2015 UWMP Guidebook
Appendices

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Appendix A

California Water Code
Urban Water Management Planning

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Chapter 1. General Declaration and Policy

SECTION 10610-10610.4

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

SECTION 10611-10617

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

SECTION 10620-10621

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, except as provided in subdivision (d).

(b) Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days before the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The 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).

(d) Each urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016.

Article 2. Contents of Plan

SECTION 10630-10634

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 that 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 basins that a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. For 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) (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.

(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 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.

(J) Distribution system water loss.

(2) The water use projections shall be in the same five-year increments described in subdivision (a).

(3) (A) For the 2015 urban water management plan update, the distribution system water loss shall be quantified for the most recent 12-month period available. For all subsequent updates, the distribution system water loss shall be quantified for each of the five years preceding the plan update.

(B) The distribution system water loss quantification shall be reported in accordance with a worksheet approved or developed by the department through a public process. The water loss quantification worksheet shall be based on the water system balance methodology developed by the American Water Works Association.

(4) (A) If available and applicable to an urban water supplier, water use projections may display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area.

(B) To the extent that an urban water supplier reports the information described in subparagraph (A), an urban water supplier shall do both of the following:

(i) Provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections.

(ii) Indicate the extent that the water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. Water use projections that do not account for these water savings shall be noted of that fact.

(f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) (A) For an urban retail water supplier, as defined in Section 10608.12, a narrative description that addresses the nature and extent of each water demand management measure implemented over the past five years. The narrative shall describe the water demand management measures that the supplier plans to implement to achieve its water use targets pursuant to Section 10608.20.

(B) The narrative pursuant to this paragraph shall include descriptions of the following water demand management measures:

(i) Water waste prevention ordinances.

(ii) Metering.

(iii) Conservation pricing.

(iv) Public education and outreach.

(v) Programs to assess and manage distribution system real loss.

(vi) Water conservation program coordination and staffing support.

(vii) Other demand management measures that have a significant impact on water use as measured in gallons per capita per day, including innovative measures, if implemented.

(2) For an urban wholesale water supplier, as defined in Section 10608.12, a narrative description of the items in clauses (ii), (iv), (vi), and (vii) of subparagraph (B) of paragraph (1), and a narrative description of its distribution system asset management and wholesale supplier assistance programs.

(g) Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water

use, as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in 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.

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

(i) For purposes of this part, urban water suppliers that are members of the California Urban Water Conservation Council shall be deemed in compliance with the requirements of subdivision (f) by complying with all the provisions of the "Memorandum of Understanding Regarding Urban Water Conservation in California," dated December 10, 2008, as it may be amended, and by submitting the annual reports required by Section 6.2 of that memorandum.

(j) An urban water supplier that relies upon a wholesale agency for a source of water shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier's plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (c). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (c).

10631.1. (a) The water use projections required by Section 10631 shall include projected water use for single-family and multifamily residential housing needed for lower income households, as defined in Section 50079.5 of the Health and Safety Code, as identified in the housing element of any city, county, or city and county in the service area of the supplier.

(b) It is the intent of the Legislature that the identification of projected water use for single-family and multifamily residential housing for lower income households will assist a supplier in complying with the requirement under Section 65589.7 of the Government Code to grant a priority for the provision of service to housing units affordable to lower income households.

10631.2. (a) In addition to the requirements of Section 10631, an urban water management plan may, but is not required to, include any of the following information:

(1) An estimate of the amount of energy used to extract or divert water supplies.

(2) An estimate of the amount of energy used to convey water supplies to the water treatment plants or distribution systems.

(3) An estimate of the amount of energy used to treat water supplies.

(4) An estimate of the amount of energy used to distribute water supplies through its distribution systems.

(5) An estimate of the amount of energy used for treated water supplies in comparison to the amount used for nontreated water supplies.

(6) An estimate of the amount of energy used to place water into or withdraw from storage.

(7) Any other energy-related information the urban water supplier deems appropriate.

(b) The department shall include in its guidance for the preparation of urban water management plans a methodology for the voluntary calculation or estimation of the energy intensity of urban water systems. The department may consider studies and calculations conducted by the Public Utilities Commission in developing the methodology.

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.

10631.7. The department, in consultation with the California Urban Water Conservation Council, shall convene an independent technical panel to provide information and recommendations to the department and the Legislature on new demand management measures, technologies, and approaches. The panel shall consist of no more than seven members, who shall be selected by the department to reflect a balanced representation of experts. The panel shall have at least one, but no more than two, representatives from each of the following: retail water suppliers, environmental organizations, the business community, wholesale water suppliers, and academia. The panel shall be convened by January 1, 2009, and shall report to the Legislature no later than January 1, 2010, and every five years thereafter. The department shall review the panel report and include in the final report to the Legislature the department's recommendations and comments regarding the panel process and the panel's recommendations.

10632. (a) The plan shall provide an urban water shortage contingency analysis that includes each of the following elements that are within the authority of the urban water supplier:

(1) 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 that are applicable to each stage.

(2) 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.

(3) 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.

(4) 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.

(5) 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.

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

(7) An analysis of the impacts of each of the actions and conditions described in paragraphs (1) to (6), 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.

(8) A draft water shortage contingency resolution or ordinance.

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

(b) Commencing with the urban water management plan update due July 1, 2016, for purposes of developing the water shortage contingency analysis pursuant to subdivision (a), the urban water supplier shall analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas, as defined in subdivision (a) of Section 115921 of the Health and Safety Code.

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, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.

(e) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.

(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

SECTION 10635

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.

Article 3. Adoption and Implementation of Plans

SECTION 10640-10645

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

(2) The plan, or amendments to the plan, submitted to the department pursuant to paragraph (1) shall be submitted electronically and shall include any standardized forms, tables, or displays specified by the department.

(b) (1) Notwithstanding Section 10231.5 of the Government Code, 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 exemplary elements of the individual plans. The department shall provide a copy of the report to each urban water supplier that has submitted its plan to 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.

(2) A report to be submitted pursuant to paragraph (1) shall be submitted in compliance with Section 9795 of the Government Code.

(c) (1) For the purpose of identifying the exemplary elements of the individual plans, the department shall identify in the report water demand management measures adopted and implemented by specific urban water suppliers, and identified pursuant to Section 10631, that achieve water savings significantly above the levels established by the department to meet the requirements of Section 10631.5.

(2) The department shall distribute to the panel convened pursuant to Section 10631.7 the results achieved by the implementation of those water demand management measures described in paragraph (1).

(3) The department shall make available to the public the standard the department will use to identify exemplary water demand management measures.

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

SECTION 10650-10656

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.

Appendix B

California Water Code
Sustainable Water Use and Demand Reduction

California Water Code Division 6, Part 2.55.

Chapter 1. General Declarations and Policy §10608-10608.8
Chapter 2. Definitions §10608.12
Chapter 3. Urban Retail Water Suppliers §10608.16-10608.44
Chapter 4. Agricultural Water Suppliers §10608.48
Chapter 5. Sustainable Water Management §10608.50
Chapter 6 Standardized Data Collection §10608.52
Chapter 7 Funding Provisions §10608.56-10608.60
Chapter 8 Quantifying Agricultural Water Use Efficiency §10608.64

Chapter 1. General Declarations and Policy

SECTION 10608-10608.8

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

SECTION 10608.12

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

SECTION 10608.16-10608.44

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 paragraph (1) 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 due in 2010 pursuant to Part 2.6 (commencing with Section 10610) 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) (1) An urban retail water supplier is 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 the 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.

(2) An urban wholesale water supplier whose urban water management plan prepared pursuant to Part 2.6 (commencing with Section 10610) was due and not submitted in 2010 is granted an extension to July 1, 2011, to permit coordination between an urban wholesale water supplier and urban retail water suppliers.

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 conservation of that military installation under federal Executive Order 13514.

(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.(a) The department shall review the 2015 urban water management plans and report to the Legislature by July 1, 2017, 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 to achieve the 20-percent reduction and to reflect updated efficiency information and technology changes.

(b) A report to be submitted pursuant to subdivision (a) shall be submitted in compliance with Section 9795 of the Government Code.

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 at facilities it operates to support urban retail water suppliers in meeting the target identified in Section 10608.16.

Chapter 4 Agricultural Water Suppliers

SECTION 10608.48

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

Section 10608.50

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

SECTION 10608.52

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

Section 10608.56-10608.60

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

SECTION 10608.64

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.

Appendix C

Changes to the California Water Code since 2010 UWMPs

Changes to the Water Code Since 2010

Italicized text indicates new language

~~Strike-out text indicates language that has been removed~~

Regular font indicates existing text

Change Number	Topic	CWC Section	Legislative Bill	Summary	Guidebook Section
1	Demand Management Measures	10631 (f)(1) and (2)	AB 2067, 2014	Requires water suppliers to provide narratives describing their water demand management measures, as provided. Requires retail water suppliers to address the nature and extent of each water demand management measure implemented over the past 5 years and describe the water demand management measures that the supplier plans to implement to achieve its water use targets.	Chapter 9
2	Submittal Date	10621 (d)	AB 2067, 2014	Requires each urban water supplier to submit its 2015 plan to the Department of Water Resources by July 1, 2016.	Chapter 10
3	Electronic Submittal	10644 (a) (2)	SB 1420, 2014	Requires the plan, or amendments to the plan, to be submitted electronically to the department.	Chapter 10
4	Standardized Forms	10644 (a) (2)	SB 1420, 2014	Requires the plan, or amendments to the plan, to include any standardized forms, tables, or displays specified by the department.	CH 1, Section 1.4
5	Water Loss	10631 (e) (1) (J) and (e) (3) (A) and (B)	SB 1420, 2014	Requires a plan to quantify and report on distribution system water loss.	Appendix L
6	Estimating Future Water Savings	10631 (e) (4)	SB 1420, 2014	Provides for water use projections to display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans, when that information is available and applicable to an urban water supplier.	Appendix K
7	Voluntary Reporting of Energy Intensity	10631.2 (a) and (b)	SB 1036, 2014	Provides for an urban water supplier to include certain energy-related information, including, but not limited to, an estimate of the amount of energy used to extract or divert water supplies.	Appendix O
8	Defining Water Features	10632	AB 2409, 2010	Requires urban water suppliers to analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas.	CH 8, Section 8.2.4

1. Demand Management Measures (AB 2067, 2014)

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 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.~~

(1) (A) For an urban retail water supplier, as defined in Section 10608.12, a narrative description that addresses the nature and extent of each water demand management measure implemented over the past five years. The narrative shall describe the water demand management measures that the

supplier plans to implement to achieve its water use targets pursuant to Section 10608.20.

(B) The narrative pursuant to this paragraph shall include descriptions of the following water demand management measures:

(i) Water waste prevention ordinances.
(ii) Metering.
(iii) Conservation pricing.
(iv) Public education and outreach.
(v) Programs to assess and manage distribution system real loss.
(vi) Water conservation program coordination and staffing support.

(vii) Other demand management measures that have a significant impact on water use as measured in gallons per capita per day, including innovative measures, if implemented.

(2) For an urban wholesale water supplier, as defined in Section 10608.12, a narrative description of the items in clauses (ii), (iv), (vi), and (vii) of subparagraph (B) of paragraph (1), and a narrative description of its distribution system asset management and wholesale supplier assistance programs.

~~(h)~~

(g) 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~~ *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),~~ *programs* 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)~~

(h) 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)~~

(i) For purposes of this part, urban water suppliers that are members of the California Urban Water Conservation Council shall be deemed in compliance with the requirements of ~~subdivisions~~ *subdivision* (f) ~~and (g)~~ by complying with all the provisions of the "Memorandum of Understanding Regarding Urban Water Conservation in California," dated December 10, 2008, as it may be amended, and by submitting the
annual reports required by Section 6.2 of that memorandum.

~~(k) Urban~~

2. Submittal Date (AB 2067, 2014)

10621. (a) Each urban water supplier shall update its plan at least once every five years on or before December 31, in years ending in five and zero *, except as provided in subdivision (d).*

(d) Each urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016.

3. Electronic Submittal (SB 1420, 2014)

10644. (a)*(2) The plan, or amendments to the plan, submitted to the department pursuant to paragraph (1) shall be submitted electronically…*

4. Standardized Forms (SB 1420, 2014)

10644. (a*)(2) The plan, or amendments to the plan, submitted to the department pursuant to paragraph (1) … shall include any standardized forms, tables, or displays specified by the department.*

5. Water Loss (SB 1420, 2014)

(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.
(J) Distribution system water loss.

(2) The water use projections shall be in the same five-year increments described in subdivision (a).

(3) (A) For the 2015 urban water management plan update, the distribution system water loss shall be quantified for the most recent 12-month period available. For all subsequent updates, the distribution system water loss shall be quantified for each of the five years preceding the plan update.

(B) The distribution system water loss quantification shall be reported in accordance with a worksheet approved or developed by the department through a public process. The water loss quantification worksheet shall be based on the water system balance methodology developed by the American Water Works Association.

6. Voluntary Reporting of Passive Savings (SB 1420, 2014)

10631 (4) (A) If available and applicable to an urban water supplier, water use projections may display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area.

(B) To the extent that an urban water supplier reports the information described in subparagraph (A), an urban water supplier shall do both of the following:

(i) Provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections.

(ii) Indicate the extent that the water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. Water use projections that do not account for these water savings shall be noted of that fact.

7. Voluntary Reporting of Energy Intensity (SB 1036, 2014)

10631.2. (a) In addition to the requirements of Section 10631, an urban water management plan may, but is not required to, include any of the following information:

(1) An estimate of the amount of energy used to extract or divert water supplies.

(2) An estimate of the amount of energy used to convey water supplies to the water treatment plants or distribution systems.

(3) An estimate of the amount of energy used to treat water supplies.

(4) An estimate of the amount of energy used to distribute water supplies through its distribution systems.

(5) An estimate of the amount of energy used for treated water supplies in comparison to the amount used for nontreated water supplies.

(6) An estimate of the amount of energy used to place water into or withdraw from storage.

(7) Any other energy-related information the urban water supplier deems appropriate.

(b) The department shall include in its guidance for the preparation of urban water management plans a methodology for the voluntary calculation or estimation of the energy intensity of urban water systems. The department may consider studies and calculations conducted by the Public Utilities Commission in developing the methodology.

8. Defining Water Features (AB 2409, 2010)

10632 (b) Commencing with the urban water management plan update due December 31, 2015, for purposes of developing the water shortage contingency analysis pursuant to subdivision (a), the urban water supplier shall analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas, as defined in subdivision (a) of Section 115921 of the Health and Safety Code.

Appendix D

Regional Water Planning and Reporting

Regional UWMP or Regional Alliance

Water suppliers coordinate with many regional entities when engaging in resource planning and even in day to day operations. This appendix addresses the specific opportunities for regional planning that relate to the 2015 Urban Water Management Plans.

In support of regional collaboration, both the UWMP Act (Section 10620(d) (1)) and the Water Conservation Bill of 2009 (Section 10608.20(a) (1) and 10608.20) provide mechanisms for supporting development of regional UWMPs and regional water conservation targets.

Suppliers may choose either or both of the two options below for regional reporting in the 2015 UWMP cycle:

- **Regional Urban Water Management Plan (RUWMP**). An RUWMP addresses all requirements of the CWC and may or may not address SB X7-7 requirements as a region.
- **Regional Alliance.** A Regional Alliance only addresses the requirements of SB X7-7, and does so as a region.

These options are described below.

RUWMP

CWC 10620
(d) (1) An urban water supplier may satisfy the requirements of this part by participation in areawide, regional, watershed, or basin wide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation and efficient water use.

The California Water Code allows water agencies a great deal of flexibility in determining which other agencies they will partner with and how much of the RUWMP will be a compilation of individual information versus common elements.

In 2010, several RUWMPs were prepared and submitted to DWR and these were prepared in a variety of ways. Examples are listed below. All of these examples address the requirements of the Water Code.

Examples of Regional UWMP Membership

- Regional wholesalers only
- Wholesaler with some or all of their associated retailer(s)
- Multiple retail agencies in the same area that are managed by one investor owned utility

- Members of an IRWMP
- Agencies sharing a water source

Examples of Individual Information and Common Elements

- RUWMP prepared in addition to individual UWMPs for each water supplier.
- RUWMP prepared in place of individual UWMPs.
- RUWMP provided water use data and target calculations for each individual agency, but addressed some elements regionally, such as climate, groundwater basin descriptions, water shortage contingency plans, and/or conservation activities.
- RUWMP did not address the requirements for a Regional Alliance. Regional baselines and targets were not included in the RUWMP.
- RUWMP addressed the requirements for a Regional Alliance by including regional baselines and targets (see more on Regional Alliance below).

Adoption of RUWMPs

Preparation of an RUWMP requires that each participating water supplier adopt the plan. If a single document is prepared and adopted by each water supplier, then documentation from each water supplier adopting the plan must be included in the final RUWMP. If a regional plan is prepared and an individual agency also prepares its own submit separate UWMP, its governing board must adopt both the individual and regional plans.

RUWMPS and Compliance with SBX7-7

Within an RUWMP, each water supplier will supply all of their individual information for compliance with the Water Conservation Bill of 2009 (SB 7-7). If the agencies that are collaborating on the RUWMP also wish to develop a regional baseline and target, in addition to the individual baselines and targets, this is accomplished by forming a Regional Alliance. See the section below for details on a Regional Alliance.

RUWMPs and Standardized Tables

RUWMPs will submit data for multiple agencies, requiring the duplicates of many standardized tables. This will be easily accomplished when using the (pending) online submittal tool, which will provide step by step guidance. However, if the supplier is compiling their data using the Excel spreadsheets in Appendix E, the supplier will need to copy the needed tables and notate each of the copies with the name of the agency to which the table pertains.

Regional Alliance

CWC 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…

A Regional Alliance addresses only the requirements of the Water Code that pertain to the baseline and target calculations for SB X7-7, The Water Conservation Act of 2009. (Appendix B) **All other requirements in the Water Code must be addressed in an individual or a Regional UWMP.**

DWR has prepared detailed guidance for agencies that choose to participate in a Regional Alliance. See Methodology 9: Regional Compliance in Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use, *(DWR 2011).*

Agencies that will be reporting as a Regional Alliance must refer to the Methodologies document in order to correctly calculate their regional baselines and targets. Key aspects of Methodology 9: Regional Compliance are summarized in the remainder of this Guidebook section.

Compliance Assessment for Water Suppliers Belonging to a Regional Alliance

- If a regional alliance meets it regional target, all suppliers in the alliance will be deemed compliant.
- If a regional alliance fails to meet its regional target, water suppliers in the alliance that meet their individual targets will be deemed compliant.
- Water suppliers in alliances that meet neither their individual targets nor their regional targets will be deemed noncompliant.

Eligibility for Regional Alliance Participation

To be eligible to form a regional alliance, water suppliers must meet at least one of the following criteria:

- Water suppliers are recipients of water from a common wholesale water supplier. For this purpose, the State Water Project and the Central Valley Project are not considered wholesale water suppliers. Wholesale water suppliers are not required to establish and meet targets for daily per capita water use. Wholesale water suppliers serving in the role of a regional alliance are representing the urban retail water suppliers that are members of

the alliance, and compliance with a regional target is on behalf of the member suppliers and not the wholesale water supplier itself.

- Water suppliers are partners with a common regional agency authorized to plan and implement water conservation.
- Water suppliers are part of a regional water management group as defined in CWC §10537.
- Water suppliers are part of an IRWM funding area, which for this purpose means an IRWM planning area formally accepted by DWR through its IRWM Region Acceptance Process.
- Water suppliers are located within the same hydrologic region, which for this purpose refers to the 10 hydrologic regions as shown in the California Water Plan. For situations where water suppliers may serve areas within more than one hydrologic region, the majority of each water supplier's Service Area Population must be located within the hydrologic region being identified as a regional alliance.
- Water suppliers have appropriate geographic scales for which methodologies developed by DWR can be applied. For this provision, water suppliers' service area boundaries must be contiguous.

Tiered Regional Alliances

In general, urban retail water suppliers can belong to only one regional alliance for the purpose of establishing and complying with urban water use targets. An exception is when regional alliances are tiered so that the members of the smallest alliance are all members of the larger alliance or alliances.

Calculation of Regional Targets and Compliance GPCD

Water suppliers in a regional alliance have three options for calculating their regional targets:

1. Each supplier calculates their individual target and the regional target is a weighted compilation of the individual targets.
2. Sum up the individual supplier's gross water use and service area population to develop regional gross water use and population. The alliance would then calculate a regional baseline GPCD and choose one target method to calculate a regional target.
3. Calculate regional gross water use or population directly for the entire regional alliance. Regional baseline GPCD and regional targets would then be derived.

REQUIREMENT

In order for DWR to evaluate the adequacy of Regional Alliance targets and compliance, the data and calculations that were used to determine the Regional Alliance's baseline, target, and compliance GPCD must be submitted to DWR.

Reporting

Regional Alliance information will be reporting to DWR through three documents:

1. Individual UWMPs. If an agency within a regional alliance chooses to submit an individual UWMP rather than (or in addition to) a Regional UWMP, the individual UWMP must identify the regional alliance that the agency belongs to and the agency's individual baseline and target calculations.

2. Regional UWMPs. Members of a regional alliance can forgo submitting individual UWMPs and instead submit a Regional UWMP. The Regional UWMP will include baseline and target information for each individual agency as well as the aggregated baseline and target information for the Regional Alliance.

3. Regional Alliance Reports. A Regional Alliance must send DWR a letter stating that an Alliance has been formed and provide a list of the water supplier members.
   Regional Alliances that do not submit a Regional UWMP are required to submit a report to DWR that shall include all the water use target data elements for each individual agency in the Alliance and shall also include the alliance-level aggregates.

Withdrawing or Separating from a Regional Alliance

If a water supplier withdraws from or is a member of a regional alliance that is later dissolved, the water supplier must inform DWR and comply individually with interim and urban water use targets. The water suppliers remaining in the regional alliance may either submit revised regional baseline or target data, or dissolve the alliance.

Appendix E

UWMP Standardized Data Tables and SB X7-7 Verification Form

UWMP Standardized Data Tables	Pages E-2 through E-23
SB X7-7 Verification Form	Pages E-24 through E-38

UWMP Standardized Data Tables

Tables in this appendix are not active spreadsheets. Excel versions of all tables are posted on the DWR 2015 UWMP Webpage
http://www.water.ca.gov/urbanwatermanagement/uwmp2015.cfm

Table 2-1 Retail Only: Public Water Systems			
Public Water System Number	Public Water System Name	Number of Municipal Connections 2015	Volume of Water Supplied 2015
	TOTAL	0	0
NOTES:			

Table 2-2: Plan Identification (Select One)		
☐	Individual UWMP	
☐	Regional UWMP (RUWMP) *(checking this triggers the next line to appear)*	
	Select One:	
	☐	RUWMP includes a Regional Alliance
	☐	RUWMP does not include a Regional Alliance
	NOTES:	

Table 2-3: Agency Identification	
Type of Agency (select one or both)	
☐	Agency is a wholesaler
☐	Agency is a retailer
Fiscal or Calendar Year (select one)	
☐	UWMP Tables Are in Calendar Years
☐	UWMP Tables Are in Fiscal Years
If Using Fiscal Years Provide Month and Day that the Fiscal Year Begins (dd/mm)	
dd/mm	
Units of Measure Used in UWMP (select from Drop down)	
Unit	
NOTES:	

Table 2-4 Retail: Water Supplier Information Exchange
The retail supplier has informed the following wholesale supplier(s) of projected water use in accordance with CWC 10631.
Wholesale Water Supplier Name *(Add additional rows as needed)*
NOTES:

Table 2-4 Wholesale: Water Supplier Information Exchange (select one)	
☐	Supplier has informed more than 10 other water suppliers of water supplies available in accordance with CWC 10631. Completion of the table below is optional. If not completed include a list of the water suppliers that were informed.
	Provide page number for location of the list.
☐	Supplier has informed 10 or fewer other water suppliers of water supplies available in accordance with CWC 10631. **Complete the table below.**
Water Supplier Name *(Add additional rows as needed)*	
NOTES:	

Table 3-1 Retail: Population - Current and Projected						
Population Served	2015	2020	2025	2030	2035	2040*(opt)*
NOTES:						

Table 3-1 Wholesale: Population - Current and Projected						
Population Served	2015	2020	2025	2030	2035	2040*(opt)*
NOTES:						

Table 4-1 Retail: Demands for Potable and Raw Water - Actual			
Use Type *(Add additional rows as needed)*	2015 Actual		
Use Drop down list *May select each use multiple times* *These are the only Use Types that will be recognized by the WUEdata online submittal tool*	Additional Description *(as needed)*	Level of Treatment When Delivered *Drop down list*	Volume
		TOTAL	0
NOTES:			

Table 4-1 Wholesale: Demands for Potable and Raw Water - Actual			
Use Type *(Add additional rows as needed)*	2015 Actual		
Use Drop down list *May select each use multiple times* *These are the only use types that will be recognized by the WUE data online submittal tool*	Additional Description *(as needed)*	Level of Treatment When Delivered *Drop down list*	Volume
		TOTAL	0
NOTES:			

Table 4-2 Retail: Demands for Potable and Raw Water - Projected						
Use Type *(Add additional rows as needed)*	Additional Description *(as needed)*	Projected Water Use *Report To the Extent that Records are Available*				
Use Drop down list *May select each use multiple times These are the only Use Types that will be recognized by the WUEdata online submittal tool*		2020	2025	2030	2035	2040-opt
	TOTAL	0	0	0	0	0
NOTES:						

Table 4-2 Wholesale: Demands for Potable and Raw Water - Projected						
Use Type *(Add additional rows as needed)*	Additional Description *(as needed)*	Projected Water Use *Report To the Extent that Records are Available*				
Drop down list *May select each use multiple times These are the only Use Types that will be recognized by the WUEdata online submittal tool.*		2020	2025	2030	2035	2040 *(opt)*
	TOTAL	0	0	0	0	0
NOTES:						

Table 4-3 Retail: Total Water Demands						
	2015	2020	2025	2030	2035	2040 *(opt)*
Potable and Raw Water *From Tables 4-1 and 4-2*	0	0	0	0	0	0
Recycled Water Demand *From Table 6-4*	0	0	0	0	0	0
TOTAL WATER DEMAND	0	0	0	0	0	0
NOTES:						

Table 4-3 Wholesale: Total Water Demands						
	2015	2020	2025	2030	2035	2040*(opt)*
Potable and Raw Water *From Tables 4-1 and 4-2*	0	0	0	0	0	0
Recycled Water Demand *From Table 6-4*	0	0	0	0	0	0
TOTAL WATER DEMAND	0	0	0	0	0	0
NOTES:						

Table 4-4 Retail: 12 Month Water Loss Audit Reporting	
Reporting Period Start Date (mm/yyyy)	Volume of Water Loss
NOTES:	

Table 4-4 Wholesale: 12 Month Water Loss Audit Reporting	
Reporting Period Start Date (mm/yyyy)	Volume of Water Loss
NOTES:	

Table 4-5 Retail Only: Inclusion in Water Use Projections	
Are Future Water Savings Included in Projections? (Refer to Appendix K of UWMP Guidebook) *Drop down list (y/n)*	
If "Yes" to above, state the section or page number, in the cell to the right, where citations of the codes, ordinances, etc… utilized in demand projections are found.	
Are Lower Income Residential Demands Included In Projections? *Drop down list (y/n)*	
NOTES:	

Table 5-1 Baselines and Targets Summary *Retail Agency or Regional Alliance Only*					
Baseline Period	Start Year	End Year	Average Baseline GPCD*	2015 Interim Target *	Confirmed 2020 Target*
10-15 year	*From SB X7-7 Table 1*	*From SB X7-7 Table 1*	*From SB X7-7 Table 5*	*From SB X7-7 Table 8*	*SB X7-7 Table 7-F*
5 Year	*From SB X7-7 Table 1*	*From SB X7-7 Table 1*	*From SB X7-7 Table 5*		
*All values are in Gallons per Capita per Day (GPCD)					
NOTES:					

Table 5-2: 2015 Compliance *Retail Agency or Regional Alliance Only**								
Actual 2015 GPCD	2015 Interim Target GPCD	**Optional Adjustments to 2015 GPCD** Enter "0" for adjustments not used *From Methodology 8*					2015 GPCD *(Adjusted if applicable)*	Did Supplier Achieve Targeted Reduction for 2015? Y/N
		Extraordinary Events	Economic Adjustment	Weather Normalization	TOTAL Adjustments	Adjusted 2015 GPCD		
					0	0	0	No
**All values are in Gallons per Capita per Day (GPCD)*								
NOTES:								

Table 6-1 Retail: Groundwater Volume Pumped						
☐	Supplier does not pump groundwater. The supplier will not complete the table below.					
Groundwater Type ***Drop Down List*** *May use each category multiple times*	Location or Basin Name	2011	2012	2013	2014	2015
Add additional rows as needed						
	TOTAL	0	0	0	0	0
NOTES:						

Table 6-1 Wholesale: Groundwater Volume Pumped						
☐	Supplier does not pump groundwater. The supplier will not complete the table below.					
Groundwater Type *Drop Down List* *May use each category multiple times*	Location or Basin Name	2011	2012	2013	2014	2015
	TOTAL	0	0	0	0	0
NOTES:						

Table 6-2 Retail: Wastewater Collected Within Service Area in 2015						
☐	There is no wastewater collection system. The supplier will not complete the table below.					
	Percentage of 2015 service area covered by wastewater collection system *(optional)*					
	Percentage of 2015 service area population covered by wastewater collection system *(optional)*					
Wastewater Collection			**Recipient of Collected Wastewater**			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated? *Drop Down List*	Volume of Wastewater Collected in 2015	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area? *Drop Down List*	Is WWTP Operation Contracted to a Third Party? *(optional)* *Drop Down List*
Add additional rows as needed						
Total Wastewater Collected from Service Area in 2015:		0				
NOTES:						

Table 6-3 Retail: Wastewater Treatment and Discharge Within Service Area in 2015										
☐	No wastewater is treated or disposed of within the UWMP service area. The supplier will not complete the table below.									
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number *(optional)*	Method of Disposal *Drop down list*	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level *Drop down list*	2015 volumes			
							Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area
Add additional rows as needed										
						Total	0	0	0	0
NOTES:										

Table 6-3 Wholesale: Wastewater Treatment and Discharge Within Service Area in 2015										
☐	Wholesale supplier does not provide supplemental treatment to recycled water it distributes. The supplier will not complete the table below.									
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number *(optional)*	Method of Disposal *Drop down list*	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level *Drop down list*	2015 volumes			
							Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area
Add additional rows as needed										
						Total	0	0	0	0
NOTES:										

Table 6-4 Retail: Current and Projected Recycled Water Direct Beneficial Uses Within Service Area									
☐	Recycled water is not used and is not planned for use within the service area of the supplier. The supplier will not complete the table below.								
Name of Agency Producing (Treating) the Recycled Water:									
Name of Agency Operating the Recycled Water Distribution System:									
Supplemental Water Added in 2015									
Source of 2015 Supplemental Water									
Beneficial Use Type *These are the only Use Types that will be recognized by the DWR online submittal tool*		General Description of 2015 Uses	Level of Treatment *Drop down list*	2015	2020	2025	2030	2035	2040 (opt)
Agricultural irrigation									
Landscape irrigation (excludes golf courses)									
Golf course irrigation									
Commercial use									
Industrial use									
Geothermal and other energy production									
Seawater intrusion barrier									
Recreational impoundment									
Wetlands or wildlife habitat									
Groundwater recharge (IPR)									
Surface water augmentation (IPR)									
Direct potable reuse									
Other	Type of Use								
			Total:	0	0	0	0	0	0
IPR - Indirect Potable Reuse									
NOTES:									

Table 6-4 Wholesale: Current and Projected Retailers Provided Recycled Water Within Service Area							
☐	Recycled water is not directly treated or distributed by the supplier. The supplier will not complete the table below.						
Name of Receiving Supplier or Direct Use by Wholesaler	Level of Treatment *Drop down list*	2015	2020	2025	2030	2035	2040 *(opt)*
Add additional rows as needed							
	Total	0	0	0	0	0	0
NOTES:							

Table 6-5 Retail: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual			
☐	Recycled water was not used in 2010 nor projected for use in 2015. The supplier will not complete the table below.		
Use Type *These are the only Use Types that will be recognized by the WUEdata online submittal tool*		2010 Projection for 2015	2015 actual use
Agricultural irrigation			
Landscape irrigation (excludes golf courses)			
Golf course irrigation			
Commercial use			
Industrial use			
Geothermal and other energy production			
Seawater intrusion barrier			
Recreational impoundment			
Wetlands or wildlife habitat			
Groundwater recharge (IPR)			
Surface water augmentation (IPR)			
Direct potable reuse			
Other	Required for this use		
Total		0	0
NOTES:			

Table 6-5 Wholesale: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual		
☐	Recycled water was not used or distributed by the supplier in 2010, nor projected for use or distribution in 2015. The wholesale supplier will not complete the table below.	
Name of Receiving Supplier or Direct Use by Wholesaler	2010 Projection for 2015	2015 actual use
Add additional rows as needed		
Total	0	0
NOTES:		

Table 6-6 Retail: Methods to Expand Future Recycled Water Use			
☐	Supplier does not plan to expand recycled water use in the future. Supplier will not complete the table below but will provide narrative explanation.		
	Provide page location of narrative in UWMP		
Name of Action	Description	Planned Implementation Year	Expected Increase in Recycled Water Use
Add additional rows as needed			
		Total	0
NOTES:			

Table 6-7 Retail: Expected Future Water Supply Projects or Programs						
☐	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.					
☐	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format.					
	Provide page location of narrative in the UWMP					
Name of Future Projects or Programs	Joint Project with other agencies?		Description (if needed)	Planned Implementation Year	Planned for Use in Year Type *Drop Down List User may select more than one.*	Expected Increase in Water Supply to Agency *This may be a range*
	Drop Down List (y/n)	*If Yes, Agency Name*				
Add additional rows as needed						
NOTES:						

Table 6-7 Wholesale: Expected Future Water Supply Projects or Programs						
☐	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.					
☐	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format.					
	Provide page location of narrative in the UWMP					
Name of Future Projects or Programs	Joint Project with other agencies?		Description *(if needed)*	Planned Implementation Year	Planned for Use in Year Type *Drop Down list User may select more than one.*	Expected Increase in Water Supply to Agency
	Drop Down Menu	*If Yes, Agency Name*				
Add additional rows as needed						
NOTES:						

Table 6-8 Retail: Water Supplies — Actual				
Water Supply	Additional Detail on Water Supply	2015		
Drop down list *May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool*		Actual Volume	Water Quality *Drop Down List*	Total Right or Safe Yield *(optional)*
Add additional rows as needed				
	Total	0		0
NOTES:				

Table 6-8 Wholesale: Water Supplies — Actual				
Water Supply	Additional Detail on Water Supply	**2015**		
Drop down list *May use each category multiple times.These are the only water supply categories that will be recognized by the WUEdata online submittal tool*		Actual Volume	Water Quality *Drop Down List*	Total Right or Safe Yield *(optional)*
Add additional rows as needed				
	Total	0		0
NOTES:				

Table 6-9 Retail: Water Supplies — Projected											
Water Supply	Additional Detail on Water Supply	Projected Water Supply *Report To the Extent Practicable*									
Drop down list *May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool*		**2020**		**2025**		**2030**		**2035**		**2040** *(opt)*	
		Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*
Add additional rows as needed											
	Total	0	0	0	0	0	0	0	0	0	0
NOTES:											

Table 6-9 Wholesale: Water Supplies — Projected											
Water Supply	Additional Detail on Water Supply	Projected Water Supply *Report To the Extent Practicable*									
Drop down list *May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool*		**2020**		**2025**		**2030**		**2035**		**2040** *(opt)*	
		Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*
Add additional rows as needed											
	Total	0	0	0	0	0	0	0	0	0	0
NOTES:											

Table 7-1 Retail: Basis of Water Year Data			
Year Type	Base Year	Available Supplies if Year Type Repeats	
		Agency may provide volume only, percent only, or both	
		Volume Available	% of Average Supply
Average Year			100%
Single-Dry Year			
Multiple-Dry Years 1st Year			
Multiple-Dry Years 2nd Year			
Multiple-Dry Years 3rd Year			
Multiple-Dry Years 4th Year *Optional*			
Multiple-Dry Years 5th Year *Optional*			
Multiple-Dry Years 6th Year *Optional*			
Agency may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If an agency uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.			
NOTES:			

Table 7-1 Wholesale: Basis of Water Year Data			
Year Type	Base Year	Available Supplies if Year Type Repeats	
		Agency may provide volume only, percent only, or both	
		Volume Available	% of Average Supply
Average Year			100%
Single-Dry Year			
Multiple-Dry Years 1st Year			
Multiple-Dry Years 2nd Year			
Multiple-Dry Years 3rd Year			
Multiple-Dry Years 4th Year *Optional*			
Multiple-Dry Years 5th Year *Optional*			
Multiple-Dry Years 6th Year *Optional*			
Agency may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If an agency uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.			
NOTES:			

Table 7-2 Retail: Normal Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040 *(Opt)*
Supply totals *(autofill from Table 6-9)*	0	0	0	0	0
Demand totals *(autofill from Table 4-3)*	0	0	0	0	0
Difference	0	0	0	0	0
NOTES:					

Table 7-2 Wholesale: Normal Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040 *(Opt)*
Supply totals *(autofill from Table 6-9)*	0	0	0	0	0
Demand totals *(autofill fm Table 4-3)*	0	0	0	0	0
Difference	0	0	0	0	0
NOTES:					

Table 7-3 Retail: Single Dry Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040 (Opt)
Supply totals					
Demand totals					
Difference	0	0	0	0	0
NOTES:					

Table 7-3 Wholesale: Single Dry Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040 (Opt)
Supply totals					
Demand totals					
Difference	0	0	0	0	0
NOTES:					

Table 7-4 Retail: Multiple Dry Years Supply and Demand Comparison						
		2020	2025	2030	2035	2040 (Opt)
First year	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Second year	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Third year	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Fourth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Fifth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Sixth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
NOTES:						

Table 7-4 Wholesale: Multiple Dry Years Supply and Demand Comparison						
		2020	2025	2030	2035	2040 (Opt)
First year	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Second year	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Third year	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Fourth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Fifth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Sixth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
NOTES:						

Table 8-1 Retail Stages of Water Shortage Contingency Plan		
Stage	Complete Both	
	Percent Supply Reduction[1] *Numerical value as a percent*	Water Supply Condition (*Narrative description)*
Add additional rows as needed		
[1] *One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.*		
NOTES:		

Table 8-1 Wholesale Stages of Water Storage Contingency Plan		
Stage	Complete Both	
	Percent Supply Reduction[1] *Numerical value as a percentage*	Water Supply Condition (*Narrative description)*
Add additional rows as needed		
[1] *One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.*		
NOTES:		

Table 8-2 Retail Only: Restrictions and Prohibitions on End Uses			
Stage	Restrictions and Prohibitions on End Users ***Drop down list*** *These are the only categories that will be accepted by the WUEdata online submittal tool*	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement? *Drop Down List*
Add additional rows as needed			
NOTES:			

Table 8-3 Retail Only: Stages of Water Shortage Contingency Plan - Consumption Reduction Methods		
Stage	Consumption Reduction Methods by Water Supplier ***Drop down list*** *These are the only categories that will be accepted by the WUEdata online submittal tool*	Additional Explanation or Reference *(optional)*
Add additional rows as needed		
NOTES:		

Table 8-4 Retail: Minimum Supply Next Three Years			
	2016	2017	2018
Available Water Supply			
NOTES:			

Table 8-4 Wholesale: Minimum Supply Next Three Years			
	2016	2017	2018
Available Water Supply			
NOTES:			

Table 10-1 Retail: Notification to Cities and Counties		
City Name	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
	☐	☐
	☐	☐
	☐	☐
County Name *Drop Down List*	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
	☐	☐
	☐	☐
	☐	☐
NOTES:		

Table 10-1 Wholesale: Notification to Cities and Counties (select one)		
☐	Supplier has notified more than 10 cities or counties in accordance with CWC 10621 (b) and 10642. **Completion of the table below is not required. Provide a separate list of the cities and counties that were notified.**	
	Provide the page or location of this list in the UWMP.	
☐	Supplier has notified 10 or fewer cities or counties. **Complete the table below.**	
City Name	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
	☐	☐
	☐	☐
	☐	☐
County Name *Drop Down List*	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
	☐	☐
	☐	☐
	☐	☐
NOTES:		

SB X7-7 Verification Form

Tables in this appendix are not active spreadsheets. Excel versions of all tables are posted on the DWR 2015 UWMP Webpage
http://www.water.ca.gov/urbanwatermanagement/uwmp2015.cfm

SB X7-7 Table 0: Units of Measure Used in UWMP* *(select one from the drop down list)*
**The unit of measure must be consistent with Table 2-3*
NOTES:

SB X7-7 Table-1: Baseline Period Ranges			
Baseline	**Parameter**	**Value**	**Units**
10- to 15-year baseline period	2008 total water deliveries		0
	2008 total volume of delivered recycled water		0
	2008 recycled water as a percent of total deliveries		Percent
	Number of years in baseline period[1]		Years
	Year beginning baseline period range		
	Year ending baseline period range[2]		
5-year baseline period	Number of years in baseline period		Years
	Year beginning baseline period range		
	Year ending baseline period range[3]		
[1] If the 2008 recycled water percent is less than 10 percent, then the first baseline period is a continuous 10-year period. If the amount of recycled water delivered in 2008 is 10 percent or greater, the first baseline period is a continuous 10- to 15-year period.			
[2] The ending year must be between December 31, 2004 and December 31, 2010.			
[3] The ending year must be between December 31, 2007 and December 31, 2010.			
NOTES:			

SB X7-7 Table 2: Method for Population Estimates	
Method Used to Determine Population (may check more than one)	
☐	**1. Department of Finance** (DOF) DOF Table E-8 (1990 - 2000) and (2000-2010) and DOF Table E-5 (2011 - 2015) when available
☐	**2. Persons-per-Connection Method**
☐	**3. DWR Population Tool**
☐	**4. Other** DWR recommends pre-review
NOTES:	

SB X7-7 Table 3: Service Area Population		
Year		**Population**
10 to 15 Year Baseline Population		
Year 1	0	
Year 2		
Year 3		
Year 4		
Year 5		
Year 6		
Year 7		
Year 8		
Year 9		
Year 10		
Year 11		
Year 12		
Year 13		
Year 14		
Year 15		
5 Year Baseline Population		
Year 1	0	
Year 2		
Year 3		
Year 4		
Year 5		
2015 Compliance Year Population		
2015		
NOTES:		

SB X7-7 Table 4: Annual Gross Water Use *								
	Baseline Year *Fm SB X7-7 Table 3*	**Volume Into Distribution System** *Fm SB X7-7 Table(s) 4-A*	**Deductions**					**Annual Gross Water Use**
			Exported Water	Change in Dist. System Storage (+/-)	Indirect Recycled Water *Fm SB X7-7 Table 4-B*	Water Delivered for Agricultural Use	Process Water *Fm SB X7-7 Table(s) 4-D*	
10 to 15 Year Baseline - Gross Water Use								
Year 1	0	0			0		0	0
Year 2	0	0			0		0	0
Year 3	0	0			0		0	0
Year 4	0	0			0		0	0
Year 5	0	0			0		0	0
Year 6	0	0			0		0	0
Year 7	0	0			0		0	0
Year 8	0	0			0		0	0
Year 9	0	0			0		0	0
Year 10	0	0			0		0	0
Year 11	0	0			0		0	0
Year 12	0	0			0		0	0
Year 13	0	0			0		0	0
Year 14	0	0			0		0	0
Year 15	0	0			0		0	0
10 - 15 year baseline average gross water use								**0**
5 Year Baseline - Gross Water Use								
Year 1	0	0			0		0	0
Year 2	0	0			0		0	0
Year 3	0	0			0		0	0
Year 4	0	0			0		0	0
Year 5	0	0			0		0	0
5 year baseline average gross water use								**0**
2015 Compliance Year - Gross Water Use								
2015		0			0		0	0
* NOTE that the units of measure must remain consistent throughout the UWMP, as reported in Table 2-3								
NOTES:								

SB X7-7 Table 4-A: Volume Entering the Distribution System(s) Complete one table for each source.				
Name of Source	**Source 1**			
This water source is:				
☐	The supplier's own water source			
☐	A purchased or imported source			
Baseline Year *Fm SB X7-7 Table 3*		Volume Entering Distribution System	Meter Error Adjustment ** Optional (+/-)*	Corrected Volume Entering Distribution System
10 to 15 Year Baseline - Water into Distribution System				
Year 1	0			0
Year 2	0			0
Year 3	0			0
Year 4	0			0
Year 5	0			0
Year 6	0			0
Year 7	0			0
Year 8	0			0
Year 9	0			0
Year 10	0			0
Year 11	0			0
Year 12	0			0
Year 13	0			0
Year 14	0			0
Year 15	0			0
5 Year Baseline - Water into Distribution System				
Year 1	0			0
Year 2	0			0
Year 3	0			0
Year 4	0			0
Year 5	0			0
2015 Compliance Year - Water into Distribution System				
2015				0
** Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document*				
NOTES:				

