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

K.1. Introduction and Background

Pursuant to California Water Code (Water Code) 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*" (California Water Code 10610.4(c)). One challenge from this directive is reflecting how the pursuit of efficient use is best represented in the projected future water uses that are the cornerstone of good planning. As required by the Act, the water uses from both existing customers and those that may be added during each five-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 for projecting future water uses for both existing customers and future, new customers based on recent trends, new codes and ordinances, land-use changes and other water-use impacting factors and it allows Suppliers to calculate anticipated conservation savings for its existing customers, as well as predict the demands for new customers.

Further, this suggested methodology can be used to reflect the outcome of required coordination with local or regional land-use authorities by allowing unique land-use classifications to be separately considered, as appropriate, to reflect varied water-use factors (e.g., residential lot density, anticipated occupancy, etc.) and be consistent with potential varied designations used by land-use authorities.

K.1.1 Background

In September 2014, two legislative bills amending sections of the Act were approved and chaptered: Assembly Bill (AB) 2067 and Senate Bill (SB) 1420. Key among the changes to existing statutes was the addition of Water Code Section 10631(d)(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. Water Code Section 10631(d) already requires an urban water supplier to comply to the following:

> (1) For an urban retail water supplier, quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, based upon information developed pursuant to subdivision (a), identifying the uses among water use sectors, including, but not necessarily limited to, all of the following:
>
> > (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.

The new statutes added a new section (subsection 4) to Water Code Section 10631(d). The new section can be incorporated by either or both retail and wholesale urban water suppliers (Suppliers). When a wholesale water supplier is accounting for 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. The new text (subsection 4) added to Water Code Section 10631(d) is as follows.

> Water Code Section 10631(d)
>
> > (4) (A): Water use projections, where available, shall display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area.
> >
> > (B) To the extent that an urban water supplier reports the information described in subparagraph (A), an urban water supplier shall do both of the following:
> >
> > > (i) Provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections.
> > >
> > > (ii) Indicate the extent that the water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. Water use projections that do not account for these water savings shall be noted of that fact.

The last statement should not be overlooked, as it explicitly requires a Supplier to note 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.

K.1.2 Why is this Important?

An urban water management plan (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-use 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 effects 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 water suppliers to really understand current and future water uses to enable useful and practical planning.

Because UWMPs are updated on a five-year cycle, 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 supplier’s UWMP. DWR recognizes that an UWMP is a Supplier’s plan — not DWR’s — and will defer to each supplier’s discretion for reflecting the quantitative benefits of applicable codes, standards, and ordinances, assuming reasonable citations and basis are provided, as required by Water Code 10631(d)(4)(B).

K.1.3 Document Organization

This document is organized to help suppliers understand how to best organize water-use 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

K.2. Using a Land-use Basis for Unit Water Demand Estimates

As noted earlier, Water Code Section 10631(d)(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 water demand of existing customers and future customers must be blended into one representative unit water demand factor. For example, 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 percent growth rate — the unit water demand factors for existing housing versus that of future housing cannot be differentiated and is generally reflected as one blended value.

To improve on this, DWR recommends but does not require, at a minimum, a water supplier separate each of the six customer categories described in Water Code Section 10631(d)(1) into "existing" and "future" customers (see Figure K-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 10 or 20 years ago. As shown in Figure K-1, through this simple separation, a supplier can readily recognize the potential decreasing unit water demand over each five-year planning increment for existing homes (as may result from natural replacements of appliances or from the water supplier's conservation actions), but can also recognize the different starting point for a home built today that must meet new landscape and building standards, and be equipped with water-efficient appliances. ("Natural replacement" is the term for adopting water conservation ethics and replacing fixtures and appliances with more efficient models.)

		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)

Figure K-1 Sample Table with "Existing" and "Future" Customer Separation

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, and lower 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 K-2 presents a more detailed table showing how data can be separated to focus the effects of codes, ordinances, and land-use plans to each applicable land-use category.

