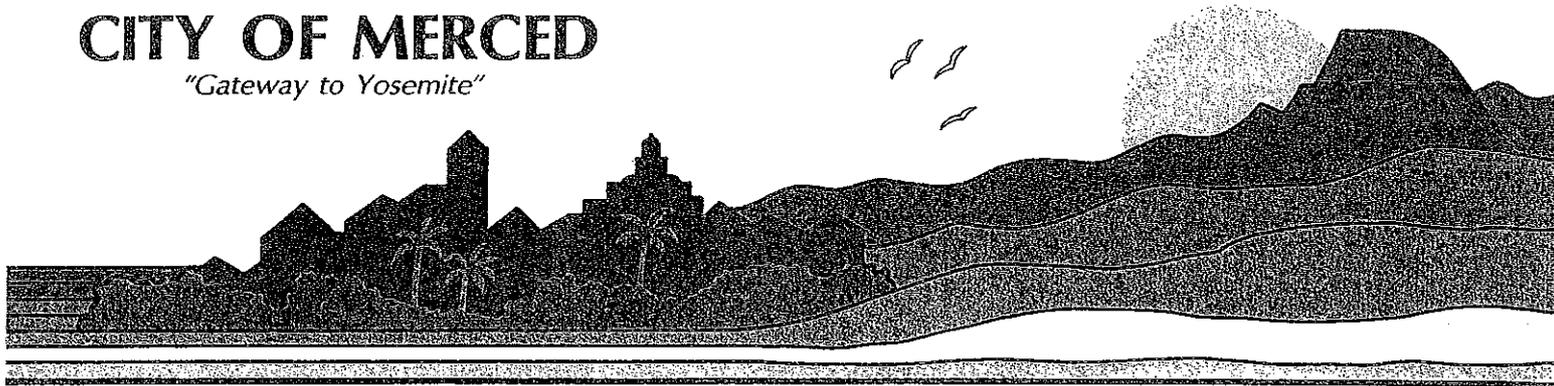
The UWMP, last updated in 2005, promotes management measures, water conservation programs and policies to maintain an adequate water supply for future beneficial uses. For more information about the UWMP, please contact us at (209) 385-6800.

Sincerely,

Michael Wegley
Public Works Director - Water Resources
and Reclamation

CITY OF MERCED

"Gateway to Yosemite"



April 19, 2011

Merced County
715 Martin Luther King Jr. Way
Merced, CA 95341

Attention: Mr. Paul Fillebrown

Subject: **Notice of Preparation of the 2010 City of Merced Urban Water Management Plan (UWMP)**

Dear Mr. Fillebrown:

This letter is intended to notify your agency that the City of Merced is in the process of preparing the 2010 Urban Water Management Plan (UWMP). The City expects to have a draft document available for review in the first week of May 2011 and conduct a public workshop at 6:00 p.m. on May 25, 2011, at the Civic Center in the Sam Pipes Room, 678 West 18th Street, Merced, CA. Comments can be submitted prior to or at the public hearing (intent to adopt) for the 2010 UWMP which will take place on June 20, 2011.

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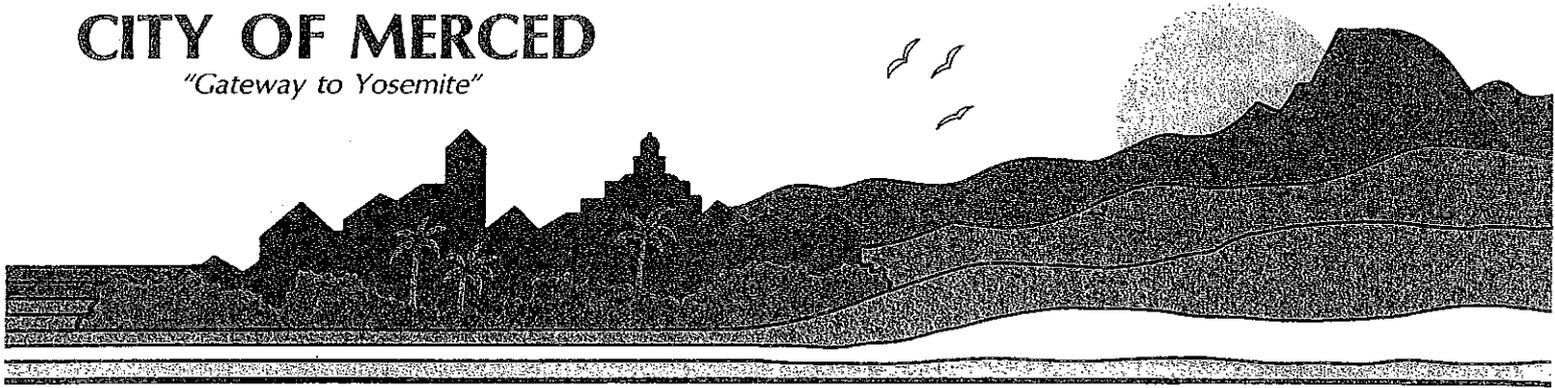
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Sincerely,

Michael Wegley
Public Works Director - Water Resources
and Reclamation

CITY OF MERCED

"Gateway to Yosemite"



April 19, 2011

Merced City School District
444 West 23rd Street
Merced, CA 95340

Attention: Ms. RoseMary Parga Duran, Ed.D.

Subject: **Notice of Preparation of the 2010 City of Merced Urban Water Management Plan (UWMP)**

Dear Ms. Duran:

This letter is intended to notify your agency that the City of Merced is in the process of preparing the 2010 Urban Water Management Plan (UWMP). The City expects to have a draft document available for review in the first week of May 2011 and conduct a public workshop at 6:00 p.m. on May 25, 2011, at the Civic Center in the Sam Pipes Room, 678 West 18th Street, Merced, CA. Comments can be submitted prior to or at the public hearing (intent to adopt) for the 2010 UWMP which will take place on June 20, 2011.

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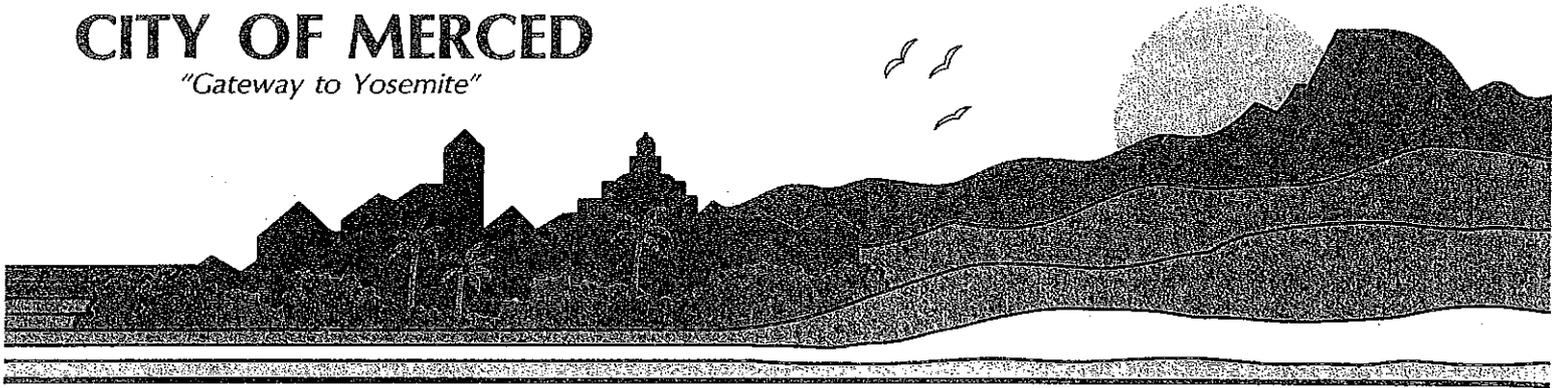
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Sincerely,

Michael Wegley
Public Works Director - Water Resources
and Reclamation

CITY OF MERCED

"Gateway to Yosemite"



April 19, 2011

Merced Union High School District
P.O. Box 2147
Merced, CA 95344-0147

Attention: Mr. Scott Scambray

Subject: **Notice of Preparation of the 2010 City of Merced Urban Water Management Plan (UWMP)**

Dear Mr. Scambray:

This letter is intended to notify your agency that the City of Merced is in the process of preparing the 2010 Urban Water Management Plan (UWMP). The City expects to have a draft document available for review in the first week of May 2011 and conduct a public workshop at 6:00 p.m. on May 25, 2011, at the Civic Center in the Sam Pipes Room, 678 West 18th Street, Merced, CA. Comments can be submitted prior to or at the public hearing (intent to adopt) for the 2010 UWMP which will take place on June 20, 2011.

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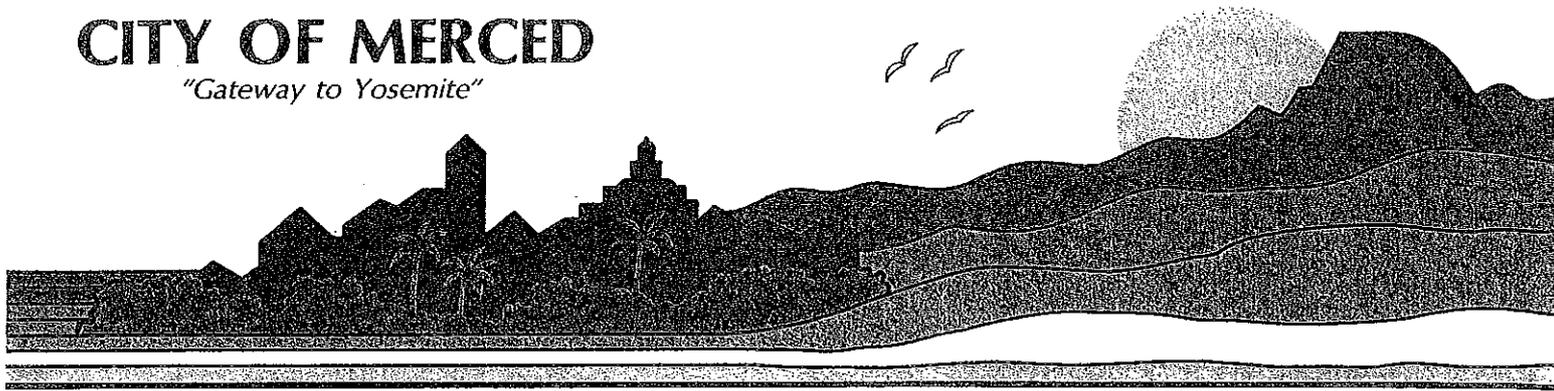
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Sincerely,

Michael Wegley
Public Works Director - Water Resources
and Reclamation

CITY OF MERCED

"Gateway to Yosemite"



April 19, 2011

Weaver Union School District
3076 E. Childs Avenue
Merced, California 95341

Attention: Mr. John Curry

Subject: **Notice of Preparation of the 2010 City of Merced Urban Water Management Plan (UWMP)**

Dear Mr. Curry:

This letter is intended to notify your agency that the City of Merced is in the process of preparing the 2010 Urban Water Management Plan (UWMP). The City expects to have a draft document available for review in the first week of May 2011 and conduct a public workshop at 6:00 p.m. on May 25, 2011, at the Civic Center in the Sam Pipes Room, 678 West 18th Street, Merced, CA. Comments can be submitted prior to or at the public hearing (intent to adopt) for the 2010 UWMP which will take place on June 20, 2011.

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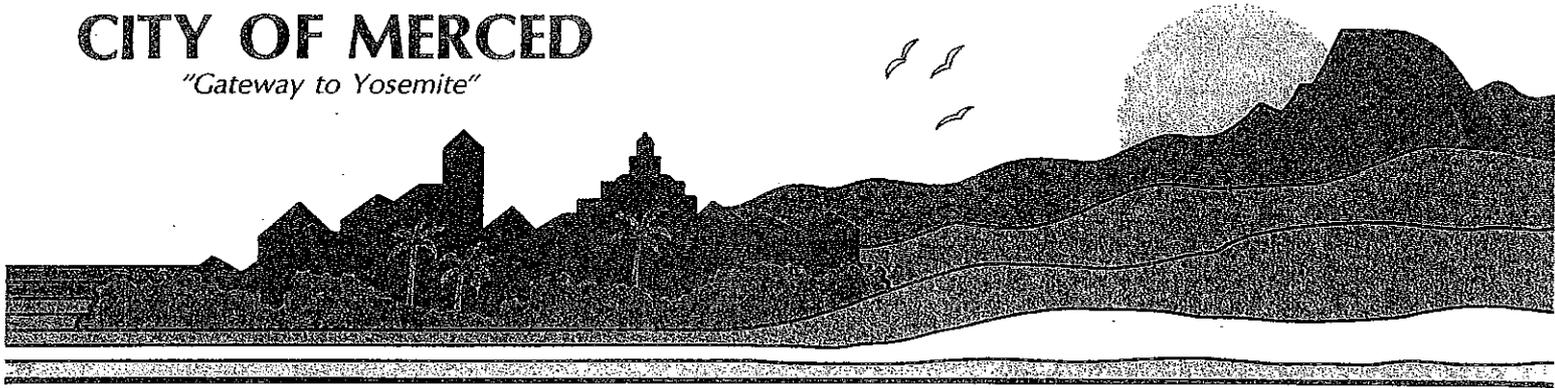
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Sincerely,

Michael Wegley
Public Works Director - Water Resources
and Reclamation

CITY OF MERCED

"Gateway to Yosemite"



April 19, 2011

Merced College
3600 M Street
Merced, California 95348

Attention: Mr. Ben Duran

Subject: **Notice of Preparation of the 2010 City of Merced Urban Water Management Plan (UWMP)**

Dear Mr. Duran:

This letter is intended to notify your agency that the City of Merced is in the process of preparing the 2010 Urban Water Management Plan (UWMP). The City expects to have a draft document available for review in the first week of May 2011 and conduct a public workshop at 6:00 p.m. on May 25, 2011, at the Civic Center in the Sam Pipes Room, 678 West 18th Street, Merced, CA. Comments can be submitted prior to or at the public hearing (intent to adopt) for the 2010 UWMP which will take place on June 20, 2011.

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Sincerely,

Michael Wegley
Public Works Director - Water Resources
and Reclamation

**CITY OF MERCED
NOTICE OF PUBLIC HEARING ON URBAN WATER MANAGEMENT PLAN
UPDATE**

NOTICE IS HEREBY GIVEN THAT PURSUANT TO THE PROVISIONS OF Section 10621 of the Water Code, the City of Merced has prepared its Urban Water Management Plan and the City intends to adopt said Plan as a result of said preparation.

That said Plan and the proposed changes and amendments are available for public inspection at the office of the Engineering Department, Second Floor, City Hall located at 678 West 18th Street, Merced, California. Loaner copies of the Plan are also available for checkout at the City office. In addition, copies of the Plan are available for public inspection at the following public libraries:

Merced County Library, 2100 O Street, Merced, CA 95340

NOTICE IS FURTHER GIVEN that a public hearing will be held on the proposed Plan at a meeting of the City Council to be held on the Twentieth day of June at the hour of 7:00 p.m .at the City Council Chambers.

Upon completion of said public hearing, the Plan will be adopted as prepared or as modified.

This notice shall be published once a week for two successive weeks in the Merced Sun-Star.

Dated: City of Merced by/ Dana Davidson, Deputy City Clerk

PROOF OF PUBLICATION

(2015.5 C.C.P)

Proof of Publication of

STATE OF CALIFORNIA)

)ss.

)

COUNTY OF MERCED

I am a citizen of the United States and a resident of the county aforesaid; I am over the age of eighteen years, and not a party to or interested in the above-entitled matter. I am the printer foreman or principal clerk of The Merced County Times, a newspaper of general circulation, printed and published in the City of Merced, County of Merced, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Merced, State of California, under the date of December 14, 1999, Case Number 143600; that the notice, of which the annexed is a printed copy has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

NOTICE OF PUBLIC WORKSHOP

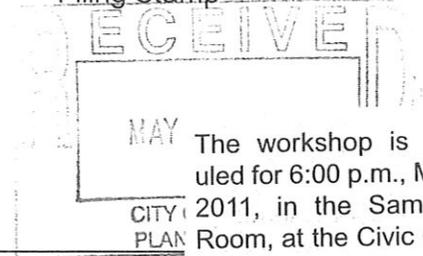
May 12, 19, 2011

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Kathy Dwy
Date: May 19, 2011

This space is for the County Clerk's

Filing Stamp



Copy of notice here

The workshop is scheduled for 6:00 p.m., May 25, 2011, in the Sam Pipes Room, at the Civic Center, located at 678 W. 18th Street, Merced, CA.

The Final Draft Plan and the proposed changes and amendments are available for public inspection at the office of the Engineering Department, Second Floor, City Hall located at 678 West 18th Street, and the Public Works Department, 1776 Grogan Avenue, Merced, California. In addition, the plan can be viewed and printed from the City's website: www.cityofmerced.org. The public review period is scheduled from May 9, 2011 to June 20, 2011.

Legal #4897

**CITY OF MERCED
NOTICE OF PUBLIC
WORKSHOP ON URBAN
WATER MANAGEMENT
PLAN UPDATE**

NOTICE IS HEREBY GIVEN THAT PURSUANT TO THE PROVISIONS OF Section 10621 of the Water Code, the City of Merced has prepared its Final Draft Urban Water Management Plan and the City intends to hold a public workshop as a result of said preparation. The workshop will provide an opportunity for the City's customers, residents, and employees to learn and ask questions about the current and future water supply of the City.

NOTICE IS FURTHER GIVEN that a public hearing will be held on the proposed Plan at a meeting of the City Council to be held on the Twentieth day of June at the hour of 7:00 p.m .at the City Council Chambers.

Upon completion of said public hearing, the Plan will be adopted as prepared or as modified.

This notice shall be published once a week for two successive weeks in the Merced County Times.

Dated: May 9, 2011
City of Merced by/Jamie Fanconi, Deputy City Clerk
Publish Dates: 5-12, 19, 2011

Commitment to Distribute the 2010 Urban Water Management Plan

The documentation currently included in this appendix satisfies California Water Code parts 10621(b) and 10642.

Two other sections of the California Water Code specify UWMP documentation that must take place after the submission of the supplier's UWMP to the DWR. These parts are as follows:

- Part 10644(a), requiring documentation that within 30 days of submitting the UWMP to DWR, the adopted UWMP has been or will be submitted to the California State Library and any city or county to which the supplier provides water.
- Part 10645, requiring documentation that the supplier will make the UWMP available for public review no later than 30 days after submission to DWR.

In order to satisfy these requirements, the City will perform the following actions:

- The City will submit its 2010 UWMP to the California DWR on **July 15, 2011**.
- The City will send a printed copy of its 2010 UWMP to the California State Library, and an electronic and/or printed copy of its 2010 UWMP to the cities and counties within which it provides water. The City will do this no later than **August 5, 2011** (30 days from filing with the DWR).
- The City will make their 2010 UWMP available for public review no later than **August 5, 2011** (30 days from filing with the DWR).

GROUNDWATER BASIN INFORMATION

This Appendix contains information about the groundwater basin underlying the City's service area. This information includes:

California Department of Water Resources Bulletin 118 for the Merced Subbasin (5-22.04)

Merced Area Groundwater Pool Interests 2008 Groundwater Management Plan



**MERCED GROUNDWATER BASIN
GROUNDWATER MANAGEMENT
PLAN UPDATE
MERCED COUNTY, CA**

Submitted to:

Merced Area Groundwater Pool Interests, Merced, CA

Submitted by:

AMEC Geomatrix, Inc., Fresno, CA



**MERCED GROUNDWATER BASIN
GROUNDWATER MANAGEMENT
PLAN UPDATE
MERCED COUNTY, CA**

Submitted to:

Merced Area Groundwater Pool Interests, Merced, CA

Submitted by:

AMEC Geomatrix, Inc., Fresno, CA

July 29, 2008

Project No. 13651.001

AMEC Geomatrix



**MERCED GROUNDWATER BASIN
GROUNDWATER MANAGEMENT
PLAN UPDATE**
Merced County, CA

July 29, 2008
Project 13651.001

This report was prepared by the staff of AMEC Geomatrix, Inc., under the supervision of the Engineer(s) and/or Geologist(s) whose seal(s) and signature(s) appear hereon.

The findings, recommendations, specifications, or professional opinions are presented within the limits described by the client, in accordance with generally accepted professional engineering and geologic practice. No warranty is expressed or implied.

A handwritten signature in black ink that reads "David M. Bean".

David M. Bean, PG, CHg
Principal Hydrogeologist

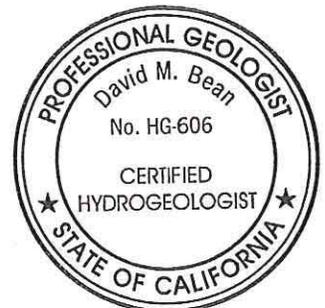


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List of Acronyms

| | |
|-------------|--|
| °C | temperature degrees Celsius |
| °F | temperature degrees Fahrenheit |
| 1,2 DCA | 1,2-dichloroethane |
| 1,2,3-TCP | 1,2,3-trichloropropane |
| AB | California Assembly Bill |
| ac-ft | acre-feet |
| ac-ft/d | acre-feet per day |
| ac-ft/y | acre-feet per year |
| bgs | below ground surface |
| BMO | Basin Management Objective |
| <i>BShs</i> | Koppen climate classification - Mediterranean Steppe |
| <i>Csa</i> | Koppen climate classification - Hot Mediterranean |
| CWC | California Water Code |
| DBCP | dibromochloropropane |
| DOHS | Department of Health Services |
| DPH | California Department of Public Health |
| DTSC | California Department of Toxic Substances Control |
| DWR | California Department of Water Resources |
| EDB | ethylene dibromide |
| EPA | United States Environmental Protection Agency |
| et. Seq. | and subsequent (Latin) |
| GMO | genetically modified organism |
| gpm | gallon per minute |
| GWMP | Groundwater Management Plan |
| IGSM | Integrated surface water / groundwater model |
| IWRIS | integrated water resources information system database |
| JPA | Joint Powers Authority |
| MAGPI | Merced Area Groundwater Pool Interests |
| MCDEH | Merced County Division of Environmental Health |
| MCL | maximum contaminant level |
| mg/L | milligrams per liter (also part per million) |
| MGWB | Merced Groundwater Basin |
| MID | Merced Irrigation District |
| MOU | Memorandum of Understanding |
| MTBE | methyl-tertiary-butyl-ether |
| PCE | perchloroethylene |
| ppm | parts per million |
| RWQCB | California Regional Water Quality Control Board |
| SB | California Senate Bill |
| SPI | Standardized Precipitation Index |
| SWRCB | California State Water Resources Control Board |
| TCE | trichloroethylene |
| TDS | total dissolved solids |
| TWG | Technical Working Group |
| UC Merced | University of California - Merced Campus |
| µg/L | micrograms per liter (also parts per billion) |
| USDA | United States Department of Agriculture |
| USGS | United States Geological Survey |

List of Acronyms (continued)

| | |
|-----|-----------------------------|
| UST | underground storage tank |
| VOC | volatile organic compound |
| WPA | wellhead protection area |
| WWP | wellhead protection program |



**MERCED GROUNDWATER BASIN
GROUNDWATER MANAGEMENT PLAN**
Merced Area Groundwater Pool Interests
Merced County, California

1.0 INTRODUCTION

The Groundwater Management Act, California Water Code (CWC) Section 10753 et. seq., originally enacted as Assembly Bill (AB) 3030, was passed by the State legislature during the 1992 session and became law on January 1, 1993. AB 3030 identifies groundwater as a valuable resource that should be managed to ensure both its safe production and its quality. It also encourages local agencies to work cooperatively to manage groundwater resources within their jurisdiction.

Groundwater management encompasses the planned and coordinated monitoring, operation, and administration of a groundwater basin or portion of a groundwater basin with the goal of long-term sustainability of the resource (DWR, 2003). Groundwater management includes a number of integrated actions, both natural processes and managed activities, which relate to groundwater recharge and discharge. Those actions include a range of options to increase water supply reliability to achieve the long-term sustainability of groundwater resources. A groundwater management plan (GWMP) provides the framework to implement a groundwater management strategy for an area, basin, or a portion of a groundwater basin. In this case, the GWMP addresses the Merced Groundwater Basin (MGWB) which is located in the eastern half of Merced County, California (Figure 1).

1.1 PURPOSE OF THE GROUNDWATER MANAGEMENT PLAN

The purpose of the GWMP is to identify and implement a number of actions using modern technology and sound science to preserve and/or increase the quantity of groundwater resources in the MGWB to ensure adequate groundwater resources for future generations. The GWMP is a living document; progress in implementing the plan will be periodically reviewed with the current understanding of groundwater levels, quality, and trends. The GWMP is a guideline for the community to use for sustainable development of groundwater resources. It is intended to be consistent with Federal, State, and County regulations; however it is not intended to replace or ensure compliance with local General Plans or the California Environmental Quality Act. The burden of proving proposed project compatibilities with applicable plans and regulations is fully borne by the lead agencies.

1.2 PREVIOUS GROUNDWATER MANAGEMENT PLAN

The Merced Irrigation District (MID) and the City of Merced prepared a final draft GWMP in 1997 to comply with legislative requirements of AB 3030. In December 1997, water purveyors within the MGWB signed a Memorandum of Understanding (MOU) creating an association identified as the Merced Area Groundwater Pool Interests (MAGPI) (Appendix A). MAGPI adopted the GWMP in December 1997. The 1997 GWMP served as the initial framework for management of groundwater resources within the MGWB.

In 2002, State Senate Bills (SB) 1938 (Groundwater Management Planning Act of 2002) and SB 1672 (Integrated Regional Water Management Planning Act of 2002) were signed into law. These bills required various changes and additions to existing basin-wide groundwater management plans. The most significant changes were the adoption of an integrated approach to basin-wide groundwater management, the development of management objectives, and a basin-wide monitoring program by stakeholders. The California Department of Water Resources (DWR) outlined the new requirements of SB 1938 in Appendix C of the 2003 update to Bulletin 118 "California's Groundwater" and suggested additional components that should be included in a GWMP.

1.3 GROUNDWATER MANAGEMENT PLAN UPDATE

This document supersedes the 1997 GWMP and incorporates new components and updates existing components to address the legislative requirements of SB 1938 and SB 1672. This update incorporates data collected since 1997 and reflects analyses performed subsequent to preparation of the 1997 GWMP. In addition, the components suggested in Bulletin 118 have been added and the existing AB 3030 components were also updated to reflect: 1) expansion of the number of MAGPI members (i.e., Lone Tree Mutual Water Company), 2) revised characterization and understanding of the basin hydrogeology, 3) the addition of new monitoring data, 4) new or revised groundwater monitoring procedures, 5) changes to the basin management objectives, and 6) changes in groundwater management practices and philosophy.

The lead agencies for this GWMP update are the City of Merced and MID on behalf of MAGPI. The GWMP has been prepared with assistance from a Technical Working Group (TWG) consisting of members of MAGPI (Stevenson Water Company, Meadowbrook Water Company, the City of Merced, MID, Winton Water & Sanitation District, Le Grand-Athlone Water District, and Merced County Department of Health Services [DOHS]), non-MAGPI agencies (East Merced Resource Conservation District, DWR, San Joaquin Raptor Rescue Center), consulting engineers and hydrogeologists (Davids Engineering and AMEC Geomatrix, Inc.), and members of the general public.

A summary of the components of a GWMP required by applicable legislation (AB 3030, SB 1938, and SB 1672) and suggested in Bulletin 118 is included in Table 1. As shown, the GWMP addresses these items:

- the twelve required components of AB 3030 that describe technical issues that should be addressed in the GWMP to manage the basin optimally and protect against adverse conditions;
- the seven components of SB 1938 that are required for agencies to be eligible for funds administered by DWR for construction of groundwater projects;
- the five required components of SB 1672 that promote integrated regional groundwater management; and
- the seven voluntary components of Bulletin 118 that link Basin Management Objectives (BMOs) to specific actions within the GWMP.

These items are addressed throughout this GWMP. The GWMP consists of the following sections:

Section 1 Introduction – This section describes the legislative framework for the GWMP and the basis of the update.

Section 2 Groundwater Planning Process – This section describes the steps and procedures that were conducted to draft, review, and finalize this GWMP. Records of public participation, input received from the TWG, and the timeline of all events relating to the GWMP update process are included in this section.

Section 3 Existing Groundwater Basin Conditions – This section describes the current hydrogeologic conditions and issues related to the MGWB. It includes discussions of the MGWB boundaries, local hydrogeology and groundwater levels, existing water supplies and groundwater extractions, and groundwater quality.

Section 4 Water Resources Setting – This section describes existing surface water and groundwater supplies and municipal, industrial, and agricultural water demands within the MGWB.

Section 5 Basin Management Goals and Objectives – This section presents MAGPI's strategy for managing the MGWB in terms of states goals and associated BMOs. The goals are broad principals, and the BMOs are quantifiable or verifiable actions for achieving the goals.

Section 6 Groundwater Management Plan Elements – This section details the specific projects, programs, and policies that will be implemented to manage the MGWB; some new, and others existing.

Section 7 Groundwater Management Plan Implementation – This section outlines a schedule for implementation and assessment of this GWMP.

Section 8 References – This section provides a list of documents utilized to prepare this GWMP.

2.0 GROUNDWATER MANAGEMENT PLANNING PROCESS

Groundwater management is the planned and coordinated monitoring, operation, and administration of a groundwater basin or portion of a groundwater basin with the goal of achieving long-term sustainability of the resource (DWR, 2003). A GWMP is a document that provides a framework to implement a groundwater management strategy for an area, basin, or a portion of a groundwater basin. This GWMP presents the approach to implement a series of integrated water management actions to secure a sustainable source of groundwater in the MGWB.

The DWR has divided the state into 10 hydrologic regions, which have been further divided into basins and subbasins. As described in the 2003 update to Bulletin 118 "California's Groundwater," the MGWB is a subbasin within San Joaquin Valley Groundwater Basin of the San Joaquin River Hydrologic Region (Figure 2).

2.1 BASIN BOUNDARIES AND ASSEMBLY BILL 3030 STUDY AREA

The MGWB is located in the San Joaquin Valley, which is surrounded by the Coast Range on the west, the San Emigdio and Tehachapi Mountains on the south, the Sierra Nevada on the east, and the Sacramento-San Joaquin Delta (Delta) and Sacramento Valley on the north. The northern portion of the San Joaquin Valley drains toward the Delta by the San Joaquin River and its tributaries, including the Fresno, Merced, Tuolumne, and Stanislaus rivers. The southern portion of the valley is internally drained by the Kings, Kaweah, Tule, and Kern rivers that flow into the Tulare drainage basin including the beds of the former Tulare, Buena Vista, and Kern lakes (DWR, 2003).

The MGWB lies on the eastern side of the San Joaquin Valley, entirely within Merced County and is generally described as the eastern half of Merced County (Figure 3). For the purposes of this GWMP, the MGWB includes lands south of the Merced River between the San Joaquin River on the west and the crystalline basement rock of the Sierra Nevada foothills on the east. The MGWB boundary on the south stretches westerly along the Madera-Merced County line (Chowchilla River) to the northern boundary of the Sierra Water District, which is followed westerly to the San Joaquin River. Although this modified study area is about 54 square miles larger than the MGWB as described in Bulletin 118, it is more consistent with natural hydraulic boundaries surrounding the basin.

2.2 GROUNDWATER MANAGEMENT WITHIN THE MERCED GROUNDWATER BASIN

During 1997, several agencies within the groundwater basin adopted Resolutions of Intention to Adopt a Groundwater Management Plan pursuant to Water Code Section 10753 et seq. In addition, these agencies formed MAGPI for the purpose of developing a basin-wide groundwater management plan to guide the management of the groundwater resources in the MGWB.

The 1997 GWMP was the result of the planning effort of the City of Merced and MID on behalf of MAGPI. In June 2001, the DWR and MAGPI entered into a MOU to work cooperatively to promote conjunctive use of surface and groundwater projects within the MGWB. Since 2001, MID (on behalf of MAGPI) has implemented a number of in-lieu recharge programs to reduce groundwater pumping and decrease stress on the aquifer. Other activities completed by MAGPI include:

- Southeast Quadrant Data Assessment (2002; DWR funding), which described the regional hydrogeologic setting of Eastern Merced County, compiled available water resources data, and developed a data management plan for MAGPI members.
- Conjunctive Use Site Assessment (2003; DWR funding), which compared and evaluated alternative artificial recharge sites.
- Cressey Pilot Recharge Basin (ongoing; MID funding), which is providing promising results with respect to infiltration rates for spreading basins.
- Public Involvement (ongoing; DWR funding), which is aimed at improving coordination among MAGPI members and between MAGPI and other entities in the MGWB.
- Stream and Groundwater Monitoring (ongoing; AB 3030 funding), which is aimed at defining stream-aquifer interaction along Bear Creek in the vicinity of Merced.

2.2.1 Agencies/Water Purveyors within the Merced Groundwater Basin

There are numerous agencies that lie either wholly or partly within the MGWB and therefore are eligible to participate in an AB 3030 GWMP. These agencies include the:

- City of Atwater
- Black Rascal Water District
- East Side Water District
- Le Grand Community Service District
- Le Grand-Athlone Water District
- City of Livingston
- Lone Tree Mutual Water Company
- Meadowbrook Water Company
- City of Merced
- Merced County Environmental Health Department

- Merced Irrigation District
- Merquin County Water District
- Planada Community Service District
- Stevinson Water District
- Turner Island Water District
- Winton Water and Sanitary District

2.2.2 Merced Area Groundwater Pool Interests

The signatory agencies to the MAGPI MOU are shown on Figure 4. These agencies, which cover most of the MGWB, agree that the groundwater and surface water resources within the MGWB are vitally important resources in that they:

- Satisfy environmental, agricultural, domestic, municipal, industrial, and other water needs and
- maintain the economic viability and prosperity of eastern Merced County.

Eastern Merced County is a vital agricultural area with increasing importance in industry and education. Because of increasing demands for California's finite water resources, it is critical that those people and agencies making use of the region's limited water supplies do so in an efficient and knowledgeable manner to preserve the resources for all elements of a robust regional economy. The MAGPI parties acknowledge that long-term groundwater level declines due to pumping can diminish water quality and quantity; cause land subsidence; increase water costs; and eventually restrict economic development.

2.2.3 Public Participation

An extensive public involvement process was conducted to provide for broad input to development of the GWMP update, including formal public hearings conducted according to AB 3030 requirements, MAGPI board meetings, and formation of an ad hoc technical working group that represented selected MAGPI members and other interested members of the public. A chronology of the various activities carried out to support the update process is provided below:

- On January 16, 2008, the MAGPI Board published a notice informing the public of the intention of the MAPGI to hold a public hearing to determine whether to adopt a resolution to prepare the groundwater management plan update. These notices are included in Appendix B.
- The MAGPI Board, in a regularly scheduled meeting on January 30, 2008, held a hearing (after publication of notice) on whether to adopt a resolution of intent to prepare a GWMP Update. In this hearing, the public was invited to comment on

whether the agency should adopt the resolution and on the planning process. The public was informed on how to provide comments to the agency.

- At the conclusion of the hearing, the MAGPI Board adopted a resolution of intent to draft the GWMP update. The MAGPI Board also directed the staff to participate with members of MAGPI and the public to form a TWG to act as an advisory committee of stakeholders in development of the GWMP update.
- From February through May, the TWG met approximately monthly to review and comment on sections of the Draft GWMP. Notice of the TWG meetings were sent via e-mail to TWG members and the MAGPI Board. The Draft sections of the GWMP were published on the MAGPI website as they were prepared, and available for public review. The TWG meetings were open to the public.
- On May 31, 2008, the MAGPI Board published a notice informing the public of the intention of MAPGI to hold a public hearing to receive input from the public leading to adoption of the Draft GWMP, which would amend and supersede the existing plan adopted by the member agencies of MAGPI on December 29, 1997. These notices are included in Appendix B.
- The MAGPI Board, in a regularly scheduled meeting on June 16, 2008, held a hearing (after publication of notice) to present the Draft GWMP update to the Board and public and solicit public comment on the Draft. In this hearing, the MAGPI Board voted to keep the hearing open until July 1, 2008 and invited the public to provide written comments on the Draft GWMP (available on the MAGPI website since June 2, 2008) by July 1, 2008. The public was informed on how to provide comments to MAGPI.
- The MAGPI Board, on July 30, 2008, passed a resolution adopting the Draft GWMP update, superseding the December 29, 1997 plan.

3.0 EXISTING GROUNDWATER BASIN CONDITIONS

This section addresses the current hydrogeologic conditions and issues related to the MGWB. It includes discussions of the physical setting, local geology, local hydrogeology and groundwater levels, existing water supplies and groundwater extractions, and groundwater quality.

3.1 PHYSICAL SETTING

The MGWB is located in the San Joaquin Valley is a broad structural trough approximately 200 miles long and up to 70 miles wide. It is filled with up to 32,000 feet of marine and continental sediments deposited during periodic inundation by the Pacific Ocean and by erosion of the surrounding mountains. Continental deposits shed from the surrounding mountains form an alluvial wedge that thickens from the valley margins toward the axis of the structural trough. This depositional axis is below and slightly west of the series of rivers, lakes, sloughs, and marshes that mark the current and historic axis of the surface drainage of the San Joaquin Valley (DWR, 2003).

The physiographic units in the MGWB area include the Sierra Nevada, dissected uplands, low alluvial plains and fans, river flood plains and channels, and overflow lands (Page and Balding, 1973). These physiographic units are presented on Figure 5. The Sierra Nevada unit, which can be found along the eastern border of the MGWB, consists of metamorphic and granitic mountains that have deep river-cut canyons and highly dissected foothills.

The dissected uplands unit has a width ranging between 5 and 18 miles and covers a significant portion of the MGWB. Local relief may be up to 200 feet. Within the uplands the Merced River has developed two terraces and a broad flood plain while the Chowchilla River is only slightly entrenched into the upland surface.

The low alluvial plains and fans unit, which consists primarily of coalescing alluvial fans, has a width ranging between 14 and 20 miles and covers a significant portion of the MGWB. Local relief may be up to 10 feet. Between Atwater and Turlock, northwest trending sand dunes underlie the surface of the plains and fans.

The river flood plains and channels unit flank the channels of the major rivers including the Merced and Chowchilla Rivers. In the dissected uplands unit, the flood plain of the Merced River ranges in width between 0.25 and 1 mile. In the Cressey area, natural levees are present. Near the valley trough, the Merced River flood plain becomes indistinguishable from the surrounding alluvial plains. The Chowchilla River, which is entrenched about 40 feet near where it leaves the Sierra Nevada, has developed a thin flood plain through the dissected uplands. The river has deposited natural levees throughout the low alluvial plains and fans unit.

The MGWB and San Joaquin Valley are classified as having a hot Mediterranean (Koppen climate classification *Csa*) to Mediterranean steppe (*BShs*) climate (McKnight & Hess, 2000). It is typically hot and dry during the summer and cool and damp in winter, leading to frequent ground fog known regionally as tule fog. Summer temperatures reach into the mid to upper

90s (degrees Fahrenheit [°F], 30s in degrees Celsius [°C]), and occasional heat waves might bring temperatures well over 100°F (38°C) with some locations topping out at around 115°F (46°C). Average precipitation ranges between 10 and 13 inches per year, increasing with elevation. Winter and spring comprise the rainy season, although during the late summer, southeasterly winds aloft can bring thunderstorms of tropical origin, mainly in the southern half of the San Joaquin Valley.

3.2 GEOLOGY

The MGWB is underlain by consolidated rocks, unconsolidated deposits, and shallow surface soils (Figure 6). The consolidated rocks, from bottom to top, include the Sierra Nevada basement complex, lone Formation and other sedimentary rocks, the Valley Springs Formation, and the Mehrten Formation (Page and Balding, 1973). The unconsolidated deposits include continental deposits, lacustrine and marsh deposits, older alluvium, younger alluvium, and flood-basin deposits. The surface soils consist of 18 soil associations based on physiographic sections. The geology and soils are described in the following sections.

3.2.1 Consolidated Rock

The consolidated rocks include the Sierra Nevada basement complex, lone Formation and other sedimentary rocks, the Valley Springs Formation, and the Mehrten Formation.

The Sierra Nevada bedrock complex consists largely of metasedimentary and metavolcanic rock of pre-Tertiary age (Page and Balding, 1973). These rocks occur as foothill ridges along the eastern edge of the MGWB. Where the basement complex occurs near the surface, fracture sets and joints within the bedrock complex may contain sufficient groundwater for domestic or stock supplies.

The Eocene lone Formation unconformably overlies the Sierra Nevada bedrock complex and is composed of marine to non-marine clay, sand, sandstone, and conglomerate (Figure 6). These rocks occur as foothill ridges along the eastern edge of the MGWB. The lone is characterized by a white sandy clay (kaolinite) at its base and beds of conglomerate and yellow, red, and gray sandstone in its upper parts. In localized areas near the Sierra Nevada foothills, the formation contains fresh water; however, well yields are highly variable.

The Miocene Valley Springs Formation overlies the lone Formation and is composed of a fluvial sequence of rhyolitic ash, sandy clay, and siliceous gravel in a clay matrix. These rocks occur as foothill ridges along the eastern edge of the MGWB (Figure 6). Because of the abundant ash and clay matrix, the Valley Springs has a relatively low groundwater yield, sufficient for domestic or stock supplies, but generally insufficient for irrigation.

The Miocene/Pliocene Mehrten Formation overlies the Valley Springs Formation and is composed of fluvial deposits of sandstone, breccia, conglomerate, tuff, siltstone and claystone. It contains a large amount of andesitic material, making it easy to distinguish. The Mehrten outcrops over a large area in eastern MGWB (Figure 6). It forms an important aquifer in the MGWB with relatively high yields.

3.2.2 Unconsolidated Deposits

The unconsolidated deposits, from bottom to top, include continental deposits, lacustrine and marsh deposits, older alluvium, younger alluvium, and flood-basin deposits. The Pliocene/Pleistocene continental deposits consist of a heterogeneous mixture of poorly sorted gravel, sand, silt and clay derived primarily from the Sierra Nevada. The sediments, which are found throughout the MGWB, dip gently to the southwest and have variable thickness up to 700 feet. The continental deposits have relatively large yields to wells and are an important part of the aquifer system.

The lacustrine and marsh deposits consist of two beds: the Corcoran Clay Member of the Pleistocene Tulare Formation and a shallow clay bed of Holocene age (Page, 1977). The Corcoran Clay is a bed of laterally extensive reduced (blue/grey) silt and clay that underlies about 770 square miles in the southeast portion of the MGWB (Figure 7). The Corcoran Clay is a significant confining layer up to 60 feet thick. The shallow clay bed of Holocene age is composed of oxidized (brown/red) sandy clay and clay with silica cemented intervals (hardpan). It is found throughout most of the MGWB at a shallow depth (~ 35 feet).

The older alluvium consists of a heterogeneous mixture of poorly sorted gravel, sand, silt and clay up to 400 feet thick derived primarily from the Sierra Nevada. The sediments, which are found throughout the MGWB, were deposited as a series of interbedded coarse-grained and fine-grained layers and form a leaky-aquifer system.

The flood-plain deposits consist of intercalated lenses of reduced to oxidized fine sand, silt, and clay. These deposits are found in the southwestern portion of the MGWB and generally are less than 30 feet thick (Figure 6).

The younger alluvium consists of well sorted gravel and sand derived primarily from the Sierra Nevada. The younger alluvium is found in a narrow band along the stream channels throughout the MGWB (Page and Balding, 1973).

3.2.3 Surface Soils

The United States Department of Agriculture (USDA) Soil Conservation Service conducted a soil survey in Merced County and identified more than 200 unique soil types within the MGWB

(USDA, 1962). These soil types can be grouped into 18 soil associations based on physiography and permeability (Figures 8 and 9).

3.3 HYDROGEOLOGY

This section provides a summary of the local hydrogeology, groundwater levels and trends, existing water supplies and groundwater extractions, and groundwater quality.

3.3.1 Occurrence of Groundwater

The base of fresh water in the MGWB is approximately 1,200 feet below ground surface (bgs, Page, 1977). Five aquifer systems have been identified in the MGWB including a fractured bedrock aquifer, the Mehrten Formation, a confined aquifer, an intermediate "leaky" aquifer, and a shallow unconfined aquifer. These are discussed below.

Fractured Bedrock - Along the eastern edge of the MGWB wells have been completed within the Valley Springs and Lone Formations (Page & Balding, 1973, Page, 1977). These wells appear to be completed in fractured bedrock with limited and variable yields. Because of the limited extent (and poor yields) of the fractured bedrock aquifer, the fractured aquifer is not a significant source of water in the MGWB.

The Mehrten Formation – The Mehrten Formation outcrops over a large area in the MGWB. Many water supply wells in the eastern portion of the MGWB penetrate the formation and it is a significant source of groundwater. Where the Mehrten occurs beneath the Corcoran Clay, it is considered a confined aquifer. Where the Mehrten does not underlie the Corcoran Clay, there is insufficient data to determine the degree of confinement of the formation.

Confined Aquifer – The confined aquifer occurs in older alluvium (and Mehrten Formation) deposits that underlie the Corcoran Clay (Figure 7). Many water supply wells in the western portion of the MGWB penetrate the Corcoran Clay into the confined aquifer and it is a significant source of groundwater.

Intermediate Leaky-Aquifer – The intermediate aquifer occurs in older alluvium deposits that overlie the Corcoran Clay or are east of the Corcoran Clay (Figure 7). Where the Corcoran Clay is absent the intermediate aquifer extends to the Mehrten Formation. In the eastern portion of the MGWB the intermediate aquifer consists of a series of interbedded coarse-grained (gravel and sand) layers separated by fine-grained (silt and clay) layers. The fine grained layers inhibit, but do not prevent vertical groundwater flow between layers and thus form a leaky-aquifer system. Many water supply wells in the MGWB are completed in the intermediate leaky-aquifer and it is a significant source of groundwater.

The Intermediate leaky-aquifer is the most extensively developed aquifer in MGWB. Measured well yields within the MGWB (Page & Balding, 1973) range from 670 to 4000 gallons per minute (gpm). Estimates of specific capacity of supply wells throughout the MGWB range from about 20 to 40 gallons per minute per foot of drawdown and indicate that the specific capacity increases from east to west (Figure 10).

Shallow Unconfined Aquifer – The shallow unconfined aquifer occurs in older and younger alluvium deposited above the shallow clay bed. Because of its shallow depth, few water supply wells are completed in the shallow unconfined aquifer. Where water levels in the intermediate leaky aquifer fall below the base of the shallow clay bed, groundwater in the intermediate aquifer becomes unconfined and water in the overlying shallow aquifer becomes perched.

3.3.2 Groundwater Levels and Historical Trends

Groundwater elevations in water supply and monitoring wells have been monitored by DWR, MID, and other entities since the 1950s. DWR monitors more than 305 wells on a semi-annual basis throughout the MGWB. MID currently measures static regional groundwater levels monthly in a total of 290 active wells within its service area (Figure 11). In addition, MID monitors shallow monitoring wells, which are located at the section corners, to evaluate localized areas of high groundwater (near ground surface) or perched groundwater table conditions. The municipalities within the MGWB also monitor groundwater levels frequently in their water supply wells. The City of Merced monitors water levels in more than 120 monitoring wells on a quarterly basis.

To simplify evaluation of the available groundwater level data in the MGWB, 34 monitoring wells (about 10 percent) with at least 30 years of history from 1970 to present were selected from the available data set. These wells are located relatively uniformly throughout the MGWB (Figure 12). Long-term hydrographs prepared for these wells show that throughout most of the MGWB, groundwater elevations are declining with time (Figure 13). Since 1980, average groundwater levels beneath the MGWB have decline approximately 14 feet (Figure 14). Most of this decline occurred between 1980 and 1996. The notable exception is beneath the El Nido area, where groundwater levels have shown a substantial increase since 1980 in response to increased delivery of surface water by MID. Individual hydrographs for the 34 selected wells are presented in Appendix C.

3.3.3 Groundwater Flow Directions

Groundwater conditions within the MGWB vary based on location. On the regional scale, groundwater flow beneath the MGWB is generally from northeast to southwest, from the foothill recharge areas toward the valley trough and the San Joaquin River. Locally, the

groundwater flow direction varies with time in response to local groundwater pumping and irrigation recharge. The response of the aquifers to changes in pumping and irrigation is relatively rapid, and localized flow directions are affected by these changes.

DWR routinely publishes potentiometric surface maps of the unconfined aquifer groundwater elevation in the San Joaquin Valley. The 1996 map indicates several major cones of depression in the potentiometric surface centered approximately on Chowchilla and El Nido (Figure 15). The DWR map for 2006 shows a highly convoluted potentiometric surface due to numerous localized pumping centers beneath Chowchilla, Merced, and Livingston (Figure 16).

The groundwater elevation data from the 34 selected monitoring wells were used to prepare simplified potentiometric surface maps on an annual basis (Appendix D). As shown on Figures 17 and 18, these maps show the same general features in the potentiometric surface as the DWR maps (Figures 15 and 16), but is more easily interpreted.

3.3.4 Groundwater Recharge and Discharge Areas

The groundwater elevations relative to the elevations of the major rivers and the interaction of the cones of depression with the rivers suggest that some reaches of the rivers lose water to groundwater while others gain water from groundwater discharge. Comparison of Chowchilla River elevations with groundwater levels indicates that the river is higher than the groundwater. Consequently, the river probably contributes some recharge to groundwater along the reach south of the study area. The pumping depressions near the Chowchilla River do not appear to be affected by the presence of the river.

The groundwater elevation data indicate that there is groundwater discharge along the San Joaquin River. There is a trough in the water table elevations that follow the San Joaquin River. Groundwater inflow to the river and surrounding areas occurs from both sides of the San Joaquin Valley. This river and the surrounding areas are the primary groundwater discharge area for the valley.

On the north side of the MGWB west of State Highway 99, the lower reaches of the Merced River appear to be a groundwater discharge area. East of the highway, the river may be acting as a constant head source and supplying water to the large cone of depression centered approximately 17 miles northwest of Merced, east of Oakdale Road (Township 5 South, Range 12 East, Section 36), the river is higher than the groundwater and probably provides some recharge to the groundwater.

3.3.5 Vertical Groundwater Gradients and Shallow Groundwater

The vertical groundwater gradient, and hence the direction of vertical groundwater flow, is downward from the shallowest groundwater to the deeper aquifers (Elliott, 1984).

Consequently, degradation of shallow groundwater can potentially affect deeper water supply wells where downward flow is significant and where dilution and chemical/biological processes are insufficient to adequately reduce the concentrations of constituents of concern.

The area of the MGWB located generally between the cities of Atwater and Livingston, south of State Highway 99 and north of State Highway 140, has historically experienced localized high groundwater levels. Groundwater levels have varied from year to year and over the course of an irrigation season as a result of pumping, precipitation and applied irrigation water. If left uncontrolled, groundwater levels of less than six feet bgs would not be uncommon, resulting in potentially adverse impacts to local crop production.

To minimize these potentially adverse impacts, the MID provided groundwater control (referred to as "drainage pumping") in areas where groundwater levels were within six feet of the ground surface. Ninety-five wells specifically designed and located for drainage purposes were used for drainage pumping. This localized high groundwater condition within MID has declined steadily over the last 10 years. As a result, many of the drainage wells are now used exclusively for irrigation purposes during periods when insufficient surface water is available. Water pumped from these wells is typically discharged into the MID water distribution system where it is used, as much as possible, for irrigation purposes.

3.3.6 Subsidence

Subsidence of the land surface is not known to be occurring in the MGWB although subsidence has been detected in the vicinity of Los Banos within the Delta-Mendota Groundwater Basin west of the San Joaquin River (Merced County General Plan, 2000). In the Le Grand area, the ground surface around two wells is reported to have fallen a few feet, leaving the well heads above ground surface (Kole Upton, personnel communication). Although this subsidence appears to have occurred beneath a relatively small area and is not known to be occurring presently, it demonstrates that there is potential for subsidence in the MGWB if groundwater levels are not sustained. Monitoring of subsidence is not occurring in the MGWB at this time.

3.4 GROUNDWATER QUALITY

Many constituents, both man-made and naturally occurring, are present in the groundwater supply within the MGWB. The constituents identified in this section either currently impact groundwater usage within the basin or have the potential to impact groundwater usage in the future.

3.4.1 Salinity

Variability in soil conditions, soil type, geologic structure, irrigation practices, and irrigation water quality result in wide variability of the quality of groundwater, especially in the upper water-bearing zone. Because of these influences, groundwater salinity is generally lowest in the easterly portion of the MGWB and in the adjoining MID. Salinity increases westward toward the San Joaquin River and southward toward the Chowchilla River (Figure 19).

Salinity levels within the MGWB range from 90 to greater than 1,250 milligrams per liter (mg/L) as measured by total dissolved solids (TDS). TDS in groundwater in the eastern two-thirds of the Basin is generally less than 500 parts per million (ppm). TDS in groundwater increases westward and southwestward towards the San Joaquin River and southward towards the Chowchilla River. In these areas, high TDS water is found in wells deeper than 350 feet. Better quality groundwater (less than 1,000 ppm) in these areas is found at shallower depths.

Groundwater with high TDS concentrations in the MGWB is principally the result of the migration of a deep saline water body which originates in regionally deposited marine sedimentary rocks that underlie the San Joaquin Valley. The depth of this saline water body within the MGWB boundaries is very shallow compared to other parts of the San Joaquin Valley.