SB X7-7 Table 4-B: Indirect Recycled Water Use Deduction *(For use only by agencies that are deducting indirect recycled water)*										
		Surface Reservoir Augmentation					Groundwater Recharge			
Baseline Year *Fm SB X7-7 Table 3*		Volume Discharged from Reservoir for Distribution System Delivery	Percent Recycled Water	Recycled Water Delivered to Treatment Plant	Transmission/ Treatment Loss	Recycled Volume Entering Distribution System from Surface Reservoir Augmentation	Recycled Water Pumped by Utility*	Transmission/ Treatment Losses	Recycled Volume Entering Distribution System from Groundwater Recharge	**Total Deductible Volume of Indirect Recycled Water Entering the Distribution System**
10-15 Year Baseline - Indirect Recycled Water Use										
Year 1	0			0		0			0	0
Year 2	0			0		0			0	0
Year 3	0			0		0			0	0
Year 4	0			0		0			0	0
Year 5	0			0		0			0	0
Year 6	0			0		0			0	0
Year 7	0			0		0			0	0
Year 8	0			0		0			0	0
Year 9	0			0		0			0	0
Year 10	0			0		0			0	0
Year 11	0			0		0			0	0
Year 12	0			0		0			0	0
Year 13	0			0		0			0	0
Year 14	0			0		0			0	0
Year 15	0			0		0			0	0
5 Year Baseline - Indirect Recycled Water Use										
Year 1	0			0		0			0	0
Year 2	0			0		0			0	0
Year 3	0			0		0			0	0
Year 4	0			0		0			0	0
Year 5	0			0		0			0	0
2015 Compliance - Indirect Recycled Water Use										
2015				0		0			0	0
**Suppliers will provide supplemental sheets to document the calculation for their input into "Recycled Water Pumped by Utility". The volume reported in this cell must be less than total groundwater pumped - See Methodology 1, Step 8, section 2.c.*										
NOTES:										

SB X7-7 Table 4-C: Process Water Deduction Eligibility *(For use only by agencies that are deducting process water) Choose Only One*	
☐	**Criteria 1**- Industrial water use is equal to or greater than 12% of gross water use. Complete SB X7-7 Table 4-C.1
☐	**Criteria 2** - Industrial water use is equal to or greater than 15 GPCD. Complete SB X7-7 Table 4-C.2
☐	**Criteria 3** - Non-industrial use is equal to or less than 120 GPCD. Complete SB X7-7 Table 4-C.3
☐	**Criteria 4** - Disadvantaged Community. Complete SB x7-7 Table 4-C.4
NOTES:	

SB X7-7 Table 4-C.1: Process Water Deduction Eligibility					
Criteria 1 Industrial water use is equal to or greater than 12% of gross water use					
Baseline Year *Fm SB X7-7 Table 3*		Gross Water Use Without Process Water Deduction	Industrial Water Use	Percent Industrial Water	**Eligible for Exclusion Y/N**
10 to 15 Year Baseline - Process Water Deduction Eligibility					
Year 1	0	0			NO
Year 2	0	0			NO
Year 3	0	0			NO
Year 4	0	0			NO
Year 5	0	0			NO
Year 6	0	0			NO
Year 7	0	0			NO
Year 8	0	0			NO
Year 9	0	0			NO
Year 10	0	0			NO
Year 11	0	0			NO
Year 12	0	0			NO
Year 13	0	0			NO
Year 14	0	0			NO
Year 15	0	0			NO
5 Year Baseline - Process Water Deduction Eligibility					
Year 1	0	0			NO
Year 2	0	0			NO
Year 3	0	0			NO
Year 4	0	0			NO
Year 5	0	0			NO
2015 Compliance Year - Process Water Deduction Eligiblity					
2015		0			NO
NOTES:					

SB X7-7 Table 4-C.2: Process Water Deduction Eligibility					
Criteria 2 Industrial water use is equal to or greater than 15 GPCD					
Baseline Year *Fm SB X7-7 Table 3*		Industrial Water Use	Population	Industrial GPCD	**Eligible for Exclusion Y/N**
10 to 15 Year Baseline - Process Water Deduction Eligibility					
Year 1	0		0		NO
Year 2	0		0		NO
Year 3	0		0		NO
Year 4	0		0		NO
Year 5	0		0		NO
Year 6	0		0		NO
Year 7	0		0		NO
Year 8	0		0		NO
Year 9	0		0		NO
Year 10	0		0		NO
Year 11	0		0		NO
Year 12	0		0		NO
Year 13	0		0		NO
Year 14	0		0		NO
Year 15	0		0		NO
5 Year Baseline - Process Water Deduction Eligibility					
Year 1	0		0		NO
Year 2	0		0		NO
Year 3	0		0		NO
Year 4	0		0		NO
Year 5	0		0		NO
2015 Compliance Year - Process Water Deduction Eligibility					
2015			0		NO
NOTES:					

SB X7-7 Table 4-C.3: Process Water Deduction Eligibility							
Criteria 3 Non-industrial use is equal to or less than 120 GPCD							
Baseline Year *Fm SB X7-7 Table 3*		Gross Water Use Without Process Water Deduction *Fm SB X7-7 Table 4*	Industrial Water Use	Non-industrial Water Use	Population *Fm SB X7-7 Table 3*	Non-Industrial GPCD	**Eligible for Exclusion Y/N**
10 to 15 Year Baseline - Process Water Deduction Eligibility							
Year 1	0	0		0	0		NO
Year 2	0	0		0	0		NO
Year 3	0	0		0	0		NO
Year 4	0	0		0	0		NO
Year 5	0	0		0	0		NO
Year 6	0	0		0	0		NO
Year 7	0	0		0	0		NO
Year 8	0	0		0	0		NO
Year 9	0	0		0	0		NO
Year 10	0	0		0	0		NO
Year 11	0	0		0	0		NO
Year 12	0	0		0	0		NO
Year 13	0	0		0	0		NO
Year 14	0	0		0	0		NO
Year 15	0	0		0	0		NO
5 Year Baseline - Process Water Deduction Eligibility							
Year 1	0	0		0	0		NO
Year 2	0	0		0	0		NO
Year 3	0	0		0	0		NO
Year 4	0	0		0	0		NO
Year 5	0	0		0	0		NO
2015 Compliance Year - Process Water Deduction Eligiblity							
2015		0		0	0		NO
NOTES:							

SB X7-7 Table 4-C.4: Process Water Deduction Eligibility				
Criteria 4 Disadvantaged Community *Use IRWM DAC Mapping tool* http://www.water.ca.gov/irwm/grants/resources_dac.cfm				
California Median Household Income		Service Area Median Household Income	Percentage of Statewide Average	**Eligible for Exclusion? Y/N**
2015 Compliance Year - Process Water Deduction Eligibility				
2010	$53,046		0%	YES
A "Disadvantaged Community" is a community with a median household income less than 80 percent of the statewide average.				
NOTES:				

SB X7-7 Table 4-D: Process Water Deduction - Volume						
Complete a separate table for each industrial customer with a process water exclusion						
Name of Industrial Customer		*Industrial Customer 1*				
Baseline Year *Fm SB X7-7 Table 3*		Industrial Customer's Total Water Use	Total Volume Supplied by Water Agency	% of Water Supplied by Water Agency	Customer's Total Process Water Use	Volume of Process Water Eligible for Exclusion for this Customer
10 to 15 Year Baseline - Process Water Deduction						
Year 1	0					0
Year 2	0					0
Year 3	0					0
Year 4	0					0
Year 5	0					0
Year 6	0					0
Year 7	0					0
Year 8	0					0
Year 9	0					0
Year 10	0					0
Year 11	0					0
Year 12	0					0
Year 13	0					0
Year 14	0					0
Year 15	0					0
5 Year Baseline - Process Water Deduction						
Year 1	0					0
Year 2	0					0
Year 3	0					0
Year 4	0					0
Year 5	0					0
2015 Compliance Year - Process Water Deduction						
2015						0
NOTES:						

SB X7-7 Table 5: Gallons Per Capita Per Day (GPCD)				
Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Annual Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use (GPCD)
10 to 15 Year Baseline GPCD				
Year 1	0	0	0	
Year 2	0	0	0	
Year 3	0	0	0	
Year 4	0	0	0	
Year 5	0	0	0	
Year 6	0	0	0	
Year 7	0	0	0	
Year 8	0	0	0	
Year 9	0	0	0	
Year 10	0	0	0	
Year 11	0	0	0	
Year 12	0	0	0	
Year 13	0	0	0	
Year 14	0	0	0	
Year 15	0	0	0	
10-15 Year Average Baseline GPCD				
5 Year Baseline GPCD				
Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use
Year 1	0	0	0	
Year 2	0	0	0	
Year 3	0	0	0	
Year 4	0	0	0	
Year 5	0	0	0	
5 Year Average Baseline GPCD				
2015 Compliance Year GPCD				
2015		0	0	
NOTES:				

SB X7-7 Table 6: Gallons per Capita per Day *Summary From Table SB X7-7 Table 5*	
10-15 Year Baseline GPCD	
5 Year Baseline GPCD	
2015 Compliance Year GPCD	
NOTES:	

SB X7-7 Table 7: 2020 Target Method *Select Only One*		
Target Method		Supporting Documentation
☐	Method 1	SB X7-7 Table 7A
☐	Method 2	SB X7-7 Tables 7B, 7C, and 7D *Contact DWR for these tables*
☐	Method 3	SB X7-7 Table 7-E
☐	Method 4	Method 4 Calculator
NOTES:		

SB X7-7 Table 7-A: Target Method 1 20% Reduction	
10-15 Year Baseline GPCD	2020 Target GPCD
	#VALUE!
NOTES:	

SB X7-7 Table 7-B: Target Method 2 Target Landscape Water Use
Tables for Target Method 2 (SB X7-7 Tables 7-B, 7-C, and 7-D) are not included in the SB X7-7 Verification Form, but are still required for water suppliers using Target Method 2. These water suppliers should contact Gwen Huff at (916) 651-9672 or gwen.huff@water.ca.gov

SB X7-7 Table 7-E: Target Method 3				
Agency May Select More Than One as Applicable	Percentage of Service Area in This Hydrological Region	Hydrologic Region	"2020 Plan" Regional Targets	Method 3 Regional Targets (95%)
☐		North Coast	137	130
☐		North Lahontan	173	164
☐		Sacramento River	176	167
☐		San Francisco Bay	131	124
☐		San Joaquin River	174	165
☐		Central Coast	123	117
☐		Tulare Lake	188	179
☐		South Lahontan	170	162
☐		South Coast	149	142
☐		Colorado River	211	200
Target *(If more than one region is selected, this value is calculated.)*				**0**
NOTES:				

SB X7-7 Table 7-F: Confirm Minimum Reduction for 2020 Target			
5 Year Baseline GPCD *From SB X7-7 Table 5*	Maximum 2020 Target*	Calculated 2020 Target *Fm Appropriate Target Table*	Confirmed 2020 Target
			0
** Maximum 2020 Target is 95% of the 5 Year Baseline GPCD*			
NOTES:			

SB X7-7 Table 8: 2015 Interim Target GPCD		
Confirmed 2020 Target *Fm SB X7-7 Table 7-F*	10-15 year Baseline GPCD *Fm SB X7-7 Table 5*	2015 Interim Target GPCD
0		0
NOTES:		

SB X7-7 Table 9: 2015 Compliance								
Actual 2015 GPCD	2015 Interim Target GPCD	Optional Adjustments *(in GPCD)*					2015 GPCD *(Adjusted if applicable)*	Did Supplier Achieve Targeted Reduction for 2015?
		Extraordinary Events	Weather Normalization	Economic Adjustment	TOTAL Adjustments	Adjusted 2015 GPCD		
	0	*From Methodology 8 (Optional)*	*From Methodology 8 (Optional)*	*From Methodology 8 (Optional)*	0	#VALUE!	#VALUE!	#VALUE!
NOTES:								

Appendix F

UWMP Checklist

This checklist is developed directly from the Urban Water Management Planning Act and SB X7-7. It is provided to support water suppliers during preparation of their UWMPs. Two versions of the UWMP Checklist are provided – the first one is organized according to the California Water Code and the second checklist according to subject matter. The two checklists contain duplicate information and the water supplier should use whichever checklist is more convenient. In the event that information or recommendations in these tables are inconsistent with, conflict with, or omit the requirements of the Act or applicable laws, the Act or other laws shall prevail.

Each water supplier submitting an UWMP can also provide DWR with the UWMP location of the required element by completing the last column of eitherchecklist. This will support DWR in its review of these UWMPs. The completed form can be included with the UWMP.

If an item does not pertain to a water supplier, then state the UWMP requirement and note that it does not apply to the agency. For example, if a water supplier does not use groundwater as a water supply source, then there should be a statement in the UWMP that groundwater is not a water supply source.

Checklist Arranged by Water Code Section

CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location *(Optional Column for Agency Use)*
10608.20(b)	Retail suppliers shall adopt a 2020 water use target using one of four methods.	Baselines and Targets	Section 5.7 and App E	
10608.20(e)	Retail suppliers shall provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.	Baselines and Targets	Chapter 5 and App E	
10608.22	Retail suppliers' per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use of the 5 year baseline. This does not apply is the suppliers base GPCD is at or below 100.	Baselines and Targets	Section 5.7.2	
10608.24(a)	Retail suppliers shall meet their interim target by December 31, 2015.	Baselines and Targets	Section 5.8 and App E	
1608.24(d)(2)	If the retail supplier adjusts its compliance GPCD using weather normalization, economic adjustment, or extraordinary events, it shall provide the basis for, and data supporting the adjustment.	Baselines and Targets	Section 5.8.2	
10608.26(a)	Retail suppliers shall conduct a public hearing to discuss adoption, implementation, and economic impact of water use targets.	Plan Adoption, Submittal, and Implementation	Section 10.3	
10608.36	Wholesale suppliers shall include an assessment of present and proposed future measures, programs, and policies to help their retail water suppliers achieve targeted water use reductions.	Baselines and Targets	Section 5.1	
10608.40	Retail suppliers shall report on their progress in meeting their water use targets. The data shall be reported using a standardized form.	Baselines and Targets	Section 5.8 and App E	
10620(b)	Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.	Plan Preparation	Section 2.1	
10620(d)(2)	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	Plan Preparation	Section 2.5.2	

10620(f)	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	Water Supply Reliability Assessment	Section 7.4	
10621(b)	Notify, at least 60 days prior to the public hearing, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.	Plan Adoption, Submittal, and Implementation	Section 10.2.1	
10621(d)	Each urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016.	Plan Adoption, Submittal, and Implementation	Sections 10.3.1 and 10.4	
10631(a)	Describe the water supplier service area.	System Description	Section 3.1	
10631(a)	Describe the climate of the service area of the supplier.	System Description	Section 3.3	
10631(a)	Indicate the current population of the service area.	System Description and Baselines and Targets	Sections 3.4 and 5.4	
10631(a)	Provide population projections for 2020, 2025, 2030, and 2035.	System Description	Section 3.4	
10631(a)	Describe other demographic factors affecting the supplier's water management planning.	System Description	Section 3.4	
10631(b)	Identify and quantify the existing and planned sources of water available for 2015, 2020, 2025, 2030, and 2035.	System Supplies	Chapter 6	
10631(b)	Indicate whether groundwater is an existing or planned source of water available to the supplier.	System Supplies	Section 6.2	
10631(b)(1)	Indicate whether a groundwater management plan has been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	System Supplies	Section 6.2.2	
10631(b)(2)	Describe the groundwater basin.	System Supplies	Section 6.2.1	
10631(b)(2)	Indicate if the basin has been adjudicated and include a copy of the court order or decree and a description of the amount of water the supplier has the legal right to pump.	System Supplies	Section 6.2.2	
10631(b)(2)	For unadjudicated basins, indicate whether or not the department has identified the basin as overdrafted, or projected to become overdrafted. Describe efforts by the supplier to eliminate the long-term overdraft condition.	System Supplies	Section 6.2.3	
10631(b)(3)	Provide a detailed description and analysis of the location, amount, and sufficiency of	System Supplies	Section 6.2.4	

	groundwater pumped by the urban water supplier for the past five years			
10631(b)(4)	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	System Supplies	Sections 6.2 and 6.9	
10631(c)(1)	Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage.	Water Supply Reliability Assessment	Section 7.1	
10631(c)(1)	Provide data for an average water year, a single dry water year, and multiple dry water years	Water Supply Reliability Assessment	Section 7.2	
10631(c)(2)	For any water source that may not be available at a consistent level of use, describe plans to supplement or replace that source.	Water Supply Reliability Assessment	Section 7.1	
10631(d)	Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.	System Supplies	Section 6.7	
10631(e)(1)	Quantify past, current, and projected water use, identifying the uses among water use sectors.	System Water Use	Section 4.2	
10631(e)(3)(A)	Report the distribution system water loss for the most recent 12-month period available.	System Water Use	Section 4.3	
10631(f)(1)	Retail suppliers shall provide a description of the nature and extent of each demand management measure implemented over the past five years. The description will address specific measures listed in code.	Demand Management Measures	Sections 9.2 and 9.3	
10631(f)(2)	Wholesale suppliers shall describe specific demand management measures listed in code, their distribution system asset management program, and supplier assistance program.	Demand Management Measures	Sections 9.1 and 9.3	
10631(g)	Describe the expected future water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and multiple-dry years.	System Supplies	Section 6.8	
10631(i)	Describe desalinated water project opportunities for long-term supply.	System Supplies	Section 6.6	
10631(j)	CUWCC members may submit their 2013-2014 CUWCC BMP annual reports in lieu of, or in addition to, describing the DMM implementation in their UWMPs. This option is only allowable if the supplier has been found to be in full compliance with the CUWCC MOU.	Demand Management Measures	Section 9.5	
10631(j)	Retail suppliers will include documentation that they have provided their wholesale supplier(s) – if any - with water use	System Supplies	Section 2.5.1	

	projections from that source.			
10631(j)	Wholesale suppliers will include documentation that they have provided their urban water suppliers with identification and quantification of the existing and planned sources of water available from the wholesale to the urban supplier during various water year types.	System Supplies	Section 2.5.1	
10631.1(a)	Include projected water use needed for lower income housing projected in the service area of the supplier.	System Water Use	Section 4.5	
10632(a) and 10632(a)(1)	Provide an urban water shortage contingency analysis that specifies stages of action and an outline of specific water supply conditions at each stage.	Water Shortage Contingency Planning	Section 8.1	
10632(a)(2)	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.	Water Shortage Contingency Planning	Section 8.9	
10632(a)(3)	Identify actions to be undertaken by the urban water supplier in case of a catastrophic interruption of water supplies.	Water Shortage Contingency Planning	Section 8.8	
10632(a)(4)	Identify mandatory prohibitions against specific water use practices during water shortages.	Water Shortage Contingency Planning	Section 8.2	
10632(a)(5)	Specify consumption reduction methods in the most restrictive stages.	Water Shortage Contingency Planning	Section 8.4	
10632(a)(6)	Indicated penalties or charges for excessive use, where applicable.	Water Shortage Contingency Planning	Section 8.3	
10632(a)(7)	Provide an analysis of the impacts of each of the actions and conditions in the water shortage contingency analysis on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts.	Water Shortage Contingency Planning	Section 8.6	
10632(a)(8)	Provide a draft water shortage contingency resolution or ordinance.	Water Shortage Contingency Planning	Section 8.7	
10632(a)(9)	Indicate a mechanism for determining actual reductions in water use pursuant to the water shortage contingency analysis.	Water Shortage Contingency Planning	Section 8.5	
10633	For wastewater and recycled water, coordinate with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.1	
10633(a)	Describe the wastewater collection and treatment systems in the supplier's service area. Include quantification of the amount of	System Supplies (Recycled Water)	Section 6.5.2	

	wastewater collected and treated and the methods of wastewater disposal.			
10633(b)	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	System Supplies (Recycled Water)	Section 6.5.2.2	
10633(c)	Describe the recycled water currently being used in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.3 and 6.5.4	
10633(d)	Describe and quantify the potential uses of recycled water and provide a determination of the technical and economic feasibility of those uses.	System Supplies (Recycled Water)	Section 6.5.4	
10633(e)	Describe the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	System Supplies (Recycled Water)	Section 6.5.4	
10633(f)	Describe the actions which may be taken to encourage the use of recycled water and the projected results of these actions in terms of acre-feet of recycled water used per year.	System Supplies (Recycled Water)	Section 6.5.5	
10633(g)	Provide a plan for optimizing the use of recycled water in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.5	
10634	Provide information on the quality of existing sources of water available to the supplier and the manner in which water quality affects water management strategies and supply reliability	Water Supply Reliability Assessment	Section 7.1	
10635(a)	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.	Water Supply Reliability Assessment	Section 7.3	
10635(b)	Provide supporting documentation that Water Shortage Contingency Plan has been, or will be, provided to any city or county within which it provides water, no later than 60 days after the submission of the plan to DWR.	Plan Adoption, Submittal, and Implementation	Section 10.4.4	
10642	Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan.	Plan Preparation	Section 2.5.2	
10642	Provide supporting documentation that the urban water supplier made the plan available for public inspection, published notice of the public hearing, and held a public hearing	Plan Adoption, Submittal, and Implementation	Sections 10.2.2, 10.3, and 10.5	

	about the plan.			
10642	The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water.	Plan Adoption, Submittal, and Implementation	Sections 10.2.1	
10642	Provide supporting documentation that the plan has been adopted as prepared or modified.	Plan Adoption, Submittal, and Implementation	Section 10.3.1	
10644(a)	Provide supporting documentation that the urban water supplier has submitted this UWMP to the California State Library.	Plan Adoption, Submittal, and Implementation	Section 10.4.3	
10644(a)(1)	Provide supporting documentation that the urban water supplier has submitted this UWMP to any city or county within which the supplier provides water no later than 30 days after adoption.	Plan Adoption, Submittal, and Implementation	Section 10.4.4	
10644(a)(2)	The plan, or amendments to the plan, submitted to the department shall be submitted electronically.	Plan Adoption, Submittal, and Implementation	Sections 10.4.1 and 10.4.2	
10645	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	Section 10.5	

Checklist Arranged by Subject

CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location *(Optional Column for Agency Use)*
10620(b)	Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.	Plan Preparation	Section 2.1	
10620(d)(2)	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	Plan Preparation	Section 2.5.2	
10642	Provide supporting documentation that the water supplier has encouraged active	Plan Preparation	Section 2.5.2	

	involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan.			
10631(a)	Describe the water supplier service area.	System Description	Section 3.1	
10631(a)	Describe the climate of the service area of the supplier.	System Description	Section 3.3	
10631(a)	Provide population projections for 2020, 2025, 2030, and 2035.	System Description	Section 3.4	
10631(a)	Describe other demographic factors affecting the supplier's water management planning.	System Description	Section 3.4	
10631(a)	Indicate the current population of the service area.	System Description and Baselines and Targets	Sections 3.4 and 5.4	
10631(e)(1)	Quantify past, current, and projected water use, identifying the uses among water use sectors.	System Water Use	Section 4.2	
10631(e)(3)(A)	Report the distribution system water loss for the most recent 12-month period available.	System Water Use	Section 4.3	
10631.1(a)	Include projected water use needed for lower income housing projected in the service area of the supplier.	System Water Use	Section 4.5	
10608.20(b)	Retail suppliers shall adopt a 2020 water use target using one of four methods.	Baselines and Targets	Section 5.7 and App E	
10608.20(e)	Retail suppliers shall provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.	Baselines and Targets	Chapter 5 and App E	
10608.22	Retail suppliers' per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use of the 5 year baseline. This does not apply is the suppliers base GPCD is at or below 100.	Baselines and Targets	Section 5.7.2	
10608.24(a)	Retail suppliers shall meet their interim target by December 31, 2015.	Baselines and Targets	Section 5.8 and App E	
1608.24(d)(2)	If the retail supplier adjusts its compliance GPCD using weather normalization, economic adjustment, or extraordinary events, it shall provide the basis for, and data supporting the adjustment.	Baselines and Targets	Section 5.8.2	
10608.36	Wholesale suppliers shall include an assessment of present and proposed future measures, programs, and policies to help their retail water suppliers achieve targeted	Baselines and Targets	Section 5.1	

	water use reductions.			
10608.40	Retail suppliers shall report on their progress in meeting their water use targets. The data shall be reported using a standardized form.	Baselines and Targets	Section 5.8 and App E	
10631(b)	Identify and quantify the existing and planned sources of water available for 2015, 2020, 2025, 2030, and 2035.	System Supplies	Chapter 6	
10631(b)	Indicate whether groundwater is an existing or planned source of water available to the supplier.	System Supplies	Section 6.2	
10631(b)(1)	Indicate whether a groundwater management plan has been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	System Supplies	Section 6.2.2	
10631(b)(2)	Describe the groundwater basin.	System Supplies	Section 6.2.1	
10631(b)(2)	Indicate if the basin has been adjudicated and include a copy of the court order or decree and a description of the amount of water the supplier has the legal right to pump.	System Supplies	Section 6.2.2	
10631(b)(2)	For unadjudicated basins, indicate whether or not the department has identified the basin as overdrafted, or projected to become overdrafted. Describe efforts by the supplier to eliminate the long-term overdraft condition.	System Supplies	Section 6.2.3	
10631(b)(3)	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years	System Supplies	Section 6.2.4	
10631(b)(4)	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	System Supplies	Sections 6.2 and 6.9	
10631(d)	Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.	System Supplies	Section 6.7	
10631(g)	Describe the expected future water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and multiple-dry years.	System Supplies	Section 6.8	
10631(i)	Describe desalinated water project opportunities for long-term supply.	System Supplies	Section 6.6	
10631(j)	Retail suppliers will include documentation that they have provided their wholesale supplier(s) – if any - with water use projections from that source.	System Supplies	Section 2.5.1	
10631(j)	Wholesale suppliers will include	System Supplies	Section 2.5.1	

	documentation that they have provided their urban water suppliers with identification and quantification of the existing and planned sources of water available from the wholesale to the urban supplier during various water year types.			
10633	For wastewater and recycled water, coordinate with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.1	
10633(a)	Describe the wastewater collection and treatment systems in the supplier's service area. Include quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.	System Supplies (Recycled Water)	Section 6.5.2	
10633(b)	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	System Supplies (Recycled Water)	Section 6.5.2.2	
10633(c)	Describe the recycled water currently being used in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.3 and 6.5.4	
10633(d)	Describe and quantify the potential uses of recycled water and provide a determination of the technical and economic feasibility of those uses.	System Supplies (Recycled Water)	Section 6.5.4	
10633(e)	Describe the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	System Supplies (Recycled Water)	Section 6.5.4	
10633(f)	Describe the actions which may be taken to encourage the use of recycled water and the projected results of these actions in terms of acre-feet of recycled water used per year.	System Supplies (Recycled Water)	Section 6.5.5	
10633(g)	Provide a plan for optimizing the use of recycled water in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.5	
10620(f)	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	Water Supply Reliability Assessment	Section 7.4	
10631(c)(1)	Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage.	Water Supply Reliability Assessment	Section 7.1	
10631(c)(1)	Provide data for an average water year, a single dry water year, and multiple dry water years	Water Supply Reliability Assessment	Section 7.2	
10631(c)(2)	For any water source that may not be available at a consistent level of use, describe plans to supplement or replace that	Water Supply Reliability Assessment	Section 7.1	

	source.			
10634	Provide information on the quality of existing sources of water available to the supplier and the manner in which water quality affects water management strategies and supply reliability	Water Supply Reliability Assessment	Section 7.1	
10635(a)	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.	Water Supply Reliability Assessment	Section 7.3	
10632(a) and 10632(a)(1)	Provide an urban water shortage contingency analysis that specifies stages of action and an outline of specific water supply conditions at each stage.	Water Shortage Contingency Planning	Section 8.1	
10632(a)(2)	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.	Water Shortage Contingency Planning	Section 8.9	
10632(a)(3)	Identify actions to be undertaken by the urban water supplier in case of a catastrophic interruption of water supplies.	Water Shortage Contingency Planning	Section 8.8	
10632(a)(4)	Identify mandatory prohibitions against specific water use practices during water shortages.	Water Shortage Contingency Planning	Section 8.2	
10632(a)(5)	Specify consumption reduction methods in the most restrictive stages.	Water Shortage Contingency Planning	Section 8.4	
10632(a)(6)	Indicated penalties or charges for excessive use, where applicable.	Water Shortage Contingency Planning	Section 8.3	
10632(a)(7)	Provide an analysis of the impacts of each of the actions and conditions in the water shortage contingency analysis on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts.	Water Shortage Contingency Planning	Section 8.6	
10632(a)(8)	Provide a draft water shortage contingency resolution or ordinance.	Water Shortage Contingency Planning	Section 8.7	
10632(a)(9)	Indicate a mechanism for determining actual reductions in water use pursuant to the water shortage contingency analysis.	Water Shortage Contingency Planning	Section 8.5	
10631(f)(1)	Retail suppliers shall provide a description of the nature and extent of each demand management measure implemented over the past five years. The description will address specific measures listed in code.	Demand Management Measures	Sections 9.2 and 9.3	
10631(f)(2)	Wholesale suppliers shall describe specific demand management measures listed in	Demand Management	Sections 9.1 and 9.3	

	code, their distribution system asset management program, and supplier assistance program.	Measures		
10631(j)	CUWCC members may submit their 2013-2014 CUWCC BMP annual reports in lieu of, or in addition to, describing the DMM implementation in their UWMPs. This option is only allowable if the supplier has been found to be in full compliance with the CUWCC MOU.	Demand Management Measures	Section 9.5	
10608.26(a)	Retail suppliers shall conduct a public hearing to discuss adoption, implementation, and economic impact of water use targets.	Plan Adoption, Submittal, and Implementation	Section 10.3	
10621(b)	Notify, at least 60 days prior to the public hearing, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.	Plan Adoption, Submittal, and Implementation	Section 10.2.1	
10621(d)	Each urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016.	Plan Adoption, Submittal, and Implementation	Sections 10.3.1 and 10.4	
10635(b)	Provide supporting documentation that Water Shortage Contingency Plan has been, or will be, provided to any city or county within which it provides water, no later than 60 days after the submission of the plan to DWR.	Plan Adoption, Submittal, and Implementation	Section 10.4.4	
10642	Provide supporting documentation that the urban water supplier made the plan available for public inspection, published notice of the public hearing, and held a public hearing about the plan.	Plan Adoption, Submittal, and Implementation	Sections 10.2.2, 10.3, and 10.5	
10642	The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water.	Plan Adoption, Submittal, and Implementation	Sections 10.2.1	
10642	Provide supporting documentation that the plan has been adopted as prepared or modified.	Plan Adoption, Submittal, and Implementation	Section 10.3.1	
10644(a)	Provide supporting documentation that the urban water supplier has submitted this UWMP to the California State Library.	Plan Adoption, Submittal, and Implementation	Section 10.4.3	
10644(a)(1)	Provide supporting documentation that the urban water supplier has submitted this UWMP to any city or county within which the supplier provides water no later than 30 days after adoption.	Plan Adoption, Submittal, and Implementation	Section 10.4.4	
10644(a)(2)	The plan, or amendments to the plan, submitted to the department shall be submitted electronically.	Plan Adoption, Submittal, and Implementation	Sections 10.4.1 and 10.4.2	

10645	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	Section 10.5	

Appendix G

Glossary of Terms, Acronyms, and Abbreviations

AB – Assembly Bill

Act – Urban Water Management Planning Act, California Water Code Division 6, Part 2.6. Also found as Appendix A of the 2015 UWMP Guidebook.

AF – Acre-Foot

Baseline – The average per capita water use for the following baseline periods and calculated in accordance with *Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use*, DWR 2011:

- A 10-15 year continuous period used to calculate baseline daily per capita water use per CWC Section 10608.20.

- A continuous 5-year period used to determine whether the 2020 urban water use target meets the legislation's minimum water use reduction requirement per CWC Section 10608.22.

BMP – Best Management Practice. A set of practices used by the California Urban Water Conservation Council and its members. The BMPs were historically identical to the Demand Management Practices (DMMs) found in the Water Code, but revisions to both the BMPs and the DMMs have now made them different sets of practices.

CASGEM – California Statewide Groundwater Elevation Monitoring Program. A program of regular and systematic monitoring in all of California's alluvial groundwater basins that relies and builds on established, local, long-term groundwater monitoring and management programs. DWR maintains the collected groundwater elevation data in a public database.

Census Designated Place (CDP) – A settled concentration of population, designated by the US Census, that is identifiable by name but not legally incorporated under the laws of the state.

CII – The combination of commercial, institutional, and industrial water use sectors.

CIMIS – California Irrigation Management Information System. A network of automated weather stations that provide real time weather data to estimate reference evapotranspiration (ETo). The stations are owned and operated cooperatively between the California Department of Water Resources and local agencies.

Compliance Daily per Capita Water Use/ Compliance GPCD – The gross water use during the final year of the reporting period, reported in gallons per capita per day. 2015 and 2020 are both compliance years. This term is used in the context of SB X7-7, The Water Conservation Act of 2009.

CUWCC – California Urban Water Conservation Council. A membership organization dedicated to urban water conservation throughout California by supporting and integrating innovative technologies and practices; encouraging effective public policies; advancing research, training, and public education; and building on collaborative approaches and partnerships.

CWC – California Water Code

Disadvantaged Community – A community with an annual median household income that is less than 80 percent of the statewide annual median household income.

Distribution System – Water distribution systems are generally large networks of pipes that deliver water for municipal purposes. Transmission canals and pipelines not used for delivering water directly to retail customers should not be included as part of the distribution system.

DMMs – Demand Management Measures. Measures listed in the California Water Code that are used by water suppliers for managing water demand. The DMMs were historically identical to the Best Management Practices (BMPs) found in the CUWCC MOU, but revisions to both the DMMs and the BMPs have now made them different sets of practices.

DOF – Department of Finance. DOF provides population estimates for cities and CDPs for inter-censal years (years between the census years).

DWR – Department of Water Resources

eARDWP – electronic Annual Reports to the Drinking Water Program. Every public water system is required to submit these annual reports to the Division of Drinking Water specifying contact and operational information for the prior calendar year.

Exchanges – Water exchanges are typically water deliveries by one water user to another water user, with the receiving water user returning the water at a specified time, or when the conditions of the parties' agreement are met. Water exchanges can be strictly a return of water on a basis agreed upon by the participants or can include payment and the return of water. For purposes of UWMP reporting, this is considered a "Wholesale Use," even if the agency is not considered a wholesale water agency as per the definition in CWC 10608.12 (p) and (r). Agencies will make their own determination as to whether water sent to another agency is a sale, transfer, or exchange.

GIS – Geographic Information System. A system used for storing, manipulating, analyzing, and presenting geographical information electronically on a computer. A computer based mapping system.

GPCD – Gallons per Capita per Day. The unit of measure used for reporting baseline and target per capita water consumption. This term is used in the context of SB X7-7, The Water Conservation Act of 2009.

Gross Water Use – The volume of water entering a supplier's distribution system over a 12 month period. This volume may be adjusted based on changes in system storage, sales to other agencies, recycled water use, agricultural water use, and industrial process water use. This term is used in the context of SB X7-7, The Water Conservation Act of 2009.

Hydrologic Region – A geographical division of the state based on the local hydrologic basins. The California Department of Water Resources divides California into 10 hydrologic regions that correspond to the state's major water drainage basins: North Coast, North Lahontan, Sacramento River, San Francisco Bay, Central Coast, San Joaquin River, Tulare Lake, South Coast, South Lahontan, and Colorado River.

Interim Urban Water Use Target – The 2015 urban water use target that is the midpoint between the supplier's 10-15 year baseline GPCD and their 2020 target GPCD. 2015 UWMPs will compare the interim water use target to the actual water use of 2015. This term is used in the context of SB X7-7, The Water Conservation Act of 2009.

IRWM – Integrated Regional Water Management. A collaborative effort to manage all aspects of water resources in a region by the application of integrated water management (IWM) principals at a regional scale.

Lower Income – Persons and families whose income does not exceed the qualifying limits for lower income families as established and amended from time to time pursuant to Section 8 of the United States Housing Act of 1937. In the event the federal standards are discontinued, the department shall, by regulation, establish income limits for lower income households for all geographic areas of the state at 80 percent of area median income, adjusted for family size and revised annually.

Methodologies – A shortened term for the publication Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use (For the Consistent Implementation of the Water Conservation Act of 2009). DWR 2011. The Water Conservation Act of 2009 (also known as SB X7-7) directed DWR to develop these technical methodologies and criteria to ensure the consistent implementation of the Act and to provide guidance to urban retail water suppliers in calculating and reporting their baseline and compliance water use.

MOU – Memorandum of Understanding – In the context of Urban Water Management Plans, this term refers to the CUWCC MOU entitled "Memorandum of Understanding Regarding Urban Water

Conservation in California". CUWCC 2011.

NOAA – National Oceanic and Atmospheric Administration. A federal agency focused on the condition of the oceans and atmosphere. NOAA provides weather data that may be useful to urban water suppliers when describing the climate of their service area.

NPDES – National Pollutant Discharge Elimination System. A permitting program to control national water pollution. The program is administered by the United States Environmental Protection Agency at the federal level and by the State Water Resources Control Board at the California State level.

Plan – Urban Water Management Plan or UWMP.

Potable Water – Water intended for human consumption, delivered through a Public Water System, and regulated by a State or local health agency.

Public Water Systems – A system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year. Public water systems are regulated by the State Water Resources Control Board, Drinking Water Program.

Raw Water – Water that is untreated and used in its natural state. This may also be called "Source Water." Some urban water agencies supply raw water to customers for non-potable uses.

Recycled Water – Municipal wastewater that has been treated to a specified quality, enabling it to be reused for a beneficial purpose.

Regional Alliance – A regional water management group that specifically addresses the requirements of the Water Conservation Act of 2009 (SB X7-7), that is, planning, reporting, and complying as an Alliance with 2015 and 2020 water use targets.

Regional UWMP – A UWMP that addresses all the requirements of the Water Code that pertain to urban water management, but not necessarily addressing the requirements of SB X7-7. Within the RUWMP agencies may elect to determine and report targets and baselines (SB X7-7 Water Conservation Act of 2009) on a regional basis through the formation of a Regional Alliance.

Retail Water Use/Demand – The sale of water directly to customers for end use. These include, single family, multi-family, landscape, or CII. The following sectors may be reported as either a wholesale or retail demand, the determination is made by the supplier: Groundwater recharge, saline intrusion barrier, agricultural, wetlands or wildlife habitat.

rGPCD – Residential Gallons per Capita per Day. This is used in drought reporting to SWRCB for purposes of complying with the Governor's drought declarations and executive orders in 2014 and

2015 (as of the publication of this Guidebook) and is solely the estimated residential water use in a service area divided by population. This differs from the GPCD used in UWMPs, which is the total water use within a service area divided by the population.

SB – Senate Bill

SB X7-7 – The Water Conservation Act of 2009 that provides for a 20% statewide reduction of urban per capita water use by the year 2020. The Act includes requirements for determining baselines and targets, among other things. The complete text is found in Appendix B of the 2015 UWMP Guidebook.

SB X7-7 Verification Form – A set of tables that present the calculations used by a retail supplier or Regional Alliance for developing baselines and targets. These tables are required for retail suppliers and Regional Alliances. These tables are presented in Appendix E of the 2015 UWMP Guidebook.

Sectors – Classifications of water use that are clearly distinct from other water uses.

SGMA – Sustainable Groundwater Management Act of 2014. Three legislative bills that provide a framework for long-term sustainable groundwater management. Local and regional authorities will form Groundwater Sustainability Agencies (GSAs) that oversee the preparation and implementation of a local Groundwater Sustainability Plan. More information can be found at http://water.ca.gov/groundwater/sgm/index.cfm

Standardized Tables – DWR has specified the use of standardized tables for reporting UWMP data. Use of these tables is required in the 2015 UWMP, to the extent that the information is available. However, water agencies may include the standardized tables in an appendix and present adapted versions of the standardized tables in the body of the Plan, if that is better adapted to the agency's records and/or better reflects the information available to the agency. The standardized tables are found in Appendix E of the UWMP Guidebook.

Surface Water Augmentation – The planned placement of recycled water into a surface water reservoir that is used as a source of domestic drinking water supply. (Used in Chapter 6, Section 6.5 Recycled Water).

SWRCB – State Water Resources Control Board. A state agency whose mission is to preserve, enhance, and restore the quality of California's water resources and drinking water for the protection of the environment, public health, and all beneficial uses, and to ensure proper water resource allocation and efficient use, for the benefit of present and future generations. Some key programs that are managed by SWRCB that pertain to UWMPs include: Emergency Drought Regulations, Drinking Water Program, Wastewater, and Water Recycling.

Target – The target per capita water use calculated for 2020 and 2015 as per *Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use*, DWR 2011. This term is used in the context of SB X7-7, The Water Conservation Act of 2009.

Target Method – The water supplier selects one of four different target methods when determining their 2020 Urban Water Use Target. See the *Methodologies* document (DWR 2011) and Appendix E, SB X7-7 Verification Form for details. This term is used in the context of SB X7-7, The Water Conservation Act of 2009.

Transfers – The CWC defines a water transfer as a temporary or long-term change in the point of diversion, place of use, or purpose of use due to a transfer, sale, lease, or exchange of water or water rights. A water transfer can be a temporary or permanent sale of water or a water right by the water right holder, a lease of the right to use water from the water right holder, or a sale or lease of a contractual right to water supply. Water transfers can also take the form of long-term contracts for the purpose of improving long-term supply reliability. For purposes of UWMP reporting, this is considered a "Wholesale Use," even if the agency is not considered a wholesale water agency as per the definition in CWC 10608.12 (p) and (r). Agencies will make their own determination as to whether water sent to another agency is a sale, transfer, or exchange.

Urban Retail Water Supplier – 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. The terms "Water Supplier" and "Water Agency" are used interchangeably in this guidebook.

UWMP – Urban Water Management Plan

Urban Wholesale Water Supplier – 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.

Water Agency – This term can refer to either an urban retail water supplier or an urban wholesale water supplier. The guidebook will explicitly state whether retail or wholesale, unless it is clear by the context surrounding the term. The terms "Water Agency" and "Water Supplier" are used interchangeably in this guidebook.

Water demand/use – Water conveyed through a distribution system that is used by a water agency and its customers for any purpose, including non-potable water uses, water losses, and other non-revenue water. For purposes of the Guidebook, the terms "Water Demand" and "Water Use" will be used interchangeably and refer to all the demand sectors listed in Section 4.2.

Water Supplier – This term can refer to either an urban retail water supplier or an urban wholesale water supplier. The guidebook will either explicitly state whether retail or wholesale, unless it is clear by the context surrounding the term. The terms "Water Agency" and "Water Supplier" are

used interchangeably in this guidebook.

Water Use Sector – Classifications of water use that are clearly distinct from other water uses.

WDR – Waste Discharge Requirement. A Program managed by SWRCB that regulates point discharges that are exempt pursuant to Subsection 20090 of Title 27 and not subject to the Federal Water Pollution Control Act, (e.g., sewage, wastewater, etc…) that meet and continue to meet, the preconditions listed for each specific exemption.

Wholesale Water Use/Demand – Generally large quantities of water not for municipal end uses. Wholesale uses include: Sales, transfers, or exchanges to other agencies. The following sectors may be reported as either a wholesale or retail demand, the determination is made by the supplier: Groundwater recharge, saline intrusion barrier, agricultural, wetlands or wildlife habitat.

WRR – Water Recycling (or Reuse) Requirement established by a Regional Water Quality Control Board.

WSCP – Water Shortage Contingency Plan. A strategic plan developed by and for a water supplier to prepare and respond to water shortages. The CWC provides specific requirements for a WSCP and Chapter 8 of the 2015 UWMP Guidebook provides guidance and standardized tables for reporting a WSCP in a UWMP.

WWTP – Waste Water Treatment Plant

Appendix H

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Appendix I

Climate Change Vulnerability Assessment

The Climate Change Vulnerability Assessment is taken from the Climate Change Handbook for Regional Water Planning, USEPA and DWR, 2011. The vulnerability assessment highlights those water-related resources that are important to a region and are sensitive to climate change.

I. Water Demand

☐ *Are there major industries that require cooling/process water in your planning region?*

- As average temperatures increase, cooling water needs may also increase.
- Identify major industrial water users in your region and assess their current and projected needs for cooling and process water.

☐ *Does water use vary by more than 50% seasonally in parts of your region?*

- Seasonal water use, which is primarily outdoor water use, is expected to increase as average temperatures increase and droughts become more frequent.
- Where water use records are available, look at total monthly water uses averaged over the last five years (if available). If maximum and minimum monthly water uses vary by more than 25%, then the answer to this question is "yes"
- Where no water use records exist, is crop irrigation responsible for a significant (say >50%) percentage of water demand in parts of your region?

☐ *Are crops grown in your region climate-sensitive? Would shifts in daily heat patterns, such as how long heat lingers before night-time cooling, be prohibitive for some crops?*

- Fruit and nut crops are climate-sensitive and may require additional water as the climate warms.