	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 (existing)							(indoor)						
							(outdoor)						
Type B (new)							(indoor)						
							(outdoor)						
Type C (existing							(indoor)						
							(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						

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

Figure K-2 Sample Detailed Demand Table

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

As part of the 2010 and 2015 UWMPs, all retail suppliers were required to determine baseline per-capita water use and set targets for reduced per-capita use by 2020, established as gallons per capita per day (GPCD). Many water suppliers used these 2020 GPCD targets to determine future demands in their 2010 and 2015 UWMPs. This is an easy calculation because it requires multiplying a future estimated population by the GPCD. While simple, this method did not provide a water supplier with the opportunity to assess the effect of codes, ordinances, and land-use plans on future water demand. Consequently, it potentially misrepresents actual trends and reduces the opportunity for the supplier 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 did not have the ability to differentiate the effect of new landscape ordinances on new construction from the effect of conservation mandates on existing customers.

For 2020 UWMPs, the supplier should consider a more robust approach than GPCD x population to not only better estimate its future water-use needs, but to also compare its projections with pending urban water-use objective that will be established prior to the 2025 UWMP period, as described in California Water Code Section 10609.25.

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

K.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 supplier’s water use. The following steps outline a simple meter analysis for residential data, though each water supplier likely has unique circumstances that may require more specialized assessments to assure the data is usable for demand forecasting purposes. Non-residential meter data can also be analyzed using similar steps.

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 typically can 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. Geographic information system (GIS) tools, if available to water suppliers, can also offer methods to help establish categories. Indoor demands can vary significantly in older neighborhoods where there is a mixture of newer and older appliances and fixtures compared to newer homes that may have been built or remodeled subject to more recent plumbing code requirements. These differences can create another basis for category distinction. Note that 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.

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 customer meter records in a given dwelling unit classification should be analyzed, but 150 records would allow for more confidence in the data. The more data used, the more errors or anomalies that can be normalized. Although 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.

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 K-3). As indicated by the data set used to create the figure, the rate structure results only in a minor offset in water use. This is more noticeable in the data set using 150 or more 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 percent 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 in meter use, and fixed annual use. The goal is to eliminate records from vacant homes, seasonally used homes, and the like. This step is subjective, requiring reasonable judgment.