Groundwater with high concentrations of total dissolved solids is present beneath the entire MGWB at depths from about 400 feet in the west to over 800 feet in the east. The shallowest high TDS groundwater occurs in zones five to six miles wide adjacent and parallel to the San Joaquin River and the lower part of the Merced River west of Hilmar, where high TDS groundwater is upwelling.

Under natural pressure, the saline groundwater body is migrating upward. Brines move up through permeable sedimentary rocks and also through wells, faults and fractures. The chemistry of groundwater in the MGWB indicates that mixing is occurring between the shallow fresh groundwater and the brines, which produces the high TDS groundwater observed. Pumping of deep wells in the western and southern parts of the MGWB may be causing these saline brines to upwell and mix with fresh water aquifers more rapidly than under natural conditions.

The Corcoran Clay has provided a natural impediment to the migration of high TDS groundwater from the confined aquifer into the unconfined aquifer. High permeability pathways through the clay from the confined to the unconfined aquifer may be created by wells perforated in both the unconfined and confined aquifers.

3.4.2 Nitrates

Nitrate occurs from both natural and man-made sources and is widespread in groundwater in many parts of the San Joaquin Valley. High concentrations of nitrate in groundwater are primarily a concern for potable water supplies. The Meadowbrook Water Company has one well (of four) that, based on a 10-year trend analysis, is expected to reach the maximum contaminant level (MCL) in 10 to 12 years. The Planada Community Services District has two wells (of five) that are at or near the MCL. The MCL for nitrate in public drinking water supplies is 45 mg/L (as nitrate).

Nitrate in irrigation water is not a major concern for many crops, because it acts as fertilizer. However, permanent crop production, including grape vineyards, may be adversely affected by excess nitrate concentrations. High nitrate concentrations, typically found in shallower groundwater zones, has been attributed to various sources such as agricultural fertilizers, sewer effluent, septic tank effluent, and animal wastes.

3.4.3 Iron and Manganese

Groundwater in some areas within the MGWB has elevated iron and manganese concentrations. For example, manganese is found near the Merced Airport at relatively shallow depths. Generally "reducing conditions" (a lack of oxygen) may lead to elevated iron and manganese concentrations in groundwater. Also, shallow groundwater near streams often has high manganese and sometimes high iron concentrations.

3.4.4 Arsenic

Arsenic concentrations in water from public water supply wells in the MGWB are below the current MCL of 0.010 mg/L. The United States Environmental Protection Agency (EPA) is currently evaluating the MCL for arsenic, which if lowered significantly could have a decided impact on groundwater usage and cost within the MGWB.

3.4.5 Radionuclides

Radionuclides are primarily from natural sources and can affect drinking water supplies. Sampling in the MGWB for radiological constituents has generally been limited to public water systems. The MCL for gross alpha is 15 picocuries per liter, and the MCL for uranium has recently been increased from 5 to 20 picocuries per liter.

The EPA has discussed establishing a standard for radon in drinking water. Depending on how low this standard is set, the natural activity of radon in groundwater could be a significant concern in the future.

3.4.6 Bacteria

Bacteriological quality in the MGWB is generally acceptable in deep groundwater aquifers. Bacteriological quality of groundwater pumped by individual wells cannot be generalized and depends on many factors pertaining to the well and surrounding conditions. Inadequately constructed and improperly located, destroyed, or abandoned water wells may contribute to bacteriological contamination of groundwater. Some of the factors that may influence contamination of water wells include location with respect to sources of contamination, inadequate construction features, general deterioration, and/or inadequate maintenance of wells, and improper use of water wells for disposal of wastes.

Bacteriological contamination of groundwater is a health concern because groundwater is used for drinking water. State DOHS standards require periodic sampling and testing for pathogenic microorganisms. The minimum number of tests depends on the number of service connections in the system.

3.4.7 Petroleum Hydrocarbons

A number of unauthorized releases from underground storage tanks (USTs) have occurred in the MGWB. The State Water Resources Control Board and Merced County Division of Environmental Health (MCDEH) are involved in monitoring and regulating the cleanup of sites involving many volatile organic compounds (VOCs) and UST spills (Figure 20). Most of these cases are very localized in nature in terms of groundwater impacts, and public water supply wells are not known to have been affected. MCDEH has a contract with the State Water Resources Control Board to provide mitigation services for the definition and cleanup of releases resulting from underground storage tanks. Benzene, toluene, xylenes, methyl-tertiary-butyl-ether (MTBE), and 1,2-dichloroethane (1,2 DCA) are the constituents of concern in groundwater.

MTBE, a mandatory gasoline additive designed to reduce air emissions, has been detected in various locations, primarily shallow monitoring wells. MTBE is highly mobile and highly soluble in water, but it does not degrade naturally like other petroleum product constituents. MTBE is also resistant to the biological treatment methods commonly used to clean up hydrocarbon spills. The incidence of MTBE may be more common than many realize because it does not show up in the commonly used EPA test methods; however, it can be detected by EPA analytical methods 502.2 or 602.

3.4.8 Pesticides

Pesticide contamination is primarily the result of the widespread use of the agricultural nematicide dibromochloropropane (DBCP) on croplands for several decades before it was banned in 1977. DBCP in the groundwater is usually associated with vineyards or orchards

where the pesticide was used. DBCP is a carcinogen at very low concentrations in water, and is a concern for potable water supplies. It moves freely with the groundwater and persists for long periods. The MCL for DBCP is 0.2 micrograms per Liter ($\mu\text{g/L}$). DBCP has been found in public water supply wells in the Merced area at levels either at or below the MCL. For public water purveyors, the frequency of monitoring for DBCP, where it has been detected, is set by DOHS. Also, 1,2,3-trichloropropane (1,2,3-TCP), a common cleaning and degreasing solvent also used in the application of soil fumigants, has been detected in shallow groundwater in the Livingston area. The MCL for 1,2,3-TCP is 0.005 $\mu\text{g/L}$.

Another nematicide that has been detected in the MGWB is ethylene dibromide (EDB). Used primarily on vineyards, EDB was banned in the early 1980s, but it has been detected in at least one public water supply well and several domestic wells in the Atwater/Livingston area.

Pesticide and fertilizer formulators and distributor sites often have releases resulting from spills, residual materials, wash racks, etc. Sites with known releases, whether they impact groundwater or not, are monitored by the Department of Toxic Substances Control (DTSC) and the Regional Water Quality Control Board (RWQCB). Sites with known releases in the MGWB are shown on Figure 20.

3.4.9 Trichloroethylene

The VOC trichloroethylene (TCE) is a nonflammable, colorless liquid with a sweet odor and is used as a solvent for dyes, rug cleaners, as well as a degreaser for metal parts. Improper storage and disposal have made TCE a major contaminant of groundwater supplies in California. The California Drinking Water Action Level of 5 parts per billion (ppb; 5 ppb is equivalent to 5 $\mu\text{g/l}$) for TCE is based upon what is considered a negligible risk level for cancer (i.e. if one million people drank about 2 liters of water containing TCE at 5 $\mu\text{g/l}$ every day over a 70-year lifetime, there would be no more than one additional case of cancer in the million people exposed).

Two locations in the MGWB, the Castle Airport Aviation and Development Center and the Merced's Eastern Industrial Park have known TCE plumes and have remediation activities in progress (Figure 20). At Castle Airport, a former United States Air Force Base, approximately 13,065 cubic yards of soil were removed and disposed of offsite. Twenty-three soil vapor extraction systems have removed 831,110 pounds of VOCs from the soil. Groundwater extraction systems were installed on and off base to protect nearby municipal wells and to remove the contaminants from the groundwater. As of 2007, 13.6 billion gallons of contaminated groundwater have been extracted and treated. All remediation has been completed or there are treatment systems in place and operating properly. (DTSC, 2007).

At the Merced Eastern Industrial Park, on-site and off-site groundwater extraction systems were installed. In addition, an impacted City of Merced supply well was replaced at an upgradient location. As of 2007, 7.2 billion gallons of contaminated groundwater have been extracted and treated, removing approximately 19,000 pounds of TCE. All groundwater remediation is completed or there are treatment systems in place and operating properly. (RWQCB, 2007).

3.4.10 Perchloroethylene

The VOC perchloroethylene (PCE) has been detected at sporadically in some of the MGWB's public water supply wells. Industrial wastes and dry cleaners are a recognized source of PCE in groundwater in many municipal areas, including the City of Merced (Figure 20). Beginning in the 1986, PCE was detected in three of the City of Merced's wells. As a result of the PCE contamination, three wells were replaced in the late 1980s and one well was rebuilt to seal off PCE contaminated aquifers. Five additional City of Merced wells are known to be at risk. Intensive monitoring and studies continue in an effort to manage the PCE problem in Merced. Improper use, improper storage, and accidental spills have resulted in unauthorized releases of PCE to groundwater.

3.4.11. Other Trace Organics

Other trace organic compounds have been detected in the MGWB including, but not limited to, carbon tetrachloride and hydrocarbon-based products. Improper use, improper storage, and accidental spills have resulted in unauthorized releases of these substances to groundwater.

Carbon tetrachloride is often attributed to auto repair shops, which have historically used it as a solvent or degreaser. There are no records of carbon tetrachloride being found in concentrations above the MCL of 0.5 µg/l in public water supply wells within the MGWB.

3.4.12. Emerging Contaminants

Many chemical and microbial constituents that have not historically been considered as contaminants are occasionally detected in groundwater. These newly recognized (or emerging) contaminants are commonly derived from municipal, agricultural, and industrial wastewater sources and pathways. These newly recognized contaminants are dispersed to the environment from domestic, commercial, and industrial uses of common household products and include such things as caffeine, artificial sweeteners, pharmaceuticals, cleaning products, etc. Residual waste products of genetically modified organisms (GMOs) are also of potential concern. A recently completed survey for pharmaceuticals at dairies in the MGWB by the UC Davis and the USGS resulted in a few detections of pharmaceuticals in shallow groundwater (Watanabe, Harter, and Bergamaschi, 2007).

4.0 WATER RESOURCES SETTING

The following sections describe the water resources setting in the MGWB, including review of water supply and demands within the MGWB and an evaluation of the sustainability of the water supply.

4.1 WATER SUPPLY

Water supplies within the MGWB consist of infiltration of precipitation, tributary inflow (surface water resulting from run-off of precipitation), surface water imported from the Merced River, and water stored in the subsurface as groundwater.

4.1.1 Precipitation

Precipitation is an important source of groundwater recharge in the MGWB. The average annual water year (July through June) precipitation in the MGWB is 12.25 inches (Figure 21) based on more than 100-years of monthly precipitation records from 1897 through 2006 collected by MID and its predecessors. Precipitation is highly seasonal with over 90 percent of precipitation occurring between the months of October and April (Figure 22).

Many quantitative measures of drought have been developed in the United States. One such index, the Standardized Precipitation Index (SPI), is useful for describing the many scales of drought. The SPI is an index based on the probability of recording a given amount of precipitation, and the probabilities are standardized so that an index of zero indicates the median precipitation amount (half of the historical precipitation amounts are below the median, and half are above the median). The index value is negative for drought, and positive for wet conditions. As the dry or wet conditions become more severe, the index becomes more negative or positive. The SPI can be computed for several time scales, ranging from one month to 24 months, to capture the various scales of both short-term (1 to 2 months) and long-term (12 to 24 months) drought.

A SPI chart for the a 12-month interval representing a water year (July through June) for the 1897 to 2006 period indicates that the MGWB is likely to receive less than average annual precipitation approximately 52 percent of the time and greater than average annual precipitation approximately 47 percent of the time (Figure 23). Using an SPI value of +/- 1.0, the MGWB is likely to receive average annual precipitation approximately 68 percent of the time, experience drought conditions about 15 percent of the time, and experience wet conditions about 16 percent of the time,

A cumulative precipitation departure curve shows that precipitation in the MGWB during the past 100 years has generally been less than the annual average with several extended

periods of drought (Figure 24). Only three intervals had extended periods with above average precipitation.

An isoheytal map of the MGWB and watersheds that are tributary to the MGWB shows that annual average precipitation increases rapidly with increasing elevation (Figure 25). Much of the precipitation accumulates as snow pack in the higher elevations, which melts and runs off during the spring and early summer months.

4.1.2 Surface Water

The Merced River is the principal renewable surface water supply in the MGWB. The Merced River is impounded by New Exchequer Dam, forming Lake McClure. Lake McClure has a storage capacity of over 1 million acre-feet (ac-ft), and is used for flood control and storage of irrigation water. Under agreement with the United States Corp of Engineers, each spring the storage pool in Lake McClure is reduced to a maximum of 675,000 ac-ft for flood control purposes.

Since 1994, storage in Lake McClure has ranged from about 98,300 to 1,022,000 ac-ft and averaged about 610,400 ac-ft (Figure 26). Since 1994, inflow into Lake McClure has ranged between zero and about 133,000 ac-ft per day (ac-ft/d) and averaged about 2,560 ac-ft/d. Outflow has ranged between zero and about negative 23,400 ac-ft/d and averaged about negative 2,325 ac-ft/d. The maximum instantaneous release recorded was negative 95,000 cubic feet per second (negative 188,340 ac-ft/d) in January 1997 (MID, 2007).

Water is diverted from the Merced River into the MID distribution system through the Northside Canal from the Merced Falls Dam and through the Main Canal from the Crocker-Huffman Diversion Dam. Between 1994 and 2007, MID diversions have ranged between 430,600 and 571,400 ac-ft/y and averaged about 499,400 ac-ft/y (Figure 27).

Other sources of surface water within the MGWB include permanent and ephemeral streams including Bear Creek, Black Rascal Creek, Burns Creek, Canal Creek, Cottonwood Creek, Deadman Creek, Dutchman Creek, Fahrens Creek, Little Dutchman Creek, Mariposa Creek and Owens Creek. Gauging stations located at flood control structures on several of these creeks (Burns, Bear, Mariposa, and Owens) indicate that since 1993, annual outflow from the creeks has ranged between 15,000 and 238,700 ac-ft/y and averaged about 94,000 ac-ft/y (Figure 28). DWR has estimated that approximately half, or about 47,000 ac-ft/y of this water infiltrates and recharges groundwater (DWR, 2003).

4.1.3 Groundwater

The 2003 DWR Bulletin 118 indicates that the MGWB has a surface area of about 491,000 acres or about 767 square miles. The MGWB, as defined in this GWMP (Section 2.1) has a surface area of about 525,000 acres or about 821 square miles. DWR estimated the total storage capacity of the MGWB as of 1995 assuming an average specific yield of 9.0 percent. Based on 1995 water levels, DWR estimated the available groundwater in storage beneath the MGWB to be approximately 15.7 million ac-ft to a depth of 300 feet and 42.2 million ac-ft to the base of fresh water.

The potentiometric surface maps in Appendix D were used to estimate the change in groundwater storage over time. Between 1995 and 2007, the average decline in groundwater levels beneath the MGWB was approximately 3.7 feet (Figure 29). Based on an average specific yield of 9.0 percent, this is equivalent to decrease in storage of approximately 117,200 ac-ft. A plot of the annual change in storage from 1980 to 2007 shows that the MGWB experiences periods of long-term groundwater level decline and subsequent recovery (Figure 30). As of 2007, the MGWB is in a state of mild groundwater level decline with a cumulative decrease in storage of approximately 720,000 ac-ft from 1980 to 2007.

4.1.4 Reclamation

Waste water reclamation plants are operated by the municipalities to treat and discharge effluent back into the MGWB. For example, the City of Merced discharges a total of about 8,700 ac-ft/y of treated effluent (City of Merced, 2008). Approximately 900 ac-ft/y of treated effluent is discharged to about 600 acres of City owned cropland and reused. Another 1,400 ac-ft/y of treated effluent is discharged to about 385 acres of wetlands. The remaining treated wastewater (approximately 6,400 ac-ft/y) is discharged to the Hartley Slough where it is utilized for agricultural and environmental purposes within and downstream of the MGWB.

The Cities of Atwater and Winton treat and discharge approximately 4,500 acft/y of municipal and industrial effluent. This treated water is reclaimed for agricultural purposes. The Cities of Le Grand, Livingston, and Planada treat and discharge approximately 6,000 ac-ft/y of effluent.

4.2 LAND AND WATER USE/DEMAND

Water demand within the MGWB consists primarily of agriculture, municipal, industrial, and environmental uses. These are described in the following Sections.

4.2.1 Agricultural

Most water within the MGWB continues to be utilized for agricultural purposes. Based on cropping patterns (DWR, 1995, 2002) and published crop demands (DWR, 1986), agricultural

demand 1995 was estimated to be 1.45 million ac-ft/y (Figure 31). Agricultural demand decreased in 2002 to an estimated 1.28 million ac-ft/y (Figure 32).

Agricultural demand within the MGWB is typically met with a combination of surface water and groundwater. MID provides surface water to neighboring water districts for agricultural application including average deliveries of about 26,400 ac-ft/y to the Stevinson Water District, 5,300 ac-ft/y to LeGrand Athlone Water District, and about 14,000 ac-ft/y to adjoining lands within the MID sphere of influence. Prior to incorporation into MID in 2004, the El Nido Water District received deliveries of about 15,000 ac-ft/y from MID. The remaining agricultural demand outside of MID (approximately 595,000 ac-ft/y) is met with groundwater solely.

Within the boundaries of MID, between 1994 and 2007, agricultural demand has ranged between 218,000 and 313,000 ac-ft/y and averaged approximately 275,000 ac-ft/y on approximately 110,000 irrigated acres (MID, 2007). To meet this demand, MID provides approximately 500,000 ac-ft/y of surface water from the Merced River and about 13,000 ac-ft/y of groundwater for irrigation in a typical year. Conveyance losses, most of which recharges the aquifer, account for approximately 80,000 to 110,000 ac-ft/y of water.

4.2.2 Municipal and Industrial

All municipal water purveyors within the MGWB rely solely on groundwater for water supply including the Cities of Atwater, Livingston, and Merced, the Black Rascal Mutual Water Company, the Le Grand and Planada Community Service Districts, the Meadowbrook Water Company, and the Winton Water and Sanitary District. Since 1996, total pumping by these municipal purveyors increased from approximately 36,100 ac-ft in 1996 to 46,250 ac-ft in 2007 (Figure 33). An estimated 4,000 ac-ft/y was produced in 2007 by small private residential water systems, commercial businesses, and industrial plants not served by the major municipal purveyors (MID, 2007).

Most of the municipal pumping is concentrated along the State Highway 99 corridor in the cities of Atwater and Merced. These two municipalities account for approximately 82 percent of municipal pumping with the City of Merced accounting for about 60 percent. Municipal water use varies seasonally with most of the municipal water demand occurring in the summer months (Figure 34).

4.2.3 Environmental

Water demand for environmental purposes is growing within the MGWB. Approximately 15,000 ac-ft/y are used at the Merced National Wildlife Refuge. Since 2000, Merced River releases by MID for the Vernalis Adaptive Management Plan to facilitate the migration of juvenile Chinook salmon have been approximately 60,000 ac-ft/y. During 2002 and again in

2007, MID released approximately 25,000 acre-feet of surface water from the Merced River to the Environmental Water Account for protection and restoration of at-risk fish species listed under the Federal and California Endangered Species Acts. MID pumped an equal amount of groundwater to replace the surface water supply to growers within the District.

4.3 GROUNDWATER YIELD AND SUSTAINABILITY

Safe yield or sustainable groundwater yield of an aquifer is defined as the amount of water that can be withdrawn annually without producing a permanent, undesired result, such as long-term groundwater level declines, groundwater quality degradation, and declines in river levels or discharge rates to wetlands resulting from increased pumping of the groundwater basin. An understanding of the sustainable groundwater yield of an aquifer, based on water availability, begins with understanding the hydrologic budget of the MGWB. A hydrologic budget is a mass balance expression that quantifies water inflow to and outflow from the MGWB.

Groundwater cannot be pumped in large quantities from the MGWB without experiencing impacts such as localized long-term groundwater level declines, which can create water quality degradation and increase pumping costs. It is not atypical in the San Joaquin Valley to have varying levels of water supply to different areas within a groundwater basin. This is the condition within the MGWB where the absence of surface supplies on the east side and southwest portions of the MGWB has resulted in concentrated pumping to support irrigated agriculture. Various methods of reducing long-term groundwater level declines to the Basin are discussed in Section 5.0 of this GWMP.

The simplified potentiometric surface maps (Appendix D) were used to estimate the change in MGWB storage on an annual basis, assuming a specific yield of 9.0 percent (Figure 30). As shown on Figure 30, there was a significant decrease in storage during the drought from 1986 through 1992 followed by a partial recovery from 1993 through 1999. As of 2007, the MGWB is in a state of mild long-term groundwater level decline, with a cumulative decrease in storage of approximately 720,000 ac-ft from 1980 to 2007, or about 26,000 ac-ft/y on average.

In response to the declining groundwater levels, MID implemented a series of programs in the 1990s to recharge the Merced subbasin aquifer system through in-lieu and direct recharge. MID has installed low-head booster pumps on several canals to provide surface water to higher lands and reducing annual pumping from about 24,000 ac-ft/yr to about 8,000 ac-ft/yr, resulting in an annual in-lieu recharge of about 16,000 ac-ft/yr. MID also implemented a program to provide more responsive service (delivery with 24 hours of demand) to its customers, which has reduced supplemental private pumping from an annual average of 42,000 ac-ft/yr to about 10,000 ac-ft/yr and resulted in an annual in-lieu recharge of about 32,000 ac-ft/yr. MID implemented a groundwater conservation incentive program, which has

resulted in the shifting of about 3,000 acres of groundwater irrigated land to surface water irrigation and resulted in the annual in-lieu recharge of about 9,000 ac-ft/yr. MID implemented the Highlands Pilot In-Lieu Recharge Project, which provides surface water to 450 acres of lands previously irrigated by groundwater only, thus replacing 12 wells and resulting in the annual in-lieu recharge of about 1,500 ac-ft/yr. MID also implemented a pilot direct recharge project at Cressey Basin, which has the potential to recharge up to 10,000 ac-ft/yr when surface water is available. In total, MID has implemented various recharge and conservation projects which combined provide an annual in-lieu recharge of about 60,000 ac-ft/yr and have resulted in the cumulative in-lieu recharge of about 300,000 ac-ft since 2001. Despite these efforts, the overall MGWB is in a state of mild long-term groundwater level decline (i.e. overdraft).

5.0 BASIN MANAGEMENT GOALS AND OBJECTIVES

MAGPI desires to identify, formulate, and implement sound groundwater management practices in order to maintain the available groundwater resources to meet the beneficial uses and needs of the MGWB. For the purposes of this groundwater management plan, Basin Management Goals (Goals) are statements of broad principles that express the desired state of the MGWB. BMOs are specific actions that are verifiable or quantifiable to achieve the Goals. Four groundwater management Goals have been established (no priority is implied). For each groundwater management goal, specific basin management objectives have been developed.

Goal 1 – Protect and maintain groundwater quality within the MGWB to satisfy current and future beneficial use.

BMOs

- 1.1 Monitor and evaluate groundwater quality within the MGWB.
- 1.2 Develop a high resolution numerical model of the groundwater system in the MGWB.

Goal 2 – Maintain groundwater quantities and eliminate conditions of long-term over draft in the MGWB to ensure water supply reliability to meet current and future beneficial use.

BMOs

- 2.1 Monitor groundwater elevations and evaluate the quantity of the MGWB's existing groundwater supplies.
- 2.2 Determine the MGWB's need for additional or improved water extraction, storage, conveyance, conservation, reuse, and intentional recharge facilities.

- 2.3 Promote in-lieu recharge of groundwater through conjunctive use of surface water.
- 2.4 Avoid subsidence through monitoring and prevention of overdraft.

Goal 3 – Protect and maintain groundwater recharge areas within the MGWB.

BMOs

- 3.1 Identify and evaluate natural recharge areas and potential intentional recharge areas within the MGWB.
- 3.2 Implement projects to intentionally recharge available surface water when surplus to needs.

Goal 4 – Manage the MGWB with local control.

BMOs

- 4.1 Provide information and guidance for the management, preservation, protection, and enhancement of the MGWB.
- 4.2 Assert local control of the region's groundwater resources.
- 4.3 Promote coordinated planning to make the best use of available water resources to meet the needs of all water users reliably and sustainably, and service territories in the mutual best interests of the inhabitants and resources of the MGWB.
- 4.4 Update the groundwater management plan for the MGWB periodically.

6.0 GROUNDWATER MANAGEMENT PLAN ELEMENTS

This section identifies the different groundwater management plan components that are included in this GWMP. The GWMP addresses these items:

- the twelve required components of AB 3030 that describe technical issues that should be addressed in GWMPs to manage the basin optimally and protect against adverse conditions;
- the seven components of SB 1938 that are required for agencies to be eligible for funds administered by DWR for construction groundwater projects;
- the five required components of SB 1672 that promote integrated regional groundwater management; and
- the seven voluntary components of Bulletin 118 that link BMOs to specific actions within the GWMP.

The correlation of the GWMP BMOs with the GWMP elements are presented in Table 2 and discussed in the following sections.

6.1 ELEMENT 1 – CONTROL OF SALINE WATER INTRUSION

Saline water can slowly degrade groundwater quality, limiting its range of potential beneficial use. Six potential sources of saline intrusion in the MGWB include:

- increase in salt content from dissolved materials (not a significant source of salts although some site-specific problems may exist),
- lateral or upward migration of saline water (not a significant source of salts, although there is some potential eastward migration of saline water from the Delta-Mendota Groundwater Basin),
- downward seepage of sewage, agricultural, or industrial waste (potential wide-spread problem associated with municipal waste water treatment plants, application of fertilizers, and dairies),
- downward seepage of mineralized surface water (potentially a wide-spread problem from infiltration of irrigation water containing salts), and
- seawater intrusion (not a potential risk in MGWB).

A program to minimize water quality degradation from saline water intrusion would include the following elements:

- Establish a network of monitoring wells completed to various depths throughout the management area using the existing monitoring well network.
- Monitor water quality periodically for salinity, nitrates, boron or other constituents of concern. Incorporate data from RWQCB, DTSC, DWR, and USGS, as appropriate.
- Identify and monitor areas where the groundwater flow patterns suggest a high probability of water quality degradation.
- Identify zones of marginal water quality that can be used in conjunction with surface water to increase the water supply for agricultural purposes and reduce migration of saline water into zones containing potable groundwater.
- Identify water management strategies that may be employed to minimize degradation.

Saline intrusion is not known to be a significant problem at this time; however, there is a potential for it to develop. For example, there is some evidence of migration of shallow saline water from west to east in the Stevinson area. At this time, the GWMP will emphasize groundwater monitoring. Groundwater monitoring, which is performed through existing activities of the individual parties of the GWMP, will allow the evaluation of saline water intrusion. If water quality changes begin to occur related to saline intrusion, the cause will be investigated and remedial actions will be considered to reverse the trend.

6.2 ELEMENT 2 – IDENTIFICATION AND MANAGEMENT OF WELLHEAD PROTECTION AREAS AND RECHARGE AREAS

The Federal Wellhead Protection Program (WPP) was established in 1986 by the Safe Drinking Water Act Amendments (Section 1428). The purpose of the WPP is to protect groundwater resources of public drinking water supplies from contamination to minimize the need for costly treatment to meet drinking water standards. The WPP is a preventative approach to protecting groundwater quality. Under the Act, the states are required to develop and EPA-approved WPP. To date, California does not have a formal state-mandated WPP program, but instead relies on public agencies to plan and implement programs under AB 3030. Merced County has developed and adopted a comprehensive countywide WPP (Appendix E).

The Merced County WPP for public water supply wells in the MGWB contains the following basic plan elements:

- Identification and description of all public water supply wells in the MGWB.
- Delineation of the wellhead protection area (WPA) for each well based on groundwater quality and flow information developed under Element 1 – Control of Saline Water Intrusion and Element 7 – Monitoring and Controlling Groundwater Levels, Quality, and Storage of this groundwater management plan.
- Identification of potential sources of contaminants within each WPA.
- Establishment of land use ordinances to preclude or control future land uses within each WPA that have the potential for groundwater contamination.
- Development of site specific well construction and abandonment programs to minimize contaminate migration (see Elements 4 and 9).
- Development of a contingency plan to implement if a WPA becomes contaminated.

A formal recharge area protection program for the MGWB does not exist at this time. Protection of recharge areas in the MGWB is realized by controlling or regulating surface contaminants before they migrate into the groundwater. This migration occurs either by percolation or via wells that have not been properly constructed or destroyed. The RWQCB, DTSC, and MCDEH regulate waste disposal.

To protected recharge areas, each MAGPI agency should provide assistance to the RWQCB, DTSC, and MCDEH by identifying areas that are most susceptible to groundwater contamination. Areas with good recharge potential should also be protected from development so that they may continue to be utilized for artificial and/or natural recharge. In addition, MAGPI agencies should closely review the applications for Waste Discharge Permits,

Tentative Waste Discharge Permits, and other environmental documents for facilities within and adjoining their boundaries with waste disposal systems that have the potential to degrade groundwater quality. Such waste disposal systems include disposal of dairy wastes, industrial wastes, sewage treatment plant effluent, and solid waste. Environmental documents and permits should be reviewed such that appropriate monitoring and mitigation measures are developed to preclude the possibility of migration of pollutants from disposal sites. Each participating agency should be observant for existing and proposed land use activities that have the potential to degrade groundwater quality so that appropriate action can be taken.

6.3 ELEMENT 3 – REGULATING CONTAMINANT MIGRATION IN GROUNDWATER

Section 10753.7c of the CWC addresses groundwater contaminants, which may originate from a number of sources such as leaking USTs or from the application, storage, and disposal of petroleum products, solvents, pesticides, fertilizers, sewage effluent, and other chemical used by businesses and in industry. These groundwater contaminants are distinguished from saline intrusion, which is addressed in Element 1 – Control of Saline Water Intrusion.

Agencies involved in mitigating groundwater contamination generally include the RWQCB, DTSC, EPA, and MCDEH. The MAGPI participant's role in protecting groundwater from contamination includes supporting each agency's efforts in monitoring and cleaning up point-source contamination sites. The RWQCB holds the primary responsibility for enforcing water quality regulations. The MCDEH oversees soil and groundwater cleanup activities associated with leaking USTs and sites. In addition, MAGPI participants should assist in understanding the hydrogeology of the MGWB, the vertical and lateral flow directions, and groundwater quality based on the groundwater monitoring activities carried out by each participating agency. Each participating agency should make the appropriate regulating agency aware of changes in groundwater quality, which may indicate that point source contamination is occurring.

6.4 ELEMENT 4 – ADMINISTRATION OF WELL ABANDONMENT AND WELL DESTRUCTION PROGRAMS

State regulations require that all unused or inactive wells be properly maintained (DWR bulletins 74-81 and 74-90) or destroyed (California Health and Safety Code Section 24400). Wells that are not properly maintained or destroyed may contribute to groundwater contamination as pollutants enter the well from the ground surface, as the well establishes vertical communication and allows poor quality water and pollutants to move from one aquifer to another, or if the well is used for illegal waste disposal.

It is the responsibility of the property owner or lessee to properly destroy their wells. Permits are required from the applicable County and/or City for destruction of wells within their

jurisdictions (See Elements 2 and 9). DWR bulletins 74-81 and 74-90 (Water Well Standards) provide the minimum standards for the destruction of wells, and Sections 13700 through 13806 of the CWC require proper destruction of wells. These standards apply to all water wells, cathodic protection wells, and monitoring wells. If a local agency does not have its own well standards, it must enforce the State Water Resources Control Board's Model Well Ordinance (Resolution 89-98). Local agency requirements may exceed California standards. For public supply wells, the DOHS may prescribe additional requirements.

Each participating MAGPI agency will continue to rely on administration of the well abandonment and destruction program by the permitting agencies. Each participating MAGPI agency's role in well abandonment and destruction should be to provide available groundwater data, assist in identifying locations of operating and abandoned wells, and provide support for a public awareness/outreach program to advise well owners why proper wells destruction is important for protection of water quality.

6.5 ELEMENT 5 – MITIGATION OF GROUNDWATER OVERDRAFT

Long-term uncontrolled groundwater level declines (overdraft) occur when the groundwater discharge rate exceeds the long-term recharge rate. Long-term groundwater level declines may result in land subsidence, degradation of groundwater quality, well dewatering, increased pumping costs, and other undesirable conditions.

At various locals within the MGWB, the amount of pumping has exceeded the recharge creating localized conditions of long-term groundwater level decline. As described in Sections 3.3.2 and 3.3.3, in general, groundwater elevations throughout the MGWB have declined approximately 14 feet since 1980 (Figure 13). Potentiometric surface maps of the unconfined aquifer indicate several major cones of depression in the potentiometric surface centered approximately on Chowchilla, El Nido, and Livingston (Figures 15 through 18).

In response to the declining groundwater levels, MID implemented a series of programs in the 1990s to recharge the Merced subbasin aquifer system through in-lieu and direct recharge. These programs are described in Section 4.4. These various recharge and conservation programs provide an annual in-lieu recharge of about 60,000 ac-ft/yr and have resulted in the cumulative in-lieu recharge of about 300,000 ac-ft since 2001. Despite these efforts, the overall MGWB is in a state of mild overdraft.

To avoid the negative impacts of groundwater long-term groundwater level decline, methods to recharge areas of decline need to be identified, evaluated, and implemented if they are economically and environmentally feasible. Restrictions on pumping should not be relied upon to mitigate long-term groundwater level decline until all possible and reasonable means of

recharge have been shown to be not viable. A conjunctive use program is one of the most cost effective ways to achieve aquifer recharge within the basin. Conjunctive use of surface water and groundwater is discussed in more detail in Element 8 – Facilitating Conjunctive Use Operations.

6.6 ELEMENT 6 – REPLENISHMENT OF GROUNDWATER EXTRACTED BY PRODUCERS

Groundwater replenishment may occur as:

- In-lieu recharge where surface water is substituted for groundwater supplies;
- natural percolation of surface water through the soil into the groundwater basin;
- intentional percolation of surface water in recharge basins that are created and maintained to maximize percolation; and
- injection of surface water or groundwater into the groundwater basin through injection wells.

Most groundwater recharge in the MGWB occurs from the application of irrigation water that is diverted from the Merced River. As the water is transported and distributed to the fields, seepage from canals and ditches percolates through the soil and recharges the groundwater basin. Annual seepage to groundwater is estimated by MID to be between 80,000 and 130,000 ac-ft/yr (Section 4.2.1). As irrigation water is applied to crops, a portion percolates past the root zone and continues downward also recharging the groundwater basin. This is most prevalent with the flood irrigation technique. As irrigation efficiency is increased through the adoption of advanced irrigation techniques like drip and micro sprinkler systems, applied water and deep percolation will decrease.

To increase groundwater replenishment, additional surface water must be recharged to the basin either by in-lieu or by direct recharge. During wet years, recharge of available surface water should be maximized. Through implementation of Element 8 – Facilitating Conjunctive Use Operations, MAGPI will be exploring methods of replenishing depleted groundwater supplies and optimizing use of available aquifer storage.

6.7 ELEMENT 7 – MONITORING AND CONTROLLING GROUNDWATER LEVELS, QUALITY, AND STORAGE

The purposes of a groundwater level and groundwater quality monitoring program are to identify areas of long-term groundwater level decline and provide information that will allow evaluation of the changes in groundwater quality and storage. Groundwater level monitoring is essential to understanding the impacts on the aquifer resulting from changes in water supply conditions and groundwater pumping activities. Such monitoring is also necessary for

administering any conjunctive water use program. Groundwater quality monitoring is essential to detect any adverse impacts on groundwater supply and to identify steps to protect groundwater quality in the MGWB.

Several participating local agencies (MID, the City of Merced, MCDEH) within the MGWB have established groundwater monitoring programs. The MID, for example, has recorded water levels in a network of shallow groundwater monitoring wells since 1942 and has recorded beginning and end-of-season water levels in its production wells since 1959. In addition, the cities are required to routinely test the groundwater quality in their supply wells. The MCDEH also maintains a groundwater monitoring program for individual domestic wells. These existing monitoring programs should be coordinated and expanded to develop a comprehensive basin-wide groundwater monitoring program.

Monitoring well networks should be established to monitor water levels both in the unconfined aquifer above and the confined aquifer below the Corcoran Clay where present. Water levels in the confined aquifer should be compared to water levels in the unconfined aquifer to evaluate the hydraulic gradient between the two zones. The hydraulic gradient is an important element in understanding how pumping affects the movement of water between the two aquifers. An adequate monitoring network should include representative wells that tap the two aquifers.

Basic elements should include:

- expanding the current network of monitoring wells to cover the entire basin;
- compiling the necessary data on the monitoring wells (e.g. location, depth, lithologic log, electric log, and casing and ground surface elevation);
- establishing the frequency of water level and quality monitoring;
- preparing an inventory of active wells and determining annual pumping amounts;
- developing a standardized data collection method;
- tabulating data and preparing groundwater maps; and
- interpreting and disseminating results.

Considering the substantial cost of implementing a comprehensive groundwater monitoring program, monitoring will largely continue to be accomplished through the existing, ongoing monitoring activities of the participating agencies. Each year, monitoring data collected by the individual agencies will be pooled and a report of groundwater conditions in the MGWB shall

be prepared. The report will address groundwater production, groundwater levels and storage changes, groundwater inflow and outflow, groundwater quality and other topics that are deemed appropriate.

To supplement the pooled effort, MAGPI participating agencies will implement routine groundwater monitoring in selected wells throughout the MGWB to collect water level data and groundwater quality samples on a consistent basis. This MGWB groundwater monitoring program is described in Section 6.13.

The MAGPI participating agencies have agreed that a numerical model of the MGWB will be useful as a means of consolidating available hydrologic and geologic data and preparing estimates of groundwater flow conditions. To that end, MAGPI has initiated a contract to prepare an integrated surface water/groundwater model (IGSM) of the MGWB. This work is anticipated to be completed within two years.

6.8 ELEMENT 8 – FACILITATING CONJUNCTIVE USE OPERATIONS

DWR Bulletin 118 defines the conjunctive operation of a groundwater basin as the "...operation of a groundwater basin in coordination with a surface water reservoir system. The basin is intentionally recharged in years of above average precipitation so groundwater can be extracted in years of below average precipitation when surface water supplies are below normal." Operation of a conjunctive use program requires the following features, all of which are present in the MGWB:

- a source of surface water during years with above normal precipitation and streamflow;
- conveyance facilities to import water;
- recharge facilities;
- usable storage capacity in the aquifer;
- extraction facilities; and
- distribution facilities for surface water and groundwater.

Conjunctive use of groundwater and surface water in a basin typically occurs when the surface water supply to the basin varies from year to year and basin water demand is relatively constant. In some years, the surface water supply is greater than the basin water demand; in other years, the surface water supply is less than the basin water demand. In the years of plentiful supply, surface water is utilized to recharge the groundwater aquifer. Recharge can occur either directly by surface recharge or injection well or by using surface water in-lieu of

groundwater when it is available. In effect, the groundwater basin is utilized as a storage reservoir and water is placed in the reservoir during wet years and withdrawn from the reservoir in dry years. This description (i.e. in-lieu recharge) generally portrays conditions in the MGWB.

In the MID portion of the MGWB, groundwater and surface water have historically been used conjunctively on an intentional but informal basis. For example, in view of the important part that canal seepage plays in recharging the MGWB aquifers, MID has elected not to line the vast majority of its canal system. Additionally, MID has implemented the in-lieu recharge project described previously. However, there has been no formalized plan for artificial recharge nor have recharge or extracted volumes been systematically inventoried.

During 2006, MID conducted a pilot recharge test of a small recharge basin north of Winton (Section 4.3). The results of this pilot test were promising, and this facility has been identified as a potential recharge project by MAGPI. Another potential recharge area has been identified in the El Nido area (Section 3.3.2). This area has been identified as a potential pilot recharge test project by MAGPI. MAGPI also intends to pursue cooperative arrangements with State and local agencies for the purpose of expanding the MGWB's conjunctive use capabilities.

6.9 ELEMENT 9 – WELL CONSTRUCTION

Improperly constructed wells can result in poor yields and may contribute to groundwater contamination by creating pathways for pollutants to enter the aquifer from surface drainage or by causing mixing of waters between aquifers of differing quality. CWC Sections 13700 through 13806 require proper construction of wells. DWR bulletins 74-81 and 74-90 specify minimum well construction standards that are adopted by local permitting authorities.

The Cities and County within the MGWB are responsible for adopting and enforcing well construction standards. Merced County and the City of Merced have adopted standards that are more strict than the minimum DWR standards. Permits are required from the applicable County and/or City for construction of a new well or to modify an existing well within their jurisdictions (See Elements 2 and 4). Well Driller's Reports must be filed with the DWR and Merced County. MCDEH is responsible for enforcing standards for construction and destruction of wells and for issuing drinking water permits for small public water systems; therefore, they maintains records on wells and groundwater. Since 1988, MCDEH has required at all new domestic wells be tested for bacteria, DBCP, EDB, and general minerals prior to issuing a use permit for the well.

The MAGPI participating agencies can augment efforts by the County and Cities by providing information on water levels and groundwater quality. These data can be used to identify

locations susceptible to intermingling of aquifer zones of varying water quality and to establish specifications for well construction and destruction to optimize well water quality and minimize mixing of water in these zones.

6.10 ELEMENT 10 – CONSTRUCTION AND OPERATION OF RECHARGE, STORAGE, CONSERVATION, WATER RECYCLING, AND EXTRACTION PROJECTS

MAGPI member agencies share the responsibility for development and operation of recharge, storage, conservation, water recycling, and extraction processes. The role of MAGPI is to promote cooperation and sharing of information among the agencies sponsoring water management projects and other member agencies. To the extent feasible, MAGPI will also support measures to coordinate development and optimize operation of facilities to improve basin-wide effectiveness and efficiency of water management. Participating agencies will take the following actions:

- Encourage sharing of information on project planning, design, and operation among member agencies.
- Promote a coordinated approach toward development and operation to lower costs and increase benefits of water management efforts.
- Identify and promote projects and programs that will contribute to water conservation, recycling, storage, and recharge within the MGWB.

In the future, MAGPI intends to form a joint powers authority (JPA) and undertake a significant recharge project as outlined in the 1995 and 2000 Merced Water Supply Plans. Potential projects to contribute to water conservation, recycling, storage, and groundwater recharge could include:

- using use non-potable surface water (secondary water) for in-lieu of potable groundwater to irrigate public lands;
- using reclaimed wastewater for agricultural or landscape irrigation purposes, taking care to not adversely impact recharge areas;
- expanding surface water distribution facilities to increase the use of surface water in areas not currently serviced;
- constructing recharge facilities in areas of long-term groundwater decline (i.e. Cressey Basin and El Nido area);
- adding wetland buffer zones around drainages and recharges areas to promote infiltration rather than run-off; and
- constructing additional surface water storage facilities to increase surface water availability.

6.11 ELEMENT 11 – DEVELOPMENT OF RELATIONSHIPS WITH LOCAL, STATE, AND FEDERAL AGENCIES

Each MAGPI participant recognizes the benefit of close coordination between their efforts and work performed by various local, state, and federal agencies to monitor and protect groundwater in the MGWB. Some of these agencies include the DTSC, DWR, RWQCB, MCDEH, EPA, and USGS. The role that each of these agencies plays in the MGWB is described below.

- DTSC – under California EPA, is responsible for regulating hazardous waste facilities and overseeing cleanup of hazardous waste site in California. This includes oversight of the cleanup of contaminated soils, surface water, and groundwater.
- DWR – is responsible for managing the water resources of California in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments. Also to develop and assess strategies for managing the State's water resources, including supporting local planning and integrated regional water management through technical and financial assistance.
- RWQCB, under the SWRCB, has a responsibility to protect the waters of the state by reviewing projects and issuing waste discharge permits, as necessary, for disposal activities that threaten both surface and groundwater supplies. They are also responsible for oversight of the cleanup of contaminated water.
- MCDEH monitors the installation and destruction of wells to protect the groundwater from degradation caused by improper procedures. They also oversee the cleanup of contamination from leaking underground storage tanks.
- Federal regulations for the protection of groundwater are developed through the EPA, which looks to the states for implementation. The USGS provides technical studies and reports and maintains a database of surface and groundwater quality.

It is important for MAGPI agencies to establish and maintain an effective working relationship with local, state, and federal agencies. The CWC requires local agencies implementing an AB 3030 GWMP within the same groundwater basin to meet annually to coordinate groundwater management activities. MAGPI meets on a semi-annual basis to discuss the status of the MGWB and review implementation of the groundwater management plan.

6.12 ELEMENT 12 – REVIEW OF LAND USE PLANS AND COORDINATION WITH LAND USE PLANNING AGENCIES

In California, land use planning decisions are generally made by City or County government agencies, special districts (i.e. school districts, UC Merced, MID, etc.). Each MAGPI participating agency should review proposed development plans and associated environmental documentation to assess the potential groundwater impacts of land use

changes. Planning departments should refer development proposals to MCDEH for direction on potential impacts, studies, and mitigation. Each MAGPI participating agency should review initial studies, proposed negative declarations, draft environmental impact reports, and provide comments as appropriate to ensure that potential threats to groundwater can be addressed and avoided. In cases where the proposed land use involves disposal of wastes, storage of hazardous materials, or handling of petroleum products, solvents, or chemicals such as pesticides and fertilizers, each participating agency should coordinate with the appropriate state regulatory agencies to ensure that compliance with regulations for containment and disposal of wastes is obtained. During periodic land use plan preparation and updates, the county and cities in the MGWB should consult with the appropriate participating agency to avail themselves of the latest information on groundwater conditions that may be affected by the proposed activities, so that necessary mitigation measures can be included in the plans.

6.13 ELEMENT 13 – MERCED GROUNDWATER BASIN GROUNDWATER MONITORING PROGRAM

A GWMP should be capable of assessing the status of the basin and responses in the basin to future management activities. The groundwater monitoring program for the MGWB will consist of measuring groundwater levels and collecting groundwater quality data from selected wells within the MGWB on a consistent basis using the same protocols.

As previously mentioned, the groundwater levels in water supply and monitoring wells have been measured by DWR, MID, and other entities since the 1950s. To simplify evaluation of the groundwater level within the MGWB, MAGPI proposes to monitor groundwater levels in a select group of wells that are located relatively uniformly throughout the MGWB. Groundwater levels in each well will be monitored at minimum each spring and each fall during a short time period using a standard protocol. It is MAGPI's intent that these wells will be maintained as a consistent long-term network that represents overall groundwater elevation conditions in the MGWB. The approximate well locations for the proposed network are shown on Figure 35.

MAGPI has applied for grants to install pressure transducers and automated data logging equipment in approximately 40 monitoring wells (i.e. the proposed monitoring well network). The purpose of these data loggers is to allow for the continuous monitoring of water levels in the selected wells on an hourly basis so that the dynamic hydraulics of the basin can be evaluated and to provide a contemporaneous record of water levels for mapping purposes. The monitoring data may also be used to help calibrate a proposed IGSM model of the MGWB.

MID, the City of Merced, MCDEH, small water distribution systems, and mutual water companies public supply wells are monitored as required by the California Department of Public Health (DPH) under California Code of Regulations Title 22 (which includes organic

compounds, inorganic compounds, metals, microbial, and radiological analytes). The MCDEH has also monitored 18 domestic wells within Merced County (9 well within the MGWB) for general minerals, inorganics, DBCP, and EDB since 1988. These comprehensive programs will be supplemented with groundwater quality data collected from up to 20 selected water supply (i.e. agricultural) wells that are not already part of these programs. Groundwater samples will be collected on a 5-year frequency and analyzed for agricultural suitability including general minerals, nitrate, and arsenic. These data will be used to evaluate the groundwater geochemistry and monitor long-term changes in groundwater quality.

Water level and quality data collected by the various member agencies as part of the groundwater monitoring program will be uploaded into a centralized repository for storage and analysis. Data will also be uploaded in to the DWR integrated water resources information system (IWRIS). Data will be made available to member agencies and the public using an internet website including the links to the DWR IWRIS.

Subsidence is not known to be occurring in the MGWB at this time. MAGPI will seek funding to evaluate subsidence in the MGWB in the future.

6.14 ELEMENT 14 – ADOPTION OF MONITORING PROTOCOLS

To improve the comparability, reliability, and accuracy of groundwater elevation data collected by MAGPI member agencies, the member agencies will adopt a standard protocol for collection of water level data. The protocol is presented in Appendix F. To collect comparable, reliable, and accurate groundwater quality data from agricultural wells to be sampled for general minerals and nitrate, a standard protocol will be used for collecting groundwater samples. The protocol is presented in Appendix F. The MGWB groundwater monitoring program described in Section 6.13 will be performed in accordance with these same protocols.

7.0 GROUNDWATER MANAGEMENT PLAN IMPLEMENTATION

The following sections discuss the implementation of the groundwater management plan and metrics to evaluate the effectiveness of the implementation. References are provided where appropriate.

7.1 INTEGRATION OF WATER RESOURCES MANAGEMENT ACTIVITIES

Integration of groundwater resources management activities was accomplished through the creation of MAGPI (see Section 2.2; Section 7.3).

7.2 REGIONAL PLANNING AND MANAGEMENT

Regional planning and management was accomplished through the preparation of the GWMP. Implementation of regional groundwater management planning within the MGWB began with the 1997 GWMP, which served as the initial framework for management of groundwater resources within the MGWB, and will continue with this update to the GWMP. Other regional planning and management activities completed include the:

- 2003 Water Management Plan,
- 2005 Merced Water Supply Plan Update, and
- 2005 City of Merced Urban Water Management Plan

7.3 FORMATION OF A REGIONAL MANAGEMENT GROUP

MAGPI acts as the regional management planning group and its responsibilities are to:

- coordinate public awareness and participation in groundwater management planning,
- provide interagency coordination,
- develop regional priorities,
- assure that the BMOs are pursued in a reasonable and timely manner,
- prepare and assure the accuracy of an annual report associated with GWMP implementation,
- evaluate and modify the GWMP as needed to address issues within the MGWB,
- update the GWMP as necessary based on the state of the basin or to reflect changes in State law or in local conditions/programs, and
- coordinate with the storm water monitoring group.

MAGPI will meet at least semi-annually, at which time it will review the report on the status of the basin, review progress made to meet the basin management goals and objectives, discuss any work planned for the upcoming year, and consider any proposed amendments to the GWMP. It will be the responsibility of individual MAGPI members to complete activities or projects within their jurisdictions. Implementation of the GWMP does not preclude any agency from pursuing programs or projects related to groundwater management either independently or in cooperation with other agencies. In the future, MAGPI should form a JPA to facilitate regional planning and management of water resources within the MGWB.

7.4 PUBLIC INVOLVEMENT

MAGPI has developed a website (<http://magpi-gw.org>) to disseminate information about MAGPI and MAGPI activities. The website provides the public with access to MAGPI governing board meeting agendas and minutes, and electronic copies of various public documents concerning water resources in the MGWB. MAGPI will hold public meetings to inform the public on the progress of the groundwater management plan. MAGPI will also form, as necessary, ad hoc committees of technical and interested public (like the GWMP TWG) to assist MAGPI in review and/or implementation of elements of the GWMP.

7.5 DEVELOPMENT OF LOCAL, REGIONAL, AND STATEWIDE PRIORITIES

Local Priorities

Development of local priorities is the responsibility of each agency participating in the GWMP; however, the overriding local priority for implementation of the GWMP is satisfying regional and local water management objectives as identified in the BMOs. Through their involvement in MAGPI and the adoption of the BMP, participating agencies have demonstrated their conviction that the most effective approach to local water management is through regional actions.

Regional Priorities

The GWMP is an effort that recognizes that the most effective approach to managing the resources of the MGWB is an integrated plan that enlists the cooperation of the agencies whose political boundaries match the physical boundaries of the basin. The GWMP includes a number of BMOs (Section 5.0) that have been agreed upon by the MAGPI member agencies to promote wise management of regional groundwater resources.

Statewide Priorities

Implementation of the GWMP will enable MAGPI member agencies to respond to a range of statewide water management initiatives. Completion and adoption of the GWMP will allow participating agencies to satisfy one of the key prerequisites for grant funding through Chapter 8 of Proposition 50, the Integrated Regional Water Management Grant Program. The GWMP also places specific groundwater and surface water management projects in the context of an integrated regional water management strategy, which leads to a more comprehensive management of water supplies in a framework for compliance with state and federal water quality standards. By promoting effective water use within the MGWB, implementation of the GWMP will:

- increase California's water supply reliability;
- reduce conflict among water users;

- contribute to meeting water quality objectives; and
- assist in the implementation of the RWQCB's Watershed Management Initiative.

7.6 GROUNDWATER MANAGEMENT PLAN IMPLEMENTATION REPORT

Periodically, MAGPI will prepare a GWMP implementation report which will summarize groundwater conditions within the MGWB, groundwater management activities; success in meeting the BMOs, and any proposed changes to plan components. This report will document conditions in the MGWB and GWMP activities completed since the previous update including a summary of:

- monitoring results, including historical trends;
- actual management actions;
- whether management actions are achieving progress in meeting management objectives, as supported by monitoring results;
- proposed management actions; and
- plan component changes, including addition or modification of management objectives.

7.7 PERIODIC EVALUATION OF GROUNDWATER MANAGEMENT PLAN

MAGPI will meet at least semi-annually, at which time it will review the status of the basin, review progress made to meet the basin management goals and objectives, discuss any work planned for the upcoming year, and consider any proposed amendments to the GWMP. The periodic evaluation of the GWMP will serve as a tool for MAGPI to organize its many activities to implement the plan, act as a driving force for plan implementation, and help interested parties understand the progress made by MAGPI in managing the groundwater resources of the MGWB.

