Chapter 5

WATER SUPPLY RELIABILITY AND WATER SHORTAGE CONTINGENCY PLANNING

This chapter describes the reliability of the City of Hanford's (City's) water supplies, including a discussion of the City's water shortage contingency plan, as well as potential supply disruptions associated with water quality issues and drought.

5.1 WATER SUPPLY RELIABILITY

The Urban Water Management Planning Act (UWMPA) requires that the Urban Water Management Plan (UWMP) address the reliability of the agency's water supplies. This includes a description of supplies that are vulnerable to seasonal or climatic variations.

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.*

5.1.1 Resource Maximization/Import Minimization

The City recognizes the importance of maintaining a high quality reliable water supply. Although water is a renewable resource, there is a limit on the amount of water that can be sustainably drawn from a given supply source (e.g., groundwater basins, surface water sources). The main focus for the City is to maximize the efficient use of water and to promote conservation. This will be accomplished through the implementation of demand management measures (DMMs) that have not been implemented by the City, continued implementation of DMMs that have currently been implemented by the City, and other conservation activities.

Additionally, the City has actively pursued supplemental programs. The programs include:

- **Recycled Water.** The City's wastewater, following treatment and disinfection, is reused by the Lakeside Irrigation Water District (LIWD) as stipulated in the Reclamation Project Agreement (Appendix H). The City pays $30 per acre-foot to LIWD, which allows LIWD to purchase additional surface water for agricultural irrigation, thus reducing the amount of groundwater used for current and future crop irrigation.

5.1.2 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 a "Yes" or "No" as appropriate in Table 5.1. A brief discussion on each of these factors is provided below.

Table 5.1 Factors Resulting in Inconsistency of Supply (Guidebook Table 29)
2010 Urban Water Management Plan
City of Hanford

Water Supply Sources	Specific Source Name	Limitation Quantification	Legal	Environmental	Water Quality	Climatic	Additional Information
Wholesale Agencies (None)	No Sources	--	--	--	--	--	--
Supplier-Produced Groundwater	City Groundwater Wells	None	No	No	No	No	No Inconsistent Supplies
Supplier-Produced Surface Water	No Sources	--	--	--	--	--	--
Transfers In	No Sources	--	--	--	--	--	--
Exchanges In	No Sources	--	--	--	--	--	--
Recycled Water	No Sources(2)	--	--	--	--	--	--
Desalinated Water	No Sources	--	--	--	--	--	--
Other	No Sources	--	--	--	--	--	--

Notes:
(1) "Guidebook Table X" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR.
(2) Recycled water is not used to offset potable water demand in the City, but is used for agricultural irrigation. See Chapter 4 for more information.

A fundamental factor that affects water supply reliability is the hydraulic capacity of supply and distribution system facilities (e.g., groundwater wells, treatment facilities, transmission mains). As the City continues to grow, it will construct the additional supply and distribution system facilities necessary to accommodate the increased water demands associated with this growth. For this reason, the physical capacity of the City's supply facilities is assumed to not be a limiting factor affecting the reliability of the City's supply in the future, as is not listed in Table 5.1.

5.1.2.1 Legal Factors

Legal factors, such as pumping limitations in adjudicated groundwater basins and surface water contracts, are capable of affecting the reliability of a water distribution system. As noted in Chapter 4, however, the Tulare Lake Groundwater Subbasin (the City's sole source of supply) is not an adjudicated groundwater basin. Therefore, there are no legal limitations on the amount of groundwater that the City can extract from this subbasin.

5.1.2.2 Environmental Factors

There is a heightened awareness of the impact on the California ecosystem from a variety of projects. As such, environmental concerns often arise during the water planning process. These concerns 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.

The City currently relies on groundwater to meet its customers' demands. It is not expected that the City's groundwater supply will be limited due to environmental concerns in the future.

5.1.2.3 Water Quality Factors

The quality of water obtained from a surface water or groundwater source can be a limiting factor on the amount of water that can be obtained from that source. Water quality considerations specific to Hanford are summarized in detail in Section 5.3. As noted in this section, the City's current groundwater supply is capable of reliably meeting City demands.

In the future, the City will take the steps necessary to comply with all existing and future groundwater quality regulations and to continue to provide reliable water service to its residents.

5.1.2.4 Climatic Factors

Climatic factors affecting the reliability of a given water supply system generally are a function of seasonal precipitation and runoff characteristics. Systems that rely primarily on surface water are particularly vulnerable to seasonal runoff. The City relies on groundwater to meet system demands. Therefore, the City is not vulnerable to supply reductions due to decreased runoff.