☐ *Do groundwater supplies in your region lack resiliency after drought events?*

- Droughts are expected to become more frequent and more severe in the future. Areas with a more hardened demand may be particularly vulnerable to droughts and may become more dependent on groundwater pumping.

☐ *Are water use curtailment measures effective in your region?*

- Droughts are expected to become more frequent and more severe in the future. Areas with a more hardened demand may be particularly vulnerable to droughts.

☐ *Are some instream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?*

- Changes in snowmelt patterns in the future may make it difficult to balance water demands. Vulnerabilities for ecosystems and municipal/agricultural water needs may be exacerbated by instream flow requirements that are:
    1. not quantified,
    2. not accurate for ecosystem needs under multiple environmental conditions including droughts, and
    3. not met by regional water managers.

II. Water Supply

☐ *Does a portion of the water supply in your region come from snowmelt?*

- Snowmelt is expected to decrease as the climate warms. Water systems supplied by snowmelt are therefore potentially vulnerable to climate change.
- Where watershed planning documents are available, refer to these in identifying parts of your region that rely on surface water for supplies; if your region contains surface water supplies originating in watersheds where snowpack accumulates, the answer to this question is "Yes."
- Where planning documents are not available, identify major rivers in your region with large users. Identify whether the river's headwaters are fed by snowpack.

☐ *Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region?*

- Some imported or transferred water supplies are sources from climate-sensitive watersheds, such as water imported from the Delta and the Colorado River.

☐ *Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past?*

- Coastal aquifers are susceptible to salt intrusion as sea levels rise, and many have already observed salt intrusion due to over-extraction, such as the West Coast Basin in southern California.

☐ *Would your region have difficulty in storing carryover supply surpluses from year to year?*

- Droughts are expected to become more severe in the future. Systems that can store more water may be more resilient to droughts.

☐ *Has your region faced a drought in the past during which it failed to meet local water demands?*

- Droughts are expected to become more severe in the future. Systems that have already come close to their supply thresholds may be especially vulnerable to droughts in the future.

☐ *Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas?*

- As invasive species are expected to become more prevalent with climate change, existing invasive species issues may indicate an ecological vulnerability to climate change.

III. Water Quality

☐ *Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby which could pose a water quality concern from increased erosion?*

- Some areas are expected to become more vulnerable to wildfires over time. To identify whether this is the case for parts of your region, the California Public Interest Energy Research (PIER)Program has posted wildfire susceptibility projections as a Google Earth application at: *http://cal-adapt.org/fire/*. These projections are only the results of a single study and are not intended for analysis, but can aid in qualitatively answering this question. Read the application's disclaimers carefully to be aware of its limitations.

☐ *Does part of your region rely on surface water bodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or algal blooms? Are there other water quality constituents potentially exacerbated by climate change?*

- Warming temperatures will result in lower dissolved oxygen levels in water bodies, which are exacerbated by algal blooms and in turn enhance eutrophication. Changes in streamflows may alter pollutant concentrations in water bodies.

☐ *Are seasonal low flows decreasing for some waterbodies in your region? If so, are the reduced low flows limiting the waterbodies' assimilative capacity?*

- In the future, low flow conditions are expected to be more extreme and last longer. This may result in higher pollutant concentrations where loadings increase or remain constant.

☐ *Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues?*

- In the future, low flows are expected decrease, and to last longer. This may result in higher pollutant concentrations where loadings increase or remain constant.

☐ *Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?*

- While it is unclear how average precipitation will change with temperature, it is generally agreed that storm severity will probably increase. More intense, severe storms may lead to increased erosion, which will increase turbidity in surface waters. Areas that already observe water quality responses to rainstorm intensity may be especially vulnerable.

IV. Sea Level Rise

☐ *Has coastal erosion already been observed in your region?*

- Coastal erosion is expected to occur over the next century as sea levels rise.

☐ *Are there coastal structures, such as levees or breakwaters, in your region?*

- Coastal structures designed for a specific mean sea level may be impacted by sea level rise.

☐ *Is there significant coastal infrastructure, such as residences, recreation, water and wastewater treatment, tourism, and transportation) at less than six feet above mean sea level in your region?*

- Coastal flooding will become more common, and will impact a greater extent of property, as sea levels rise. Critical infrastructure in the coastal floodplain may be at risk.
- Digital elevation maps should be compared with locations of coastal infrastructure.

☐ *Are there climate-sensitive low-lying coastal habitats in your region?*

- Low-lying coastal habitats that are particularly vulnerable to climate change include estuaries and coastal wetlands that rely on a delicate balance of freshwater and salt water.

☐ *Are there areas in your region that currently flood during extreme high tides or storm surges?*

- Areas that are already experiencing flooding during storm surges and very high tides, are more likely to experience increased flooding as sea levels rise.

☐ *Is there land subsidence in the coastal areas of your region?*

- Land subsidence may compound the impacts of sea level rise.

☐ *Do tidal gauges along the coastal parts of your region show an increase over the past several decades?*

- Local sea level rise may be higher or lower than state, national, or continental projections.
- Planners can find information on local tidal gauges at *http://tidesandcurrents.noaa.gov/sltrends/sltrends_states.shtml?region=ca*

V. Flooding

☐ *Does critical infrastructure in your region lie within the 200-year floodplain? DWR's best available floodplain maps are available at: http://www.water.ca.gov/floodmgmt/lrafmo/fmb/fes/best_available_maps/*

- While it is unclear how average precipitation will change with temperature, it is generally agreed that storm severity will probably increase. More intense, severe storms may lead to higher peak flows and more severe floods.
- Refer to FEMA floodplain maps and any recent FEMA, US Army Corps of Engineers, or DWR studies that might help identify specific local vulnerabilities for your region. Other follow-up questions that might help answer this question:

    1. What public safety issues could be affected by increased flooding events or intensity? For example, evacuation routes, emergency personnel access, hospitals, water treatment and wastewater treatment plants, power generation plants and fire stations should be considered.
    2. Could key regional or economic functions be impacted from more frequent and/or intense flooding?

☐ *Does part of your region lie within the Sacramento-San Joaquin Drainage District?*

- The SSJDD contains lands that are susceptible to overflows from the Sacramento and San Joaquin Rivers, and are a key focus of the Central Valley Flood Protection Plan. (*http://www.water.ca.gov/cvfmp/program.cfm*).

☐ *Does aging critical flood protection infrastructure exist in your region?*

- Levees and other flood protection facilities across the state of California are aging and in need of repair. Due to their overall lowered resiliency, these facilities may be particularly vulnerable to climate change impacts.
- DWR is evaluating more than 300 miles of levees in the San Joaquin and Sacramento Rivers Valleys and the Delta (*http://www.water.ca.gov/levees/*).

☐ *Have flood control facilities (such as impoundment structures) been insufficient in the past?*

- Reservoirs and other facilities with impoundment capacity may be insufficient for severe storms in the future. Facilities that have been insufficient in the past may be particularly vulnerable.

☐ *Are wildfires a concern in parts of your region?*

- Wildfires alter the landscape and soil conditions, increasing the risk of flooding within the burn and downstream areas. Some areas are expected to become more vulnerable to wildfires over time. To identify whether this is the case for parts of your region, the California Public Interest Energy Research Program (PIER) has posted wildfire susceptibility projections as a Google Earth application at: *http://cal-adapt.org/fire/*. These projections are the results of only a single study and are not intended for analysis, but can aid in qualitatively answering this question. Read the application's disclaimers carefully to be aware of its limitations.

VI. Ecosystem and Habitat Vulnerability

☐ *Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues?*

- Erosion is expected to increase with climate change, and sedimentation is expected to shift. Habitats sensitive to these events may be particularly vulnerable to climate change.

☐ *Does your region include estuarine habitats which rely on seasonal freshwater flow patterns?*

- Seasonal high and low flows, especially those originating from snowmelt, are already shifting in many locations.

☐ *Do climate-sensitive fauna or flora populations live in your region?*

- Some specific species are more sensitive to climate variations than others.

- ☐ *Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region?*
  - Species that are already threatened or endangered may have a lowered capacity to adapt to climate change.

- ☐ *Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?*
  - Economic values associated with natural habitat can influence prioritization.

- ☐ *Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life?*
  - Constrained water quality and quantity requirements may be difficult to meet in the future.

- ☐ *Do estuaries, coastal dunes, wetlands, marshes, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region?*
  - Storm surges are expected to result in greater damage in the future due to sea level rise. This makes fragile coastal ecosystems vulnerable.

- ☐ *Does your region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change http://www.endangered.org/its-getting-hot-out-there/ ?*
  - These ecosystems are particularly vulnerable to climate change.

- ☐ *Are there areas of fragmented estuarine, aquatic, or wetland wildlife habitat within your region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement?*
  - These ecosystems are particularly vulnerable to climate change.

VII. Hydropower

- ☐ *Is hydropower a source of electricity in your region?*
  - As seasonal river flows shift, hydropower is expected to become less reliable in the future.

- ☐ *Are energy needs in your region expected to increase in the future? If so, are there future plans for hydropower generation facilities or conditions for hydropower generation in your region?*

  - Energy needs are expected to increase in many locations as the climate warms. This increase in electricity demand may compound decreases in hydropower production, increasing its priority for a region.

Appendix J

Industrial Process Water Exclusion from Gross Water Calculations

§ 596. Process Water.
(a) An urban retail water supplier that has a substantial percentage of industrial water use in its service area is eligible to exclude the process water use of existing industrial water customers from the calculation of its gross water use to avoid a disproportionate burden on another customer sector.
(b) The Department of Water Resources will review and assess the implementation of this article and may amend its provisions upon considering the recommendations of the Commercial, Industrial and Institutional task force convened pursuant to section 10608.43 of the Water Code.
(c) This regulation supplements “Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use for Consistent Implementation of the Water Conservation Act of 2009” February 2011, and the “Provisional Method 4 for Determining Water Use Targets” February 2011, hereby incorporated by reference.

§ 596.1. Applicability and Definitions.
(a) Sections 596.2 through 596.5 describe criteria and methods whereby an urban retail water supplier may deduct process water use when calculating their gross water use in developing their urban water use targets.
(b) The terms used in this article are defined in this subdivision.
(1) “commercial water user” means a water user that provides or distributes a product or service. Examples include commercial businesses and retail stores, office buildings, restaurants, hotels and motels, laundries, food stores, and car washes.
(2) “disadvantaged community” means a community with an annual median household income that is less than 80 percent of the statewide annual median household income.
(3) “distribution system” means a water conveyance system that delivers water to a residential, commercial, or industrial customer and for public uses such as fire safety where the source of water is either raw or potable water.
(4) “drought emergency” means a water shortage emergency condition that exists when there would be insufficient water for human consumption, sanitation and fire protection, as set forth in California Water Code Section 350-359 and Government Code Section 8550-8551.
(5) “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:
(A) Recycled water that is delivered within the service area of an urban retail water supplier or its urban wholesale water supplier
(B) The net volume of water that the urban retail water supplier places into long-term storage
(C) The volume of water the urban retail water supplier conveys for use by another urban water supplier
(D) The volume of water delivered for agricultural use, except as otherwise provided in subdivision (f) of Section 10608.24 of the Water Code.
(6) “incidental water use” means water that is used by industry for purposes not related to producing a product or product content or research and development. This includes incidental cooling, air conditioning, heating, landscape irrigation, sanitation, bathrooms, cleaning, food preparation, kitchens, or other water uses not related to the manufacturing of a product or research and development.

(7) “industrial water user” means a manufacturer or processor of materials as defined by the North American Industry Classification System (NAICS) code sectors 31 to 33, inclusive, or an entity that is a water user primarily engaged in research and development. An industrial water user is primarily involved in product manufacturing and processing activities and research and development of products, such as those related to chemicals, food, beverage bottling, paper and allied products, steel, electronics and computers, metal finishing, petroleum refining, and transportation equipment. Data centers dedicated to research and development are considered an industrial water user.
(8) “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.
(9) “local agency” means any municipality, such as a city or county government or public water agency.
(10) “non-industrial water use” means gross water use minus industrial water use.
(11) “process water” means water used by industrial water users for producing a product or product content, or water used for research and development. Process water includes, but is not limited to; the continuous manufacturing processes, water used for testing, cleaning and maintaining equipment. Water used to cool machinery or buildings used in the manufacturing process or necessary to maintain product quality or chemical characteristics for product manufacturing or control rooms, data centers, laboratories, clean rooms and other industrial facility units that are integral to the manufacturing or research and development process shall be considered process water. Water used in the manufacturing process that is necessary for complying with local, State and federal health and safety laws, and is not incidental water, shall be considered process water. Process water does not include incidental, commercial or institutional water uses.
(12) “recycled water” means water 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:
(A) For groundwater recharge, including recharge through spreading basins, water supplies that are all of the following:
(i) Metered.
(ii) Developed through planned investment by the urban water supplier or a wastewater treatment agency.
(iii) Treated to a minimum tertiary level.
(iv) 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.
(B) For reservoir augmentation, water supplies that meet the criteria of subdivision (A) and are conveyed through a distribution system constructed specifically for recycled water.
(13) “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.
(14) “Urban Water Management Plan” means a plan prepared pursuant to California Water Code Division 6 Part 2.6. 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.

§ 596.2. Criteria for Excluding Industrial Process Water Use from Gross Water Use Calculation.

When calculating its gross water use, an urban retail water supplier may elect to exclude up to 100 percent of process water use from its gross water use if any one of the following criteria is met in its service area:

(a) Total industrial water use is equal to or greater than 12 percent of gross water use, or

(b) Total industrial water use is equal to or greater than 15 gallons per capita per day, or

(c) Non-industrial water use is equal to or less than 120 gallons per capita per day if the water supplier has self-certified the sufficiency of its water conservation program with the Department of Water Resources under the provisions of section 10631.5 of the Water Code, or

(d) The population as a whole within the supplier's service area meets the criteria for a disadvantaged community.

§ 596.3. Quantification and Verification of Total Industrial Process and Industrial Incidental Water.

The volumes of water uses in Section 596.2 shall be for the same period as urban water suppliers calculate their baseline daily per capita water use and reported in their Urban Water Management Plans.

(a) The volume of process water use shall be verified and separated from incidental water use.

(1) To establish a baseline for determining process water use, urban retail water suppliers shall calculate the process water use over a continuous ten year period ending no earlier than December 31, 2004, and no later than December 31, 2010.

(2) Verification of process water volumes can be accomplished by metering, sub-metering or other means determined suitable and verifiable by the urban retail water supplier and reported in their Urban Water Management Plans and reviewed by the Department of Water Resources.

(b) In cases where the urban retail water supplier provides only a portion of an industrial water user's water supply, the urban retail water supplier shall prorate the volume of process water use excluded from gross water use by considering the average share of the industrial water use that it supplied over a continuous ten year period ending no earlier than December 31, 2004, and no later than December 31, 2010.

The verification of the proportion of industrial water use supplied shall be accomplished through metering, sub-metering, or other means determined suitable and verifiable by the urban water supplier such as audits, historic manufacturing output or suppliers' billing records and as reported in their Urban Water Management Plans.

Example.If an urban water supplier delivered only 60 percent of the average annual water used by an industrial water user, the urban supplier can only use that 60 percent of industrial water in determining if it is eligible to exclude process water from its gross water use; and if it is eligible, it can exclude only 60 percent of the volume of process water used by such industrial water user.

§ 596.4. Existing Industrial Customers.
When implementing this article, urban retail water suppliers shall meet the following provisions:
(a) Any ordinance or resolution adopted by an urban retail water supplier after November 10, 2009 shall not require industrial water customers existing as of November 10, 2009 to undertake changes in product formulation, operations, or equipment that would reduce process water use.
(b) An urban retail water supplier may encourage existing industrial customers to utilize water efficiency technologies, methodologies, or practices through the use of financial and technical assistance.
(c) This section shall not limit an ordinance or resolution adopted pursuant to a declaration of drought emergency by an urban retail water supplier.

§ 596.5. New and Retrofitted Industries.
Local agencies and water suppliers shall encourage newly-established and retrofitted industries to adopt industry-specific water conservation practices and technologies where such technologies exist.

Appendix K

Estimating Future Water Savings from Adopted Codes, Standards, Ordinances, or Transportation and Land Use Plans

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Section 1 – Introduction and Background

Pursuant to California Water Code (CWC) Section 10610 et seq., referred to as the Urban Water Management Planning Act (Act), an urban water supplier "*shall be required to develop water management plans to actively pursue the efficient use of available supplies*."[1] One challenge from this directive is reflecting how the pursuit of efficient use is best represented in the projected future water demands that are the cornerstone of good planning. As required by the Act, the water demands from both existing customers and those that may be added during each 5-year increment for at least a 20 year planning horizon should be reflected in projections of future water demands.

This document provides urban water suppliers guidance on reflecting future water savings from adopted codes, standards, ordinances or transportation and land use plans within 2015 Urban Water Management Plans (UWMPs), as is now a voluntary option for UWMPs.

1.1 Background

In September 2014, two legislative bills amending sections of the Act were approved and chaptered: AB 2067 and SB1420. Key among the changes to existing statutes was the addition of CWC Section 10631(e)(4). This specific addition provides the option for urban water suppliers to reflect its and its customer's efficiency efforts as part of its future demand projection. CWC Section 10631(e) already requires an urban water supplier to:

> *(1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors, including, but not necessarily limited to, all of the following uses:*
>
> > *(A) Single-family residential.*
> > *(B) Multifamily.*
> > *(C) Commercial.*
> > *(D) Industrial.*
> > *(E) Institutional and governmental.*
> > *(F) Landscape.*
> > *(G) Sales to other agencies.*
> > *(H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.*
> > *(I) Agricultural.*
> > *(J) Distribution system water loss.*

[1] California Water Code 10610.4(c)

The new statutes added the following to CWC Section 10631(e):[2]

> *(4) (A): If available and applicable to an urban water supplier, water use projections may display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area.*
>
> *(B) To the extent that an urban water supplier reports the information described in subparagraph (A), an urban water supplier shall do both of the following:*
>
> > *(i) Provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections.*
> > *(ii) Indicate the extent that the water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. Water use projections that do not account for these water savings shall be noted of that fact.*

Section 10631(e)(4) is voluntary for both retail and wholesale water suppliers. However, as required in subsection (B)(ii), water projections not accounting for these factors shall note this fact.

The last statement should not be overlooked, as it explicitly requires a water supply to identify when water use projections do not account for these water savings. As part of standard review processes, DWR will be checking for this notation as appropriate.

1.2 Why is this Important?

A UWMP should be viewed as more than a document prepared to simply meet requirements of the Act. It should serve as an opportunity for a water supplier to continually evaluate water supply and water demand conditions to assure the most reliable, economically viable water services to its municipal and industrial customers. UWMPs provide an opportunity to (a) manage compliance with state mandates (e.g. per-capita targets), (b) understand and evaluate affects of its own water use ordinances, expected impacts of growth, and benefits of existing customer water conservation actions, (c) support infrastructure planning, capital improvement plans, and rate setting, and (d) support land-use planning such as community General Plans, or project-specific development plans. The California Department of Water Resources (DWR) encourages

[2] The new section can be incorporated by either or both retail and wholesale urban water suppliers. When a wholesale water supplier is accounting for the factors on behalf of its retail suppliers, it must closely coordinate with the retail supplier to assure consistency in how factors are represented by both parties. When multiple retail agencies coordinate on a regional plan, the methods to account for these factors should be consistently applied for each retailer's service area.

water suppliers to really understand current and future water demands to enable useful and practical planning.

Since UWMPs are updated on a 5-year cycle, water suppliers should feel comfortable making assumptions using recent data, modifying previous assumptions based upon new facts (with appropriate notations of the basis for such modifications), and testing effects of various conservation strategies, as these can and should be revisited at the next UWMP cycle.

At the same time, DWR recognizes that the variable nature of codes, standards and ordinances will translate to varying interpretations and representations of such in a purveyor's UWMP. DWR recognizes that an UWMP is a supplier's plan – not DWR's – and will defer to each purveyor's discretion for reflecting the quantitative benefits of applicable codes, standards and ordinances, assuming reasonable citations and basis are provided, as required by CWC 10631(e)(4)(B).

1.3 Document Organization

This document is organized to help water suppliers understand how to best organize water demand forecasts to account for savings from adopted codes, standards, ordinances or transportation and land use plans. The following sections are included:

- Section 1 – Introduction and background
- Section 2 – Using a land-use basis for unit water demand estimates
- Section 3 – Implementation Examples
- Section 4 – Additional Useful Information
- Section 5 – Conclusions

Section 2 – Using a Land-use Basis for Unit Water Demand Estimates

As noted earlier, CWC Section 10631(e)(1) requires water suppliers to separate water use into several categories, ranging from "single-family residential" to "institutional and government." Though this subdivision is helpful, it still limits a water supplier's opportunity to reflect the impact of conservation measures or land uses because the differences between the unit demand of existing customers and future customers must be blended into one representative unit demand factor. For instance, if a water supplier currently serves 15,000 residential customers, but anticipates adding another 5,000 customers over the next 10 years – approximately a 3% growth rate – the unit demand factors for existing housing versus that of future housing cannot be differentiated and is generally reflected as one blended value.

To improve upon this, DWR suggests that, at a minimum, a water supplier separate each of the six customer categories described in CWC Section 10631(e)(1) into "existing" and "future" customers (see Figure 2-1). This allows the water supplier to assign different unit demand factors to each customer category, allowing adjustments to reflect important water-using drivers – such as existing versus future housing density, and new building standards versus those in place ten or twenty years ago. As shown in Figure 2-1, through this simple separation, a water supplier can readily recognize the potential decreasing unit demand over each 5-year planning increment for existing homes – as may result from natural replacements of appliances or from the water supplier's conservation actions – while separately recognizing the different starting point for a home built today that must meet new landscape and building standards, and will be equipped with water efficient appliances.

Figure 2-1: Sample table with "existing" and "future" customer separation

		No. of Units over 5-yr increments	Land-use Specific Demand Factors	Projected Demand over 5-yr increments
Land use type A	Existing	(stable or fewer)	(may decrease over time)	(Unique value for each class and over time)
	Future	(increasing)	(likely stable over time)	
Land use type B	Existing			
	Future			
Land use type C	Existing			
	Future			
			Total Demand	(sum of parts)

Further expanding the land-use categories allows even more discrete application of codes, ordinances and land-use plans to be applied to existing and future customers. For instance, growth in many communities reflects a trend to smaller lots with larger homes than the existing customer base. This subtle change just to residential housing products

can significantly reduce the available space for outdoor landscaping – lowering the outdoor demand of future housing without considering any other factors. By expanding the land-use categories beyond the simple "existing" and "future" to also include varying residential lots sizes, a water supplier has the ability to further refine demand estimates. This can be expanded again to reflect indoor versus outdoor demands for each land-use category. The greater the number of categories, the more unique water use factors can be reflected to best correspond to actual and predicted conditions. **Figure 2-2** presents a more detailed table showing how data can be separated to focus the affects of codes, ordinances, and land-use plans to each applicable land-use category.

Figure 2-2: Sample detailed demand table

[Note: ideally the "Demand Factor" column would be expanded to allow for a unique factor for each corresponding 5-year increment. This would allow "existing" factors to be lowered over time to show benefits of conservation.]

	Unit Count or Acreage						Demand Factor	Demand (af/yr)					
Category	Current	2020	2025	2030	2035	2040	(af/du or af/ac)	Current	2020	2025	2030	2035	2040
Residential													
Type A							(indoor)						
(existing)							(outdoor)						
Type B							(indoor)						
(new)							(outdoor)						
Type C							(indoor)						
(existing							(outdoor)						
DU Total													
							Indoor Subtotal						
							Outdoor Subtotal						
Commercial													
Type A													
Type B													
Type C													
Type D													
							Subtotal						
Public													
Type A													
Type B													
							Subtotal						
Park													
Streetscape													
Open Space													
							Outdoor Subtotal						
							Indoor Total						
							Outdoor Total						
							Total						
							Outdoor Non-revenue water 10%						
							Indoor Non-revenue water 10%						
							Total Indoor						
							Total Outdoor						
							Total Proposed Project Demand						

2.1 Using Land-use instead of Population to Estimate Water Demand

As part of the 2010 UWMPs, all water suppliers were required to determine baseline per-capita water use and set targets for reduced per-capita use by 2020 – established as

gallons per person per day (GPCD). Many water suppliers used these 2020 GPCD targets to determine future demands in their 2010 UWMPs. This is an easy calculation since it simply requires multiplying a future estimated population by the GPCD. While simple, this method does not provide a water supplier with the opportunity to assess the affect of codes, ordinances, and land-use plans on future water demand – and thus potentially misrepresents actual trends and reduces the opportunity of the water purveyor to assess success toward achieving its 2020 target. For example, a water supplier that forecasts future demands by simply applying GPCD targets to population projections will not have the ability to differentiate the affect of new landscape ordinances on new construction from the affect of conservation mandates on existing customers.

DWR strongly encourages water suppliers to shift to land-use based demand factors in order to have a more thorough understanding of how demand may change over time, as influenced by the composition of its existing and future customers.

2.2 Using Meter Data to Develop Unit Demand Factors

The most accurate way to analyze existing demands for differing land-use classifications is to review historic meter records obtained from the water system itself – especially for residential customers that often constitute the majority of an urban suppliers water demand. The following steps outline a simple meter analysis for residential data, though each water supplier likely has unique circumstances that may required more specialized assessments to assure the data is usable for demand forecasting purposes. Non-residential meter data can also be analyzed using similar steps.

1. Create land-use categories – In this step the lot sizes, housing types, neighborhood types, and relative ages of structures are used to develop appropriate land-use categories in relation to expected differences in water use. Existing residential developments can typically be grouped by age and size into a manageable number of dwelling unit categories. Some typical characteristics that can be used for dwelling unit classification include: lot size, housing square footage, and general development age. As outdoor demands are generally the largest component of residential water use, net landscape area provides a good basis for creating land-use categories. Generally large developments are built grouping similar sized homes into their own neighborhoods. One method for defining a lot type is to review satellite photos of a few houses in a neighborhood and identify the general lot size, house size, and net landscape area. GIS tools also offer methods to help establish categories, if a water supplier has such functionality. Indoor demands can vary significantly in older neighborhoods where there is a mixture of newer

and older appliances and fixtures compared to post-plumbing code remodels, creating another basis for category distinction.[3]

2. Download meter data – For each land-use classification, obtain a few years (minimum) of monthly customer meter data from at least one representative neighborhood [note: this step requires staff or consultant access to query the billing database or other source of records]. Typically, meter data will be available in database form where a spreadsheet can be generated through a query designed to reflect the categories developed in Step 1. This is the most primitive type of data pull and is easily achieved by locating a few streets in neighborhoods with identified housing types. At least 50 meter records in a given dwelling unit classification should be analyzed but 150 allows for more confidence in the data. The more data used, the more errors or anomalies that can be normalized. While it can be valuable to assess all residential customer data, often-representative samplings provide a solid basis for developing the unique unit water demand factors. If the meter data database is accessible through a GIS system, then data queries can be defined by geographical area and can encompass entire tracts easily. There are a number of GIS based tools emerging that may be used to simplify the meter data analysis process.

3. Sort data – This step allows the data to be scrubbed so that it appears reflective of the general water demand characteristics of the selected land-use category. Assuming a typical inclined rate structure, the resulting total annual demands should graph into an offset bell curve when plotted as a histogram. This curve will smooth with more meters, but 150 is typically enough to define the shape. The more data available for a land-use class the more representative the average consumption data will be – see **Figure 2-3**. As indicated by the data set used to create the figure, the rate structure only results in a minor offset in water use.[4] This is more noticeable in the data set using 150 or above customer meters and is absent in the data set with only 50 customer meters. From this curve the erroneous or outlier meter sets can be eliminated. Meters with exceptionally high and exceptionally low use can be eliminated so as to not inappropriately skew the analysis of "typical" water use characteristics for the specific land-use class. Specific thresholds are not defined in this guide but typically eliminating the top and bottom 10% of records (in relation to annual quantity of use) will improve the relevance of the curve. Monthly data should be reviewed in chart format and errors removed. Some basic criteria for removal include: months with zero use, incomplete meter records, months with default minimum use, lack of seasonality

[3] Typical neighborhoods built after the initial plumbing codes in the early 1990's (e.g. 1.6 gallon per flush toilets) will see normalized indoor demands. Homes built after the latest efficiency codes (e.g. 1.28 gallon per flush toilets) see even lower indoor demands.
[4] Figure 2-3 represents the distribution of customer's consumption for just one month.

in meter use, and fixed annual use. The idea is to eliminate records from vacant homes, seasonally used homes, etc. This is a subjective step requiring reasonable judgment.

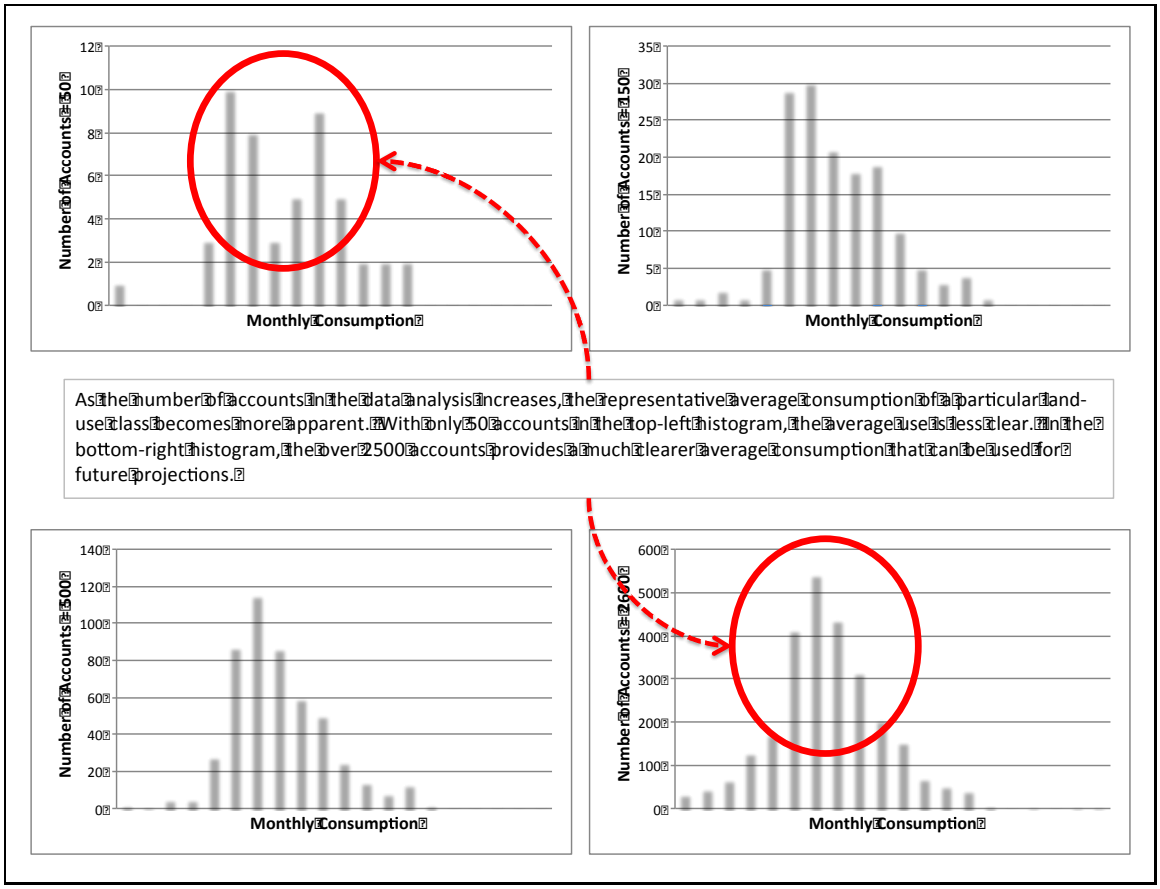


Figure 2-3: Histogram shape changes with more accounts included

4. Analyze data – Using the sorted data for each land-use category, monthly averages can be developed, indoor and outdoor use characteristics can be ascertained, and use between categories can be compared. This step may result in some consolidation of the original land-use categories (see Step 1), or may verify that enough variance exists to maintain separate categories. Finally, an annual demand per unit can be developed (e.g. acre-feet per year or average gallons per day per house type A). This value represents the "current" demand of the "existing" customer categories. From this existing set of demand factors, the water supplier can begin applying reductions to account for the affects of codes and ordinances applicable to existing customer types.

   These existing demand factors can also act as a baseline factors for future land-use categories. For instance, a medium density neighborhood built in the early 2000's has a determined set of demand factors that can indicate indoor use. New

medium density homes should have an indoor factor that is less by at least 10% to reflect plumbing codes and building standards changes since the existing homes were constructed (e.g. CalGreen Building Standards or California Energy Commission Title 20 appliance standards for toilets, urinals, faucets, and showerheads).

Demand factors for future uses can also be developed through end-use modeling for both existing and new customers. This method identifies fixtures and appliances available, considering saturation rates for existing customers, and couples with customer behavioral data, to develop expected average unit demand factors for a specific land-use class. More information is available here: http://www.allianceforwaterefficiency.org/residential-end-uses-of-water-study-1999.aspx

Another example of the use of meter data may be found in how many water suppliers are assessing monthly water use data to satisfy mandated State Water Resources Control Board (SWRCB) reporting. In the SWRCB monthly reporting, suppliers have the opportunity to separate residential from non-residential use on a monthly basis. Throughout the year, the determination of percentage of residential versus non-residential should vary.[5] The supplier that is already reporting this likely has the data readily available to also take the steps above to develop land-use based demand factors.

2.3 Converting Per-capita to Land-use Based Demand Factors

Per-capita demand factors can easily be calculated from land-use based demand factors. Unfortunately, a simple method to convert per-capita demand factors into land-use demand factors is not viable. Because the use characteristics between land-use classes can vary significantly, trying to convert a purveyor's average of 120 GPCD (example only) is meaningless without looking at actual water use characteristics for each land-use class. DWR strongly encourages purveyor's using a per-capita basis for forecasting demands switch to the more refined land-use based approach, then convert back to GPCD to understand overall trending toward per-capita targets or other purveyor-specific objectives.

Care should be taken, however, when converting back to GPCD that the appropriate population estimate is used that best reflects the land-use forecasts. For instance, a water purveyor's land-use based forecast may assume that 1,000 medium-density, single-family and 500 multi-family homes are constructed over the next 10 years. Based upon available census data, the water purveyor may determine the average single-family residence has 3.1 people, while the multi-family housing averages 1.8 people. This would generate a forecasted population (all other aspects remaining the same) of 4,000

[5] For example, a hot inland area would see a residential use as a higher percentage of overall water demand. This results from more extensive outdoor residential water demand in the summer months due to landscaping. In winter months, the percentage of residential use compared to non-residential would lower reflecting only minimal residential outdoor watering.

people. In contrast, the Department of Finance may project the 10-year population to grow by 4,500 people – based upon birth, death and migration statistics. These two different methods will result in different projected GPCD values. DWR strongly recommends that the population basis used to convert back to GPCD values match that used to determine the baseline GPCD values, as first documented in a water purveyor's 2010 UWMP.

2.4 Representing Unique Land-use Classifications

Several water purveyors in the state have unique land uses, or variation of uses, that fall outside of the six categories described in 10631(e)(1). Some examples of this include vacation homes, dual plumbed homes, and "rural residential" or "country estate" type larger (multi-acre) parcels with active agricultural demands. In each of these cases, the most appropriate method to develop unit demand factors is to obtain representative meter data – either from existing similar projects already served by the purveyor or through coordination with another purveyor with similar circumstances. For instance, estimating the future demand from new vacation homes would require some analysis of similar vacation homes in the region (whether served by the purveyor or not). It is important to remember that this is representative data to assist the purveyor in performing demand forecasts, so absolute certainty is not required. If data is not available, subjective-based adjustments could be made to existing uses, such as multiplying outdoor use per square foot for a standard residential development, then applying the value to the larger lots.[6]

Agencies should take into consideration the potential demands these unique lot types may put on the water system and determine if any impact to GPCD targets or water availability is identifiable. DWR recommends addressing possible impacts with these commonly implemented measures including but not limited to concepts such as: additional limits on landscaping for vacation homes or rural estates, demand offset requirements, conservation fees, dual plumbed systems for recycled supplies, dual plumbing for domestic and irrigation water meters.

[6] Obviously many factors can affect water use in unique land classifications. But generally if existing data is not available for similar uses, the unique use is likely a small contributor to the overall demand of the purveyor. For instance, in a vacation community, the purveyor should have ample access to data to establish usable demand factors. In a community with a new vacation development, the new demand likely represents a small portion of existing demand, so can be assessed using professional judgment extrapolating existing land-use factors.

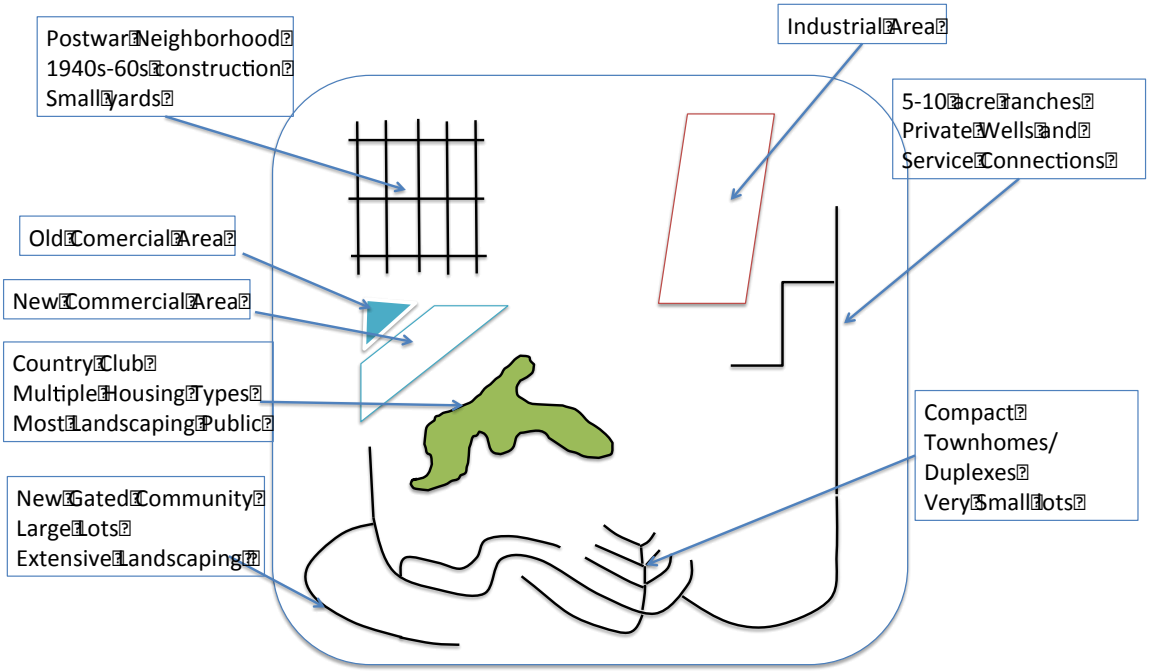
Section 3 – Implementation Examples

This section provides a few examples to illustrate the benefits of creating multiple land-use categories and unit demand factors.

3.1 Example "Water Supplier A"

Water Supplier A is located on the outskirts of a major metropolitan area. The community has existed for many years and benefitted from growth in neighboring industries resulting in significant population increases in the last couple decades. **Figure 3-1** depicts the key water demand sectors.

Figure 3-1: Water Supplier A's water demand sectors



Water Supplier A serves a mix of residential housing types, an industrial area, historic downtown commercial, new big-box commercial establishments, and a private golf course and country club with housing. In this example the residential demands comprise 80 percent of the annual water demands and are therefore assessed in more detail.[7] As shown in **Figure 3-1**, this example includes distinct residential classifications, including older postwar housing, ranches, townhomes, large estates, typical low-density new developments, medium density new developments, high-density new developments, and

[7] Generally, the detailed analysis of any land-use classification, whether residential, industrial, commercial, or agriculture is justified when that classification uses more than 20 percent of water delivered by the water supplier. Detailed analysis is also justified in small subsectors if a significant change in that sector is anticipated (e.g. an older section of town will be undergoing redevelopment).

a country club with distinct housing types. **Figure 3-2** displays a sample table that subdivides each unique residential land-use classification.[8]

Figure 3-2: Water Supplier A's residential classification table (example only)

Unit Type	Unit Count						Demand Factors						Demands					
	Current	2020	2025	2030	2035	2040	Current	2020	2025	2030	2035	2040	Current	2020	2025	2030	2035	2040
Ranches 2-10ac																		
Estates 5-2ac																		
Low Density 25-.5ac																		
Medium Density 1-.25ac																		
Old Housing Development																		
Townhomes																		
High Density																		
Large Country Club Housing Type A																		
Large Country Club Housing Type B																		
Large Country Club Housing Type C																		

Some key features of this table to note are (1) categorizing by residential type, (2) tracking the number of dwelling unit changes over each time increment, (3) the inclusion of demand factors, and (4) the tracking of demand factors by year.

1. Categorizing by residential type allows the total demand to be subdivided so that no single residential type masks important demand characteristics of other types (e.g. the older homes demand factors are not inadvertently higher due to influence of the country club housing, which may have greater per-unit use). Lot size is typically the driver of water use as landscaping is the largest annual household demand for single-family homes. Another example illustrating the value of sub-categories is the ability to account for varying population or homeowners association controlled landscaping. For instance, consider that "Housing Type A" in the country club is the same size as the typical "low density" new developments. But if the country club is an age-restricted community and has front yard landscaping controlled by a homeowners association (HOA), water demands per unit may be measurably lower than other similar size residences – due to few people per house and more consistent irrigation management by the HOA.
2. Especially in service areas experiencing growth, the number of dwelling units added during each 5-year increment within each residential type becomes a critical component of understanding future demand – especially near-term future demand. By understanding which residential types may be added over time – by integrating information from land-use plans – the supplier can more closely

[8] One important addition to this sample table that is not shown in the sample table of Figure 2-2 is the inclusion of multiple columns to record unit demand factors. This allows demand factors for an existing land-use category to be modified over time to reflect anticipated affects of conservation measures, codes, ordinances, etc. For instance, assume the water purveyor has a toilet rebate program targeting older homes. The unit demand factors for the "Old Housing Development" could be lowered over the next 5 to 10 years from the "current" value (as determined through meter analysis) to reflect saturation of new toilets and other targeted conservation efforts – possibly reducing the demand factor by 10% or more.

anticipate and evaluate water supply circumstances. Since the UWMP is updated again in 5 years, the emphasis should be on the near-term growth, while using mid-term growth to help plan infrastructure needs and supply augmentation (if necessary). Further, by separating the "existing" residential units, the water supplier can apply unique demand factors for new homes (likely much lower than existing homes), while separately applying the affect of conservation measures to the existing units whose count generally does not change.

3. Demand factors are derived from the result of meter analysis, as used directly for existing homes, and used as a baseline from which to adjust for new homes. As discussed previously, the ability to uniquely characterize the demand for separated residential types provides the water supplier a more accurate forecast of demands into the future, helping track GPCD objectives and adjust where conservation efforts are targeted.
4. Tracking of demand factors over time allows for the affect of conservation measures to be recognized. An example of this might be in the old part of town. If the water supplier has yet to complete meter installation on the legacy housing, demand factors could reasonably be dropped by 20% (or appropriate expected value) in 2025 to account for full meter implementation in the next ten years. For example, the existing unit demand factor could be 0.5 acre-feet per house per year (af/du/yr), which is listed under "current" in the table. The supplier anticipates a 20% reduction in total use after meters are fully installed. Under the 2025 column, the demand factor for this land-use category would show 0.4 af/du/yr. The reduction in future demand would automatically be reflected for 2025.

For purposes of example, assume Water Supplier A has adopted an ordinance that applies the new Model Water Efficient Landscape Ordinance (MWELO) provisions – but not more.[9] The MWELO provisions will require the new planned gated community with large lots (see Figure 3-1) to significantly restrict the installation of turf. As a result, each new dwelling unit will have a much smaller water demand than the same size unit in the existing country club area. Thus, the demand factor for these new large-lot residences would be lower than the demand factor for the existing large lots within the country club. Further, assume that Water Supplier A has offered a cash-for-grass program throughout its service area. Participation is strong within the housing development and is expected to reduce the average demand for housing in this category. Water Supplier A can reflect these changes by adjusting the 2020 through 2040 demand factors as appropriate for each category, resulting in a more accurate projection of future demands.

To understand the potential rate of growth for the new large-lot development, Water Supplier A looks to the local land-use planning agency's adopted documents – such as a development specific plan, or simply a general plan – and can directly incorporate or

[9] While a water supplier can adopt ordinances to mimic or expand the MWELO to which they can assure compliance, the local land use agency has authority to enforce compliance with the MWELO.

adjust growth rates and housing absorption schedules. Further, Water Supplier A may already have prepared a Water Supply Assessment (per CWC Section 10910 et seq.) that identifies the anticipated phasing of the new development. [10]

By separating the residential types, Water Supplier A can better understand the affects of various codes, ordinances, and applicable land-use plans on its available supplies and make adjustments as necessary to assure compliance with its 2020 GPCD targets.