8.0 REFERENCES

- California Department of Water Resources (DWR), 2003, San Joaquin Valley Groundwater Basin – Merced Subbasin, (updated February 27)
http://www.dpla2.water.ca.gov/publications/groundwater/bulletin118/basins/pdfs_desc/5-22.04.pdf
- Elliott, Ann L., 1984, Groundwater Conditions and Shallow Test-Well Information in the Eastern Half of Merced County, California 1967-82, U.S. Geological Survey Water-Resources Investigations (Report 83-4081), August, 1984.
- DWR, 1986, Crop Water Use in California, Bulletin 113-4 (DWR, 1896).
- DWR, 2003, California's Groundwater, Bulletin 118 – Update 2003 (DWR, 2003).
http://www.dpla2.water.ca.gov/publications/groundwater/bulletin118/Bulletin118_Entire.pdf
- MAGPI, December 1997, Merced Groundwater Basin, Groundwater Management Plan (GMP) (1997 GMP).
- McKnight, Tom L; Hess, Darrel (2000). "Climate Zones and Types: The Köppen System", *Physical Geography: A Landscape Appreciation*. Upper Saddle River, NJ: Prentice Hall, pp. 200-1. ISBN 0-13-020263-0
- Page, R.W., 1977, Appraisal of Ground-Water Conditions in Merced, California, and Vicinity: U.S. Open-File Report 77-454, 43 p.
- Page, R.W. and Balding, G.O., 1973, Geology and Quality of Water in the Modesto-Merced Area, San Joaquin Valley, California, with a Brief Section on Hydrology: U.S. Geological Survey Water-Resources Investigations 6-73, 85 p.
- http://www.dtsc.ca.gov/Success/upload/Castle_AFB.pdf
- <http://www.epa.gov/region09/waste/organics/symposium/naoko-watanabe.pdf>

TABLE 1

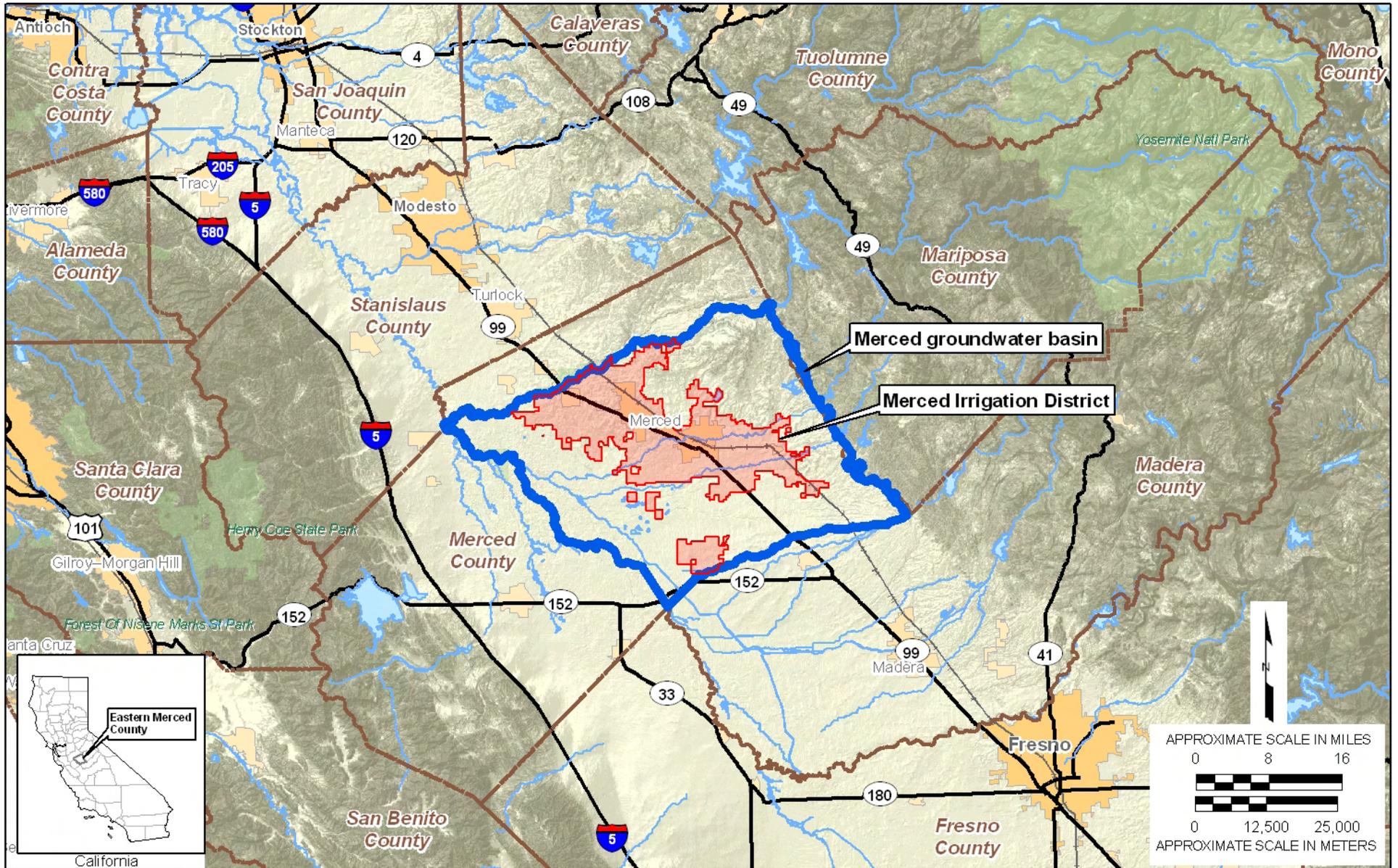
MERCED GROUNDWATER BASIN GROUNDWATER MANAGEMENT PLAN COMPONENTS REVIEW

| Item | Summary of Compliance Requirements | DWR Bulletin 118 Append C Line Item | Updated GMP Report Section | Notes |
|---|---|---|----------------------------------|---|
| A. California Water Code Section 10750 et seq., Required Components (SB1938) | | | | |
| 1 | Documentation of public involvement statement | 1 | 7.4 | |
| 2 | Basin Management Objectives (BMOs) | 6 | 5.0 | |
| 3 | Monitoring and management of groundwater elevations, groundwater quality, inelastic land surface subsidence, and changes in surface water flows and quality that directly affects groundwater levels or quality or are caused by pumping. | 7 | 6.7, 6.13 | |
| 4 | Plan to involve other agencies located within groundwater basin. | 2 | 2.2, 7.3 | |
| 5 | Adoption of monitoring protocols by basin stakeholders | 9 | 6.14 | |
| 6 | Map of groundwater basin showing area of agency subject to GMP, other local agency boundaries, and groundwater basin boundary as defined in DWR Bulletin 118. | 3 | 2.1, Figure 3 | |
| 7 | For agencies not overlying groundwater basins, preparation of GMP using appropriate geologic and hydrologic principles. | 14 | Not Applicable | Not applicable to the Merced Basin |
| B. California Department of Water Resources Suggested Components, Bulletin 118 | | | | |
| 1 | Management with guidance of advisory committee | 4 | 2.2, 7.3 | |
| 2 | Description of area to be managed under GMP | 5 | 2.1 | |
| 3 | Creation of link between BMOs and goals and actions of BMP | 8 | 5.0, Table 2 | |
| 4 | Description of GMP monitoring program | 10 | 6.7, 6.13 | Section 6.7 is still a little disjointed and the two sections don't coordinate all that well. |
| 5 | Description of integrated water management planning efforts | 11 | 2.2, 7.1, 7.3 | |
| 6 | Report on implementation of GMP | 12,13 | 2.2; 7.6 | |
| 7 | Periodic evaluation of GMP | 12,13 | 7.7 | |
| C. California Water Code Section 10750 et seq., Required Components (AB3030) | | | | |
| 1 | Control of saline water intrusion | | 6.1 | |
| 2 | Identification and management of wellhead protection areas and recharge areas. | | 6.2 | |
| 3 | Regulation of the migration of contaminated groundwater | | 6.3 | |
| 4 | Administration of well abandonment and well destruction programs | | 6.4 | |
| 5 | Mitigation of conditions of overdraft | | 6.5 | |
| 6 | Replenishment of groundwater extracted by water producers | | 6.6 | |
| 7 | Monitoring of groundwater levels and storage | | 6.7 | |
| 8 | Facilitating of conjunctive use operations | | 6.8 | |
| 9 | Identification of well construction policies | | 6.9 | |
| 10 | Construction and operation by local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects | | 6.10 | |
| 11 | Development of relationships with state and federal regulatory agencies | | 6.11 | |
| 12 | Review of land use plans and coordination with land use planning agencies to assess activities that create reasonable risk of groundwater contamination | | 6.12 | |
| D. Integrated Regional Planning (SB 1672) | | | | |
| 1 | Integration of water resource management activities | | 2.2, 7.1 | What exists vs. what is planned for future implementation hasn't been addressed. |
| 2 | Regional planning and management | | 2.2, 7.2 | |
| 3 | Formation of a regional management group | | 2.2, 7.3 | |
| 4 | Public involvement | | 7.4 | |
| 5 | Development of local, regional, and statewide priorities. | | 7.5 | |

TABLE 2
CORRELATION OF BASIN MANAGEMENT OBJECTIVES WITH ELEMENTS



| Groundwater Management Goal | Element 1 | Element 2 | Element 3 | Element 4 | Element 5 | Element 6 | Element 7 | Element 8 | Element 9 | Element 10 | Element 11 | Element 12 | Element 13 | Element 14 | Section 7.1 | Section 7.2 | Section 7.3 | Section 7.4 | Section 7.5 | Section 7.6 | Section 7.8 | |
|---|--------------------------------|---|---|--|-------------------------------------|---|---|---------------------------------------|-------------------|---|--|---|------------------------------------|----------------------------------|--|----------------------------------|--|--------------------|--|---------------------------|----------------------------|---|
| | Control Saline Water Intrusion | Identification and Management of Wellhead Protection Areas and Recharge Areas | Regulating Contaminant Migration in Groundwater | Administrative of Well Abandonment and Well Destruction Programs | Mitigation of Groundwater Overdraft | Replenishment of Groundwater Extracted by Producers | Monitoring and Controlling Groundwater Levels, Quality, and Storage | Facilitating Conjunctive Use Programs | Well Construction | Construction and Operation of Recharge, Storage, Conservation, Water Recycling, and Extraction Projects | Development of Relationships with Local, State, and Federal Agencies | Review of Land Use Plans and Coordination with Land Use Planning Agencies | MGB Groundwater Monitoring Program | Adoption of Monitoring Protocols | Integration of Water Resources Management Activities | Regional Planning and Management | Formation of a Regional Management Group | Public Involvement | Development of Local, Regional, and Statewide Priorities | GMP Implementation Report | Periodic Evaluation of GMP | |
| Goal 1 Protect and maintain groundwater quality with the MGB to meet current and future beneficial use. | X | X | X | X | | | X | | X | | | | X | X | | | | | | | | |
| BMO 1.1 - Evaluate and monitor the quality of the MGB's existing groundwater supplies. | X | | X | | | | X | | | | | | X | X | | | | | | | | |
| BMO 1.2 - Develop a high resolution numerical model of the groundwater supply in the MGB. | | | | | | | X | | | | | | | | | | | | | | | |
| Goal 2 Maintain groundwater quantities and eliminate conditions of long-term over draft in the MGB to ensure water supply reliability to meet current and future beneficial use. | | | | | X | X | X | X | | X | | | X | | | | | | | | | |
| BMO 2.1 - Determine the extent and evaluate the quantity of the MGB's existing groundwater supply. | | | | | | | X | | | | | | X | | | | | | | | | |
| BMO 2.2 - Determine the MGB's need for additional or improved water extraction, storage, conveyance, conservation, reuse, and intentional recharge facilities. | | X | | | X | X | | | | X | | | | | | | | | | | | |
| BMO 2.3 - Promote in-lieu recharge of groundwater through conjunctive use of surface water. | | | | | X | | | X | | X | | | | | | | | | | | | |
| BMO 2.4 - Avoid subsidence through monitoring and use of alternative water resources. | | | | | | | | | | | | | X | | | | | | | | | |
| Goal 3 Protect and maintain the beneficial use of groundwater recharge areas within the MGB. | | X | X | X | | | | | | | | | | | | | | | | | | |
| BMO 3.1 - Identify and evaluate natural recharge areas and potential intentional recharge areas within the MGB. | | X | | | | | | | | | | | | | | | | | | | | |
| BMO 3.2 - Seek to change regulations to promote recharge of excess surface water. | | X | | | | | | X | | X | | | | | | | | | | | | |
| Goal 4 Manage the MGB with local control. | | | | | | | | | | | | X | | | X | | X | | | | | |
| BMO 4.1 - Provide information and guidance for the management, preservation, protection, and enhancement of the MGB. | | | | | | | | | | | | | | | | | X | X | | | X | |
| BMO 4.2 - Provide a way to maintain local control of the region's groundwater resources. | | | | | | | | | | | | | | | X | X | X | | | | | |
| BMO 4.3 - Promote coordinated planning to make the best use of available water resources to meet the needs of the association's respective constituents and service territories in the mutual best interests of the inhabitants and resources of the MGB. | | | | | | | | | | X | X | | | | X | X | X | | | X | | X |
| BMO 4.4 - Periodically update the the groundwater plan for the MGB for review and adoption by the appropriate agency or agencies. | | | | | | | | | | | | | | | | | | | | | | X |

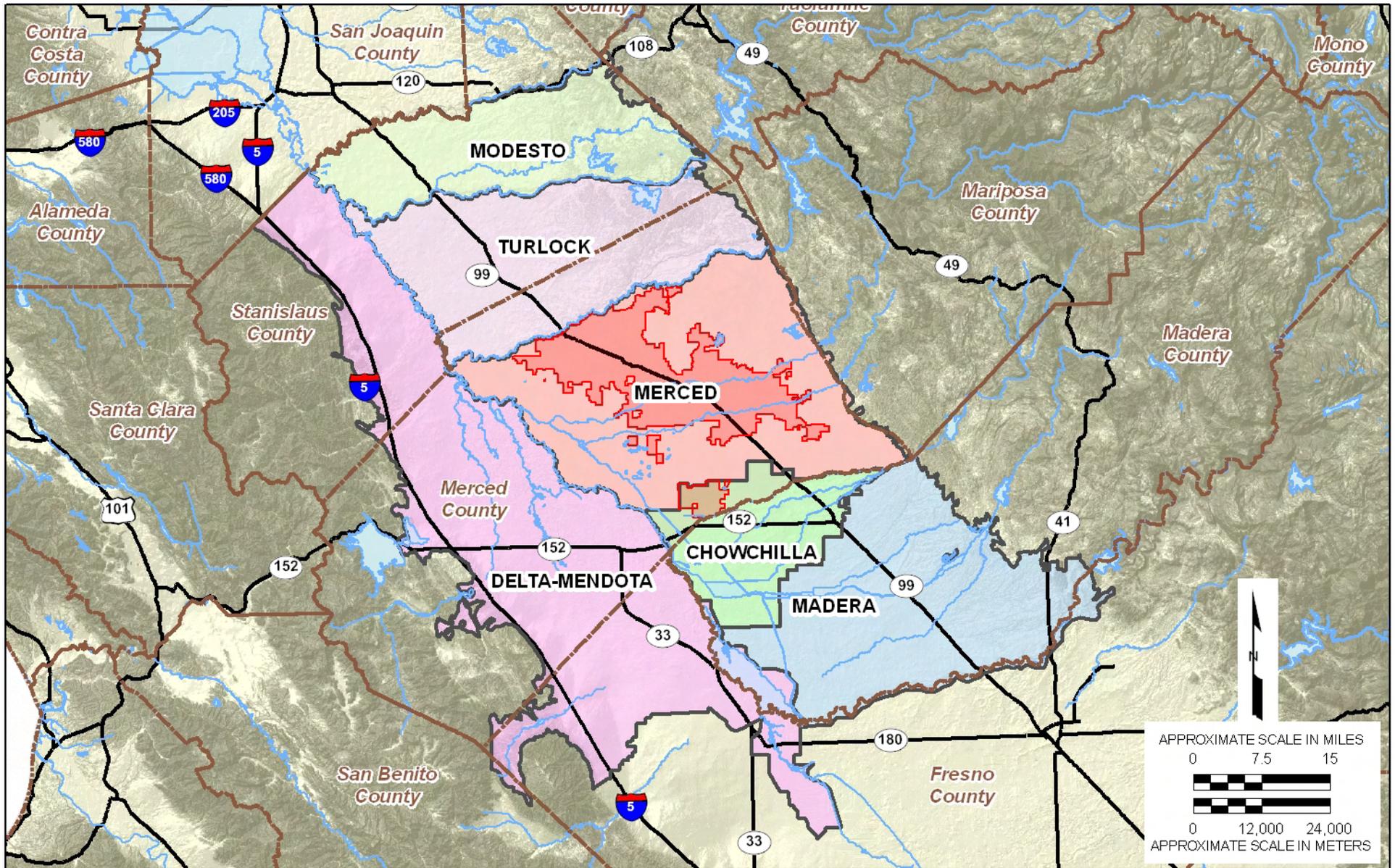


LOCATION MAP
Groundwater Management Plan Update
Merced, California

By: KLU Date: June 2008 Project No. 13651.000



Figure 1



GROUNDWATER BASINS - SAN JOAQUIN BASIN HYDROLOGIC STUDY AREA
Groundwater Management Plan Update
Merced, California

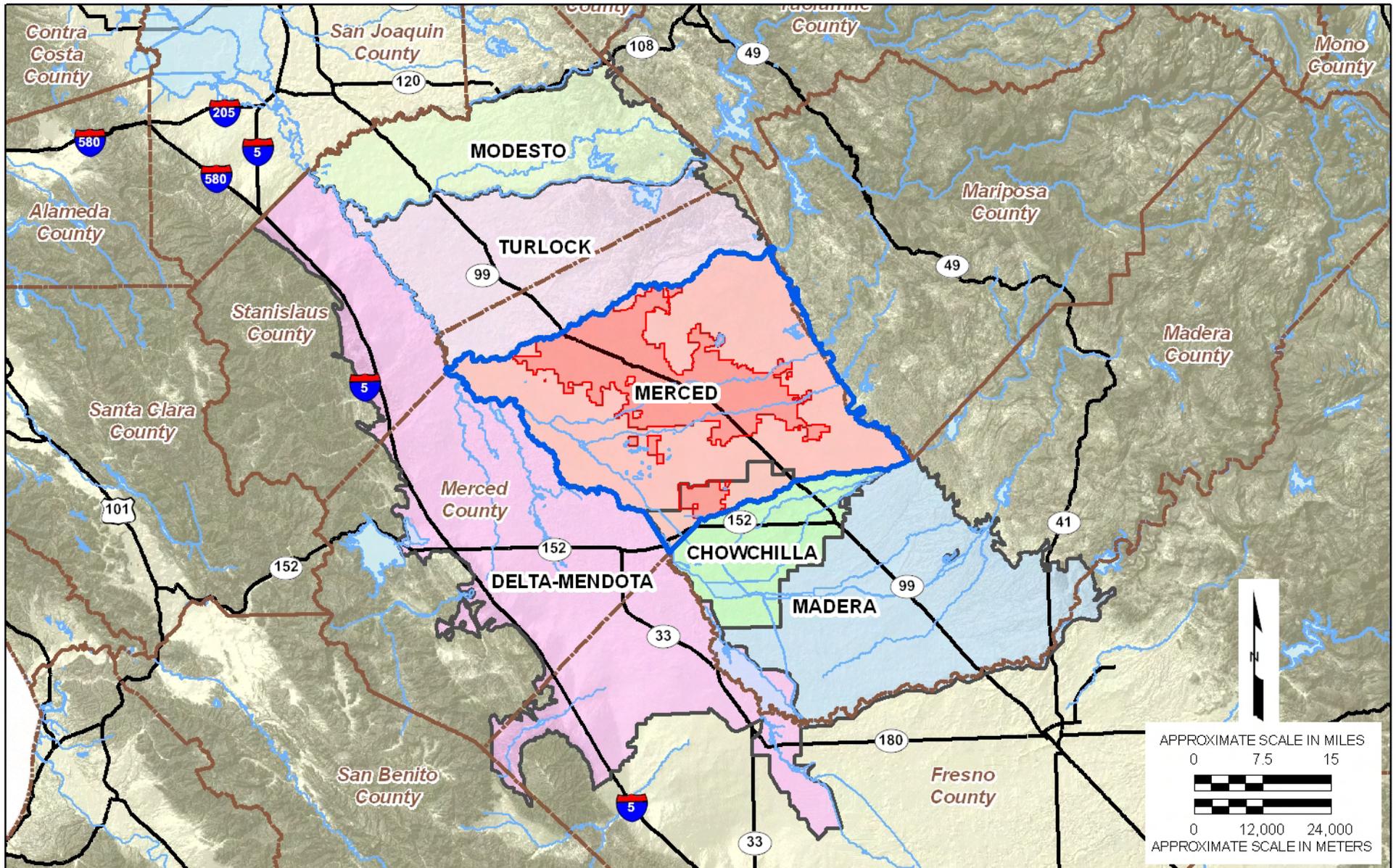
By: KLU

Date: June 2008

Project No. 13651.000



Figure 2



MODIFIED MERCED GROUNDWATER BASINS
SAN JOAQUIN BASIN HYDROLOGIC STUDY AREA
Groundwater Management Plan Update
Merced, California

By: KLU

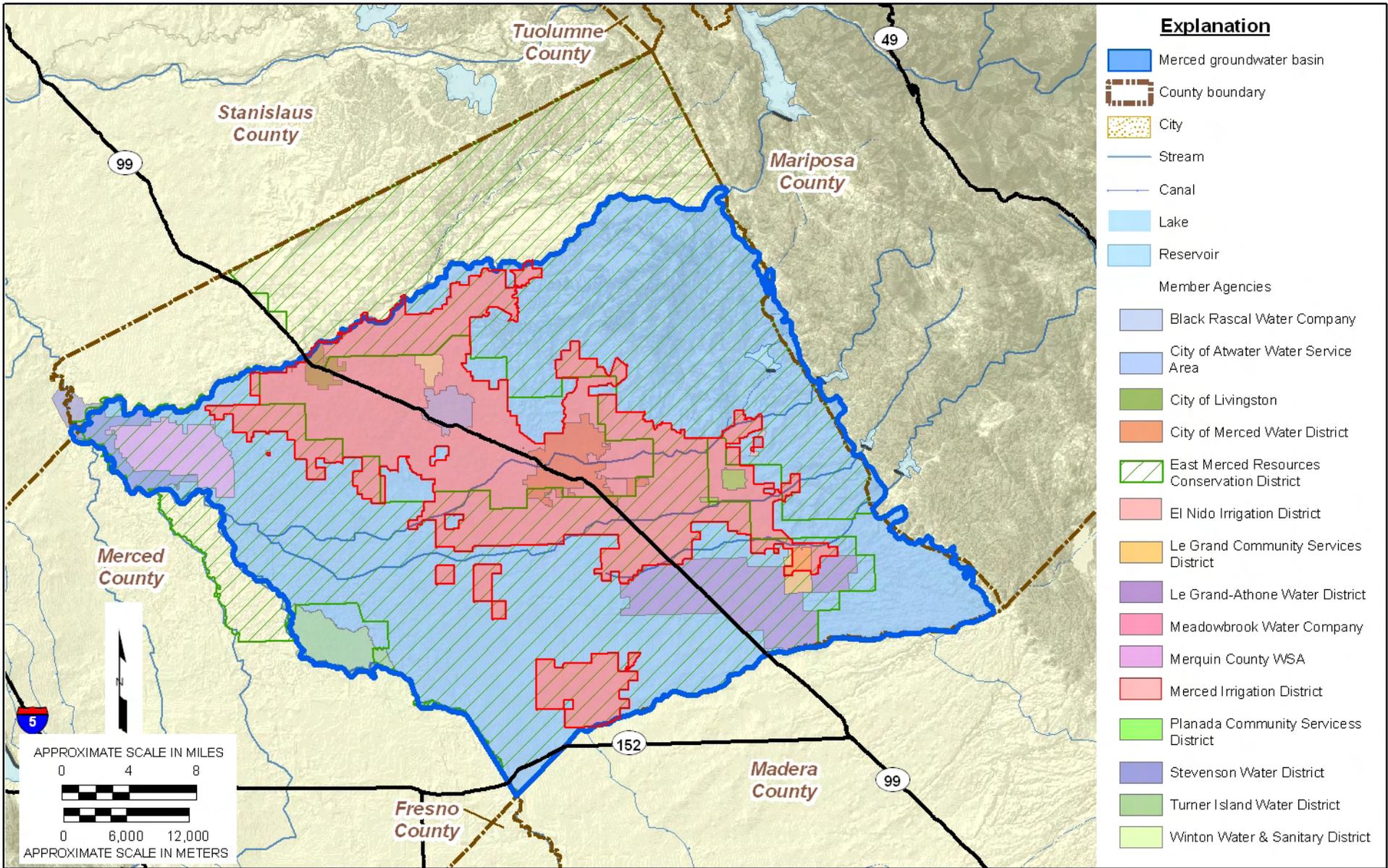
Date: June 2008

Project No. 13651.000



Geomatrix

Figure 3



MAGPI AGENCIES WITHIN THE MERCED GROUNDWATER BASIN
Groundwater Management Plan Update
Merced, California

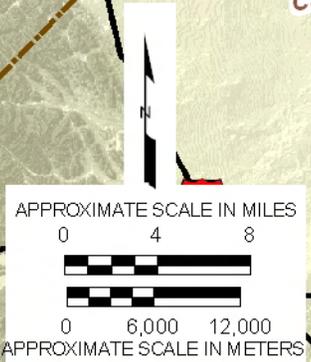
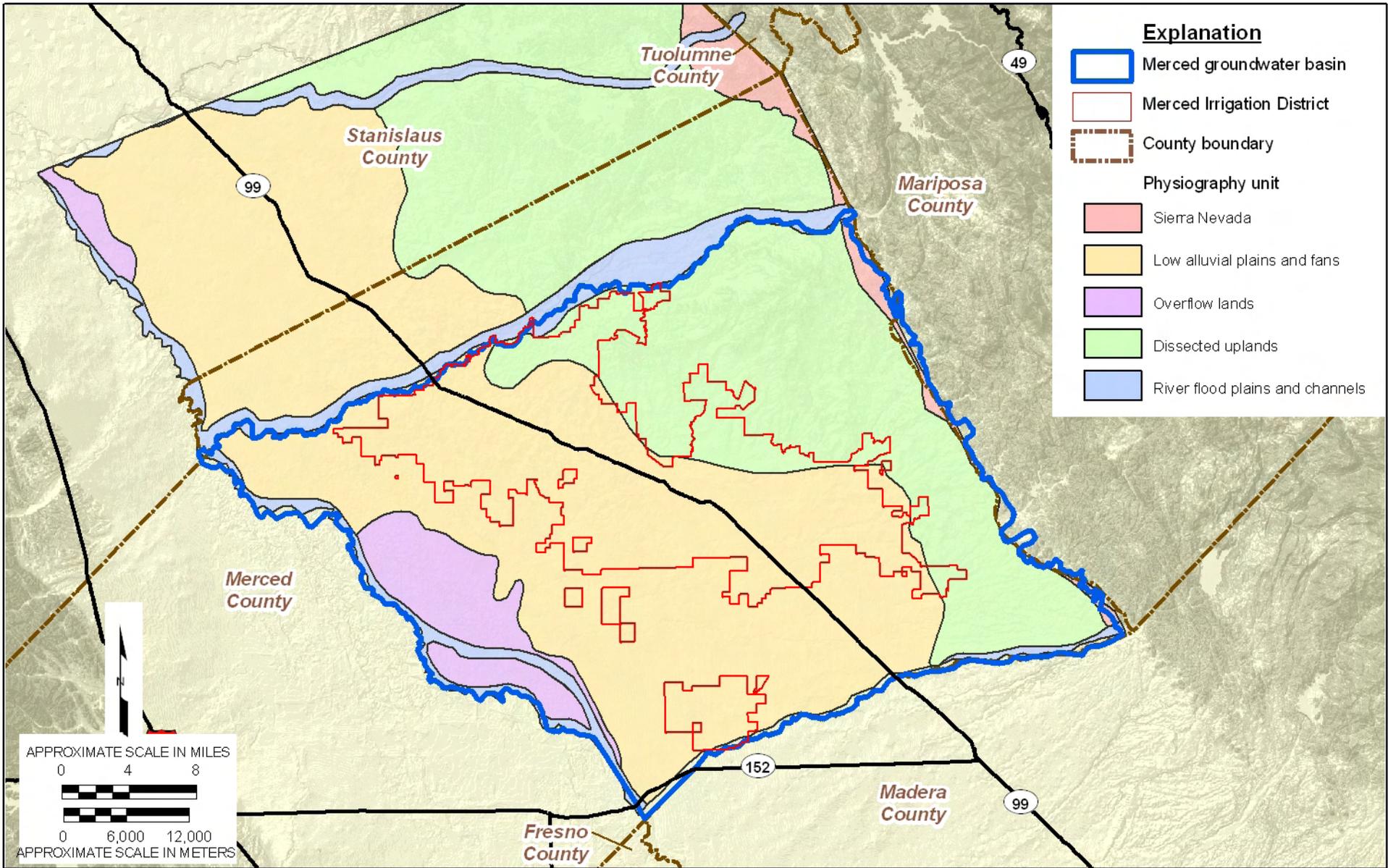
By: KLU

Date: June 2008

Project No. 13651.000



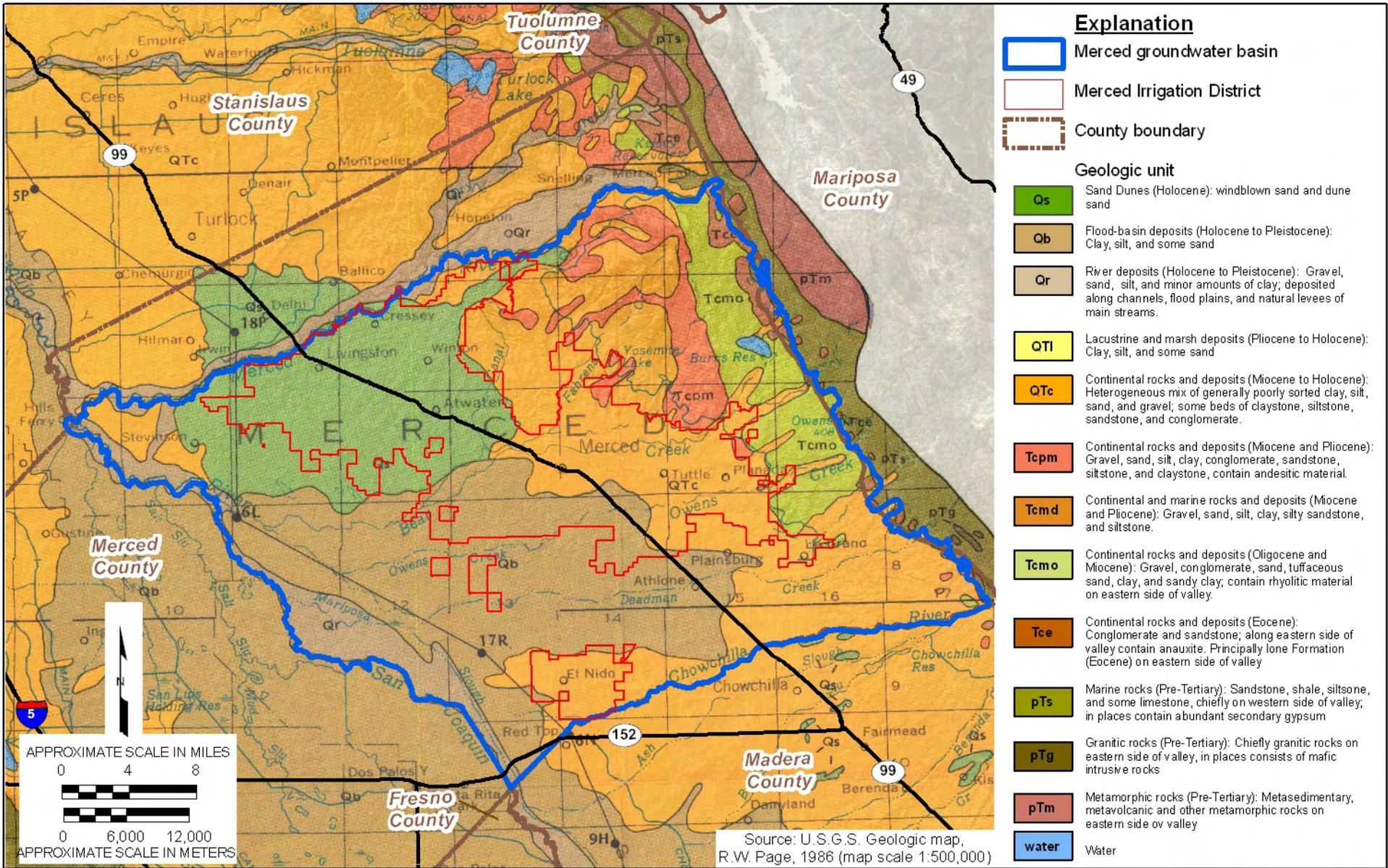
Figure 4



PHYSIOGRAPHIC UNITS WITHIN THE MERCED GROUNDWATER BASIN
Groundwater Management Plan Update
Merced, California

By: KLU Date: June 2008 Project No. 13651.000

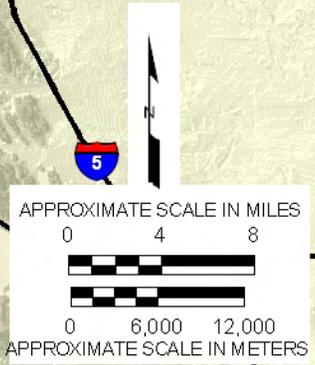
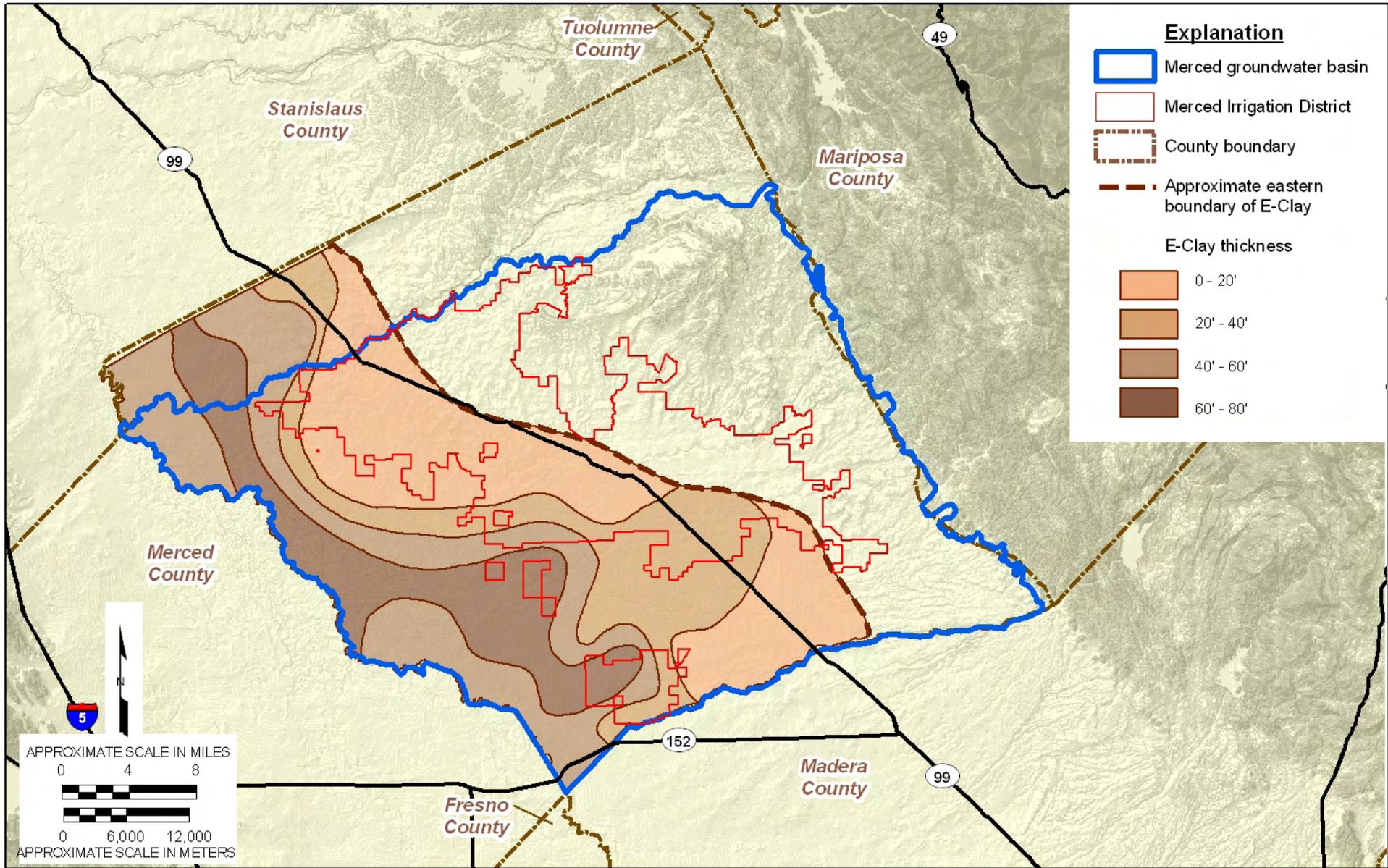




GENERALIZED GEOLOGY - MERCED GROUNDWATER BASIN
 Groundwater Management Plan Update
 Merced, California

By: KLU Date: June 2008 Project No. 13651.000

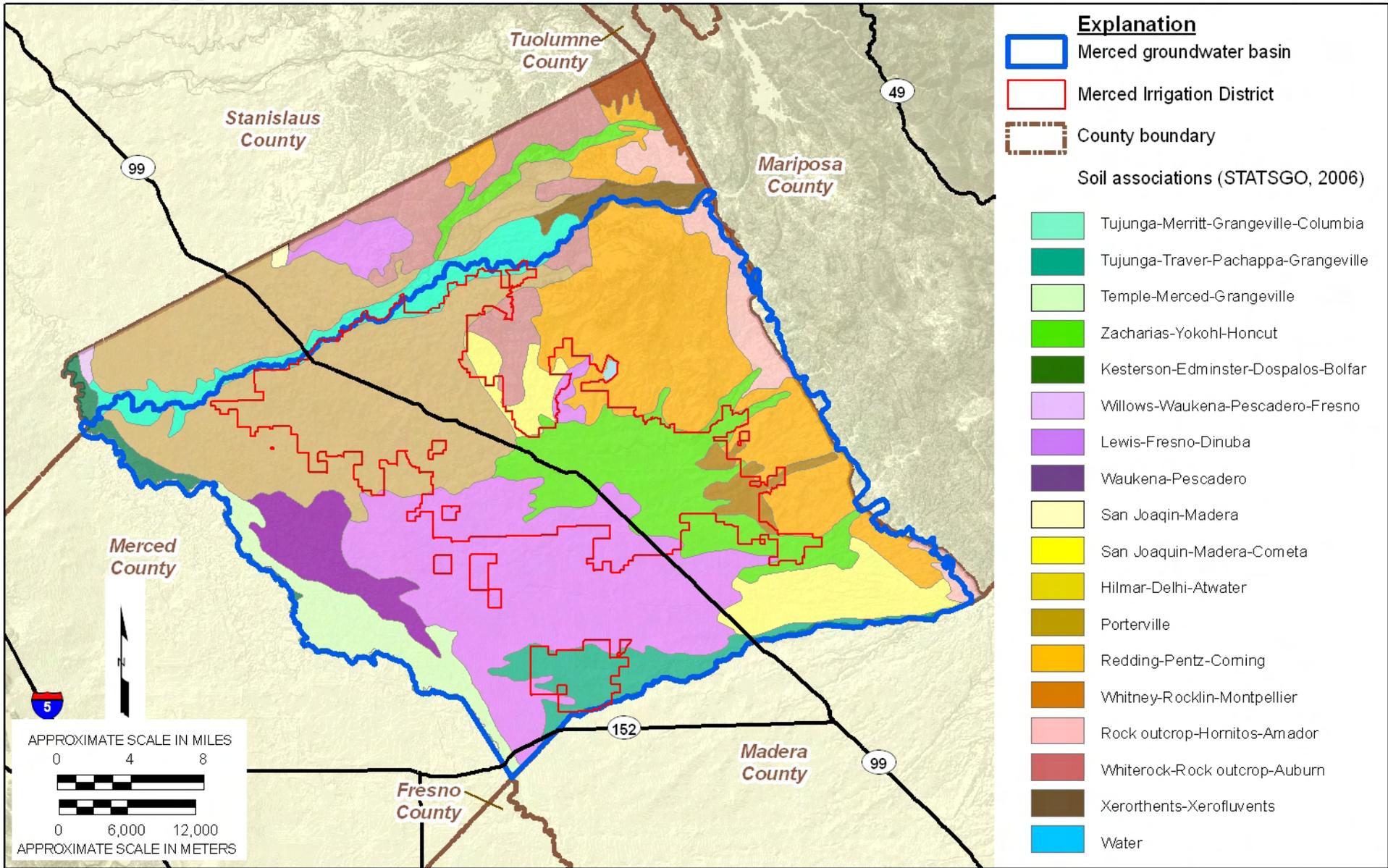




LATERAL EXTENT OF THE CORCORAN CLAY - MERCED GROUNDWATER BASIN
Groundwater Management Plan Update
Merced, California

By: KLU Date: June 2008 Project No. 13651.000





SOIL ASSOCIATIONS MAP - MERCED GROUNDWATER BASIN
Groundwater Management Plan Update
Merced, California

By: KLU

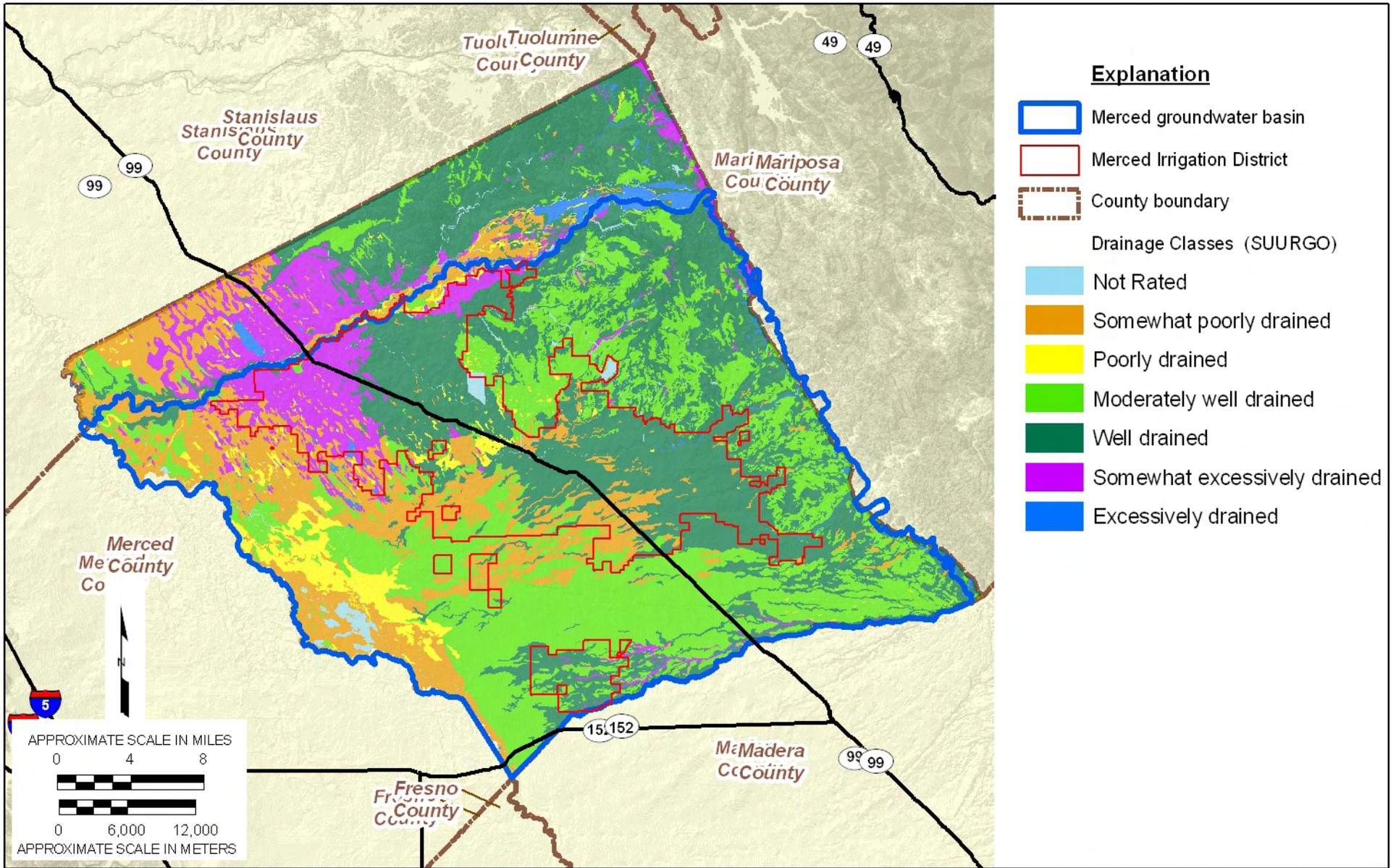
Date: June 2008

Project No. 13651.000

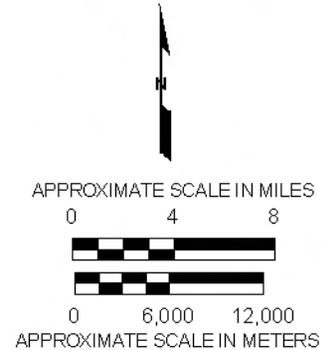
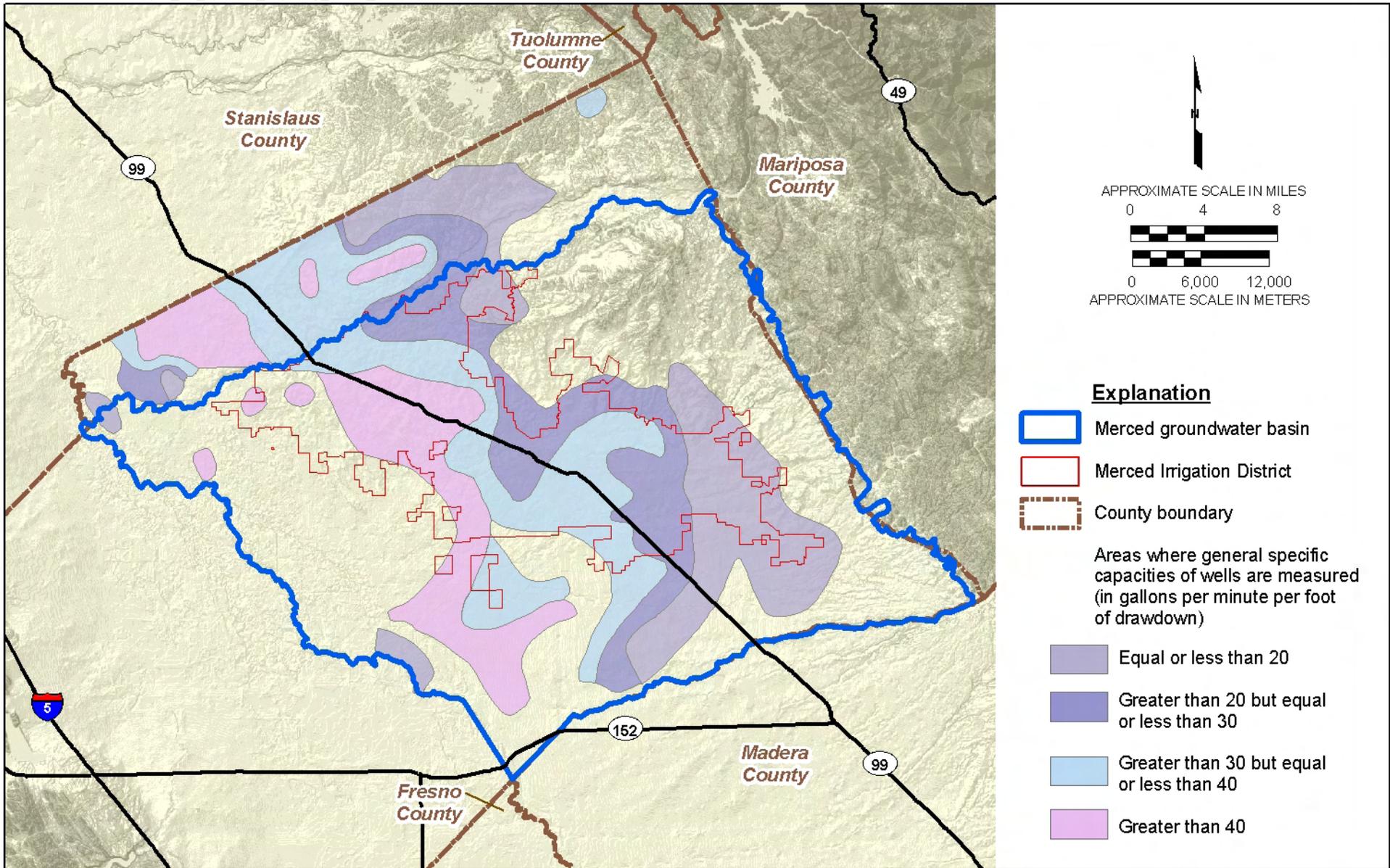


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Figure 8



ESTIMATED SOIL PERMEABILITY MAP - MERCED GROUNDWATER BASIN
 Groundwater Management Plan Update
 Merced, California



Explanation

-  Merced groundwater basin
-  Merced Irrigation District
-  County boundary

Areas where general specific capacities of wells are measured (in gallons per minute per foot of drawdown)

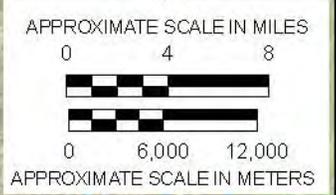
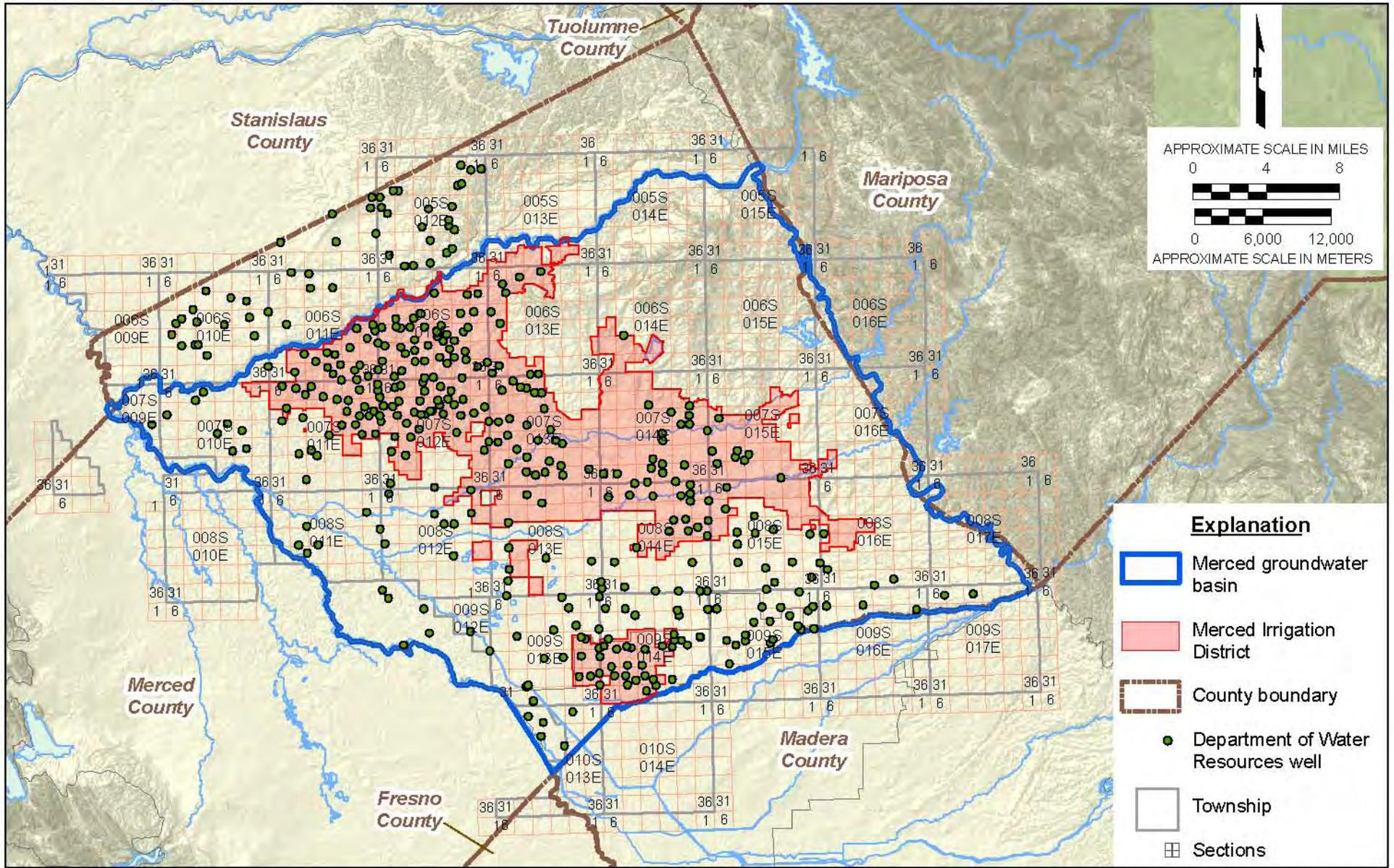
-  Equal or less than 20
-  Greater than 20 but equal or less than 30
-  Greater than 30 but equal or less than 40
-  Greater than 40