Not all dry years lead to water supply shortages and groundwater overdraft. In an average or wet year, the water supply sources exceed the water needs. During extended drought periods, groundwater levels generally decline and will require more aggressive demand management practices. Overall, however, the reliability and vulnerability of the City's groundwater supply to seasonal or climatic shortages remains constant. Therefore, the annual quantity of groundwater available to the City is not expected to vary significantly in relation to wet or dry years. The City's projected supply and demands associated with drought periods are discussed in greater detail in Section 5.4.

Groundwater pumping in the Tulare Lake Hydrologic Region continues to increase in response to growing urban and agricultural demands. Long-term groundwater overdraft can result in land subsidence, which also results in a loss of storage space. This has caused some damage to canals, utilities, pipelines and roads in the region. However, some agencies within the Tulare Lake Hydrologic Region have adopted groundwater replenishment programs to ensure groundwater will continue to be a viable water supply.

For this reason, climatic concerns are not expected to significantly impact the City's current or future supply reliability.

5.2 WATER SHORTAGE CONTINGENCY PLANNING

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

Law

> *10632 (a). (Describe) 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.*
>
> *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.*
>
> *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.*
>
> *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 (h). A draft water shortage contingency resolution or ordinance.*
>
> *10632 (i). (Provide) a mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.*

5.2.1 Stages of Action and Reduction Objectives

Water agencies relying solely on groundwater, such as the City, are much less likely to experience water shortages than those agencies relying primarily on surface water.

The City has developed a three-stage rationing plan that will be invoked during declared water shortages. Each stage includes a water reduction objective, in percent of normal water demands. The rationing plan is dependent on the cause, severity and anticipated duration of the water supply shortage. A combination of voluntary and mandatory water conservation measures would be used to reduce water usage in the event of water shortages. Table 5.2 outlines the stages of action.

Table 5.2 Water Shortage Contingency - Rationing Stages (Guidebook Table 35) 2010 Urban Water Management Plan City of Hanford		
Stage	**Condition**	**Reduction Objective**
1 - Minor Shortage Potential	• Below average rainfall in the previous 12-24 months • 10 percent or more of municipal wells out of service • Warm weather patterns typical of summer months	10-20% reduction in total water demands from baseline
2 - Moderate Shortage Potential	• Below average rainfall in the previous 24-36 months • Prolonged periods of low water pressure • 10 percent or more of municipal wells out of service • Warm weather typical of summer months	20-35% reduction in total water demands from baseline
3 - Critical Shortage Potential	• Below average rainfall in the previous 36 months • Prolonged periods of low water pressure • 10 percent or more of municipal wells out of service • Warm weather patterns typical of summer months	35-50% reduction in total water demands from baseline
Note: (1) "Guidebook Table X" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR.		

Emergency response stage actions become effective when the City Manager declares that the City is unable to provide sufficient water supply to meet ordinary demands, to the extent that insufficient supplies would be available for human consumption, sanitation and fire protection. The declaration will be based on his/her judgment as to the degree of the immediate or future supply deficiency. Table 5.2 also provides guidelines to assist in declaring a water shortage stage.

5.2.1.1 Administration of Water Shortage Program

The administration of a water shortage program would involve coordination among a number of City departments. It is anticipated that the Public Works Department would have primary responsibility for managing the program, since it is responsible for the City's water system. An individual in the Public Works Department would be identified as the Program Manager and be the primary coordinator of water shortage activities.

An appropriate organizational structure for water shortage management team would be determined based on the actual situation. Specific individuals would be designated to fill the identified roles. The City would probably not have to hire additional staff or outside contractors to implement the program.

The major elements to be considered in administering and implementing the program include:

- **Identifying the City staff members to fill the key roles on the water shortage management team.** It is anticipated that the Public Works Director would designate the appropriate individuals, including the Program Manager.
- **Intensifying the public information program to provide comprehensive information on the water shortage as necessary actions that must be undertaken by the City and by the public.** The scope of the public information program can be developed by reviewing published references, especially those published by the Department of Water Resources (DWR), and researching successful aspects of the current programs conducted by neighboring water agencies. A public information hotline may be advisable to answer any questions regarding the program.
- **Monitoring program effectiveness.** Ongoing monitoring will be needed to track supply availability and actual water user reductions. This procedure will allow the City to continuously re-evaluate the situation and make informal decisions as to whether another reduction level is needed.
- **Enforcing program requirements.** From the 35 to 50 percent reduction programs, enforcement of water use prohibitions and water use allocations will be more important in achieving the program goals. Inspectors and enforcement personnel could be identified among City staff that are in the community on other business, such as police, Parks Division, street maintenance, meter readers, etc.
- **Dealing with equity issues that might arise from the mandatory restrictions or higher water rates.** Depending on the level of restriction, there may be a greater need to address specific concerns of individual customers who might have special conditions or extenuating circumstances and are unduly affected by the program. A procedure should be identified for dealing with such special requests and/or for reviewing specific accounts.
- **Coordinating with Kings County Water District (KCWD).** Since the KCWD is the principal water management agency in the County and sets the countywide water use reduction goals, it is critical to have ongoing coordination with a specific contact person at the District who will be aware of the City's needs.
- **Adjusting water rates.** Revenues from water sales should be reviewed periodically to determine whether an increase in rates might be needed to cover revenue shortfalls due to the decrease in demand.