3.2 Example "Water Supplier B"

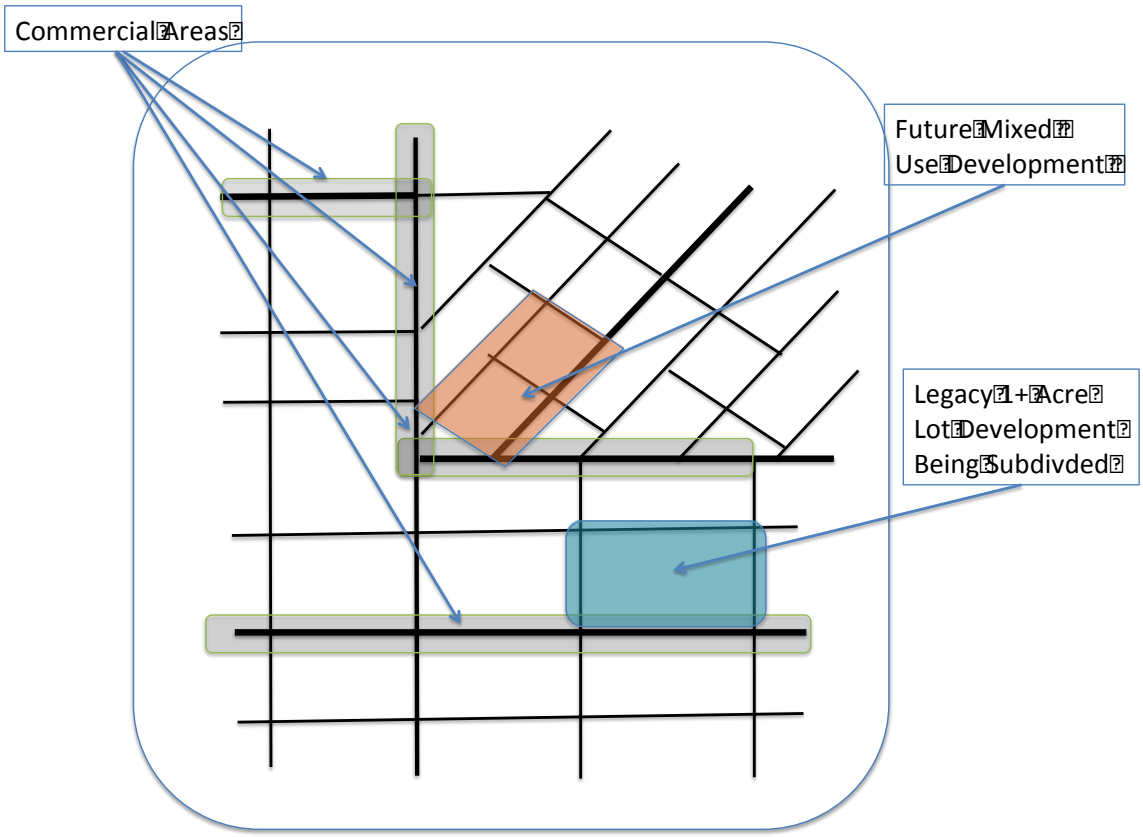
Water Supplier B is located in a major metropolitan area, and though once only a suburb, it is now considered a borough with urban area completely surrounding it. The community has existed for many years in its current state and population has remained steady in the last couple of decades with growth focused on redevelopment of existing areas. Similar to Water Supplier A, water demand is driven significantly by residential demands. Below is a graphic depicting the key water demand sectors.

Much like Water Supplier A, subdividing the residential types provides more useful information in terms of planning. Key changes coming in Water Supplier B's service area include a new commercial re-development that will turn an area of single-story strip malls into multi-story mixed use units with condos/townhome above and walking friendly ground floor commercial and courtyards. Another change will focus on subdividing a legacy development, shifting from generally small homes with nominal landscaping on 1-acre or greater lots to ½ acre estate housing with extensive landscaping and large homes.

Through the use of the expanded table, it is noted that both redevelopments will increase population numbers. The 2010 UWMP prepared by Water Supplier B accounted for this and was estimating the increased population to drive GPCD down – as a result of applying the 2020 target GPCD to all the population. By undertaking an analysis for its 2015 UWMP using unique demand factors for each residential type, Water Supplier B discovered total water use was higher than previously projected – driven mainly by higher than anticipated use at the new estate housing. When translated to GPCD, Water Supplier B realizes it may now miss its 2020 target GPCD.

[10] The water purveyor should evaluate the date and assumptions of land planning documents to understand whether they reflect older trends – whether build-out rates or lot sizes – which may reasonably be updated. For instance, a General Plan completed in the early 2000's likely reflected a trend toward large-lots single family homes and rapid growth (as was being experienced at the time). Current development projects, while again seeing growth trends, are trending toward more dense single-family housing and slower growth rates than may have been assumed a decade ago.

Figure 3-3: Water Supplier B's water demand sectors



As a result of this analysis, Water Supplier B considers significantly increasing its water conservation programs – targeting the existing customers – and considers placing additional landscaping restrictions on the new estate housing that exceed the state's MWELO. After adjusting the unit demand factors and reassessing overall water demand for these considerations, Water Supplier B feels confident its 2020 GPCD targets will be met and embarks on formally adopting new ordinances to affectively achieve compliance.

Section 4 – Additional Useful Information

As discussed in the previous sections, developing unit water demand factors for various land-use classifications is essential to understanding current customer use characteristics and to forecast future water demands. As allowed by the statute, a purveyor may voluntarily reflect codes, standards, ordinances or transportation and land use plans in its forecasted water demands. Incorporating these into future unit demand factors – to include in tables such as sampled in Figure 3-2 – requires a purveyor to make adjustments to baseline demand factors determined through the assessment of meter data. There is no standard formula to accomplish this task. Rather, a purveyor is essentially left to professional judgment, a discretionary action that will be supported by DWR during review of UWMPs. This section provides guidance that assist with that judgment.

4.1 Applicable State Codes and Ordinances

Standard rules do not exist for reflecting the benefits of state codes and ordinances on future unit water demand factors. However, in combination with sound professional judgments, the following guidance is offered:

1. Model Water Efficient Landscape Ordinance (affective December 1, 2015) – Although the resulting water demand from application of the MWELO to various defined land-uses (e.g. large-lot versus small-lot residential units), the new ordinance is projected to reduce typical residential landscape demands by about 20% from the estimated demand using the prior ordinance provisions. Commercial landscapes may reduce water demands by about 35% over the prior ordinance.
2. California Energy Commission Title 20 appliance standards for toilets, urinals, faucets, and showerheads – The appliance standards determine what can be sold in California and therefore will impact both new construction and replacement fixtures in existing homes.
3. CALGreen Building Code - The CALGreen Building Code requires residential and non-residential water efficiency and conservation measures for new buildings and structures that will reduce the overall potable water use inside each building and structure by 20 percent.[11] The 20 percent water savings can be achieved in one of the following ways: (1) installation of plumbing fixtures and fittings that meet the 20 percent reduced flow rate specified in the CAL Green Code, or (2) by demonstrating a 20 percent reduction in water use from the building "water use

[11] Temporarily, the Code also addresses the outdoor landscape efficiency improvements sought by the Governor's Drought Executive Order of April 1, 2015 (EO B-29-15), which directed the MWELO be updated. Once the new MWELO takes affect December 1, 2015, this portion of the CalGreen Code will be modified to reflect the new MWELO. Currently, a minor difference exists in one of the calculation factors, but that will be rectified once the new MWELO is effective. [http://www.documents.dgs.ca.gov/bsc/2015TriCycle/BSC-Meetings/Emergency-Regs/BSC-EF-01-15-ET-Pt11.pdf]

baseline." The practical representation of the savings in unit water demands from this code would be to reduce indoor baseline unit demands for recently constructed residential units downward by 2% to 5%, though this may be redundant with any reduction already represented by the Title 20 appliance standards.

Overall, a water purveyor retains discretion to reflect these conservation savings as deemed appropriate for its circumstances. If baseline unit demand factors for existing land-uses are used as a basis, these State codes and ordinances will, at a minimum cause a reduction from the baseline. Experimenting with the sensitivity of overall forecast demands by modifying the affect of all these factors can help a purveyor assess likely 2020 GPCD conditions, the value of existing conservation efforts, and the need to potential make adjustments prior to the next UMWP update.

4.2 Examples of Applying Local Ordinances and Conservation Programs

Standard rules do not exist for reflecting the benefits of local ordinances on future demand factors. However, through assessments of selected meter data, use of readily available studies and reports, sound professional judgments can be made. Overall, the anticipated reduction in unit water demand factors for specific land-use classes needs to consider the existing circumstances (e.g. age of home, cost of water to customer, and local demographics). Though current extreme efforts to manage demand during the 2015 drought crisis indicate reductions in excess of 20% or even 30%, the actual long-term savings for existing residential users may be much less. Absent a more thorough assessment, a water purveyor may conservatively assume existing residential customers reduce unit demands by 5% to 10% over the forecast timeframe. More sophisticated analysis to support reductions can be undertaken, however, using available guidance from existing reports. Consider these examples:

1. Turf replacement – with several water purveyors throughout the state implementing these programs over the past several years, data to guide anticipated savings is readily available. As noted in a recent California Urban Water Conservation Council Study (CUWCC),[12] not all programs achieve success, with savings dependent on the design of the program. Before and after meter data can be helpful in providing guidance as to expected long-term benefits to unit demand factors.
2. Fixture and appliance rebates – to an even greater extent than turf replacement, fixture and appliance rebates have been on-going for many years – with varied success. Again the CUWCC has useful assumptions that can be made on a fixture-by-fixture basis,[13] but the water purveyor will need to extrapolate this to

[12] Turf Removal and Replacement: Lessons Learned; March 2015; California Urban Water Conservation Council [http://www.cuwcc.org/Resources/Publications-and-Reports].
[13] https://www.cuwcc.org/Resources/Conservation-at-Home-and-Work/Smart-Rebates-Program

match anticipated participation rates and ultimate reductions in the various unit water demand factors.

3. Natural Replacement – even absent targeted conservation programs, existing water users will generally experience a reduction in unit water demands over time as fixtures and appliances are replaced and conservation ethics continue to be embodied – this is considered natural replacement. For instance, absent a rebate residential customers will purchase new clothes washers over time, likely replacing an inefficient appliance with one meeting today's state appliance standards. Care must be taken, however, to make sure the acceleration of replacement intended through rebate programs is not double counted with natural replacement.

In addition to specific conservation programs, the water purveyor or land-use agency may have other specific ordinances that will affect unit demand factors. Most of the time, these will need to be reflected in unit demands for future land-uses (e.g. the anticipated homes and commercial establishments occurring in the next 5 or 10 year increment). Examples of local ordinances include expansions beyond the State's MWELO, adding turf percentage limits, turf square footage limits, native area landscaping or open space requirements, more strict irrigation limits, stricter water budgets, and native only or xeriscaping requirements.

The CUWCC, the Alliance for Water Efficiency, and other conservation-oriented advocacy groups offer many tools to assist water purveyors.[14]

4.3 Using Standardized Values

DWR prefers the use of actual purveyor-specific meter data as the best source for baseline demand factors. However, some future land-uses, especially those a predicted in the 20th year may not have detailed information beyond a general zoning designation of "residential" or "commercial." These land-uses may include large tracts of land designated in an adopted zoning map or may be nearer term projects not currently part of a purveyor's customer base (e.g. a hotel or particular industry). For these instances, water use data from a recently completed Specific Plan or possible Water Supply Assessment, may provide a standard value. Lacking any other data, a standard AWWA value or other common standard in the industry may be used as available.[15]

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[14] Examples of tools can be found at https://www.cuwcc.org/Resources/Planning-Tools-and-Models and http://www.allianceforwaterefficiency.org/Tracking-Tool.aspx. Membership in the organization is required to access the tools.

[15] Caution should be used when applying typical engineering standards to develop annual residential demands. These standards often represent a daily demand in gallons per unit for purpose of sizing infrastructure. Expanding to an annual value (multiplying by 365 days) could be misleading. Daily values can be useful, however for estimating commercial and industrial uses, as these uses tend to be stable throughout most of the year (e.g. office building, retail center, shipping warehouse, etc.)

4.4 Recognizing Trends in Land-Use Planning

As noted earlier, when using land-use or transportation planning documents to help define future land-use classes, the time-relevance of those documents needs to be considered. For instance, a General Plan completed prior to 2005 likely reflected the trend toward larger lots and rapid build-out – matching the conditions of the late 1990's. Today, however, land-use agencies are promoting trends to more dense residential developments, mixed uses, and slower growth. Developers are responding with combinations of compressed densities but also with large homes on smaller lots. The affect of this latter trend is significant reductions in outdoor landscaped square footage – as the house and hardscapes cover most of the lot. This translates to lower unit demand factors when compared to what might have otherwise been reflected under existing land-use documents – even if the result is more dwelling units, as the indoor demands are typically less than the previously projected outdoor demands for the larger lots.

Ideally, incorporating land-use and transportation planning documents provides an opportunity for the water purveyor and local land-use agency(ies) to coordinate on trends, applications of ordinances (e.g. the state or local MWELO), and anticipated growth rates. Improved coordination also allows the 2015 UWMP to be a useful resource to land planning agencies that may be updating General Plans or evaluating specific development proposals.

4.5 Including Citations

As required in the statute, a water purveyor must "*Provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections"* or otherwise note the absence of estimated savings from its water use projections. Citations can easily be included by simple reference to an ordinance or basis of a calculation, or the source of land-use information (e.g. from 2005 General Plan for City A). Appropriately citing sources and methods will allow a water purveyor to easily revisit approaches and assumptions made in the 2015 UWMP when it is undertaken the 2020 UWMP.

Section 5 – Conclusions

To enable the most reasonable representation of codes, standards, ordinances or transportation and land use plans within 2015 Urban Water Management Plans (UWMPs), water purveyors are strongly encouraged to transition to land-use based demand projections. Further, land-use based demands should separate existing customer demands from those anticipated in each of the 5-year forecast increments.

Water purveyors should view the 2015 UWMP as an opportunity to garner a better understanding of whether 2020 GPCD targets will be met. And, if there is a risk of not achieving this, identify where to focus near-term conservation efforts to achieve success. Working with only per-capita and population-based values, including basing forecasts on assumed successfully reaching the GPCD target, can mislead a water purveyor into a false sense of success.

Importantly, while this statute is voluntary, a water purveyor must indicate in its 2015 UWMP when its forecasts do not reflect any representation of water savings from codes, standards, ordinances or transportation and land use plans, as required by CWC 10631(e)(4)(B)(ii).

Finally, the concept of disaggregating demand and associating it with land-use classes is understandably a highly technical process. But as has been acknowledged by others, the degree of disaggregation and associated effort may only add incrementally to the understanding of demand characteristics or to the accuracy of demand forecasts. Even simply taking the first step to create separate demand factors for existing land-uses from those for new land-uses will provide significant planning utility to a water purveyor.

Appendix L

DWR Water Audit Manual

1 INTRODUCTION

1.1 What is the AWWA Water Audit?

The water audit is an accounting exercise that is conceptually similar to a financial audit. Whereas a financial audit tracks all sources and uses of funds for an organization, a water audit tracks all sources and uses of water within a water system over a specified period. By answering the following questions, the exercise can help reveal and clarify inefficiencies in water delivery and revenue generation:

- How much water entered the system?
- How much water was used?
- For what purposes was water used?
- How much water was lost?
- What types of water loss occurred?
- What was the financial cost of water losses?
- What was the volume of non-revenue water?
- What was the financial cost of non-revenue water?

Most utility operators recognize leakage as a form of water loss. Less widely appreciated are water losses due to metering inaccuracies, unauthorized consumption, and data handling errors, which are collectively termed "Apparent Losses", also known as "paper losses".

The AWWA Water Audit methodology is consistent with that developed by the International Water Association (IWA) Water Loss Task Force, of which AWWA was a participating member. The effort drew from the best practices of various approaches to water auditing to develop a universal, standardized methodology that can be applied to any water distribution system.

"What about Unaccounted-for-Water?"

The concept of unaccounted-for-water has been formally abandoned by AWWA as an effective tool for managing system losses due to its unreliable application and inconsistent definition. As you will see throughout the process of completing the AWWA water audit, ***you can account for all volumes of water, including water losses.*** *Upon doing so, you can refer to valuable performance indicators that more accurately describe system performance. These are discussed in detail in*

1.2 Why Perform a Water Audit?

1.2.1 *Utility Motivations*

A water audit evaluates the quality and efficiency of operations. It can answer questions such as:

- How much water fails to generate revenue? How much revenue is lost as a result?
- What are the volumes of the various components of non-revenue water—how much is attributable to leakage, customer meter error, unbilled consumption, and data handling errors?
- How much leakage does your system experience, and how does that compare to what could be expected from your system? What is the cost of leakage?
- How accurate are the master meters upon which your water production and import volumes are based? What is the cost of such inaccuracy?

An AWWA audit is an excellent way to understand your water losses. Once you understand your water losses, you can devise and implement strategies that result in the following improvements in:

- Water resources management—by reducing water waste, thereby maximizing the value of existing sources and reducing the need for new sources.
- Financial performance—by optimizing revenue recovery, improving ratepayer equity, reducing wasteful operating expenses, and reducing the need for costly capital expansion.
- Operational performance—by improving understanding of the distribution system, reducing service disruptions, and generating reliable performance data.

The benefits above can improve relations with the public—both ratepayers and members of the financial community, such as rating agencies. In sum, a water audit and the management of water losses can facilitate a broader adoption of more goal-oriented, metric-driven, financially-sensible, and publicly-accountable practices.

1.2.2 *Statewide Context*

Beyond the internal reasons to perform a water audit, there is increased regulatory pressure to manage water efficiently, including the following developments:

- In November 2009, the California Legislature passed SB X7-7, which set a statewide goal of reducing urban per capita water use by 20% by 2020, and requires urban water suppliers to set water use targets.[i]
- California State Senate Bill 1420 was signed into law in September 2014, requiring urban water suppliers to include a water loss audit as part of their Urban Water Management Plan.[ii]
- In spring of 2015, Governor Brown mandated a 25% statewide reduction in urban water use. To achieve this reduction, individual water suppliers have been issued conservation mandates of between 8% and 36%.

Water auditing is the basis for effective water loss control, which can help utilities achieve these regulatory standards. Additionally, efficient management of water losses can help utilities meet the challenges posed by increasing water costs and water scarcity.

1.3 How to Use This Manual

This manual is intended to help water utilities complete the AWWA Water Audit on an annual basis, which shall be submitted to the Department of Water Resources every five years along with their respective Urban Water Management Plans.

The manual is meant to be clear, logical, and consistent with AWWA water audit methodology.

The manual proceeds as follows:

- Chapters 2 and 3 introduce the concept of the water audit and how to approach it.
- Chapters 4 and 5 show you how to complete the water audit using the AWWA Water Audit Software.
- Chapter 6 provides information on how to interpret the results of the water audit, including performance indicators.

Important: *While the DWR requires submission of annual water audits at five year intervals, it is imperative that utilities actually complete the audit on an annual basis, for the following reasons:*

- *To protect against loss of historical data and the understanding of historical data.*
- *To build the organizational capacity to accurately complete the water audit.*
- *To utilize the annual water audit as a basis for management decisions.*

It is recommended that you proceed in the order that the manual is written, which follows the general flow of the water audit methodology.

2 Introduction to the Water Audit Methodology

2.1 The Water Balance

The heart of the water audit is the water balance, which is a graphical and intuitive representation of the water audit. Figure 1 presents a simplified version of the AWWA water balance.

For the time being, do not worry about the definitions of all the terms in the water balance, which will be discussed later. For now, the important thing is to grasp the methodology behind the water balance.

Each box represents a specific category, or "volume", of water. For example, Water Supplied represents the total volume of water that entered the water system over a particular audit period for use within the distribution system. In the example shown in Figure 1, Water Supplied is 100 million gallons (MG).

By definition, each box is equal in volume to another box or boxes of equal height. For example, Water Supplied = Authorized Consumption + Water Losses (100 MG = 88 MG + 12 MG). Similarly, Revenue Water = Billed Metered Consumption + Billed Unmetered Consumption (84 MG = 82 MG + 2 MG). Boxes **need not** be next to each other to make comparisons. For example, Water Supplied = Revenue Water + Non-Revenue Water (100 MG = 84 MG + 16 MG).

Keep in mind that the sizes of the boxes in the water balance **do not** correspond to the actual volumes they represent.

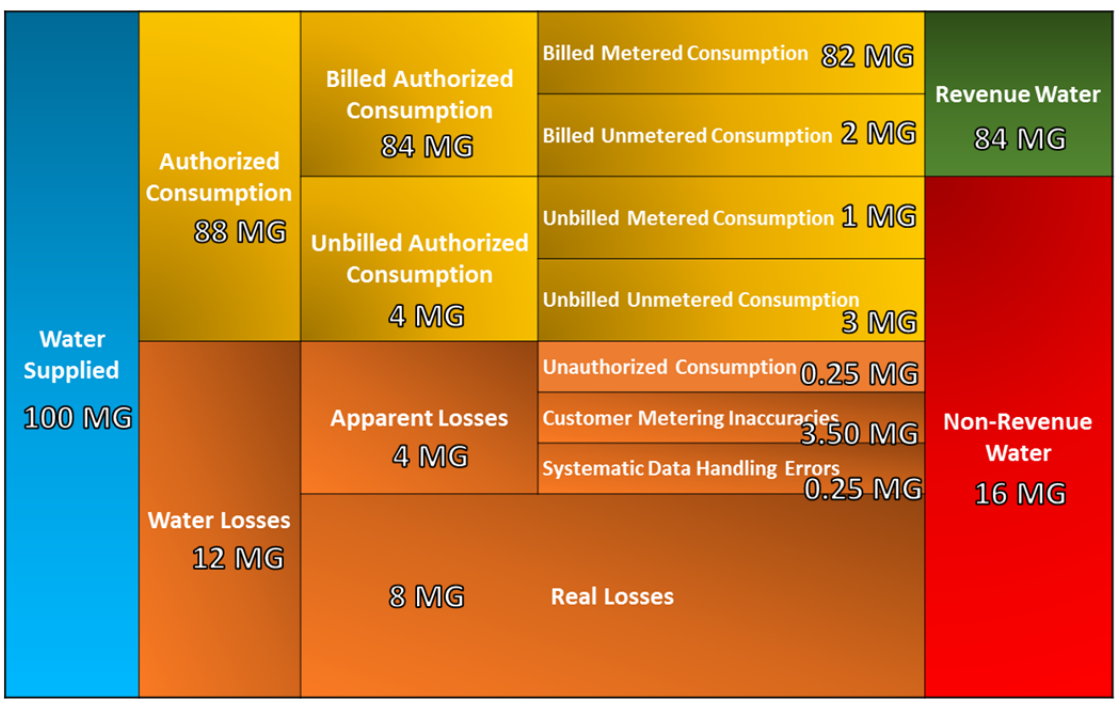


Figure 1[1]

[1] Volumes for "Leakage on Transmission and/or Distribution Mains", "Leakage and Overflows at Utility's Storage Tanks", and "Leakage on Service Connections" (components of Real Losses) are not presented here, because these determinations are not part of the AWWA Water Audit software methodology.

The exercise below helps you understand the methodology behind the water balance without yet having to consider the complexities of your own system.

Exercise: Based on the information provided in Figure 2, determine the volumes for the categories that are in ***black italicized*** font.

(Hint: Water Losses = Water Supplied – Authorized Consumption)

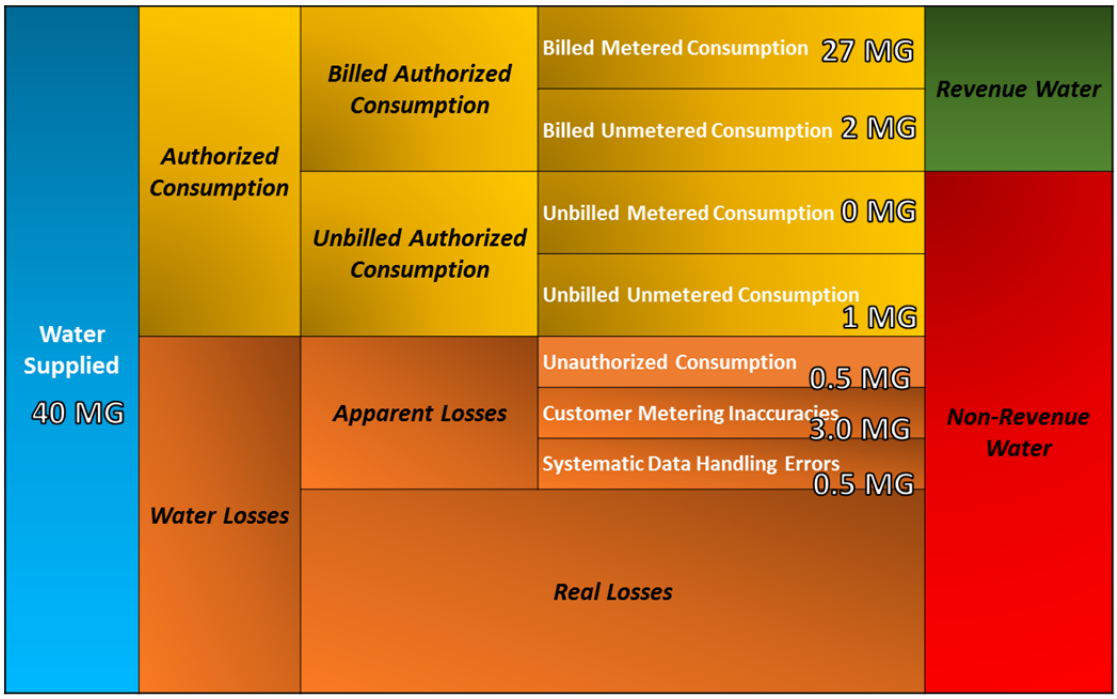


Figure 2

Answers are provided in Section 2.4.

2.1.1 *The Process of Deduction*

As you may have noticed, some volumes are simply sums of other volumes. For instance, Authorized Consumption is the sum of Billed Authorized Consumption and Unbilled Authorized Consumption. However, Water Losses and Real Losses are *deduced,* or *derived*, volumes—in other words, volumes that are calculated through a process of elimination:

- Water Losses are calculated by subtracting Authorized Consumption from Water Supplied.
- Real Losses are calculated by subtracting Apparent Losses from Water Losses.
- Since Water Losses and Real Losses are derived volumes, they are not entered by the auditor. The AWWA software will automatically calculate them based on the information entered in other portions of the water balance. (The software will be discussed in detail at a later point).

A primary outcome of the water audit is the determination of the volume of Water Losses and Real Losses. However, since these are derived volumes, they are only as accurate as the accuracy of the other volumes informing the calculation.

For example, the volume of Water Losses and Real Losses in Figure 2 were respectively determined to be 10 MG and 6 MG. However, if the volume of Water Supplied was not 40 MG but actually 42 MG due to source meter inaccuracy, then the respective volumes of Water Losses and Real Losses respectively be would be 12 MG and 8 MG.

This is all to say that *an accurate determination of Water Losses and Real Losses relies upon the accuracy of the other volumes of the Water Balance.*

2.2 Performance Indicators

As discussed in the previous section, a complete water balance provides the following pieces of important information:

- Volume of Water Losses: The difference between Water Supplied into the system and Authorized Consumption.
- Volume of Apparent Losses: “Paper losses”, the non-physical losses associated with water delivered but not measured or recorded accurately.
- Volume of Real Losses: Physical leakage.
- Volume of Non-Revenue Water: Water that fails to generate revenue to the utility.

While this information is certainly helpful, the water balance in itself is of limited value for comparing management of water losses between systems and over time. You may ask why you could not simply calculate percentages for each volume (e.g. Real Losses as percent of Water Supplied) as a means of evaluating performance. The reason is that percentages can be very misleading as measures of performance, particularly with respect to evaluating leakage. (See Appendix B: Limits of the Use of Percentages as Performance Indicators for a discussion of this.)

For this reason, the AWWA water audit utilizes specific performance indicators that provide additional meaning to the water balance. These performance indicators are presented in Section 6.

2.3 Applicability of the Water Audit to Wholesale Water Agencies

Wholesalers face distinct operating conditions from retail agencies. For example, the instance of water theft experienced by a wholesaler is presumably less than a retail agency, because a wholesaler has only a limited number of customer connections and has infrastructure that is less vulnerable to theft. Nonetheless, *the methodology of the water balance,* which is based on a simple mass-balance framework, remains applicable.

However, the *performance indicators* referenced in the previous section were designed for retail distribution systems, and are of limited value when evaluating performance of wholesale supply systems, in particular:

- *Real Losses per Service Connection per Day:* This performance indicator is meaningful only in systems that feature a service connection density of greater than 32 connections per mile, and thus is deemed not applicable in systems of 32 connections per mile or fewer. Since wholesale suppliers typically feature a small number of service connections, it is expected that this performance indicator would not apply. Consequently, Real Losses per Service Connection per Day per PSI would also not apply. Instead, Real Losses per Length of Main per Day would be the more appropriate indicator.
- *Infrastructure Leakage Index*: This performance indicator is based on a calculated allowance of leakage designed for retail distribution systems. It is not a useful metric for evaluating wholesale water systems.

2.4 Answers to the Introductory Exercise

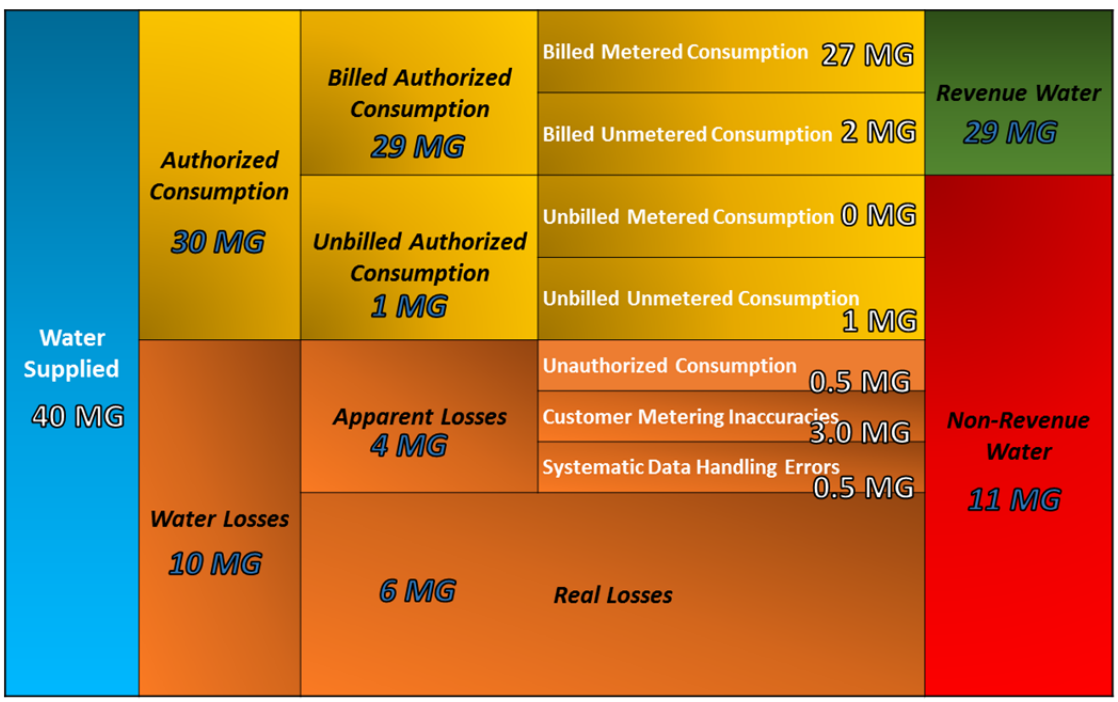


Figure 3

3 How to Approach the Water Audit

While the water audit is at its basic level a formulaic procedure, the quality of the water audit – and therefore its usefulness—is entirely dependent on the quality of data. Anybody can fill out a water audit, but to complete a water audit that is *meaningful* and *useful* typically requires particular habits. The following recommendations are valuable for the compilation of a high-quality audit.

3.1 Responsibility

It is advised that there be a dedicated person who is responsible for completion of the water audit. This person should be someone who has a general understanding of how the utility operates and, most importantly, is able to work with the appropriate people from all relevant departments to gather the necessary information. This person should have at least basic proficiency with Microsoft Excel and data management, since the water audit will be completed using Excel-based software and requires compilation of data.

While it is recommended that one person be responsible for the completion of the water audit, it is also advised that all pieces of submitted information be subject to scrutiny from multiple sets of eyes. This will ensure that information is complete, relevant, and accurate. Additionally, such sharing of information will often raise important questions that may have been overlooked by any one person. It is recommended that the utility set up an internal water audit task force or working group that includes knowledgeable staff from the relevant departments responsible for providing audit data.

3.2 Transparency

By definition, an audit sheds light on organizational practices. As such, utilities will often discover aspects of their operations that had previously gone unnoticed. Sometimes these findings will be discouraging. Nonetheless, the completion of an accurate and meaningful audit requires an organizational commitment to a culture of transparency. Without such a commitment, the quality of data is questionable and the accuracy of the audit suffers. Thus, it is important that the utility facilitate an open environment where data and operations can be discussed critically and candidly.

3.3 Continuous Improvement

Water auditing is not a one-time event, but a *continual process*. The important thing is not that the water audit be perfect—no audit ever will be—but that the process of performing the audit be treated as an opportunity for continuous organizational improvement. As mentioned previously, utilities may encounter previously unknown issues or run into the limits of their own knowledge of the system. For instance, utilities may ask themselves questions like “How do we know how accurate our customer meters are if they haven’t been thoroughly tested in the last 10 years?” or “What master meter testing procedures does our wholesaler follow?”

The water audit should not be seen as a one-time exercise to find errors and faults, but rather as an important means by which a utility may continually assess and improve upon current practices.

3.4 Skepticism

In order to achieve the highest possible degree of accuracy of the audit, those involved in its completion should ask the following questions with respect to the information that is gathered:

> ***Is it relevant/representative?*** Does the information reflect what is actually being requested? For instance, when calculating Billed Metered Consumption, a utility should make sure to exclude consumption of recycled water by customers, since recycled water does not belong in a potable water audit.
>
> ***Is it complete?*** Does the data fully answer what is being requested? For instance, does a customer consumption report include consumption by all accounts, even if those accounts were marked as inactive?
>
> ***Is it accurate/reliable?*** How trustworthy is the data, and how do you know? For instance, a utility may calculate the volume of water entering the system based on an input meter (also known as a source meter or master meter) with known accuracy issues. If that is the case, the data should be corrected for known error or qualified. Even if a utility is not able to correct for specific volumes that have known accuracy issues, it is important that such issues be documented for data validity evaluation and guidance of future improvement efforts.

3.5 Pragmatism

While data accuracy is essential in the completion of any audit, you should be pragmatic about how you focus your time. The use of staff time should be prioritized in accordance with the potential impact of inaccuracy for a particular volume or category. In other words, inaccuracies for the larger volumes of water such as Water Supplied and Billed Authorized Consumption will have a far greater impact than inaccuracies for presumably smaller volumes such as Unauthorized Consumption (water theft). Here are a few ordinary examples of pragmatism at work:

- Given limited staff resources, it would be of greater value to spend time evaluating master meter accuracy than to try to perfectly account for consumption by the Fire Department, since the former volume will have a potentially large impact on the water balance, while the latter presumably will not.
- Given limited staff resources, it would probably be of greater value to spend time conducting customer meter tests for the sake of calculating customer meter error than to deploy staff in search of water theft, since the former volume will have a potentially large impact on the water balance, while the latter presumably will not in most utility environments.

3.6 Time

Lastly, a water audit can take time. Even though the audit requires only a limited number of fields to be completed, the process of compiling, validating, and analyzing information can take a significant amount of time, particularly in complex water systems. For this reason, it is advised that you start early and tackle the audit in manageable parts.

By following these recommended practices, utilities will be able to get more out of performing the water audit.

4 Overview of AWWA Water Audit Software

4.1 The AWWA Water Audit Software

California Senate Bill No. 1420 ("SB 1420") requires water utilities that submit Urban Water Management Plans to calculate annual system water losses using the water audit methodology developed by the American Water Works Association ("AWWA").[iii] SB 1420 requires that utilities submit these audits every five years as part of their respective Urban Water Management Plans.

To facilitate user-friendly and consistent water auditing practices, AWWA has developed the AWWA Free Water Audit Software, which is based on the principles of the AWWA M36 Water Audit methodology.[iv] Per Department of Water Resources guidelines, utilities should use this software to complete the water audit. The software is in the form of a Microsoft Excel workbook. At the time of writing, the most current version of the software is Version 5.0, which is available on AWWA's website.[v] Because the instructions and graphics in this guide are based on Version 5.0, it is recommended that utilities also use this version. At the time of writing, versions 5.0 and higher will be accepted by DWR for submission purposes.

Important: To access the AWWA Free Water Audit Software, you must register an online account on AWWA's website. The account is free and does not require AWWA membership.

Upon opening the AWWA Free Water Audit Software Excel spreadsheet, the user will notice that there are 12 worksheets. Don't be overwhelmed—only three of these worksheets require data entry, and two of those three require little information (the sheets titled "Instructions" and "Comments"). The other nine sheets serve a variety of functions, including presentation of performance indicators, the automatically-populated water balance, and helpful background information and definitions.

Sections 4 and 5 provide a guide to completing the sheets that require data entry. Other sheets will be discussed later in this manual.

4.2 "Instructions" Worksheet

The worksheet titled "Instructions" provides a general orientation to the software. This is also where basic audit information should be entered. Figure 4 shows the worksheet filled out for a hypothetical water agency, the "Gold Country Water District". This example agency will be used throughout this guide for illustrative purposes.

Cells within the software are color-coded in the following manner:

- A value to be entered by the user
- A calculated value based on data from other cells
- Contains a recommended default value

1 **Name of City/Utility:** It is important that you enter the same name that is listed in the DWR Urban Water Management Plan online submittal tool. This will allow DWR to properly aggregate data.[2]

2 **Year, Start Date, End Date**: Enter the appropriate water audit reporting period ("audit period") here. In the example, the agency has selected Financial Year 2015 as the audit period.

3 **Volume Reporting Units:** This is where you should select the units that your agency will be reporting in with respect to volumes of water. In the example, the agency has selected "million gallons" as the volumetric reporting unit.

4 **PWSID / Other ID:** At the time of writing, DWR is in the process of developing an identification system.

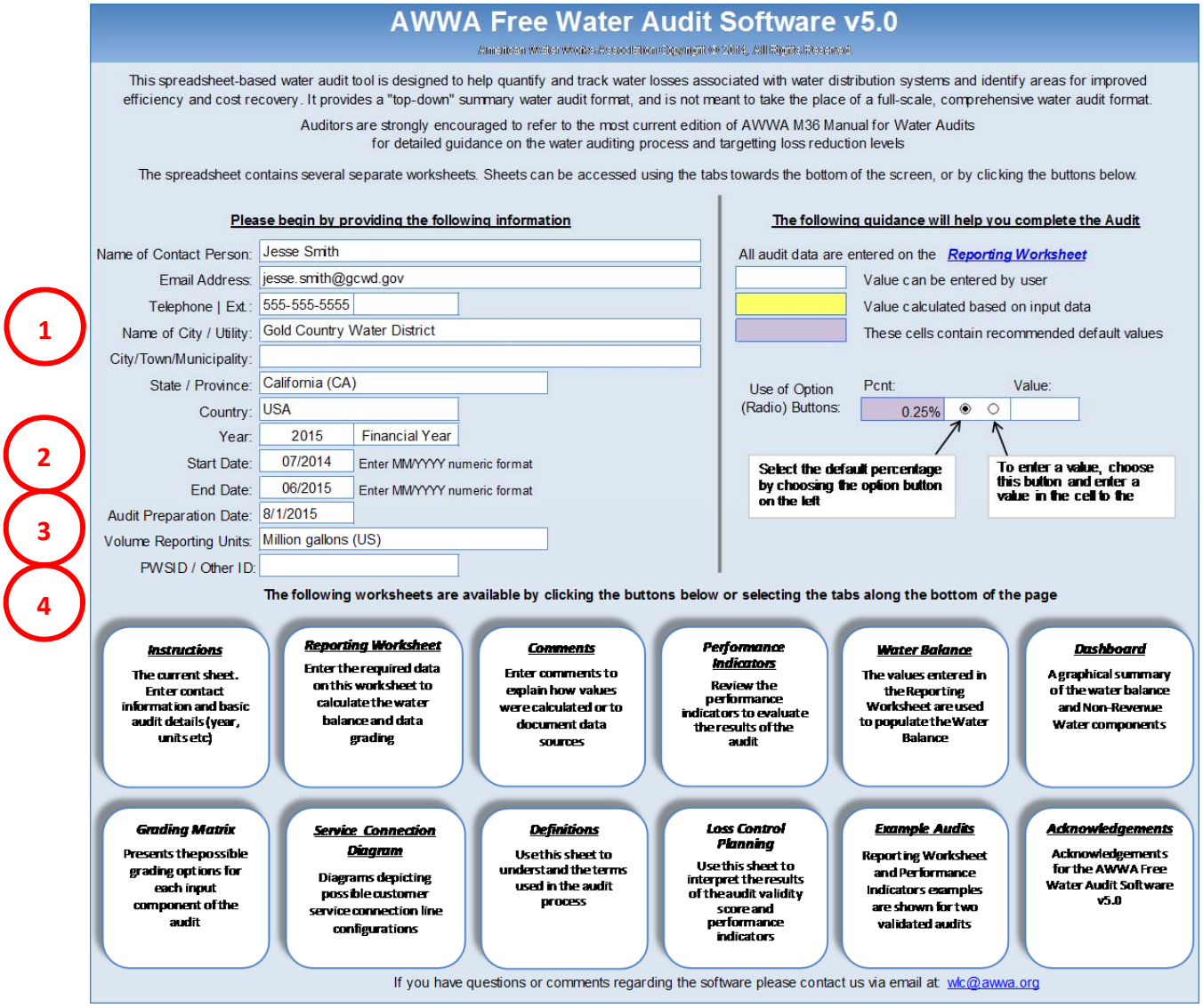


Figure 4

[2] http://www.water.ca.gov/urbanwatermanagement/dost/

4.3 "Reporting Worksheet"

This worksheet is where you should complete the water audit. The worksheet follows the general flow

> ***Important:*** Remember that the water audit pertains exclusively to the *potable* portion of a water system. Therefore, non-potable water volumes such as raw water and recycled water must be excluded. To produce accurate results, this needs to be consistently followed for all steps of the water audit, including determination of billed customer volumes.

of the water balance methodology.

There are three types of entries in the Reporting Worksheet:

- Entries that represent or impact **volumes of water**. These are discussed sequentially, beginning with Section 5. They are indicated in Figure 5 by the **blue arrows.**
- Entries that pertain to **Data Validity Scoring**. The concept of Data Validity Scoring is introduced immediately below and is remarked upon in further detail with respect to particular volumes of water in the ensuing sections. Data Validity entries are indicated in Figure 5 by the **red arrows.**
- Buttons that redirect you to the **Comments** Worksheet, where you can add comments with respect to specific pieces of data that you have entered. Comments can take note of sources of data and methodology to ensure consistency in future audits. You can click on the + to make a comment, as indicated by the **yellow arrows** in Figure 5.

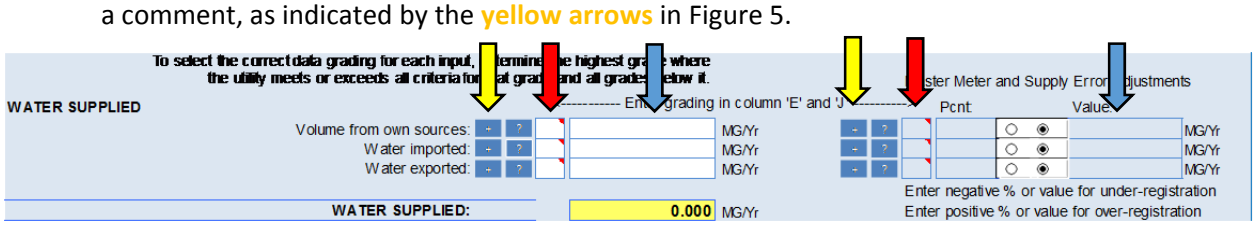


Figure 5

4.3.1 *Data Validity Grading: An Introduction*

The AWWA Free Water Audit Software helps you evaluate the validity of the audit by allowing you to grade each component of the water balance. The data validity scoring system describes the level of accuracy and reliability of each data entry contributing to the audit.

A detailed guide on how to grade each component is provided in the worksheet titled "Grading Matrix," and you should review this worksheet before assigning grades. Additionally, you can hover over individual data validity cells to reveal a shorthand guide to data validity grading for the respective category. While the Grading Matrix is very helpful, it cannot account for all of the particularities of individual California water utilities. As such, you will need to use a degree of discretion in assigning grades. *Remember that the purpose of the grading system is for utilities to be able to reflect upon their own practices in order to identify opportunities for improvement.* Thus, you should approach the data validity evaluation with a critical mind. **To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds <u>all</u> criteria for that grade and all grades below it.**

5 COMPLETING THE WATER AUDIT

5.1 Water Supplied

The determination of Water Supplied is the first step and the foundation of the water balance. Because Water Supplied is the largest volume in the water balance, error can have a large impact. Thus, it is critical that you be as thorough as possible in determining this volume.