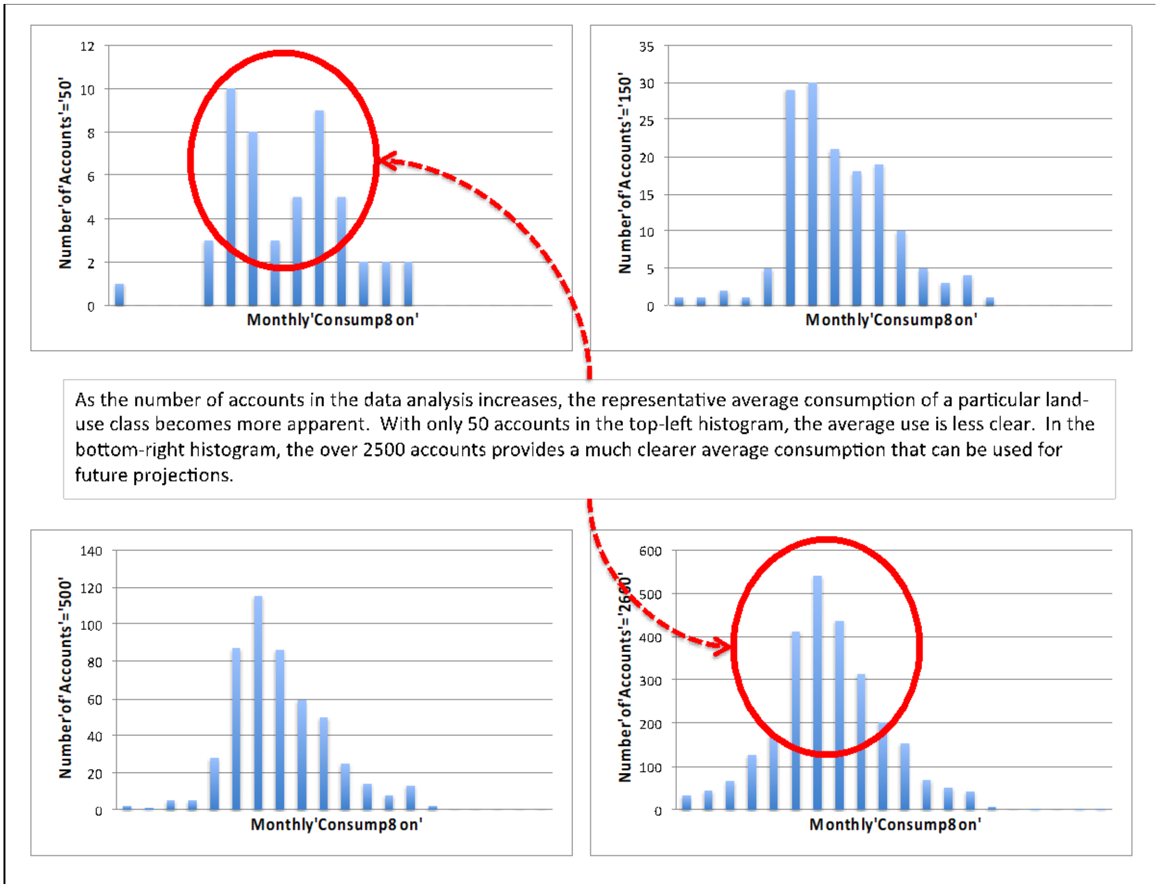

Figure K-3 Histogram Shape of Monthly Consumption Exemplifying how it Can Change with More Accounts Included

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 water 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 effects of codes and ordinances and other water conservation-related factors 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 2000s 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 some percentage to reflect plumbing code and building standard 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).

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. 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 because of landscaping needs. In winter months, the percentage of residential use compared to non-residential would lower reflecting only minimal residential outdoor watering. 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.

K.2.2.1 Commercial Water-Use Sector Considerations

The commercial water sector is a very broad category that may include a wide range of non-residential water users, from large regional shopping centers, to neighborhood retail centers, to high-rise office buildings, hotels, and medical centers. If the commercial class is a significant portion of water demands or a number of unique water users exist, then suppliers are encouraged to create appropriate subcategories to enable appropriate analysis for future water needs. Because of the wide variety of customer types in this class and the large variability of water use and lot size, suppliers are encouraged to use a demand per-acre value to account for varied businesses within one metered water service account. For example, a neighborhood retail center may have a mix of very low and very high water users, such as a laundromat or restaurant. Individually, the use varies significantly; but for the entire commercial parcel, including parking areas, ornamental landscaping and other features, the entire water use can be averaged per acre of the commercial space. However, a neighborhood retail center may vary from a high-rise office complex, which may cause the supplier to create a separate category under the "commercial" sector for each. The important consideration is to create unique categories as most appropriate to facilitate future water-use projections as those may vary by each subcategory.

K.2.2.2 Industrial Sector Considerations

The industrial water-use sector is another category with a wide range of actual or potential water use and an even greater range of land development intensity, making forecasts challenging. For example, a new major industrial facility may be opening soon or may expect to significantly expand. Conversations with the local land-use authority are extremely important to understand likely new industrial water users otherwise unknown to the supplier.

For this classification, suppliers are encouraged to closely review the water-use history of its industrial customers and potentially group into "high-water using" or other categories that can facilitate forecasts for future water needs. In some instances, conversations with the high-water users may be useful for projecting whether demands may change over the next five-year period. Overall, this category requires close analysis to assure future demands reflect anticipated conditions.

K.2.2.3 Institutional and Governmental Sector Considerations

This water-use sector likely has obvious subclasses for water-use analysis, such as parks, schools, fire stations, or other explicit uses. Often these can be significant water users with only a limited number of water-service accounts, allowing easy separation into unique categories. The class may also capture some unique land-use classes, such as large airports, which should be separated from the general use in the class.

K.2.2.4 Representing Unique Water-Use Sectors and Land-Use Classification

Several water suppliers in the state have unique land uses, or variation of uses, that fall outside of the six categories described in

Water Code Section 10631(d)(1) (see page K-2). Some examples 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 supplier or through coordination with another supplier with similar circumstances. For example, estimating the future demand from new vacation homes would require some analysis of similar vacation homes in the region (whether served by the supplier or not). It is important to remember that this is representative data to assist the supplier 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.

Many factors can affect water use in unique land classifications. Generally, if existing data is not available for similar uses, the unique use is likely a small contributor to the overall demand of the supplier. For example, in a vacation community, the supplier 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 it can be assessed using professional judgment extrapolating existing land-use factors.

Other unique water-use classes which a worth analyzing as their own subclass may include universities, resorts, large hospitals, large office and research parks, and large hotels. In addition to the unique examples in previous sections, each of these categories can represent a significant water use and impact the larger trends on the supplier as a whole.