- **Addressing new development proposals.** During periods of severe water shortage, it may be necessary to impose additional requirements on new development to reduce new demand or to temporarily curtail new hook-ups.

5.2.2 Actions During a Catastrophic Interruption

During declared shortages, or when a shortage declaration appears imminent, the City Manager will activate a water shortage response team. The team includes: public works, water, fire, planning, health, and emergency services. Other actions and procedures to follow during catastrophic events will be developed.

5.2.3 Mandatory Prohibitions on Water Wasting

Mandatory compliance measures enacted during a water shortage are more severe than voluntary measures, produce greater savings, and are less costly to the utility. The principal drawback to these measures is the customer resentment if the measures are not seen as equitable. Therefore, such measures need to be accompanied by a good public relations campaign.

Mandatory measures may include:

- Ordinances making water waste illegal
- Ordinances controlling landscape irrigation
- Ordinances restricting non-irrigation outdoor water uses
- Prohibitions on new connections or the incorporation of new areas
- Rationing

Prohibitions on new development may conflict with other policies and needs. However, if existing customers are called upon to make sacrifices during a drought period, they may feel that water agencies should concentrate on fulfilling current obligations rather than taking on new customers. Such prohibitions may need to be considered in the event of a critical shortage, such as the 50 percent reduction program. If necessary, an offset program might be considered whereby developers demonstrate that they will implement measures to conserve at least as much water in the existing community as their new project will use. In some cases, a two to one offset may be required of the new development.

The City currently enforces Municipal Code Section 13.04.150 Water Use Unlawful Acts. This code specifies certain water use prohibitions described in Table 5.3. In addition, the City may implement additional consumption reduction methods during Water Conservation Stages 1, 2, and 3, as summarized in Section 5.2.4.

Table 5.3 Water Shortage Contingency - Mandatory Prohibitions (Guidebook Table 36) 2010 Urban Water Management Plan City of Hanford	
Prohibitions	**Stage When Prohibition Becomes Mandatory**
Sprinkle, irrigate or otherwise apply water to any yard, ground, premises or vegetation except on the following designated days: Properties ending with even-numbered addresses, Tuesday, Thursday and Saturday. Properties with odd-numbered addresses, Wednesday, Friday, and Sunday.	Stage 1, 2, and 3
Sprinkle, irrigate or otherwise apply water to any yard, ground, premises or vegetation or wash any type of vehicle, boat, or trailer on Monday.	Stage 1, 2, and 3
Sprinkle, irrigate or otherwise apply water to any yard, ground, premises or vegetation on any day of the week between the hours of ten a.m. and six p.m. during periods designated as “daylight savings time” (generally occurring between April 15th and October 15th).	Stage 1, 2, and 3
Sprinkle, irrigate or otherwise apply water to any yard, ground, premises or vegetation except by the use of a hand held hose, a sprinkler device or an approved sprinkler system.	Stage 1, 2, and 3
Keep, maintain, operate, or use any water connection, hose faucet, hydrant, pipe, outlet or plumbing fixture which is not tight and free from leakage or dripping.	Stage 1, 2, and 3
Sprinkle, irrigate or otherwise apply water to any yard, ground, premises or vegetation between the hours of twelve midnight and five a.m. unless the water device used to apply such water is controlled by an automatic shut-off device or a person is in immediate attendance of the watering device.	Stage 1, 2, and 3
Allow excess water to run or waste from his or her property on to sidewalks, streets or adjoining or adjacent property.	Stage 1, 2, and 3
Use water for side walk, driveway or walkway washing or cleaning, except that a business may apply water to paved areas of the business premises in order to maintain the same in a clear and sanitary condition.	Stage 1, 2, and 3
Willfully or negligently, waste water in any manner.	Stage 1, 2, and 3

Note:
(1) “Guidebook Table X” refers to a specific table in the “Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan” by DWR.