ESTIMATED DISTRIBUTION OF SPECIFIC CAPACITY - MERCED GROUNDWATER BASIN
 Groundwater Management Plan Update
 Merced, California

By: KLU Date: June 2008 Project No. 13651.000



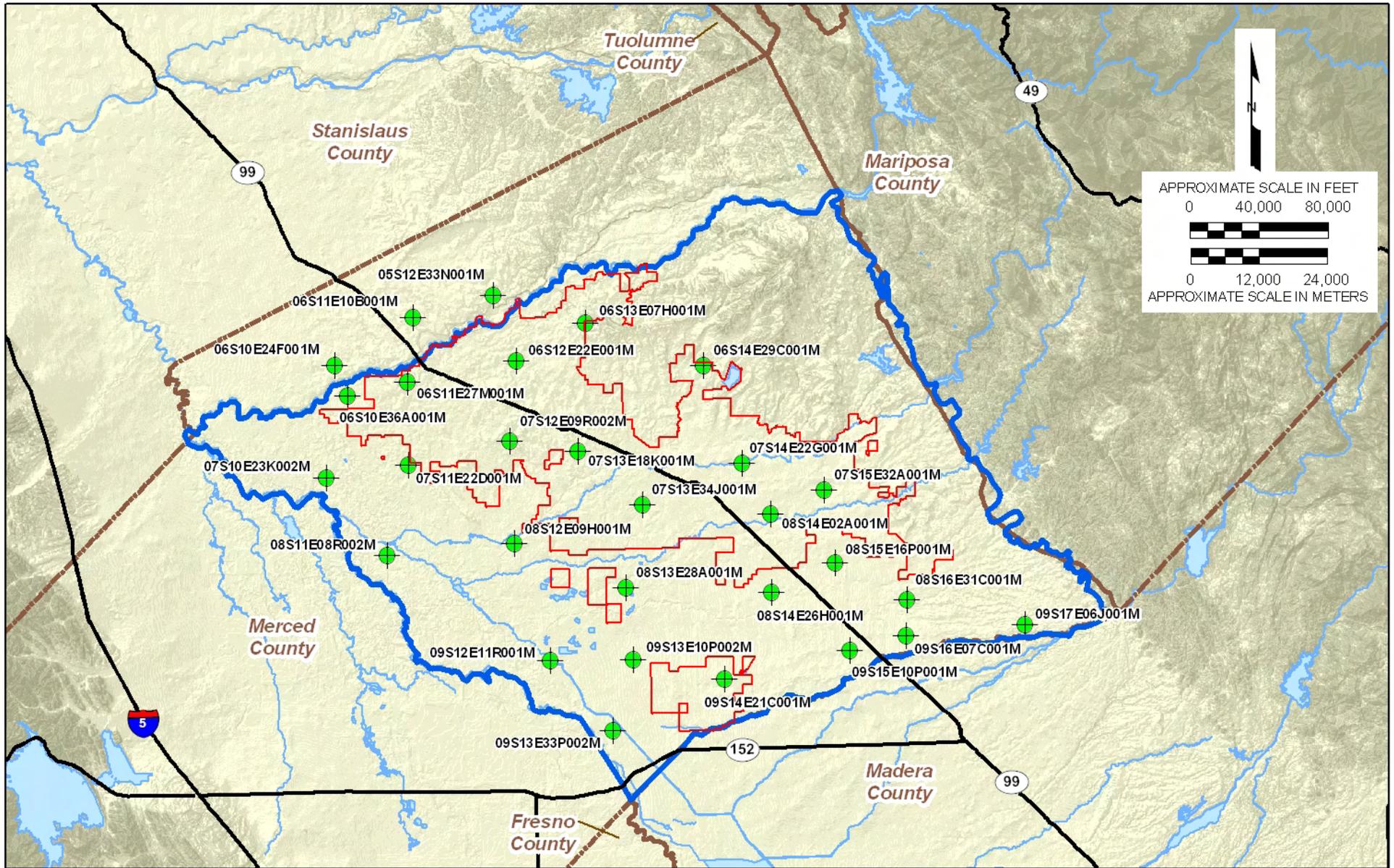
Figure 10



MONITORED WATER SUPPLY WELLS WITHIN THE MERCED GROUNDWATER BASIN
Merced Groundwater Basin
Merced, California

By: KLU Date: 04/14/2008 Project No. 13651.000



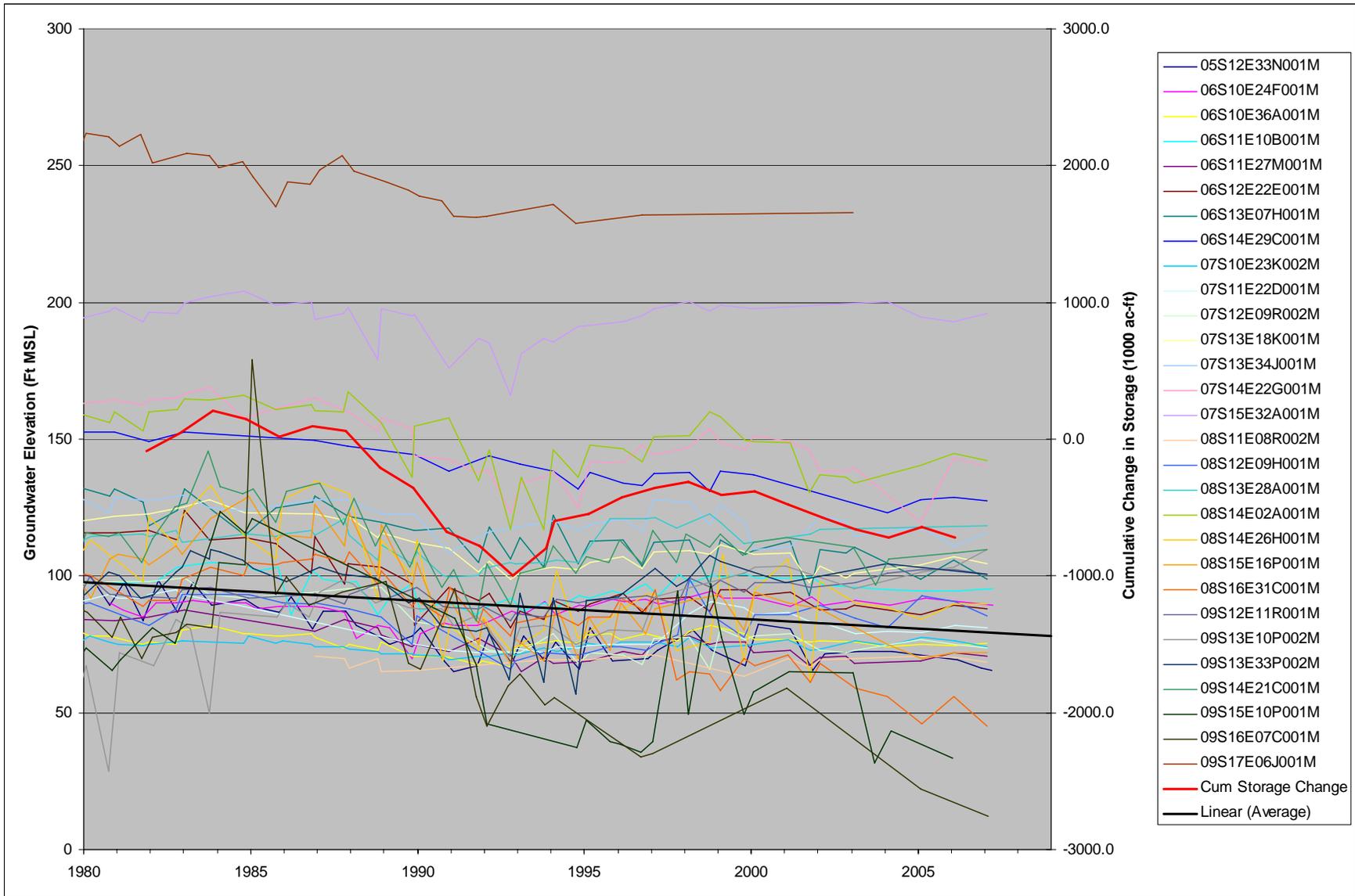


SELECTED WATER SUPPLY WELLS FOR LONG-TERM HYDROGRAPHS
 Groundwater Management Plan Update
 Merced, California

| | | |
|---------|-----------------|-----------------------|
| By: KLU | Date: June 2008 | Project No. 13651.000 |
|---------|-----------------|-----------------------|



Figure 12



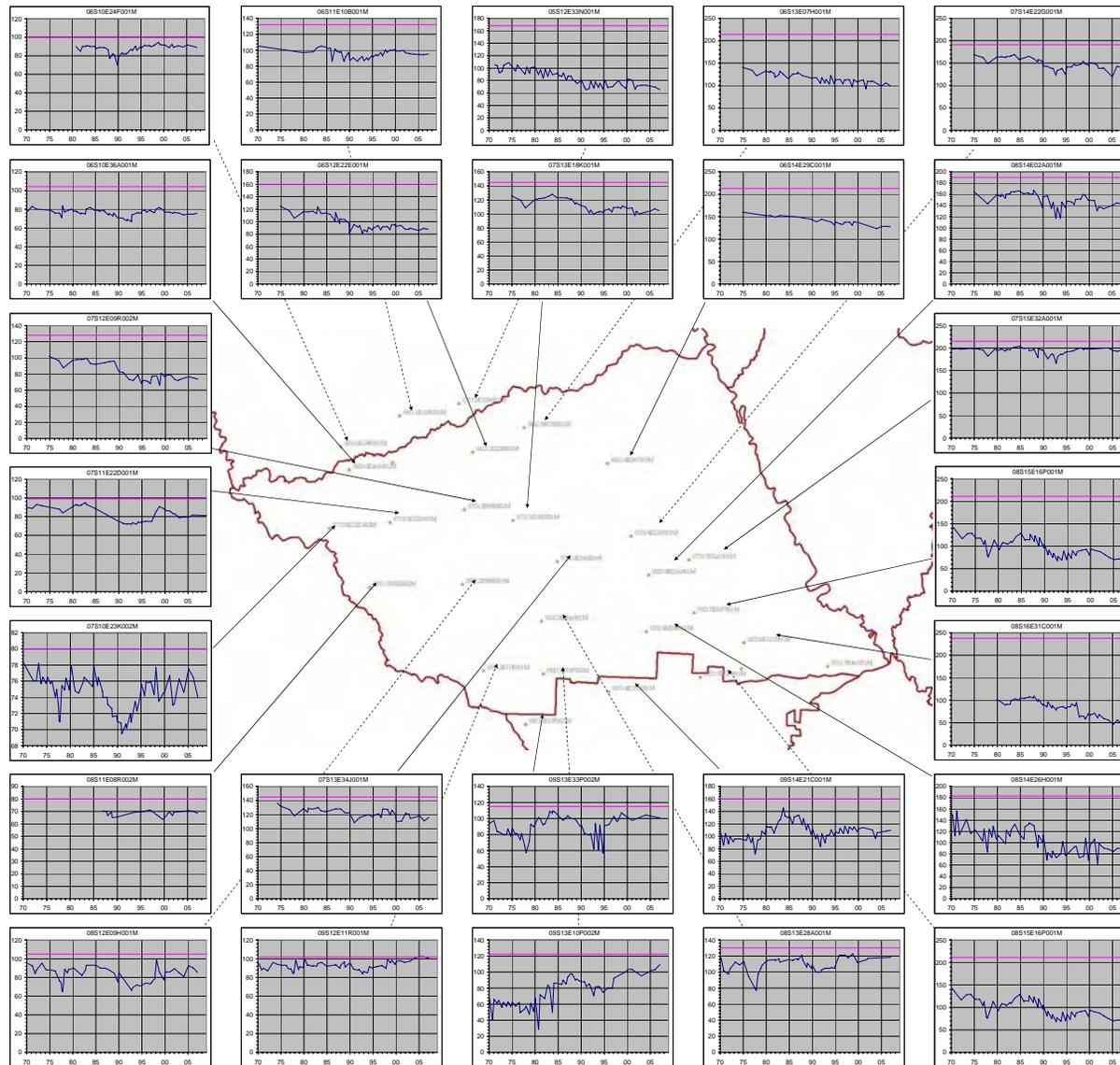
LONG-TERM HYDROGRAPHS IN SELECTED MONITORING WELLS
 MERCED GROUNDWATER BASIN
 Groundwater Management Plan Update
 Merced, California

By: dmb

Date: 5/27/08

Project No. 13651.000





Explanation

-  Ground Surface Elevation
-  Groundwater Elevation

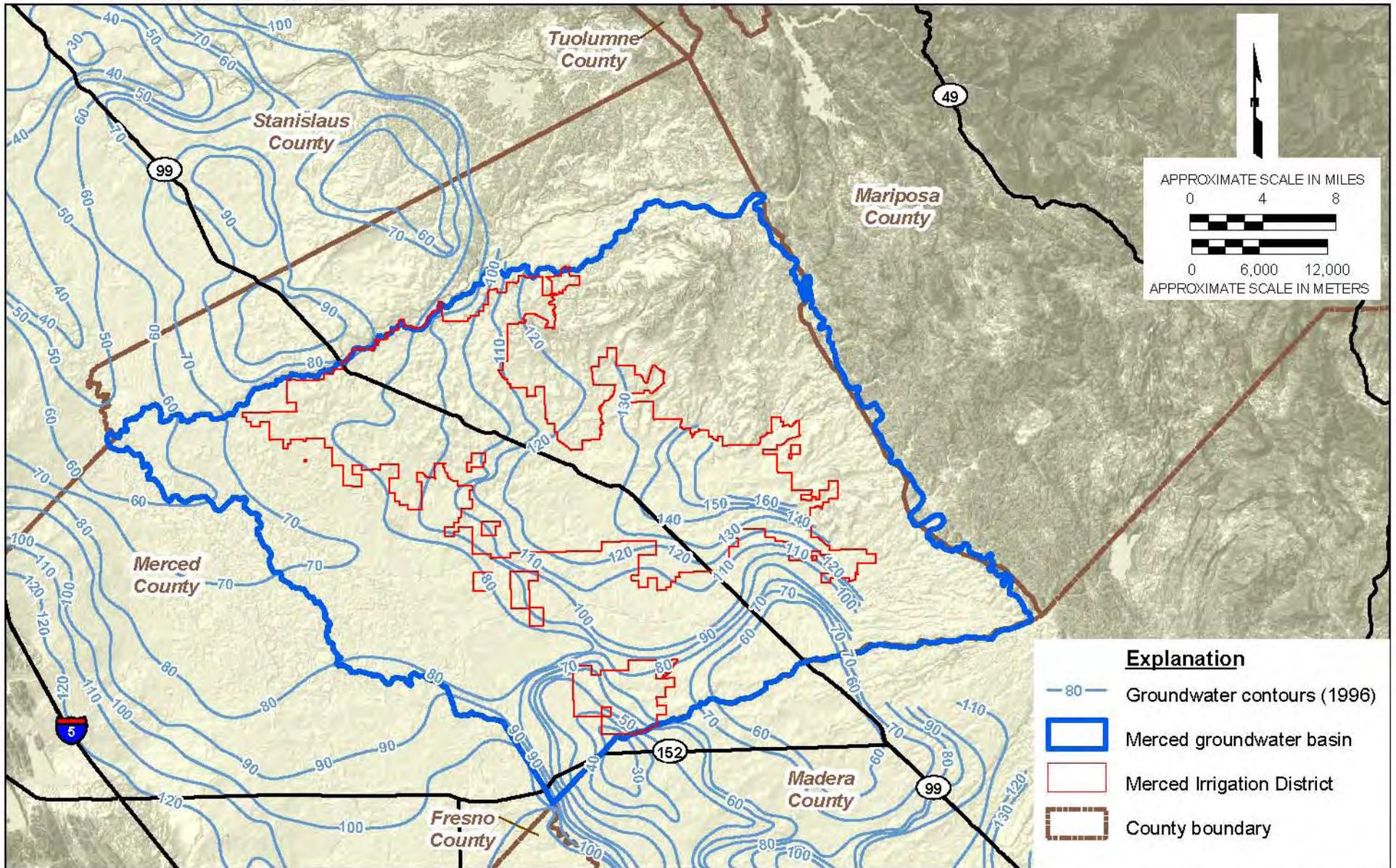
SPATIAL DISTRIBUTION OF LONG-TERM HYDROGRAPHS
MERCED GROUNDWATER BASIN
 Groundwater Management Plan Update
 Merced, California

By: dmb

Date: 5/27/08

Project No. 13651.000





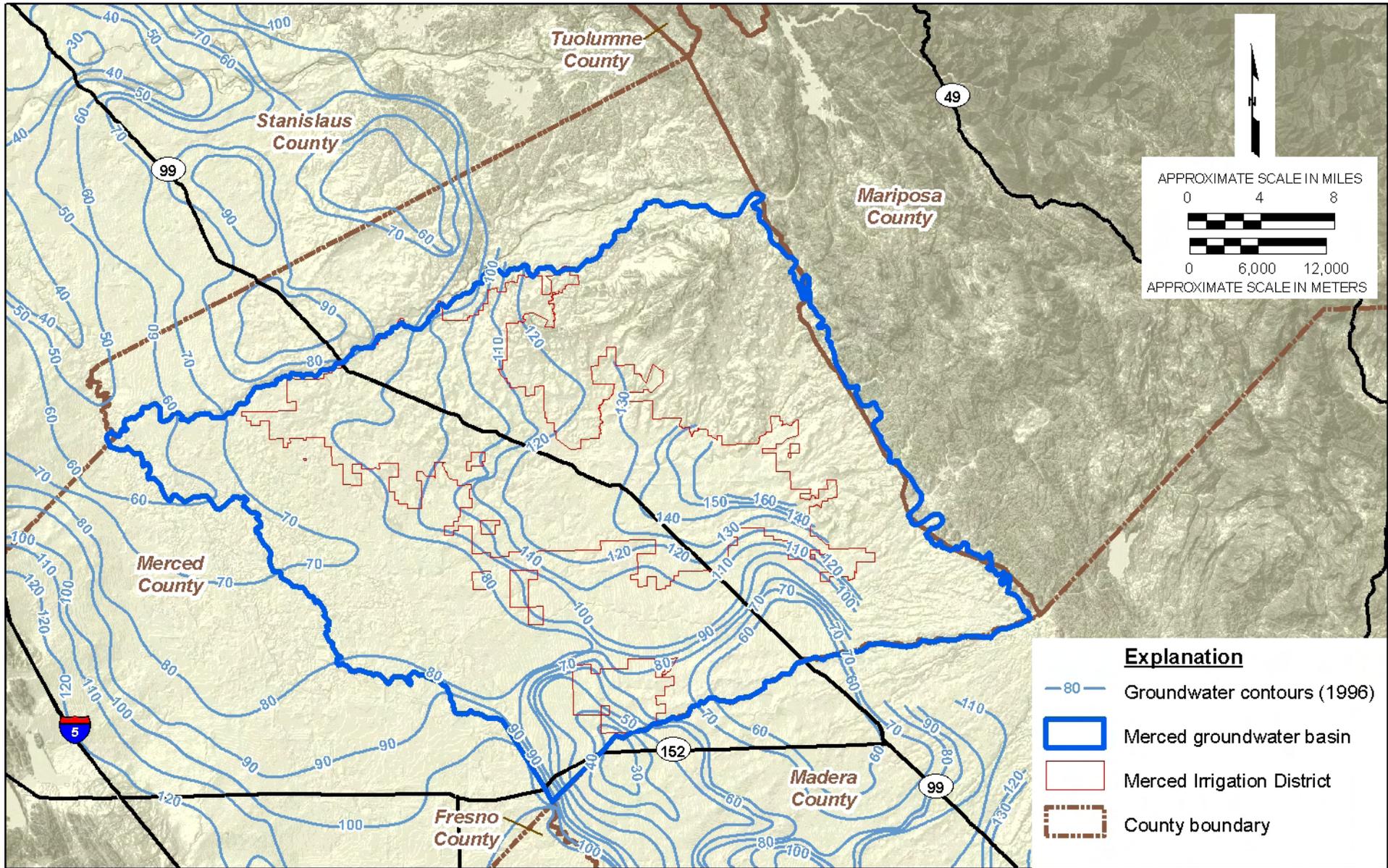
Explanation

- 80 — Groundwater contours (1996)
- Merced groundwater basin
- Merced Irrigation District
- County boundary

DWR 1996 POTENTIOMETRIC SURFACE MAP OF THE UNCONFINED AQUIFER
 Groundwater Management Plan Update
 Merced, California

| | | |
|---------|-----------------|-----------------------|
| By: KLU | Date: June 2008 | Project No. 13651.000 |
|---------|-----------------|-----------------------|





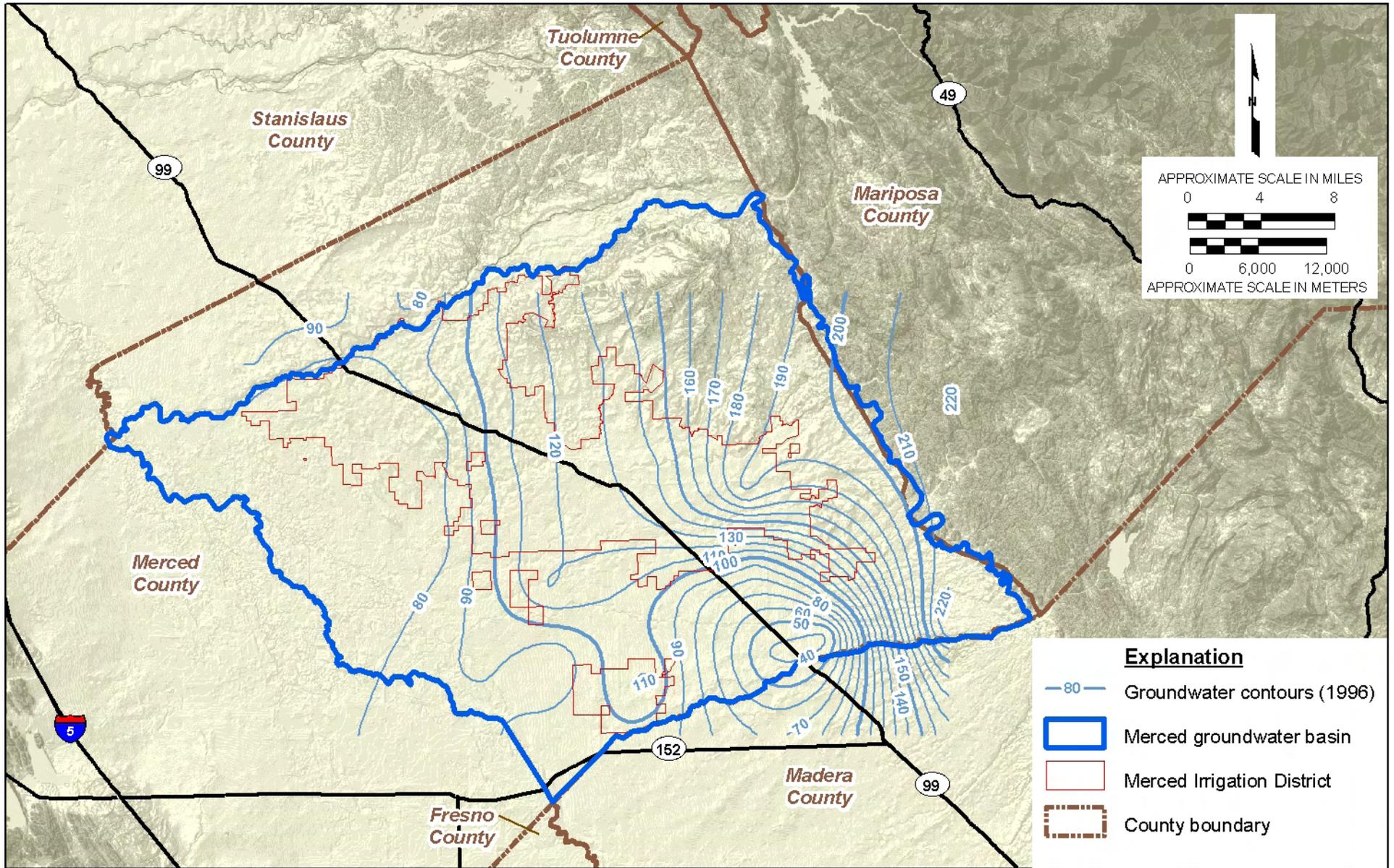
Explanation

- 80 — Groundwater contours (1996)
- Merced groundwater basin
- Merced Irrigation District
- County boundary

DWR 2006 POTENTIOMETRIC SURFACE MAP OF THE UNCONFINED AQUIFER
 Groundwater Management Plan Update
 Merced, California

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|---------|-----------------|-----------------------|
| By: KLU | Date: June 2008 | Project No. 13651.000 |
|---------|-----------------|-----------------------|

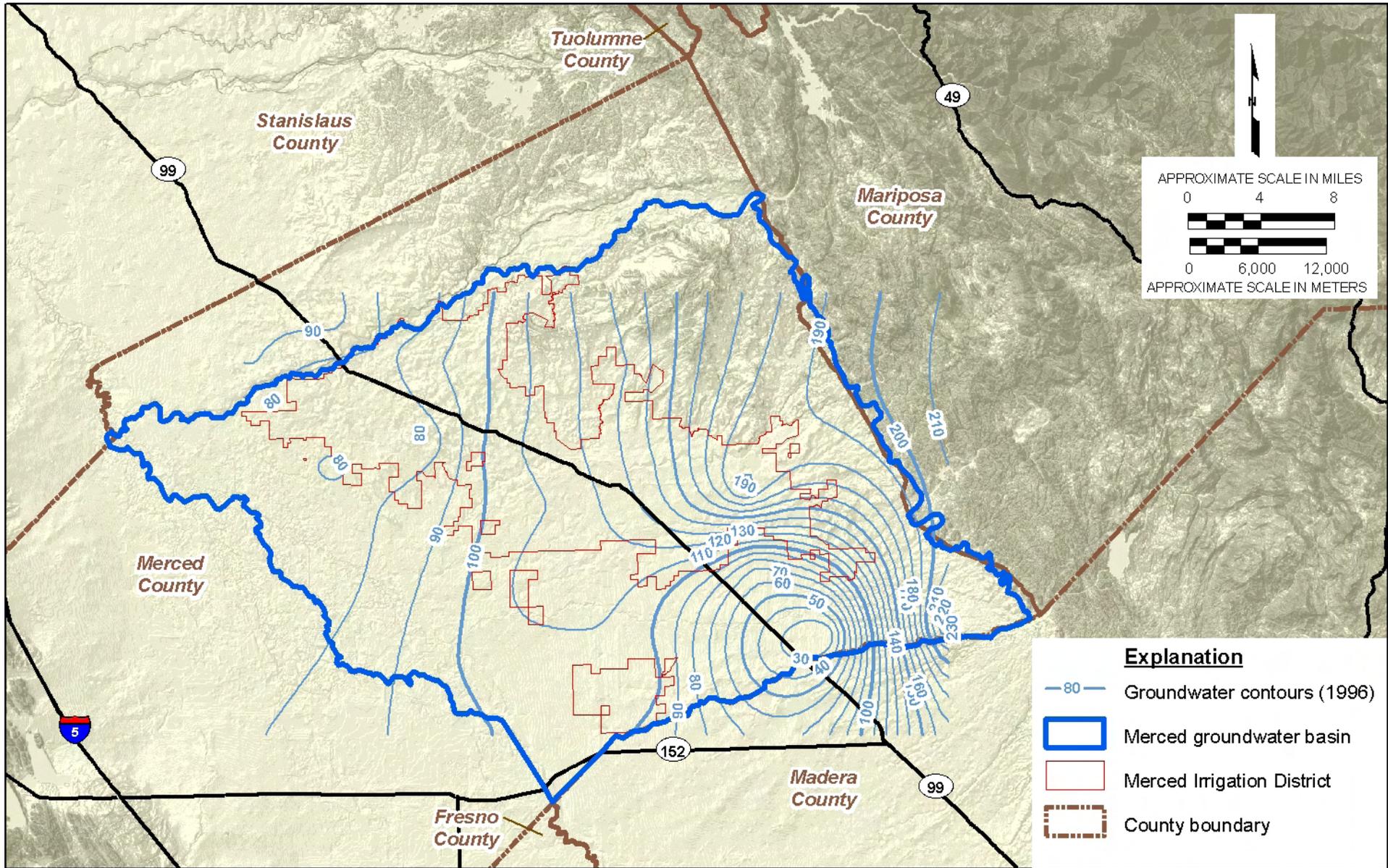




Explanation

- 80 — Groundwater contours (1996)
- Merced groundwater basin
- Merced Irrigation District
- County boundary

SIMPLIFIED 1996 POTENTIOMETRIC SURFACE MAP OF THE UNCONFINED AQUIFER
 Groundwater Management Plan Update
 Merced, California



SIMPLIFIED 2006 POTENTIOMETRIC SURFACE MAP OF THE UNCONFINED AQUIFER
 Groundwater Management Plan Update
 Merced, California

By: KLU

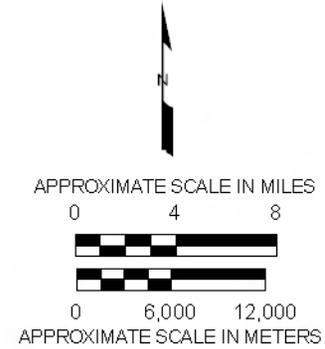
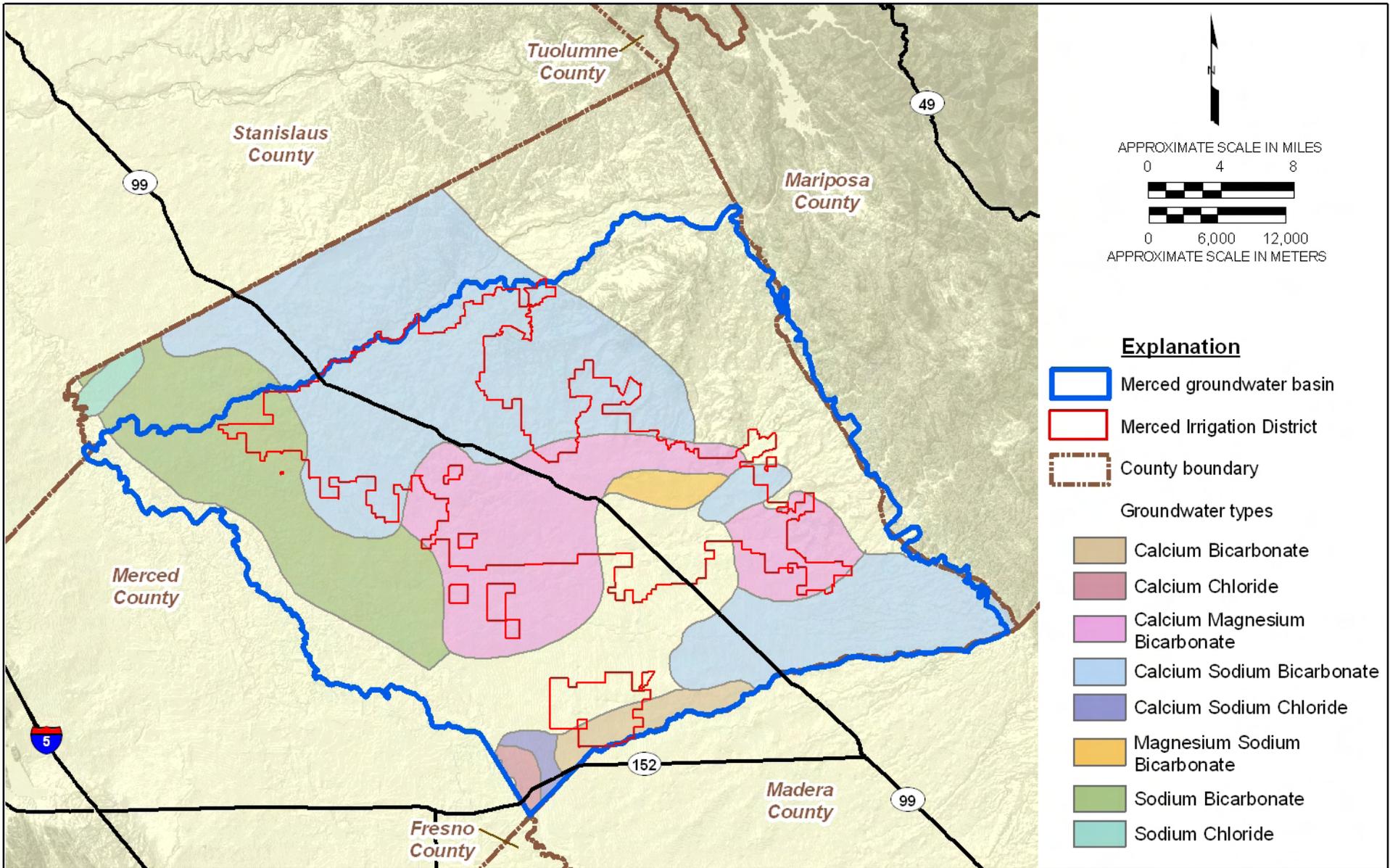
Date: June 2008

Project No. 13651.000



Geomatrix

Figure **18**



Explanation

- Merced groundwater basin
- Merced Irrigation District
- County boundary

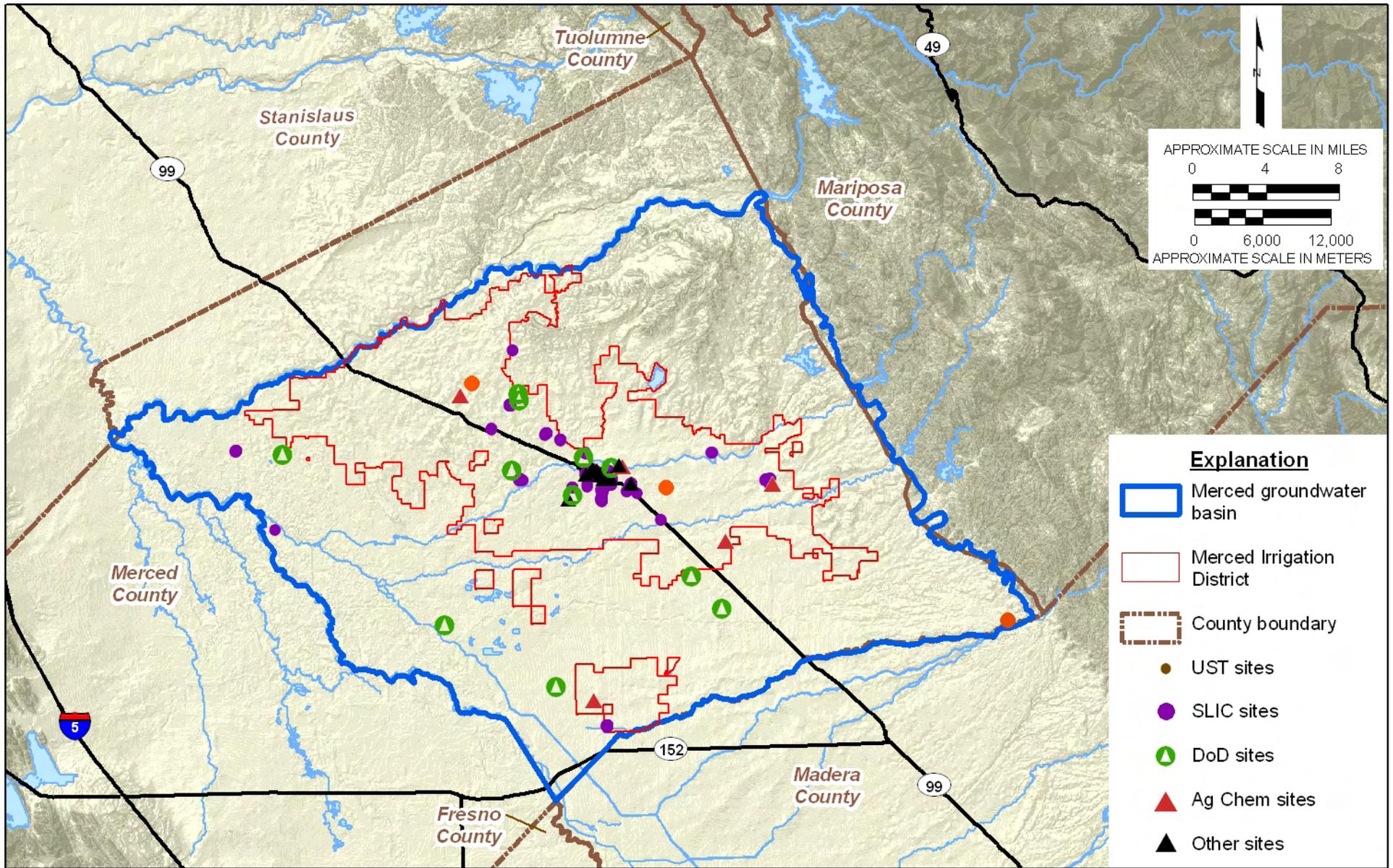
Groundwater types

- Calcium Bicarbonate
- Calcium Chloride
- Calcium Magnesium Bicarbonate
- Calcium Sodium Bicarbonate
- Calcium Sodium Chloride
- Magnesium Sodium Bicarbonate
- Sodium Bicarbonate
- Sodium Chloride

DISTRIBUTION OF GROUNDWATER TYPES - MERCED GROUNDWATER BASIN
 Groundwater Management Plan Update
 Merced, California

By: KLU Date: June 2008 Project No. 13651.000

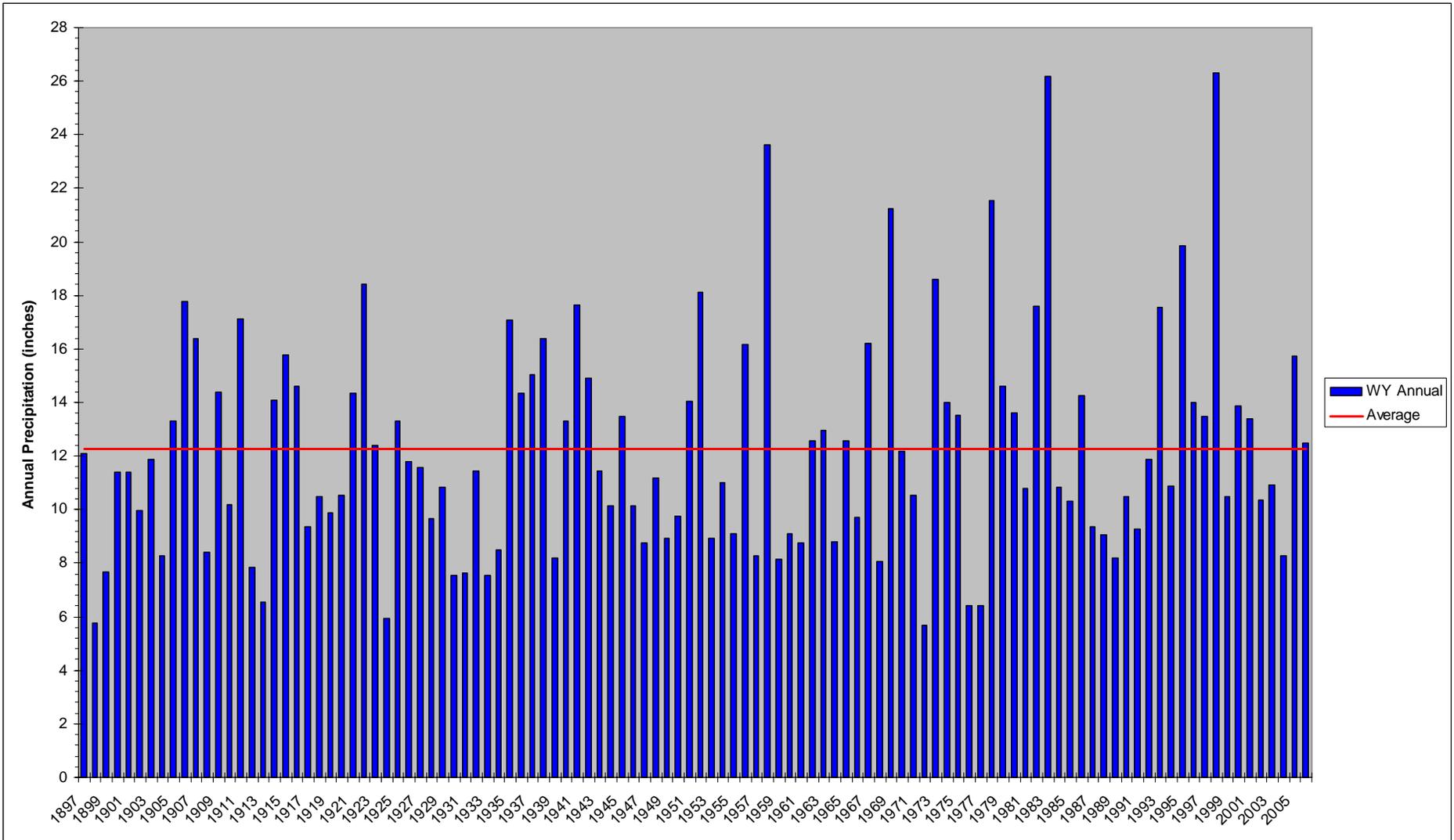




LOCATIONS OF KNOWN LEAKY USTs AND CHEMICAL RELEASES
 Groundwater Management Plan Update
 Merced, California

| | | |
|---------|-----------------|-----------------------|
| By: KLU | Date: June 2008 | Project No. 13651.000 |
|---------|-----------------|-----------------------|





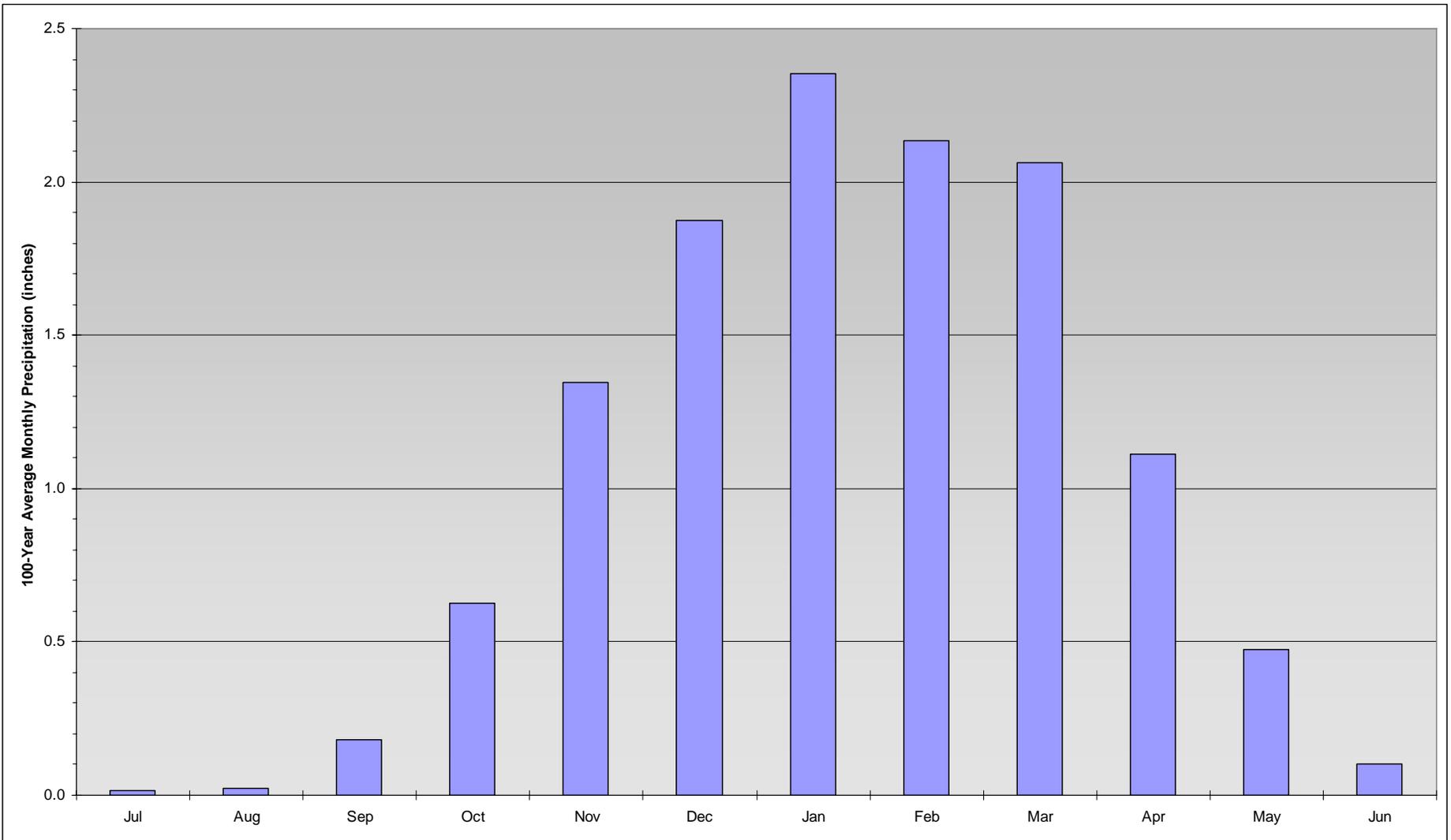
HISTORICAL ANNUAL PRECIPITATION
MERCED GROUNDWATER BASIN
 Groundwater Management Plan Update
 Merced, California

By: dmb

Date: 5/27/08

Project No. 13651.000





HISTORICAL MONTHLY AVERAGE PRECIPITATION
MERCED GROUNDWATER BASIN
 Groundwater Management Plan Update
 Merced, California

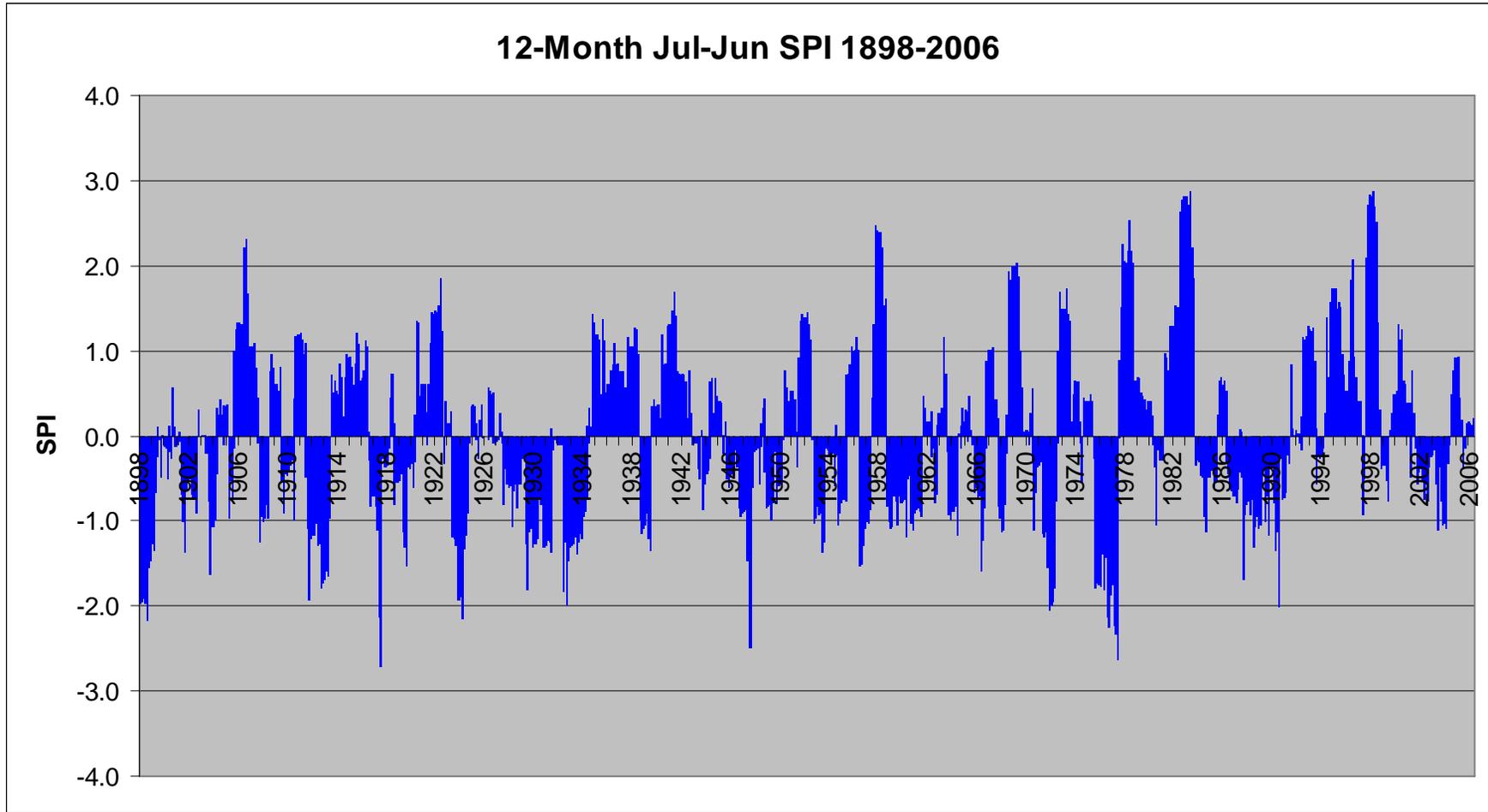
By: dmb

Date: 5/27/08

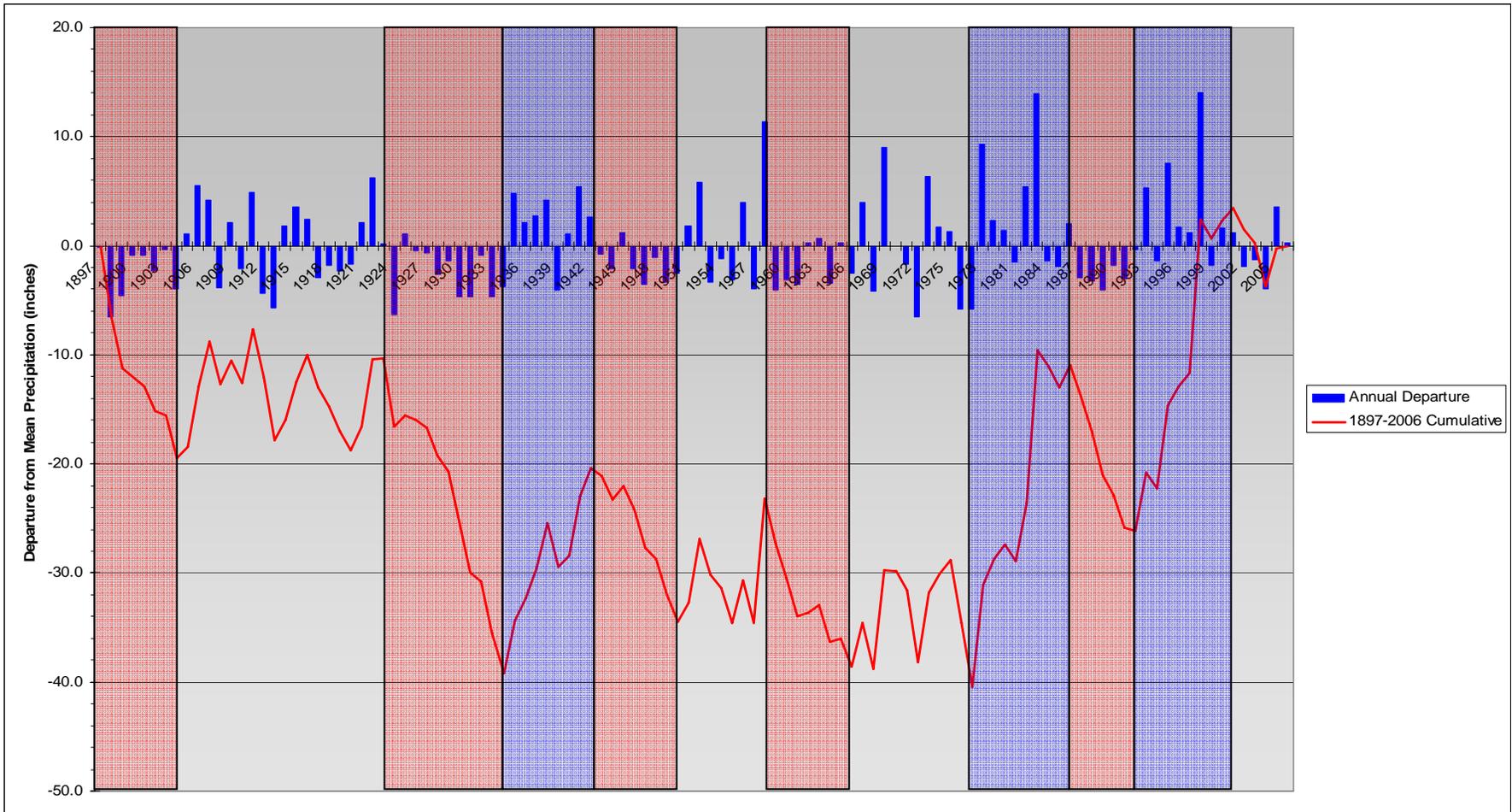
Project No. 13651.000



Figure **22**



High SPI Values (~3) indicate wet periods
 Medium SPI values (~0) indicate normal precipitation
 Low SPI values (~-3) indicate periods of drought