> ***Water Supplied***: The volume of treated and pressurized water input to the retail water distribution system. [vi] Mathematically:
>
> *Water Supplied = System Input Volume – Water Exported*

It is advised that you collect Water Supplied data from meters that are located immediately at or prior to entry into the distribution system. For example, if faced with the choice of using flow data from either a water treatment plant influent or effluent meter, the effluent meter would be preferable (insofar as it is in good working order, because the effluent meter captures only the water that enters the distribution system (whereas the influent meter may also capture water used for operational purposes at the treatment plant, which is upstream of the distribution system).

An excerpt of the water balance is presented in Figure 6 below to illustrate the relationship between Water Supplied and other key volumes. Water Supplied is highlighted.

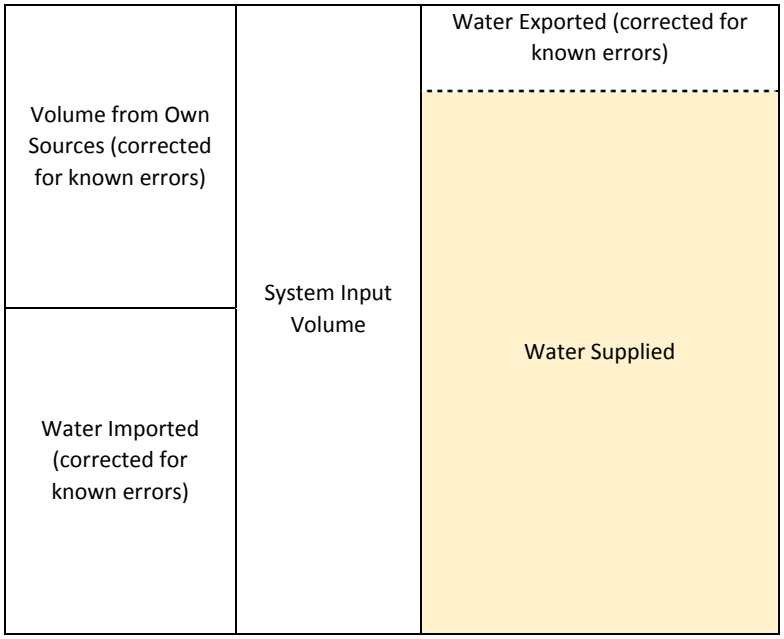


Figure 6

Volume from Own Sources: The volume of water withdrawn from water resources (rivers, lakes, wells, etc.) controlled by the water utility and then treated for potable water distribution. [vii]

Water Imported: Bulk water typically purchased from a neighboring water utility or regional water authority, which is metered at the custody transfer point of interconnection between the two utilities. [vii] Also known as "import", "purchased" or "wholesale" water. For California utilities, this could be water from the Metropolitan Water District ("MWD"), the State Water Project ("SWP"), the Central Valley Project ("CVP"), or any number of other wholesalers.

System Input Volume: The volume of water that is introduced to the water distribution system over the audit period. According to the AWWA M36 Manual, it is "the volume of water input to that part of the water supply system to which the water balance relates." [viii] Mathematically:

System Input Volume = Volume from Own Sources (incl. net changes in storage) + Water Imported

Water Exported: Bulk water sold to neighboring water systems that exist outside the service area. [vii]

Figure 7 shows the Gold Country Water District water system. GCWD's potable water comes from two wells, surface water, and treated imported water. Well water and surface water go to the water treatment plant prior to entering the distribution network. Flow volumes are metered as effluent from the treatment plant. Imported water enters the distribution network directly and is metered at the interconnection between the GCWD system and the neighboring system. GCWD exports some water to a neighboring agency, which is metered at the system interconnection.

As such, Volume from Own Sources consists of water from wells and surface water, which is cumulatively metered as treated effluent at the water treatment plant. Water Imported consists of imported water. Water Exported consists of export water to the neighboring agency. GCWD's auditor collected data for the audit period from the three relevant meters, indicated by the letter "M" in orange.

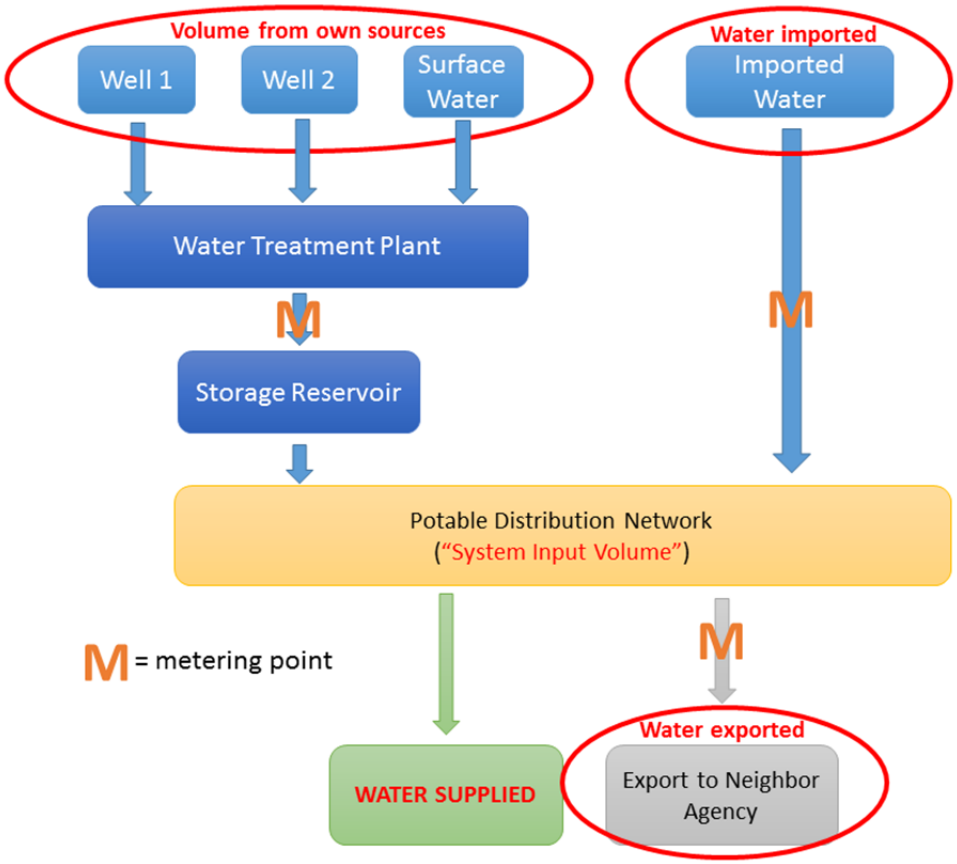


Figure 7

You may turn to a number of different sources for Water Supplied data. For example, your utility may have information from any number of the following sources:

- Monthly water purchases on bills from wholesalers
- Monthly groundwater extraction volumes on statements from groundwater-regulating agencies
- Manual meter readings
- SCADA meter readings

Ultimately, you will need to determine which data sources most accurately reflect the actual volume of water entering the distribution system and leaving as exports. This step can be challenging, and often requires the collaboration of a number of staff to devise the best approach. However, a thorough approach will pay off in the accuracy of the audit.

Note: Changes in Storage should only be accounted for if storage is located downstream of the metering points that are relied upon for Water Supplied data. If storage is upstream of those meters, then changes in storage will already be accounted for by the meters and will not need to be accounted for separately.

5.1.1 *Accounting for Changes in Storage*

Best practice is to account for changes in reservoir storage levels over the course of the audit period.[ix] If the volume of stored water increased between the first and last day of the audit period, then the change in storage represents a withdrawal of water from the distribution system. In other words, the increase

in storage represents water that was supplied into the system but then temporarily withheld from customer use. In this case, the absolute value of the volumetric change should be *subtracted* from the calculation of Water Supplied. The inverse is true: if stored volume decreased between the first and last day of the audit period, then the change represents an additional supply of water to distribution system, and the absolute value of the volumetric change should be *added* to the calculation of Water Supplied.

The AWWA Free Water Audit Software does not provide a separate field for Changes in Storage. As such, Changes in Storage be applied to either Volume from Own Sources or Water Imported, depending on the setup of the system.[ix] For GCWD, storage was calculated to have decreased by 18.850 MG between the first and last days of the audit period based on reservoir levels. Therefore, the auditor should *add* 18.850 MG to Volume from Own Sources, since it represents an additional supply to the distribution system.

It is a good idea to make a note of the specific volume of Changes in Storage that was applied to Volume from Own Sources, using the Comments feature.

5.1.2 *Compiling & Entering Water Supplied Volumes*

The auditor has compiled the following data for the audit period:

Note: Some utilities keep monthly records of changes in storage, in which case the storage changes over the course of the year-long audit period can be added together. Make sure that "+" and "–" signs are properly taken into account.

	VOLUME (MG)
Effluent from Water Treatment Plant	20,714.690
Decrease in Storage	18.850
Imported Water	17,975.104
Exports to Neighbor Agency	385.586

Table 1

Caution: At this point, do not take metering inaccuracies or data errors into account – these will be covered in the following section.

From the data, the auditor has calculated the following volumes:

Volume from own sources = 20,714.690 + 18.850 = 20,733.540 MG
Water imported = 17,975.104 MG
Water exported = 385.586 MG

Figure 8 shows the Reporting Worksheet given the information stated in the example.

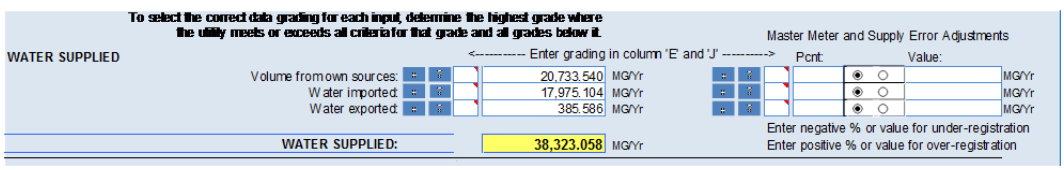


Figure 8

Every water system is unique, so you will have to consider the distinct setup of your own system when determining how to appropriately calculate Water Supplied. Nonetheless, this checklist can help you make sure that Water Supplied is accurately calculated:

- ✓ Did you account for all sources of water?
- ✓ Did you ensure that no water was mistakenly double-counted?
- ✓ Did you account for all exports of water?
- ✓ Did you make sure to exclude all non-potable water?
- ✓ Did you properly incorporate changes in storage, if applicable?

5.1.3 *Master Meter and Supply Error Adjustments*

This is where you should account for any known errors in master meters. Sources of error include meter inaccuracy (under- or over-registration) and data gaps caused by outages of the meter instrumentation.

Because every utility has a unique combination of master metering setup, testing and calibration procedures and data management processes, there is no uniform method for calculating master meter and supply error. You will have to use the available information and your best judgment. For example, GCWD has made the following adjustments, based on the available information:

- The effluent meter at the water treatment plant under-registered by an average of 1.2% in a test performed during the audit period. Using this percent error, the auditor determined the appropriate volume to enter into Master Meter Supply and Error Adjustments (see the sidebar "Calculating Meter Error Volumes").
- The imported water meter passed instrumentation calibration tests on two separate occasions, but staff is not aware of any volumetric or comparative tests that have been performed (see the note under the "Data Validity Grading" portion of this section for an explanation of the difference between instrumentation calibration and meter testing). In the absence of specific quantitative information, the auditor did not assign any volumes to Master Meter Supply and Error Adjustments, but took these uncertainties into account when assigning a data validity grading.
- The export meter over-registered by 0.5% in the most recent test. Using this percent error, the auditor determined the appropriate volume to enter into Master Meter Supply and Error Adjustments.

Because the AWWA Free Water Audit Software includes a single data field for the error associated with each component of Water Supplied (Volume from Own Sources, Water Imported, Water Exported), it is recommended that the auditor calculate the error adjustments on a separate spreadsheet, as shown in the example spreadsheet for GCWD below. This is especially true when data from multiple meters must be added together to determine a particular component of Water Supplied.

Calculating Meter Error Volumes

Given a known meter percent error, use the formula below to calculate the meter error volume:

$$u - \frac{u}{x}$$

Where u is the original, uncorrected metered volume

Where x is the tested **percent accuracy** of the meter (e.g. 98.8% means 98.8% accurate).[x]

		Uncorrected Metered Volume (MG)	Master Meter Accuracy	Master Meter Error and Supply Adjustment Volume (MG)
a	**Effluent from Treatment Plant**	20,714.690	98.8%	-251.595
b	**Decrease in Storage**	18.850	NA	NA
c	**Imported Water**	17,975.104	NA	NA
d	**Exports to Neighbor Agency**	385.586	100.5%	1.918
A = a + b	**Volume from Own Sources**	20,733.540		-251.595
B = c	**Water Imported**	17,975.104		0.000
C = d	**Water Exported**	385.586		1.918

Table 2

Important: In the AWWA software, a positive value or percentage entered in the Master Meter and Supply Error Adjustments section indicates over-registration, while a negative value or percentage indicates under-registration. Be careful not to overlook this key aspect of the software methodology—an oversight could have significant consequences on the accuracy of the audit. In the example, the auditor calculated the meter error adjustment volumes on a separate spreadsheet to ensure that the software would be filled out properly.

The auditor then filled in the AWWA Free Water Audit Software accordingly, as shown in Figure 9. Because the auditor calculated specific error volumes—not percentages—the "Value" button was selected, as circled in red.

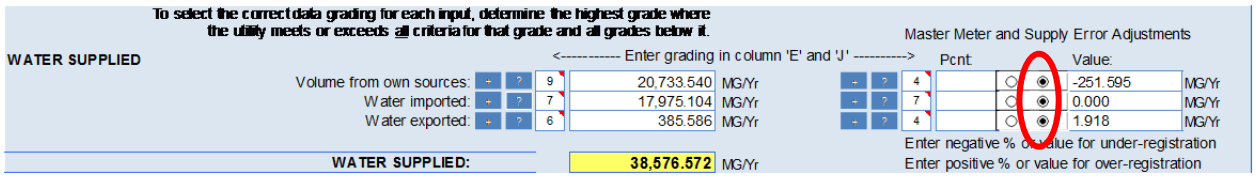


Figure 9

Data Validity Grading

It is recommended that you thoroughly review the Grading Matrix included in the AWWA Free Water Audit Software when assessing data validity associated with the various volumes making up Water Supplied. Below are some of the key considerations:

- Are sources of water metered?
- If so, are master meters tested and calibrated? How often? When was the nearest test and/or calibration with respect to the audit period?
- How accurate are the master meters (specifically, in percent error terms)?
- Were comparative or volumetric tests conducted, or solely calibration of the meters?
- In what format are the production volumes associated with Volume from Own Sources logged? By hand or electronically?
- How frequently is production data reviewed and, if necessary, corrected?
- How are changes in storage taken into account, if applicable? In what format are they logged, and how frequently?
- Is there a computerized system (e.g. SCADA) that automatically balances flows from all sources and storage? Is the computerized system calibrated with master meters to ensure minimal data transfer error?

Note: There is a notable difference between accuracy testing of the primary metering device and calibration of related instrumentation (e.g. a pressure differential cell). A meter test compares the test meter reads to either a reference meter or a fixed volume, while instrument calibration ensures accurate communication of the electronics of certain types of meters. While calibration of instrumentation is critical, it does not guarantee meter accuracy in itself.[xi]

5.2 Authorized Consumption

The determination of the volume of Authorized Consumption is the second major component of the

> ***Authorized Consumption:*** The volume of metered and/or unmetered water taken by registered customers, the water supplier, and others who are authorized to do so.[xii]

AWWA water balance. According to the AWWA M36 manual.

Figure 6 below shows the position of Authorized Consumption and its sub-components within the simplified water balance.[3]

<table>
<tr><td rowspan="10">Water Supplied</td><td rowspan="4">Authorized Consumption</td><td rowspan="2">Billed Authorized Consumption</td><td>Billed Metered Consumption</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="8">Non-Revenue Water</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="6">Water Losses</td><td rowspan="3">Apparent Losses</td><td>Unauthorized Consumption</td></tr>
<tr><td>Customer Metering Inaccuracies</td></tr>
<tr><td>Systematic Data Handling Errors</td></tr>
<tr><td rowspan="3">Real Losses</td><td>Leakage on Transmission and/or Distribution Mains</td></tr>
<tr><td>Leakage and Overflows at Utility's Storage Tanks</td></tr>
<tr><td>Leakage on Service Connections</td></tr>
</table>

Figure 10

As shown above, Authorized Consumption consists of Billed Authorized Consumption and Unbilled Authorized Consumption, which can be further divided into the following components:

[3] This manual uses the term "simplified water balance" to refer to the portion of the water balance that begins with Water Supplied (thereby excluding the presentation of Water Exported).

Billed Metered Consumption: Consumption that generates revenue, the volume of which is determined by a water meter.

Billed Unmetered Consumption: Consumption that generates revenue, the volume of which is determined by estimation or is not known.

Unbilled Metered Consumption: Consumption that does not generate revenue, the volume of which is determined a water meter.

Unbilled Unmetered Consumption: Consumption that does not generate revenue, the volume of which is determined by estimation or is not known. [xiii]

It is important to accurately distinguish amongst these categories because they directly inform your utility's understanding of revenue and non-revenue water. Additionally, the process of categorization can lead to valuable insights as to how to improve the reliability of data.

This guide proceeds by describing how to calculate the volumes associated with the four types of Authorized Consumption and provides examples to clarify how particular uses of water should be categorized.

Note: *It is best practice to keep track of the particular parameters and procedures that are followed to generate data, so that you can replicate the process year-to-year.*

5.2.1 *Billed Metered Consumption*

Billed metered consumption consists of all uses that generate revenue and are metered. In a utility where most of or all customers are metered, consumption by retail customers will comprise the majority of billed metered consumption, so it is imperative that you be thorough in the determination of this volume. Any errors introduced at this step will have a relatively large impact on the accuracy of the water balance and the calculation of real losses.

Work with your billing department to generate a customer consumption report that includes all classes of potable customers that provide revenue to the utility. It is important to include temporary meters that generate revenue, such as meters used for construction sites. Make sure that the parameters of the report be established such that the consumption data best reflects consumption *as it actually occurred within the audit period,* so that your comparison of "water in" from source meters to "water out" to customers makes sense. Although every utility conducts billing in a unique manner, here are some guidelines that most utilities will find applicable:

1. If your billing system utilizes Advanced Metering Infrastructure (AMI), you probably have access to actual daily consumption data, which allows you to very

Note: *Do not confuse exports to other agencies with billed metered consumption—even if such volumes are billed and metered! Exports should be treated as "Water Exported" in the determination of Water Supplied. Some customer billing systems include records of sales to outside agencies—if so, make sure to exclude them from the calculation of Authorized Consumption.*

accurately capture consumption over the audit period. This is ideal.

2. If your billing system does not utilize AMI—if your utility uses either Automatic Meter Reading or manual readings—then run a consumption report in which the *meter read date* falls within the audit period.
3. If your billing system does not allow you to run a report by meter read date, then run a report in which the *bill date* falls within the audit period. For the purpose of capturing consumption as it actually occurred in the audit period, this method is less accurate than using meter read date because bills are sent out later than the meter read date and less accurately reflect the actual timing of customer consumption.

Ensure that the Report Reflects the Parameters of the Water Audit

The following checks can help ensure that the consumption report accurately reflects the parameters of the water audit:

- ✓ Does the data include all billed metered customers and exclude unbilled metered customers such as non-paying municipal accounts (or at least identify those accounts so that you may account for them separately)?
- ✓ Did you make sure that any sales to outside agencies were excluded (or at least identified so that you may account for them separately)?
- ✓ Did you make sure that any non-potable water sales were excluded (or at least identified so that you may exclude them yourself)?
- ✓ Are you sure that the consumption data reflects actual volumetric use, and not changes that may have been made to billed consumption for the sole purpose of making financial adjustments to the bill?

Consistency of Units

Make sure that volumetric units within the billing database are consistent. Some utilities have meters that are read in different units—some may be read in CCF (hundred cubic feet), while others may be read in KGAL (thousand gallons). If the billing database features more than one volumetric unit, make sure to make the necessary conversions to standardize the data.

Correct for Misalignment between Billing Period and Audit Period

If you used Option 2 or 3 above to generate a consumption report, it is best practice to correct for the misalignment between the meter reading / billing cycles and the audit period. This is applicable when meter reading / billing cycles do not perfectly coincide with the audit period.

Correcting for billing period misalignment using the pro-rating method is especially important in utilities that bill at less frequent intervals, such as on a bi-monthly or quarterly basis.

The following example introduces the concept of correcting for misalignment in a simple situation—where customer meters are read on a single day every month. However, the exercise can become quite complex in utilities with a high number of meter reading / billing cycles. The example below does not show the specific calculations that were performed to make the corrections for misalignment. Those calculations are presented in Appendix A: Correcting for Misalignment between Meter Reading / Billing Cycles and Audit Period

Gold Country Water District reads customer meters on the same day every month. The GCWD auditor compiled billed metered sales data relevant to the audit period (7/1/14 - 6/30/15), as detailed in Table 3 below, plus an extra meter read on either side of the audit period in order to correct for misalignment. This data is shown in the column titled "Customer Sales". The final column of Table 3 shows the volume of sales after correcting for misalignment.

Read Date	Customer Sales (MG)	Customer Sales – Corrected for Misalignment (MG)
6/10/2014	3,104.146	0.000
7/10/2014	3,471.978	1,157.326
8/10/2014	3,439.905	3,439.905
9/10/2014	3,068.071	3,068.071
10/8/2014	2,865.882	2,865.882
11/10/2014	2,460.604	2,460.604
12/9/2014	2,422.748	2,422.748
1/10/2015	2,278.897	2,278.897
2/10/2015	2,233.471	2,233.471
3/11/2015	2,278.897	2,278.897
4/12/2015	2,877.013	2,877.013
5/10/2015	2,952.724	2,952.724
6/10/2015	3,202.570	3,202.570
7/10/2015	4,169.549	2,779.699
Total FY15	**33,642.876**	**34,017.808**

Table 3

The GCWD auditor filled out the Reporting Worksheet accordingly:

AUTHORIZED CONSUMPTION

Billed metered: + ? 8 34,017.808 MG/yr

The example above shows the value of correcting for misalignment. Without doing so, billed metered consumption would have been 33,642.876 MG, which is 1.1% less than the corrected volume. If left uncorrected, this 1.1% difference would have been carried through the remaining steps of the water balance and been accounted for as real losses. The resulting volume of real losses would have been calculated to be 3,244 MG instead of 2,858 MG – overstated by 13.5%. In other words, make sure to get this step right, because it will impact your understanding of water losses, real losses, revenue and non-revenue water, and the resulting performance metrics for your system.

Data Validity Grading

It is recommended that you thoroughly review the Grading Matrix included in the AWWA Free Water Audit Software when assessing data validity associated with billed metered consumption. Below are some of the key considerations:

- Are billing records maintained on paper or electronically?
- What is the meter read success rate?
- What is the frequency and scale of estimates?
- Are billing records audited, by whom, and at what frequency?
- What is the frequency and scale of meter testing?
- What portion of meters are read using AMI or AMR?
- What factors inform the decision to replace a customer meter?

5.2.2 *Billed Unmetered Consumption*

Billed unmetered consumption consists of consumption that generates revenue but is not metered. These accounts are often referred to as "flat rate" or "flat fee" customers, since they are assessed a fixed charge based on an estimated volume of use.

There are a number of means by which consumption can be estimated, such as using a sample of *metered* accounts similar in characteristics (e.g. customer category, meter size) and extrapolating consumption habits from those accounts to the non-metered population. However, even such an approach contributes a great deal of uncertainty to the determination of consumption volumes. Because of the difficulty in accurately determining consumption through estimation, "it is highly recommended that all customers be properly metered, read, and archived." [xiv]

In the example of GCWD, all customers are metered, with the exception of some unmetered condominium developments. These unmetered accounts are billed an assumed monthly usage of 8 CCF per housing unit, which is based on an approximate average monthly consumption for metered multi-family housing units. These accounts are included in the customer billing database and uniquely identified as flat fee. The total audit period consumption for these accounts was 29.872 MG. When calculating *billed metered* authorized consumption, the auditor made sure to exclude those accounts.

The GCWD auditor filled out the Reporting Worksheet accordingly:

AUTHORIZED CONSUMPTION					
Billed metered:	+	?	8	34,017.909	MG/Yr
Billed unmetered:	+	?	7	29.872	MG/Yr

Data Validity Grading

It is recommended that you thoroughly review the Grading Matrix included in the AWWA Free Water Audit Software when assessing data validity associated with billed unmetered consumption. Below are some of the key considerations:

- What portion of billed customers in the system are unmetered?
- What is the degree of thoroughness with which consumption volumes are estimated?

REVENUE AND NON-REVENUE WATER

You've just completed the necessary information to be able to determine an important metric: the volume of revenue (and non-revenue) water. As shown in the water balance in Figure 6, revenue water is simply the volume of Billed Authorized Consumption (the sum of billed metered consumption and billed unmetered consumption). Non-revenue water can then be calculated by subtracting Billed Authorized Consumption from Water Supplied. In the AWWA Software, refer to the line titled "Non-Revenue Water" or go to the sheet titled "Water Balance" to see the calculated volumes of revenue and non-revenue water for your system.

In the case of GCWD, revenue water is 34,017.808 + 29.872 = 34,047.680 MG, and non-revenue water is 38,960.239 - 34,047.680 = 4,528.892 MG.

5.2.3 *Unbilled Metered Consumption*

Unbilled metered consumption includes all uses that are metered but do not generate revenue for the utility. In California, such use is typically associated with metered operational uses by the water utility, such as flushing programs that utilize temporary meters to track usage. Unbilled metered uses may be tracked in the billing system, on operational records, or a combination of the two, depending on utility practices (see sidebar). Keep in mind that consumption volumes that are *calculated* rather than *metered*—such as the filling of a fixed-volume water truck—should be categorized as unbilled unmetered consumption, as described in Section 5.2.4.

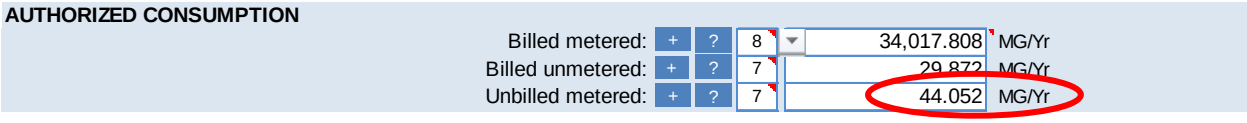
Important: *There may be accounts located within the billing database that do not generate revenue, such as metered operational uses by the water utility. Such consumption should be classified as unbilled metered consumption. Make sure to exclude such uses in the determination of billed metered consumption.*

The auditor for GCWD has identified the following unbilled metered uses and consumption volumes for the audit period, and performed the appropriate lag time correction:

Type of Use	FY15 Pro-Rated Consumption (MG)
Water Utility Facilities—Indoor	41.464
Water Utility Facilities—Irrigation	2.588
Total Unbilled Metered Consumption	**44.052**

Table 4

The auditor has filled out the relevant section of the Reporting Worksheet accordingly:



Data Validity Grading

It is recommended that you thoroughly review the Grading Matrix included in the AWWA Free Water Audit Software when assessing data validity associated with unbilled metered consumption. Below are some of the key considerations:

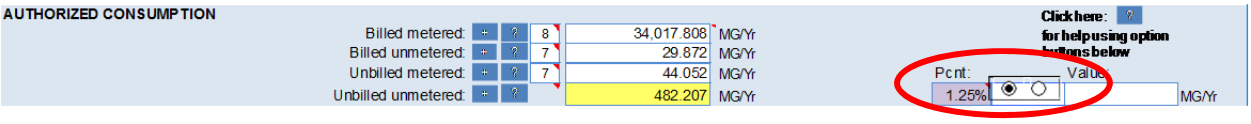
- To what degree are the policies pertaining to unbilled accounts codified and adhered to?
- What is the quality of available information on the number of unbilled metered accounts?
- What is the frequency of meter reading and level of meter upkeep?
- In what manner are consumption volumes determined (estimation, meter reading)?

Important: *The AWWA default value is provided in recognition of the fact that many utilities do not have accurate records of unbilled unmetered consumption. That said, it is best practice to over time develop a system for tracking such uses. Many utilities have begun doing this as part of their drought response. Some utilities find that their volume of unbilled unmetered consumption differs significantly from the AWWA default value.*

5.2.4 *Unbilled Unmetered Consumption*

Unbilled unmetered consumption consists of those uses that are neither metered nor revenue-generating. Most often, this includes operational uses by the water utility. Because the volumes associated with these forms of consumption can be challenging to compile and accurately quantify, AWWA provides a default value that can be used until better information within the utility becomes available. The default value equates to 1.25% of the volume of Water Supplied. AWWA recommends using the default value unless you have reason to believe that the actual volume may be significantly different than 1.25% of Water Supplied.[xv] You should be aware that tracking down such consumption volumes can be time-consuming and potentially not worth the expense given the relatively small volume of water typically in question.

The GCWD auditor used the default percentage because GCWD does not keep thorough documentation of unbilled unmetered consumption, as shown below. However, the auditor suspects that the actual consumption volume is less than the default value and has initiated a utility-wide review of all unbilled unmetered uses so that future audits can more accurately estimate consumption.



If you choose to quantify unbilled unmetered uses rather than use the default value, the following types of uses commonly fall into this category:

- Reservoir draining
- Water use at water utility facilities (if unmetered)
- Water quality testing
- Water treatment plant operations (if within boundaries of water audit, i.e. downstream of the source meters relied upon for Water Supplied data)
- Flushing water mains (hydrant flushing), storm inlets, culverts and sewers
- Firefighting and training*
- Fire flow tests performed by the utility*
- Street cleaning*
- Landscaping/irrigation in public areas*
- Construction sites (should be billed metered, but sometimes not enforced by utilities)*

Important: *In California, Proposition 218 requires that all water be charged for at the cost of service, with the exception of uses by the water utility. As such, the listed uses that are followed by an asterisk should be integrated into the billed customer base as soon as possible, if they are not*

*See sidebar on right.

Data Validity Grading

It is recommended that you thoroughly review the Grading Matrix included in the AWWA Free Water Audit Software when assessing data validity associated with unbilled unmetered consumption. If you choose to use the AWWA default value, the data validity grade is automatically assessed a "5". If you calculate unbilled unmetered consumption on your own, here are some of the key considerations:

- To what degree are unbilled unmetered uses known?
- To what extent are there procedures in place to track unbilled unmetered consumption?
- To what extent are unbilled unmetered consumption volumes actually quantified in practice?
- In what manner are unbilled unmetered consumption volumes quantified (time by flow rate formulae, known fixed volumes, other methods of estimation)?
- What is the quality of record-keeping?

WATER LOSSES

You've just completed the necessary information to be able to determine an important metric: the volume of water losses. Water losses, which include apparent losses (paper losses) and real losses (leakage) can be thought of simply as "Water In minus Water Out". As shown in the water balance in Figure 6, water losses is the volume of Water Supplied minus Authorized Consumption. In the AWWA Software, refer to the line titled "Water Losses" on the Reporting Worksheet or go to the sheet titled "Water Balance" to see the calculated volume of water losses for your system.

5.3 Water Losses

Water Losses consists of Apparent Losses and Real Losses, as shown in Figure 11. First, you will determine the volume of Apparent Losses, which will in turn determine the volume of Real Losses—which is simply the remainder after the volume of Apparent Losses has been subtracted from the volume of Water Losses.

<table>
<tr><td rowspan="9">Water Supplied</td><td rowspan="4">Authorized Consumption</td><td rowspan="2">Billed Authorized Consumption</td><td>Billed Metered Consumption</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="7">Non-Revenue Water</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="5">Water Losses</td><td rowspan="3">Apparent Losses</td><td>Unauthorized Consumption</td></tr>
<tr><td>Customer Metering Inaccuracies</td></tr>
<tr><td>Systematic Data Handling Errors</td></tr>
<tr><td rowspan="3">Real Losses</td><td>Leakage on Transmission and/or Distribution Mains</td></tr>
<tr><td>Leakage and Overflows at Utility's Storage Tanks</td></tr>
<tr><td>Leakage on Service Connections</td></tr>
</table>

Figure 11

5.3.1 *Apparent Losses*

Apparent Losses is one of the two primary components of Water Losses. The determination of the volume of Apparent Losses is the third major step in assembling the AWWA water balance. According to the AWWA M36 manual:

> ***Apparent Losses:*** The nonphysical losses that occur when water is successfully delivered to the customer but is not measured or recorded accurately. [xvi]

Figure 6 below shows the position of Apparent Losses and its sub-components within the simplified water balance.

<table>
<tr><td rowspan="9">Water Supplied</td><td rowspan="4">Authorized Consumption</td><td rowspan="2">Billed Authorized Consumption</td><td>Billed Metered Consumption</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="7">Non-Revenue Water</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="5">Water Losses</td><td rowspan="3">Apparent Losses</td><td>Unauthorized Consumption</td></tr>
<tr><td>Customer Metering Inaccuracies</td></tr>
<tr><td>Systematic Data Handling Errors</td></tr>
<tr><td rowspan="3">Real Losses</td><td>Leakage on Transmission and/or Distribution Mains</td></tr>
<tr><td>Leakage and Overflows at Utility's Storage Tanks</td></tr>
<tr><td>Leakage on Service Connections</td></tr>
</table>

Figure 12

As shown above, Apparent Losses consists of Unauthorized Consumption, Customer Metering Inaccuracies, and Systematic Data Handling Errors:

Unauthorized Consumption: Consumption that is not explicitly or implicitly authorized by the utility, commonly known as water theft.

Customer Metering Inaccuracies: Inaccuracies in registering water consumption by retail customer meters.

Systematic Data Handling Errors: Errors caused by accounting omissions, errant computer programming, data gaps, and data entry; inaccurate estimates used for accounts that fail to produce meter readings; billing adjustments that manipulate billed consumption so as to generate a rightful financial credit in such a way that billed consumption does not reflect actual consumption. [xvii]

Controlling Apparent Losses can offer substantial opportunities for revenue recovery, since such water is valued at the customer retail cost. In other words, Apparent Losses represent water that is being delivered but not being billed for—the recovery of which can have significant financial benefits. Thorough investigation of Apparent Losses not only has revenue recovery potential, but can also shed light on opportunities for improving operational practices with respect to meter reading, customer billing, account management, and meter testing and replacement.

It is important to develop an accurate understanding of Apparent Losses because its relationship with Real Losses is zero-sum, due to the deduced determination of Real Losses. **Any under-estimation of Apparent Losses will result in an over-estimation of Real Losses, and vice versa.**

This guide proceeds by describing how to calculate the volumes associated with the three types of Apparent Losses.

5.3.1.1 *Unauthorized Consumption*

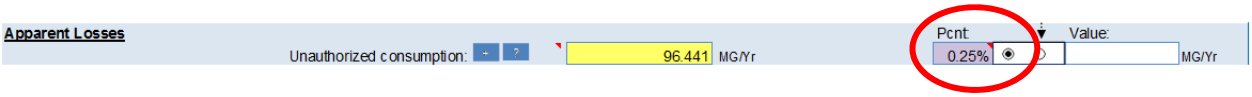
Unauthorized consumption, also known as water theft, can include:

- Illegal connections
- Open bypasses
- Buried or otherwise obscured meters
- Misuse of fire hydrants and fire-fighting systems
- Vandalized or bypassed consumption meters (meter tampering)
- Tampering with meter reading equipment
- Illegally opening intentionally closed valves or curb stops on customer service piping that has been discontinued or shut off for nonpayment. [xviii]

While Unauthorized Consumption varies from system to system, the total volume of water lost is typically a very small portion of the volume of Water Supplied. AWWA has found a default estimate of 0.25% of Water Supplied to be suitable in most cases.

Because investigating Unauthorized Consumption can be challenging and tedious, and because the volume of water at stake is typically very small, it is recommended that you use the default estimate unless you have reason to believe that your system experiences significantly different levels of theft.[xviii] That said, investigation of water theft has value beyond the sake of the water audit, so the availability of the AWWA default estimate should not be a reason to neglect proper oversight of water theft.

In our example of Gold Country Water District, the auditor has selected the AWWA default estimate of 0.25% of Water Supplied, which translates to 96.441 MG. Nonetheless, the auditor has started a working group with colleagues to evaluate water theft oversight, including a systematic review of policies, procedures, and practices.



Data Validity Grading

It is recommended that you thoroughly review the Grading Matrix included in the AWWA Free Water Audit Software when assessing data validity associated with Unauthorized Consumption. If the default estimate is selected, the data validity grading will automatically be assessed at a "5". If you choose to determine the volume yourself, you should consider the following when grading data validity:

- Level of awareness of extent of theft
- Coherence of policies and procedures to prevent and punish theft
- Thoroughness of estimation procedures

5.3.1.2 *Customer Metering Inaccuracies*

Customer metering inaccuracies (also called "customer metering error") account for the fact that all meter populations feature a certain degree of inaccuracy in registering customer consumption volumes. Inaccuracies typically reflect meter under-registration due to wear-and-tear and inappropriate meter sizing (usually over-sizing). Meter over-registration is possible, though less common.

Testing Before Installation

Best practice is to inspect and test all large meters prior to use. While this is practical for large meters, it would be practically challenging to test every meter in a large set of small meters, so it is advised that the utility test a random sample of meters (stratified by relevant criteria, such as meter manufacturer/model/size) prior to installation.

It is simply not practical to inspect and test every single customer meter. Large, high-revenue meters are typically associated with industrial, commercial, and agricultural customers that produce a much larger share of revenue per account than small meters, which tend to be associated with residential uses. As such, it is recommended that the utility annually inspect and test high-revenue meters and a random sample of small meters.[xix]

The purpose of this section is to introduce key concepts with respect to the determination of customer metering error. For a more comprehensive guide for meter testing, refer to the AWWA Manual M6, *Water Meters—Selection, Installation, Testing, and Maintenance.*

Small Meter Testing

Utilities should test a random sample of small meters (see sidebar on the meaning of "random"). Ideally, the utility would stratify its small meter population into different groups, based on any combination of manufacturer, model, and size, and randomly test meters within each group. Information on meter age and/or total throughput (cumulative water volume passed through the meter over its lifespan) could be included for additional analysis. Keep in mind that any given sample of a particular meter group should be sufficiently large to be meaningful—for example, three tests of 3/4" Badger meters is not sufficiently large to confidently represent the actual performance of the entire population of 3/4" Badger meters. The level of specificity to which the analysis goes should be informed by your utility's capacity to test meters and perform data analysis.

What is a "random" meter sample?
A random meter sample means that meters are selected entirely by chance and not for any particular reason. This can be achieved by labeling all of the meters with a unique ID code and using a random-number generator such as that offered by Microsoft Excel. Here are a few examples of samples that are ***not*** *random:*

- Test results from meters that were removed due to customer complaints
- Test results from meters that were removed due to age
- Test results from meters located in a particular geographic area

Small meters are typically tested at a number of flow rates because meter accuracy varies with flow rate. Table 5 summarizes test results for GCWD, which randomly selected 100 small meters for testing.

Test Flow Rate	Mean Accuracy
Low (0.25 gpm)	94.60%
Medium (2.0 gpm)	97.20%
High (15.0 gpm)	99.20%

Table 5

The next step is to identify the volume of consumption registered at different flow rates. Sometimes, utilities will have system-specific data showing the breakdown of consumption by flow rates, but this is rare. For utilities that do not have such information at hand, it is advised that the AWWA volume-weighted standards be applied. These values are shown in Table 6, under column A. The GCWD auditor used the combination of AWWA volume-weighted standards, consumption data, and meter test results to calculate meter error, as detailed in Table 6. The determination of customer meter error applies to metered consumption only, so any unmetered consumption should be excluded from this analysis. Stuck meters, or "dead" meters—where the register does not turn at all when water is passed through—should be excluded from this analysis insofar as there are policies and procedures in place to identify dead meters promptly, to replace them, and to bill the customer accordingly.

Important: *Investigate how meters are tested:*

- *Using a test bench?*
- *Portably, in the field?*
- *Sent to certified third party?*

Go even further by assessing the reliability of these testing forms. For example, how do you know that the meter test bench produces accurate results? Has the test bench been tested or calibrated?

Table 6

	A	B	C = A * B	D	E = (C / D) - C
Flow Rate	**Consumption Volume Distribution**[4]	**GCWD FY15 Small Meter Total Consumption (MG)**[5]	**GCWD FY15 Small Meter Consumption at Flow Rate (MG)**	**Mean Accuracy**	**Meter Error (MG)** [6]
Low (0.5 – 1.0 gpm)	2.0%	26,946.454	538.929	94.60%	30.763
Medium (1 - 10 gpm)	63.8%	26,946.454	17,191.838	97.20%	495.238
High (10 - 15 gpm)	34.2%	26,946.454	9,215.687	99.20%	74.320
Total	**100.0%**	**26,946.454**	**26,946.454**	**97.82%**[7]	**600.322**

[4] In other words, an estimated 2.0% of total consumption by small meters is registered at low flows.
[5] Based on sales data.
[6] The formula for meter error produces a value of opposite sign to the formula that was used to calculate meter error for source meters in Section 5.1.3. That is because the AWWA software is set up such that negative values mean under-registration for source meter error, while negative values mean *over-registration* for customer meters.
[7] The total mean accuracy of 97.82% is a composite accuracy calculated by comparing the total uncorrected volume of small meter consumption to the total corrected volume [(26,946.454 / (26,946.454 + 600.322)].

Large Meters

A similar analysis described above for small meters above can be performed for large meters. However, there is no reliable industry standard for consumption volume distribution by flow rate, since large meter use is much more unpredictable and variable. If your utility has reliable information on the breakdown of large meter consumption volumes by flow range, that is ideal. If such information is not available, then you can equally weight accuracy at all flows by utilizing a simple average. Table 7 shows large meter accuracy results for GCWD from tests that were performed during the audit period. GCWD tests approximately half of its large meters every year.

	Test Flow Rate	Mean Accuracy
A	Low	91.40%
B	Medium	96.90%
C	High	99.90%
(A + B + C)/3	**Average**	**96.07%**

Table 7

The GCWD auditor used the average accuracy of 96.07% and billing data to calculate large meter error, as shown in Table 8.

A	B	C = (B / A) - B
Meter Accuracy	**GCWD FY15 Large Meter Total Consumption (MG)**	**Meter Error**
96.07%	7,071.354	289.528

Table 8

For GCWD, total customer metering inaccuracies for FY15 were 889.95 MG, as shown in Table 9.

	Meter Error (MG)
Small Meters	600.322
Large Meters	289.528
Total	**889.850**

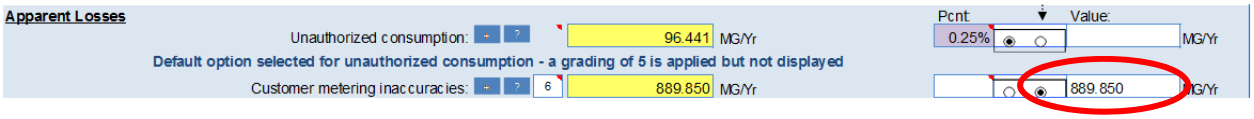
Table 9

What if my utility does not have any meter testing documentation?

If your utility does not have any reliable, representative meter test data available, you should nonetheless estimate meter accuracy. You should speak with those in your utility who are most knowledgeable about the customer meter stock, and consider the following factors when estimating accuracy:

- *Age distribution of the meter stock*
- *Meter installation quality*
- *Any miscellaneous test results (e.g. tests on retired meters)*

The auditor then filled out the Reporting Worksheet accordingly by selecting the "Value" function for Customer Metering Inaccuracies:



Data Validity Grading

It is recommended that you thoroughly review the Grading Matrix included in the AWWA Free Water Audit Software when assessing data validity associated with Customer Metering Inaccuracies. Below are some of the key considerations:

- Quality of recordkeeping on customer meter population
- Extent and frequency of meter testing
- Extent of meter replacement program, and degree to which the program is strategically designed
- Means by which accuracy levels are determined
- Whether third party review of customer meter management is utilized

5.3.1.3 *Systematic Data Handling Errors*

Systematic Data Handling refers to the processes that "transmit, archive, and report customer consumption totals as derived from the meter population". In other words, it consists of the various processes from the point of the meter read to the use of the consumption data.[xx]

To determine the Apparent Losses volume attributable to Systematic Data Handling Errors, you can either rely upon the AWWA default estimate of 0.25% of Billed Metered Authorized Consumption or perform a rigorous review of data handling. Your utility can benefit from the latter option, since such an exercise not only contributes to a more accurate audit but is an essential part of quality control. That said, the AWWA default estimate is useful when time and resources are limited.

If you choose to determine the volume yourself, rather than rely upon the default estimate, the paragraphs below can help get you started.

Meter Reading

Meter reading can introduce errors or inaccuracies into the billing system in a number of ways.