5.2.4 Consumption Reduction Methods in Most Restrictive Stage

In order to achieve a 50 percent reduction in water use during the most restrictive stage of a water supply emergency, the City will implement and enforce the water prohibitions described in Section 5.2.3. Other mandated restrictions in water use for all reductions stages, including Stage 3, will be determined by the City Council, and may include the actions described in Table 5.4.

Table 5.4 Water Shortage Contingency - Consumption Reduction Methods (Guidebook Table 37)
2010 Urban Water Management Plan
City of Hanford

Reduction Category	Reduction Method Description	Stage When Method Takes Effect(2)	Projected Reduction(3) (%)
Landscape (Except Residential)	Eliminate watering of ornamental turf areas. Water only actively used turf areas no more than twice per week. Trees and shrubs may be water only twice per week using a hand-held hose with a positive shutoff nozzle or drip irrigation. Use of reclaimed water (if available), is exempt.	Stage 1 - 3	Up to 50%
Households (Residential Landscapes)	Water no more than twice per week using only hand-held hoses with positive shutoff nozzle or drip irrigation systems. Eliminate sprinkler use.	Stage 1 - 3	Up to 50%
Construction Use	All construction water must be reclaimed or non-potable. Issuance of construction meters will be only for testing and disinfection of potable water lines.	Stage 1 - 3	Up to 50%
Development Construction	Prior to the issuance of any building permit, the developer will be required to certify that a reduction of the projected average water usage for that development shall be achieved.	Stage 1 - 3	Up to 50%

Notes:
(1) "Guidebook Table X" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR.
(2) Consumption reduction measures will be implemented by the City as appropriate given the nature of the water supply shortage.
(3) Projected reductions, when implemented in concert, should be capable of achieving a system wide reduction of 50%.

5.2.5 Excessive Use Penalties

Customers violating the regulations and restrictions on water use set forth in the Water Code shall receive actions by the City, as summarized in Table 5.5.

Table 5.5 Water Shortage Contingency - Penalties and Charges (Guidebook Table 38)
2010 Urban Water Management Plan
City of Hanford

Violation Occurrence	Penalty/Charge	Stage When Penalty Takes Effect
Flat Rate Customers		
First	A verbal warning of the violation shall be issued to the water customer.	Stage 1 - 3
Second	A written notice of the violation shall be issued to the water customer.	Stage 1 - 3
Third	A written notice of the violation shall be issued to the water customer, and a charge of fifteen dollars ($15.00) shall be added to the next water bill as a one-time charge. The customer shall pay the full amount of such charge within thirty (30) days of the date of the water bill.	Stage 1 - 3
Fourth	A written notice of the violation shall be issued to the water customer, and a water meter shall be installed by the City. All costs of the water meter shall be billed to the water customer, and the customer shall pay the full amount thereof within thirty (30) days of the date of billing.	Stage 1 - 3
Fifth	A written notice of the violation shall be issued to the water customer, and a charge of fifty dollars ($50.00) shall be added to the next water bill as a one-time charge. The customer shall pay the full amount of such charge within thirty (30) days of the date of the water bill.	Stage 1 - 3
Metered Customers		
First - Third, Fifth	The notices and charges for metered water service are the same as flat rate water service with regards to the first, second, third, and fifth violations as identified above.	Stage 1 - 3
Fourth	A written notice of the violation shall be issued to the water customer, and a charge of twenty-five dollars ($25.00) shall be added to the next water bill as a one time charge. The customer shall pay the full amount of such charge within thirty (30) days of the date of the water bill.	Stage 1 - 3
Flat Rate and Metered Customers		
Sixth	A written notice of the violation shall be issued to the water customer, and a water flow restricter shall be installed by the City. All costs of the water flow restricter shall be billed to the customer, and the customer shall pay the full amount of such cost within thirty (30) days of the date of billing. The flow restricter shall remain installed until the customer has provided the City's public works department with evidence that the customer has modified its water use so that it will not again violate the ordinance or the provisions of the policy.	Stage 1 - 3

Note:
(1) "Guidebook Table X" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR.

A customer that has been assessed a penalty for violating or exceeding the water use allocation will have the right to a review of the penalty by the City Manager. A customer notified that a flow restrictor will be installed for exceeding the water use allocation will have the right to a review by the City Manager.

These reviews will be held if the customer files a written request for review with the City within 15 days after receipt of notification. The review will be held within a reasonable time after receipt of the request thereof.

5.2.6 Revenue and Expenditure Impacts/Measures to Overcome Impacts

The majority of operating costs for most water agencies are fixed rather than a function of the amount of water sold. As a result, when significant conservation programs are undertaken, it is frequently necessary to raise water rates because the revenue generated is based on lower total consumption while the revenue required is basically fixed. Typically, water rates need to be increased by the percentages listed in Table 5.6 when the indicated stages are implemented. However, reductions in water demands, especially peak demands, can delay the need to develop costly new water sources in growing communities.