-  Period of above average precipitation
-  Period of average precipitation
-  Period of below average precipitation

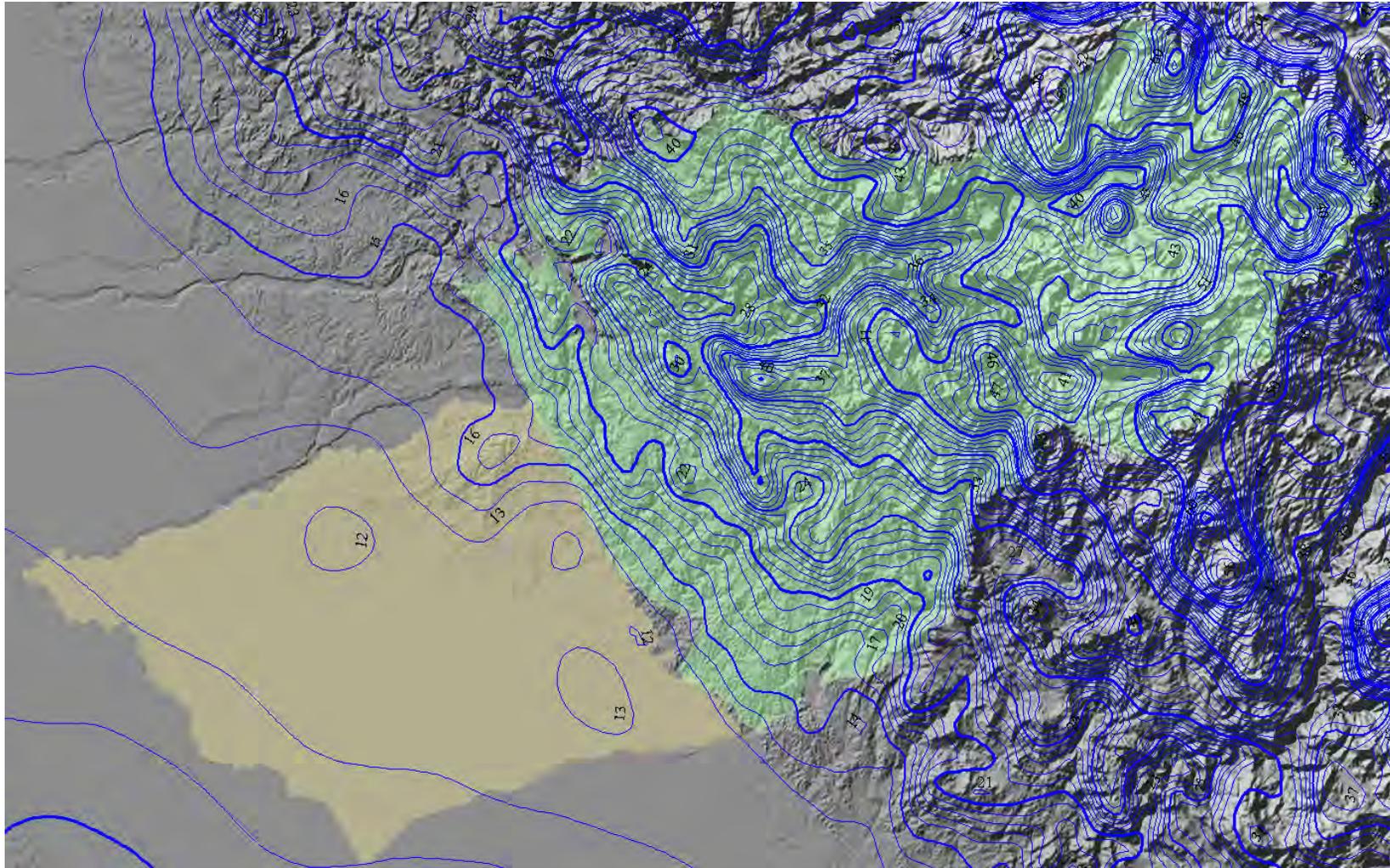
CUMULATIVE PRECIPITATION DEPARTURE CURVE
MERCED GROUNDWATER BASIN
 Groundwater Management Plan Update
 Merced, California

By: dmb

Date: 5/27/08

Project No. 13651.000





- Merced Groundwater Basin
- Watersheds Tributary to Merced Groundwater Basin
- 1971-2000 Average Isoheytal Contours

1971 – 2000 AVERAGE ISOHEYTAL CONTOURS
MERCED GROUNDWATER BASIN
Groundwater Management Plan Update
Merced, California

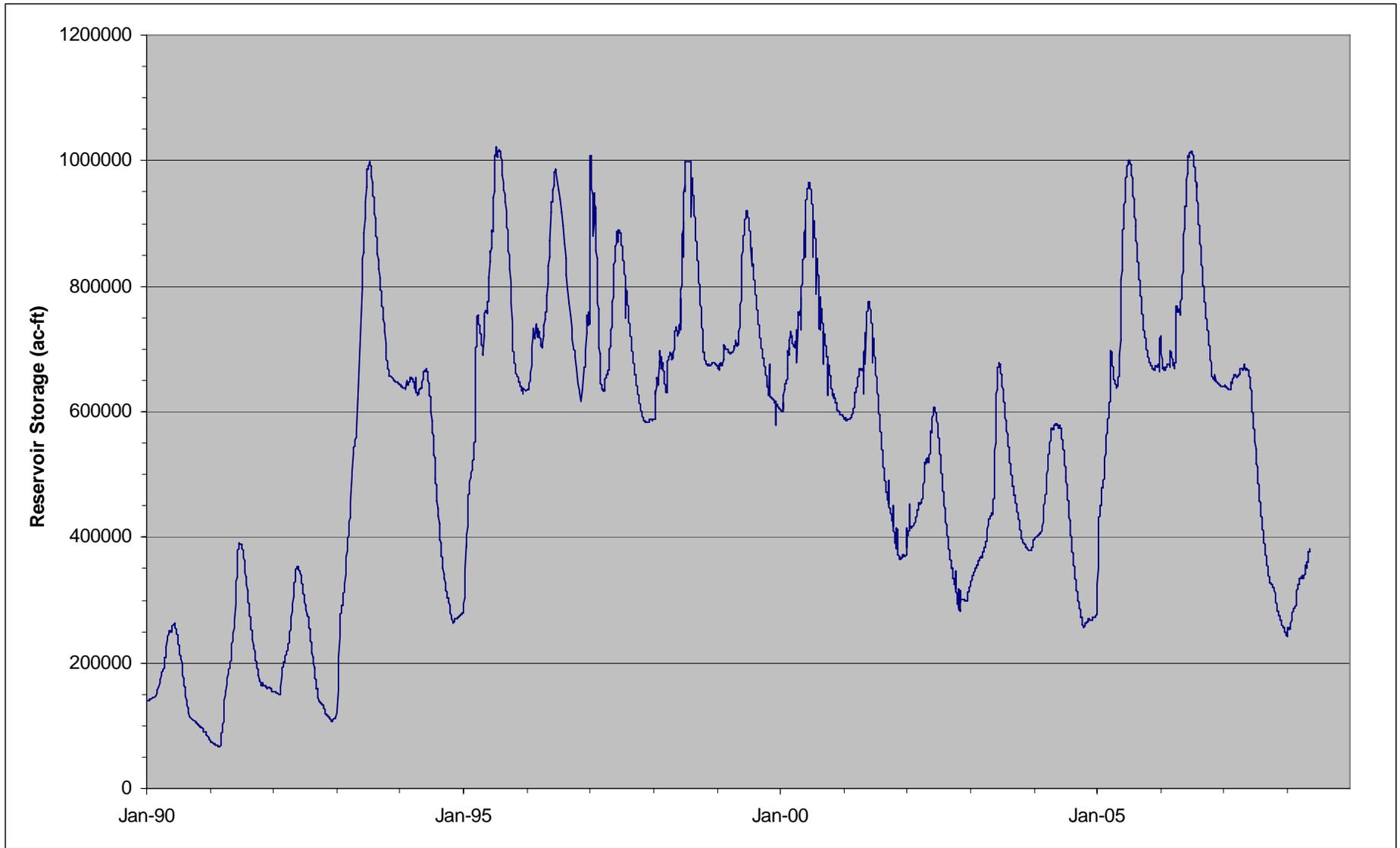
By: dmb

Date: 5/27/08

Project No. 13651.000



Figure **25**



1990 – 2007 LAKE MCCLURE RESERVOIR STAGE
MERCED GROUNDWATER BASIN
Groundwater Management Plan Update
Merced, California

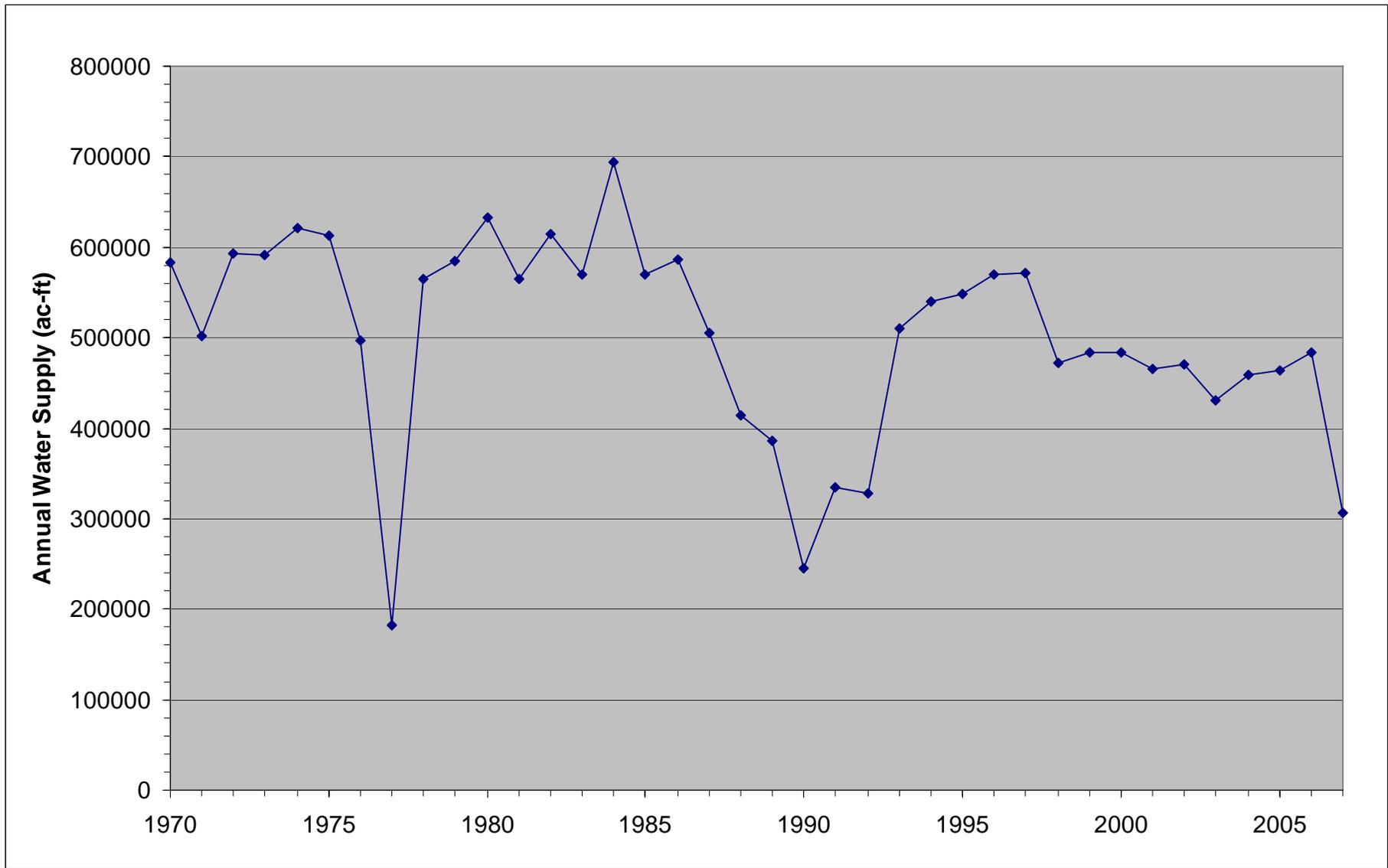
By: dmb

Date: 5/27/08

Project No. 13651.000



Figure 26



1970 – 2007 MERCED RIVER DERVERSIONS
 MERCED GROUNDWATER BASIN
 Groundwater Management Plan Update
 Merced, California

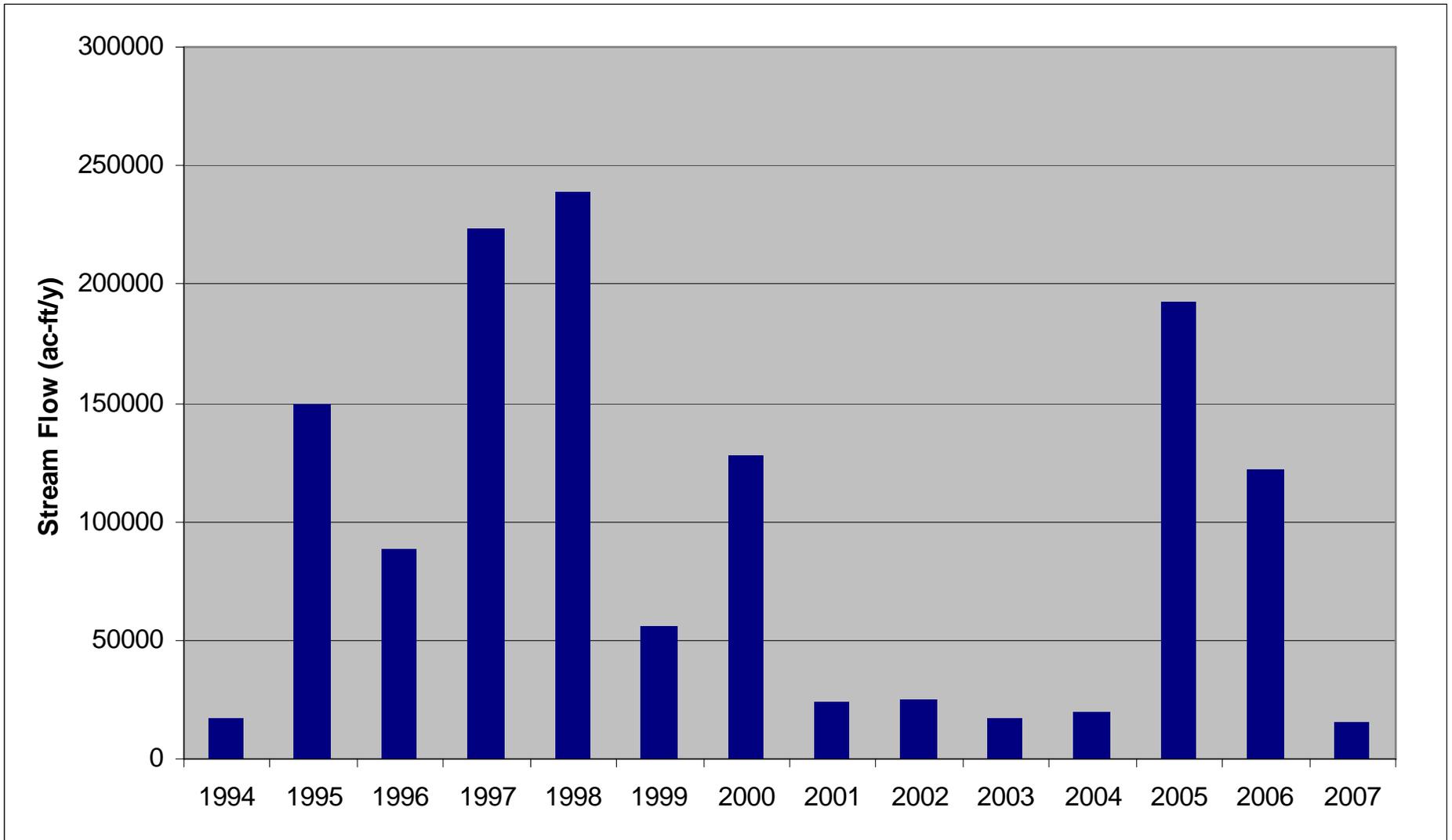
By: dmb

Date: 5/27/08

Project No. 13651.000



Figure **27**



1994 – 2007 TRIBUTARY STREAM FLOW INTO THE
 MERCED GROUNDWATER BASIN
 Groundwater Management Plan Update
 Merced, California

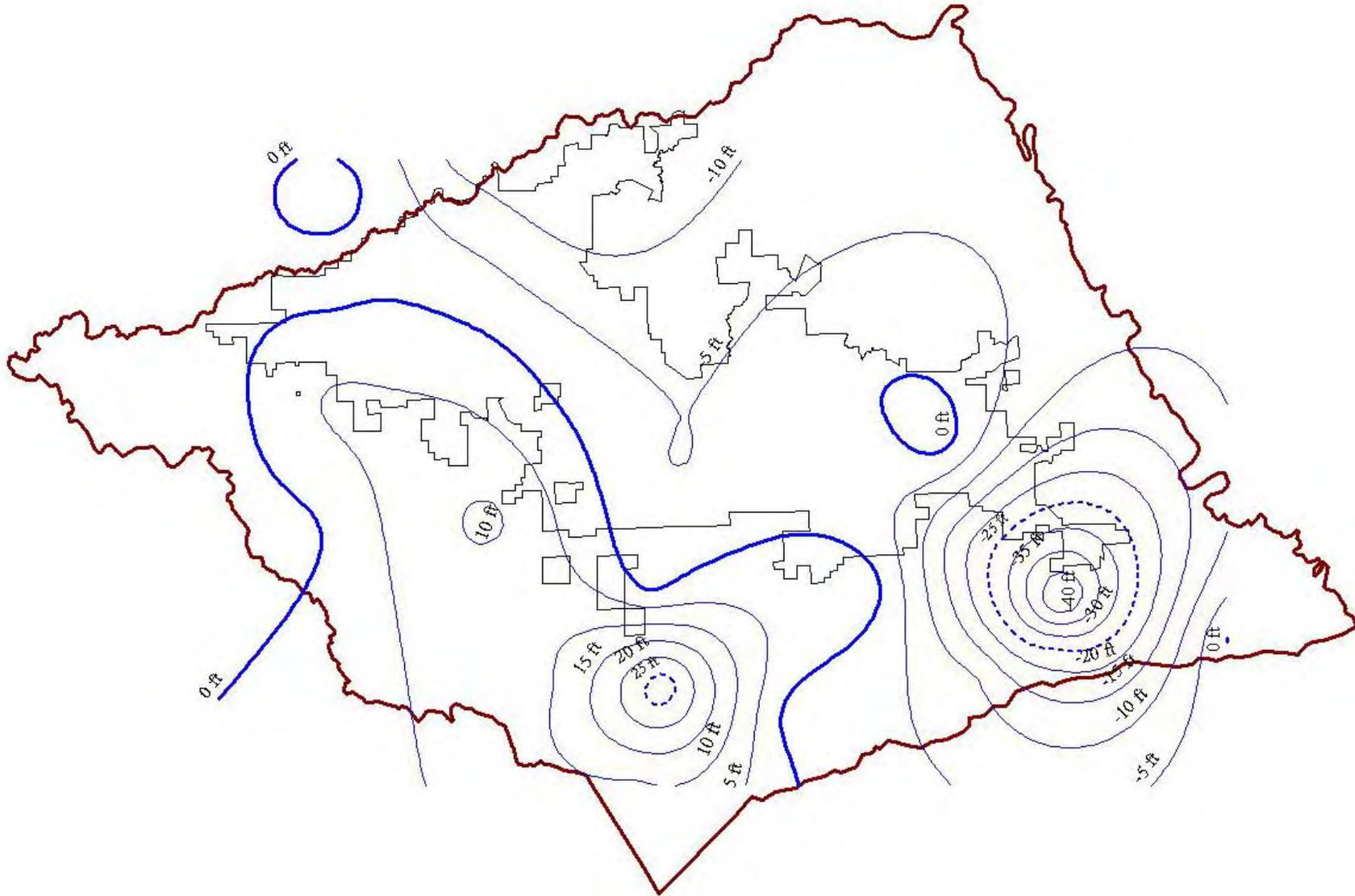
By: dmb

Date: 5/27/08

Project No. 13651.000



Figure **28**



1996 – 2007 CHANGE IN UNCONFINED AQUIFER
POTENTIOMETRIC SURFACE
Groundwater Management Plan Update
Merced, California

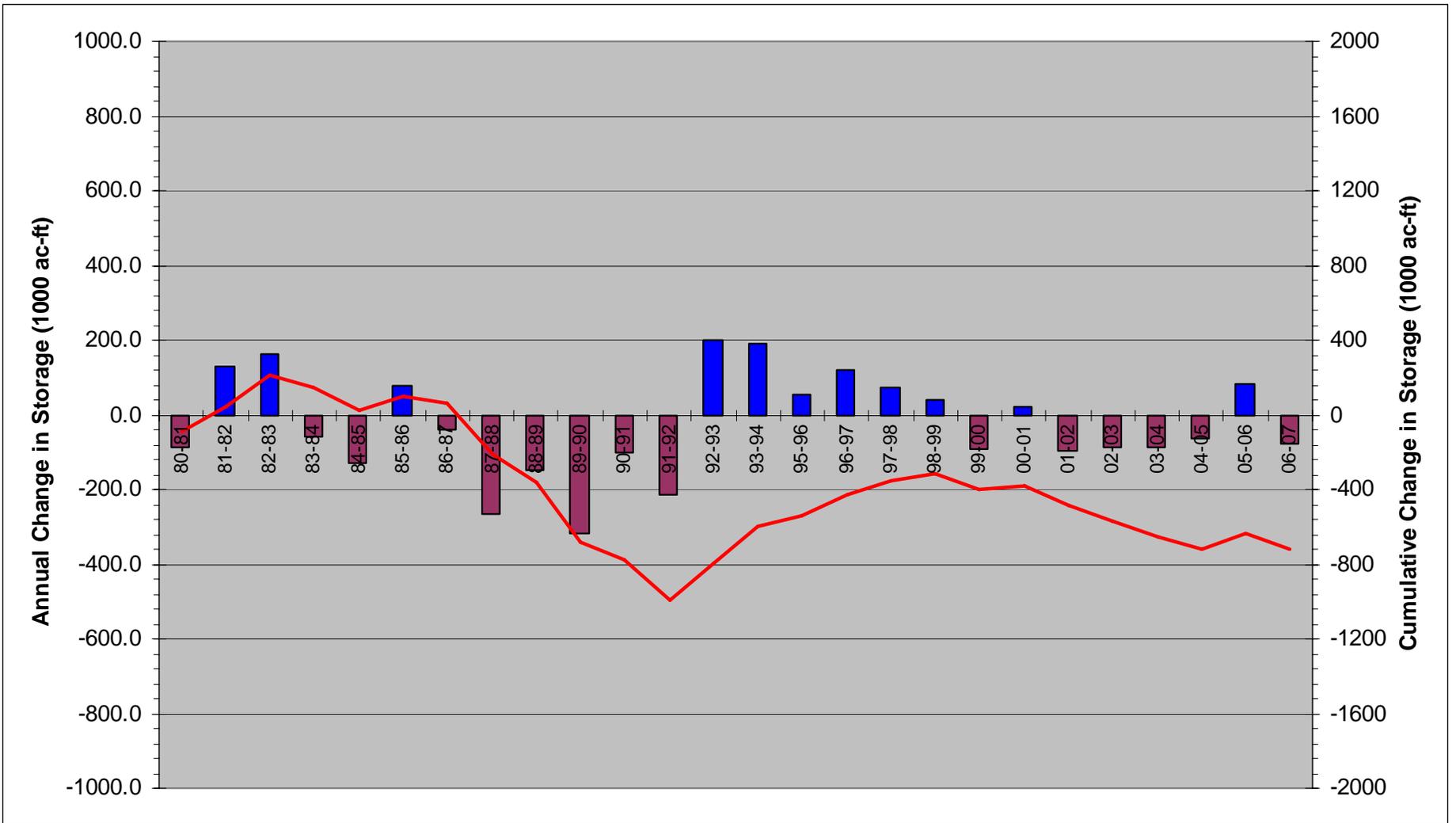
By: dmb

Date: 5/27/08

Project No. 13651.000



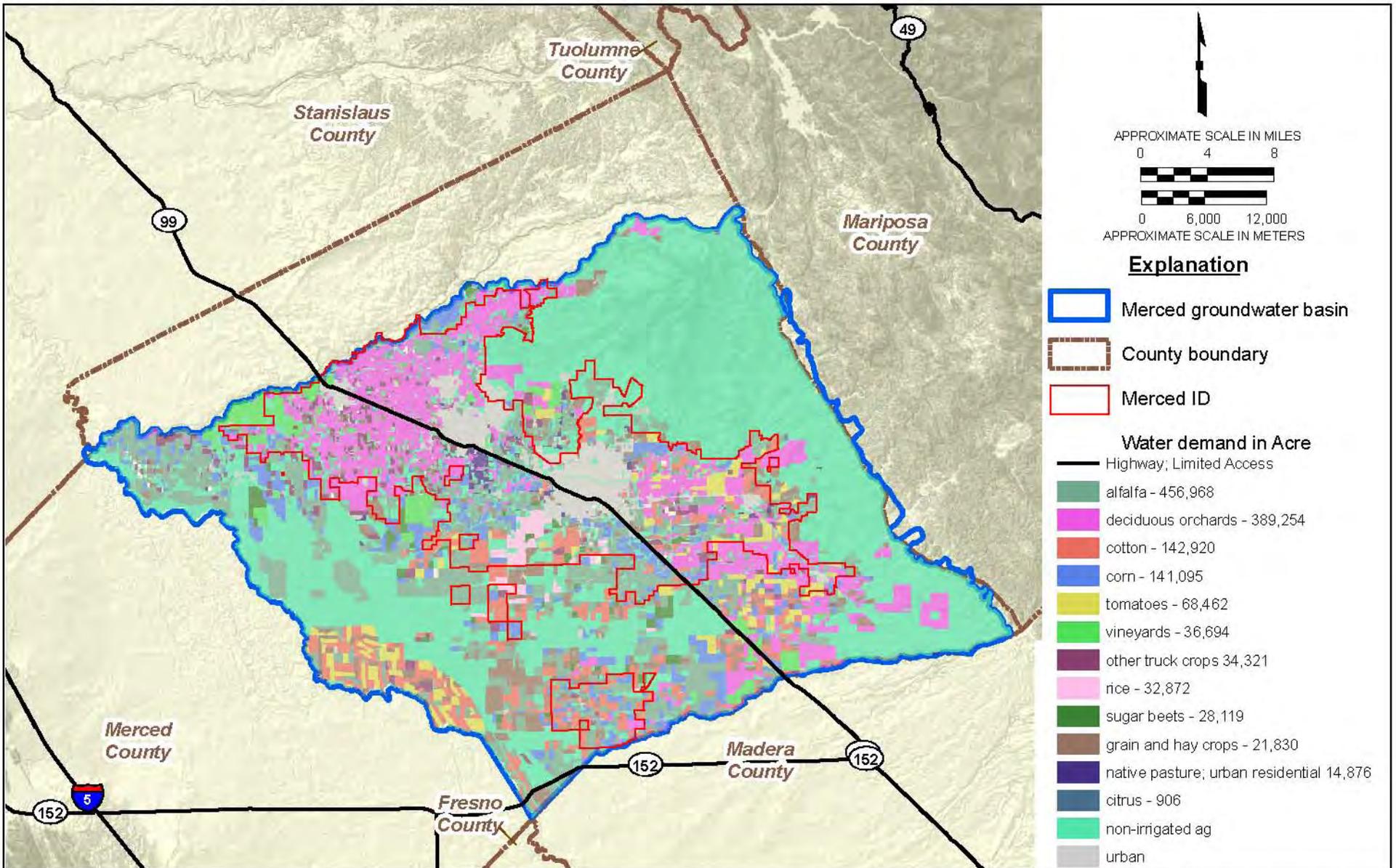
Figure 29



1980 – 2007 APPROXIMATE ANNUAL CHANGE IN STORAGE AND CUMULATIVE CHANGE IN STORAGE
 Groundwater Management Plan Update
 Merced, California

By: dmb Date: 5/27/08 Project No. 13651.000





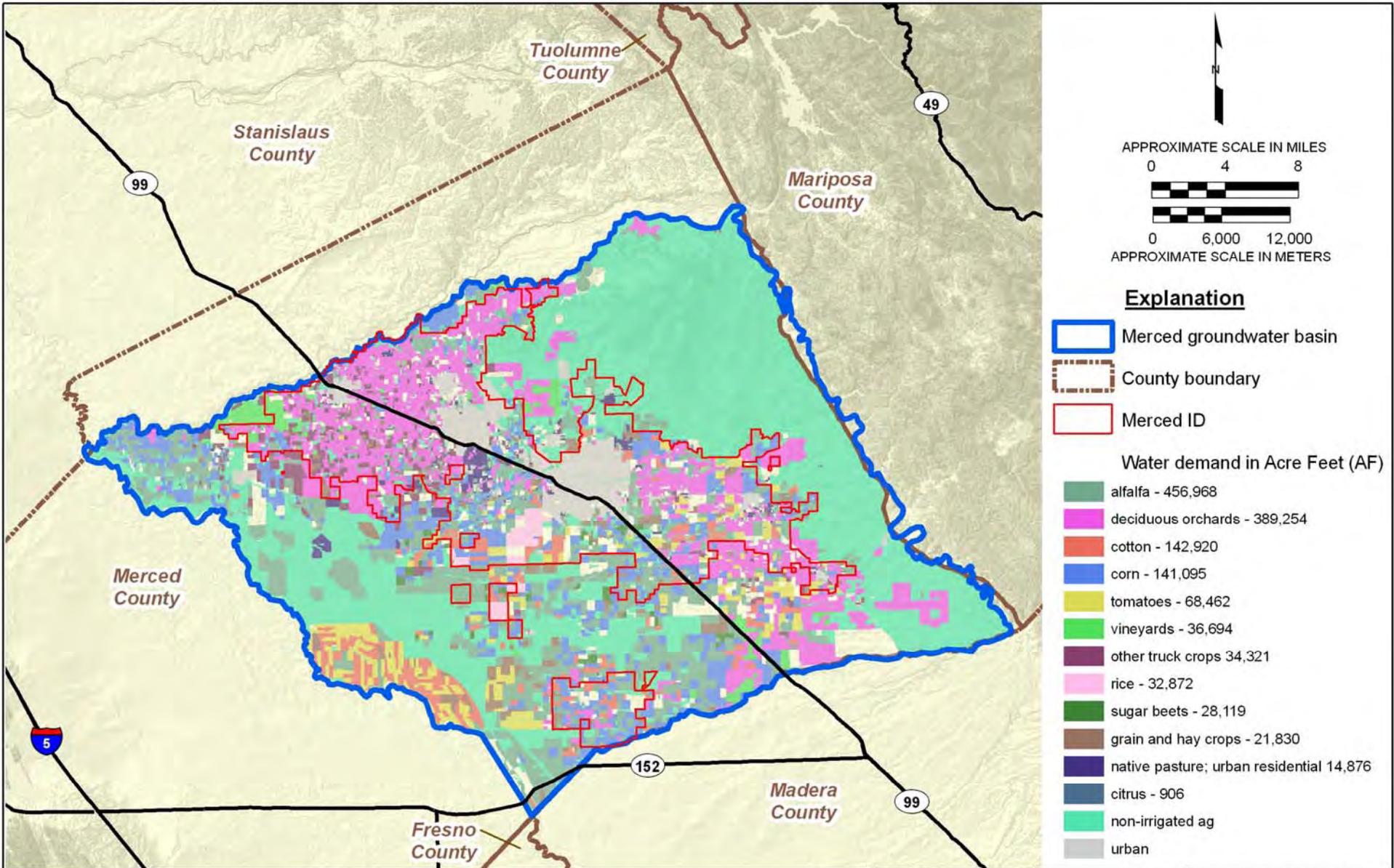
1995 ESTIMATED WATER DEMAND BASED ON
LAND USE AND CROPPING PATTERNS
Groundwater Management Plan Update
Merced, California

By: KLU

Date: June 2008

Project No. 13651.000





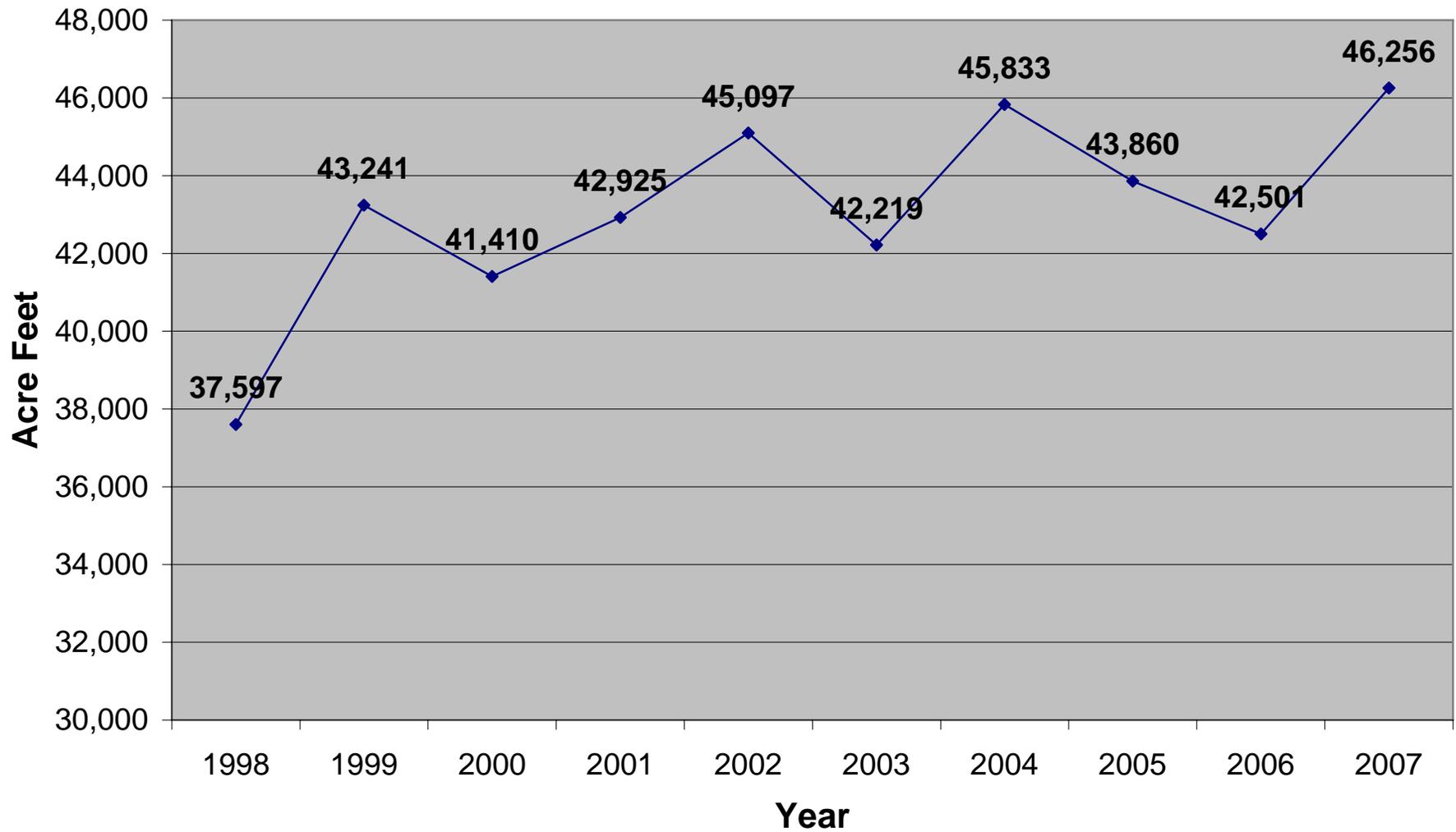
2002 ESTIMATED WATER DEMAND BASED ON
 LAND USE AND CROPPING PATTERNS
 Groundwater Management Plan Update
 Merced, California

By: KLU

Date: June 2008

Project No. 13651.000





1998 – 2007 TOTAL MUNICIPAL PRODUCTION
 MERCED GROUNDWATER BASIN
 Groundwater Management Plan Update
 Merced, California

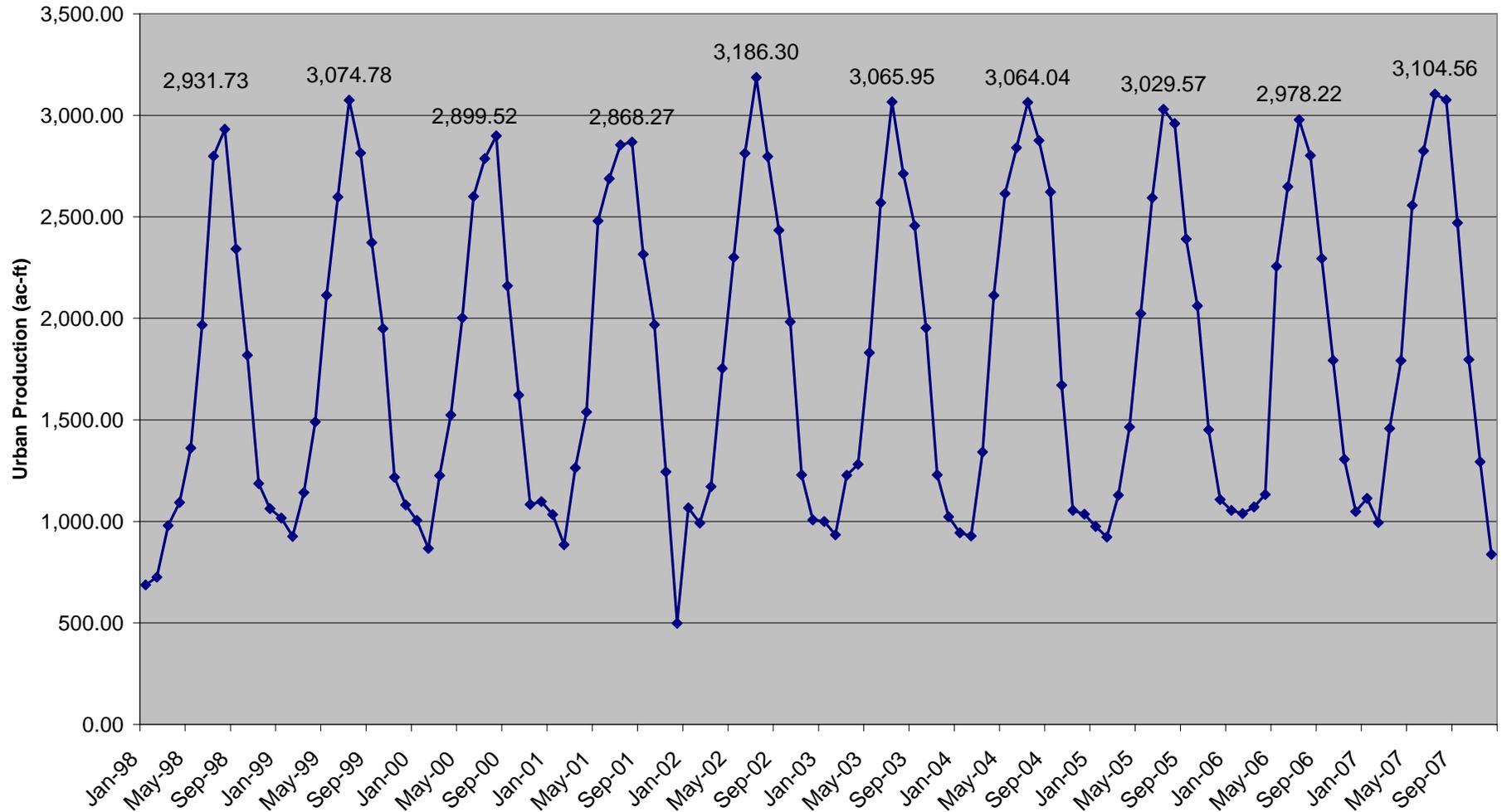
By: dmb

Date: 5/27/08

Project No. 13651.000



Figure **33**



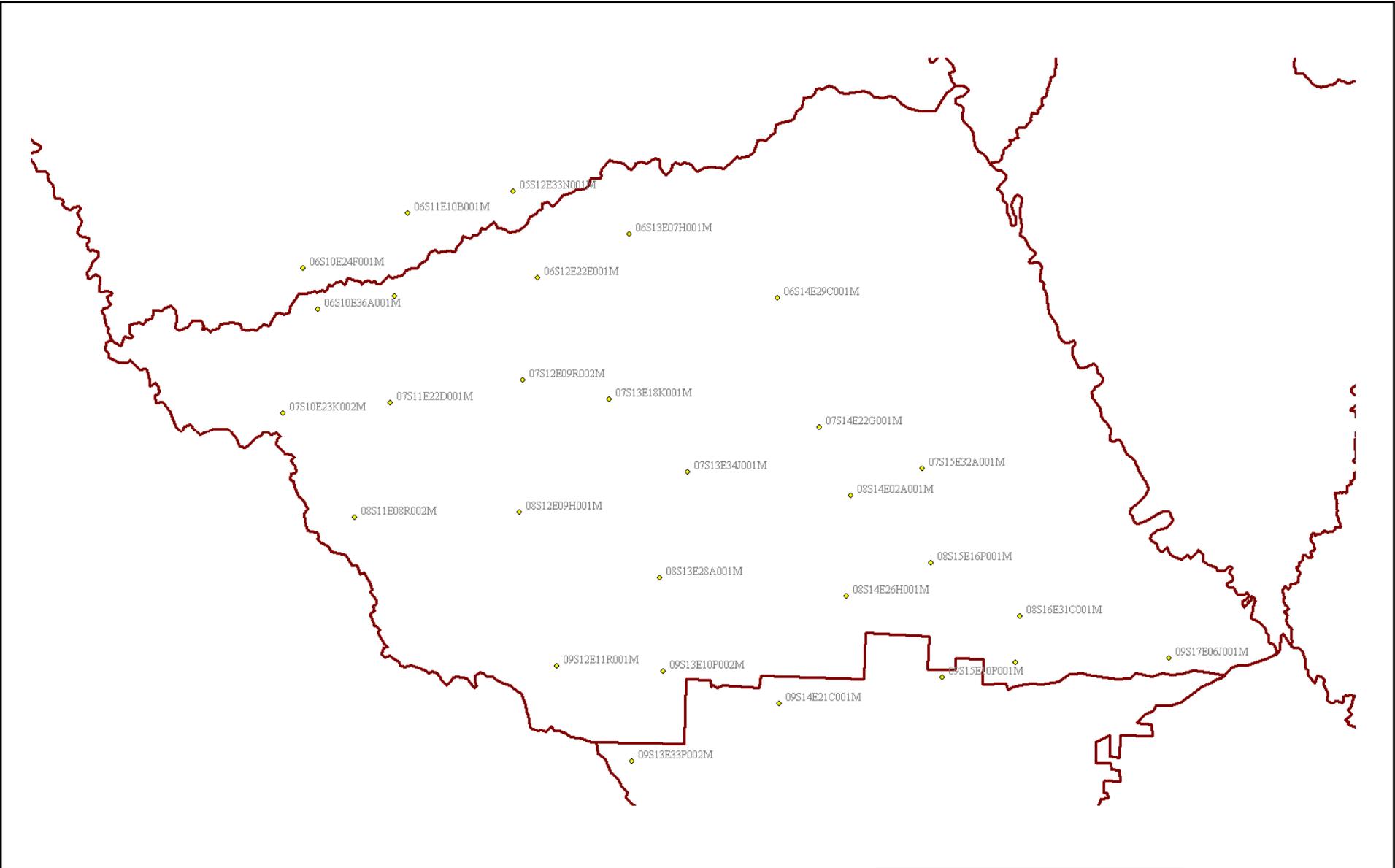
1998 – 2007 MONTHLY MUNICIPAL PRODUCTION
 MERCED GROUNDWATER BASIN
 Groundwater Management Plan Update
 Merced, California

By: dmb

Date: 5/27/08

Project No. 13651.000





PROPOSED GROUNDWATER MONITORING WELL NETWORK
MERCED GROUNDWATER BASIN
 Groundwater Management Plan Update
 Merced, California

By: dmb

Date: 5/27/08

Project No. 13651.000



Figure **35**

San Joaquin Valley Groundwater Basin

Merced Subbasin

- Groundwater Subbasin Number: 5-22.04
- County: Merced
- Surface Area: 491,000 acres (767 square miles)

Basin Boundaries and Hydrology

The San Joaquin Valley is surrounded on the west by the Coast Ranges, on the south by the San Emigdio and Tehachapi Mountains, on the east by the Sierra Nevada and on the north by the Sacramento-San Joaquin Delta and Sacramento Valley. The northern portion of the San Joaquin Valley drains toward the Delta by the San Joaquin River and its tributaries, the Fresno, Merced, Tuolumne, and Stanislaus Rivers. The southern portion of the valley is internally drained by the Kings, Kaweah, Tule, and Kern Rivers that flow into the Tulare drainage basin including the beds of the former Tulare, Buena Vista, and Kern Lakes.

The Merced subbasin includes lands south of the Merced River between the San Joaquin River on the west and the crystalline basement rock of the Sierra Nevada foothills on the east. The subbasin boundary on the south stretches westerly along the Madera-Merced County line (Chowchilla River) and then between the boundary of the Le Grand-Athlone Water District and the Chowchilla Water District. The boundary continues west along the northern boundaries of Chowchilla Water District and El Nido Irrigation District. The southern boundary then follows the western boundary of El Nido I.D. south to the northern boundary of the Sierra Water District, which is followed westerly to the San Joaquin River. Average annual precipitation is 11 to 13 inches, increasing eastward.

Hydrogeologic Information

The San Joaquin Valley represents the southern portion of the Great Central Valley of California. The San Joaquin Valley is a structural trough up to 200 miles long and 70 miles wide. It is filled with up to 32,000 feet of marine and continental sediments deposited during periodic inundation by the Pacific Ocean and by erosion of the surrounding mountains, respectively. Continental deposits shed from the surrounding mountains form an alluvial wedge that thickens from the valley margins toward the axis of the structural trough. This depositional axis is below to slightly west of the series of rivers, lakes, sloughs, and marshes, which mark the current and historic axis of surface drainage in the San Joaquin Valley.

Water Bearing Formations

Geologic units in the Merced Subbasin consist of consolidated rocks and unconsolidated deposits. The consolidated rocks include the Ione Formation, the Valley Springs Formation, and the Mehrten Formation. In the eastern part of the area, the consolidated rocks generally yield small quantities of water to wells except for the Mehrten Formation, which is an important aquifer.

The unconsolidated deposits were laid down during the Pliocene to present. From oldest to youngest, these deposits include continental deposits, lacustrine and marsh deposits, older alluvium, younger alluvium, and flood-basin deposits. The continental deposits and older alluvium are the main water-yielding units in the unconsolidated deposits. The lacustrine and marsh deposits (which include the Corcoran, or "E-" Clay), and the flood-basin deposits yield little water to wells, and the younger alluvium in most places probably yields only moderate quantities of water to wells (Page 1973.)

There are three ground water bodies in the area: an unconfined water body, a confined water body, and the water body in consolidated rocks. The unconfined water body occurs in the unconsolidated deposits above and east of the Corcoran Clay, which underlies the western half of the subbasin at depths ranging between about 50 and 200 feet (DWR 1981), except in the western and southern parts of the area where clay lenses occur and semi-confined conditions exist. The confined water body occurs in the unconsolidated deposits below the Corcoran Clay and extends downward to the base of fresh water. The water body in consolidated rocks occurs under both unconfined and confined conditions.

The estimated average specific yield of this subbasin is 9.0 percent (based on DWR, San Joaquin District internal data and that of Davis 1959).

Restrictive Structures

Groundwater flow is primarily to the southwest, following the regional dip of basement rock and sedimentary units. DWR (2000) data show two groundwater depressions south and southeast of the city of Merced during 1999.

Groundwater Level Trends

Changes in groundwater levels are based on annual water level measurements by DWR and cooperators. Water level changes were evaluated by quarter township and computed through a custom DWR computer program using geostatistics (kriging). On average, the subbasin water level has declined nearly 30 feet from 1970 through 2000. The period from 1970 through 1978 showed steep declines totaling about 15 feet. The ten-year period from 1978 to 1988 saw stabilization and a rebound of about 10 feet. 1988 through 1995 again showed steep declines, bottoming out in 1996 with water levels rising from 1996 to 2000. Water level declines have been more severe in the eastern portion of the subbasin

Groundwater Storage

Estimations of the total storage capacity of the subbasin and the amount of water in storage as of 1995 were calculated using an estimated specific yield of 9.0 percent and water levels collected by DWR and cooperators. According to these calculations, the total storage capacity of this subbasin is estimated to be 21,100,000 af to a depth of 300 feet and 47,600,000 af to the base of fresh groundwater. These same calculations give an estimate of 15,700,000 af of groundwater to a depth of 300 feet stored in this subbasin as of 1995 (DWR 1995). According to published literature, the amount of

stored groundwater in this subbasin as of 1961 is 37,000,000 af to a depth of ≤ 1000 feet (Williamson 1989).

Groundwater Budget (Type B)

Although a detailed budget was not available for this subbasin, an estimate of groundwater demand was calculated based on the 1990 normalized year and data on land and water use. A subsequent analysis was done by a DWR water budget spreadsheet to estimate overall applied water demands, agricultural groundwater pumpage, urban pumping demand and other extraction data.

Natural recharge into the subbasin is estimated to be 47,000 af. Values for artificial recharge and subsurface inflow are not determined. There is approximately 243,000 af of applied water recharge into the subbasin. Annual urban and agricultural extractions are 54,000 af and 492,000 af, respectively. Other extractions equal approximately 9,000 af. Subsurface inflow values are not determined.

Groundwater Quality

Characterization. The groundwater in this subbasin is characterized by calcium-magnesium bicarbonate at the basin interior, sodium bicarbonate to the west, and calcium-sodium bicarbonate to the south. Small areas of sodium chloride and calcium-sodium chloride waters exist at the southwest corner of the basin (Page 1973). TDS values range from 100 to 3,600 mg/L, with a typical range of 200 to 400 mg/L. The Department of Health Services, which monitors Title 22 water quality standards, reports TDS values in 46 wells ranging from 150 to 424 mg/L, with an average value of 231 mg/L. For 10 wells, EC values range from 260 to 410 $\mu\text{mhos/cm}$, with an average value of 291 $\mu\text{mhos/cm}$.

Impairments. There are localized areas of high hardness, iron, nitrate, and chloride in this subbasin.

Water Quality in Public Supply Wells

| Constituent Group ¹ | Number of wells sampled ² | Number of wells with a concentration above an MCL ³ |
|--------------------------------|--------------------------------------|--|
| Inorganics – Primary | 65 | 0 |
| Radiological | 58 | 1 |
| Nitrates | 64 | 2 |
| Pesticides | 62 | 8 |
| VOCs and SVOCs | 59 | 1 |
| Inorganics – Secondary | 65 | 8 |

¹ A description of each member in the constituent groups and a generalized discussion of the relevance of these groups are included in *California's Groundwater – Bulletin 118* by DWR (2003).

² Represents distinct number of wells sampled as required under DHS Title 22 program from 1994 through 2000.

³ Each well reported with a concentration above an MCL was confirmed with a second detection above an MCL. This information is intended as an indicator of the types of activities that cause contamination in a given basin. It represents the water

quality at the sample location. It does not indicate the water quality delivered to the consumer. More detailed drinking water quality information can be obtained from the local water purveyor and its annual Consumer Confidence Report.

Well Characteristics

| Well yields (gal/min) | | |
|-----------------------|--------------------|------------------------|
| Municipal/Irrigation | Range: 100 – 4,450 | Average: 1,500 – 1,900 |
| Total depths (ft) | | |
| Domestic | | |
| Municipal/Irrigation | Range: 100 - 800 | |

Active Monitoring Data

| Agency | Parameter | Number of wells / measurement frequency |
|---|------------------------|---|
| DWR (incl. Cooperators) | Groundwater levels | 378 Semi-annually |
| Department of Health Services (including Cooperators) | Title 22 water quality | 142 Varies |

Basin Management

| | |
|-------------------------|--|
| Groundwater management: | None |
| Water agencies | |
| Public | Merced I.D., Merquin County Water District, Turner Island Water District, Le Grand-Athlone W.D., Plainsburg I.D., Stevinson W.D. |
| Private | Not Determined |

References Cited

- California Department of Water Resources (DWR), San Joaquin District. Unpublished Land and Water Use Data.
- _____. Well completion report files.
- _____. 1995. Internal computer spreadsheet for 1990 normal computation of net water demand used in preparation of DWR Bulletin 160-93.
- _____. 1981. *Depth to Top of Corcoran Clay*. 1:253,440 scale map.
- _____. 2000. *Spring 1999, Lines of Equal Elevation of Water in Wells, Unconfined Aquifer*. 1:253,440 scale map sheet.
- Davis, GH, Green, JH, Olmstead, SH, and Brown, DW. 1959a. *Ground Water Conditions and Storage Capacity in the San Joaquin Valley, California*; US Geological Survey Water Supply Paper No. 1469, 287p.
- Page, RW, and Balding, GO. 1973. *Geology and Quality of Water in the Modesto-Merced Area, San Joaquin Valley, California, with a Brief Section of Hydrology*. USGS Water-Resources Investigations 6-73, 85p.