Regardless of the type of meter reading system employed (manual reads, AMR, AMI), a certain number of reads will fail to successfully register. The frequency of **failed reads** (the positive equivalent would be the meter read success rate) should be investigated, particularly in settings where meters are read manually.

When a successful read is not obtained, estimates are typically made. The frequency of **estimates** should be evaluated, as well as the volumetric impact of such reads (e.g. 2.5% of volumetric sales were associated with estimated reads.) Additionally, you should look into the means by which consumption is estimated, and assess whether such methodology is appropriate. Sometimes estimates are based on outdated information that poorly reflects actual consumption.

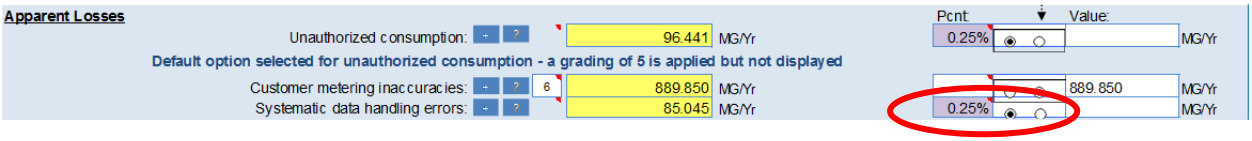
"Zero reads"—reads where consumption is zero—should be investigated. Sometimes these reads will reflect genuine zero-consumption—for example, on an account where the customer has been on extended vacation—but other times they can indicate failed reads, meter tampering or theft, or a stuck meter. Accounts that feature strings of consecutive zero reads should be given close attention.

Billing adjustments, which are made in order to resolve financial concerns, can sometimes interfere with the accurate calculation of consumption. Many utilities will modify billed consumption volumes to trigger a financial adjustment, in the process distorting consumption data. Ideally, utilities will either issue financial adjustments without changing consumption volumes, or will keep two distinct fields for customer consumption: one for *registered* consumption (actual water use), and another for *billed* consumption.[xxi] In the absence of such practices, you as the auditor would need to thoroughly review adjustments to get a sense of their volumetric impact. One place to start would be to examine negative billed consumption volumes, which would presumably reflect a credit issued to the customer.

Policy and procedure shortcomings can contribute to Apparent Losses, including but not limited to:

- Inefficiencies or delays in permitting, metering, or billing, allowing water use to occur without proper tracking.
- Poor customer account management, such as accounts that were not initiated, lost, or transferred erroneously. [xxi]

The GCWD auditor determined that such a thorough review was beyond the scope of the FY15 water audit and relied upon the AWWA default estimate. It is the auditor's goal to perform a manual review of Systematic Data Handling Errors for the next audit in conjunction with the customer billing department. As such, the auditor has filled out the Reporting Worksheet accordingly. The worksheet automatically calculated the volume of Systematic Data Handling Errors to be 85.045 MG.

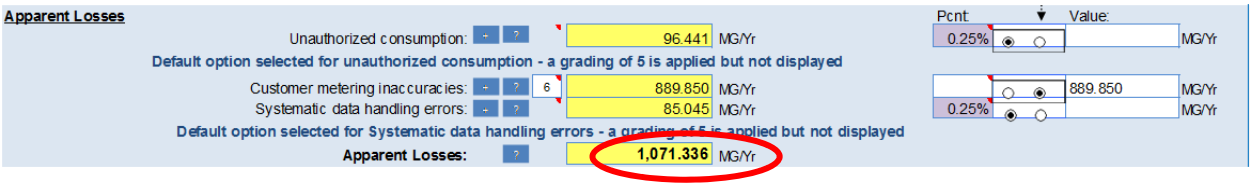


Data Validity Grading

It is recommended that you thoroughly review the Grading Matrix included in the AWWA Free Water Audit Software when assessing data validity associated with Systematic Data Handling Errors. If the default estimate is selected, the data validity grading will automatically be assessed at a "5". If you choose to determine the volume yourself, you should consider the following when grading data validity:

- Coherence and rigor of policies and procedures governing account activation and billing operations
- Recordkeeping system (computerized, paper records)
- Relationship between billing adjustments and measured consumption volumes, and understanding of that relationship
- Frequency and rigor of internal checks on billing accuracy
- Utilization of third party auditing
- Coherence of policies and procedures to prevent and punish theft

Upon completing the three categories of Apparent Losses, the AWWA Software will automatically sum them to determine a total volume of Apparent Losses, as shown below using the example of GCWD:



5.3.2 *Real Losses*

At this point, you have entered all of the necessary information to be able to determine the volume of Real Losses (leakage). As discussed in Section 2.1.1, in a top-down water audit such as this one, Real Losses are derived using a process of deduction or process of elimination. Now that you have calculated the volume of Water Supplied, Authorized Consumption, and Apparent Losses, the volume of Real Losses is simply what is left over.

In the case of GCWD, the volume of Real Losses is 2,931.297 MG, as shown in the excerpt from the Reporting Worksheet below. (This can also be seen in the "Water Balance" worksheet).

It is important to distinguish between the top-down method of calculating Real Losses and the bottom-up, or "Component Analysis," method of calculation. The bottom-up method seeks to quantify volumes of leakage using a combination of leak-break documentation and engineering modeling. This approach is very helpful for breaking down leakage into discrete categories and designing targeted leakage mitigation strategies, and can be used in conjunction with the top-down approach. For more information, see "Further Resources."

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses

Congratulations, you now have a complete *water balance* in place! At this point, you do not quite yet have a complete *water audit*—the following sections discuss the necessary pieces of system information and cost data that are necessary to complete the water audit, which provides useful performance metrics beyond the water balance itself.

5.4 System Data

To complete a water audit, it is essential to provide key information about the water system to which the audit pertains. This information informs the calculation of key performance metrics. Specifically, system data determines the "leakage allowance" for your system. All systems—even brand new ones—will inevitably leak. The leakage allowance represents the baseline volume of leakage that is deemed unavoidable given current operating conditions. In technical terms, this leakage allowance is referred to as the volume of "Unavoidable Annual Real Losses" (UARL).

System Data is not used solely for informational purposes, but is critical to the development of a meaningful audit.

The UARL is determined by length of piping, density of service connections, and average operating pressure. Figure 13 below shows the System Data section within the Reporting Worksheet of the AWWA Software.

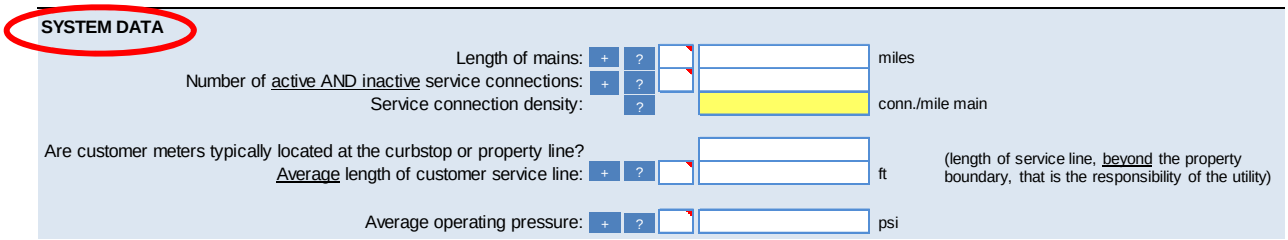


Figure 13

Please note that the UARL has not been proven fully valid for systems that are very small and/or operate at a low pressure. As described in the "Definitions" tab of the AWWA Software, if

A) $(Lm \times 32) + Nc < 3{,}000$

Where Lm is the length of mains, in miles

Where Nc is the number of service connection

OR

B) Pressure < 35 PSI

then the calculated UARL value may not be valid. In this case, the AWWA Water Audit Software does not calculate the UARL and the Infrastructure Leakage Index (ILI) and instead displays a "N/A" message.

5.4.1 *Length of Mains*

This is the total length of transmission and distribution pipelines in the potable water system to which the audit pertains. It does not include the length of service lines, but it does include fire hydrant lateral pipe—the segment of pipe between the water main and the hydrant. If the actual length of fire hydrant lateral pipe is not known, an average length can be estimated, and then multiplied by the number of hydrants in the system.

Data Validity

You should consider the following when grading data validity:

- Quality of procedures to document new water main installations
- Type of recordkeeping (paper records, GIS, asset management database)
- Quality of recordkeeping
- Frequency of field validation

5.4.2 *Number of Active and Inactive Service Connections*

This includes the total number of customer service connection laterals, which are located between the water main and the customer. It does not include fire hydrant lateral pipe, which should be accounted for in "Length of Mains". It is important to note that this statistic reflects distinct piping connections, including fire connections, regardless of whether the respective account is active or inactive. This number may be different from the number of customers or accounts.

Data Validity

You should consider the following when grading data validity:

- Strength of permitting policy for new service connections
- Strength of enforcement and oversight of permitting
- Quality of recordkeeping
- Type of recordkeeping (paper records, GIS, asset management database)
- Frequency of field validation
- Results of field validation

5.4.3 *Are Customer Meters Typically Located at the Curbstop or Property Line?*

This field requires a yes/no response. The point of this question is to determine the length of customer-owned pipe that is upstream of the meter. If your customer meters at located at the curbstop or the property line, then this length is zero, and you should select "Yes". However, if your customer meters are typically located beyond the customer property line, you will need to select "No", and then estimate the average length of customer service line. If most of your customers are unmetered, then you should select "No" and estimate the average length of customer service line between the point of ownership transfer and the building line.

In California, most utilities' customer meters are located at the property line (typically on or adjacent to the sidewalk).

For a helpful visual display of the various metering setups, refer to the "Service Connection Diagram" worksheet in the AWWA software, as well as the definition under the "Definitions" worksheet.

Data Validity

If the response to this question was "Yes", then an automatic grading of 10 is applied. If the response was "No", then you will need to assign a data validity score, in which case you should consider the following:

- Clarity of policy governing delineation of water utility ownership and customer ownership of service connection piping
- Basis for estimate of average length of piping (number of field measurements, statistical validity of sample)
- Quality of recordkeeping system

5.4.4 *Average Operating Pressure*

The average operating pressure for the potable distribution network plays a critical role in determining the leakage allowance volume (Unavoidable Annual Real Losses). Thus, it is important to be as thorough as possible in determining this value.

There are a number of ways to determine this value:

- If your utility utilizes a hydraulic model, an average of the nodes can be taken. Ensure that the model has been recently calibrated with actual field pressures and that the nodes are geographically distributed throughout the system. If you do not have a calibrated hydraulic model, use one of the following three methods:
    - If the water distribution system is relatively flat and/or consists of a single pressure zone, you should take a representative sample of pressure readings, and then simply average those values.

- If the water distribution system features significant elevation changes, and/or consists of multiple pressure zones, the average pressures for each zone should be taken, and then weighted according to either the number of service connections or miles of mains within each zone, depending on the following:
  - If there are >32 service connections per mile of main for the entire system, use number of service connections as the basis for weighting.
  - If there are <= 32 service connections per mile of main for the entire system, use miles of main as the basis for weighting.[xxii]

Tip: *The service connection density for your system is automatically calculated by the AWWA software on the Reporting Worksheet, under "System Data."*

- If you are compiling the audit for the first time and do not have the ability to conduct such testing, the average pressure can be approximated, but with a low data validity grading.

Regardless of which method is used above, do your best to gain a representative sample of average system operating conditions. Consider the level of demand throughout the day—it would not be advisable to use pressure data from the middle of the night, when demand is at its lowest and pressure is highest, or in the early morning, when demand peaks and pressure is at its lowest. Also take into account tank operations and how they impact pressure throughout the day.

Data Validity

You should consider the following when grading data validity:

- Means of gathering pressure data
- Representativeness of pressure data
- Pressure management setup
- Pressure monitoring system
- Quality of pressure zone management / discreteness of pressure zones (extent of breaches)

In the case of GCWD, the auditor has assembled system data and filled out the Reporting Worksheet accordingly:

SYSTEM DATA

Length of mains:	+	?	6	1,254.8	miles
Number of active AND inactive service connections:	+	?	6	123,560	
Service connection density:		?		98	conn./mile main
Are customer meters typically located at the curbstop or property line?				Yes	
Average length of customer service line:	+	?			(length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure:	+	?	7	82.4	psi

5.5 Cost Data

A water audit provides more than just an accounting of water over a given period. It also provides meaningful *financial* information that can inform forward-looking management decisions.

The AWWA software provides financial performance indicators based on three different pieces of information entered by the auditor, discussed in the following sections.

Cost Data is not just for informational purposes, but is critical to the development of a meaningful audit.

Figure 13 below shows the Cost Data section within the Reporting Worksheet of the AWWA Software.

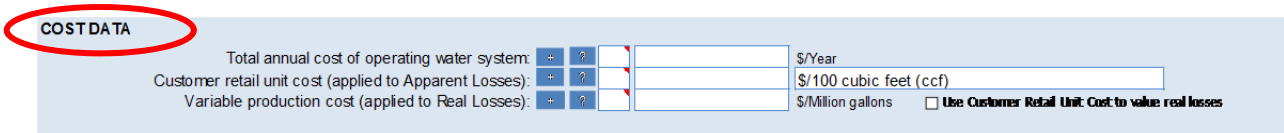


Figure 14

Total Annual Cost of Operating Water System: The total cost of operating the potable water system, including, but not limited to:

- Operations and maintenance (O&M)
- Financing costs (debt service)
- Salaries and benefits
- Insurance and administrative costs

5.5.1 *Total Annual Cost of Operating Water System*

Make sure to include *only* costs pertaining to the potable water system. Costs associated with wastewater, biosolids, and recycled water should be excluded.

Data Validity

You should consider the following when grading data validity:

- Type of accounting system (paper, electronic)
- Reliability of accounting system
- Frequency and rigor of auditing

5.5.2 *Customer Retail Unit Cost*

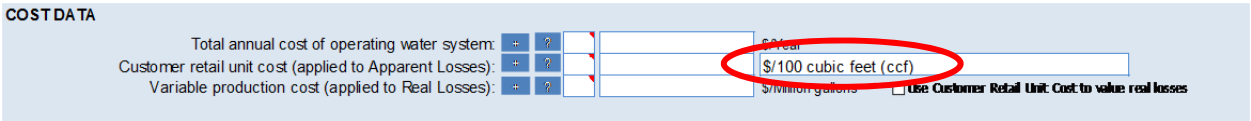
Customer Retail Unit Cost: This represents the charge that customers pay for water and serves as the unit cost that is applied to Apparent Losses, since such water is delivered to customers but not billed for. Additional charges for sewer, storm water, and/or biosolids processing may be included, insofar as those charges are directly based on the volume of potable water consumed.

To determine the appropriate cost, you should ask yourself, "If we fail to collect payment for a unit of water consumed by a retail customer, how much revenue is lost?" Because every utility has a unique rate structure, often featuring a mix of fixed service fees, variable use charges, tiers, and base allocations, you will have to come up with the most reasonable way to determine a composite cost for the audit period. A simple approach would be to divide total volume-based revenues by the total volume of potable water delivered.

Tip: *If your utility employs the services of a professional rate consultant, they can be a valuable resource in calculating the customer retail unit cost.*

AWWA M36 states that additional charges for sewer, storm water, and/or biosolids processing may be included, *insofar as those charges are directly based on the volume of potable water consumed*. Otherwise, such costs should be excluded.

Finally, **make sure that you select the appropriate volumetric unit** in the field circled in red below.



The GCWD auditor determined the customer retail unit cost to be $2.55/CCF, based on the following information:

A	FY15 Billed Metered Consumption (MG)	34,017.81
B = A * 1,000,000 / 748	FY15 Billed Metered Consumption (CCF)	45,478,352.98
C	FY15 Volume-Based Water Sales	$115,969,800.00
D = C / B	Customer Retail Unit Cost	$2.55

Table 10

Data Validity

You should consider the following when grading data validity:

- Degree to which billing operations accurately reflect rate structure
- Means by which the composite rate is calculated
- Auditing procedures

5.5.3 *Variable Production Cost*

Real Losses (leakage) are typically valued at the Variable Production Cost. In other words, the Variable

Variable Production Cost: The cost to supply the next unit of water to the system. This cost is determined by calculating the summed unit costs for ground and surface water treatment and all power used for pumping from the source to the customer. It may also include other miscellaneous unit costs that apply to the production of drinking water. It should also include the unit cost of bulk water purchased as an import, if applicable. [vii]

Production Cost represents the value associated with leakage (and its recovery).

Determining the cost of providing water can be quite complex, depending on the degree of detail that you choose to go into.

According to the M36, the cost rate "depends on the local economic and water resource considerations of the utility."[8] Ultimately, you will need to determine the most accurate means of assessing the cost to your utility of providing water. The five common approaches below can help inform your determination:

Caution: *The AWWA software is set up such that the reporting of Variable Production Cost will be in whichever unit was selected for volumetric reporting at the beginning of the audit. Make sure that volumetric units are properly taken into account when performing calculations.*

1. **Power & Chemicals:** This is a present-oriented approach that could be used in a utility where 100% of supply comes from groundwater and/or surface water, and the sole cost of production is power and chemicals. It does not consider the value of future-oriented benefits of real loss reduction, such as avoided expansion of supply (e.g. drilling new wells).
2. **Cost of Imports:** This would be appropriate in a utility that imports 100% of its water. Alternatively, it could be used in a utility that features a mix of local and imported sources but where leakage reduction would translate directly to reduced imported water purchases.
3. **Cost of Most Expensive Source:** This approach is appropriate in a utility where leakage reduction would translate directly to reduced supply of the most expensive source of water, whatever that may be (e.g. desalinated water).
4. **Composite/Average Cost:** This approach averages the cost to supply water from the various sources (e.g. groundwater, surface and import water). This approach would be appropriate in a utility that does not know how leakage reduction would impact the use of different water sources.

[8] Local circumstances can vary considerably. For example, agencies that generate hydropower via distribution system flows could take into account the value of electricity generation form "Consequential Hydropower Generation" and "Self-Generated Renewable Energy" (see Appendix O "Water Energy Guidance") in assessing the Variable Production Cost.

5. **Cost of Avoided Expansion of Supply:** This is the most future-oriented approach, as it assesses the value of leakage reduction at the avoided cost of future expansion of supply. It could be appropriate in a utility where leakage reductions translate directly to avoided expansions such as new wells and treatment plants.

Additionally, the AWWA software offers the auditor the option of valuing real losses at the Customer Retail Unit Cost instead of the Variable Production Cost (see "Note" below).

Important: *DWR asks that you provide commentary on how you determined the Variable Production Cost. You can do so using the "Comments" feature of the software. DWR's request notwithstanding, this is a good idea in itself—the information will be helpful when completing*

As an example of a starting point, you can add up the direct variable costs associated with water production and wholesale purchases, and then divide by the total volume of Water Supplied (if applicable to your utility).

The following costs should be included, where known:

- Treatment costs (chemicals)
- Energy costs for pumping, treatment
- Wholesale (a.k.a. bulk or import) purchase costs

For example, the GCWD auditor determined the Variable Production Cost to be $2,240.87/MG, based on the following calculation:

A	Water Purchases	$55,722,822
B	Chemicals	$4,146,708
C	Energy - Treatment	$9,330,093
D	Energy - Pumping	$17,245,376
E = A + B + C + D	Total Cost	$86,445,000
F	Water Supplied (MG)	38,576.57
G = E / F	Variable Production Cost ($/MG)	$2,240.87

Table 11

Note: *AWWA software versions 5.0 and newer include an optional check box that allows you to value Real Losses at the Customer Retail Unit instead of the Variable Production Cost. This option can be appropriate in times of constrained water resources such as drought, where the value of reducing leakage should be compared to conservation programs that reduce billed customer consumption. Because reduction of leakage does not reduce customer sales, it can be assessed at the value of "revenue not lost".*

Data Validity

You should consider the following when grading data validity:

- Reliability of accounting system
- Thoroughness of cost allocations (whether indirect or secondary costs are included)
- Auditing procedures

6 How to Interpret the Results of the Water Audit

Based on the information that you have entered into the Reporting Worksheet, the AWWA software produces a number of helpful metrics. To varying degrees, these metrics can help improve water audit validity, inform water loss control planning efforts, and compare performance over time and with that of other utilities.

Of the metrics presented within the AWWA software, the following six are particularly important.

1. ***Water Audit Data Validity Score (Reporting Worksheet)***
   - This is a composite score that reflects the quality of the data entered into the audit, as determined by your self-reported data validity scores for individual fields. The score is a volumetrically-weighted average, in which a lower score reflects less confidence in the accuracy of data, and a higher score reflects greater confidence.
   - The AWWA software offers general water loss control guidance on the worksheet titled "Loss Control Planning" based on the results of the Data Validity Score.

The only criteria for a "good" data validity score is whether the score accurately reflects the quality of data. In other words, a low data validity score is not in itself a bad thing. It is better to have a lower score that accurately reflects the quality of data than a higher score that is less accurate. That said, once you have established a trustworthy data validity score, you should continually work to improve upon it through concrete

2. ***Priority Areas for Attention (Reporting Worksheet)***
   - The audit software identifies priorities areas for data validity improvement based on the data validity scores that you entered when completing the audit. These suggestions offer opportunities to improve the overall data validity score and the reliability of the performance indicators produced by the audit. *It is important to note that improvement of these priority areas will result in higher data validity, but not necessarily improved system performance in managing water losses.*

Figure 15 shows these two metrics for the Gold Country Water District. GCWD's composite data validity score of 73 out of 100 could be increased by improving the reliability of data that informs Water Imported, Variable Product Cost, and Customer Metering Inaccuracies.

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 73 out of 100 ***

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Water imported

2: Variable production cost (applied to Real Losses)

3: Customer metering inaccuracies

Figure 15

While the previous two metrics shed light on the *quality* of the audit, the following performance indicators (PIs) speak to the *performance of the system* during the audit period. They are calculated

Remember that the quality of water audit results is only as good as the data going into the audit. Thus, the following performance metrics should be considered in context of the level of data validity of your audit.

solely according to the actual data that you entered into the water audit and are not impacted by the data validity scores associated with those entries. These PIs can be located on the Performance Indicators worksheet.

3. Non-Revenue Water as Percent by Cost of Operating System

- This PI is *financial* in nature, as it tells you the value of Non-Revenue Water as a percentage of the total cost to run the water system. It should not be deemed an *operational* indicator, as it does not *specifically* speak to the level of Real Losses or Apparent Losses. [xxiii] Remember that Non-Revenue Water includes Real Losses (leakage), Apparent Losses (paper losses), and Unbilled Authorized Consumption.
- For example, the value of Non-Revenue Water in GCWD's system was 5.9% of the total cost to operate the system for the audit period, as shown in Figure 16 below.

4. Infrastructure Leakage Index (ILI)

- The ILI indicates how well a distribution system controls Real Losses (leakage), taking into account its key characteristics, namely the length of water mains, number of service connections, and average system operating pressure. The ILI is a leading benchmark standard for evaluating system performance over time and in comparison to other utilities.[xxiv]
- Mathematically, it is the ratio of the *actual* annual volume of Real Losses to the *lowest possible volume* of Real Losses that can be technically achieved for that water system given current operating conditions (Current Annual Real Losses divided by Unavoidable Annual Real Losses). For example, an ILI of 2.5 indicates that the volume of Real Losses within a distribution system is 2.5 times the technical minimum, while an ILI of 1.0 indicates that the volume of Real Losses approximates the technical minimum.
- The ILI does not serve as a valid performance indicator for systems that are very small and/or operate at a low pressure. For additional detail on these thresholds of calculation, please refer to Section 5.4, where UARL requirements (necessary for the calculation of ILI) are introduced in the context of system data entry.
- For example, the ILI for GCWD for the audit period was 3.85, as shown in Figure 16 below.

Changes in performance metrics over time can reflect changes in the quality of data, and not necessarily actual changes in system performance. For this reason, you are encouraged to promptly improve data validity as much as possible, so that performance metrics can best reflect actual system performance.

The calculation of the ILI is largely dependent on average system pressure, which determines the leakage allowance (Unavoidable Annual Real Losses or UARL). As such, changes over time in average system pressure can impact the ILI in a way that can sometimes be misleading. For example, imagine a scenario where a utility reduces its average system pressure substantially. Because of the direct relationship between pressure and leakage, the volume of leakage is thereby reduced. However, in spite of the overall improvement in leakage management, the ILI could remain the same, or even increase, because of the decrease in the leakage allowance!

Given an appreciation for the ILI's sensitivity to pressure, it is an extremely helpful performance indicator – especially when a system's key characteristics are stable.

5. ***Apparent Losses per Service Connection per Day***
   - This PI normalizes Apparent Losses so that you can evaluate performance over time even as the number of service connections changes. It is expressed in gallons per service connection per day. It is helpful as a means of comparing performance across utilities.
   - For example, GCWD experienced Apparent Losses of 23.75 gallons per service connection per day for the audit period, as shown in Figure 16 on the following page.
6. ***Real Losses per Service Connection per Day***
   - This PI normalizes Real Losses so that you can evaluate performance over time as the number of service connections changes. It is expressed in gallons per service connection per day. It is of limited value as a means of comparing performance across utilities, since systems operate at different pressures. A higher pressure system can be expected to leak more, and vice versa, due to the direct relationship between pressure and leakage. As such, Real Losses per Service Connection per Day *per PSI of Pressure* is a more useful metric for comparing performance across utilities.
     - If your system's service connection density is less than 32 service connections per mile of pipeline, then the more appropriate PI is Real Losses per Length of Main per Day. The AWWA Software will automatically present the appropriate indicator based on the service connection density of your system.
   - For example, GCWD experienced Real Losses of 65.00 gallons per service connection per day for the audit period, as shown in Figure 16 on the following page.

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	11.7%	
	Non-revenue water as percent by cost of operating system:	5.9%	Real Losses valued at Variable Production Cost
Operational Efficiency:	Apparent Losses per service connection per day:	23.75	gallons/connection/day
	Real Losses per service connection per day:	65.00	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	0.79	gallons/connection/day/psi
	From Above, Real Losses = Current Annual Real Losses (CARL):	2,931.30	million gallons/year
	? Infrastructure Leakage Index (ILI) [CARL/UARL]:	3.85	

Figure 16

"Where do I find Unaccounted-for-Water?"

As discussed in detail in Section 1.1, the concept of unaccounted-for-water has been formally abandoned by the industry because it has been deemed inconsistent and unreliable for the management of system losses. As you have seen, **you have accounted for all volumes of water** through the water audit, leaving no water unaccounted-for. Even better, you have broken down water losses into the more specific components of Apparent Losses and Real Losses, which is far more useful than simply writing off losses as unaccounted-for.[xxv]

"Where do I find percent losses?"

Most people intuitively want to know what percent of water in the system is lost. However, the use of percentages can be misleading because they do not allow for proper comparisons of performance between utilities or within the same utility over time. The PIs mentioned in this section are superior to percentages in these respects. For specific examples of the limitations of

APPENDIX A: CORRECTING FOR MISALIGNMENT BETWEEN METER READING / BILLING CYCLES AND AUDIT PERIOD

To properly correct for misalignment between meter reading/billing cycles and the audit period, the auditor should first determine billed metered consumption for every meter reading cycle (by date). For small utilities, there may be just a few meter reading cycles; for large utilities, there could be many.

The example below introduces the concept with a very simple meter reading schedule: where meters are read on the same day each month.

Gold Country Water District staff read customer meters on the same day every month. The GCWD auditor compiled billed metered sales data relevant to the audit period (7/1/14 - 6/30/15), as detailed in Table 3 below, plus an extra meter read on either side of the audit period in order to correct for misalignment.

Read Date	Customer Sales (MG)
6/10/2014	3,104.146
7/10/2014	3,471.978
8/10/2014	3,439.905
9/10/2014	3,068.071
10/8/2014	2,865.882
11/10/2014	2,460.604
12/9/2014	2,422.748
1/10/2015	2,278.897
2/10/2015	2,233.471
3/11/2015	2,278.897
4/12/2015	2,877.013
5/10/2015	2,952.724
6/10/2015	3,202.570
7/10/2015	4,169.549
Total FY15	**33,642.876**

Table 12

The auditor then made adjustments to billed metered sales on both ends of the audit period, based on the pro-rated share of consumption actually falling within the audit period. This is shown in Table 13.

	Read Date	7/10/2014	7/10/2015
	Previous Read Date	6/10/2014	6/10/2015
A	**Customer Sales**	3,471.978	4,169.549
B	**Days in Audit Period**	10	20
C	**Days of Consumption**	30	30
D = A * (B / C)	**Customer Sales – Corrected**	1,157.326	2,779.699

Table 13

Table 14 below shows monthly customer sales after correcting for misalignment.

Read Date	Customer Sales (MG)	Customer Sales – Corrected for Misalignment (MG)
6/10/2014	3,104.146	0.000
7/10/2014	3,471.978	1,157.326
8/10/2014	3,439.905	3,439.905
9/10/2014	3,068.071	3,068.071
10/8/2014	2,865.882	2,865.882
11/10/2014	2,460.604	2,460.604
12/9/2014	2,422.748	2,422.748
1/10/2015	2,278.897	2,278.897
2/10/2015	2,233.471	2,233.471
3/11/2015	2,278.897	2,278.897
4/12/2015	2,877.013	2,877.013
5/10/2015	2,952.724	2,952.724
6/10/2015	3,202.570	3,202.570
7/10/2015	4,169.549	2,779.699
Total FY15	**33,642.876**	**34,017.808**

Table 14

In reality, most utilities have more complex reading cycles. Therefore, a meter lag correction should be used for each meter reading route. This will require that the auditor determine the volume of billed consumption for each meter reading route, and then making the correction in the manner as described above.

APPENDIX B: LIMITS OF THE USE OF PERCENTAGES AS PERFORMANCE INDICATORS

The use of percentages as performance indicators can be misleading because they are "highly sensitive to the level of customer consumption…despite the fact that no change in loss levels may have occurred."[xxvi] (The level of leakage in a system is unrelated to the volume of customer consumption.)[xxvii]

For example:

As shown in Table 15 below, Utility A had a Water Supplied volume of 100 MG for Year 1. Authorized Consumption was 90 MG. Water Losses were 10 MG, consisting entirely of Real Losses (no Apparent Losses). Thus, Utility A had Real Losses of 10.0% for Year 1.

Year 2 was especially dry, and witnessed increased irrigation use. As a result, customers used 10 MG more water, while the leakage volume remained the same. Thus, Utility A had a Water Supplied volume of 110 MG and Authorized Consumption of 100 MG for Year 2. Just like Year 1, Water Losses (all Real Losses) were 10 MG. However, the percent losses decreased to 9.1%—suggesting that the utility's performance improved—when in fact, the volume of Real Losses did not actually change at all.

		Year 1	**Year 2**
A	Water Supplied	100 MG	110 MG
B	Authorized Consumption	90 MG	100 MG
C = A - B	Water Losses (all Real Losses)	10 MG	10 MG
D = C / A	Water Losses (all Real Losses)	10.0%	9.1%

Table 15

FURTHER RESOURCES

- AWWA Free Water Audit Software & AWWA Water Loss Control Committee

  http://www.awwa.org/resources-tools/water-knowledge/water-loss-control.aspx

- AWWA M36: Water Audits and Loss Control Programs, Third Edition. 2009.

  http://www.awwa.org/store/productdetail.aspx?productId=6725

- AWWA M6: Water Meters—Selection, Installation, Testing, and Maintenance, Fifth Edition. 2012.

  http://www.awwa.org/store/productdetail.aspx?productid=39311822

GLOSSARY OF TERMS

Apparent Losses: The nonphysical losses that occur when water is successfully delivered to the customer but is not measured or recorded accurately. Apparent Losses can result from customer metering inaccuracies, unauthorized consumption (theft), or systematic data handling error. Often referred to as "paper losses".[xxviii]

Apparent Losses per Service Connection per Day: A performance indicator that describes the volume of Apparent Losses in a normalized fashion (gallons per service connection per day), for means of assessment over time and between systems.

Authorized Consumption: The volume of metered and/or unmetered water taken by registered customers, the water supplier, and others who are authorized to do so.[xii]

Billed Authorized Consumption: All water, metered and unmetered, that is taken for authorized purposes and generates revenue to the water supplier.

Billed Metered Consumption: Water that is taken for authorized purposes that is both metered and generates revenue for the water supplier.

Billed Unmetered Consumption: Water that is taken for authorized purposes that is not metered and generates revenue for the water supplier.

Changes in Storage: The annual volumetric change in stored water that is located within the bounds of the water audit.

Current Annual Real Losses (CARL): The volume of water lost to all forms of leakage or spillage. The ratio of the CARL to the Unavoidable Annual Real Losses (UARL) is the Infrastructure Leakage Index (ILI).

Infrastructure Leakage Index (ILI): A performance indicator that indicates how well a distribution system controls Real Losses (leakage), taking into account its key characteristics, namely the length of water mains, number of service connections, and pressure. The ILI is a leading benchmark for evaluating system performance over time and in comparison to other utilities. Mathematically, it is the ratio of Current Annual Real Losses (CARL) to Unavoidable Annual Real Losses (UARL).

Non-Revenue Water: Water that fails to generate revenue for the water supplier for any reason. Non-Revenue Water includes Apparent Losses (paper losses), Real Losses (leakage), and Unbilled Authorized Consumption.

Non-Revenue Water as Percent by Cost of Operating System: A financial performance indicator that assesses the value of non-revenue water relative to the annual cost of operating the water system. It should not be deemed an operational indicator, as it does not specifically speak to the level of Real Losses or Apparent Losses.

Real Losses: Physical loss of water from the system as a result of leaks, breaks, or spillage that occurs prior to the point of customer consumption (the customer meter in metered systems; in unmetered systems, it is the point of transfer of responsibility). Customer-side leaks are not considered Real Losses.

Real Losses per Service Connection per Day: A performance indicator that indicates the level of leakage in the water system in a normalized fashion (gallons per service connection per day), for means of assessment over time.

Real Losses per Service Connection per Day per PSI: The same as Real Losses per Service Connection per Day, except that it is normalized for pressure, allowing for more appropriate comparison between systems of different operating pressures.

Revenue Water: Water that generates revenue for the utility. It consists of Billed Authorized Consumption (and Billed Water Exported in the expanded version of the Water Balance).

System Input Volume: The volume of water that is introduced to the water distribution system over the audit period. It is equal to the water produced by the water supplier's own source waters (Volume from Own Sources), plus Water Imported, plus or minus the net change in applicable water storage (Changes in Storage).

Systematic Data Handling Errors: A form of Apparent Loss pertaining to "customer consumption and billing data error in the water utility's business processes as a result of lax oversight, poor procedures, or gaps in information programming and archiving." Specifically, it can be error caused by accounting omissions, errant computer programming, data gaps, and data entry; inaccurate estimates used for accounts that fail to produce meter readings; and billing adjustments that manipulate billed consumption so as to generate a rightful financial credit in such a way that billed consumption does not reflect actual consumption. [viii]

Unauthorized Consumption: Any water that is taken in an unauthorized fashion, in other words water theft. This may include "unpermitted water withdrawn from fire hydrants, illegal connections, bypasses to customer meters, meter or meter reading equipment tampering, or similar actions." A form of Apparent Loss. [xxix]

Unavoidable Annual Real Losses (UARL): The UARL is a theoretical reference value representing the technical low limit of leakage that could be achieved if all of today's best technology could be successfully applied, given the pipeline mileage, service connection density, and average operating pressure of the system. It serves as the denominator in the ratio that determines the Infrastructure Leakage Index. [viii]

The formula for calculating the UARL is:

UARL (gallons/day) = (5.41Lm + 0.15Nc + 7.5Lc) x P

Where Lm is the length of mains in miles

Where Nc is the number of active and inactive service connections

Where Lc is the average length of customer piping

Where P is the average system operating pressure

Multiply the result by 365 to determine the annual volume.

Unbilled Authorized Consumption: All water, metered and unmetered, that is taken for authorized purposes and does not generate revenue for the water supplier.

Unbilled Metered Consumption: Water that is taken for authorized purposes that is metered and does not generate revenue for the water supplier.

Unbilled Unmetered Consumption: Water that is taken for authorized purposes that is not metered and does not generate revenue for the water supplier, such as system flushing.

Volume from Own Sources: The volume of water withdrawn from water resources (rivers, lakes, wells, etc.) controlled by the water utility, and then treated for potable water distribution. [vii]

Water Exported: Bulk water sold to neighboring water systems that exist outside the service area. [vii]

Water Imported: Bulk water typically purchased from a neighboring water utility or regional water authority, which is metered at the custody transfer point of interconnection between the two utilities. Also known as “import”, “purchased” or “wholesale” water. [vii]

Water Losses: Consists of Real Losses (leakage) plus Apparent Losses (paper losses). Can also be derived by subtracting Authorized Consumption from Water Supplied.

Water Supplied: The volume of treated and pressurized water input to the retail water distribution system. [vi]

ENDNOTES

[i] http://www.water.ca.gov/wateruseefficiency/sb7/
[ii] http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB1420
[iii] http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB1420
[iv] American Water Works Association. M36: Water Audits and Loss Control Programs, 3rd Edition. 2009.
[v] http://www.awwa.org/resources-tools/water-knowledge/water-loss-control.aspx
[vi] American Water Works Association. M36: Water Audits and Loss Control Programs, 3rd Edition. 2009. p 275.
[vii] AWWA Free Water Audit Software, Version 5.0, "Definitions".
[viii] American Water Works Association. M36: Water Audits and Loss Control Programs, 3rd Edition. 2009. p 272.
[ix] Ibid. p 21.
[x] Ibid. p 21. Note that the formula in this manual produces a value of opposite sign from the formula in the M36 manual. This is due to the particular setup of the AWWA software.
[xi] Ibid. p 25.
[xii] American Water Works Association. M36: Water Audits and Loss Control Programs, 4th Edition. To be published. Chapter 3.
[xiii] Ibid.
[xiv] Ibid. p 28.
[xv] Ibid. p 30.
[xvi] Ibid. p 38.
[xvii] Ibid. p 70, 71.
[xviii] Ibid. p 49.
[xix] American Water Works Association. M36: Water Audits and Loss Control Programs, 4th Edition. To be published. Chapter 3.
[xx] American Water Works Association. M36: Water Audits and Loss Control Programs, 3rd Edition. 2009. p 41.
[xxi] Ibid. p 47.
[xxii] American Water Works Association. M36: Water Audits and Loss Control Programs, 4th Edition. To be published. Chapter 3.
[xxiii] American Water Works Association. M36: Water Audits and Loss Control Programs, 3rd Edition. 2009. p 54.
[xxiv] Ibid. p 55.
[xxv] Ibid. p 4, 8.
[xxvi] Ibid. p 52.
[xxvii] Ibid. p 95.
[xxviii] American Water Works Association. M36: Water Audits and Loss Control Programs, 4th Edition. To be published. Chapter 3.
[xxix] American Water Works Association. M36: Water Audits and Loss Control Programs, 3rd Edition. 2009. p 273.

Appendix M

Recycled Water

This appendix describes the various aspects of municipal recycled water to support completion of the UWMP recycled water section and tables discussed in Section 5. The appendix provides clarification on how to define and document recycled water in the 2015 UWMPs, as well as additional background information which may be helpful for understanding recycled water and, in turn, completing the wastewater and recycled water requirements in the 2015 UWMPs.

The topics covered in Appendix M are:

Status of Recycled Water in California *M-2*
Recycled Water Definition *M-2*
Title 22 *M-3*
Levels of Treatment *M-4*
Disposal Versus Recycling *M-5*
Direct Versus Indirect Use *M-5*
Planned Versus Unplanned Beneficial Uses *M-5*
Potable Versus Non-potable Reuse *M-6*
Direct Potable and Indirect Potable Reuse *M-6*
Supplemental Water *M-7*
Quantifying recycled water production and use within the area considered by the UWMP *M-7*
Estimating versus Metering *M-8*
Involved Agencies *M-8*
Wholesaler vs Retailer *M-8*
Internal Reuse *M-8*
Coordination of UWMP and the 2015 Recycled Water Survey Data *M-8*
Beneficial Uses *M-9*
Recycled Water Use and Urban Per Capita Water Use Targets *M-12*
Fit For Purpose *M-12*
Tables *M-13*
Figures *M-24*

Status of Recycled Water in California

Recycled water as a water supply has the ability to provide additional locally-available and locally-controlled water resources. It has been safely reused in California for over 100 years and the state, as of 2009, is annually reusing 669,000 AF to meet water supply needs. Although this is a significant amount of water, there is potential to increase this amount and provide greater local water supply reliability.

Recycled Water Definition

Municipal recycled water is wastewater that has been treated to a specified quality to enable it to be used again. As defined in Water Code Section 13050(n), recycled water means *water which, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur and is therefor considered a valuable resource.* Although the

legal definition does not specify the source of water, in common use "recycled water" refers to water originating as municipal wastewater, and it is the reuse of that wastewater that is tracked in UWMPs.

There are two requirements treated municipal water must meet to be classified as recycled water in UWMPs. It must be reused:

- Beneficially, in a manner consistent with recycled water criteria in Title 22 of the California Code of Regulations
- In accordance with a Regional Water Quality Control Board (RWQCB) permit, such as National Pollutant Discharge Elimination System (NPDES), waste discharge requirements (WDR), or water recycling requirements (WRR)

The terms "recycled water" and "reclaimed water" have the same meaning and can be used interchangeably. However, recycled water is used more commonly and implies a municipal wastewater source. The process by which a facility (industrial or otherwise) uses process water multiple times is usually referred to as internal reuse to distinguish it from municipal recycled water.

The quality of most water discharged from a wastewater facility in the state of California is suitable to be recycled for some beneficial use. Recycled water encompasses a range of water qualities, depending on the level of treatment provided at the wastewater facility. The distinction between discharged or disposed wastewater effluent and recycled water is the act of the planned beneficial reuse that makes the treated effluent 'recycled water'. The term "recycled water" indicates a beneficial use after wastewater treatment. It does not mean or imply a certain level of treatment, such as "tertiary-treatment."

Municipal wastewater originates primarily from domestic (household) sources, but it can include commercial, industrial, and institutional (CII) wastewater discharged to a sanitary sewer. Industrial water is considered municipal recycled water when it is comingled with other municipal wastewater or treated by a municipal wastewater treatment facility. Industrial wastewater that is separately treated and reused is not categorized as municipal recycled water.

Title 22

Title 22 (California Code of Regulations, Division 4, Chapter 3, §60301 et seq.) is the regulation overseeing reuse or "recycling" of municipal wastewater to protect public health. Level of treatment and bacteriological water quality standards are used in Title 22 to define what uses are legally allowed, based on the probability of public contact to protect public health. Title 22 identifies uses for a range of wastewater treatment levels, from undisinfected secondary treatment through water that has undergone advanced treatment. Title 22 regulations also specify monitoring and reporting requirements and onsite use area requirements.

The SWRCB's Division of Drinking Water (DDW, before July 1, 2014 within the California Department of Public Health) administers the adoption of Title 22 regulations and oversees their application. The applicable provisions of Title 22 are incorporated into permits issued by the Regional Water Quality Control Boards (RWQCB) or statewide general permits issued by the State Water Resource Control Board (SWRCB). These permits are the mechanism for enforcement of Title 22 regulations.

Levels of Treatment

Municipal wastewater that can be beneficially reused is classified by its level of treatment in accordance with Title 22. Primary-treated water, that which has removed 70 to 85 percent of the organic and inorganic solids through either settling or floating, is not able to be recycled in California. When reporting level of treatment in Tables 6-3 and 6-4, one of the five treatment categories specified in Title 22 are to be used. The specific requirements for each level of treatment are included in Title 22, but are briefly summarized, as follows:

- Secondary, Undisinfected (California Code of Regulations,CCR §60301.900) – oxidized wastewater.
- Secondary, Disinfected-23 (CCR §60301.225) - Oxidized and disinfected wastewater.
- Secondary, Disinfected-2.2 (CCR §60301.220) - Oxidized and disinfected to a higher level than Secondary, Disinfected-23.
- Tertiary (CCR §60301.230) – Oxidized, filtered, and disinfected wastewater to achieve both bacterial and virus removal.
- Advanced (CCR §60320.201) - Treatment technologies beyond conventional coagulation, filtration and disinfection, including reverse osmosis, micro- or nanofiltration, ozonation, or advanced oxidation. Refer to the CCR for specific requirements.

Figure M-1 (from California Water Plan Update 2013, DWR 2014) summarizes uses allowed for levels of municipal recycled water treatment specified in Title 22. While Title 22 lists specific allowed uses, other uses are permitted and approved on a case-by-case evaluation by the State Water Resources Control Board's DDW. Examples of other specific allowed non-potable recycled water applications are geothermal power production and carpet-dying. In general, the linkage between level of recycled water treatment and potential uses specified in Title 22 is strongly influenced by the potential for direct human contact and ingestion, with higher levels of treatment (tertiary or advanced) required for open public access and worker contact conditions.

A key component of incorporating municipal recycled water into water supply is aligning potential uses to the availability of various levels of treated municipal recycled water. Determining municipal recycled water availability requires coordination with both the local water and wastewater agencies, because each jurisdiction has its own roles, authorities, and service areas with respect to municipal recycled water generation and distribution.