Table 5.6 Guide for Rate Adjustment
2005 Urban Water Management Plan
City of Hanford

Stage	Rate Adjustment
1	• 25 percent increase over pre-shortage rates
2	• 50 percent increase over pre-shortage rates
3	• 100 percent increase over pre-shortage rates
End of Water Shortage Emergency	• 15 percent increase over pre-shortage rates. This rate increase is implemented based on historical information from communities that experienced water shortage and found that consumption rate (gpcd) does not return to pre-shortage levels. In anticipation of reduced sales, the City rates should be set for one year at 115 percent of the pre-shortage rates. This rate increase should be re-evaluated every two years.

The City does not currently have an Emergency Fund but maintains substantial reserve funds in its Water Capital fund after consideration of operations and capital expenditures. The City will seriously be considering using these reserve funds to establish an emergency fund to mitigate the impacts of a water shortage. The emergency fund will then be used to stabilize water rates during periods of water shortage or disasters affecting the water supplies. Excess water revenues collected as a result of shortage rate adjustments will be used to enhance the Emergency Fund.

5.2.7 Water Shortage Contingency Ordinance/Resolution

The City adopted its water shortage contingency plan on January 20, 2004. A copy of the adopting resolution is included in Appendix I.

5.2.8 Reduction Measuring Mechanism

The City's water system is supplied by the groundwater wells. Each well includes a flow monitoring devise that records the amount of water entering the City's distribution system. The City will use these devices to monitor the citywide actual reductions in water use.

5.3 WATER QUALITY

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

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 water management strategies and supply reliability.*

In 2006, the United States Environmental Protection Agency (EPA) published the Ground Water Rule (GWR), which contains measures to establish multiple barriers to further protect against bacteria and viruses in drinking water from the groundwater sources. The GWR specifies when corrective action is required to further protect consumers serviced by groundwater systems from bacteria and viruses. The City does not currently disinfect its supply water. In California, groundwater has long been considered free of sanitary contamination.

The City is faced with two water quality conditions that are the result of the natural deposition that formed the valley fill, arsenic and hydrogen sulfide accompanied by color. Each successive layer of material deposited on the valley floor carried with it a portion of the minerals that are present in the surrounding mountains and these became a part of the geology of the Valley. Many of these minerals contribute to the quality of the soils and to the quality of the groundwater. Most of the minerals are in concentrations that do not affect the suitability of the water for domestic use. Arsenic however, is concentrated in the clay strata in the Hanford area in sufficient quantity that the use of the water for domestic consumption can be compromised.

Arsenic has been a constituent of ongoing concern for the City. In fact, the City has one of the most extensively studied water systems in the country when it comes to arsenic. Historically, some City wells were abandoned under EPA's old maximum contaminant level (MCL) of 0.05 milligrams per liter (mg/L). Deeper wells were constructed in the early 1980's to obtain water with arsenic concentrations below the old EPA standard of 0.05 mg/L. To

meet EPA's current arsenic standard (0.010 mg/L), the City has implemented several arsenic reduction projects (see Section 5.3.1).

Hydrogen sulfide, which causes a "rotten egg" type of taste and odor is present in some of the City's wells and is accompanied by color. Taste, odor, and color are secondary drinking water quality standards and affect customer acceptance of the water supply, but do not pose any health risks or affect the City's water supply reliability.

A copy of the City's 2009 Consumer Confidence Report is included in Appendix J.

5.3.1 Arsenic Improvement Projects

In order to protect the public health, Congress passed the Safe Drinking Water Act (SDWA) in 1975. In accordance with the SDWA, EPA established a MCL for arsenic of 0.050 mg/L. Amendments to the SDWA by Congress in 1996 required EPA to promulgate a new national drinking water regulation for arsenic. EPA, through its discretionary authority under the 1996 amendments, established the current MCL for arsenic of 0.010 mg/L, which became effective on January 23, 2006.

The City has prepared several studies to determine the best methods for reducing the levels of arsenic in the water supply. These include:

- 1989 Water Quality Study (Carollo)
- 1996 Water System Master Plan (Boyle)
- 2005 Arsenic Reduction Study (Carollo)
- 2005 Water Supply and Distribution Capacity Analysis for the Arsenic Reduction Study (Carollo)

The City considered several different options for reducing arsenic concentrations below the EPA MCL. The alternatives considered were: (1) abandon high arsenic wells and drill replacement wells with lower concentrations, (2) blend water from wells with higher concentrations with wells of lower concentrations, (3) install well head treatment, (4) rehabilitate wells that produced water with high arsenic concentrations to block of strata with high concentrations so that low arsenic water would be produced.