Williamson, Alex K, Prudic, David E, and Swain, Lindsay A. 1989. *Groundwater flow in the Central Valley, California*. US Geological Survey Professional Paper 1401-D. 127 p.

Additional References

Balding, GO, and Page, RW. 1971. *Data for Wells in the Modesto-Merced Area San Joaquin Valley, California*. U.S. Geological Survey Open-File Report.

California Department of Water Resources. 1980. Bulletin 118-80. *Ground Water Subbasins in California*.

_____. 1994. Bulletin 160-93. *California Water Plan Update, Vol. 1*.

Davis, SN and Hall, FR. 1959b. *Water Quality of Eastern Stanislaus and North Merced Counties, California*; Stanford Univ. Pubs., Geol. Sci., v. 6, no. 1. 112 p.

Errata

Changes made to the basin description will be noted here.

URBAN WATER MANAGEMENT PLAN ACT

Established: [AB 797, Klehs, 1983](#)

Amended: [AB 2661, Klehs, 1990](#)

[AB 11X, Filante, 1991](#)

[AB 1869, Speier, 1991](#)

[AB 892, Frazee, 1993](#)

[SB 1017, McCorquodale, 1994](#)

[AB 2853, Cortese, 1994](#)

[AB 1845, Cortese, 1995](#)

[SB 1011, Polanco, 1995](#)

[AB 2552, Bates, 2000](#)

[SB 553, Kelley, 2000](#)

[SB 610, Costa, 2001](#)

[AB 901, Daucher, 2001](#)

[SB 672, Machado, 2001](#)

[SB 1348, Brulte, 2002](#)

[SB 1384, Costa, 2002](#)

[SB 1518, Torlakson, 2002](#)

[AB 105, Wiggins, 2004](#)

[SB 318, Alpert, 2004](#)

[SB 1087, Florez, 2005](#)

[SBX7 7, Steinberg, 2009](#)

CALIFORNIA WATER CODE DIVISION 6 PART 2.6. URBAN WATER MANAGEMENT PLANNING

CHAPTER 1. GENERAL DECLARATION AND POLICY

10610. This part shall be known and may be cited as the "Urban Water Management Planning Act."

10610.2. (a) The Legislature finds and declares all of the following:

- (1) The waters of the state are a limited and renewable resource subject to ever-increasing demands.
- (2) The conservation and efficient use of urban water supplies are of statewide concern; however, the planning for that use and the implementation of those plans can best be accomplished at the local level.
- (3) A long-term, reliable supply of water is essential to protect the productivity of California's businesses and economic climate.

- (4) As part of its long-range planning activities, every urban water supplier should make every effort to ensure the appropriate level of reliability in its water service sufficient to meet the needs of its various categories of customers during normal, dry, and multiple dry water years.
- (5) Public health issues have been raised over a number of contaminants that have been identified in certain local and imported water supplies.
- (6) Implementing effective water management strategies, including groundwater storage projects and recycled water projects, may require specific water quality and salinity targets for meeting groundwater basins water quality objectives and promoting beneficial use of recycled water.
- (7) Water quality regulations are becoming an increasingly important factor in water agencies' selection of raw water sources, treatment alternatives, and modifications to existing treatment facilities.
- (8) Changes in drinking water quality standards may also impact the usefulness of water supplies and may ultimately impact supply reliability.
- (9) The quality of source supplies can have a significant impact on water management strategies and supply reliability.

(b) This part is intended to provide assistance to water agencies in carrying out their long-term resource planning responsibilities to ensure adequate water supplies to meet existing and future demands for water.

10610.4. The Legislature finds and declares that it is the policy of the state as follows:

- (a) The management of urban water demands and efficient use of water shall be actively pursued to protect both the people of the state and their water resources.
- (b) The management of urban water demands and efficient use of urban water supplies shall be a guiding criterion in public decisions.
- (c) Urban water suppliers shall be required to develop water management plans to actively pursue the efficient use of available supplies.

CHAPTER 2. DEFINITIONS

10611. Unless the context otherwise requires, the definitions of this chapter govern the construction of this part.

10611.5. "Demand management" means those water conservation measures, programs, and incentives that prevent the waste of water and promote the reasonable and efficient use and reuse of available supplies.

10612. "Customer" means a purchaser of water from a water supplier who uses the water for municipal purposes, including residential, commercial, governmental, and industrial uses.

10613. "Efficient use" means those management measures that result in the most effective use of water so as to prevent its waste or unreasonable use or unreasonable method of use.

10614. "Person" means any individual, firm, association, organization, partnership, business, trust, corporation, company, public agency, or any agency of such an entity.

10615. "Plan" means an urban water management plan prepared pursuant to this part. A plan shall describe and evaluate sources of supply, reasonable and practical efficient uses, reclamation and demand management activities. The components of the plan may vary according to an individual community or area's characteristics and its capabilities to efficiently use and conserve water. The plan shall address measures for residential, commercial, governmental, and industrial water demand management as set forth in Article 2 (commencing with Section 10630) of Chapter 3. In addition, a strategy and time schedule for implementation shall be included in the plan.

10616. "Public agency" means any board, commission, county, city and county, city, regional agency, district, or other public entity.

10616.5. "Recycled water" means the reclamation and reuse of wastewater for beneficial use.

10617. "Urban water supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells for ultimate resale to customers. This part applies only to water supplied from public water systems subject to Chapter 4 (commencing with Section 116275) of Part 12 of Division 104 of the Health and Safety Code.

CHAPTER 3. URBAN WATER MANAGEMENT PLANS

Article 1. General Provisions

10620.

- (a) Every urban water supplier shall prepare and adopt an urban water management plan in the manner set forth in Article 3 (commencing with Section 10640).
- (b) Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.
- (c) An urban water supplier indirectly providing water shall not include planning elements in its water management plan as provided in Article 2 (commencing with Section 10630) that would be applicable to urban water suppliers or public agencies directly providing water, or to their customers, without the consent of those suppliers or public agencies.
- (d)
 - (1) An urban water supplier may satisfy the requirements of this part by participation in areawide, regional, watershed, or basinwide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation and efficient water use.
 - (2) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.
- (e) The urban water supplier may prepare the plan with its own staff, by contract, or in cooperation with other governmental agencies.
- (f) An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.

10621.

- (a) Each urban water supplier shall update its plan at least once every five years on or before December 31, in years ending in five and zero.
- (b) Every urban water supplier required to prepare a plan pursuant to this part shall notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any city or county that receives notice pursuant to this subdivision.
- (c) The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640).

Article 2. Contents of Plans

10630. It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied.

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

- (a) Describe the service area of the supplier, including current and projected population, climate, and other demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.
- (b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a). If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:
 - (1) A copy of any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management.
 - (2) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree.

For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition.

- (3) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the

past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

- (4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.
- (c) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:
- (1) An average water year.
 - (2) A single dry water year.
 - (3) Multiple dry water years.

For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.

- (d) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.
- (e)
- (1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors including, but not necessarily limited to, all of the following uses:
 - (A) Single-family residential.
 - (B) Multifamily.
 - (C) Commercial.
 - (D) Industrial.
 - (E) Institutional and governmental.
 - (F) Landscape.
 - (G) Sales to other agencies.
 - (H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.
 - (I) Agricultural.

- (2) The water use projections shall be in the same five-year increments described in subdivision (a).
- (f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:
- (1) A description of each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures, including, but not limited to, all of the following:
 - (A) Water survey programs for single-family residential and multifamily residential customers.
 - (B) Residential plumbing retrofit.
 - (C) System water audits, leak detection, and repair.
 - (D) Metering with commodity rates for all new connections and retrofit of existing connections.
 - (E) Large landscape conservation programs and incentives.
 - (F) High-efficiency washing machine rebate programs.
 - (G) Public information programs.
 - (H) School education programs.
 - (I) Conservation programs for commercial, industrial, and institutional accounts.
 - (J) Wholesale agency programs.
 - (K) Conservation pricing.
 - (L) Water conservation coordinator.
 - (M) Water waste prohibition.
 - (N) Residential ultra-low-flush toilet replacement programs.
 - (2) A schedule of implementation for all water demand management measures proposed or described in the plan.

- (3) A description of the methods, if any, that the supplier will use to evaluate the effectiveness of water demand management measures implemented or described under the plan.
 - (4) An estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the supplier's ability to further reduce demand.
- (g) An evaluation of each water demand management measure listed in paragraph (1) of subdivision (f) that is not currently being implemented or scheduled for implementation. In the course of the evaluation, first consideration shall be given to water demand management measures, or combination of measures, that offer lower incremental costs than expanded or additional water supplies. This evaluation shall do all of the following:
- (1) Take into account economic and noneconomic factors, including environmental, social, health, customer impact, and technological factors.
 - (2) Include a cost-benefit analysis, identifying total benefits and total costs.
 - (3) Include a description of funding available to implement any planned water supply project that would provide water at a higher unit cost.
 - (4) Include a description of the water supplier's legal authority to implement the measure and efforts to work with other relevant agencies to ensure the implementation of the measure and to share the cost of implementation.
- (h) Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs, other than the demand management programs identified pursuant to paragraph (1) of subdivision (f), that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single-dry, and multiple-dry water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.

- (i) Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.
- (j) Urban water suppliers that are members of the California Urban Water Conservation Council and submit annual reports to that council in accordance with the "Memorandum of Understanding Regarding Urban Water Conservation in California," dated September 1991, may submit the annual reports identifying water demand management measures currently being implemented, or scheduled for implementation, to satisfy the requirements of subdivisions (f) and (g).
- (k) Urban water suppliers that rely upon a wholesale agency for a source of water, shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier's plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (c). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (c), including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.

10631.5. The department shall take into consideration whether the urban water supplier is implementing or scheduled for implementation, the water demand management activities that the urban water supplier identified in its urban water management plan, pursuant to Section 10631, in evaluating applications for grants and loans made available pursuant to Section 79163. The urban water supplier may submit to the department copies of its annual reports and other relevant documents to assist the department in determining whether the urban water supplier is implementing or scheduling the implementation of water demand management activities.

10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:

- (a) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions which are applicable to each stage.

- (b) An estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.
- (c) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.
- (d) Additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.
- (e) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.
- (f) Penalties or charges for excessive use, where applicable.
- (g) An analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.
- (h) A draft water shortage contingency resolution or ordinance.
- (i) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.

10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area, and shall include all of the following:

- (a) A description of the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.
- (b) A description of the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.

- (c) A description of the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.
- (d) A description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.
- (e) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.
- (f) A description of actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.
- (g) A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.

10634. The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631, and the manner in which water quality affects water management strategies and supply reliability.

Article 2.5 Water Service Reliability

10635.

- (a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled

pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

- (b) The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.
- (c) Nothing in this article is intended to create a right or entitlement to water service or any specific level of water service.
- (d) Nothing in this article is intended to change existing law concerning an urban water supplier's obligation to provide water service to its existing customers or to any potential future customers.

Articl 3. Adoption and Implementation of Plans

10640. Every urban water supplier required to prepare a plan pursuant to this part shall prepare its plan pursuant to Article 2 (commencing with Section 10630).

The supplier shall likewise periodically review the plan as required by Section 10621, and any amendments or changes required as a result of that review shall be adopted pursuant to this article.

10641. An urban water supplier required to prepare a plan may consult with, and obtain comments from, any public agency or state agency or any person who has special expertise with respect to water demand management methods and techniques.

10642. Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area. After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

10643. An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.

10644.

- (a) An urban water supplier shall file with the department and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be filed with the department and any city or county within which the supplier provides water supplies within 30 days after adoption.
- (b) The department shall prepare and submit to the Legislature, on or before December 31, in the years ending in six and one, a report summarizing the status of the plans adopted pursuant to this part. The report prepared by the department shall identify the outstanding elements of the individual plans. The department shall provide a copy of the report to each urban water supplier that has filed its plan with the department. The department shall also prepare reports and provide data for any legislative hearings designed to consider the effectiveness of plans submitted pursuant to this part.

10645. Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

CHAPTER 4. MISCELLANEOUS PROVISIONS

10650. Any actions or proceedings to attack, review, set aside, void, or annul the acts or decisions of an urban water supplier on the grounds of noncompliance with this part shall be commenced as follows:

- (a) An action or proceeding alleging failure to adopt a plan shall be commenced within 18 months after that adoption is required by this part.
- (b) Any action or proceeding alleging that a plan, or action taken pursuant to the plan, does not comply with this part shall be commenced within 90 days after filing of the plan or amendment thereto pursuant to Section 10644 or the taking of that action.

10651. In any action or proceeding to attack, review, set aside, void, or annul a plan, or an action taken pursuant to the plan by an urban water supplier on the grounds of noncompliance with this part, the inquiry shall extend only to whether there was a prejudicial abuse of discretion. Abuse of discretion is established if the supplier has not proceeded in a manner required by law or if the action by the water supplier is not supported by substantial evidence.

10652. The California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) does not apply to the preparation and adoption of plans pursuant to this part or to the implementation of actions taken pursuant to Section 10632. Nothing in this part shall be interpreted as exempting from the California Environmental Quality Act any project that would significantly affect water

supplies for fish and wildlife, or any project for implementation of the plan, other than projects implementing Section 10632, or any project for expanded or additional water supplies.

10653. The adoption of a plan shall satisfy any requirements of state law, regulation, or order, including those of the State Water Resources Control Board and the Public Utilities Commission, for the preparation of water management plans or conservation plans; provided, that if the State Water Resources Control Board or the Public Utilities Commission requires additional information concerning water conservation to implement its existing authority, nothing in this part shall be deemed to limit the board or the commission in obtaining that information. The requirements of this part shall be satisfied by any urban water demand management plan prepared to meet federal laws or regulations after the effective date of this part, and which substantially meets the requirements of this part, or by any existing urban water management plan which includes the contents of a plan required under this part.

10654. An urban water supplier may recover in its rates the costs incurred in preparing its plan and implementing the reasonable water conservation measures included in the plan. Any best water management practice that is included in the plan that is identified in the "Memorandum of Understanding Regarding Urban Water Conservation in California" is deemed to be reasonable for the purposes of this section.

10655. If any provision of this part or the application thereof to any person or circumstances is held invalid, that invalidity shall not affect other provisions or applications of this part which can be given effect without the invalid provision or application thereof, and to this end the provisions of this part are severable.

10656. An urban water supplier that does not prepare, adopt, and submit its urban water management plan to the department in accordance with this part, is ineligible to receive funding pursuant to Division 24 (commencing with Section 78500) or Division 26 (commencing with Section 79000), or receive drought assistance from the state until the urban water management plan is submitted pursuant to this article.

10657.

- (a) The department shall take into consideration whether the urban water supplier has submitted an updated urban water management plan that is consistent with Section 10631, as amended by the act that adds this section, in determining whether the urban water supplier is eligible for funds made available pursuant to any program administered by the department.
- (b) This section shall remain in effect only until January 1, 2006, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2006, deletes or extends that date.

CHAPTER 4

An act to amend and repeal Section 10631.5 of, to add Part 2.55 (commencing with Section 10608) to Division 6 of, and to repeal and add Part 2.8 (commencing with Section 10800) of Division 6 of, the Water Code, relating to water.

[Approved by Governor November 10, 2009. Filed with Secretary of State November 10, 2009.]

LEGISLATIVE COUNSEL'S DIGEST

SB 7, Steinberg. Water conservation.

(1) Existing law requires the Department of Water Resources to convene an independent technical panel to provide information to the department and the Legislature on new demand management measures, technologies, and approaches. "Demand management measures" means those water conservation measures, programs, and incentives that prevent the waste of water and promote the reasonable and efficient use and reuse of available supplies.

This bill would require the state to achieve a 20% reduction in urban per capita water use in California by December 31, 2020. The state would be required to make incremental progress towards this goal by reducing per capita water use by at least 10% on or before December 31, 2015. The bill would require each urban retail water supplier to develop urban water use targets and an interim urban water use target, in accordance with specified requirements. The bill would require agricultural water suppliers to implement efficient water management practices. The bill would require the department, in consultation with other state agencies, to develop a single standardized water use reporting form. The bill, with certain exceptions, would provide that urban retail water suppliers, on and after July 1, 2016, and agricultural water suppliers, on and after July 1, 2013, are not eligible for state water grants or loans unless they comply with the water conservation requirements established by the bill. The bill would repeal, on July 1, 2016, an existing requirement that conditions eligibility for certain water management grants or loans to an urban water supplier on the implementation of certain water demand management measures.

(2) Existing law, until January 1, 1993, and thereafter only as specified, requires certain agricultural water suppliers to prepare and adopt water management plans.

This bill would revise existing law relating to agricultural water management planning to require agricultural water suppliers to prepare and adopt agricultural water management plans with specified components on or before December 31, 2012, and update those plans on or before December

31, 2015, and on or before December 31 every 5 years thereafter. An agricultural water supplier that becomes an agricultural water supplier after December 31, 2012, would be required to prepare and adopt an agricultural water management plan within one year after becoming an agricultural water supplier. The agricultural water supplier would be required to notify each city or county within which the supplier provides water supplies with regard to the preparation or review of the plan. The bill would require the agricultural water supplier to submit copies of the plan to the department and other specified entities. The bill would provide that an agricultural water supplier is not eligible for state water grants or loans unless the supplier complies with the water management planning requirements established by the bill.

(3) The bill would take effect only if SB 1 and SB 6 of the 2009–10 7th Extraordinary Session of the Legislature are enacted and become effective.

The people of the State of California do enact as follows:

SECTION 1. Part 2.55 (commencing with Section 10608) is added to Division 6 of the Water Code, to read:

PART 2.55. SUSTAINABLE WATER USE AND DEMAND REDUCTION

CHAPTER 1. GENERAL DECLARATIONS AND POLICY

10608. The Legislature finds and declares all of the following:

(a) Water is a public resource that the California Constitution protects against waste and unreasonable use.

(b) Growing population, climate change, and the need to protect and grow California's economy while protecting and restoring our fish and wildlife habitats make it essential that the state manage its water resources as efficiently as possible.

(c) Diverse regional water supply portfolios will increase water supply reliability and reduce dependence on the Delta.

(d) Reduced water use through conservation provides significant energy and environmental benefits, and can help protect water quality, improve streamflows, and reduce greenhouse gas emissions.

(e) The success of state and local water conservation programs to increase efficiency of water use is best determined on the basis of measurable outcomes related to water use or efficiency.

(f) Improvements in technology and management practices offer the potential for increasing water efficiency in California over time, providing an essential water management tool to meet the need for water for urban, agricultural, and environmental uses.

(g) The Governor has called for a 20 percent per capita reduction in urban water use statewide by 2020.

(h) The factors used to formulate water use efficiency targets can vary significantly from location to location based on factors including weather, patterns of urban and suburban development, and past efforts to enhance water use efficiency.

(i) Per capita water use is a valid measure of a water provider's efforts to reduce urban water use within its service area. However, per capita water use is less useful for measuring relative water use efficiency between different water providers. Differences in weather, historical patterns of urban and suburban development, and density of housing in a particular location need to be considered when assessing per capita water use as a measure of efficiency.

10608.4. It is the intent of the Legislature, by the enactment of this part, to do all of the following:

(a) Require all water suppliers to increase the efficiency of use of this essential resource.

(b) Establish a framework to meet the state targets for urban water conservation identified in this part and called for by the Governor.

(c) Measure increased efficiency of urban water use on a per capita basis.

(d) Establish a method or methods for urban retail water suppliers to determine targets for achieving increased water use efficiency by the year 2020, in accordance with the Governor's goal of a 20-percent reduction.

(e) Establish consistent water use efficiency planning and implementation standards for urban water suppliers and agricultural water suppliers.

(f) Promote urban water conservation standards that are consistent with the California Urban Water Conservation Council's adopted best management practices and the requirements for demand management in Section 10631.

(g) Establish standards that recognize and provide credit to water suppliers that made substantial capital investments in urban water conservation since the drought of the early 1990s.

(h) Recognize and account for the investment of urban retail water suppliers in providing recycled water for beneficial uses.

(i) Require implementation of specified efficient water management practices for agricultural water suppliers.

(j) Support the economic productivity of California's agricultural, commercial, and industrial sectors.

(k) Advance regional water resources management.

10608.8. (a) (1) Water use efficiency measures adopted and implemented pursuant to this part or Part 2.8 (commencing with Section 10800) are water conservation measures subject to the protections provided under Section 1011.

(2) Because an urban agency is not required to meet its urban water use target until 2020 pursuant to subdivision (b) of Section 10608.24, an urban retail water supplier's failure to meet those targets shall not establish a violation of law for purposes of any state administrative or judicial proceeding prior to January 1, 2021. Nothing in this paragraph limits the use of data reported to the department or the board in litigation or an

administrative proceeding. This paragraph shall become inoperative on January 1, 2021.

(3) To the extent feasible, the department and the board shall provide for the use of water conservation reports required under this part to meet the requirements of Section 1011 for water conservation reporting.

(b) This part does not limit or otherwise affect the application of Chapter 3.5 (commencing with Section 11340), Chapter 4 (commencing with Section 11370), Chapter 4.5 (commencing with Section 11400), and Chapter 5 (commencing with Section 11500) of Part 1 of Division 3 of Title 2 of the Government Code.

(c) This part does not require a reduction in the total water used in the agricultural or urban sectors, because other factors, including, but not limited to, changes in agricultural economics or population growth may have greater effects on water use. This part does not limit the economic productivity of California's agricultural, commercial, or industrial sectors.

(d) The requirements of this part do not apply to an agricultural water supplier that is a party to the Quantification Settlement Agreement, as defined in subdivision (a) of Section 1 of Chapter 617 of the Statutes of 2002, during the period within which the Quantification Settlement Agreement remains in effect. After the expiration of the Quantification Settlement Agreement, to the extent conservation water projects implemented as part of the Quantification Settlement Agreement remain in effect, the conserved water created as part of those projects shall be credited against the obligations of the agricultural water supplier pursuant to this part.

CHAPTER 2. DEFINITIONS

10608.12. Unless the context otherwise requires, the following definitions govern the construction of this part:

(a) "Agricultural water supplier" means a water supplier, either publicly or privately owned, providing water to 10,000 or more irrigated acres, excluding recycled water. "Agricultural water supplier" includes a supplier or contractor for water, regardless of the basis of right, that distributes or sells water for ultimate resale to customers. "Agricultural water supplier" does not include the department.

(b) "Base daily per capita water use" means any of the following:

(1) The urban retail water supplier's estimate of its average gross water use, reported in gallons per capita per day and calculated over a continuous 10-year period ending no earlier than December 31, 2004, and no later than December 31, 2010.

(2) For an urban retail water supplier that meets at least 10 percent of its 2008 measured retail water demand through recycled water that is delivered within the service area of an urban retail water supplier or its urban wholesale water supplier, the urban retail water supplier may extend the calculation described in paragraph (1) up to an additional five years to a maximum of

a continuous 15-year period ending no earlier than December 31, 2004, and no later than December 31, 2010.

(3) For the purposes of Section 10608.22, the urban retail water supplier's estimate of its average gross water use, reported in gallons per capita per day and calculated over a continuous five-year period ending no earlier than December 31, 2007, and no later than December 31, 2010.

(c) "Baseline commercial, industrial, and institutional water use" means an urban retail water supplier's base daily per capita water use for commercial, industrial, and institutional users.

(d) "Commercial water user" means a water user that provides or distributes a product or service.

(e) "Compliance daily per capita water use" means the gross water use during the final year of the reporting period, reported in gallons per capita per day.

(f) "Disadvantaged community" means a community with an annual median household income that is less than 80 percent of the statewide annual median household income.

(g) "Gross water use" means the total volume of water, whether treated or untreated, entering the distribution system of an urban retail water supplier, excluding all of the following:

(1) Recycled water that is delivered within the service area of an urban retail water supplier or its urban wholesale water supplier.

(2) The net volume of water that the urban retail water supplier places into long-term storage.

(3) The volume of water the urban retail water supplier conveys for use by another urban water supplier.

(4) The volume of water delivered for agricultural use, except as otherwise provided in subdivision (f) of Section 10608.24.

(h) "Industrial water user" means a water user that is primarily a manufacturer or processor of materials as defined by the North American Industry Classification System code sectors 31 to 33, inclusive, or an entity that is a water user primarily engaged in research and development.

(i) "Institutional water user" means 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.

(j) "Interim urban water use target" means the midpoint between the urban retail water supplier's base daily per capita water use and the urban retail water supplier's urban water use target for 2020.

(k) "Locally cost effective" means that the present value of the local benefits of implementing an agricultural efficiency water management practice is greater than or equal to the present value of the local cost of implementing that measure.

(l) "Process water" means water used for producing a product or product content or water used for research and development, including, but not limited to, continuous manufacturing processes, water used for testing and maintaining equipment used in producing a product or product content, and

water used in combined heat and power facilities used in producing a product or product content. Process water does not mean incidental water uses not related to the production of a product or product content, including, but not limited to, water used for restrooms, landscaping, air conditioning, heating, kitchens, and laundry.

(m) “Recycled water” means recycled water, as defined in subdivision (n) of Section 13050, that is used to offset potable demand, including recycled water supplied for direct use and indirect potable reuse, that meets the following requirements, where applicable:

(1) For groundwater recharge, including recharge through spreading basins, water supplies that are all of the following:

(A) Metered.

(B) Developed through planned investment by the urban water supplier or a wastewater treatment agency.

(C) Treated to a minimum tertiary level.

(D) Delivered within the service area of an urban retail water supplier or its urban wholesale water supplier that helps an urban retail water supplier meet its urban water use target.

(2) For reservoir augmentation, water supplies that meet the criteria of paragraph (1) and are conveyed through a distribution system constructed specifically for recycled water.

(n) “Regional water resources management” means sources of supply resulting from watershed-based planning for sustainable local water reliability or any of the following alternative sources of water:

(1) The capture and reuse of stormwater or rainwater.

(2) The use of recycled water.

(3) The desalination of brackish groundwater.

(4) The conjunctive use of surface water and groundwater in a manner that is consistent with the safe yield of the groundwater basin.

(o) “Reporting period” means the years for which an urban retail water supplier reports compliance with the urban water use targets.

(p) “Urban retail water supplier” means a water supplier, either publicly or privately owned, that directly provides potable municipal water to more than 3,000 end users or that supplies more than 3,000 acre-feet of potable water annually at retail for municipal purposes.

(q) “Urban water use target” means the urban retail water supplier’s targeted future daily per capita water use.

(r) “Urban wholesale water supplier,” means a water supplier, either publicly or privately owned, that provides more than 3,000 acre-feet of water annually at wholesale for potable municipal purposes.

CHAPTER 3. URBAN RETAIL WATER SUPPLIERS

10608.16. (a) The state shall achieve a 20-percent reduction in urban per capita water use in California on or before December 31, 2020.

(b) The state shall make incremental progress towards the state target specified in subdivision (a) by reducing urban per capita water use by at least 10 percent on or before December 31, 2015.

10608.20. (a) (1) Each urban retail water supplier shall develop urban water use targets and an interim urban water use target by July 1, 2011. Urban retail water suppliers may elect to determine and report progress toward achieving these targets on an individual or regional basis, as provided in subdivision (a) of Section 10608.28, and may determine the targets on a fiscal year or calendar year basis.

(2) It is the intent of the Legislature that the urban water use targets described in subdivision (a) cumulatively result in a 20-percent reduction from the baseline daily per capita water use by December 31, 2020.

(b) An urban retail water supplier shall adopt one of the following methods for determining its urban water use target pursuant to subdivision (a):

(1) Eighty percent of the urban retail water supplier’s baseline per capita daily water use.

(2) The per capita daily water use that is estimated using the sum of the following performance standards:

(A) For indoor residential water use, 55 gallons per capita daily water use as a provisional standard. Upon completion of the department’s 2016 report to the Legislature pursuant to Section 10608.42, this standard may be adjusted by the Legislature by statute.

(B) For landscape irrigated through dedicated or residential meters or connections, water efficiency equivalent to the standards of the Model Water Efficient Landscape Ordinance set forth in Chapter 2.7 (commencing with Section 490) of Division 2 of Title 23 of the California Code of Regulations, as in effect the later of the year of the landscape’s installation or 1992. An urban retail water supplier using the approach specified in this subparagraph shall use satellite imagery, site visits, or other best available technology to develop an accurate estimate of landscaped areas.

(C) For commercial, industrial, and institutional uses, a 10-percent reduction in water use from the baseline commercial, industrial, and institutional water use by 2020.

(3) Ninety-five percent of the applicable state hydrologic region target, as set forth in the state’s draft 20x2020 Water Conservation Plan (dated April 30, 2009). If the service area of an urban water supplier includes more than one hydrologic region, the supplier shall apportion its service area to each region based on population or area.

(4) A method that shall be identified and developed by the department, through a public process, and reported to the Legislature no later than December 31, 2010. The method developed by the department shall identify per capita targets that cumulatively result in a statewide 20-percent reduction in urban daily per capita water use by December 31, 2020. In developing urban daily per capita water use targets, the department shall do all of the following:

(A) Consider climatic differences within the state.

(B) Consider population density differences within the state.

(C) Provide flexibility to communities and regions in meeting the targets.

(D) Consider different levels of per capita water use according to plant water needs in different regions.

(E) Consider different levels of commercial, industrial, and institutional water use in different regions of the state.

(F) Avoid placing an undue hardship on communities that have implemented conservation measures or taken actions to keep per capita water use low.

(c) If the department adopts a regulation pursuant to paragraph (4) of subdivision (b) that results in a requirement that an urban retail water supplier achieve a reduction in daily per capita water use that is greater than 20 percent by December 31, 2020, an urban retail water supplier that adopted the method described in paragraph (4) of subdivision (b) may limit its urban water use target to a reduction of not more than 20 percent by December 31, 2020, by adopting the method described in paragraph (1) of subdivision (b).

(d) The department shall update the method described in paragraph (4) of subdivision (b) and report to the Legislature by December 31, 2014. An urban retail water supplier that adopted the method described in paragraph (4) of subdivision (b) may adopt a new urban daily per capita water use target pursuant to this updated method.

(e) An urban retail water supplier shall include in its urban water management plan required pursuant to Part 2.6 (commencing with Section 10610) due in 2010 the baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.

(f) When calculating per capita values for the purposes of this chapter, an urban retail water supplier shall determine population using federal, state, and local population reports and projections.

(g) An urban retail water supplier may update its 2020 urban water use target in its 2015 urban water management plan required pursuant to Part 2.6 (commencing with Section 10610).

(h) (1) The department, through a public process and in consultation with the California Urban Water Conservation Council, shall develop technical methodologies and criteria for the consistent implementation of this part, including, but not limited to, both of the following:

(A) Methodologies for calculating base daily per capita water use, baseline commercial, industrial, and institutional water use, compliance daily per capita water use, gross water use, service area population, indoor residential water use, and landscaped area water use.

(B) Criteria for adjustments pursuant to subdivisions (d) and (e) of Section 10608.24.

(2) The department shall post the methodologies and criteria developed pursuant to this subdivision on its Internet Web site, and make written copies

available, by October 1, 2010. An urban retail water supplier shall use the methods developed by the department in compliance with this part.

(i) (1) The department shall adopt regulations for implementation of the provisions relating to process water in accordance with subdivision (l) of Section 10608.12, subdivision (e) of Section 10608.24, and subdivision (d) of Section 10608.26.

(2) The initial adoption of a regulation authorized by this subdivision is deemed to address an emergency, for purposes of Sections 11346.1 and 11349.6 of the Government Code, and the department is hereby exempted for that purpose from the requirements of subdivision (b) of Section 11346.1 of the Government Code. After the initial adoption of an emergency regulation pursuant to this subdivision, the department shall not request approval from the Office of Administrative Law to readopt the regulation as an emergency regulation pursuant to Section 11346.1 of the Government Code.

(j) An urban retail water supplier shall be granted an extension to July 1, 2011, for adoption of an urban water management plan pursuant to Part 2.6 (commencing with Section 10610) due in 2010 to allow use of technical methodologies developed by the department pursuant to paragraph (4) of subdivision (b) and subdivision (h). An urban retail water supplier that adopts an urban water management plan due in 2010 that does not use the methodologies developed by the department pursuant to subdivision (h) shall amend the plan by July 1, 2011, to comply with this part.

10608.22. Notwithstanding the method adopted by an urban retail water supplier pursuant to Section 10608.20, an urban retail water supplier's per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use as defined in paragraph (3) of subdivision (b) of Section 10608.12. This section does not apply to an urban retail water supplier with a base daily per capita water use at or below 100 gallons per capita per day.

10608.24. (a) Each urban retail water supplier shall meet its interim urban water use target by December 31, 2015.

(b) Each urban retail water supplier shall meet its urban water use target by December 31, 2020.

(c) An urban retail water supplier's compliance daily per capita water use shall be the measure of progress toward achievement of its urban water use target.

(d) (1) When determining compliance daily per capita water use, an urban retail water supplier may consider the following factors:

(A) Differences in evapotranspiration and rainfall in the baseline period compared to the compliance reporting period.

(B) Substantial changes to commercial or industrial water use resulting from increased business output and economic development that have occurred during the reporting period.

(C) Substantial changes to institutional water use resulting from fire suppression services or other extraordinary events, or from new or expanded operations, that have occurred during the reporting period.

(2) If the urban retail water supplier elects to adjust its estimate of compliance daily per capita water use due to one or more of the factors described in paragraph (1), it shall provide the basis for, and data supporting, the adjustment in the report required by Section 10608.40.

(e) When developing the urban water use target pursuant to Section 10608.20, an urban retail water supplier that has a substantial percentage of industrial water use in its service area, may exclude process water from the calculation of gross water use to avoid a disproportionate burden on another customer sector.

(f) (1) An urban retail water supplier that includes agricultural water use in an urban water management plan pursuant to Part 2.6 (commencing with Section 10610) may include the agricultural water use in determining gross water use. An urban retail water supplier that includes agricultural water use in determining gross water use and develops its urban water use target pursuant to paragraph (2) of subdivision (b) of Section 10608.20 shall use a water efficient standard for agricultural irrigation of 100 percent of reference evapotranspiration multiplied by the crop coefficient for irrigated acres.

(2) An urban retail water supplier, that is also an agricultural water supplier, is not subject to the requirements of Chapter 4 (commencing with Section 10608.48), if the agricultural water use is incorporated into its urban water use target pursuant to paragraph (1).

10608.26. (a) In complying with this part, an urban retail water supplier shall conduct at least one public hearing to accomplish all of the following:

(1) Allow community input regarding the urban retail water supplier's implementation plan for complying with this part.

(2) Consider the economic impacts of the urban retail water supplier's implementation plan for complying with this part.

(3) Adopt a method, pursuant to subdivision (b) of Section 10608.20, for determining its urban water use target.

(b) In complying with this part, an urban retail water supplier may meet its urban water use target through efficiency improvements in any combination among its customer sectors. An urban retail water supplier shall avoid placing a disproportionate burden on any customer sector.

(c) For an urban retail water supplier that supplies water to a United States Department of Defense military installation, the urban retail water supplier's implementation plan for complying with this part shall consider the United States Department of Defense military installation's requirements under federal Executive Order 13423.

(d) (1) Any ordinance or resolution adopted by an urban retail water supplier after the effective date of this section shall not require existing customers as of the effective date of this section, to undertake changes in product formulation, operations, or equipment that would reduce process water use, but may provide technical assistance and financial incentives to those customers to implement efficiency measures for process water. This section shall not limit an ordinance or resolution adopted pursuant to a declaration of drought emergency by an urban retail water supplier.

(2) This part shall not be construed or enforced so as to interfere with the requirements of Chapter 4 (commencing with Section 113980) to Chapter 13 (commencing with Section 114380), inclusive, of Part 7 of Division 104 of the Health and Safety Code, or any requirement or standard for the protection of public health, public safety, or worker safety established by federal, state, or local government or recommended by recognized standard setting organizations or trade associations.

10608.28. (a) An urban retail water supplier may meet its urban water use target within its retail service area, or through mutual agreement, by any of the following:

(1) Through an urban wholesale water supplier.

(2) Through a regional agency authorized to plan and implement water conservation, including, but not limited to, an agency established under the Bay Area Water Supply and Conservation Agency Act (Division 31 (commencing with Section 81300)).

(3) Through a regional water management group as defined in Section 10537.

(4) By an integrated regional water management funding area.

(5) By hydrologic region.

(6) Through other appropriate geographic scales for which computation methods have been developed by the department.

(b) A regional water management group, with the written consent of its member agencies, may undertake any or all planning, reporting, and implementation functions under this chapter for the member agencies that consent to those activities. Any data or reports shall provide information both for the regional water management group and separately for each consenting urban retail water supplier and urban wholesale water supplier.

10608.32. All costs incurred pursuant to this part by a water utility regulated by the Public Utilities Commission may be recoverable in rates subject to review and approval by the Public Utilities Commission, and may be recorded in a memorandum account and reviewed for reasonableness by the Public Utilities Commission.

10608.36. Urban wholesale water suppliers shall include in the urban water management plans required pursuant to Part 2.6 (commencing with Section 10610) an assessment of their present and proposed future measures, programs, and policies to help achieve the water use reductions required by this part.

10608.40. Urban water retail suppliers shall report to the department on their progress in meeting their urban water use targets as part of their urban water management plans submitted pursuant to Section 10631. The data shall be reported using a standardized form developed pursuant to Section 10608.52.

10608.42. The department shall review the 2015 urban water management plans and report to the Legislature by December 31, 2016, on progress towards achieving a 20-percent reduction in urban water use by December 31, 2020. The report shall include recommendations on changes to water efficiency standards or urban water use targets in order to achieve

the 20-percent reduction and to reflect updated efficiency information and technology changes.

10608.43. The department, in conjunction with the California Urban Water Conservation Council, by April 1, 2010, shall convene a representative task force consisting of academic experts, urban retail water suppliers, environmental organizations, commercial water users, industrial water users, and institutional water users to develop alternative best management practices for commercial, industrial, and institutional users and an assessment of the potential statewide water use efficiency improvement in the commercial, industrial, and institutional sectors that would result from implementation of these best management practices. The taskforce, in conjunction with the department, shall submit a report to the Legislature by April 1, 2012, that shall include a review of multiple sectors within commercial, industrial, and institutional users and that shall recommend water use efficiency standards for commercial, industrial, and institutional users among various sectors of water use. The report shall include, but not be limited to, the following:

- (a) Appropriate metrics for evaluating commercial, industrial, and institutional water use.
- (b) Evaluation of water demands for manufacturing processes, goods, and cooling.
- (c) Evaluation of public infrastructure necessary for delivery of recycled water to the commercial, industrial, and institutional sectors.
- (d) Evaluation of institutional and economic barriers to increased recycled water use within the commercial, industrial, and institutional sectors.
- (e) Identification of technical feasibility and cost of the best management practices to achieve more efficient water use statewide in the commercial, industrial, and institutional sectors that is consistent with the public interest and reflects past investments in water use efficiency.

10608.44. Each state agency shall reduce water use on facilities it operates to support urban retail water suppliers in meeting the target identified in Section 10608.16.

CHAPTER 4. AGRICULTURAL WATER SUPPLIERS

10608.48. (a) On or before July 31, 2012, an agricultural water supplier shall implement efficient water management practices pursuant to subdivisions (b) and (c).

(b) Agricultural water suppliers shall implement all of the following critical efficient management practices:

- (1) Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10 and to implement paragraph (2).
- (2) Adopt a pricing structure for water customers based at least in part on quantity delivered.

(c) Agricultural water suppliers shall implement additional efficient management practices, including, but not limited to, practices to accomplish all of the following, if the measures are locally cost effective and technically feasible:

(1) Facilitate alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including drainage.

(2) Facilitate use of available recycled water that otherwise would not be used beneficially, meets all health and safety criteria, and does not harm crops or soils.

(3) Facilitate the financing of capital improvements for on-farm irrigation systems.

(4) Implement an incentive pricing structure that promotes one or more of the following goals:

(A) More efficient water use at the farm level.

(B) Conjunctive use of groundwater.

(C) Appropriate increase of groundwater recharge.

(D) Reduction in problem drainage.

(E) Improved management of environmental resources.

(F) Effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.

(5) Expand line or pipe distribution systems, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance, and reduce seepage.

(6) Increase flexibility in water ordering by, and delivery to, water customers within operational limits.

(7) Construct and operate supplier spill and tailwater recovery systems.

(8) Increase planned conjunctive use of surface water and groundwater within the supplier service area.

(9) Automate canal control structures.

(10) Facilitate or promote customer pump testing and evaluation.

(11) Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress reports.

(12) Provide for the availability of water management services to water users. These services may include, but are not limited to, all of the following:

(A) On-farm irrigation and drainage system evaluations.

(B) Normal year and real-time irrigation scheduling and crop evapotranspiration information.

(C) Surface water, groundwater, and drainage water quantity and quality data.

(D) Agricultural water management educational programs and materials for farmers, staff, and the public.

(13) Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.

(14) Evaluate and improve the efficiencies of the supplier's pumps.

(d) Agricultural water suppliers shall include in the agricultural water management plans required pursuant to Part 2.8 (commencing with Section 10800) a report on which efficient water management practices have been implemented and are planned to be implemented, an estimate of the water use efficiency improvements that have occurred since the last report, and an estimate of the water use efficiency improvements estimated to occur five and 10 years in the future. If an agricultural water supplier determines that an efficient water management practice is not locally cost effective or technically feasible, the supplier shall submit information documenting that determination.

(e) The data shall be reported using a standardized form developed pursuant to Section 10608.52.

(f) An agricultural water supplier may meet the requirements of subdivisions (d) and (e) by submitting to the department a water conservation plan submitted to the United States Bureau of Reclamation that meets the requirements described in Section 10828.

(g) On or before December 31, 2013, December 31, 2016, and December 31, 2021, the department, in consultation with the board, shall submit to the Legislature a report on the agricultural efficient water management practices that have been implemented and are planned to be implemented and an assessment of the manner in which the implementation of those efficient water management practices has affected and will affect agricultural operations, including estimated water use efficiency improvements, if any.

(h) The department may update the efficient water management practices required pursuant to subdivision (c), in consultation with the Agricultural Water Management Council, the United States Bureau of Reclamation, and the board. All efficient water management practices for agricultural water use pursuant to this chapter shall be adopted or revised by the department only after the department conducts public hearings to allow participation of the diverse geographical areas and interests of the state.

(i) (1) The department shall adopt regulations that provide for a range of options that agricultural water suppliers may use or implement to comply with the measurement requirement in paragraph (1) of subdivision (b).

(2) The initial adoption of a regulation authorized by this subdivision is deemed to address an emergency, for purposes of Sections 11346.1 and 11349.6 of the Government Code, and the department is hereby exempted for that purpose from the requirements of subdivision (b) of Section 11346.1 of the Government Code. After the initial adoption of an emergency regulation pursuant to this subdivision, the department shall not request approval from the Office of Administrative Law to readopt the regulation as an emergency regulation pursuant to Section 11346.1 of the Government Code.

CHAPTER 5. SUSTAINABLE WATER MANAGEMENT

10608.50. (a) The department, in consultation with the board, shall promote implementation of regional water resources management practices through increased incentives and removal of barriers consistent with state and federal law. Potential changes may include, but are not limited to, all of the following:

(1) Revisions to the requirements for urban and agricultural water management plans.

(2) Revisions to the requirements for integrated regional water management plans.

(3) Revisions to the eligibility for state water management grants and loans.

(4) Revisions to state or local permitting requirements that increase water supply opportunities, but do not weaken water quality protection under state and federal law.

(5) Increased funding for research, feasibility studies, and project construction.

(6) Expanding technical and educational support for local land use and water management agencies.

(b) No later than January 1, 2011, and updated as part of the California Water Plan, the department, in consultation with the board, and with public input, shall propose new statewide targets, or review and update existing statewide targets, for regional water resources management practices, including, but not limited to, recycled water, brackish groundwater desalination, and infiltration and direct use of urban stormwater runoff.

CHAPTER 6. STANDARDIZED DATA COLLECTION

10608.52. (a) The department, in consultation with the board, the California Bay-Delta Authority or its successor agency, the State Department of Public Health, and the Public Utilities Commission, shall develop a single standardized water use reporting form to meet the water use information needs of each agency, including the needs of urban water suppliers that elect to determine and report progress toward achieving targets on a regional basis as provided in subdivision (a) of Section 10608.28.

(b) At a minimum, the form shall be developed to accommodate information sufficient to assess an urban water supplier's compliance with conservation targets pursuant to Section 10608.24 and an agricultural water supplier's compliance with implementation of efficient water management practices pursuant to subdivision (a) of Section 10608.48. The form shall accommodate reporting by urban water suppliers on an individual or regional basis as provided in subdivision (a) of Section 10608.28.

CHAPTER 7. FUNDING PROVISIONS

10608.56. (a) On and after July 1, 2016, an urban retail water supplier is not eligible for a water grant or loan awarded or administered by the state unless the supplier complies with this part.

(b) On and after July 1, 2013, an agricultural water supplier is not eligible for a water grant or loan awarded or administered by the state unless the supplier complies with this part.

(c) Notwithstanding subdivision (a), the department shall determine that an urban retail water supplier is eligible for a water grant or loan even though the supplier has not met the per capita reductions required pursuant to Section 10608.24, if the urban retail water supplier has submitted to the department for approval a schedule, financing plan, and budget, to be included in the grant or loan agreement, for achieving the per capita reductions. The supplier may request grant or loan funds to achieve the per capita reductions to the extent the request is consistent with the eligibility requirements applicable to the water funds.

(d) Notwithstanding subdivision (b), the department shall determine that an agricultural water supplier is eligible for a water grant or loan even though the supplier is not implementing all of the efficient water management practices described in Section 10608.48, if the agricultural water supplier has submitted to the department for approval a schedule, financing plan, and budget, to be included in the grant or loan agreement, for implementation of the efficient water management practices. The supplier may request grant or loan funds to implement the efficient water management practices to the extent the request is consistent with the eligibility requirements applicable to the water funds.

(e) Notwithstanding subdivision (a), the department shall determine that an urban retail water supplier is eligible for a water grant or loan even though the supplier has not met the per capita reductions required pursuant to Section 10608.24, if the urban retail water supplier has submitted to the department for approval documentation demonstrating that its entire service area qualifies as a disadvantaged community.

(f) The department shall not deny eligibility to an urban retail water supplier or agricultural water supplier in compliance with the requirements of this part and Part 2.8 (commencing with Section 10800), that is participating in a multiagency water project, or an integrated regional water management plan, developed pursuant to Section 75026 of the Public Resources Code, solely on the basis that one or more of the agencies participating in the project or plan is not implementing all of the requirements of this part or Part 2.8 (commencing with Section 10800).

10608.60. (a) It is the intent of the Legislature that funds made available by Section 75026 of the Public Resources Code should be expended, consistent with Division 43 (commencing with Section 75001) of the Public Resources Code and upon appropriation by the Legislature, for grants to implement this part. In the allocation of funding, it is the intent of the

Legislature that the department give consideration to disadvantaged communities to assist in implementing the requirements of this part.

(b) It is the intent of the Legislature that funds made available by Section 75041 of the Public Resources Code, should be expended, consistent with Division 43 (commencing with Section 75001) of the Public Resources Code and upon appropriation by the Legislature, for direct expenditures to implement this part.

CHAPTER 8. QUANTIFYING AGRICULTURAL WATER USE EFFICIENCY

10608.64. The department, in consultation with the Agricultural Water Management Council, academic experts, and other stakeholders, shall develop a methodology for quantifying the efficiency of agricultural water use. Alternatives to be assessed shall include, but not be limited to, determination of efficiency levels based on crop type or irrigation system distribution uniformity. On or before December 31, 2011, the department shall report to the Legislature on a proposed methodology and a plan for implementation. The plan shall include the estimated implementation costs and the types of data needed to support the methodology. Nothing in this section authorizes the department to implement a methodology established pursuant to this section.

SEC. 2. Section 10631.5 of the Water Code is amended to read:

10631.5. (a) (1) Beginning January 1, 2009, the terms of, and eligibility for, a water management grant or loan made to an urban water supplier and awarded or administered by the department, state board, or California Bay-Delta Authority or its successor agency shall be conditioned on the implementation of the water demand management measures described in Section 10631, as determined by the department pursuant to subdivision (b).

(2) For the purposes of this section, water management grants and loans include funding for programs and projects for surface water or groundwater storage, recycling, desalination, water conservation, water supply reliability, and water supply augmentation. This section does not apply to water management projects funded by the federal American Recovery and Reinvestment Act of 2009 (Public Law 111-5).

(3) Notwithstanding paragraph (1), the department shall determine that an urban water supplier is eligible for a water management grant or loan even though the supplier is not implementing all of the water demand management measures described in Section 10631, if the urban water supplier has submitted to the department for approval a schedule, financing plan, and budget, to be included in the grant or loan agreement, for implementation of the water demand management measures. The supplier may request grant or loan funds to implement the water demand management measures to the extent the request is consistent with the eligibility requirements applicable to the water management funds.

(4) (A) Notwithstanding paragraph (1), the department shall determine that an urban water supplier is eligible for a water management grant or loan even though the supplier is not implementing all of the water demand management measures described in Section 10631, if an urban water supplier submits to the department for approval documentation demonstrating that a water demand management measure is not locally cost effective. If the department determines that the documentation submitted by the urban water supplier fails to demonstrate that a water demand management measure is not locally cost effective, the department shall notify the urban water supplier and the agency administering the grant or loan program within 120 days that the documentation does not satisfy the requirements for an exemption, and include in that notification a detailed statement to support the determination.

(B) For purposes of this paragraph, “not locally cost effective” means that the present value of the local benefits of implementing a water demand management measure is less than the present value of the local costs of implementing that measure.

(b) (1) The department, in consultation with the state board and the California Bay-Delta Authority or its successor agency, and after soliciting public comment regarding eligibility requirements, shall develop eligibility requirements to implement the requirement of paragraph (1) of subdivision (a). In establishing these eligibility requirements, the department shall do both of the following:

(A) Consider the conservation measures described in the Memorandum of Understanding Regarding Urban Water Conservation in California, and alternative conservation approaches that provide equal or greater water savings.

(B) Recognize the different legal, technical, fiscal, and practical roles and responsibilities of wholesale water suppliers and retail water suppliers.

(2) (A) For the purposes of this section, the department shall determine whether an urban water supplier is implementing all of the water demand management measures described in Section 10631 based on either, or a combination, of the following:

(i) Compliance on an individual basis.

(ii) Compliance on a regional basis. Regional compliance shall require participation in a regional conservation program consisting of two or more urban water suppliers that achieves the level of conservation or water efficiency savings equivalent to the amount of conservation or savings achieved if each of the participating urban water suppliers implemented the water demand management measures. The urban water supplier administering the regional program shall provide participating urban water suppliers and the department with data to demonstrate that the regional program is consistent with this clause. The department shall review the data to determine whether the urban water suppliers in the regional program are meeting the eligibility requirements.

(B) The department may require additional information for any determination pursuant to this section.

(3) The department shall not deny eligibility to an urban water supplier in compliance with the requirements of this section that is participating in a multiagency water project, or an integrated regional water management plan, developed pursuant to Section 75026 of the Public Resources Code, solely on the basis that one or more of the agencies participating in the project or plan is not implementing all of the water demand management measures described in Section 10631.

(c) In establishing guidelines pursuant to the specific funding authorization for any water management grant or loan program subject to this section, the agency administering the grant or loan program shall include in the guidelines the eligibility requirements developed by the department pursuant to subdivision (b).

(d) Upon receipt of a water management grant or loan application by an agency administering a grant and loan program subject to this section, the agency shall request an eligibility determination from the department with respect to the requirements of this section. The department shall respond to the request within 60 days of the request.

(e) The urban water supplier may submit to the department copies of its annual reports and other relevant documents to assist the department in determining whether the urban water supplier is implementing or scheduling the implementation of water demand management activities. In addition, for urban water suppliers that are signatories to the Memorandum of Understanding Regarding Urban Water Conservation in California and submit biennial reports to the California Urban Water Conservation Council in accordance with the memorandum, the department may use these reports to assist in tracking the implementation of water demand management measures.

(f) This section shall remain in effect only until July 1, 2016, and as of that date is repealed, unless a later enacted statute, that is enacted before July 1, 2016, deletes or extends that date.

SEC. 3. Part 2.8 (commencing with Section 10800) of Division 6 of the Water Code is repealed.

SEC. 4. Part 2.8 (commencing with Section 10800) is added to Division 6 of the Water Code, to read:

PART 2.8. AGRICULTURAL WATER MANAGEMENT PLANNING

CHAPTER 1. GENERAL DECLARATIONS AND POLICY

10800. This part shall be known and may be cited as the Agricultural Water Management Planning Act.

10801. The Legislature finds and declares all of the following:

- (a) The waters of the state are a limited and renewable resource.
- (b) The California Constitution requires that water in the state be used in a reasonable and beneficial manner.
- (c) Urban water districts are required to adopt water management plans.

(d) The conservation of agricultural water supplies is of great statewide concern.