Disposal Versus Recycling

There are three situations where there may be misconceptions about the distinction between wastewater disposal and recycled water:

- Release of treated municipal wastewater into a receiving water body
- Land application of treated municipal wastewater onto a field for the primary purpose of disposal
- Treated wastewater percolation ponds

Once the treatment process is complete and the effluent is released into a receiving water body, the effluent becomes part of the receiving water body and is considered disposal unless there is a contractual arrangement to use the river to convey the treated water from the discharger to a downstream user. If a downstream user extracts water from the water body without a contractual relationship with the upstream discharger, the reuse of the treated effluent would be considered an incidental use (see below for further discussion of incidental use).

If a wastewater treatment plant uses land application to dispose of its treated effluent, how the irrigated field is subsequently used distinguishes whether the disposal can also be considered as water recycling. If the field has a planned use for pastureland or crop cultivation, then the effluent would be classified as recycling for agricultural irrigation. If there is no use of the field, then the effluent discharge is considered disposal without recycling.

Percolation disposal ponds may be adding water to a usable aquifer, but that incidental recharge is not a planned purpose of such ponds and these ponds are not regulated as a water supply source. Thus, percolation from disposal ponds is not counted as groundwater recharge or recycled water use.

Direct Versus Indirect Use

Direct beneficial use is defined in the Code of California Regulations § 60301.200 *as the use of recycled water that has been transported from the point of treatment or production to the point of use without an intervening discharge to waters of the State.* Direct reuse involves a conveyance structure, such as a pipe or canal, to take treated wastewater from the point of treatment to the point of use. Typically, treated wastewater is discharged into rivers and streams as part of permitted disposal practices. Discharged water then commingles with the stream or river that may be a water source for downstream communities or agricultural users. These downstream uses are considered indirect reuse. Groundwater recharge and surface water augmentation with recycled water are two forms of planned indirect reuse for potable use, which are discussed further below.

Planned Versus Unplanned Beneficial Uses

Treated municipal wastewater is integrated into California's water supply through both planned and unplanned applications. A planned reuse is an intentional use of recycled water without

relinquishing control. Planned reuses are generally identified in planning studies and permit applications. They also generally involve agreement between the recycled water supplier and the recycled water user. An unplanned reuse occurs when water is discharged and subsequently reused by an entity that is not the discharger without a continuity of custody of the water. Indirect reuse is often also unplanned reuse, with the major exception of indirect potable reuse, which is discussed below. Nonpotable indirect reuse may also be planned if treated wastewater is discharged — usually into a surface water body — and there is prearranged agreement or intention between the producer and user that treated wastewater discharge will be maintained in specified quantities and times for use by downstream diverters. Discharged treated wastewater supplements river flow and can be a downstream benefit for wetland or aquatic habitat, or withdrawn by a downstream river water user. In the case of the latter, the wastewater discharge is regulated to protect the all beneficial uses of the receiving water (Recycled Water Task Force 2003). The instream benefits of treated wastewater discharge and indirect reuse by downstream diversions are both important components of managing California's water resources, but they are distinguished from planned reuse.

Potable Versus Non-potable Reuse

Non-potable recycling includes any application not involving drinking water for human consumption, such as landscape or agricultural irrigation, commercial applications like car washes or dual-plumbed office buildings, or industrial process such as oil refineries or cooling towers. Examples of nonpotable uses are given in the Beneficial Uses section below. Potable reuse results in augmentation to drinking water supplies. Potable reuse can be either direct reuse or indirect reuse (see below).

Direct Potable and Indirect Potable Reuse

Direct potable reuse is the planned introduction of recycled water either directly into a public water system, as defined in Section 116275 of the Health and Safety Code, or into a raw water supply immediately upstream of a water treatment plant. Direct potable reuse is a practice which is not currently occurring in California.

Indirect potable reuse occurs when tertiary or advanced treated wastewater augments drinking water resources. The two types of indirect potable reuse are:

- Indirect potable reuse for groundwater recharge - where recycled water recharges a groundwater basin and groundwater is later extracted from the basin
- Surface water augmentation – where recycled water is added into a surface water reservoir used as a source of domestic drinking water supply

Potable use does not actually occur until the water is subsequently pumped from the ground or withdrawn from the reservoir, treated, and added to the drinking water distribution system. Because seawater intrusion barriers typically result in groundwater recharge, they may be considered a form of indirect potable reuse.

Indirect potable reuse through groundwater recharge has occurred in California since 1962. Title 22, Division 4, Chapter 3, Article 5.1 (CCR §60320 *et seq*) describes the permitting and monitoring process required to obtain a RWQCB permit for groundwater recharge.

Indirect potable reuse through surface water augmentation is not currently permitted in California, but regulations are being drafted and are expected to be completed by December 31, 2016. Like groundwater recharge with recycled water, surface water augmentation will only occur with a permit and monitoring requirements from a RWQCB.

The feasibility of implementing direct potable reuse in California is currently being reviewed by an expert panel supported by the DDW. It is required to provide recommendations to the DDW by December 2016 to:

- Advise DDW on public health issues and scientific and technical matters regarding the feasibility of developing uniform water recycling criteria for direct potable reuse.
- Assess what, if any, additional areas of research are needed to be able to establish uniform water recycling criteria for direct potable reuse.

Supplemental Water

Supplemental water is water added to a recycled water system to meet peak demands when the supply of recycled water cannot meet demands. Supplemental water may also be added to recycled water systems during interruptions in the recycled water supply or to a groundwater recharge project as a required blend with tertiary-treated water.

Supplemental water can be potable or non-potable. If a supplier adds supplemental water to its recycled water system, the volume of supplemental water is not to be included in the volumes of recycled water provided by UWMP preparers in Tables 6-4 and 6-5, but is to be included as a separate line in Table 6-4.

Quantifying recycled water production and use within the area considered by the UWMP

The focus of the discussion of recycled water in an UWMP is to be the volume of wastewater generated and treated and the amount of recycled water beneficially reused within the service area. This can be a straight-forward assessment when there is one utility that provides both water and water services within a service area. It can get very complicated in larger urban areas where cities abut each other and independent suppliers provide regional services. For example, wastewater generated within a service area is not always treated within the service area or recycled water used in a service area may have been generated in another service area.

Guidance on collection and treatment scenarios and how an UWMP preparer should approach completing Tables 6-2 and 6-3 is provided at the end of this section.

Estimating versus Metering

Table 6-2 summarizes wastewater volumes collected within the service area. Because wastewater volumes frequently are not metered, it may be necessary to estimate values. For this table, indicate in the appropriate column whether the values provided are from estimated or metered data. It is assumed that the volumes in the remaining tables summarizing wastewater and recycling will be metered data with the exception of Table 6-6 (methods to increase recycled water use).

Involved Agencies

The guidebook requests a summary list of agencies or organizations involved in the collection, treatment, or discharge of wastewater. This list should also include recycled water agencies and may consider organizations involved but not directly participating in the treatment process, such as groups operating a wetland or participants in memoranda of understanding. It could also include contracted operations as well as joint venture participants. It is likely that many of these organizations would be part of the overall UWMP outreach effort.

Wholesaler vs Retailer

A recycled water wholesaler is an organization that distributes recycled water to another organization that is not an end user. A wholesaler obtains the recycled water fully-treated from another agency, may provide additional treatment to partially-treated wastewater, or may provide all treatment of wastewater. A recycled water retailer distributes recycled water to end users. An agency may also be both a wholesaler and a retailer if it has direct customers which use recycled water and provides recycled water to another organization that distributes it to end users in that service area.

Internal Reuse

Wastewater facilities frequently internally reuse partially- or fully-treated, non-potable water within their facilities for equipment cleaning or minor landscaping. This is a similar practice to industrial internal reuse. Although this internal reuse is a beneficial use, internal industrial or wastewater treatment reuse should not be included with other recycled uses in Table 6-3, 6-4, or 6-5.

If a wastewater plant uses treated effluent for onsite landscape irrigation at a treatment plant where public access is not restricted, that volume should be entered in Table 6-4 as landscape irrigation. The table should also include treated wastewater used offsite for sewer system maintenance, such as sewer line flushing (included in the ‘other’ category).

Coordination of UWMP and the 2015 Recycled Water Survey Data

The SWRCB and DWR are conducting a statewide survey of all municipal recycled water beneficial use for the 2015 calendar year, with the intent that data from the survey will be

coordinated with that provided in the UWMPs. This will enable a subsequent, interagency, comprehensive analysis of statewide recycling of municipal wastewater. This coordinated collection of data for dual purposes should streamline the survey process, support consistent data reporting, and facilitate water supply planning.

The two agencies are working closely together and have developed uniform definitions and data collection approaches to facilitate this data collection effort. In this 'two-pronged' effort, the SWRCB's survey will focus on the wastewater producers, with DWR's UWMPs focusing on the potable water suppliers. Beneficial use classifications and definitions (see below) are consistent between the two efforts.

Recycled water information provided in the UWMPs will provide more information on specific uses and system background information than the volumes provided by the wastewater producers. Pairing of the efforts by the two agencies is hoped to benefit the recycled water users and producers, as well as the state agencies responsible for overseeing recycled water use in the state.

It is expected that the SWRCB electronic survey request will be provided to the wastewater producers early in 2016. Because UWMPs will be in preparation at that time, an UWMP preparer may be able to coordinate directly with the wastewater producers for some of the information requested in the UWMPs. If a wastewater plant provides recycled water to areas supplied by multiple water suppliers, data will have to be disaggregated by water supplier service area for UWMP preparers. If a UWMP preparer does not have the information on the wastewater agency contact for the recycled water survey, that information can be obtained from DWR.

Beneficial Uses

The term beneficial uses applies to almost every aspect of water use in California. California Water Code §13050(f) specifies *"beneficial uses" of the waters of the state that may be protected against quality degradation include, but are not limited to, domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.*

For the purposes of recycled water, California Water Code 10633(d) specifies that a UWMP must contain a *description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.* UWMP preparers are requested to review the descriptions, provided below, of the recycled water beneficial uses to be quantified and apply them to completing the tables

summarizing recycled water use for their service area. Recycled water does not have to offset potable demand to be considered beneficially reused.

For the 2015 survey, reported volumes are to be categorized by use, instead of the user type. For example, if a commercial or industrial customer (such as an apartment building or industrial park) is using all of its recycled for landscape irrigation, the use type should be landscape irrigation. If the commercial user estimates that 75% of its water use is for landscape irrigation and 25% for process water, and does not have separate recycled water meters for interior and exterior water use, the reported use would be landscape irrigation. If the same commercial user has two separate meters, the metered value for each would be classified according to its use – 75% for landscape irrigation and 25 % for commercial use.

The quantified data provided for the beneficial uses by the recycled water provider must be for uses authorized by a permit issued by a RWQCB or SWRCB for waste discharge or water recycling. Volumes indicated in Tables 6-4 and 6-5 should be consistent with that permit.

An "other" category is included in Tables 6-4 and 6-5. However, it is intended that the category only be used if there is no other appropriate category. A category of water use, institutional water use, is used in water use accounting but is not used in recycled water use accounting. An institutional water user is a water user dedicated to public service, including but not limited to, higher education institutions, schools, courts, churches, prisons, hospitals, government facilities, and non-profit institutions. Recycled water used by institutional water users is to be included with the type of use and will generally be landscape irrigation, golf course irrigation, agricultural irrigation, or 'other' categories.

The following provides specific definitions of each beneficial use classification.

Agricultural Irrigation

Irrigation of food, fiber, and fodder crops, and pastureland. This also includes christmas tree production, pasture for farm animals , and wholesale plant nurseries.

Landscape Irrigation (excluding Golf Courses)

Irrigation of parks, schools, cemeteries, churches, residential, streetscapes, slope protection, or public facilities. Golf course irrigation is not included. Water to maintain aesthetic impoundments within landscaped areas is included with landscape irrigation. Fill stations primarily used for public use should be classified as landscape irrigation.

Golf Course Irrigation

Irrigation of golf courses, whether publically or privately held. Water used to maintain aesthetic impoundments within golf courses is also included with golf course irrigation.

Commercial Use

Uses by commercial water users, except landscape irrigation. A commercial water user is a water user that provides or distributes a product or service. Examples of commercial water use

are: commercial building use (toilets, HVAC, etc.), car washes, laundries, and retail nurseries. Landscape irrigation of commercial building areas is to be classified as landscape irrigation if it is separately metered or if landscape is the dominant use of mixed uses served by a single meter. Fill stations, if they are primarily used for commercial use, should be classified as commercial use. Landscape irrigation on golf courses should be reported as golf course irrigation. Fill stations primarily used for public use should be classified as landscape irrigation.

Industrial Use

Uses by industrial water users, except landscape irrigation and geothermal energy production. An industrial user is a water user that is primarily a manufacturer or processor of materials. Examples of industrial water uses are cooling towers, oil refining, process water, and mining. Landscape irrigation of industrial building areas is to be classified as landscape irrigation if it is separately metered or if landscape is the dominant use of mixed uses served by a single meter.

Geothermal and Other Energy Production

Water used to augment geothermal zones or used in the energy industry, excluding refineries. Refinery use is classified as industrial.

Seawater Intrusion Barrier

Injected water in coastline setting designed to reduce seawater intrusion into a coastal aquifer with a seawater interface.

Recreational Impoundment

Addition of water to maintain water levels in a lake for recreation or other non-potable uses. Lakes for wildlife habitat are included in the natural systems/restoration category. Small impoundments that are features in parks or golf courses are included as part of landscape irrigation or golf course irrigation.

Natural Systems/Restoration

Any water provided to a designated wildlife area, whether included as part of a wastewater facilities treatment process or an independent area. The area must be designated as a wetland or wildlife area and so does NOT include water that a wastewater facility must discharge to maintain habitat in the creek to which it is discharging. This category also includes recycled water used at wetlands, wildlife habitats and refuges, and duck clubs.

Groundwater Recharge (IPR)

Addition of water to augment groundwater aquifers for future use. Only groundwater recharge projects that are permitted by the state or regional board for the purpose of groundwater recharge is accounted for in this category. A water agency cannot claim as planned groundwater recharge treated wastewater incidentally recharging groundwater as a result of leakage from evaporation/percolation ponds.

When recycled water is blended with other water sources within the recharge system, only the amount of recycled water is to be reported in Tables 6-4 and 6-5.

Surface Water Augmentation (IPR)

Surface water augmentation is defined in the CWC as *the planned placement of recycled water into a surface water reservoir used as a source of domestic drinking water supply* (CWC §13561). Surface water augmentation is not allowed in California at this time (see above), so 2015 recycled water use cannot be classified as surface water augmentation. However, regulations for its implementation are being prepared by the SWRCB's DDW, so projects may be permitted and implemented by 2020. In Table 6-4, surface water augmentation may be considered a future beneficial use in 2020 and thereafter.

Direct Potable Reuse

Direct potable reuse is defined in the CWC as *the planned introduction of recycled water either directly into a public water system or into a raw water supply immediately upstream of a water treatment plant* (CWC §13561). This use is currently not permitted in the State of California, but its feasibility is being assessed by an expert panel supported by the SWRCB's DDW. A time frame for permitting and implementing direct potable reuse projects is uncertain at this time, but a water supplier may be considering and planning for its enactment. In Table 6-4, direct potable reuse may be considered a future beneficial use in 2020 or thereafter, but it is not certain that regulations allowing implementation will be in place.

Other

If a recycled water use cannot be classified into one of the categories identified above, an UWMP preparer may use this category. However, how the recycled water is used must be identified and described in Table 6-4. Sewer system flushing and firefighting are two possible uses that could be classified as 'other'. Fill stations should not be classified as 'other'. If the fill station was primarily used by commercial users for dust control or other purposes, fill station use should be classified as 'commercial'. If the majority was used by landscapers or residential customers, then the use should be classified as 'landscape irrigation'.

Recycled Water Use and Urban Per Capita Water Use Targets

Urban water suppliers may exclude recycled water use for the purpose of setting and meeting per capita water use targets. The amounts of recycled water excluded must be calculated in accordance with the methodologies in Section 5 and these amounts may not coincide with the amounts of recycled water reported in Tables 6-4 and 6-5.

Fit For Purpose

A concept that organizations may find useful for increasing recycled water use within the UWMP area is a concept referred to as 'fit for purpose' (U.S. Environmental Protection Agency 2012). The basis of this concept is that the level of wastewater treatment should be commensurate with the uses of recycled water to ensure adequate treatment to meet the needs of users or protect public health while avoiding excessive treatment and associated costs. More rigorous treatment (and more energy-intensive processes) is reserved for uses with higher human or food production contact to minimize pathogen or harmful chemical contact. Conversely, less-

treated wastewater has been safely used for decades in many agricultural reuse applications, which is the largest category of recycled water use in California. Greater reuse of secondary-treated wastewater in agriculture and environmental settings, where additional "natural treatment" through exposure to sunlight and soil contact can augment wastewater plant treatment, may provide additional opportunities for expanding recycled water use. Finally, water suppliers may determine that having available multiple levels of treated wastewater may support increased integration of recycled water use into their water supply portfolio. For example, West Basin Municipal Water District is successfully providing multiple water quality levels of recycled water to its customers to meet specific needs of its diverse customer base.

Tables

Three to five tables addressing wastewater and recycled water are required to be completed for each UWMP. Three tables (6-2, 6-3, and 6-6) are to be completed in each UWMP. If recycled water is being used in an UWMP area or is planned to be during the planning horizon of the UWMP (required to be 20 years, but may be 25 at the discretion of the UWMP preparer), then Tables 6-4 and 6-5 must also be completed. Table 6-6 is required to show actions water suppliers have considered to begin or increase use of recycled water. Additional guidance for completing each table is included here.

Table 6-2 Retail
Wastewater Generated Within Service Area in 2015

row \ column	A	B	C	D	E	F	G
	Table 6-2 Retail: Wastewater Generated Within Service Area in 2015						
1	Percentage of 2015 service area covered by wastewater collection system *(optional)*						
2	Percentage of 2015 service area population covered by wastewater collection system *(optional)*						
				Receiving Wastewater Treatment			
	Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated? *Drop Down List*	Volume of Wastewater Collected in 2015	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area? *Drop Down List*	Is WWTP Operation Contracted to a Third Party? *(optional)* *Drop Down List*
3							
4	**Total Wastewater Collected from Service Area in 2015:**		0				
5	NOTES:						

This table is to be completed by each retail UWMP preparer for all wastewater COLLECTED within the UWMP area.

Rows

Row 1	Using the 2015 size of the UWMP area, identify what percentage (to the nearest whole number) of the service area is covered by sewer service.
Row 2	Using the 2015 population determined for the gpcd calculations (Section 5), identify what percentage (to the nearest whole number) of the population is covered by sewer service.
Row 3	Use as many rows as needed. For each collection agency and WWTP within the UWMP service area, provide the requested information
Row 4	Add the total amount of wastewater generated in 2015 within the UWMP area
Row 5	Provide any comments important to data reporting in the table.

Columns

Column A	Enter the names (one per row) of each wastewater collection agency
Column B	Drop Down Menu - Enter "metered" or "estimated" for the method used to determine flow.
Column C	Enter the volume of wastewater COLLECTED witihin the UWMP area and treated at the wastewater facility identified in the row.
Column D	Enter the names (one per row) of each agency receiving collected wastewater and then treating it
Column E	Enter the names of the wastewater facility (one per row) treating the wastewater produced within the UWMP area
Column F	Drop Down Menu - Enter "yes" or "no"
Column G	Drop Down Menu - Enter "yes" or "no"

Table 6-3 Retail
Wastewater Treatment and Discharge Within Service Area in 2015

row \ column	A	B	C	D	E	F	G	H	I	J	K
	Table 6-3 Retail: Wastewater Treatment and Discharge Within Service Area in 2015										
1	☐	No wastewater is treated or disposed of within the UWMP service area. The supplier will not complete the table below.									
								2015 volumes			
	Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number *(optional)*	Method of Disposal *Drop Down List*	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level *Drop Down List*	Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area
2											
3							Total	0	0	0	0
4	NOTES:										

This table is to be completed for all wastewater TREATED OR DISPOSED within the UWMP area. If neither occur, the table does not have to be completed.

Rows

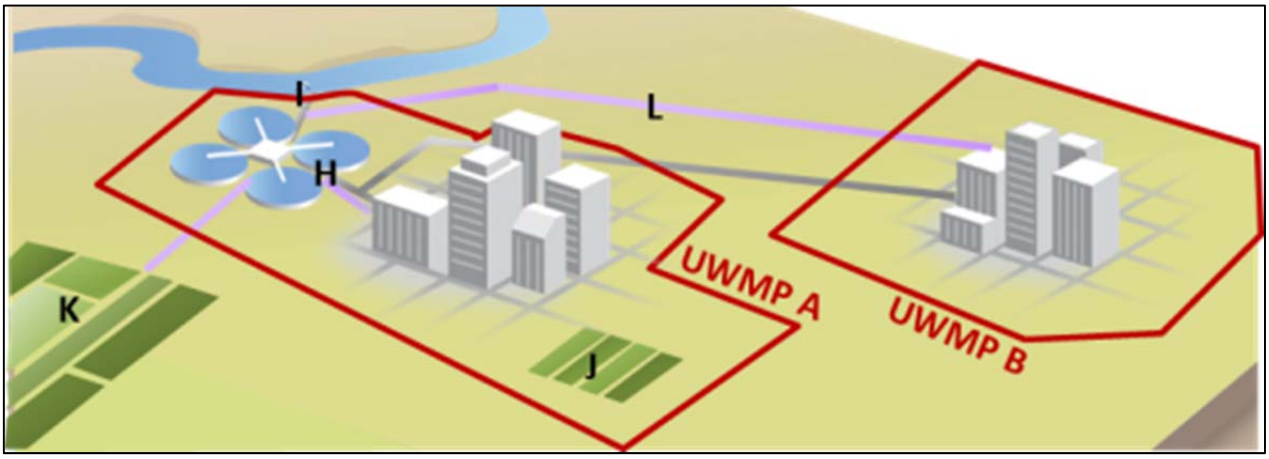
Row 1	If wastewater is neither treated nor disposed, then check the box and do not complete the rest of the table. If wastewater is treated or disposed withing the service area, including use of recycled water, then complete the table.
Row 2	Use as many rows as needed. Multiple rows can be used for one treatment plant, if different quality waters are produced, or if there are multiple discharge locations or Wastewater Disharge IDs. For each WWTP and non-recycled wastewater discharged within the UWMP service area, provide the requested information.
Row 3	Add the total amount of wastewater generated in 2015 within the UWMP area. The value in the outlined cells are what should be reported in Tables 6-4 and 6-5.
Row 4	Provide any comments important to data reporting in the table.

Columns

Column A	Enter the names (one per row) of each wastewater treatment plant or discharge location within the UWMP area.
Column B	Enter the name or descriptive identifier of each wastewater discharge location.
Column C	Enter additional discharge location description information, such as a water body name or specific geographic coordinates.
Column D	Enter the Waste Discharge identifier number issued by the state or regional water control board for the facility or discharge location. If this information is not available to the UWMP preparer, please contact Toni Pezzetti at DWR (tpezzett@water.ca.gov).
Column E	Drop Down Menu - Enter the method of disposal. Drop down menu options: • Ocean outfall • River or creek outfall • Bay or estuary outfall • Lake outfall • Wetlands • Subsurface infiltration gallery • Land disposal • Percolation ponds • Deep injection well • Other (specify in the notes row)
Column F	Drop Down Menu - Enter "yes" or "no", indicating whether wastewater generated from outside the UWMP area was treated at this facility.
Column G	Drop Down Menu - Enter the treatment level of the discharge (defined by Title 22) at the time of release. If multiple treatment levels occur, use additional rows (one per treatment level). Drop down menu options: • Secondary, Undisinfected • Secondary, Disinfected-23 • Secondary, Disinfected-2.2 • Tertiary • Advanced

Table 6-3 Retail *(continued)*

Column H	Enter the total volume of water treated at the wastewater facilty associated with the discharge location. If more than one row is used to fully account for different levels of wastewater treatment and/or discharge locations, only enter total wastewater for the facility once.
Column I	Enter the volume to treated wastewater that was not recycled and was discharged to the environment at the discharge location.
Column J	Enter the volume of recycled water used within the service area. If more than one treatment level of recycled water is used, use more than one row.
Column K	Enter the volume of recycled water produced within the service area, but transported for use to another area that is included in the UWMP of a different water supplier.



Letters correspond to the Table 6-3 columns

Table 6-3 Wholesale
Wastewater Treatment and Discharge Within Service Area in 2015

row \ column	A	B	C	D	E	F	G	H	I	J	K
	Table 6-3 Wholesale: Wastewater Treatment and Discharge Within Service Area in 2015										
1	☐	Wholesale supplier does not provide supplemental treatment to recycled water it distributes. The supplier will not complete the table below.									
								2015 volumes			
	Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number *(optional)*	Method of Dispoal *Drop Down List*	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level *Drop Down List*	Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area
2											
3							Total	0	0	0	0
4	NOTES:										

This table is to be completed by a wholesale UWMP preparer it it provides supplemental treatment to recycled water it distributes.

Rows

Row 1	If wastewater is neither treated nor disposed, then check the box and do not complete the rest of the table. If wastewater is treated or disposed withing the service area, including use of recycled water, then complete the table.
Row 2	Use as many rows as needed. Multiple rows can be used for one treatment plant, if different quality waters are produced, or if there are multiple discharge locations or Wastewater Disharge IDs. For each WWTP and non-recycled wastewater discharged within the UWMP service area, provide the requested information.
Row 3	Add the total amount of wastewater generated in 2015 within the UWMP area. The value in the outlined cells are what should be reported in Tables 6-4 and 6-5.
Row 4	Provide any comments important to data reporting in the table.

Columns

Column A	Enter the names (one per row) of each wastewater treatment plant or discharge location within the UWMP area.
Column B	Enter the name or descriptive identifier of each wastewater discharge location.
Column C	Enter additional discharge location description information, such as a water body name or specific geographic coordinates.
Column D	Enter the Waste Discharge identifier number issued by the state or regional water control board for the facility or discharge location. If this information is not available to the UWMP preparer, please contact Toni Pezzetti at DWR (tpezzett@water.ca.gov).
Column E	Drop Down Menu - Enter the method of disposal. Drop down menu options: • Ocean outfall • River or creek outfall • Bay or estuary outfall • Lake outfall • Wetlands • Subsurface infiltration gallery • Land disposal • Percolation ponds • Deep injection well • Other (specify in the notes row)
Column F	Drop Down Menu - Enter "yes" or "no", indicating whether wastewater generated from outside the UWMP area was treated at this facility.
Column G	Drop Down Menu - Enter the treatment level of the discharge (defined by Title 22) at the time of release. If multiple treatment levels occur, use additional rows (one per treatment level). Drop down menu options: • Secondary, Undisinfected • Secondary, Disinfected-23 • Secondary, Disinfected-2.2 • Tertiary • Advanced

Table 6-3 Wholesale *(continued)*

Column H	Enter the total volume of water treated at the wastewater facilty associated with the discharge location. If more than one row is used to fully account for different levels of wastewater treatment and/or discharge locations, only enter total wastewater for the facility once.
Column I	Enter the volume to treated wastewater that was not recycled and was discharged to the environment at the discharge location.
Column J	Enter the volume of recycled water used within the service area. If more than one treatment level of recycled water is used, use more than one row.
Column K	Enter the volume of recycled water produced within the service area, but transported for use to another area that is included in the UWMP of a different water supplier.

Table 6-4 Retail
Current and Projected Recycled Water Direct Beneficial Uses Within Service Area

row \ column	A	B	C	D	E	F	G	H	I	J
	Table 6-4 Retail: Current and Projected Recycled Water Direct Beneficial Uses Within Service Area*									
1	☐	Recycled water is not used and is not planned for use within the service area of the supplier. The supplier will not complete the table below.								
2	Name of Agency Producing (Treating) the Recycled Water:									
3	Name of Agency Operating the Recycled Water Distribution System:									
4	Supplemental Water Added in 2015									
5	Source of 2015 Supplemental Water									
	Beneficial Use Type		General Description of 2015 Uses	Level of Treatment *Drop Down List*	2015	2020	2025	2030	2035	2040 (opt)
6	Agricultural irrigation									
	Landscape irrigation (exc golf courses)									
	Golf course irrigation									
	Commercial use									
	Industrial use									
	Geothermal and other energy production									
	Seawater intrusion barrier									
	Recreational impoundment									
	Wetlands or wildlife habitat									
	Groundwater recharge (IPR)									
	Surface water augmentation (IPR)									
	Direct potable reuse									
	Other	*Type of Use*								
7				**Total:**	0	0	0	0	0	0
	IPR - Indirect Potable Reuse									
	** This may include* ***use outside the the UWMP area that is NOT included in another UWMP area. It is to be noted in the general description cell.***									
8	NOTES:									

This table is to be completed for all recycled water USED within the UWMP area. If recycled water is not or planned to be used, the table does not have to be completed.

NOTE: If recycled water within the UWMP area is supplied by more than one entity operating separate systems, the UWMP preparer should duplicate this table so that each system is reported in its own table. If recycled water is obtained from multiple suppliers but operated within a single system, please provide the total amount of recycled water obtained in 2015 from each provider in Row 1, but report the use numbers in a single table.

Rows

Row 1	If recycled water is not used within the service area and is not planed to be before 2040, then check the box and do not complete the table.
Row 2	Identify the name of the agency treating the recycled water used in the UWMP area. If more than one entity supplies recycled water into a single distribution system, indicate each supplier's 2015 total. For example, Supplier A (250 AF) and Supplier B (125 AF).
Row 3	Identify the name of the agency distributing recycled water within the UWMP area. Only one recycled water supplier should be included within each table.
Row 4	Indentify the volume of water added to the recycled water system in 2015 that was NOT municipal recycled water..
Row 5	Indentify the source of water added to the recycled water system that was NOT municipal recycled water (such as untreated groundwater, potable water, etc).
Row 6	Provide the actual and projected uses for the identified uses of recycled water. Definitions for each beneficial use are included on pages M-9 through M-11. For 'surface water augmentation' and 'direct potable reuse', entry of 2015 use is not allowed because these uses are currently not permitted. Regulations are currently being written for surface water augmentation and can be entered for 2020 and beyond. The feasibiltiy of implementing direct potable reuse in California is being evaluated. It is not known if it will be a permitted practice after 2020, but a water supplier may choose to plan for its use after 2020. The 'other' category is to be used for uses not classified by any of the provided use types. 'Other' use types may include fire fighting, fill stations, dust control, etc. If a water supplier has multiple 'other' uses, additional lines can be inserted. For each 'other' use, identify the use type in Column B and a brief description in Column C.

Table 6-4 Retail *(continued)*

Row 7	Add the total amount of recycled water used in 2015 or planned to be used in the future within the UWMP area. The value in the outlined cell should equal the value of the sum of the outlined cells in Tables 6-3 and 6-5.
Row 8	Provide any comments important to data reporting in the table.

Columns

Column A	Enter the names (one per row) of each retail agency receiving recycled water from the recycled water system.
Column B	Enter the specific use of recycled water included in the 'other' category.
Column C	Provide additional information on the types of recycled water uses included in the beneficial use type. For example, identify the types of crops irrigated with recycled water in 2015, the types of comercial uses, or the name of the recreational impoundments using recycled water.
Column D	Identify the level of treatment for the recycled water use, using the drop-down menu. If multiple qualities are used, indicate each on a separate row. Drop down menu options: • Secondary, Undisinfected • Secondary, Disinfected-23 • Secondary, Disinfected-2.2 • Tertiary • Advanced
Column E	Enter the volume being beneficially reused for the 2015, using the category descriptions below.
Column F-J	Enter the volume expected to be benefically reused for the subquent planning years. 2040 is an optional year.

See Appendix M, pages M-8 through M-11 for definition and discussion of each beneficial use type

Table 6-4 Wholesale
Current and Projected Retailers Provided Recycled Water Within Service Area

row \ column	A	B	C	D	E	F	G	H
	Table 6-4 Wholesale: Current and Projected Retailers Provided Recycled Water Within Service Area*							
1	☐	Recycled water is not directly treated or distributed by the supplier. The supplier will not complete the table below.						
	Name of Receiving Supplier or Direct Use by Wholesaler	Level of Treatment *Drop Down List*	2015	2020	2025	2030	2035	2040 *(opt)*
2								
3		**Total:**	0	0	0	0	0	0
	** This may include use outside the the UWMP area that is NOT included in another UWMP area. It is to be noted in the general description cell.*							
4	NOTES:							

This table is to be completed by a wholesale UWMP preparer for any recycled water it directly treats or distributes to retail agencies.

Rows

Row 1	If recycled water is not treated or distributed within the service area and is not planned to be before 2040, then check the box and do not complete the table.
Row 2	Identify the name of each agency to which recycled water was provided and used in the UWMP area.
Row 3	Add the total amount of recycled water used in 2015 or planned to be used in the future within the UWMP area. The value in the outlined cell should equal the value of the sum of the outlined cells in Tables 6-3 and 6-5.
Row 4	Provide any comments important to data reporting in the table.

Columns

Column A	Enter the names (one per row) of each retail agency receiving recycled water from the recycled water system.
Column B	Identify the level of treatment for the recycled water use, using the drop-down menu. If multiple qualities are used, indicate each on a separate row. Drop down menu options: • Secondary, Undisinfected • Secondary, Disinfected-23 • Secondary, Disinfected-2.2 • Tertiary • Advanced
Columns C-H	Enter the volume expected to be benefically reused for the subquent planning years. 2040 is an optional year.

Table 6-5 Retail
2010 UWMP Use Projection Compared to 2015 Actual

row \ column	A	B	C
	Table 6-5 Retail: 2010 UWMP Use Projection Compared to 2015 Actual		
1	☐ Recycled water was not used in 2010 nor projected for use in 2015. The supplier will not complete the table below.		
	Use type	2010 Projection for 2015	2015 actual use
2	Agricultural irrigation		
	Landscape irrigation (ex golf courses)		
	Golf course irrigation		
	Commercial use		
	Industrial use		
	Geothermal and other energy production		
	Seawater intrusion barrier		
	Recreational impoundment		
	Wetlands or wildlife habitat		
	Groundwater recharge (IPR)		
	Other *Type of Use*		
3	**Total**	0	0
4	**NOTES:**		

This table is to be completed for all recycled water USED within the UWMP area. If recycled water was not used in 2010 or 2015, the table does not have to be completed.

Rows

Row 1	If recycled water was not used in 2015, and was not predicted to be in 2010, then check the box and do not complete the table.
Row 2	Provide the actual and projected uses for the identified uses of recycled water. Definitions for each beneficial use are provided o n pages M-9 through M-11. 'Surface water augmentation' and 'direct potable reuse' are not shown in this table because they are currently not permitted. The 'other' category is to be used for uses that are not classified by any of the provided use types and are to be the same as those shown in Table 6-4.
Row 3	Add the total amount of recycled water used in 2015. The value in the outlined cell should equal the value of the sum of the outlined cells in Table 6-3 and 6-4
Row 4	Provide any comments important to data reporting in the table.

Columns

Column A	Enter the specific use of recycled water included in the 'other' category. For Actual 2015, they are to be the same as those shown in Table 6-4.
Column B	Enter the 2015 volumes predicted in the 2010 UWMP
Column C	Enter the volume actually used in 2015 for each use type. This column should be identical to the 2015 data shown in Table 6-4.

Table 6-5 Wholesale
2010 UWMP Use Projection Compared to 2015 Actual

row \ column	A	B	C
	Table 6-5 Wholesale: 2010 UWMP Use Projection Compared to 2015 Actual		
1	☐	Recycled water was not used or distributed by the wholesale supplier in 2010, nor projected for use or distribution in 2015. The wholesale supplier will not complete the table below.	
	Name of Receiving Supplier or Direct Use by Wholesaler	2010 Projection for 2015	2015 actual use
2			
3	**Total**	0	0
4	**NOTES:**		

This table is to be completed by wholesale UWMP preparers if they distributed recycled water in 2010 or 2015. If recycled water was not used in 2010 or 2015, the table does not have to be completed.

Rows

Row 1	If recycled water was not used or distributed by the wholesale supplier within the service area in 2015, and it was not predicted to be in 2010, then check the box and do not complete the table.
Row 2	Provide the actual and projected volumes of recycled water provided to retail customers in 2015. are to be the same as those shown in Table 6-4.
Row 3	Add the total amount of recycled water used in 2015. The value in the outlined cell should equal the value of the sum of the outlined cells in Tables 6-3 and 6-4. If not, please explain in the UWMP text.
Row 4	Provide any comments important to data reporting in the table.

Columns

Column A	Enter the specific use of recycled water included in the 'other' category. For Actual 2015, they are to be the same as those shown in Table 6-4.
Column B	Enter the 2015 volumes predicted in the 2010 UWMP
Column C	Enter the volume actually used in 2015 for each use type. This column should be identical to the 2015 data shown in Table 6-4.

Table 6-6 Retail
Methods to Expand Future Recycled Water Use

row \ column	A	B	C	D
	Table 6-6 Retail: Methods to Expand Future Recycled Water Use			
	Name of Action	Description	Planned Implementation Year	Expected Increase in Recycled Water Use
1				
2			**Total**	0
3	NOTES:			

This table is to be completed by retail UWMP preparers if recycled water is or is not planned to be used.

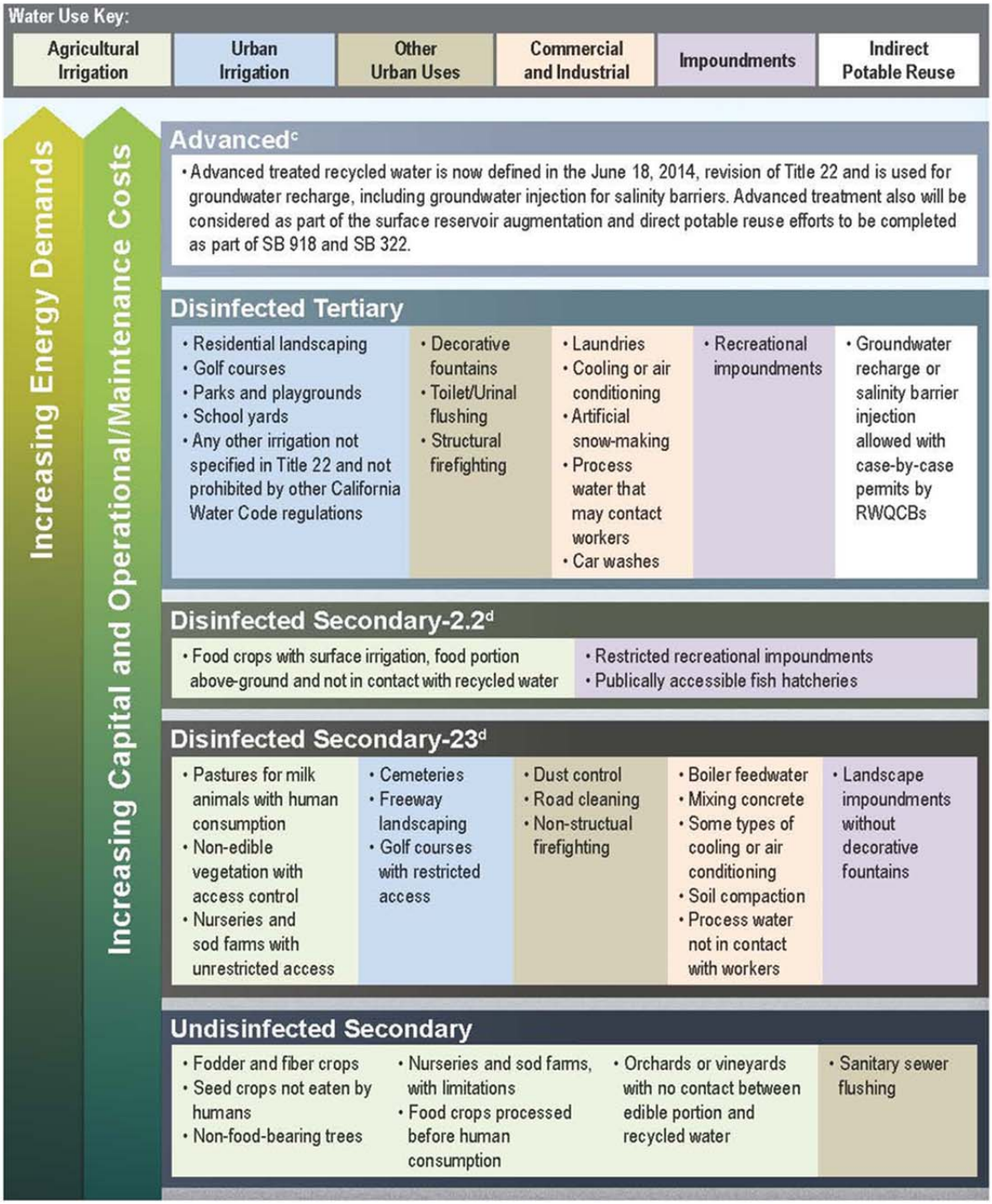
Rows

Row 1	Identify specific actions planned to be taked to increase the use of recycled water within the UWMP area. These may include specific programs such as onsite retrofit support, price reduction per unit volume of recycled water, increased discussion with potential users of recycled water, changes in the permitting to expand user or use area, or development of joint projects with regional partners.
Row 2	Add the expected increase in volume of recycled water use this is expected to result in.
Row 3	Provide any comments important to data reporting in the table.

Columns

Column A	Identify the name of the action
Column B	Provide a brief desciption of the action
Column C	Identify the approximate year to implement the action. A range of years may be entered.
Column D	Provide a general estimate (or detailed one, if available) of the increase in recycled water use resulting from implementing the action.

Figure M-1
Summary of Most Recycled Water Uses Approved Under Title 22



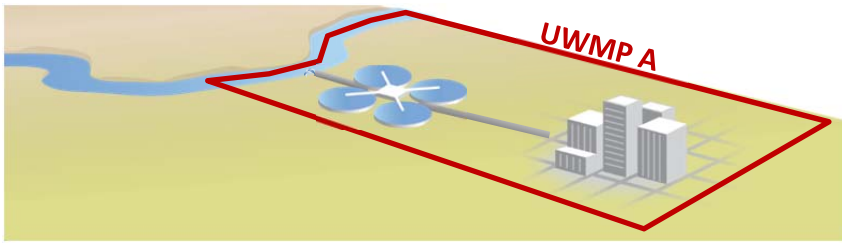
a. Based on California Code of Regulations Title 22, Section 60001 et seq.

b. Uses for increasing levels of treatment also include all uses for lower treatment levels.

c. Wastewater treated with reverse osmosis and advanced oxidation processes.

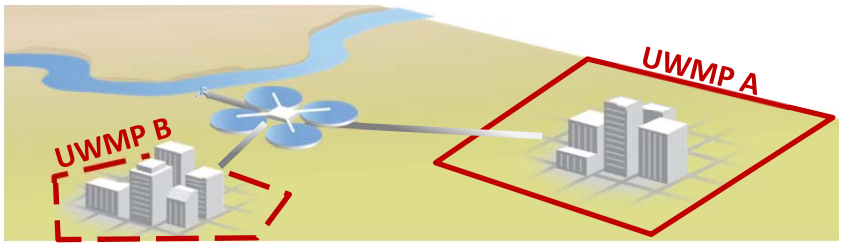
d. Recycled water with a median concentration of total coliform bacteria not exceeding a most probable number of 2.2 or 23 per 100 milliliters (see California Code of Regulations, Title 22).

Figure M-2
Collection and Treatment Scenarios for Completing Table 6-2



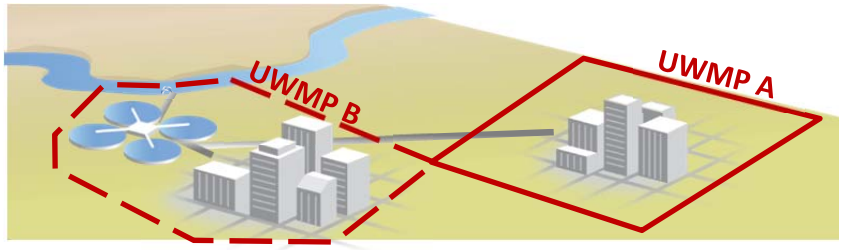
TS1: The UWMP preparer is responsible for collecting, treating, and disposing of the wastewater generated within its service area.

- Complete Tables 6-3



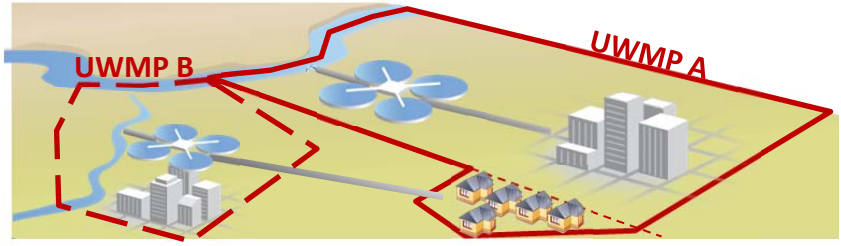
TS2: The UWMP preparer does not treat or dispose of the wastewater generated within its service area. Wastewater is treated and disposed by an organization that does not prepare an UWMP.