Ultimately, the City implemented an arsenic reduction plan based on a non-treatment approach, which was found to be the most cost effective approach for the City. The plan was comprised of three improvement projects:

- Six shallow wells with low production capacities and high concentrations of arsenic were abandoned. These wells were replaced with two new wells with higher production capacities and acceptable arsenic concentrations.

- Three wells that were not amenable to rehabilitation were abandoned and replaced with new wells that had higher production capacities and acceptable arsenic concentrations.
- Three deep wells were rehabilitated so they would only draw from a zone of groundwater with lower arsenic concentrations.

Following completion of these projects, the City's water supply was capable of producing water below the federal MCL for arsenic. The overall number of wells in the City was reduced from 19 to 14, however, the City's overall production capacity was increased slightly from 24,455 gallons per minute (gpm) in 2005 to 24,650 gpm.

5.3.2 Water Quality Impacts Summary

As summarized in the previous sections, arsenic has been an on-going concern for Hanford for some time. Through the implementation of the arsenic reduction projects, however, the City's wells are now able to produce water below the federal MCL. Furthermore, the City has not identified any specific water quality issues that will affect the City's ability to reliably provide high quality water to its residents. For this reason, the potential supply impacts listed in Table 5.7 are listed as "0."

Table 5.7 Water Quality - Current and Projected Water Supply Impacts (Guidebook Table 30)
2010 Urban Water Management Plan
City of Hanford

Water Source	Description of Condition	Potential Supply Impacts (AFY)					
		2010	2015	2020	2025	2030	2035
Supplier-Produced Groundwater	Supply reductions from arsenic or other constituents	0	0	0	0	0	0

Note:
(1) "Guidebook Table X" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR.

5.4 DROUGHT PLANNING

The UWMPA requires that an UWMP include water supply and demand projections for normal, single-dry year, and multiple-dry years.

Law

> *10631 (c) (1). 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: (A) an average water year, (B) a single dry water year, (C) multiple dry water years.*
>
> *10632 (b). (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.*
>
> *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.*

This section considers the City's water supply reliability during three climate-related 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.

The City's water supply consists solely of groundwater.

5.4.1 Basis of Water Year Data

Historical rainfall data available for Visalia from the California Department of Water Resources' (DWR) California Data Exchange Center (CDEC)[1] were examined to establish a basis of water year for normal, single dry, and multiple dry years. As shown in Table 5.8, for the purposes of this report, the year 2000 is classified as a "normal" year, the year 1984 is classified as a "single dry" year, and the years 1987 to 1990 are classified as "multiple dry" years.

[1] Source: http://cdec.water.ca.gov/. Data was examined for the Visalia (VSL) Station (period of record: 1905 - 2010).

Table 5.8 Basis of Water Year Data (Guidebook Table 27) 2005 Urban Water Management Plan City of Hanford	
Water Year Type	**Base Year(s)**
Average Water Year	2000
Single Dry Water Year	1984
Multiple Dry Water Years	1987-1990

Notes:

(1) "Guidebook Table X" 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: Historic rainfall records for Visalia station from California Data Exchange Center (CDEC) website.

5.4.2 Supply Reliability - Historic and Current Conditions

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. However, this increase can be offset, at least in part, by increased conservation measures. 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 1984 through 2010 is shown in Figure 5.1.

As shown in Figure 5.1, the per-capita demand has trended downward. Overall, there was a sharp decrease in per capita water use in the City in the 1980s to mid 1990s, followed by a more gradual decrease since that time. To account for this downward trend, two linear fit trend lines (for the periods of 1984 to 1995 and 1995 to 2010, respectively) were developed.

Table 5.9 presents calculations showing the percentage of supply available for the hydrologic years shown in Table 5.8. The percentages provided in Table 5.9 were developed by comparing the actual per capita demand to the per capita demand trend. Because the City relies solely on groundwater to meet its customers' demands, the available "supply" drawn from the groundwater aquifer in any year is essentially equal to the system-wide water demand for that year. As such, the variation in per capita water use from the historic trend does not necessarily coincide with "dry" or "wet" years. Factors such as conservation efforts and economic conditions also play a role in the per capita demand. For this reason, the supply percentages in Table 5.9 should not be interpreted to be a "surplus" or "deficit" in supply for those years. The percentages are simply the deviation from the historical per capita trend lines.