(e) There is a great amount of reuse of delivered water, both inside and outside the water service areas.

(f) Significant noncrop beneficial uses are associated with agricultural water use, including streamflows and wildlife habitat.

(g) Significant opportunities exist in some areas, through improved irrigation water management, to conserve water or to reduce the quantity of highly saline or toxic drainage water.

(h) Changes in water management practices should be carefully planned and implemented to minimize adverse effects on other beneficial uses currently being served.

(i) Agricultural water suppliers that receive water from the federal Central Valley Project are required by federal law to prepare and implement water conservation plans.

(j) Agricultural water users applying for a permit to appropriate water from the board are required to prepare and implement water conservation plans.

10802. The Legislature finds and declares that all of the following are the policies of the state:

(a) The conservation of water shall be pursued actively to protect both the people of the state and the state's water resources.

(b) The conservation of agricultural water supplies shall be an important criterion in public decisions with regard to water.

(c) Agricultural water suppliers shall be required to prepare water management plans to achieve conservation of water.

CHAPTER 2. DEFINITIONS

10810. Unless the context otherwise requires, the definitions set forth in this chapter govern the construction of this part.

10811. "Agricultural water management plan" or "plan" means an agricultural water management plan prepared pursuant to this part.

10812. "Agricultural water supplier" has the same meaning as defined in Section 10608.12.

10813. "Customer" means a purchaser of water from a water supplier who uses water for agricultural purposes.

10814. "Person" means any individual, firm, association, organization, partnership, business, trust, corporation, company, public agency, or any agency of that entity.

10815. "Public agency" means any city, county, city and county, special district, or other public entity.

10816. "Urban water supplier" has the same meaning as set forth in Section 10617.

10817. “Water conservation” means the efficient management of water resources for beneficial uses, preventing waste, or accomplishing additional benefits with the same amount of water.

CHAPTER 3. AGRICULTURAL WATER MANAGEMENT PLANS

Article 1. General Provisions

10820. (a) An agricultural water supplier shall prepare and adopt an agricultural water management plan in the manner set forth in this chapter on or before December 31, 2012, and shall update that plan on December 31, 2015, and on or before December 31 every five years thereafter.

(b) Every supplier that becomes an agricultural water supplier after December 31, 2012, shall prepare and adopt an agricultural water management plan within one year after the date it has become an agricultural water supplier.

(c) A water supplier that indirectly provides water to customers for agricultural purposes shall not prepare a plan pursuant to this part without the consent of each agricultural water supplier that directly provides that water to its customers.

10821. (a) An agricultural water supplier required to prepare a plan pursuant to this part shall notify each city or county within which the supplier provides water supplies that the agricultural water supplier will be preparing the plan or reviewing the plan and considering amendments or changes to the plan. The agricultural water supplier may consult with, and obtain comments from, each city or county that receives notice pursuant to this subdivision.

(b) The amendments to, or changes in, the plan shall be adopted and submitted in the manner set forth in Article 3 (commencing with Section 10840).

Article 2. Contents of Plans

10825. (a) It is the intent of the Legislature in enacting this part to allow levels of water management planning commensurate with the numbers of customers served and the volume of water supplied.

(b) This part does not require the implementation of water conservation programs or practices that are not locally cost effective.

10826. An agricultural water management plan shall be adopted in accordance with this chapter. The plan shall do all of the following:

(a) Describe the agricultural water supplier and the service area, including all of the following:

- (1) Size of the service area.
- (2) Location of the service area and its water management facilities.
- (3) Terrain and soils.
- (4) Climate.

- (5) Operating rules and regulations.
- (6) Water delivery measurements or calculations.
- (7) Water rate schedules and billing.
- (8) Water shortage allocation policies.

(b) Describe the quantity and quality of water resources of the agricultural water supplier, including all of the following:

- (1) Surface water supply.
- (2) Groundwater supply.
- (3) Other water supplies.
- (4) Source water quality monitoring practices.
- (5) Water uses within the agricultural water supplier's service area,

including all of the following:

- (A) Agricultural.
- (B) Environmental.
- (C) Recreational.
- (D) Municipal and industrial.
- (E) Groundwater recharge.
- (F) Transfers and exchanges.
- (G) Other water uses.

(6) Drainage from the water supplier's service area.

(7) Water accounting, including all of the following:

(A) Quantifying the water supplier's water supplies.

(B) Tabulating water uses.

(C) Overall water budget.

(8) Water supply reliability.

(c) Include an analysis, based on available information, of the effect of climate change on future water supplies.

(d) Describe previous water management activities.

(e) Include in the plan the water use efficiency information required pursuant to Section 10608.48.

10827. Agricultural water suppliers that are members of the Agricultural Water Management Council, and that submit water management plans to that council in accordance with the "Memorandum of Understanding Regarding Efficient Water Management Practices By Agricultural Water Suppliers In California," dated January 1, 1999, may submit the water management plans identifying water demand management measures currently being implemented, or scheduled for implementation, to satisfy the requirements of Section 10826.

10828. (a) Agricultural water suppliers that are required to submit water conservation plans to the United States Bureau of Reclamation pursuant to either the Central Valley Project Improvement Act (Public Law 102-575) or the Reclamation Reform Act of 1982, or both, may submit those water conservation plans to satisfy the requirements of Section 10826, if both of the following apply:

(1) The agricultural water supplier has adopted and submitted the water conservation plan to the United States Bureau of Reclamation within the previous four years.

(2) The United States Bureau of Reclamation has accepted the water conservation plan as adequate.

(b) This part does not require agricultural water suppliers that are required to submit water conservation plans to the United States Bureau of Reclamation pursuant to either the Central Valley Project Improvement Act (Public Law 102-575) or the Reclamation Reform Act of 1982, or both, to prepare and adopt water conservation plans according to a schedule that is different from that required by the United States Bureau of Reclamation.

10829. An agricultural water supplier may satisfy the requirements of this part by adopting an urban water management plan pursuant to Part 2.6 (commencing with Section 10610) or by participation in areawide, regional, watershed, or basinwide water management planning if those plans meet or exceed the requirements of this part.

Article 3. Adoption and Implementation of Plans

10840. Every agricultural water supplier shall prepare its plan pursuant to Article 2 (commencing with Section 10825).

10841. Prior to adopting a plan, the agricultural water supplier shall make the proposed plan available for public inspection, and shall hold a public hearing on the plan. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned agricultural water supplier pursuant to Section 6066 of the Government Code. A privately owned agricultural water supplier shall provide an equivalent notice within its service area and shall provide a reasonably equivalent opportunity that would otherwise be afforded through a public hearing process for interested parties to provide input on the plan. After the hearing, the plan shall be adopted as prepared or as modified during or after the hearing.

10842. An agricultural water supplier shall implement the plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan, as determined by the governing body of the agricultural water supplier.

10843. (a) An agricultural water supplier shall submit to the entities identified in subdivision (b) a copy of its plan no later than 30 days after the adoption of the plan. Copies of amendments or changes to the plans shall be submitted to the entities identified in subdivision (b) within 30 days after the adoption of the amendments or changes.

(b) An agricultural water supplier shall submit a copy of its plan and amendments or changes to the plan to each of the following entities:

- (1) The department.
- (2) Any city, county, or city and county within which the agricultural water supplier provides water supplies.
- (3) Any groundwater management entity within which jurisdiction the agricultural water supplier extracts or provides water supplies.
- (4) Any urban water supplier within which jurisdiction the agricultural water supplier provides water supplies.

(5) Any city or county library within which jurisdiction the agricultural water supplier provides water supplies.

(6) The California State Library.

(7) Any local agency formation commission serving a county within which the agricultural water supplier provides water supplies.

10844. (a) Not later than 30 days after the date of adopting its plan, the agricultural water supplier shall make the plan available for public review on the agricultural water supplier's Internet Web site.

(b) An agricultural water supplier that does not have an Internet Web site shall submit to the department, not later than 30 days after the date of adopting its plan, a copy of the adopted plan in an electronic format. The department shall make the plan available for public review on the department's Internet Web site.

10845. (a) The department shall prepare and submit to the Legislature, on or before December 31, 2013, and thereafter in the years ending in six and years ending in one, a report summarizing the status of the plans adopted pursuant to this part.

(b) The report prepared by the department shall identify the outstanding elements of any plan adopted pursuant to this part. The report shall include an evaluation of the effectiveness of this part in promoting efficient agricultural water management practices and recommendations relating to proposed changes to this part, as appropriate.

(c) The department shall provide a copy of the report to each agricultural water supplier that has submitted its plan to the department. The department shall also prepare reports and provide data for any legislative hearing designed to consider the effectiveness of plans submitted pursuant to this part.

(d) This section does not authorize the department, in preparing the report, to approve, disapprove, or critique individual plans submitted pursuant to this part.

CHAPTER 4. MISCELLANEOUS PROVISIONS

10850. (a) Any action or proceeding to attack, review, set aside, void, or annul the acts or decisions of an agricultural water supplier on the grounds of noncompliance with this part shall be commenced as follows:

(1) An action or proceeding alleging failure to adopt a plan shall be commenced within 18 months after that adoption is required by this part.

(2) Any action or proceeding alleging that a plan, or action taken pursuant to the plan, does not comply with this part shall be commenced within 120 days after submitting the plan or amendments to the plan to entities in accordance with Section 10844 or the taking of that action.

(b) In an action or proceeding to attack, review, set aside, void, or annul a plan, or an action taken pursuant to the plan by an agricultural water supplier, on the grounds of noncompliance with this part, the inquiry shall extend only to whether there was a prejudicial abuse of discretion. Abuse

of discretion is established if the agricultural water supplier has not proceeded in a manner required by law, or if the action by the agricultural water supplier is not supported by substantial evidence.

10851. The California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) does not apply to the preparation and adoption of plans pursuant to this part. This part does not exempt projects for implementation of the plan or for expanded or additional water supplies from the California Environmental Quality Act.

10852. An agricultural water supplier is not eligible for a water grant or loan awarded or administered by the state unless the supplier complies with this part.

10853. No agricultural water supplier that provides water to less than 25,000 irrigated acres, excluding recycled water, shall be required to implement the requirements of this part or Part 2.55 (commencing with Section 10608) unless sufficient funding has specifically been provided to that water supplier for these purposes.

SEC. 5. This act shall take effect only if Senate Bill 1 and Senate Bill 6 of the 2009–10 Seventh Extraordinary Session of the Legislature are enacted and become effective.

APPENDIX E
ORDINANCES AND RESOLUTIONS

ORDINANCE NO. 1842

AN ORDINANCE ADDING CHAPTER 15.42 TO THE MERCED MUNICIPAL CODE PROHIBITING CERTAIN USES OF WATER FOR WATER CONSERVATION PURPOSES AND DECLARING AN EMERGENCY

WHEREAS, a water shortage emergency exists because of shortage of water due to a prolonged drought; and

WHEREAS, this Council finds that the ordinary demands and requirements of water consumers cannot be satisfied without depleting the water supply to the extent that there would be insufficient water for human consumption, sanitation, and fire protection; and

WHEREAS, it is imperative to the public well-being that those uses of water which are not essential to public health, safety, or welfare be either prohibited or restricted; and

WHEREAS, the regulations and penalty rate structure hereinafter enacted is designed to discourage violations of the prohibitions hereinafter enacted and other nonessential or wasteful uses, encourage conservation, minimize peak load demands on City facilities, conserve the water supply of the City for the greatest public benefit with particular regard to domestic use, sanitation, and fire protection, and to avoid the necessity of even more serious rationing measures; and

WHEREAS, the usage regulations hereinafter established will spread the burden of restricted usage most equally and equitably over all consumers of City water regardless of the category or type of use.

WHEREAS, the actions herein taken are exempt from the provisions of the California Environmental Quality Act of 1970 as a project undertaken as immediate action necessary to prevent or mitigate an emergency pursuant to Section 15071(c) of the State guidelines.

THE CITY COUNCIL OF THE CITY OF MERCED DOES ORDAIN AS FOLLOWS:

SECTION 1. ADDITION TO CODE. Chapter 15.42 is hereby added to the Merced Municipal Code to read as follows:

"CHAPTER 15.42
WATER SHORTAGE REGULATIONS

Section 15.42.010. DECLARATION OF EMERGENCY.

It is hereby found and declared that a water shortage and emergency exists within the water source and service area of the Water Department of the City of Merced, and that it is necessary to prohibit and regulate water uses as provided in this Chapter.

Section 15.42.020. APPLICATION OF REGULATIONS.

The provisions of this Chapter shall apply to all persons using water both in and outside the City served by the City water system, and regardless of whether any person using water shall have a contract for water service with the City.

Section 15.42.030. PROVISIONS SUPERSEDED.

Notwithstanding other Code provisions inconsistent with this Chapter, the provisions of this Chapter shall supersede and prevail for the duration of the emergency and until repeal of this Chapter.

Section 15.42.040. PROHIBITED USES.

It is unlawful for any person to use water obtained from the water system of the City of Merced through fraud, including misrepresentations made to obtain a particular allocation of water, or for any prohibited use as hereinafter defined:

A. The washing of sidewalks, driveways, filling station aprons, porches or other outdoor surfaces except when necessary to protect the public health and safety.

B. The washing of the exterior of dwellings, buildings, and structures, with the following exceptions:

1. Window washing.
2. Washing in conjunction with the painting of the exterior of a dwelling, building or structure.
3. Washing of a dwelling, building or structure may be allowed once every twelve months.

All exceptions listed above must comply with Section 15.42.090 (A. and B.) and the hose(s) must be fitted with an automatic shut-off device(s).

C. The operation of any ornamental fountain or other such structure making a use of water from the City domestic water system, unless said fountain or structure uses a recirculating water system.

D. The use of water, except for domestic use, where an adequate alternate source of water is available whether such

alternate source is reclaimed water, well water, spring water, or other source.

E. The external washing of trailers, trailer houses, mobile homes, and home exteriors unless in conjunction with painting the exterior of said trailers, or homes.

F. The washing of boats or motor vehicles in with a hose that is not fitted with an automatic shut off device.

G. The indiscriminate running of water or washing with water not otherwise prohibited above which is wasteful and without reasonable purpose.

Section 15.42.050. VARIANCES.

The Director of Public Works may grant variances for uses of water otherwise prohibited if he finds and determines that to fail to do so would cause an emergency condition affecting health, sanitation, or fire protection to the applicant or the public. His determination shall be final.

Section 15.42.060. DISCONNECTION FOR VIOLATION.

Any person within the water service area who is in violation of the water prohibition provisions of Section 15.42.040 shall be subject to immediate disconnection of water service and/or the installation of a meter at the violator's expense. Upon disconnection of water service a written notice shall be served upon the violator which shall state the time, place, and general

description of the violation or penalty, and the method by which reconnection can be made.

Section 15.42.070. RECONNECTION CONDITIONS.

Where water service has been disconnected as authorized in Section 15.42.050, the water service shall be immediately reconnected on condition that:

A. The Public Works Department be authorized by the appropriate person to install a water meter on the consumer's water service; and

B. An installation charge be paid for the installation of said meter in accordance with the Merced Municipal Code; and

C. A reconnection charge is paid in an amount fixed pursuant to the Merced Municipal Code Section 15.32.170.

Section 15.42.080. EQUIPMENT TAMPERING ILLEGAL.

It is unlawful for any person to remove, replace, alter or damage any water meter or components thereof including, but not limited to, the meter face, its dials or other water usage indicators.

Section 15.42.090. PROHIBITED USES - MANDATORY.

The following uses, methods, types or techniques of use of water are hereby determined and declared non-essential and are prohibited:

A. ALL USERS.

1. Allowing broken or defective plumbing, or sprinklers, watering or irrigation systems which permit the escape or leakage of water.

2. The use of water in any manner which causes, allows, or permits the flooding of any premises, or any portion thereof..

3. All uses of non-potable water without the permission of the Public Works Department.

B. GARDENS AND LANDSCAPING

1. Any sprinkling, watering or irrigation between the hours of 11:00 a.m. and 7:00 p.m.

2. Any watering by persons with even numbered addresses is prohibited on Sunday, Wednesday and Friday.

3. Any watering by persons with odd numbered addresses is prohibited on Tuesday, Thursday and Saturday.

4. Any watering by persons on Monday.

C. NEW PLANTING. Notwithstanding the prohibitions contained in B. above, new lawns, ground cover, or bedding plants, may be watered every day between 7:00 p.m. and 11:00 a.m. provided the following conditions are met:

1. New lawns, ground cover, or bedding plants shall not include the reseedling of existing lawns or replacement of existing ground cover, or bedding plants, and shall be newly rototilled earth.

2. A permit must be obtained from the Department of Public Works and a \$10.00 permit fee paid.
3. The permit shall be limited to thirty (30) days duration.
4. The Director of Public Works may impose such other restrictions as are deemed necessary to prevent the waste of water.

Section 15.42.100. IMPLEMENTATION.

A. The Director of Public Works is hereby authorized and empowered to delegate his authority hereunder to such deputies, officers, employees, or agents of the City as he shall designate, and to establish such rules, regulations, and procedures, and to prepare or furnish such forms, warnings, et cetera as he deems necessary or appropriate to carry out the provisions of this Chapter.

B. Upon a determination by the Director of Public Works, or his designee, that a person has consumed or used water in violation of any of the mandatory provisions of this Chapter, or of any exception granted pursuant to the provisions of Section 15.40.080 hereof, the Director may issue an Order to Cease and Desist from such violation, and further order such person to comply forthwith with such provisions or exceptions, or otherwise to take appropriate remedial or preventive action. Any Cease and Desist Order may be served personally, by mail, or by leaving a copy at or posted upon the person's residence or place of business.

C. If, after the issuance of such Cease and Desist Order, such person continues to consume or use, or again consumes or uses, water in violation of any such provision or exception, the Director may issue a Notice of Intention to Impose a Penalty. Said Notice shall:

- (1) Identify the date, time and circumstances of violation,
- (2) State the amount of penalty to be imposed, and
- (3) Advise the person of the appeal rights as provided herein.

The Notice of Intention to Impose a Penalty shall be served in the same manner as the Cease and Desist Order.

D. After a Notice of Intention to Impose a Penalty is served, a penalty shall be assessed to the utility account of the person in the amount of \$25 for the first violation, \$50 for the second violation and \$100 for the third and each of any subsequent violations. The penalty shall be subject to collection in the same manner as any unpaid water service charges.

E. A person shall have the right to appeal the imposition of the penalty assessed to the utility account. The person must request an appeal hearing in writing within fifteen (15) days from the date of service of the Notice of Intention to Impose a Penalty. The request for hearing must be addressed to the Public Works Director and shall be deemed served only when received by the City.

Failure to properly serve the request for hearing within the fifteen day period shall be deemed a waiver of the right to appeal the matter, and the penalty will be assessed against the person's account.

F. The appeal hearing shall be held before the Public Works Director, or his designee, who shall make a factual finding on the existence of a violation. The person to be assessed shall be allowed to present such witnesses and evidence as he or she may desire and may be represented by an attorney or other representative of his or her choosing. The hearing officer shall give written notice by first class mail of the date and time of the appeal hearing at least ten (10) days prior thereto. Said hearing shall be held not later than thirty (30) days from receipt of the request for hearing unless continued by mutual consent of the person to be assessed and the hearing officer. The decision of the hearing officer shall be final. If a violation is found, the penalty shall be assessed to the utility account."

SECTION 2. REPEAL OF PRIOR ORDINANCE. Ordinance No. 1781 is hereby repealed.

SECTION 3. DECLARATION OF URGENCY. This Ordinance is declared to be an emergency measure adopted pursuant to the provisions of the Merced City Charter and is necessary for preserving the public peace, health, safety, and property, and the

general welfare and the urgency for its adoption is set forth in the findings above.

SECTION 4. EFFECTIVE DATE. This ordinance shall take effect immediately upon adoption and shall remain in effect until rescinded by the City Council of the City of Merced.

SECTION 5. PUBLICATION. The City Clerk is directed to cause a copy of this ordinance to be published in the official newspaper at least once within fifteen (15) days after its adoption.

The foregoing ordinance was introduced and adopted at a regular meeting of said Council held on the 19th day of January, 1993, by the following called vote:

- AYES: Council Members: BERGMAN, BERNASCONI, KNUDSEN, DIAS, HASSETT, LINDSEY
- NOES: Council Members: NONE
- ABSTAIN: Council Members: NONE
- ABSENT: Council Members: NONE (one vacancy)

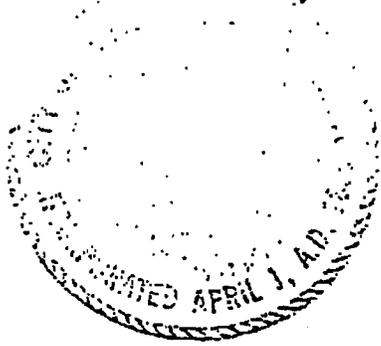
APPROVED:

James R. ...
Mayor

ATTEST:

JAMES G. MARSHALL, CITY CLERK

BY: *Deputy C. ...*
Deputy City Clerk



(SEAL)

C15WTRCON

WATER CONSERVATION COST EFFECTIVENESS

Demand Management Measures

Cost-Benefit Analysis

ASSUMPTIONS COMMON TO ALL DMMS

General Assumptions

- 1) Each DMM is implemented by itself e.g. not combined with other DMMS
- 2) When unavailable in the 2005 UWMP, values were derived (as noted) from the *BMP Cost and Savings Study, A Guide to Data and Methods for Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices*, Prepared for the California Urban Water Conservation Council, A & N Technical Services, March 2005

Specific Assumptions

| | Value | Units | Comments |
|--|-------|-------|---|
| Avoidable Supply Acquisition Costs | 181 | \$/AF | \$45,200,000 of Supply Projects listed in Water Master Plan; 6% discount rate, 25 year useful life; additional 19,524 AF/Yr |
| Avoided Capacity Expansion Cost | 611 | \$/AF | \$153,011,000 of Expansion Projects listed in Water Master Plan; 6% discount rate, 25 year useful life; additional 19,524 AF/Yr |
| Annual Pumping and Chemical Costs | 160 | \$/AF | Per 2005 UWMP |
| Environmental Benefits per AF of water saved | 100 | \$/AF | Per 2005 UWMP |
| Interest Rate | 6 | % | |
| Agency Discount Rate | 2.5 | % | |
| Social Discount Rate | 2 | % | |
| Staff Hourly Rate including Overhead | 75 | \$ | |
| No Wastewater Expansion Capital Costs - Wastewater expansion is driven by peak wet weather flows, not base sanitary flows. | | | |

Values highlighted in orange on the following pages were assumed due to lack of data

BMP 01 Residential Surveys - Annual Program Cost Worksheet

| Administration Costs | | | |
|---|----|--------------------------|-------------------------|
| 1. Staff hours to administer the survey program | | <u>200.00</u> | hrs/yr |
| 2. Staff hourly rate, including overhead | \$ | <u>75.00</u> | /hr |
| 3. Administration costs (Line 1 x Line 2) | \$ | <u>15,000.00</u> | /yr |
| Field Labor Costs | | Single Family Surveys | Multi Family Surveys |
| 4. Field labor hours | | <u>255</u> | hrs/yr |
| 5. Field labor hourly rate, including overhead | \$ | <u>75.00</u> | /hr |
| 6. Field labor cost (Line 4 x Line 5) | \$ | <u>19,125.00</u> | /yr |
| | | Single Family Surveys | Multi Family Surveys |
| Materials Costs | | | |
| 7. Unit cost of materials ¹ (e.g., retrofit kits, lawn kits, nozzles) | \$ | <u>50.00</u> | /unit |
| 8. Number of surveys ² | | <u>204.00</u> | /yr |
| 9. Total materials cost (Line 7 x Line 8) | \$ | <u>10,200.00</u> | /yr |
| | | Single Family Surveys | Multi Family Surveys |
| | | <u>58</u> | hrs/yr |
| | \$ | <u>4,312.50</u> | /yr |
| | \$ | <u>2,300.00</u> | /yr |
| | \$ | <u>8,000.00</u> | /yr |
| | \$ | <u>4,000.00</u> | /yr |
| | \$ | <u>4,000.00</u> | /yr |
| | \$ | <u>5,000.00</u> | /yr |
| | \$ | <u>63,937.50</u> | /yr |
| | \$ | <u>-</u> | /yr |
| | \$ | <u>63,937.50</u> | /yr |

Notes:

- 1) Average cost considering several alternatives of providing materials & installation
- 2) Requirement of 1.5% of all residential customers per year; 6,797 SFR accounts and 1,519 MFR accounts in 2009, assuming double this number of residential accounts due to 50% of all customers being unmetered.

SFR: $0.015 \times 6,197 \times 2 = 204$ surveys
MFR: $0.015 \times 1,519 \times 2 = 46$ surveys

BMP 01 Residential Surveys - Water Savings Worksheet

| | Single Family Surveys | Multi Family Surveys |
|---|------------------------|-----------------------|
| 1. Reduction in Avg. Use ¹ (gallons per day per residential unit) | <u>32.00</u> gpd | <u>32.00</u> gpd |
| 2. Savings Decay ² | <u>25.00</u> %/yr | <u>25.00</u> %/yr |
| 3. Number of Surveys (from STEP 2 Line 8) | <u>204.00</u> | <u>46.00</u> |
| 4. Lifetime Savings | <u>29.22</u> AF | <u>6.59</u> AF |

Notes:

- 1) Per 2005 CUWCC BMP Cost Savings Study Update - targeting high users
- 2) Per 2005 CUWCC BMP Cost Savings Study Update

BMP 01 Residential Surveys - Agency Benefits Worksheet

| Avoided Supply Acquisition Costs (include future avoided capital costs as appropriate) | |
|--|-------------------|
| 1. Marginal Source of Supply ¹ (List name) | Groundwater Wells |
| 2. Avoidable Supply Acquisition Cost ² | \$ 181 /AF |
| Avoided Treatment & Distribution Capacity Costs | |
| 3. Avoided capacity expansion costs ² (dollars per AF of water saved by conservation) | \$ 611 /AF |
| Avoided Wastewater Capacity Costs (if service provided by agency) | |
| 4. Avoided capacity expansion costs ² (dollars per AF of water saved by conservation) | \$ 0 /AF |
| Avoided Treatment & Distribution Variable Costs (include wastewater services if provided by agency) | |
| 5. Avoided Treatment & Distribution Variable Costs ² | \$ 160.00 /AF |
| 6. Total Supply & Wastewater Benefits (Line 2 + Line 3 + Line 4 + Line 17) | \$ 952.00 /AF |
| Environmental Benefits | |
| 7. Environmental benefit per AF saved ² (e.g. value of instream flow, improved water quality, avoided environmental mitigation for supply development or wastewater disposal) | \$ 100 /AF |

Notes:

- 1) Additional supplies identified in the City of Merced's 2009 Water Master Plan
- 2) As described in "Assumptions for all DMMS"

BMP 01 Residential Surveys - Other Benefits and Costs Worksheet

OTHER BENEFITS

Avoided Customer Energy Costs

| | Single Family Surveys | Multi Family Surveys |
|--|-----------------------|----------------------|
| 1. Hot water use as a percent of meter water savings | 2 % | 2 % |
| 2. Percent of residential hot water heated with gas ¹ | 90 % | 90 % |
| 3. Marginal cost per therm | \$ 1.5 /therm | |
| 4. Marginal cost per KWh | \$ 0.12 /KWh | |
| 5. Customer Energy Benefit | \$ 47.02 /AF | \$ 47.02 /AF |

Avoided Wastewater Utility Variable Costs (IMPORTANT: do not include those listed in STEP 3 Agency Benefits)

6. Avoided energy & chemical costs \$ 0 /AF of conserved water

Avoided Wastewater Utility Capacity Costs (IMPORTANT: do not include those listed in STEP 3 Agency Benefits)

7. Avoided wastewater capacity expai \$ 0 /AF of conserved water

OTHER COSTS

Customer participation costs

| | Single Family Surveys | Multi Family Surveys |
|---|-----------------------|----------------------|
| 8. Average customer expenditures per survey (e.g., change landscaping, appliances, etc) | \$ 100 /Survey | 100 /Survey |
| 9. Number of surveys (from Line 8 of STEP 1) | 204.00 /yr | 46.00 /yr |
| 10. Total customer costs (Line 8 x Line 9) | \$ 20,400.00 /yr | \$ 4,600.00 /yr |

Notes:

1) Source: <http://websafe.kemainc.com/RASSWEB/DesktopDefault.aspx>; data is for SCE)

BMP 01 Residential Surveys - Discounting Information

Discount Rates (required)

- | | |
|-------------------------|--------------|
| 1. Agency Discount Rate | <u>2.5</u> % |
| 2. Social Discount Rate | <u>2.0</u> % |

Annual Escalation Rates (optional)

- | | |
|---|---------------|
| 3. Avoided cost of water and wastewater | <u>-</u> %/yr |
| 4. Environmental benefits | <u>-</u> %/yr |
| 5. Energy cost | <u>-</u> %/yr |

BMP 01 Residential Surveys - Summary of Costs & Benefits

| <u>Program Present Value Costs</u> | <u>Agency Perspective</u> | <u>Society Perspective</u> |
|---|---------------------------|----------------------------|
| 1. Total surveys | 250 | 250 |
| 2. Total water savings | 35.8 AF | 35.8 AF |
| 3. Agency program costs | \$63,938 | \$63,938 |
| 4. Customer program costs | NA | \$25,000 |
| 5. Cost share | \$0 | NA |
| 6. Net Program Cost | <u>\$63,938</u> | <u>\$88,938</u> |
| <u>Program Present Value Benefits</u> | | |
| 7. Agency supply & wastewater bene | \$31,780 | \$32,209 |
| 8. Environmental benefits | \$3,338 | \$3,383 |
| 9. Customer program benefits | NA | \$1,591 |
| ## Other utility benefits | NA | \$0 |
| ## Total benefits | <u>\$35,118</u> | <u>\$37,183</u> |
| ## Net Present Value (Line 11 - Line 6) | (\$28,820) | (\$51,755) |
| ## Benefit-Cost Ratio (Line 11 ÷ Line 6) | 0.55 | 0.42 |
| ## Simple Unit Supply Cost (Line 6 ÷ Line 2) | \$1,785 /AF | \$2,483 /AF |
| ## Discounted Unit Supply Cost (Line 6 ÷ discounted water savings) | \$1,915 /AF | \$2,629 /AF |
| <i>This BMP is not cost-effective to implement from the Agency Perspective</i> <i>This BMP is not cost-effective to implement from the Society Perspective</i> | | |

BMP 01 Residential Surveys - Summary of Costs & Benefits
Society Perspective

| Year | Water Savings | | | Undiscounted Program Benefits | | | | Discounted Program Benefits | | | | Discounted Supply AF |
|--------|------------------|-----------------|----------|-------------------------------|------------------|-----------------------------|--------------------------------|-----------------------------|---------------|--------------------------|-----------------------------|----------------------|
| | Single Family AF | Multi Family AF | Total AF | Supply & Wastewater \$ | Environmental \$ | Customer Energy Benefits \$ | Wastewater Utility Benefits \$ | Supply & Wastewater | Environmental | Customer Energy Benefits | Wastewater Utility Benefits | |
| 0 | 7.3 | 1.6 | 9.0 | 8,530 | 896 | 421 | - | 8,530 | 896 | 421 | - | 9.0 |
| 1 | 5.5 | 1.2 | 6.7 | 6,397 | 672 | 316 | - | 6,272 | 659 | 310 | - | 6.6 |
| 2 | 4.1 | 0.9 | 5.0 | 4,798 | 504 | 237 | - | 4,612 | 484 | 228 | - | 4.8 |
| 3 | 3.1 | 0.7 | 3.8 | 3,598 | 378 | 178 | - | 3,391 | 356 | 167 | - | 3.6 |
| 4 | 2.3 | 0.5 | 2.8 | 2,699 | 283 | 133 | - | 2,493 | 262 | 123 | - | 2.6 |
| 5 | 1.7 | 0.4 | 2.1 | 2,024 | 213 | 100 | - | 1,833 | 193 | 91 | - | 1.9 |
| 6 | 1.3 | 0.3 | 1.6 | 1,518 | 159 | 75 | - | 1,348 | 142 | 67 | - | 1.4 |
| 7 | 1.0 | 0.2 | 1.2 | 1,139 | 120 | 56 | - | 991 | 104 | 49 | - | 1.0 |
| 8 | 0.7 | 0.2 | 0.9 | 854 | 90 | 42 | - | 729 | 77 | 36 | - | 0.8 |
| 9 | 0.5 | 0.1 | 0.7 | 640 | 67 | 32 | - | 536 | 56 | 26 | - | 0.6 |
| 10 | 0.4 | 0.1 | 0.5 | 480 | 50 | 24 | - | 394 | 41 | 19 | - | 0.4 |
| 11 | 0.3 | 0.1 | 0.4 | 360 | 38 | 18 | - | 290 | 30 | 14 | - | 0.3 |
| 12 | 0.2 | 0.1 | 0.3 | 270 | 28 | 13 | - | 213 | 22 | 11 | - | 0.2 |
| 13 | 0.2 | 0.0 | 0.2 | 203 | 21 | 10 | - | 157 | 16 | 8 | - | 0.2 |
| 14 | 0.1 | 0.0 | 0.2 | 152 | 16 | 8 | - | 115 | 12 | 6 | - | 0.1 |
| 15 | 0.1 | 0.0 | 0.1 | 114 | 12 | 6 | - | 85 | 9 | 4 | - | 0.1 |
| 16 | 0.1 | 0.0 | 0.1 | 85 | 9 | 4 | - | 62 | 7 | 3 | - | 0.1 |
| 17 | 0.1 | 0.0 | 0.1 | 64 | 7 | 3 | - | 46 | 5 | 2 | - | 0.0 |
| 18 | 0.0 | 0.0 | 0.1 | 48 | 5 | 2 | - | 34 | 4 | 2 | - | 0.0 |
| 19 | 0.0 | 0.0 | 0.0 | 36 | 4 | 2 | - | 25 | 3 | 1 | - | 0.0 |
| 20 | 0.0 | 0.0 | 0.0 | 27 | 3 | 1 | - | 18 | 2 | 1 | - | 0.0 |
| 21 | 0.0 | 0.0 | 0.0 | 20 | 2 | 1 | - | 13 | 1 | 1 | - | 0.0 |
| 22 | 0.0 | 0.0 | 0.0 | 15 | 2 | 1 | - | 10 | 1 | 0 | - | 0.0 |
| 23 | 0.0 | 0.0 | 0.0 | 11 | 1 | 1 | - | 7 | 1 | 0 | - | 0.0 |
| 24 | 0.0 | 0.0 | 0.0 | 9 | 1 | 0 | - | 5 | 1 | 0 | - | 0.0 |
| Total: | 29.2 | 6.6 | 35.8 | 34,093 | 3,581 | 1,684 | - | 32,209 | 3,383 | 1,591 | - | 33.8 |

BMP 02 Residential Plumbing Retrofit - Annual Program Cost Worksheet

Administration Costs

1. Staff hours to administer the retrofit program 200 hrs/yr
2. Staff hourly rate, including overhead \$ 75.00 /hr
3. Administration costs (Line 1 x Line 2) \$ 15,000 /yr

Field Labor Costs

Single Family Plumbing Retrofits Multi Family Plumbing Retrofits

4. Field labor hours¹ (e.g. kit distribution, direct installation) 2,720 hrs/yr 608 hrs/yr
5. Field labor hourly rate, including overhead \$ 75.00 /hr \$ 75.00 /hr
6. Field labor cost (Line 4 x Line 5) \$ 204,000 /yr \$ 45,600 /yr

Materials Costs

Single Family Plumbing Retrofits Multi Family Plumbing Retrofits

7. Unit cost of materials² (e.g., plumbing retrofit kits, nozzles, etc.) \$ 30.00 /unit \$ 30.00 /unit
8. Number of kits distributed³ 680 /yr 152 /yr
9. Total materials cost (Line 7 x Line 8) \$ 20,400 /yr \$ 4,560 /yr

Publicity Costs

10. Marketing collateral cost (e.g., brochure design, printing, web services) \$ 4,000 /yr
11. Advertising cost (i.e. newspaper, radio, TV, web) \$ 4,000 /yr
12. Total publicity costs (Line 10 + Line 11) \$ 8,000 /yr

Evaluation and Followup Costs

13. Labor & Consultant costs \$ 5,000 /yr

14. **Total Costs** (Line 3 + Line 6 + Line 9 + Line 12 + Line 13) \$ 302,560 /yr

Program Cost Sharing

15. Cost Share from Others (e.g., other agencies, grants, in-kind contrib.) \$ - /yr

16. **Net Agency Cost** (Line 14 - Line 15) \$ 302,560 /yr

Notes:

- 1) Assuming 4 hours per kit for assembling materials and delivery
- 2) Assumed average. Low-end: provide materials, High-end, install materials
- 3) Required 5% of all residences per year for 10 years per 2005 UWMP; 6,797 SFR accounts and 1,519 MFR accounts in 2009, assuming double this number of residential accounts due to 50% of all customers being unmetered.

SFR: 0.05 x 6,197 x 2 = 680 surveys
MFR: 0.05 x 1,519 x 2 = 152 surveys

BMP 02 Residential Plumbing Retrofit - Water Savings Worksheet

| | Single Family Plumbing Retrofits | Multi Family Plumbing Retrofits |
|---|-------------------------------------|------------------------------------|
| 1. Reduction in Avg. Use ¹ (gallons per day per residential unit) | 13.70 gpd | 13.70 gpd |
| 2. Savings Decay ² | 40 %/yr | 40 %/yr |
| 3. Number of Kits Distributed (from STEP 1 Line 8) | 680 | 152 |
| 4. Percent of Kits Installed | 50 %/yr | 50 %/yr |
| 5. Lifetime Savings | 13.04 AF | 2.92 AF |

Notes:

- 1) From 2005 UWMP; Similar to results of indoor retrofits in the 2005 CUWCC BMP Cost Savings Study
- 2) Per 2005 CUWCC BMP Cost Savings Study Update

BMP 02 Residential Plumbing Retrofit - Agency Benefits Worksheet

| Avoided Supply Acquisition Costs (include future avoided capital costs as appropriate) | |
|--|-------------------|
| 1. Marginal Source of Supply ¹ (List name) | Groundwater Wells |
| 2. Avoidable Supply Acquisition Cost ² | \$ 181 /AF |
| Avoided Treatment & Distribution Capacity Costs | |
| 3. Avoided capacity expansion costs ² (dollars per AF of water saved by conservation) | \$ 611 /AF |
| Avoided Wastewater Capacity Costs (if service provided by agency) | |
| 4. Avoided capacity expansion costs ² (dollars per AF of water saved by conservation) | \$ 0 /AF |
| Avoided Treatment & Distribution Variable Costs (include wastewater services if provided by agency) | |
| 5. Avoided Treatment & Distribution Variable Costs ² (Line 10 + Line 16) | \$ 160.00 /AF |
| 6. Total Supply & Wastewater Benefits (Line 2 + Line 3 + Line 4 + Line 17) | \$ 952.00 /AF |
| Environmental Benefits | |
| 7. Environmental benefit per AF saved ² (e.g. value of instream flow, improved water quality, avoided environmental mitigation for supply development or wastewater disposal) | \$ 100 /AF |

Notes:

- 1) Additional supplies identified in the City of Merced's 2009 Water Master Plan
- 2) As described in "Assumptions for all DMMs"

BMP 02 Residential Plumbing Retrofit - Other Benefits and Costs Worksheet

OTHER BENEFITS

Avoided Customer Energy Costs

| | Single Family Plumbing Retrofits | Multi Family Plumbing Retrofits |
|--|-------------------------------------|------------------------------------|
| 1. Hot water use as a percent of total plumbing device water savings | <u>2</u> % | <u>2</u> % |
| 2. Percent of residential hot water heated with gas ¹ | <u>90</u> % | <u>90</u> % |
| 3. Marginal cost per therm | \$ <u>1.50</u> /therm | |
| 4. Marginal cost per KWh | \$ <u>12</u> /KWh | |
| 5. Customer Energy Benefit | \$ <u>857.31</u> /AF | \$ <u>857.31</u> /AF |

Avoided Wastewater Utility Variable Costs (IMPORTANT: do not include those listed in STEP 3 Agency Benefits)

6. Avoided energy & chemical costs \$ 0 /AF of conserved water

Avoided Wastewater Utility Capacity Costs (IMPORTANT: do not include those listed in STEP 3 Agency Benefits)

7. Avoided wastewater capacity expansion \$ 0 /AF of conserved water

OTHER COSTS

Customer participation costs

| | Single Family Plumbing Retrofits | Multi Family Plumbing Retrofits |
|---|-------------------------------------|------------------------------------|
| 8. Average customer expenditures per kit installed (e.g., change landscaping, appliances, etc) | \$ <u>0</u> /kit | <u>0</u> /kit |
| 9. Number of kits distributed (from Line 8 of STEP 1) | <u>680</u> /yr | <u>152</u> /yr |
| 10. Percent of Kits Installed (from Line 4 of STEP 2) | <u>50</u> %/yr | <u>50</u> %/yr |
| 11. Total customer costs (Line 8 x Line 9 x Line 10) | \$ <u>-</u> /yr | \$ <u>-</u> /yr |

Notes:

1) Source: <http://websafe.kemainc.com/RASSWEB/DesktopDefault.aspx>; data is for SCE)

BMP 02 Residential Plumbing Retrofit - Discounting Information

Discount Rates (required)

- | | |
|-------------------------|-------|
| 1. Agency Discount Rate | 2.5 % |
| 2. Social Discount Rate | 2.0 % |

Annual Escalation Rates (optional)

- | | |
|---|--------|
| 3. Avoided cost of water and wastewater | - %/yr |
| 4. Environmental benefits | - %/yr |
| 5. Energy cost | - %/yr |

BMP 02 Residential Plumbing Retrofit - Summary of Costs & Benefits

| <u>Program Present Value Costs</u> | <u>Agency Perspective</u> | <u>Society Perspective</u> |
|--|---------------------------|----------------------------|
| 1. Total devices distributed | 832 | 832 |
| 2. Total water savings | 16.0 AF | 16.0 AF |
| 3. Agency program costs | \$302,560 | \$302,560 |
| 4. Customer program costs | NA | \$0 |
| 5. Cost share | \$0 | NA |
| 6. Net Program Cost | <u>\$302,560</u> | <u>\$302,560</u> |
| <u>Program Present Value Benefits</u> | | |
| 7. Agency supply & wastewater benefits | \$14,655 | \$14,757 |
| 8. Environmental benefits | \$1,539 | \$1,550 |
| 9. Customer program benefits | NA | \$13,290 |
| ## Other utility benefits | NA | \$0 |
| ## Total benefits | <u>\$16,195</u> | <u>\$29,597</u> |
| ## Net Present Value (Line 11 - Line 6) | (\$286,365) | (\$272,963) |
| ## Benefit-Cost Ratio (Line 11 ÷ Line 6) | 0.05 | 0.10 |
| ## Simple Unit Supply Cost (Line 6 ÷ Line 2) | \$18,961 /AF | \$18,961 /AF |
| ## Discounted Unit Supply Cost (Line 6 ÷ discounted water savings) | \$19,654 /AF | \$19,518 /AF |
| <p><i>This BMP is not cost-effective to implement from the Agency Perspective</i> <i>This BMP is not cost-effective to implement from the Society Perspective</i></p> | | |

BMP 02 Residential Plumbing Retrofit - Summary of Costs & Benefits
Society Perspective

| Year | Water Savings | | | Undiscounted Program Benefits | | | | Undiscounted Program Benefits | | | | Discounted Supply AF |
|---------------|------------------|-----------------|-------------|-------------------------------|------------------|-----------------------------|--------------------------------|-------------------------------|---------------|--------------------------|-----------------------------|----------------------|
| | Single Family AF | Multi Family AF | Total AF | Supply & Wastewater \$ | Environmental \$ | Customer Energy Benefits \$ | Wastewater Utility Benefits \$ | Supply & Wastewater | Environmental | Customer Energy Benefits | Wastewater Utility Benefits | |
| 0 | 5.2 | 1.2 | 6.4 | 6,077 | 638 | 5,472 | - | 6,077 | 638 | 5,472 | - | 6.4 |
| 1 | 3.1 | 0.7 | 3.8 | 3,646 | 383 | 3,283 | - | 3,574 | 375 | 3,219 | - | 3.8 |
| 2 | 1.9 | 0.4 | 2.3 | 2,188 | 230 | 1,970 | - | 2,103 | 221 | 1,893 | - | 2.2 |
| 3 | 1.1 | 0.3 | 1.4 | 1,313 | 138 | 1,182 | - | 1,237 | 130 | 1,114 | - | 1.3 |
| 4 | 0.7 | 0.2 | 0.8 | 788 | 83 | 709 | - | 728 | 76 | 655 | - | 0.8 |
| 5 | 0.4 | 0.1 | 0.5 | 473 | 50 | 426 | - | 428 | 45 | 385 | - | 0.4 |
| 6 | 0.2 | 0.1 | 0.3 | 284 | 30 | 255 | - | 252 | 26 | 227 | - | 0.3 |
| 7 | 0.1 | 0.0 | 0.2 | 170 | 18 | 153 | - | 148 | 16 | 133 | - | 0.2 |
| 8 | 0.1 | 0.0 | 0.1 | 102 | 11 | 92 | - | 87 | 9 | 78 | - | 0.1 |
| 9 | 0.1 | 0.0 | 0.1 | 61 | 6 | 55 | - | 51 | 5 | 46 | - | 0.1 |
| 10 | 0.0 | 0.0 | 0.0 | 37 | 4 | 33 | - | 30 | 3 | 27 | - | 0.0 |
| 11 | 0.0 | 0.0 | 0.0 | 22 | 2 | 20 | - | 18 | 2 | 16 | - | 0.0 |
| 12 | 0.0 | 0.0 | 0.0 | 13 | 1 | 12 | - | 10 | 1 | 9 | - | 0.0 |
| 13 | 0.0 | 0.0 | 0.0 | 8 | 1 | 7 | - | 6 | 1 | 6 | - | 0.0 |
| 14 | 0.0 | 0.0 | 0.0 | 5 | 1 | 4 | - | 4 | 0 | 3 | - | 0.0 |
| 15 | 0.0 | 0.0 | 0.0 | 3 | 0 | 3 | - | 2 | 0 | 2 | - | 0.0 |
| 16 | 0.0 | 0.0 | 0.0 | 2 | 0 | 2 | - | 1 | 0 | 1 | - | 0.0 |
| 17 | 0.0 | 0.0 | 0.0 | 1 | 0 | 1 | - | 1 | 0 | 1 | - | 0.0 |
| 18 | 0.0 | 0.0 | 0.0 | 1 | 0 | 1 | - | 0 | 0 | 0 | - | 0.0 |
| 19 | 0.0 | 0.0 | 0.0 | 0 | 0 | 0 | - | 0 | 0 | 0 | - | 0.0 |
| 20 | 0.0 | 0.0 | 0.0 | 0 | 0 | 0 | - | 0 | 0 | 0 | - | 0.0 |
| 21 | 0.0 | 0.0 | 0.0 | 0 | 0 | 0 | - | 0 | 0 | 0 | - | 0.0 |
| 22 | 0.0 | 0.0 | 0.0 | 0 | 0 | 0 | - | 0 | 0 | 0 | - | 0.0 |
| 23 | 0.0 | 0.0 | 0.0 | 0 | 0 | 0 | - | 0 | 0 | 0 | - | 0.0 |
| 24 | 0.0 | 0.0 | 0.0 | 0 | 0 | 0 | - | 0 | 0 | 0 | - | 0.0 |
| Total: | 13.0 | 2.9 | 16.0 | 15,191 | 1,596 | 13,680 | - | 14,757 | 1,550 | 13,290 | - | 15.5 |

BMP 05 ETo-Landscape Water Budget Component- Coverage Requirement Worksheet

| Coverage Requirement | | |
|--|-------|------|
| 1. Year Agency Signed MOU | | 0 |
| 2. Latest Year BMP 5 Implementation to Commence | | 1999 |
| 3. Number of CII Sites with Dedicated Irrigation Meters in 2009 | | 293 |
| 4. Number of ETo-Based Water Budgets Already Implemented | | 0 |
| 5. Number of CII Sites with Dedicated Irrigation Meters Expected to have ETo-Based Water Use Budgets by 20(| | 264 |
| (0.9 x Line 3 - Line 4) | | |
| Implementation Schedule Assumed for Analysis | | |
| | 2011 | 66 |
| <i>The default analysis schedule assumes budget development is spread evenly over four years. Click the button to the right to use this default schedule, or enter a schedule of your own.</i> | 2012 | 66 |
| | 2013 | 66 |
| | 2014 | 66 |
| | Total | 264 |

BMP 05 ETo-Landscape Water Budget Component- Program Cost Worksheet

| | |
|---|--|
| Budget Development Costs | |
| 1. Select Method of Landscape Measurement | Landscape Plans ▼ |
| 2. Average No. of Sites Measured Per Year (base selection on STEP 1 schedule) | <= 99 ▼ |
| 3. Measurement Cost Per Site | \$ <u>126</u> /budget <input checked="" type="radio"/> Use Default Cos |
| Establish Customer Notice/Billing System | |
| 4. Link budgets to billing or customer notice system | \$ <u>4,000</u> one-time setup cost |
| Staff Management of Budget Development | |
| 5. Staff hours to manage budget development tasks | <u>100</u> hrs/yr |
| 6. Staff hourly rate, including overhead | \$ <u>75.00</u> /hr |
| 7. Staff costs (Line 5 x Line 6) | \$ <u>7,500</u> /yr |
| Staff Management of Budget Program (post development) | |
| 8. Staff hours to manage budget program | <u>200</u> hrs/yr |
| 9. Staff hourly rate, including overhead | \$ <u>75.00</u> /hr |
| 10. Staff costs (Line 8 x Line 9) | \$ <u>15,000</u> /yr |
| Customer Followup Costs | |
| 11. Percent of Budgeted Sites Receiving Followup Assistance | <u>30</u> %/yr |
| 12. Per site followup cost | \$ <u>150</u> /site |
| 13. Avg. Annual Followup Cost Per Budget | \$ <u>45</u> /budget |
| Program Cost Sharing | |
| 14. Cost Share from Others for Budget Development (e.g., other agencies, grants, in-kind contrib.) | \$ <u>-</u> one-time cost share |
| 15. Cost Share for Program Operation | \$ <u>-</u> /yr |

BMP 05 ETo-Landscape Water Budget Component - Water Savings Worksheet

| | |
|--|---------------------|
| 1. Number of CII Sites with Dedicated Irrigation Meters in 2009 (from Line 3 of STEP 1) | <u>293</u> |
| 2. Avg. Annual Use by CII Sites with Dedicated Irrigation Meters in 2009 | <u>1,179</u> AF |
| 3. Avg. Annual Use Per Site (Line 2 ÷ Line 1) | <u>4.02</u> AF/Site |
| 4. Percentage Reduction in Annual Use | <u>20</u> %/yr |
| 5. Annual Water Savings Per Site (Line 3 x Line 4) | <u>0.80</u> AF/Site |

Notes:

1) Per 2009 Demands provided by City

BMP 05 ETo-Landscape Water Budget Component - Agency Benefits Worksheet

| Avoided Supply Acquisition Costs (include future avoided capital costs as appropriate) | |
|---|-----------------------------|
| 1. Marginal Source of Supply ¹ (List name) | Groundwater Wells |
| 2. Avoidable Supply Acquisition Cost ² | \$ <u>181</u> /AF |
| Avoided Treatment & Distribution Capacity Costs | |
| 3. Avoided capacity expansion costs ² (dollars per AF of water saved by conservation) | \$ <u>611</u> /AF |
| Avoided Wastewater Capacity Costs (if service provided by agency) | |
| 4. Avoided capacity expansion costs ² (dollars per AF of water saved by conservation) | \$ <u>0</u> /AF |
| Avoided Treatment & Distribution Variable Costs | |
| 17. Avoided Treatment & Distribution Variable Costs ² (Line 10 + Line 16) | \$ <u>160.00</u> /AF |
| 18. Total Supply & Wastewater Benefits (Line 2 + Line 3 + Line 4 + Line 19) | \$ <u><u>952.00</u></u> /AF |
| Environmental Benefits | |
| 20. Environmental benefit per AF saved ² (e.g. value of instream flow, improved water quality, avoided environmental mitigation for supply development or wastewater disposal) | \$ <u>100</u> /AF |

Notes:

- 1) Additional supplies identified in the City of Merced's 2009 Water Master Plan
- 2) As described in "Assumptions for all DMMs"

BMP 05 ETo-Landscape Water Budget Component - Other Benefits and Costs Worksheet

OTHER BENEFITS

OTHER COSTS

Customer participation costs

Landscape
Budgets

- 1. Average customer expenditures per budget
(e.g., change landscaping, install new equipment, etc)

\$ /site

BMP 05 ETo-Landscape Water Budget Component - Discounting Information

Discount Rates (required)

- | | |
|-------------------------|--------------|
| 1. Agency Discount Rate | <u>2.5</u> % |
| 2. Social Discount Rate | <u>2.0</u> % |

Annual Escalation Rates (optional)

- | | |
|---|---------------|
| 3. Avoided cost of water and wastewater | <u>-</u> %/yr |
| 4. Environmental benefits | <u>-</u> %/yr |