K.2.4 Converting Per-capita to Land-use Based Demand Factors

Per-capita demand factors can easily be calculated from land-use-based demand factors. Unfortunately, the converse is not true – there is no simple method to convert per-capita demand factors into land-use demand factors. Because the use characteristics between land-use classes can vary significantly, trying to convert a supplier's average of

120 GPCD (example only) is meaningless without looking at actual water-use characteristics for each land-use class. DWR encourages suppliers 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 supplier-specific objectives.

Care should be taken when converting back to GPCD that the appropriate population estimate is used that best reflects the land-use forecasts. As an example, a water supplier'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 on available census data, the water supplier may determine that the average single-family residence has 3.1 people and the multi-family housing averages 1.8 people. These numbers would generate a forecasted population (all other aspects remaining the same) of 4,000 people. In contrast, the California Department of Finance may project a 10-year population growth of 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 supplier's 2010 and 2015 UWMPs.

K.3. Implementation Examples

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

K.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 K-4 depicts the key water demand sectors.

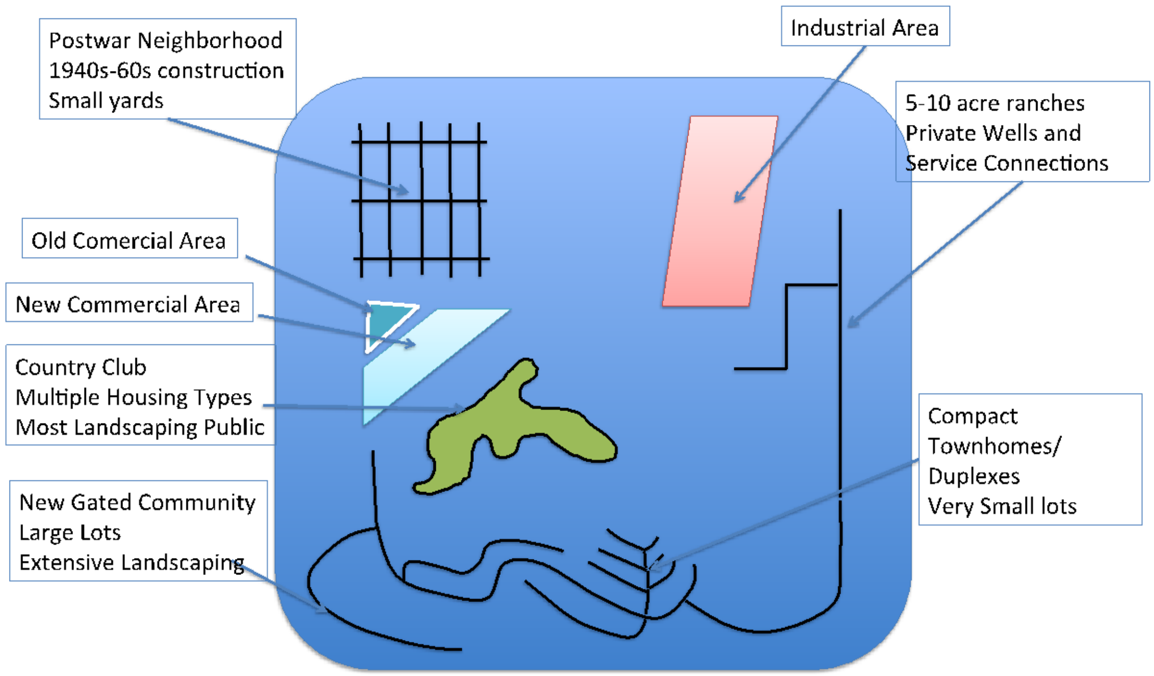

Figure K-4 Water Supplier A's Water-Demand Sectors

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, accordingly, assessed in more detail. As shown in Figure K-4, 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 a country club with distinct housing types. Figure K-5 displays a sample table that subdivides each unique residential land-use classification.

Note that, 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., planned redevelopment of older section of town).

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																		

Note that one important addition in Figure K-5 that is not shown in the sample table above 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 effects of conservation measures, codes, ordinances, etc. For example, assume the water supplier 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 percent or more. Note also that Figure K-5 includes multiple columns to adjust demand factors, it does not include the separation between existing and future customers in each class that is represented in Figure K-2. Ideally, the multiple demand factor columns allow existing customer use to be modified, while separating existing customers from future customers allows for a completely different demand factor for new customers (e.g., new homes likely use less than existing homes).