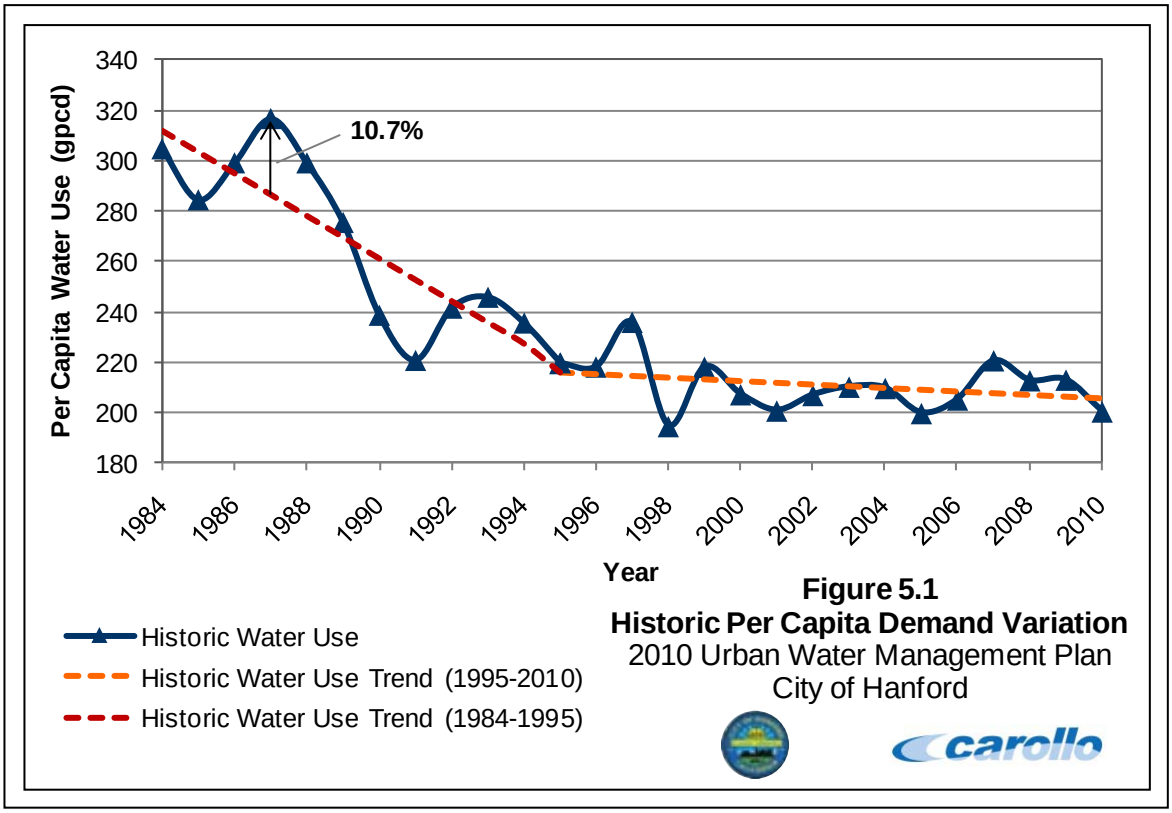

Figure 5.1
Historic Per Capita Demand Variation
2010 Urban Water Management Plan
City of Hanford

Table 5.9 Supply Reliability - Historical Conditions (Guidebook Table 28)
2005 Urban Water Management Plan
City of Hanford

Supply Source	Average/ Normal Year (2000)	Single Dry Year (1984)	Multiple Dry Years			
			1987	1988	1989	1990
Tulare Lake Groundwater Subbasin	9,649	8,074	8,964	8,673	8,470	8,252
% of Normal	**97%**	**98%**	**111%**	**108%**	**102%**	**91%**

Note:
(1) "Guidebook Table X" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR.

As shown, the per capita consumption in 1987 was about 11 percent above the linear trend. This year corresponds to the first year of the multiple dry year period, and is considered indicative of the potential variation in water demands on an annual basis. For conservative planning purposes, it is appropriate to increase water demands by this percentage for the single dry and multiple dry hydrologic years. Based on these conservative planning assumptions, the City's current supply reliability is summarized in Table 5.10. The "Normal Year" water use for Table 5.10 was calculated by multiplying the City's 2010 population (54,200) by the City's baseline per capita water use of 212 gpcd. This equates to an annual

Table 5.10 Supply Reliability - Current Water Source (Guidebook Table 31) 2005 Urban Water Management Plan City of Hanford					
	Water Use (AFY)				
			Multiple Dry Years		
Supply Source	Average/ Normal Year(2)	Single Dry Year	Year 1	Year 2	Year 3
Tulare Lake Groundwater Subbasin	12,877	14,250	14,250	14,250	14,250
% of Normal	**100%**	**111%**	**111%**	**111%**	**111%**

Notes:

(1) "Guidebook Table X" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR.