- Provide narrative description on wastewater disposal (treatment level and location)



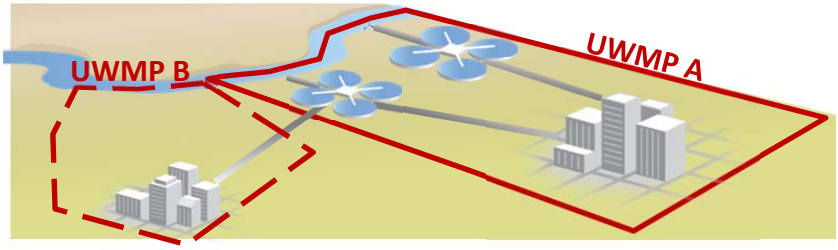
TS3: The UWMP preparer does not treat or dispose of the wastewater generated within its service area. Wastewater is conveyed for treatment to another entity which also prepares an UWMP.

- Provide narrative description on wastewater disposal and the name of the UWMP that applies to the plant receiving the effluent



TS4: A portion of the wastewater collected in UWMP preparer's area is conveyed for treatment to another entity which also prepares an UWMP.

- Complete Table 6-3 for the wastewater treated within the service area
- Provide narrative description on wastewater disposal and the name of the UWMP that applies to the plant receiving the effluent



TS5: Multiple wastewater facilities may occur within the UWMP'S preparer area. Untreated wastewater may be received from another agency.

- Complete Table 6-3 for the wastewater treated within the service area
- Summarize volumes reported in Table 6-3 by each separate facility

TS = treatment scenario

Appendix N

Case Study on Integrated Rate Design and Communication

Moulton Niguel Water District

District Background

Moulton Niguel Water District (MNWD) provides water, wastewater, and recycled water services to approximately 170,000 people within the Cities of Laguna Niguel, Laguna Hills, Aliso Viejo, Mission Viejo and Dana Point in South Orange County. The MNWD service area is 100% dependent on imported water from Metropolitan Water District of Southern California.

The annual potable demand is approximately 29,000AF; 25% of total demand is met from the reuse of imported water. MNWD has been very proactive in conservation and water use efficiency over the years. Fiscal year 2014-2015 (the District is on a July to June fiscal year) has the lowest potable water usage on record since 1991.

The total annual budget (including operations/maintenance and capital improvement projects) is $126 Million for FY 2014/2015. The key sources of revenues are water, wastewater, and recycled water rates and ad valorem property tax. MNWD has a strong financial position, receiving an "AA+" rating from Standard & Poors and "AAA" from Fitch. Unlike most agencies in California, MNWD has not increased its rates at regular intervals, having only 7 rate increases over the last 30 years.

Historical Tiered Rate Structure and 2009 Drought Response

MNWD historically has had a tiered rate structure with five tiers which had a modest price increase from Tier 1 to Tier 5. In 2009, MNWD sought to aggressively respond to drought restrictions and consequent wholesale allocation reductions from the Municipal Water District of Orange County using an enforcement-oriented approach. Mandatory watering days were enforced, and violators were issued fines after several warnings. To manage this effort, MNWD increased its staffing by about 12 full-time employees and issued approximately 20,000 warning letters and violations. One result of limiting the days a customer could water is that some people overwatered on the days that they were allowed to irrigate: nullifying the District's attempt to save water. Additionally, the enforcement effort resulted in customer backlash because of resentment of the District acting as "water cops," and was perceived as telling customers how to manage their own private property.

Changing to Water Budget Based Rate Structure

The decision to adopt a Water Budget Based Rate Structure (WBBRS) was a result of our experience in 2009 with mandatory restrictions. Implementing a WBBRS has resulted in a more efficient use of water. An econometric modeling study in 2014 demonstrated that our WBBRS accounted for an approximate 20% reduction in water usage since 2007, the year in which the District experienced the highest demand in its history. At a public hearing in February of 2015, MNWD adopted the new water budget rate structure, which included rate increases for the next three years.

Planning for the Rate Change Process

MNWD began to evaluate increasing and restructuring its rate structure in March of 2014. However, the planning and preparation started much earlier. To prepare for future rate increases and rate structure modifications, we involved staff from all levels of the organization. In addition to internal feedback solicitation, we sought input from customers and communities to identify areas of improvement for the future. We evaluated numerous aspects of the rate implementation process to ensure the WBBRS's

success, including: planning, roll-out, internal and external communication, public education, timing of rate adoption, financial implications, legal considerations, creating clear messaging and ongoing resource needs.

MNWD also looked at other agencies' experiences with their own rate structures to see what could be learned. We paid close attention to litigation and legal opinions, including the Capistrano Taxpayers Association v. City of San Juan Capistrano case, a suit which had been filed against a neighboring city. Based on our own experience and others' experiences, we knew that not only did we have to meet the legal requirements of the Proposition 218 process, but we had to make sure that the public could understand what we were proposing with our rates and that we needed to establish a comprehensive administrative record that described and clarified the rate setting process. We needed to understand the impacts to customers, have clear rationales to justify the changes, and have extensive outreach to ensure a successful rate adoption.

Another important step that MNWD took was to bring rate analysis expertise in-house rather than relying on consultants every three to five years when rates are typically reviewed. The in-house resource has allowed for ongoing monitoring and evaluation of the rate structure which has allowed for continuity and flexibility in responding to changing conditions and financial needs.

Customer Communication

When the Governor declared the drought emergency in January of 2014, MNWD saw it as a great opportunity to increase awareness and focus the public interest on water in order to implement good policy. We knew that people held a high value for water because of its scarcity, and the timing was right to further promote water efficiency and to prime our customers for future needs and ensure a reliable water supply.

Additionally, we were able to utilize the water efficiency funds, which are collected from inefficient users in the over-allocation tiers, to partner with cities and school districts on large turf removal projects and provide several million dollars in funding to create long term savings and encourage behavioral shifts to less thirsty plants. These visible partnerships helped the customers understand the value of WBBRs in allowing us to invest in our communities and help them respond to the drought.

In addition, we wanted to implement our new rates in spring instead of in summer. Rate increases/changes during summer, when water usage is at its highest, could result in significant increases to customer bills; instead, in the cooler season, the customers have a chance to get used the rates and adjust their usage accordingly.

To add to the momentum, when the State Water Resources Control Board mandated the drought emergency regulations, we saw an unprecedented level of public attention to water statewide. We saw this as yet another opportunity to demonstrate the value of WBBRS to our customers. Part of the emergency regulations required enforcement of restricted watering days. Based on our 2009 experience, we knew this approach would be counterproductive in our service area. We communicated our concerns to the SWRCB and were allowed to submit an Alternate Plan, which was approved and allowed us to continue with our water efficiency programs and plans to further our efforts. This was a great message to our customers who appreciated being able to take responsibility into their own hands in conserving water. They also recognized that WBBRS is an effective and sustainable tool to manage demand. MNWD was only one of two agencies in the State to have its Alternate Plan approved.

Incorporation of a Water Shortage Contingency Plan
MNWD's new rate structure includes the ability to respond to drought conditions by incorporating a Water Shortage Contingency Plan (WSCP). The inclusion of a WSCP allows MNWD to modify allocations during times of droughts or other emergencies without conducting another Prop 218, resulting in the ability for more immediate action when it's needed. Additionally, the gallons per capita per day indoor factor and the plant factor for the outdoor water budget were lowered in the normal condition rate structure to further encourage long-term water efficiency in the District.

Long Range Planning Effort
We knew that having a long range financial plan that forecasted MNWD's need for the next ten years would serve as the foundation for any future rate discussions. Also, a better understanding of reliability projects based on the service area's future needs would help to define the required funding to ensure continued reliability. Staff and consultants worked together to develop a long range water reliability plan to study future demand, risks associated with system and supply, and potential projects that should be considered to enhance reliability. We also revised our reserve policy to make sure that reserve targets and funding levels were designed to offset current volatility to mitigate risk in the face of drawing down reserves. Part of the plan included utilizing funds from the reserve to mitigate the short-term rate impact.

Project Team
When the official rate review started, the first step was to get a strong team together. We knew from the past that it was critical to involve staff members from various departments and from all levels. It was important to understand the experience and insight of customer service representatives who dealt with customers daily, the conservation group, and finance and management. In addition to in-house rate experts, MNWD also hired a consultant to work with staff to ensure a comprehensive effort. From day one, MNWD involved a legal advisor who is an expert on Proposition 218, Article X of the State Constitution and the legal precedents for water utility rates. Legal review and guidance occurred every step of the way, to ensure a justifiable and defensible cost of service and rate design. The finance group worked with a financial consultant and across all levels of staff and departments to develop a detailed and comprehensive cost of service, which led to a rate design that will strengthen the financial stability of MNWD while incentivizing water use efficiency.

The team closely reviewed MNWD's existing rates, identified lessons learned, and researched various legal cases against rates so we knew what pitfalls to avoid in structuring our rates.

Crisis as Opportunity
Some agencies thought that increasing/modifying rates during a drought emergency would create additional challenge in garnering public support. MNWD saw it as an opportunity to showcase how well WBBRS works and the benefits of the rate structure for the community. The fact that the price of water goes up especially during drought when supply is scarce made sense to the customers.

We also utilized news stories about major line breaks because it reminded the public of the importance of repairing and replacing infrastructure now to avoid even greater costs in the future. We helped our customers understand that water purchases and capital improvement projects are the major drivers of rising costs. The need to spend money to maintain our infrastructure to avoid major failures that cause service disruptions and significant damage to private properties was also understood by our customers.

Legal Guidance

Having legal guidance and involvement throughout the process was critical. Having the team understand the legal implications as well as having legal counsel familiar with MNWD and its operations made the process collaborative, resulting in everyone working together and ensuring buy-in every step of the way. The approach also gave the Board of Directors the assurance that we were going above and beyond the minimum to develop a rate structure that supported our needs and could withstand any potential legal challenges. The cost of service study and rate design consisted of more than numbers and technical information to support the proposed rates. The importance of having a comprehensive and extensive administrative record was clearly demonstrated by various legal challenges so our approach to the cost of service study was to make it clear, easy to understand, educational, and informational. Those who criticize and decide on the merits of rates are not water experts, so it was critical that the supporting material of the rates were developed and written so that anyone could review and understand what's contained in them. The same philosophy applied to the Proposition 218 notice. Rather than simply taking the legal minimum requirement approach, the notice included information about the drought to provide context for why the rates were being proposed. The assistant general manager was listed as the contact in the notice so that anyone who called with questions and/or concerns wouldn't be routed to different departments based on their needs, and in addition, with each call, we would take advantage of the opportunity to help better inform customers about various water related issues. Staff also sat down with anyone interested to address concerns of the rate changes.

Importance of Customer Outreach

While the customers may not be happy with the rate increase, they were very appreciative of the level of customer service they received. Customers who had received this high level of service complimented the District on the way the District handled the rate process during the rate hearing.

MNWD remains committed to early, proactive and frequent communication with its customers, and we realize that we should approach our outreach on rates in the same manner. Leading up to the rate review, we built positive relationships with cities, civic groups and community based organizations, which was integral in establishing trust which is invaluable when raising rates. When we started the rate study, we went to the cities served by MNWD and presented to both city council and city staff. We also incorporated our plans for the rate study to our speaker's bureau program and every speaking engagement staff attended over the course of the study. We met with the cities and our highest water users so they could understand how the rate increase and structure change would impact their bills. We held numerous board meetings to discuss our plans and progress during the rate study in a public forum to provide transparency. Every month, the board was given an update on the rate study in addition to special meetings and workshops to facilitate focus and discussion on rates. MNWD's Citizens Advisory Committee (CAC) was also updated so that we could obtain feedback and the CAC members could help spread the word to their various community contacts. Several of the CAC members spoke in support of MNWD at the public hearing. We continued to communicate until people told us that they got all the information they needed; they appreciated our outreach efforts and applauded our commitment to transparency.

Public Hearing

Our diligence never stopped. Leading up to the public hearing, MNWD received 16 letters of protest from the 170,000 people we serve. Even with so little protest, we planned for the public hearing. The Board President, who presided over the hearing, was given a script developed with legal counsel that included all the pertinent information. The team had their roles in presenting the information as well as responding to the board or members of the public. At the day of the meeting, approximately 30 members of the public attended, and many came to support the new rates. Of the 13 people who spoke, only 4 spoke in disfavor of the rates. The hearing concluded with the board adopting the proposed rate structure, which took effect April 1, 2015.

New Rate Structure

Moving forward, demand management continues to be regarded as our core function. We've restructured our organization to enhance integration of all departments to center around demand management as a District-wide responsibility and commitment, not just something that management and conservation departments are tasked with. The new rates ensure the following:

- Those who place the greatest demands on the system pay for the cost associated with that demand;
- Those who use water inefficiently pay at a higher rate than efficient users to collect the proportionate cost of efficiency programs to maintain a reliable water supply for all;
- The funds from higher rates are used to further incentivize efficient use and support demand management strategies;
- In times of drought or other emergencies impacting supply, inefficient users are first to be penalized under the water shortage contingency plan;
- The water shortage contingency plan is integrated with the rate structure to avoid the necessity of a new Proposition 218 notification to change allocation in a drought or other emergencies to be more responsive and adaptive;
- The water shortage contingency plan was adopted as an ordinance to allow for penalties to be applied for the inefficient use of water;
- Wholesale costs for imported water and sewer treatment are built in as a pass-through for the next five years;
- Fixed cost recovery is achieved, improving financial stability regardless of water sales;
- A rate structure that's more effective and cost-effective for our service area in promoting efficient usage better than mandatory restrictions.

The complete rate study can be found on Moulton Niguel Water District's website at http://www.mnwd.com/financial/

Looking Forward

We plan to have ongoing discussions about rates because the more we communicate and review, the better everyone can understand. We are already preparing for the next rate study by doing additional planning, including a comprehensive asset management plan. We continue to build on the relationships and partnerships in our region and participate in statewide efforts to encourage the public's understanding of rates.

Despite litigation challenging rate structures, particularly the ones involving budget based rate structures, MNWD has had a positive and successful rate hearing process. The success of the recent rate adoption is credited to the staff who turned crisis into an opportunity by applying valuable lessons learned, tackling challenges with enthusiasm and creativity, while dedicating themselves to earn the respect and trust of the customers.

Every agency is different because the communities and customers we serve are unique. There is no one-size-fits-all strategy or structure. Knowing your customers and having relationships in place are what makes any rate review successful. Rates are not something to be reviewed or discussed every handful of years; it's a constant discussion and ongoing education for MNWD.

Appendix O

Voluntary Reporting of Energy Intensity

Voluntary Reporting of Energy Intensity

This appendix provides guidance for voluntary reporting of the energy intensity associated with sources of water used by the urban water supplier as required by CWC §§10631.2(a). This section of the Urban Water Management Plan is optional, but urban water suppliers are encouraged to provide as much information as possible. If complete data are not available, estimates, informed judgements, and assumptions can be used to fill in missing information.

CWC 10631.2(a)
In addition to the requirements of Section 10631, an urban water management plan may, but is not required to, include any of the following information:
(1) An estimate of the amount of energy used to extract or divert water supplies.
(2) An estimate of the amount of energy used to convey water supplies to the water treatment plants or distribution systems.
(3) An estimate of the amount of energy used to treat water supplies.
(4) An estimate of the amount of energy used to distribute water supplies through its distribution systems.
(5) An estimate of the amount of energy used for treated water supplies in comparison to the amount used for nontreated water supplies.
(6) An estimate of the amount of energy used to place water into or withdraw from storage.
(7) Any other energy-related information the urban water supplier deems appropriate.

CWC 10631.2 (b)
The department shall include in its guidance for the preparation of urban water management plans a methodology for the voluntary calculation or estimation of the energy intensity of urban water systems. The department may consider studies and calculations conducted by the Public Utilities Commission in developing the methodology.

Energy intensity reporting has many benefits for water utilities and their customers including:

- Identifying energy saving opportunities as energy consumption is often a large portion of the cost of delivering water.
- Calculating energy savings and greenhouse gas (GHGs) emissions reductions associated with water conservation programs.
- Potential opportunities for receiving energy efficiency funding for water conservation programs.
- Informing climate change mitigation strategies
- Benchmarking of energy use at each water acquisition and delivery step and the ability to compare energy use among similar agencies.

Water Energy Intensity Defined

Water Energy intensity is the total amount of energy, calculated on a whole-system basis, required for the use of a given amount of water in a specific location (Wilkinson 2000). This guidance provides a methodology and tools for calculating the operational energy intensity, which is defined as the total amount of energy expended by the Urban Water Supplier on a per acre-foot basis to take water from the location where the Urban Water Supplier acquires the water to its point of delivery.

For the purposes of voluntary water energy reporting for Urban Water Management Plans, urban water suppliers are only expected to report the *energy intensity* associated with *water management processes* occurring within their *operational control.* Any energy embedded in water supplies by an upstream

water supplier (such as a water wholesaler) is not intended to be included in the energy intensity reported in Table O-1. Urban water suppliers that wish to report the embedded energy of their water supplies are encouraged to do so by adding additional text and tables in the Water Energy section of their UWMP.

Overview of Energy Intensity Guidance & Operational Control

This guidance is intended to cover reporting of the energy intensity of water supplies within an urban water supplier's operational control for extraction, diversion, conveyance, placement into storage, treatment, and distribution for a one year time period. Operational control in this context is defined as authority over normal business operations at the operational level. Thus, an urban water supplier would likely *not* have *operational control* over systems from which the urban water supplier purchases water e.g., the State Water Project and other wholesale water supplies, and would therefore not include energy intensity information for those systems.

Reporting Methods

The availability of water-related energy consumption data varies greatly across urban water management wholesalers and suppliers. This guidance is intended to accommodate a range of energy consumption detail. Three reporting options are provided; urban water suppliers should decide which level of reporting to provide based on the resolution of available energy consumption data. Using the more detailed reporting approach (A) will provide water managers with the best understanding of the energy intensity of their systems and how energy consumption of water management operations compares throughout the state.

> ***Water Supply Process Approach (A):*** Report energy intensity by water management operation (aggregated across all supply sources). Enter amount of energy consumed for extraction, conveyance, placement into storage, treatment, and distribution (See Table O-1A on page 10).
>
> ***Total Utility Approach (B):*** Report a single energy intensity for all water management operations. Enter total energy consumed by agency's water operations. The agency's energy intensity is automatically calculated as the ratio of energy consumption over volume of water entering the distribution system (See Table O-1B on page 11).
>
> ***Multiple Water Delivery Products(C):*** Water Supply Process Approach (A) methodology with additional functionality for reporting energy intensity by water delivery product (Retail Potable, Retail Non-Potable, Wholesale Potable, Wholesale Non-Potable, Agricultural, Environmental, and Other deliveries.). (See Table O-1C on page 12).

Reporting Period

This guidance uses a one year reporting period. Ideally the reporting period will match the 2015 period selected by the urban water supplier for other sections for their UWMP. If energy consumption data is not available for the 2015 time period, urban water suppliers can select an alternate one year reporting period. As with other elements of the UWMP, only one year of data is being requested. Urban water

suppliers wishing to report multiple years of energy intensity data can do so by filling out table O-1 for multiple one year periods.

Water Delivery Product

The type of water delivered by an urban water supplier can significantly impact the reported energy intensity. For the purposes of this guidance water delivery products include: Retail Potable, Retail Non-Potable, Wholesale Potable, Wholesale Non-Potable, Agricultural, Environmental, and Other deliveries. Tables O-1A and O-1B request the urban water suppliers to report a single type of water being delivered. Urban water suppliers delivering more than one type of water should use Table O-1C.

Water Management Processes

Water management processes are defined as Extract and Divert, Place into Storage, Conveyance, Treatment, and Distribution. Urban water suppliers using Table O-1A or O-1C will report the amount of energy consumed by and the volume of water entering each water management process. Although the definitions for each water management process define clear boundaries between the system components, in reality, these boundaries can be fuzzy. For example, an agency may pump high-quality groundwater from a well and add small amounts of chlorine at the well for disinfection prior to distribution to customers. In this case, the energy requirements for groundwater pumping and chlorine injection are likely captured by a single electricity meter and there is no way to distinguish between the energy requirements for source water extraction and treatment. Using this analytical framework, the user will have to use their judgement to either partition the energy consumption between the two processes or classify the energy requirements as source extraction or treatment. Either method or classification is acceptable. To avoid double counting the user must be sure not to include the energy requirements as both source extraction and treatment.

Volume of Water

Volume of Water Entering Water Management Process: Many urban water suppliers have multiple water supplies, each of these supplies may have different water management process characteristics e.g., some but not all supplies will pass through the extract and divert , place into storage, conveyance or treatment processes. For O1-A only, the volume of water is entered for each water management process to account for the differences in volume of water passing through each water management processes. The volume of water entered in the "Total Utility" column should equal the volume of water entering the distribution system, in most cases this is the total volume calculated in UWMP Table 4-1: Demands for Potable and Raw Water in 2015. Recycled water should not be included in the water volumes (see discussion of recycled water on page 4).

Hydropower and other Electricity Generation within the Water System

Consequential Hydropower Generation: Consequential hydropower generation occurs where energy generation is a direct consequence of water delivery. All water passing through the energy generation devices is delivered to users and an interruption in water deliveries would result in an interruption in energy generation. An example of consequential hydropower generation is the State Water Project's Warne, Alamo, and Devils Canyon energy recovery power plants. Consequential hydropower generation should be netted from the total amount of energy consumed by each water delivery process. If consequential hydropower generation is greater than the amount of total energy consumed, energy

intensity will be a negative value meaning that the water delivery is a net negative energy consumer or a net positive energy generator.

Non-Consequential Hydropower Generation (optional): Non-Consequential Hydropower Generation is defined as power generated by water systems where the generation of electricity is not directly connected to water deliveries i.e., energy could be generated even if no water were being delivered to water users. An example of non-consequential hydropower generation is the energy generated from the State Water Project by the Hyatt-Thermalito Powerplant at Oroville Dam. Water flowing out of Oroville Dam generates electricity, the water is then released to the Feather River channel where it could replenish groundwater, support environmental needs, flow out to sea or be delivered to SWP customers. There are many challenges in appropriating non-consequential hydropower generation; this guidance provides the option to include non-consequential hydropower generation, but does not provide a detailed methodology for partitioning hydropower production amongst multiple users or benefits. Urban water suppliers that wish to include non-consequential hydropower generated from facilities within their operational control can do so by entering the amount of energy produced by hydropower facilities as a negative value. The urban water supplier will also have to provide a volume of water passing through the hydropower generation process in order to calculate a per acre-foot energy intensity metric. The determination of how to quantify the amount of water passing through the hydropower generation process is left up to the urban water supplier and should be described in the narrative portion of the submission.

Self-Generated Energy Sources: Self-generated or other onsite energy generation should not be netted out from energy consumed. If self-generated energy (i.e. solar, wind, geothermal, Biomass, co-generation, diesel generator) is directly consumed by a water management process (generation "behind the meter"), add the estimated amount of energy produced by the self-generation source to the metered energy consumption for the appropriate water management process. While energy production from self-generated energy sources is not considered in these energy intensity calculations it should be included when considering GHG emissions associated with water management. Urban water suppliers that want to report self-generated renewable energy can do so in Table 0-1 and in the narrative section of this chapter.

Groundwater Banking

This guidance does not address how to incorporate the energy intensity from groundwater banking operations. It is possible to include the energy intensity from groundwater banking in the "Place into Storage" water management process. If groundwater banking operations occur within the urban water supplier's operational control please include a brief discussion of how groundwater banking was addressed in energy intensity calculations or provide a general overview of how groundwater banking would impact the overall energy intensity of water supplies.

Place into Storage

This is the amount of energy consumed within an urban water supplier's *operational control* to place water into a storage reservoir or groundwater bank less any *consequential hydropower generation*. Because only one year of data is being requested, the volume of water entering the Extract and Divert and Place into Storage processes may be substantially different from the volume of water entering the distribution system. If inter-annual storage occurs the total and net calculated energy intensities may

not fully reflect the energy that was applied to the water prior to placement into multi-year storage. Urban water suppliers with inter-annual storage should address this issue by providing a qualitative discussion of how inter-annual storage operations would have impacted the Total Utility and Net Utility Energy Intensities.

Wastewater Energy Intensity

For urban water suppliers that do not provide waste water treatment services, the reporting guidelines for wastewater will not apply. However, for urban water suppliers that do provide wastewater collection, treatment, or discharge services within their operational control a separate reporting table (O-2) is provided to report energy intensity for these processes.
The energy intensity of wastewater operations is the amount of energy consumed within an urban water supplier's *operational control* to collect, treat, and dispose of wastewater from domestic and industrial sources less any consequential energy production, divided by the amount of water entering the wastewater treatment plant(s).

Wastewater specific definitions are provided in a separate section at the end of Appendix O.

Recycled Water Energy Intensity

Recycled water is reported separately from other water supplies because it is currently not utilized as a direct potable water supply. For urban water suppliers that do not provide recycled water, the reporting guidelines for recycled water will not apply. However, for urban water suppliers that do provide recycled water conveyance, treatment, or distribution services within their operational control a separate reporting table (O-2) is provided to report energy intensity for these processes.

The energy intensity of recycled water operations is the incremental amount of energy consumed within an urban water supplier's operation control to convey, treat, and distribute recycled water supplies that exceeds the amount of energy that otherwise would have been required to collect, treat, and discharge wastewater effluent divided by the amount of water entering the recycled water distribution system. Recycled water definitions are provided in a separate section at the end of Appendix O.

Report Narrative

Please provide a narrative for each water supply discussing water management processes in which energy is consumed or produced. Please also provide a narrative documenting data sources, assumptions and methods used to complete the energy intensity calculations.

This guidance and associated reporting tables do not capture all of the water-energy complexities or issues that may be of interest to the urban water supplier. Urban water suppliers are encouraged to include additional tables, charts, text and other additional water-energy information that are of interest.

General Definitions

(words within definitions that are italicized are also defined in this list)**:**

Consequential Hydropower Generation (kWh): Amount of energy generated using turbines or other generation devices to generate electricity from falling water where the energy generation is a direct consequence of water delivery. Water passing through the energy generation devices is delivered to users.

Conveyance (kWh): Amount of energy consumed within an UWMP's *operational control* to transport untreated water through aqueducts, canals, and pipelines from its source to a water treatment facility or directly to an end user less any *consequential hydropower generation*. This does not include any energy expended by a water wholesaler e.g., DWR for the conveyance of State Water Project supplies. For wholesale water supplies, the conveyance energy to be reported by the urban water supplier is only the energy expended by the urban water supplier itself to transport the water from the point at which it receives the water from the wholesaler to the urban water supplier's treatment plant.

Data Quality: The urban water supplier is asked to make a subjective assessment of the quality of the data that is being provided in table O-1. DWR recognizes that energy intensity reporting for water supplies may be new for some urban water suppliers and that some processes may not be sub-metered to allow for precise quantification of energy use. Estimates and informed judgement by the water supplier should be used to fill in as much information as possible.

Distribution (kWh): Amount of energy expended within an urban water supplier's *operational control* to transport treated water from the treatment plant or wellhead disinfection point to the point of delivery. For treated wholesale water supplies, distribution starts at the point where the urban water supplier takes control of water. Reported distribution energy should include only energy expended by the urban water supplier to transport water from the point it receives the water to the point of delivery less any *consequential hydropower generation*.

Embedded Energy in Wholesale Water Supplies: Energy that has been applied to a water supply by all upstream wholesalers. Embedded energy in wholesale water supplies is not included in this voluntary reporting. Urban water suppliers that wish to report embed energy can do so by adding additional text and tables in the Water Energy section of their UWMP.

Energy Intensity (kWh/AF): Quantity of energy consumed divided by volume of water entering the water management process. A measure of the required amount of energy needed to take a unit volume of water from its starting location through all necessary steps to its point of use.

Extract and Divert (kWh): Amount of energy consumed within an urban water supplier's *operational control* to remove water from a channel, pipeline, stream, or aquifer less any *consequential hydropower generation*.

Kilowatt-hour (kWh): A measure of electricity defined as a unit of work or energy, measured as 1 kilowatt (1,000 watts) of power expended for 1 hour. One kWh is equivalent to 3,412 Btu.

Net Utility Energy Consumed (kWh): Total energy consumed within an urban water supplier's o*perational control* for all *water management processes* less any *Non-Consequential Hydropower* production. [Net Utility Energy Consumed = Total Utility Energy Consumed + (- Hydropower)]

Net Utility Energy Intensity (kWh/AF): *Net Utility Energy Consumed* divided by volume of water entering distribution system. [Net Utility Energy Intensity = Net Utility Energy Consumed / Total Utility Volume of Water Entering Process]

Non-Consequential Hydropower Generation: Amount of energy generated using turbines or other generation devices to generate electricity from falling water where the energy generation is not a direct consequence of water delivery. If water that has generated electricity is released to natural channels and may or may not end up being delivered to an end user the generation should be considered *non-consequential hydropower generation*. [Enter as negative value in spreadsheet]

Operational Control: Authority over normal business operations at the operational level. This would not include other systems from which the urban water supplier purchases water.

Place into Storage (kWh): Amount of energy consumed within an urban water supplier's *operational control* to place water into a storage reservoir or groundwater bank less any *consequential hydropower generation*.

Production Volume (AF): Volume of water entering distribution system. If delivery occurs prior to distribution system use volume of water delivered.

Reporting Period: One year period for reporting *volume of water delivered* and quantity of energy consumed. When possible, use time period used to report 2015 data in other sections of UWMP.

Self-Generated Renewable Energy (kWh): Amount of renewable energy generated by facilities under urban water supplier's operational control not included in Consequential or Non-Consequential Hydropower Generation items (examples include solar, wind, geothermal, tidal).

Start Date: First day of one year *Reporting Period*.

Total Utility Energy Consumed (kWh): Total energy consumed within an urban water supplier's o*perational control* for all *water management processes*. [sum(Energy Consumed for all *Water Management Processes*)]

Total Utility Energy Intensity (kWh/AF): Total Utility *Energy Consumed* divided by the volume of water entering the distribution system. [Total Utility Energy Consumed / Total Utility Volume of Water Entering Process]

Treatment (kWh): Amount of energy consumed within an urban water supplier's *operational control* to treat water prior to distribution to customers. Treatment of recycled water is not included in this guidance for calculating energy intensity of urban water supplies.

Volume Entering Water Management Process (AF): Volume of water that entered given water management process in Acre-Feet for 2015 or selected reporting period. Volume of water entered for the "Total Utility" column should equal the amount of water entering the distribution system, in most cases this is the total volume calculated in UWMP Table 4-1: Demands for Potable and Raw Water in 2015.

Water Delivery Product: Describes type of water delivered. Water delivery types include: Retail Potable, Retail Non-Potable, Wholesale Potable, Wholesale Non-Potable, Agricultural, Environmental, and Other deliveries.

Water Management Processes: For the purpose of Appendix O defined as *Extract and Divert*, *Place into Storage*, *Conveyance*, *Treatment*, and *Distribution*.

Wastewater Definitions

Wastewater Collection:

Energy Consumed (kWh): Amount of energy consumed within an urban water supplier's *operational control* to collect and transport wastewater from domestic and industrial sources to a wastewater treatment plant.
Volume (AF): Volume of wastewater entering wastewater treatment plant.

Wastewater Treatment:

Energy Consumed (kWh): Amount of energy consumed within an urban water supplier's operational control to treat wastewater to the level of quality required for discharge to the environment less any consequential energy production.
Volume (AF): Volume of wastewater entering wastewater treatment plant.

Wastewater Discharge

Energy Consumed (kWh): Amount of energy consumed within an urban water supplier's *operational control* to transport treated wastewater from the wastewater treatment plant to the point of discharge .
Volume (AF): Volume of wastewater exiting wastewater treatment plant that is not used for recycling.

Wastewater Total

Energy Consumed (kWh): Total energy consumed within an urban water supplier's o*perational control* to collect, treat and discharge wastewater. [sum(Energy Consumed for all Wastew*ater Management Processes*)]
Volume (AF): Volume of wastewater entering wastewater treatment plant.

Recycled Water Definitions

Recycled Water Conveyance:

Energy Consumed (kWh): The incremental amount of energy needed to convey wastewater effluent from its point of discharge from a wastewater treatment plant to the recycled water treatment plant.
Volume (AF): Volume of water entering recycled water treatment plant.

Recycled Water Treatment:

Energy Consumed (kWh): The incremental amount of energy needed to treat wastewater effluent to recycled water quality that exceeds the amount of energy that otherwise would have been required to treat the wastewater effluent to a quality acceptable for discharge less any consequential energy production.

Volume (AF): Volume of water entering recycled water treatment plant.

Recycled Water Distribution

Energy Consumed (kWh): Amount of energy expended within an urban water supplier's *operational control* to transport recycled water from the recycled water treatment plant to the point of delivery.

Volume (AF): Volume of water entering recycled water distribution system.

Recycled Water Total

Energy Consumed (kWh): Total amount of energy consumed within an urban water supplier's o*perational control* to convey, treat and distribute recycled water supplies. [sum(Energy Consumed for all Recycled Water Management Processes)]

Volume (AF): Volume of water entering recycled water distribution system.

Citations:

Wilkinson, Robert C., 2000. *Methodology For Analysis of The Energy Intensity of California's Water Systems, and an Assessment of Multiple Potential Benefits Through Integrated Water-Energy Efficiency Measures*, Exploratory Research Project, Ernest Orlando Lawrence Berkeley Laboratory, California Institute for Energy Efficiency.

Water Energy Tables

The following pages provide instruction for completing the Water Energy tables. Excel versions of these tables are found at http://www.water.ca.gov/urbanwatermanagement/uwmp2015.cfm

- Table O-1A – Water Supply Process Approach
- Table O-1B – Total Utility Approach
- Table O-1C – Multiple Water Delivery Products
- Table O-2 – Wastewater & Recycled Water

Instructions Table O-1A: Water Supply Process Approach

Water Delivery Product (If delivering more than one type of product use Table O-1C)

dropdown menu

Select type of water delivered.

Only report energy consumed or produced by water systems within the urban water suppliers operational control

Table O-1A: Voluntary Energy Intensity - Water Supply Process Approach

Enter Start Date for Reporting Period 10/1/2014

End Date 9/30/2015

Enter start date for reporting period.

Enter volume of water passing through each water management process.

	Urban Water Supplier Operational Control							
	Water Management Process						Non-Consequential Hydropower (if applicable)	
	Extract and Divert	Place into Storage	Conveyance	Treatment	Distribution	Total Utility	Hydropower	Net Utility
Volume of Water Entering Process (AF)	*manual input*	*manual input*	*manual input*	*manual input*	*manual input*	*calculated*	*manual input*	*calculated*
Energy Consumed (kWh)	*manual input*	*manual input*	*manual input*	*manual input*	*manual input*	*calculated*	*manual input*	*calculated*
Energy Intensity (kWh/AF)	*calculated*	*calculated*	*calculated*	*calculated*	*calculated*	*calculated*	*calculated*	*calculated*

Enter amount of energy consumed by each water management process less any consequential energy generation.

Quantity of Self-Generated Renewable Energy

kWh

Enter non-hydropower renewable energy production

Data Quality *(Estimate, Metered Data, Combination of Estimates and Metered Data)*

dropdown menu

Select quality of the data entered in Table O-1A

Data Quality Narrative:

Enter narrative for data quality.

Narrative:

Provide narrative describing general data sources, methodology, assumptions and process where energy is removed from the system by consequential hydropower generation.

Instructions Table O-1B: Total Utility Approach

Select type of water delivered.

Only report energy consumed or produced by water systems with in the urban water suppliers operational control

Water Delivery Product (If delivering more than one type of product use Table O-1C)

dropdown menu

Enter start date for reporting period.

Table O-1B: Voluntary Energy Intensity - Total Utility Approach

Enter Start Date for Reporting Period 10/1/2014

End Date 9/30/2015

Enter Volume of water entering the distribution system

	Urban Water Supplier Operational Control		
	Sum of All Water Management Processes	Non-Consequential Hydropower	
	Total Utility	Hydropower	Net Utility
Volume of Water Entering Process (AF)	*manual input*	*manual input*	*calculated*
Energy Consumed (kWh)	*manual input*	*manual input*	*calculated*
Energy Intensity (kWh/AF)	*calculated*	*calculated*	*calculated*

Enter amount of energy consumed by all water management processes minus any consequential energy generation.

Quantity of Self-Generated Renewable Energy

kWh

Enter Non-Hydropower Renewable Energy

Data Quality *(Estimate, Metered Data, Combination of Estimates and Metered Data)*

dropdown menu

Select quality of the data entered in Table O-1A

Data Quality Narrative:

Enter narrative for data quality.

Narrative:

Enter narrative describing general data sources, methodology, assumptions and process where energy is removed from the system by consequential hydropower generation.

Instructions Table O-1C: Multiple Water Delivery Types

Only report energy consumed or produced by water systems with in the urban water suppliers operational control

Enter start date for reporting period.

Enter volume of water passing through each water management process.

Enter percentage of "Total Volume of Water Entering Process" contributed by each water product type. Total percentage in each column must equal 100%.

Table O-1C: Voluntary Energy Intensity - Multiple Water Delivery Products

Enter Start Date for Reporting Period 10/1/2014

End Date 9/30/2015

	Urban Water Supplier Operational Control							
	Water Management Process						Non-Consequential Hydropower (if applicable)	
	Extract and Divert	Place into Storage	Conveyance	Treatment	Distribution	Total Utility	Hydropower	Net Utility
Total Volume of Water Entering Process (AF)	*manual input*	*manual input*	*manual input*	*manual input*	*manual input*	*calculated*	*manual input*	*calculated*
Retail Potable Deliveries (%)	*manual input*	*manual input*	*manual input*	*manual input*	*manual input*		*manual input*	
Retail Non-Potable Deliveries (%)	*manual input*	*manual input*	*manual input*	*manual input*	*manual input*		*manual input*	
Wholesale Potable Deliveries(%)	*manual input*	*manual input*	*manual input*	*manual input*	*manual input*		*manual input*	
Wholesale Non-Potable Deliveries (%)	*manual input*	*manual input*	*manual input*	*manual input*	*manual input*		*manual input*	
Agricultural Deliveries (%)	*manual input*	*manual input*	*manual input*	*manual input*	*manual input*		*manual input*	
Environmental Deliveries (%)	*manual input*	*manual input*	*manual input*	*manual input*	*manual input*		*manual input*	
Other (%)	*manual input*	*manual input*	*manual input*	*manual input*	*manual input*		*manual input*	
Total Percentage [must equal 100%]	*calculated*	*calculated*	*calculated*	*calculated*	*calculated*	*N/A*	*calculated*	*N/A*
Energy Consumed (kWh)	*manual input*	*manual input*	*manual input*	*manual input*	*manual input*	*calculated*	*manual input*	*calculated*
Energy Intensity (kWh/AF)	*calculated*	*calculated*	*calculated*	*calculated*	*calculated*	*calculated*	*calculated*	*calculated*

Enter amount of energy consumed by each water management process less any consequential energy generation.

Water Delivery Type	*Production Volume (AF)*	*Total Utility (kWh/AF)*	*Net Utility (kWh/AF)*
Retail Potable Deliveries	*manual input*	*calculated*	*calculated*
Retail Non-Potable Deliveries	*manual input*	*calculated*	*calculated*
Wholesale Potable Deliveries	*manual input*	*calculated*	*calculated*
Wholesale Non-Potable Deliveries	*manual input*	*calculated*	*calculated*
Agricultural Deliveries	*manual input*	*calculated*	*calculated*
Environmental Deliveries	*manual input*	*calculated*	*calculated*
Other	*manual input*	*calculated*	*calculated*
All Water Delivery Types	*calculated*	*calculated*	*calculated*

Enter production volume for each water product type

Quantity of Self-Generated Renewable Energy

manual input kWh

Enter non-hydropower renewable energy production

Data Quality *(Estimate, Metered Data, Combination of Estimates and Metered Data)*

dropdown menu

Select quality of the data entered in Table O-1A

Data Quality Narrative:

Enter narrative for data quality.

Narrative:

Provide narrative describing general data sources, methodology, assumptions and process where energy is removed from the system by consequential hydropower generation.

Instructions Table O-2: Wastewater and Recycled Water Energy Intensity

Enter start date for reporting period.

Only report energy consumed or produced by wastewater or recycled water systems with in the urban water suppliers

Table O-2: Voluntary Energy Intensity - Wastewater & Recycled Water

Enter Start Date for Reporting Period 10/1/2014

End Date 9/30/2015

	Urban Water Supplier Operational Control			
	Wastewater / Recycled Water Management Process			
	Collection / Conveyance	Treatment	Discharge / Distribution	Total
Volume of Wastewater (AF)	*manual input*	*manual input*	*manual input*	*calculated*
Wastewater Energy Consumed (kWh)	*manual input*	*manual input*	*manual input*	*calculated*
Wastewater Energy Intensity (kWh/AF)	*calculated*	*calculated*	*calculated*	*calculated*
Volume of Recycled Water (AF)	*manual input*	*manual input*	*manual input*	*calculated*
Recycled Water Energy Consumed (kWh)	*manual input*	*manual input*	*manual input*	*calculated*
Recycled Water Energy Intensity (kWh/AF)	*calculated*	*calculated*	*calculated*	*calculated*

Enter volume of wastewater entering process

Enter volume of wastewater discharged from wastewater treatment plant.

Enter amount of energy consumed by each wastewater management processes minus any consequential energy generation.

Enter amount of energy consumed by each recycled water management processes minus any consequential energy generation.

Enter volume of water entering recycled process.

Enter volume of water entering recycled water distribution system.

Quantity of Self-Generated Renewable Energy related to recycled water and wastewater operations

kWh

Data Quality *(Estimate, Metered Data, Combination of Estimates and Metered Data)*

dropdown menu

Data Quality Narrative:

Enter narrative for data quality.

Narrative:

Enter narrative describing general data sources, methodology, assumptions and process where energy is removed from the system by consequential hydropower generation.

Appendix P

Quantifying Increased Regional Reliability

Agencies may choose to quantify their water use over time to demonstrate an increase in regional water supply reliability. The appendix provides an optional method and tables that agencies may use to show any changes in their use of water supplies over time. The tables may be completed for an individual agency, whether retail or wholesale, or may be completed for a region.

Excel version of the table and worksheet used for this method can be found at http://www.water.ca.gov/urbanwatermanagement/uwmp2015.cfm

Increasing Regional Supply Reliability (Optional)												
	1980		1990		2000		2010		2020		2030	
Water Supply Sources	Volume	% of Supply	Volume	% of Supply	Volume	% of Supply	Volume	% of Supply	Volume	% of Supply	Volume	% of Supply
Local groundwater												
Local surface water												
Recycled water												
Desalination ocean												
Desalination brackish water												
Storm water capture												
Imported Water (By Source)												
Transfers into Service Area												
Other												
Conservation [1]												
Total Water Supplies	0	0	0	0	0	0	0	0	0	0	0	0

[1]Conservation is included as a source of water for this table only. It may not be considered a source for use in the tables found in Chapter 6.
See Worksheet for Calculating Conservation Savings

Conservation as Water Supply

For the purposes of completing the table" Increasing Regional Supply Reliability", conservation may be included as a water supply. Table 6-8 in Chapter 6 does not allow for the inclusion of "conservation" as a supply. Rather, it is reflected as a reduction in demand, as reported in Table 4-3.

If an agency includes conservation as a water supply in the "Increasing Regional Supply Reliability" table, DWR has provided a method and a worksheet (Worksheet for calculating Conservation Savings), which may be used to determine the volume of conservation savings.

METHOD FOR CALCUALTING CONSERVATION SAVINGS

1. Calculate the Conservation Savings in GPCD

   - Year 1990 - (1980 GPCD) – (1990 GPCD) = 1990 Conservation Savings $_{GPCD}$
   - Years 2000-2030 - (10-15 Year Baseline Water Use $_{GPCD}$) – (Selected Year Water Use $_{GPCD}$) = Selected Year Conservation Savings $_{GPCD}$

2. Convert Per Capita per Day Savings to Agency per Day Savings

   (Conservation Savings $_{GPCD}$) X (Population) = Conservation Savings $_{Gallons/Agency/Day}$

3. Convert Agency Savings from Gallons per Day to Acre Feet per Year

$$\frac{(\text{Conservation Savings}_{\text{Gallons/Agency/Day}}) \times (365_{\text{days/year}})}{325{,}850_{\text{gallons/acrefoot}}} = \text{Conservation Savings}_{\text{AF/Year}}$$

Worksheet for Calculating Conservation Savings						
Year	Annual Agency Gross Water Use (AF)	Population	GPCD	Conservation Savings (GPCD)	Annual Conservation Savings (AF/Year)	
From Table 5-1		10 - 15 Year Baseline Water Use (GPCD)				
1980			#DIV/0!			user fill
1990			#DIV/0!	#DIV/0!	#DIV/0!	auto calculate
2000			#DIV/0!	#VALUE!	#VALUE!	leave blank
2010			#DIV/0!	#DIV/0!	#DIV/0!	
2020			#DIV/0!	#DIV/0!	#DIV/0!	
2030			#DIV/0!	#DIV/0!	#DIV/0!	
1990 savings are not compared to baseline, but are calculated using this equation: 1980 GPCD - 1990 GPCD = 1990 conservation savings						