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.

Figure K-5 Water Supplier A’s Residential Classification Table (example only)

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 as a result of 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 subcategories is the ability to account for varying population or homeowners association controlled landscaping. For example, 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 – as a result of few people per house and more consistent irrigation management by the HOA.

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 anticipate and evaluate water supply circumstances. Because the UWMP will be 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 effect of conservation measures to the existing units whose count generally does not change.

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.

Tracking of demand factors over time allows for the effect of conservation measures to be recognized. An example of this might be in an older 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 percent (or appropriate expected value) in 2025 to account for full meter implementation in the next 10 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 percent 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. Note that 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. The MWELO provisions will require the new planned gated community with large lots (see Figure K-4) 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. As a result, 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 2025–2045 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 adjust growth rates and housing absorption schedules. Further, Water Supplier A may already have prepared a Water Supply Assessment (per Water Code Section 10910 et seq.) that identifies the anticipated phasing of the new development. The water supplier 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 2000s likely reflected a trend toward large-lot, 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.

By separating the residential types, Water Supplier A can better understand the effects 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.

K.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. Figure K-6 depicts Water Supplier B's 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 redevelopment that will turn an area of single-story strip malls into multi-story mixed-use units with condos/townhomes above and pedestrian-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 half-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 2015 UWMP prepared by Water Supplier B accounted for this growth and estimated 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 2020 UWMP using unique demand factors for each residential type, Water Supplier B discovered total water use was higher than previously projected. This was driven mainly by higher than anticipated use at the new estate housing. When translated to GPCD, Water Supplier B realized it may have missed its 2020 target GPCD.

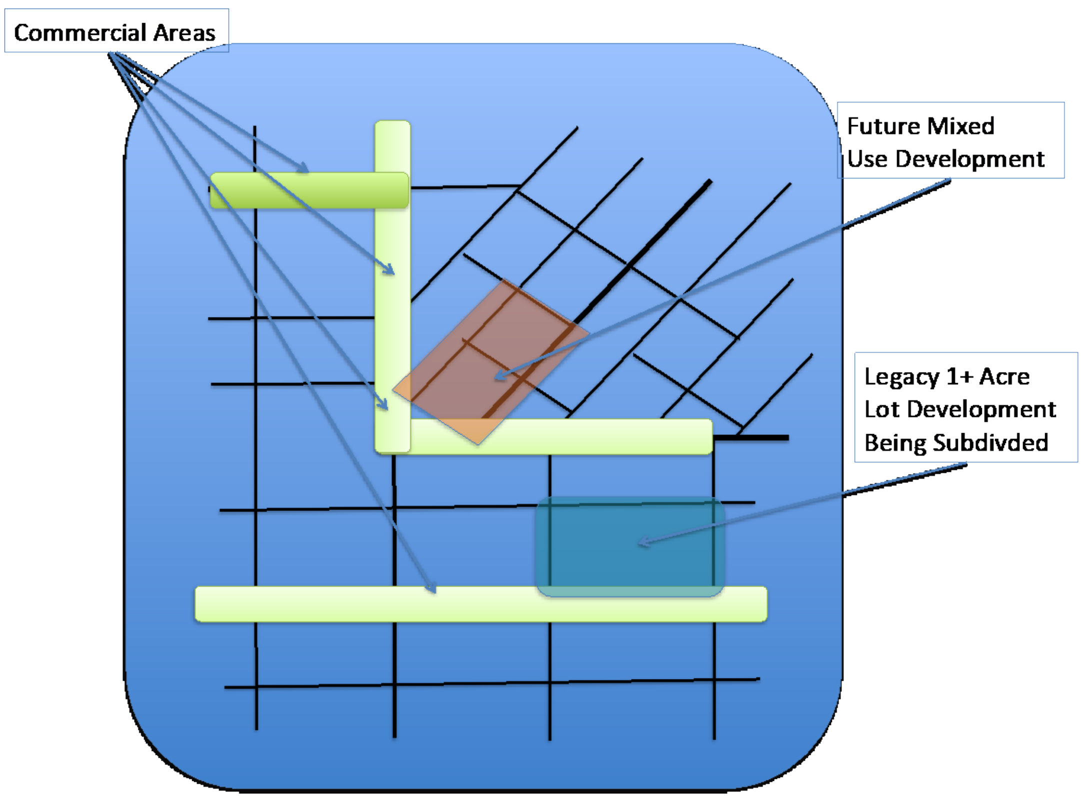

Figure K-6 Water Supplier B's Water-Demand Sectors

As a result of this analysis, Water Supplier B must consider significantly increasing its water conservation programs — targeting the existing customers — and consider placing additional landscaping restrictions on the new estate housing that exceed the State's MWELO provisions. Water Supplier B believes these actions will help position them for the pending urban water-use objectives that will be forthcoming under Water Code Section 10609.25.