(2) Normal Year based on 2010 population (54,200) and 10-year baseline use of 212 gpcd.

volume of 12,877 AFY for a "normal" condition. Note that the City's actual 2010 water use was somewhat less than this value (12,170 AFY). Single and multiple dry year water uses are an increase of 11 percent over the normal current water use of 12,877 AFY, or 14,250 AFY.

5.4.3 Projected Normal Year Supply/Demand

The normal year water demands through 2035 are estimated based on the per capita water use targets summarized in Chapter 3 and populations presented in Chapter 2. The projected normal water year water supply and demand projections are provided in Table 5.11. As shown in Table 5.11, the projected supplies and demands are equal, because the City's supply source is groundwater.

Table 5.11 Supply and Demand Comparison - Normal Year (Guidebook Table 32) 2005 Urban Water Management Plan City of Hanford					
	Projected Supply/Demand (AFY)				
Supply/Demand Condition	2015	2020	2025	2030	2035
Supply Totals (from Guidebook Table 16)	13,886	14,563	16,690	19,131	21,934
Demand totals (From Guidebook Table 11)	13,886	14,563	16,690	19,131	21,934
% of Normal Demand	100%	100%	100%	100%	100%
Supply and Demand Difference	0	0	0	0	0
Difference as % of Supply	0%	0%	0%	0%	0%
Difference as % of Demand	0%	0%	0%	0%	0%

Note:

(1) "Guidebook Table X" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR.

5.4.4 Projected Single Dry Year Supply/Demand

The projected single dry year water demands through 2035 are estimated based on the normal year demands, the anticipated demand and supply increase (11 percent). The projected single dry water year supplies and demands are presented in Table 5.12. As shown in Table 5.12, the projected supplies and demands are equal, because the City's supply source is groundwater.

Table 5.12 Supply and Demand Comparison - Single Dry Year (Guidebook Table 33)
2005 Urban Water Management Plan
City of Hanford

Supply/Demand Condition	Projected Supply/Demand (AFY)				
	2015	2020	2025	2030	2035
Supply Totals (from Guidebook Table 16)	15,366	16,115	18,469	21,170	24,272
Demand totals (From Guidebook Table 11)	15,366	16,115	18,469	21,170	24,272
% of Normal Demand	111%	111%	111%	111%	111%
Supply and Demand Difference	0	0	0	0	0
Difference as % of Supply	0%	0%	0%	0%	0%
Difference as % of Demand	0%	0%	0%	0%	0%

Note:
(1) "Guidebook Table X" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR.

5.4.5 Projected Multiple Dry Year Supply/Demand

The projected multiple dry year water demands through 2035 are estimated based on the normal year demands and the anticipated demand and supply increase (11 percent). The projected multiple dry water year supplies and demands are presented in Table 5.13. As shown in Table 5.13, the projected supplies and demands are equal, because the City's supply source is groundwater.

Table 5.13 Supply and Demand Comparison - Multiple Dry Year Events (Guidebook Table 34)
2005 Urban Water Management Plan
City of Hanford

Year		Supply/Demand Condition	Projected Supply/Demand (AFY)				
			2015	2020	2025	2030	2035
Multiple-Dry Year	1st Year Supply	Supply Totals	15,366	16,115	18,469	21,170	24,272
		Demand totals	15,366	16,115	18,469	21,170	24,272
		% of Normal Demand	111%	111%	111%	111%	111%
		Supply and Demand Difference	0	0	0	0	0
		Difference as % of Supply	0%	0%	0%	0%	0%
		Difference as % of Demand	0%	0%	0%	0%	0%
	2nd Year Supply	Supply Totals	15,366	16,115	18,469	21,170	24,272
		Demand totals	15,366	16,115	18,469	21,170	24,272
		% of Normal Demand	111%	111%	111%	111%	111%
		Supply and Demand Difference	0	0	0	0	0
		Difference as % of Supply	0%	0%	0%	0%	0%
		Difference as % of Demand	0%	0%	0%	0%	0%
	3rd Year Supply	Supply Totals	15,366	16,115	18,469	21,170	24,272
		Demand totals	15,366	16,115	18,469	21,170	24,272
		% of Normal Demand	111%	111%	111%	111%	111%
		Supply and Demand Difference	0	0	0	0	0
		Difference as % of Supply	0%	0%	0%	0%	0%
		Difference as % of Demand	0%	0%	0%	0%	0%

Note:

(1)"Guidebook Table X" refers to a specific table in the "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan" by DWR.