BMP 05 ETo-Landscape Water Budget Component - Summary of Costs & Benefits

| | <u>Agency Perspective</u> | <u>Society Perspective</u> |
|---|-------------------------------|--------------------------------|
| <u>Program Present Value Costs</u> | | |
| 1. Total budgets | 264 | 264 |
| 2. Total water savings | 4,775 AF | 4,775 AF |
| 3. Agency program costs | \$528,393 | \$556,338 |
| 4. Customer program costs | NA | \$256,054 |
| 5. Cost share | \$0 | NA |
| 6. Net Program Cost | <u>\$528,393</u> | <u>\$812,392</u> |
| <u>Program Present Value Benefits</u> | | |
| 7. Agency supply & wastewater benefits | \$3,322,810 | \$3,528,331 |
| 8. Environmental benefits | <u>\$349,035</u> | <u>\$370,623</u> |
| ## Total benefits | <u>\$3,671,845</u> | <u>\$3,898,954</u> |
| ## Net Present Value (Line 11 - Line 6) | <u>\$3,143,452</u> | <u>\$3,086,562</u> |
| ## Benefit-Cost Ratio (Line 11 ÷ Line 6) | 6.95 | 4.80 |
| ## Simple Unit Supply Cost (Line 6 ÷ Line 2) | \$111 /AF | \$170 /AF |
| ## Discounted Unit Supply Cost (Line 6 ÷ discounted water savings) | \$151 /AF | \$219 /AF |
| <i>This BMP is cost-effective to implement from the Agency Perspective</i> | | |
| <i>This BMP is cost-effective to implement from the Society Perspective</i> | | |

BMP 05 ETo-Landscape Water Budget Component - Summary of Costs & Benefits

Agency Perspective

| Year | Water Savings | | | Undiscounted Agency Benefits | | | Discounted Agency Benefits | | | Discounted Supply AF |
|---------------|-------------------|----------------|--------------|------------------------------|------------------|------------------|----------------------------|----------------|------------------|----------------------|
| | Budgets Developed | Active Budgets | Savings AF | Supply & Wastewater \$ | Environmental \$ | Total \$ | Supply & Wastewater | Environmental | Total | |
| 0 | 66 | | - | - | - | - | - | - | - | - |
| 1 | 66 | 66 | 53 | 50,566 | 5,312 | 55,877 | 49,333 | 5,182 | 54,514 | 51.8 |
| 2 | 66 | 132 | 106 | 101,132 | 10,623 | 111,755 | 96,259 | 10,111 | 106,370 | 101.1 |
| 3 | 66 | 198 | 159 | 151,697 | 15,935 | 167,632 | 140,866 | 14,797 | 155,663 | 148.0 |
| 4 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 183,032 | 19,226 | 202,258 | 192.3 |
| 5 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 178,568 | 18,757 | 197,325 | 187.6 |
| 6 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 174,213 | 18,300 | 192,512 | 183.0 |
| 7 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 169,964 | 17,853 | 187,817 | 178.5 |
| 8 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 165,818 | 17,418 | 183,236 | 174.2 |
| 9 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 161,774 | 16,993 | 178,767 | 169.9 |
| 10 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 157,828 | 16,579 | 174,407 | 165.8 |
| 11 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 153,979 | 16,174 | 170,153 | 161.7 |
| 12 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 150,223 | 15,780 | 166,003 | 157.8 |
| 13 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 146,559 | 15,395 | 161,954 | 153.9 |
| 14 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 142,985 | 15,019 | 158,004 | 150.2 |
| 15 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 139,497 | 14,653 | 154,150 | 146.5 |
| 16 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 136,095 | 14,296 | 150,390 | 143.0 |
| 17 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 132,775 | 13,947 | 146,722 | 139.5 |
| 18 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 129,537 | 13,607 | 143,144 | 136.1 |
| 19 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 126,378 | 13,275 | 139,652 | 132.7 |
| 20 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 123,295 | 12,951 | 136,246 | 129.5 |
| 21 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 120,288 | 12,635 | 132,923 | 126.4 |
| 22 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 117,354 | 12,327 | 129,681 | 123.3 |
| 23 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 114,492 | 12,026 | 126,518 | 120.3 |
| 24 | | 264 | 212 | 202,033 | 21,222 | 223,255 | 111,699 | 11,733 | 123,432 | 117.3 |
| Total: | 263.7 | 5,933.7 | 4,775 | 4,546,097 | 477,531 | 5,023,628 | 3,322,810 | 349,035 | 3,671,845 | 3,490.3 |

Agency Perspective (cont'd)

| Year | Budget Counts | | Undiscounted Agency Costs | | | | | | | Present Value | |
|---------------|-------------------|----------------|---------------------------|------------------------|--------------------------|--------------------------|----------------|--------------------|------------|-------------------------|-----------------------|
| | Budgets Developed | Active Budgets | Meas. Costs | Cust. Notices/ Billing | Staff Cost - Development | Staff Cost - Program Mgt | Cust. Followup | Total Agency Costs | Cost Share | Discounted Agency Costs | Discounted Cost Share |
| | | | \$ | \$ | \$ | \$ | \$ | \$ | \$ | \$ | \$ |
| 0 | 66 | | 8,316 | 4,000 | 7,500 | - | - | 19,816 | - | 19,816 | - |
| 1 | 66 | 66 | 8,316 | | 7,500 | 15,000 | 2,970 | 33,786 | - | 32,962 | - |
| 2 | 66 | 132 | 8,316 | | 7,500 | 15,000 | 5,940 | 36,756 | - | 34,985 | - |
| 3 | 66 | 198 | 8,278 | | 7,500 | 15,000 | 8,910 | 39,688 | - | 36,854 | - |
| 4 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 24,340 | - |
| 5 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 23,746 | - |
| 6 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 23,167 | - |
| 7 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 22,602 | - |
| 8 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 22,051 | - |
| 9 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 21,513 | - |
| 10 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 20,988 | - |
| 11 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 20,476 | - |
| 12 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 19,977 | - |
| 13 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 19,490 | - |
| 14 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 19,014 | - |
| 15 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 18,550 | - |
| 16 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 18,098 | - |
| 17 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 17,657 | - |
| 18 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 17,226 | - |
| 19 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 16,806 | - |
| 20 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 16,396 | - |
| 21 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 15,996 | - |
| 22 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 15,606 | - |
| 23 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 15,225 | - |
| 24 | | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 14,854 | - |
| Total: | 263.7 | 5,933.7 | 33,226 | 4,000 | 30,000 | 360,000 | 267,017 | 694,243 | - | 528,393 | - |

BMP 05 ETo-Landscape Water Budget Component - Summary of Costs & Benefits

Society Perspective

| Year | Water Savings | | | Undiscounted Program Benefits | | | Discounted Program Benefits | | | Discounted Supply AF |
|---------------|-------------------|----------------|--------------|-------------------------------|------------------|------------------|-----------------------------|----------------|------------------|----------------------|
| | Budgets Developed | Active Budgets | Savings AF | Supply & Wastewater \$ | Environmental \$ | Total \$ | Supply & Wastewater | Environmental | Total \$ | |
| 0 | 66 | - | - | - | - | - | - | - | - | - |
| 1 | 66 | 66 | 53 | 50,566 | 5,312 | 55,877 | 49,574 | 5,207 | 54,782 | 52.1 |
| 2 | 66 | 132 | 106 | 101,132 | 10,623 | 111,755 | 97,205 | 10,211 | 107,415 | 102.1 |
| 3 | 66 | 198 | 159 | 151,697 | 15,935 | 167,632 | 142,948 | 15,016 | 157,963 | 150.2 |
| 4 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 186,648 | 19,606 | 206,254 | 196.1 |
| 5 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 182,988 | 19,221 | 202,209 | 192.2 |
| 6 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 179,400 | 18,845 | 198,244 | 188.4 |
| 7 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 175,882 | 18,475 | 194,357 | 184.8 |
| 8 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 172,434 | 18,113 | 190,546 | 181.1 |
| 9 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 169,053 | 17,758 | 186,810 | 177.6 |
| 10 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 165,738 | 17,409 | 183,147 | 174.1 |
| 11 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 162,488 | 17,068 | 179,556 | 170.7 |
| 12 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 159,302 | 16,733 | 176,035 | 167.3 |
| 13 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 156,178 | 16,405 | 172,584 | 164.1 |
| 14 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 153,116 | 16,084 | 169,200 | 160.8 |
| 15 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 150,114 | 15,768 | 165,882 | 157.7 |
| 16 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 147,170 | 15,459 | 162,629 | 154.6 |
| 17 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 144,285 | 15,156 | 159,441 | 151.6 |
| 18 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 141,456 | 14,859 | 156,314 | 148.6 |
| 19 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 138,682 | 14,567 | 153,249 | 145.7 |
| 20 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 135,963 | 14,282 | 150,245 | 142.8 |
| 21 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 133,297 | 14,002 | 147,299 | 140.0 |
| 22 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 130,683 | 13,727 | 144,410 | 137.3 |
| 23 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 128,121 | 13,458 | 141,579 | 134.6 |
| 24 | - | 264 | 212 | 202,033 | 21,222 | 223,255 | 125,609 | 13,194 | 138,803 | 131.9 |
| Total: | 263.7 | 5,933.7 | ##### | 4,546,097 | 477,531 | 5,023,628 | 3,528,331 | 370,623 | 3,898,954 | 3,706.2 |

Society Perspective (cont'd)

| Year | Budget Counts | | Undiscounted Agency Costs | | | | | | | Present Value | |
|---------------|-------------------|----------------|---------------------------|-----------------------|--------------------------|--------------------------|----------------|--------------------|----------------|-------------------------|---------------------------|
| | Budgets Developed | Active Budgets | Meas. Costs | Cust. Notices/Billing | Staff Cost - Development | Staff Cost - Program Mgt | Cust. Followup | Total Agency Costs | Cust. Costs | Discounted Agency Costs | Discounted Customer Costs |
| | | | \$ | \$ | \$ | \$ | \$ | \$ | \$ | \$ | \$ |
| 0 | 66 | | 8,316 | 4,000 | 7,500 | - | - | 19,816 | 66,000 | 19,816 | 66,000 |
| 1 | 66 | 66 | 8,316 | | 7,500 | 15,000 | 2,970 | 33,786 | 66,000 | 33,124 | 64,706 |
| 2 | 66 | 132 | 8,316 | | 7,500 | 15,000 | 5,940 | 36,756 | 66,000 | 35,329 | 63,437 |
| 3 | 66 | 198 | 8,278 | | 7,500 | 15,000 | 8,910 | 39,688 | 65,700 | 37,399 | 61,911 |
| 4 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 24,820 | - |
| 5 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 24,334 | - |
| 6 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 23,857 | - |
| 7 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 23,389 | - |
| 8 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 22,930 | - |
| 9 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 22,481 | - |
| 10 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 22,040 | - |
| 11 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 21,608 | - |
| 12 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 21,184 | - |
| 13 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 20,769 | - |
| 14 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 20,361 | - |
| 15 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 19,962 | - |
| 16 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 19,571 | - |
| 17 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 19,187 | - |
| 18 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 18,811 | - |
| 19 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 18,442 | - |
| 20 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 18,080 | - |
| 21 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 17,726 | - |
| 22 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 17,378 | - |
| 23 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 17,038 | - |
| 24 | - | 264 | - | | - | 15,000 | 11,867 | 26,867 | - | 16,703 | - |
| Total: | 263.7 | 5,933.7 | 33,226 | 4,000 | 30,000 | 360,000 | 267,017 | 694,243 | 263,700 | 556,338 | 256,054 |

BMP 06 High Efficiency Washing Machine Rebate Programs - Annual Program Cost Worksheet

| | |
|---|---------------|
| Administration Costs | |
| 1. Staff hours to administer the rebate program | 200 hrs/yr |
| 2. Staff hourly rate, including overhead | \$ 75.00 /hr |
| 3. Administration costs (Line 1 x Line 2) | \$ 15,000 /yr |
| Washing Machine Rebate Costs | |
| 4. Rebate (or utility incentive cost) ¹ | \$ 50 /rebate |
| 5. Number of rebates distributed | 200 /yr |
| 6. Total rebate cost (Line 4 x Line 5) | \$ 10,000 /yr |
| Rebate Processing Costs | |
| 7. Average rebate processing cost (if not included in Admin. Costs) | \$ 25 /rebate |
| 8. Total rebate processing cost (Line 5 x Line 7) | \$ 5,000 /yr |
| Publicity Costs | |
| 9. Marketing collateral cost (e.g., brochure design, printing, web services) | \$ 4,000 /yr |
| 10. Advertising cost (i.e. newspaper, radio, TV, web) | \$ 4,000 /yr |
| 11. Total publicity costs (Line 9 + Line 10) | \$ 8,000 /yr |
| Evaluation and Followup Costs | |
| 12. Labor & Consultant costs | \$ 5,000 /yr |
| 13. Total Costs (Line 3 + Line 6 + Line 8 + Line 11 + Line 12) | \$ 43,000 /yr |
| Program Cost Sharing | |
| 14. Cost Share from Others (e.g., other agencies, grants, in-kind contrib.) | \$ - /yr |
| 15. Net Agency Cost (Line 13 - Line 14) | \$ 43,000 /yr |

Notes:

1) Per 2005 UWMP

**BMP 06 High Efficiency Washing Machine Rebate Programs -
Water Savings Worksheet**

| | High-Efficiency Washing Machines |
|--|-------------------------------------|
| 1. Savings per machine (gallons per year per machine) | <u>5,250.00</u> gpy/machine |
| 2. Useful Life ¹ | <u>12.0</u> yrs |
| 3. Number of Rebates Distributed (from STEP 1 Line 5) | <u>200</u> |
| 4. Percent Free-riders ² | <u>35</u> %/yr |
| 5. Lifetime Savings | <u>25.13</u> AF |

Notes:

1) Per 2005 UWMP

2) Per 2005 CUWCC BMP Cost Savings Study Update

BMP 06 High Efficiency Washing Machine Rebate Programs - Agency Benefits Worksheet

| Avoided Supply Acquisition Costs (include future avoided capital costs as appropriate) | |
|--|-------------------|
| 1. Marginal Source of Supply ¹ (List name) | Groundwater Wells |
| 2. Avoidable Supply Acquisition Cost ² | \$ 181 /AF |
| Avoided Treatment & Distribution Capacity Costs | |
| 3. Avoided capacity expansion costs ² (dollars per AF of water saved by conservation) | \$ 611 /AF |
| Avoided Wastewater Capacity Costs (if service provided by agency) | |
| 4. Avoided capacity expansion costs ² (dollars per AF of water saved by conservation) | \$ /AF |
| Avoided Treatment & Distribution Variable Costs (include wastewater services if provided b | |
| 5. Avoided Treatment & Distribution Variable Costs ² (Line 10 + Line 16) | \$ 160.00 /AF |
| 6. Total Supply & Wastewater Benefits (Line 2 + Line 3 + Line 4 + Line 17) | \$ 952.00 /AF |
| Environmental Benefits | |
| 7. Environmental benefit per AF saved ² (e.g. value of instream flow, improved water quality, avoided environmental mitigation for supply development or wastewater disposal) | \$ 100 /AF |

Notes:

- 1) Additional supplies identified in the City of Merced's 2009 Water Master Plan
- 2) As described in "Assumptions for all DMMs"

BMP 06 High Efficiency Washing Machine Rebate Programs - Other Benefits and Costs Worksheet

OTHER BENEFITS

Avoided Customer Energy Costs

High Efficiency
Clothes Washer

| | |
|--|----------------|
| 1. Percent of residential hot water heated with gas ¹ (can get estimate from local utility or CEC) | 90 % |
| 2. Percent of residential dryers using gas ¹ (can get estimate from local utility or CEC) | 62 % |
| 2. Marginal cost per therm of gas | \$ 1.50 /therm |
| 3. Marginal cost per KWh of electricity | \$ 0.12 /KWh |
| 5. Customer Energy Benefit | \$ 45.69 /Yr |

Avoided Wastewater Utility Costs (IMPORTANT: do not include those listed in STEP 3 Agency Benefits)

| | |
|--|-----------------------------|
| 6. Avoided energy & chemical costs | \$ 0 /AF of conserved water |
| 7. Avoided wastewater capacity expansion | \$ 0 /AF of conserved water |
| 8. Total avoided wastewater utility costs (Line 6 + Line 7) | \$ - /AF of conserved water |

Notes:

1) Source: <http://websafe.kemainc.com/RASSWEB/DesktopDefault.aspx>; data is for SCE)

**BMP 06 High Efficiency Washing Machine Rebate Programs -
Discounting Information**

| | |
|---|---------------|
| Discount Rates (required) | |
| 1. Agency Discount Rate | <u>2.5</u> % |
| 2. Social Discount Rate | <u>2.0</u> % |
| Annual Escalation Rates (optional) | |
| 3. Avoided cost of water and wastewater | <u>-</u> %/yr |
| 4. Environmental benefits | <u>-</u> %/yr |
| 5. Energy cost | <u>-</u> %/yr |

**BMP 06 High Efficiency Washing Machine Rebate Programs -
Summary of Costs & Benefits**

| <u>Program Present Value Costs</u> | <u>Agency Perspective</u> | <u>Society Perspective</u> |
|---|--------------------------------------|---------------------------------------|
| 1. Total rebates distributed | 200 | 200 |
| 2. Total water savings | 25.1 AF | 25.1 AF |
| 3. Agency program costs | \$43,000 | \$43,000 |
| 4. Customer program costs | NA | NA |
| 5. Cost share | \$0 | NA |
| 6. Net Program Cost | <u>\$43,000</u> | <u>\$43,000</u> |
| <u>Program Present Value Benefits</u> | | |
| 7. Agency supply & wastewater benefits | \$20,451 | \$21,084 |
| 8. Environmental benefits | \$2,148 | \$2,215 |
| 9. Customer program benefits | NA | \$96,636 |
| 10. Other utility benefits | NA | \$0 |
| 11. Total benefits | <u>\$22,599</u> | <u>\$119,935</u> |
| 12. Net Present Value (Line 11 - Line 6) | (\$20,401) | \$76,935 |
| 13. Benefit-Cost Ratio (Line 11 ÷ Line 6) | 0.53 | 2.79 |
| 14. Simple Unit Supply Cost (Line 6 ÷ Line 2) | \$1,711 /AF | \$1,711 /AF |
| 15. Discounted Unit Supply Cost (Line 6 ÷ discounted water savings) | \$2,002 /AF | \$1,942 /AF |
| <i>This BMP is not cost-effective to implement from the Agency Perspective</i> <i>This BMP is cost-effective to implement from the Society Perspective</i> | | |

BMP 06 High Efficiency Washing Machine Rebate Programs - Summary of Costs & Benefits
Present Value Benefits - Society Perspective

| Year | Water Savings | | Undiscounted Program Benefits | | | | Discounted Program Benefits | | | | Discounted Supply AF |
|---------------|----------------|------------------|-------------------------------|------------------|-----------------------------|--------------------------------|-----------------------------|---------------|--------------------------|-----------------------------|----------------------|
| | Rebates Number | Water Savings AF | Supply & Wastewater \$ | Environmental \$ | Customer Energy Benefits \$ | Wastewater Utility Benefits \$ | Supply & Wastewater | Environmental | Customer Energy Benefits | Wastewater Utility Benefits | |
| 0 | 200.0 | | | | | | | | | | |
| 1 | - | 2.1 | 1,994 | 209 | 9,138 | - | 1,955 | 205 | 8,959 | - | 2.1 |
| 2 | - | 2.1 | 1,994 | 209 | 9,138 | - | 1,916 | 201 | 8,783 | - | 2.0 |
| 3 | - | 2.1 | 1,994 | 209 | 9,138 | - | 1,879 | 197 | 8,611 | - | 2.0 |
| 4 | - | 2.1 | 1,994 | 209 | 9,138 | - | 1,842 | 193 | 8,442 | - | 1.9 |
| 5 | - | 2.1 | 1,994 | 209 | 9,138 | - | 1,806 | 190 | 8,276 | - | 1.9 |
| 6 | - | 2.1 | 1,994 | 209 | 9,138 | - | 1,770 | 186 | 8,114 | - | 1.9 |
| 7 | - | 2.1 | 1,994 | 209 | 9,138 | - | 1,736 | 182 | 7,955 | - | 1.8 |
| 8 | - | 2.1 | 1,994 | 209 | 9,138 | - | 1,702 | 179 | 7,799 | - | 1.8 |
| 9 | - | 2.1 | 1,994 | 209 | 9,138 | - | 1,668 | 175 | 7,646 | - | 1.8 |
| 10 | - | 2.1 | 1,994 | 209 | 9,138 | - | 1,636 | 172 | 7,496 | - | 1.7 |
| 11 | - | 2.1 | 1,994 | 209 | 9,138 | - | 1,603 | 168 | 7,349 | - | 1.7 |
| 12 | - | 2.1 | 1,994 | 209 | 9,138 | - | 1,572 | 165 | 7,205 | - | 1.7 |
| 13 | - | - | - | - | - | - | - | - | - | - | - |
| 14 | - | - | - | - | - | - | - | - | - | - | - |
| 15 | - | - | - | - | - | - | - | - | - | - | - |
| 16 | - | - | - | - | - | - | - | - | - | - | - |
| 17 | - | - | - | - | - | - | - | - | - | - | - |
| 18 | - | - | - | - | - | - | - | - | - | - | - |
| 19 | - | - | - | - | - | - | - | - | - | - | - |
| 20 | - | - | - | - | - | - | - | - | - | - | - |
| 21 | - | - | - | - | - | - | - | - | - | - | - |
| 22 | - | - | - | - | - | - | - | - | - | - | - |
| 23 | - | - | - | - | - | - | - | - | - | - | - |
| 24 | - | - | - | - | - | - | - | - | - | - | - |
| 25 | - | - | - | - | - | - | - | - | - | - | - |
| Total: | 200.0 | 25.1 | 23,924 | 2,513 | 109,655 | - | 21,084 | 2,215 | 96,636 | - | 22.1 |

BMP 09 CII Surveys - Annual Program Cost Worksheet

| | CII Surveys |
|--|-------------------|
| Administration Costs | |
| 1. Staff hours to administer the survey program | 200.00 hrs/yr |
| 2. Staff hourly rate, including overhead | \$ 75.00 /hr |
| 3. Administration costs (Line 1 x Line 2) | \$ 15,000.00 /yr |
| Field Labor Costs | |
| 4. Field labor hours | 3.00 hrs/srvy |
| 5. Field labor hourly rate, including overhead | \$ 75.00 /hr |
| 6. Number of surveys ¹ | 24.00 /yr |
| 7. Field labor cost (Line 4 x Line 5 x Line 6) | \$ 5,400.00 /yr |
| Materials/ Outside Services Costs | |
| 8. Unit cost of materials ² (e.g., plumbing fixtures) | \$ 680.00 /srvy |
| 9. Consulting Services Cost ² | \$ 1,680.00 /srvy |
| 10. Number of surveys (from Line 6) | 24 /yr |
| 11. Total materials/outside services cost (Line 8 x Line 9) | \$ 56,640.00 /yr |
| Publicity Costs | |
| 12. Marketing collateral cost (e.g., brochure design, printing, web services) | \$ 5,000.00 /yr |
| 13. Advertising cost (i.e. newspaper, radio, TV, web) | \$ 5,000.00 /yr |
| 14. Total publicity costs (Line 11 + Line 12) | \$ 10,000.00 /yr |
| Evaluation and Followup Costs | |
| 15. Labor & Consultant costs | \$ 5,000.00 /yr |
| 16. Total Costs (Line 3 + Line 7 + Line 10 + Line 13 + Line 14) | \$ 92,040.00 /yr |
| Program Cost Sharing | |
| 17. Cost Share from Others (e.g., other agencies, grants, in-kind contrib.) | \$ - /yr |
| 18. Net Agency Cost (Line 15 - Line 16) | \$ 92,040.00 /yr |

Notes:

- 1) 10% of CII Customers in 10 years, target 1% per year of 1,178 accounts x 2 = 24
- 2) Per 2005 UWMP

BMP 09 CII Surveys - Water Savings Worksheet

| | CII Surveys |
|--|-----------------|
| 1. Avg. Water Savings Per Survey | N/a gpd |
| 2. Avg. Water Savings Per Survey | 0.34 AF/yr |
| 4. Savings Decay | 10.00 %/yr |
| 5. Number of Surveys (from STEP 1 Line 6) | 24.00 |
| 6. Cumulative Savings | 75.74 AF |

Notes:

1) Per 2005 CUWCC BMP Cost Savings Study, 7.4 AF/Yr CII Savings for 22 Consultant Surveys

BMP 09 CII Surveys - Agency Benefits Worksheet

| Avoided Supply Acquisition Costs (include future avoided capital costs as appropriate) | |
|--|-------------------|
| 1. Marginal Source of Supply ¹ (List name) | Groundwater Wells |
| 2. Avoidable Supply Acquisition Cost ² | \$ 181 /AF |
| Avoided Treatment & Distribution Capacity Costs | |
| 3. Avoided capacity expansion costs ² (dollars per AF of water saved by conservation) | \$ 611 /AF |
| Avoided Wastewater Capacity Costs (if service provided by agency) | |
| 4. Avoided capacity expansion costs ² (dollars per AF of water saved by conservation) | \$ /AF |
| Avoided Treatment & Distribution Variable Costs (include wastewater services if provided by agency) | |
| 5. Avoided Treatment & Distribution Variable Costs ² (Line 10 + Line 16) | \$ 160.00 /AF |
| 6. Total Supply & Wastewater Benefits (Line 2 + Line 3 + Line 4 + Line 17) | \$ 952.00 /AF |
| Environmental Benefits | |
| 7. Environmental benefit per AF saved ² (e.g. value of instream flow, improved water quality, avoided environmental mitigation for supply development or wastewater disposal) | \$ 100 /AF |

Notes:

- 1) Additional supplies identified in the City of Merced's 2009 Water Master Plan
- 2) As described in "Assumptions for all DMMs"

BMP 09 CII Surveys - Other Benefits and Costs Worksheet

| OTHER BENEFITS | |
|---|------------------------------------|
| Avoided Wastewater Utility Variable Costs (IMPORTANT: do not include those listed in STEP 3 Agency Benefits) | |
| 1. Avoided energy & chemical costs | \$ <u>0</u> /AF of conserved water |
| Avoided Wastewater Utility Capacity Costs (IMPORTANT: do not include those listed in STEP 3 Agency Benefits) | |
| 2. Avoided wastewater capacity expansion | \$ <u>0</u> /AF of conserved water |
| Customer Energy Benefits | |
| 3. Average reduction in energy purchases | \$ <u>100</u> /Srvy/yr |
| OTHER COSTS | |
| Customer participation costs | |
| | CII Surveys |
| 4. Average customer expenditures per survey ¹ (e.g., cooling system modifications, etc) | \$ <u>1707</u> /Survey |
| 5. Number of surveys (from Line 8 of STEP 1) | <u>24.00</u> /yr |
| 6. Total customer costs (Line 2 x Line 3) | \$ <u>40,968.00</u> /yr |

Notes:

1) Per 2005 CUWCC BMP Cost Savings Study, Assuming Consultant Analysis and full implementation, Average cost to implement is \$6,828; 25% actual implementation = \$1,707

BMP 09 CII Surveys - Discounting Information

| Discount Rates (required) | |
|---|---------------|
| 1. Agency Discount Rate | <u>2.5</u> % |
| 2. Social Discount Rate | <u>2.0</u> % |
| Annual Escalation Rates (optional) | |
| 3. Avoided cost of water and wastewater | <u>-</u> %/yr |
| 4. Environmental benefits | <u>-</u> %/yr |
| 5. Energy cost | <u>-</u> %/yr |

BMP 09 CII Surveys - Summary of Costs & Benefits

| <u>Program Present Value Costs</u> | <u>Agency Perspective</u> | <u>Society Perspective</u> |
|--|---------------------------|----------------------------|
| 1. Total surveys | 24 | 24 |
| 2. Total water savings | 75.7 AF | 75.7 AF |
| 3. Agency program costs | \$92,040 | \$92,040 |
| 4. Customer program costs | NA | 40,968 |
| 5. Cost share | \$0 | NA |
| 6. Net Program Cost | <u>\$92,040</u> | <u>\$133,008</u> |
| <u>Program Present Value Benefits</u> | | |
| 7. Agency supply & wastewater benefits | \$61,234 | \$72,106 |
| 8. Environmental benefits | \$6,432 | \$7,574 |
| 9. Customer energy benefits | NA | \$19,507 |
| ## Other utility benefits | NA | \$0 |
| ## Total benefits | <u>\$67,666</u> | <u>\$99,188</u> |
| ## Net Present Value (Line 9 - Line 6) | (\$24,374) | (\$33,820) |
| ## Benefit-Cost Ratio (Line 9 ÷ Line 6) | 0.74 | 0.75 |
| ## Simple Unit Supply Cost (Line 6 ÷ Line 2) | \$1,215 /AF | \$1,756 /AF |
| ## Discounted Unit Supply Cost (Line 6 ÷ discounted water savings) | \$1,431 /AF | \$2,005 /AF |
| <p><i>This BMP is not cost-effective to implement from the Agency Perspective</i> <i>This BMP is not cost-effective to implement from the Society Perspective</i></p> | | |

BMP 09 CII Surveys - Discounting Information
Agency Perspective

| Year | Water Savings | Undiscounted Agency Benefits | | | Discounted Agency Benefits | | |
|--------|---------------|------------------------------|---------------|--------|----------------------------|---------------|--------|
| | CII Surveys | Supply & Wastewater | Environmental | Total | Supply & Wastewater | Environmental | Total |
| | AF | \$ | \$ | \$ | | | |
| 0 | 8.16 | 7,768 | 816 | 8,584 | 7,768 | 816 | 8,584 |
| 1 | 7.34 | 6,991 | 734 | 7,726 | 6,821 | 716 | 7,537 |
| 2 | 6.61 | 6,292 | 661 | 6,953 | 5,989 | 629 | 6,618 |
| 3 | 5.95 | 5,663 | 595 | 6,258 | 5,259 | 552 | 5,811 |
| 4 | 5.35 | 5,097 | 535 | 5,632 | 4,617 | 485 | 5,102 |
| 5 | 4.82 | 4,587 | 482 | 5,069 | 4,054 | 426 | 4,480 |
| 6 | 4.34 | 4,128 | 434 | 4,562 | 3,560 | 374 | 3,934 |
| 7 | 3.90 | 3,716 | 390 | 4,106 | 3,126 | 328 | 3,454 |
| 8 | 3.51 | 3,344 | 351 | 3,695 | 2,745 | 288 | 3,033 |
| 9 | 3.16 | 3,010 | 316 | 3,326 | 2,410 | 253 | 2,663 |
| 10 | 2.85 | 2,709 | 285 | 2,993 | 2,116 | 222 | 2,338 |
| 11 | 2.56 | 2,438 | 256 | 2,694 | 1,858 | 195 | 2,053 |
| 12 | 2.30 | 2,194 | 230 | 2,424 | 1,631 | 171 | 1,803 |
| 13 | 2.07 | 1,975 | 207 | 2,182 | 1,432 | 150 | 1,583 |
| 14 | 1.87 | 1,777 | 187 | 1,964 | 1,258 | 132 | 1,390 |
| 15 | 1.68 | 1,599 | 168 | 1,767 | 1,104 | 116 | 1,220 |
| 16 | 1.51 | 1,439 | 151 | 1,591 | 970 | 102 | 1,072 |
| 17 | 1.36 | 1,296 | 136 | 1,432 | 851 | 89 | 941 |
| 18 | 1.22 | 1,166 | 122 | 1,288 | 748 | 79 | 826 |
| 19 | 1.10 | 1,049 | 110 | 1,160 | 656 | 69 | 725 |
| 20 | 0.99 | 944 | 99 | 1,044 | 576 | 61 | 637 |
| 21 | 0.89 | 850 | 89 | 939 | 506 | 53 | 559 |
| 22 | 0.80 | 765 | 80 | 845 | 444 | 47 | 491 |
| 23 | 0.72 | 689 | 72 | 761 | 390 | 41 | 431 |
| 24 | 0.65 | 620 | 65 | 685 | 343 | 36 | 379 |
| Total: | 75.09 | 72,106 | 7,574 | 79,681 | 61,234 | 6,432 | 67,666 |

| Discounted Supply |
|-------------------|
| AF |
| 8.16 |
| 7.16 |
| 6.29 |
| 5.52 |
| 4.85 |
| 4.26 |
| 3.74 |
| 3.28 |
| 2.88 |
| 2.53 |
| 2.22 |
| 1.95 |
| 1.71 |
| 1.50 |
| 1.32 |
| 1.16 |
| 1.02 |
| 0.89 |
| 0.79 |
| 0.69 |
| 0.61 |
| 0.53 |
| 0.47 |
| 0.41 |
| 0.36 |
| 64.32 |

BMP 09 CII Surveys - Discounting Information
Society Perspective

| Water Savings | | Program Benefits | | | | Discounted Program Benefits | | | | | | Discounted Supply AF |
|---------------|-------------|------------------------|---------------|--------------------------------|-----------------------------------|-----------------------------|------------------------|---------------|--------------------------------|-----------------------------------|--------|----------------------------|
| | CII Surveys | Supply & Wastewater | Environmental | Customer Energy Benefits | Wastewater Utility Benefits | Total | Supply & Wastewater | Environmental | Customer Energy Benefits | Wastewater Utility Benefits | Total | |
| Year | AF | \$ | \$ | \$ | \$ | \$ | \$ | \$ | \$ | \$ | \$ | |
| 0 | 8.16 | 7,768 | 816 | 2,400 | - | 10,984 | 7,768 | 816 | 2,400 | - | 10,984 | 8.16 |
| 1 | 7.34 | 6,991 | 734 | 2,160 | - | 9,886 | 6,854 | 720 | 2,118 | - | 9,692 | 7.20 |
| 2 | 6.61 | 6,292 | 661 | 1,944 | - | 8,897 | 6,048 | 635 | 1,869 | - | 8,552 | 6.35 |
| 3 | 5.95 | 5,663 | 595 | 1,750 | - | 8,008 | 5,336 | 561 | 1,649 | - | 7,546 | 5.61 |
| 4 | 5.35 | 5,097 | 535 | 1,575 | - | 7,207 | 4,709 | 495 | 1,455 | - | 6,658 | 4.95 |
| 5 | 4.82 | 4,587 | 482 | 1,417 | - | 6,486 | 4,155 | 436 | 1,284 | - | 5,875 | 4.36 |
| 6 | 4.34 | 4,128 | 434 | 1,275 | - | 5,838 | 3,666 | 385 | 1,133 | - | 5,184 | 3.85 |
| 7 | 3.90 | 3,716 | 390 | 1,148 | - | 5,254 | 3,235 | 340 | 999 | - | 4,574 | 3.40 |
| 8 | 3.51 | 3,344 | 351 | 1,033 | - | 4,728 | 2,854 | 300 | 882 | - | 4,036 | 3.00 |
| 9 | 3.16 | 3,010 | 316 | 930 | - | 4,256 | 2,518 | 265 | 778 | - | 3,561 | 2.65 |
| 10 | 2.85 | 2,709 | 285 | 837 | - | 3,830 | 2,222 | 233 | 686 | - | 3,142 | 2.33 |
| 11 | 2.56 | 2,438 | 256 | 753 | - | 3,447 | 1,961 | 206 | 606 | - | 2,772 | 2.06 |
| 12 | 2.30 | 2,194 | 230 | 678 | - | 3,102 | 1,730 | 182 | 534 | - | 2,446 | 1.82 |
| 13 | 2.07 | 1,975 | 207 | 610 | - | 2,792 | 1,526 | 160 | 472 | - | 2,158 | 1.60 |
| 14 | 1.87 | 1,777 | 187 | 549 | - | 2,513 | 1,347 | 141 | 416 | - | 1,904 | 1.41 |
| 15 | 1.68 | 1,599 | 168 | 494 | - | 2,262 | 1,188 | 125 | 367 | - | 1,680 | 1.25 |
| 16 | 1.51 | 1,439 | 151 | 445 | - | 2,035 | 1,049 | 110 | 324 | - | 1,483 | 1.10 |
| 17 | 1.36 | 1,296 | 136 | 400 | - | 1,832 | 925 | 97 | 286 | - | 1,308 | 0.97 |
| 18 | 1.22 | 1,166 | 122 | 360 | - | 1,649 | 816 | 86 | 252 | - | 1,154 | 0.86 |
| 19 | 1.10 | 1,049 | 110 | 324 | - | 1,484 | 720 | 76 | 223 | - | 1,019 | 0.76 |
| 20 | 0.99 | 944 | 99 | 292 | - | 1,335 | 636 | 67 | 196 | - | 899 | 0.67 |
| 21 | 0.89 | 850 | 89 | 263 | - | 1,202 | 561 | 59 | 173 | - | 793 | 0.59 |
| 22 | 0.80 | 765 | 80 | 236 | - | 1,082 | 495 | 52 | 153 | - | 700 | 0.52 |
| 23 | 0.72 | 689 | 72 | 213 | - | 974 | 437 | 46 | 135 | - | 617 | 0.46 |
| 24 | 0.65 | 620 | 65 | 191 | - | 876 | 385 | 40 | 119 | - | 545 | 0.40 |
| Total: | 75.74 | 72,106 | 7,574 | 22,277 | - | 101,958 | 63,141 | 6,632 | 19,507 | - | 89,281 | 66.32 |

BMP 14 ULFT Replacement Programs - Annual Program Cost Worksheet

Administration Costs

- | | |
|---|----------------------|
| 1. Staff hours to administer the rebate program | <u>200</u> hrs/yr |
| 2. Staff hourly rate, including overhead | \$ <u>75.00</u> /hr |
| 3. Administration costs (Line 1 x Line 2) | \$ <u>15,000</u> /yr |

ULFT Costs

- | | Single-Family | Multi-Family |
|---|---------------------|---------------------|
| 4. ULFT Cost (or incentive cost) | \$ <u>100</u> /ULFT | \$ <u>100</u> /ULFT |
| 5. Number of ULFTs (or incentives) distributed | <u>50</u> /yr | <u>50</u> /yr |
| 6. Total ULFT replacement cost (Line 4 x Line 5) | \$ <u>5,000</u> /yr | \$ <u>5,000</u> /yr |

Incentive Processing Costs

- | | |
|--|---------------------|
| 7. Average rebate processing cost (if not included in Adm) | \$ <u>10</u> /ULFT |
| 8. Total rebate processing cost (Line 5 x Line 7) | \$ <u>1,000</u> /yr |

Publicity Costs

- | | |
|---|---------------------|
| 9. Marketing collateral cost (e.g., brochure design, printing, web services) | \$ <u>4,000</u> /yr |
| 10. Advertising cost (i.e. newspaper, radio, TV, web) | \$ <u>4,000</u> /yr |
| 11. Total publicity costs (Line 9 + Line 10) | \$ <u>8,000</u> /yr |

Evaluation and Followup Costs

- | | |
|--|----------------------|
| 12. Labor & Consultant costs | \$ <u>5,000</u> /yr |
| 13. Total Costs (Line 3 + Line 6 + Line 8 + Line 11 + Line 12) | \$ <u>39,000</u> /yr |

Program Cost Sharing

- | | |
|--|----------------------|
| 14. Cost Share from Others (e.g., other agencies, grants, in-kind contrib.) | \$ <u>-</u> /yr |
| 15. Net Agency Cost (Line 13 - Line 14) | \$ <u>39,000</u> /yr |

BMP 14 ULFT Replacement Programs - Water Savings Worksheet

| | Single-Family | Multi-Family |
|--|-----------------|-----------------|
| 1. Avg. Persons Per Household ¹ | <u>3.1</u> | <u>2.2</u> |
| 2. Avg. Savings per ULFT (gallons per day per ULFT) | <u>23.5</u> gpd | <u>39.7</u> gpd |
| 3. Toilet Natural Replacement Rate | <u>4.0</u> %/yr | <u>4.0</u> %/yr |
| 4. Number of ULFTs Distributed (from STEP 1 Line 5) | <u>50</u> | <u>50</u> |
| 5. Percent Free-riders | <u>35</u> % | <u>35</u> % |
| 6. 25-Year Savings | 13.7 AF | 23.1 AF |

Notes:

1) From 2005 UWMP

BMP 14 ULFT Replacement Programs - Agency Benefits Worksheet

| Avoided Supply Acquisition Costs (include future avoided capital costs as appropriate) | |
|--|-------------------|
| 1. Marginal Source of Supply ¹ (List name) | Groundwater Wells |
| 2. Avoidable Supply Acquisition Cost ² | \$ 181 /AF |
| Avoided Treatment & Distribution Capacity Costs | |
| 3. Avoided capacity expansion costs ² (dollars per AF of water saved by conservation) | \$ 611 /AF |
| Avoided Wastewater Capacity Costs (if service provided by agency) | |
| 4. Avoided capacity expansion costs ² (dollars per AF of water saved by conservation) | \$ 0 /AF |
| Avoided Treatment & Distribution Variable Costs (include wastewater services if provided by agency) | |
| 5. Avoided Treatment & Distribution Variable Costs ² (Line 10 + Line 16) | \$ 160.00 /AF |
| 6. Total Supply & Wastewater Benefits (Line 2 + Line 3 + Line 4 + Line 17) | \$ 952.00 /AF |
| Environmental Benefits | |
| 7. Environmental benefit per AF saved ² (e.g. value of instream flow, improved water quality, avoided environmental mitigation for supply development or wastewater disposal) | \$ 100 /AF |

Notes:

- 1) Additional supplies identified in the City of Merced's 2009 Water Master Plan
- 2) As described in "Assumptions for all DMMs"

BMP 14 ULFT Replacement Programs - Other Benefits and Costs Worksheet

OTHER BENEFITS

Avoided Wastewater Utility Costs (IMPORTANT: do not include those listed in STEP 3 Agency Benefits)

- | | |
|--|------------------------------------|
| 1. Avoided energy & chemical costs | \$ <u>0</u> /AF of conserved water |
| 2. Avoided wastewater capacity expansion | \$ <u>0</u> /AF of conserved water |
| 3. Total avoided wastewater utility costs (Line 6 + Line 7) | \$ <u>-</u> /AF of conserved water |

OTHER COSTS

| Customer Participation Costs | Single Family ULFTs | Multi Family ULFTs |
|---|------------------------|-----------------------|
| 4. Average customer expenditures per ULFT (e.g., installation, disposal of old toilet) | \$ <u>125</u> /ULFT | \$ <u>125</u> /ULFT |
| 5. Number of ULFTs distributed (from Line 5 of STEP 1) | <u>50</u> | <u>50</u> |
| 6. Percent of Freeriders (from Line 5 of STEP 2) | <u>35 %</u> | <u>35 %</u> |
| 7. Total customer costs (Line 4 x Line 5 x (1 - Line 6)) | \$ <u>4,062.50</u> | \$ <u>4,062.50</u> |

BMP 14 ULFT Replacement Programs - Discounting Information

Discount Rates (required)

| | |
|-------------------------|-------|
| 1. Agency Discount Rate | 2.5 % |
| 2. Social Discount Rate | 2.0 % |

Annual Escalation Rates (optional)

| | |
|---|--------|
| 3. Avoided cost of water and wastewater | - %/yr |
| 4. Environmental benefits | - %/yr |
| 5. Energy cost | - %/yr |

BMP 14 ULFT Replacement Programs - Summary of Costs & Benefits

| <u>Program Present Value Costs</u> | <u>Agency Perspective</u> | <u>Society Perspective</u> |
|---|-------------------------------|--------------------------------|
| 1. Total ULFTs distributed | 100 | 100 |
| 2. Total water savings | 36.8 AF | 36.8 AF |
| 3. Agency program costs | \$39,000 | \$39,000 |
| 4. Customer program costs | NA | \$8,125 |
| 5. Cost share | \$0 | NA |
| 6. Net Program Cost | <u>\$39,000</u> | <u>\$47,125</u> |
| <u>Program Present Value Benefits</u> | | |
| 7. Agency supply & wastewater benefits | \$27,150 | \$28,489 |
| 8. Environmental benefits | \$2,852 | \$2,993 |
| 9. Other utility benefits | NA | \$0 |
| 10. Total benefits | <u>\$30,002</u> | <u>\$31,482</u> |
| 11. Net Present Value (Line 10 - Line 6) | (\$8,998) | (\$15,643) |
| 12. Benefit-Cost Ratio (Line 10 ÷ Line 6) | 0.77 | 0.67 |
| 13. Simple Unit Supply Cost (Line 6 ÷ Line 2) | \$1,060 /AF | \$1,281 /AF |
| 14. Discounted Unit Supply Cost (Line 6 ÷ discounted water savings) | \$1,368 /AF | \$1,575 /AF |
| <i>This BMP is not cost-effective to implement from the Agency Perspective</i> <i>This BMP is not cost-effective to implement from the Society Perspective</i> | | |

BMP 14 ULFT Replacement Programs - Summary of Costs & Benefits
Present Value Benefits - Agency Perspective

| Year | Water Savings | | | Undiscounted Agency Benefits | | | Discounted Agency Benefits | | | Discounted Supply AF |
|--------|------------------|-----------------|------------------------|------------------------------|------------------|----------|----------------------------|---------------|--------|----------------------|
| | Single Family AF | Multi Family AF | Total Water Savings AF | Supply & Wastewater \$ | Environmental \$ | Total \$ | Supply & Wastewater | Environmental | Total | |
| 0 | | | | | | | | | | |
| 1 | 0.9 | 1.4 | 2.3 | 2,191 | 230 | 2,421 | 2,137 | 224 | 2,362 | 2.2 |
| 2 | 0.8 | 1.4 | 2.2 | 2,103 | 221 | 2,324 | 2,002 | 210 | 2,212 | 2.1 |
| 3 | 0.8 | 1.3 | 2.1 | 2,019 | 212 | 2,231 | 1,875 | 197 | 2,072 | 2.0 |
| 4 | 0.8 | 1.3 | 2.0 | 1,938 | 204 | 2,142 | 1,756 | 184 | 1,940 | 1.8 |
| 5 | 0.7 | 1.2 | 2.0 | 1,861 | 195 | 2,056 | 1,644 | 173 | 1,817 | 1.7 |
| 6 | 0.7 | 1.2 | 1.9 | 1,786 | 188 | 1,974 | 1,540 | 162 | 1,702 | 1.6 |
| 7 | 0.7 | 1.1 | 1.8 | 1,715 | 180 | 1,895 | 1,442 | 152 | 1,594 | 1.5 |
| 8 | 0.6 | 1.1 | 1.7 | 1,646 | 173 | 1,819 | 1,351 | 142 | 1,493 | 1.4 |
| 9 | 0.6 | 1.0 | 1.7 | 1,580 | 166 | 1,746 | 1,265 | 133 | 1,398 | 1.3 |
| 10 | 0.6 | 1.0 | 1.6 | 1,517 | 159 | 1,676 | 1,185 | 124 | 1,310 | 1.2 |
| 11 | 0.6 | 1.0 | 1.5 | 1,456 | 153 | 1,609 | 1,110 | 117 | 1,227 | 1.2 |
| 12 | 0.5 | 0.9 | 1.5 | 1,398 | 147 | 1,545 | 1,040 | 109 | 1,149 | 1.1 |
| 13 | 0.5 | 0.9 | 1.4 | 1,342 | 141 | 1,483 | 974 | 102 | 1,076 | 1.0 |
| 14 | 0.5 | 0.9 | 1.4 | 1,288 | 135 | 1,424 | 912 | 96 | 1,008 | 1.0 |
| 15 | 0.5 | 0.8 | 1.3 | 1,237 | 130 | 1,367 | 854 | 90 | 944 | 0.9 |
| 16 | 0.5 | 0.8 | 1.2 | 1,187 | 125 | 1,312 | 800 | 84 | 884 | 0.8 |
| 17 | 0.4 | 0.8 | 1.2 | 1,140 | 120 | 1,260 | 749 | 79 | 828 | 0.8 |
| 18 | 0.4 | 0.7 | 1.1 | 1,094 | 115 | 1,209 | 702 | 74 | 775 | 0.7 |
| 19 | 0.4 | 0.7 | 1.1 | 1,051 | 110 | 1,161 | 657 | 69 | 726 | 0.7 |
| 20 | 0.4 | 0.7 | 1.1 | 1,009 | 106 | 1,115 | 616 | 65 | 680 | 0.6 |
| 21 | 0.4 | 0.6 | 1.0 | 968 | 102 | 1,070 | 576 | 61 | 637 | 0.6 |
| 22 | 0.4 | 0.6 | 1.0 | 930 | 98 | 1,027 | 540 | 57 | 597 | 0.6 |
| 23 | 0.3 | 0.6 | 0.9 | 892 | 94 | 986 | 506 | 53 | 559 | 0.5 |
| 24 | 0.3 | 0.6 | 0.9 | 857 | 90 | 947 | 474 | 50 | 523 | 0.5 |
| 25 | 0.3 | 0.5 | 0.9 | 822 | 86 | 909 | 444 | 47 | 490 | 0.5 |
| Total: | 13.7 | 23.1 | 36.8 | 35,027 | 3,679 | 38,707 | 27,150 | 2,852 | 30,002 | 28.5 |

BMP 14 ULFT Replacement Programs - Summary of Costs & Benefits
Present Value Benefits - Society Perspective

| Year | Water Savings | | | Undiscounted Program Benefits | | | | Discounted Program Benefits | | | | Discounted Supply AF |
|--------|------------------|-----------------|------------------------|-------------------------------|------------------|--------------------------------|----------|-----------------------------|------------------|--------------------------------|----------|----------------------|
| | Single Family AF | Multi Family AF | Total Water Savings AF | Supply & Wastewater \$ | Environmental \$ | Wastewater Utility Benefits \$ | Total \$ | Supply & Wastewater \$ | Environmental \$ | Wastewater Utility Benefits \$ | Total \$ | |
| 0 | | | | | | | | | | | | |
| 1 | 0.9 | 1.4 | 2.3 | 2,191 | 230 | - | 2,421 | 2,148 | 226 | - | 2,373 | 2.3 |
| 2 | 0.8 | 1.4 | 2.2 | 2,103 | 221 | - | 2,324 | 2,021 | 212 | - | 2,234 | 2.1 |
| 3 | 0.8 | 1.3 | 2.1 | 2,019 | 212 | - | 2,231 | 1,902 | 200 | - | 2,102 | 2.0 |
| 4 | 0.8 | 1.3 | 2.0 | 1,938 | 204 | - | 2,142 | 1,790 | 188 | - | 1,979 | 1.9 |
| 5 | 0.7 | 1.2 | 2.0 | 1,861 | 195 | - | 2,056 | 1,685 | 177 | - | 1,862 | 1.8 |
| 6 | 0.7 | 1.2 | 1.9 | 1,786 | 188 | - | 1,974 | 1,586 | 167 | - | 1,753 | 1.7 |
| 7 | 0.7 | 1.1 | 1.8 | 1,715 | 180 | - | 1,895 | 1,493 | 157 | - | 1,650 | 1.6 |
| 8 | 0.6 | 1.1 | 1.7 | 1,646 | 173 | - | 1,819 | 1,405 | 148 | - | 1,552 | 1.5 |
| 9 | 0.6 | 1.0 | 1.7 | 1,580 | 166 | - | 1,746 | 1,322 | 139 | - | 1,461 | 1.4 |
| 10 | 0.6 | 1.0 | 1.6 | 1,517 | 159 | - | 1,676 | 1,244 | 131 | - | 1,375 | 1.3 |
| 11 | 0.6 | 1.0 | 1.5 | 1,456 | 153 | - | 1,609 | 1,171 | 123 | - | 1,294 | 1.2 |
| 12 | 0.5 | 0.9 | 1.5 | 1,398 | 147 | - | 1,545 | 1,102 | 116 | - | 1,218 | 1.2 |
| 13 | 0.5 | 0.9 | 1.4 | 1,342 | 141 | - | 1,483 | 1,038 | 109 | - | 1,147 | 1.1 |
| 14 | 0.5 | 0.9 | 1.4 | 1,288 | 135 | - | 1,424 | 977 | 103 | - | 1,079 | 1.0 |
| 15 | 0.5 | 0.8 | 1.3 | 1,237 | 130 | - | 1,367 | 919 | 97 | - | 1,016 | 1.0 |
| 16 | 0.5 | 0.8 | 1.2 | 1,187 | 125 | - | 1,312 | 865 | 91 | - | 956 | 0.9 |
| 17 | 0.4 | 0.8 | 1.2 | 1,140 | 120 | - | 1,260 | 814 | 86 | - | 900 | 0.9 |
| 18 | 0.4 | 0.7 | 1.1 | 1,094 | 115 | - | 1,209 | 766 | 80 | - | 847 | 0.8 |
| 19 | 0.4 | 0.7 | 1.1 | 1,051 | 110 | - | 1,161 | 721 | 76 | - | 797 | 0.8 |
| 20 | 0.4 | 0.7 | 1.1 | 1,009 | 106 | - | 1,115 | 679 | 71 | - | 750 | 0.7 |
| 21 | 0.4 | 0.6 | 1.0 | 968 | 102 | - | 1,070 | 639 | 67 | - | 706 | 0.7 |
| 22 | 0.4 | 0.6 | 1.0 | 930 | 98 | - | 1,027 | 601 | 63 | - | 664 | 0.6 |
| 23 | 0.3 | 0.6 | 0.9 | 892 | 94 | - | 986 | 566 | 59 | - | 625 | 0.6 |
| 24 | 0.3 | 0.6 | 0.9 | 857 | 90 | - | 947 | 533 | 56 | - | 589 | 0.6 |
| 25 | 0.3 | 0.5 | 0.9 | 822 | 86 | - | 909 | 501 | 53 | - | 554 | 0.5 |
| Total: | 13.7 | 23.1 | 36.8 | 35,027 | 3,679 | - | 38,707 | 28,489 | 2,993 | - | 31,482 | 29.9 |