K.4 – Additional Useful Information

As discussed in 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. The Water Code requires that a supplier shall reflect codes, standards, ordinances, or transportation and land-use plans in its forecasted water demands, where such information is available. Incorporating these into future unit demand factors (to include in tables such as sampled in Figure K-2 and Figure K-5) requires a supplier 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 supplier is encouraged to use professional judgment, a discretionary action that will be supported by DWR during review of UWMPs. This section provides guidance.

K.4.1 Applicable State Codes and Ordinances

At the State level, various codes and ordinances are adopted and put into law, which increases efficiency statewide. Overall, a water supplier 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 effect of all these factors can help a supplier assess likely 2025 GPCD conditions, the value of existing conservation efforts, and the need to potentially make adjustments prior to the next UMWP update. A brief description follows of several statewide codes and ordinances that should affect future water needs.

K.4.1.1 Model Water Efficient Landscaping Ordinance

The Water Conservation in Landscaping Act was enacted in 2006 and has since been revised and expanded multiple times by DWR resulting in the current MWELO (Government Code sections 65591-65599). In response to Governor Brown's executive order dated April 1, 2015, (EO B-29-15), DWR updated MWELO and the California Water Commission approved the adoption and incorporation of the updated State standards for MWELO on July 15, 2015. MWELO requires a retail water supplier or a county to adopt MWELO provisions or to enact its own provisions equal to or more restrictive than the MWELO provisions. The changes included a reduction from 70 percent to 55 percent of the reference evapotranspiration (ETo) for the maximum amount of water that may be applied to a landscape for residential projects, and non-residential projects to 45 percent, which effectively reduces the landscape area that can be planted with high-water-use plants, such a turf. For residential projects, the allowable maximum coverage of high-water-use plants is reduced to 25 percent of the landscaped area (down from 33 percent). The updated MWELO also now applies to new construction with a landscape area greater than 500 square feet (the prior MWELO only applied to landscapes greater than 2,500 square feet, per Cal. Code Reg. Tit. 23, Div. 2, Ch. 27, Sec. 490.1.).

K.4.1.2 California Energy Commission Title 20

First developed in 1977, the California Energy Commission (CEC) introduced appliance energy-efficiency standards. Since then, these standards have been expanded to include a number of household items related to water and energy use including dishwashers, clothes washers, sprinklers, showerheads, faucets, toilets, and urinals. These standards are applied in addition to national standards. In many cases, within a few years, national standards are modeled on and adopted from California’s standards. Following approval of a new standard, the CEC ensures that only items that can pass new testing procedures are legally allowed to be sold in California.

K.4.1.3 Cal-Green Building Code

Beginning in January 2010, the California Building Standards Commission adopted the statewide mandatory Green Building Standards Code (CALGreen Code) requiring the installation of water-efficient indoor and outdoor infrastructure for all new projects after January 1, 2011. The CALGreen Code was incorporated as Part 11 into Title 24 of the California Code of Regulations and was revised in 2016 to address changes to MWELO adopted during the 2012–2016 statewide drought. Revisions to CALGreen Code in 2019 modified sections to direct users to MWELO regulations.

The 2016 Triennial Code Adoption Cycle consisted primarily of the MWELO updates adopted in response to the drought. Indoor infrastructure changes were limited to some minor non-residential fixture changes and changes to the voluntary Tier 1 and Tier 2 requirements. Additionally, the Code was updated to match the new Title 20 Appliance Efficiency Regulations. The 2019 updated sections to direct CALGreen code users to Title 23 of the California Code of Regulations to allow Title 23 to be the sole location of MWELO requirements.

The CALGreen Code applies to the planning, design, operation, construction, use, and occupancy of every newly constructed or remodeled building or structure. All new residential and non-residential customers added to the District's demands must meet the CALGreen Code as well as the outdoor requirements described by MWELO. Generally, remodels and new construction will satisfy these indoor requirements through the use of appliances and fixtures such as high-efficiency toilets, faucet aerators, on-demand water heaters, or other fixtures, as well as Energy Star and California Energy Commission-approved appliances.

K.4.1.4 Water Conservation Objectives and Legislative Actions

In 2009, Governor Arnold Schwarzenegger signed Senate Bill No. 7 (SBX7-7), which established a statewide goal of achieving a 20 percent reduction in urban per capita water use by 2020 for urban retail water suppliers (Water Code Section 10608.20). The efforts undertaken by urban retail suppliers to comply with this statute affects existing customer purchases of replacement appliances and fixtures, has caused landscapes to alter, and has generally created a continuing water conservation ethic.

In response to multi-year drought conditions, Governor Brown issued Executive Order B-37-16, "Making Water Conservation a California Way of Life," in May 2016. In May 2018, Governor Brown signed into law SB 606 and AB 1668, both of which imposed additional statutory requirements above and beyond the 20 percent by 2020 target and resulted in continued efforts to increase water-use efficiency and ultimately to reduce water demands of existing customers.

In 1991, SB 229 passed which created Water Code Section 525 and required water suppliers to install meters on all new service connections after January 1, 1992. Water Code Section 527, modified in 2004 by AB 2572, required water suppliers to charge for water based upon the actual volume of water delivered if a meter has been installed, and more importantly, to install water meters on all customers by January 1, 2025. Customers that are metered and billed in part based upon volume have consistently shown a lower use when compared to flat rate non-metered customers.

K.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). Although recent extreme efforts to manage demand during the 2015 drought crisis indicate reductions in excess of 30 percent, the actual long-term savings for existing residential users may be much less. Without a more thorough assessment, a water supplier may conservatively assume existing residential customers reduce unit demands by 5 to 10 percent over the forecast timeframe. More sophisticated analysis to support reductions can be undertaken using available guidance from existing reports. Consider these examples:

Turf replacement — With several water suppliers throughout the state implementing these programs over the past several years, data to guide anticipated savings is readily available. As noted in a 2015 study by the California Water Efficiency Partnership (California Water Efficiency Partnership/California Urban Water Conservation Council 2015), 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.

Fixture and appliance rebates — To an even greater extent than turf replacement, fixture and appliance rebates have been ongoing for many years with varied success. The supplier will need to anticipate participation rates and ultimate reductions in the various unit water demand factors.

Natural Replacement — Even without targeted conservation programs, existing water users will generally experience a reduction in unit water demands over time as fixtures and appliances are replaced and water conservation ethics continue to be embodied. This is considered "natural replacement." For instance, even without a rebate incentive, residential customers will purchase new washing machines over time, likely replacing an inefficient appliance with one meeting the current State appliance standards. Care must be taken to ensure the acceleration of replacement intended through rebate programs is not double counted with natural replacement.

In addition to specific conservation programs, the water supplier or land-use agency may have other specific ordinances that will affect unit demand factors. Most of the time, these factors 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 California Water Efficiency Partnership, the Alliance for Water Efficiency, and other conservation-oriented advocacy groups offer many tools to assist water suppliers. Examples of tools are available online at California Water Efficiency Partnership and Alliance for Water Efficiency websites. (Membership may be required to access some tools and references.)

K.4.3 Using Standardized Values

DWR prefers the use of actual supplier-specific meter data as the best source for baseline demand factors. However, some future land-uses, especially those 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 supplier'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 American Water Works Association-approved value or other common standard in the industry may be used as available.

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. But daily values can be useful for estimating commercial and industrial uses (e.g., office buildings, retail centers, shipping warehouses), as these uses tend to be stable throughout most of the year.

K.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 1990s. But today, land-use agencies are promoting trends to more dense residential developments, mixed uses, and slower growth, although they may not have updated their general plans or other relevant land-use documents. Developers are responding with combinations of compressed densities but also with large homes on smaller lots. The effect 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 been otherwise 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 supplier 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 2020 UWMP to be a useful resource to land planning agencies that may be updating general plans or evaluating specific development proposals.

Suppliers are encouraged to work with local land-use authorities to understand growth plans and incorporate these into more realistic and aligned water demand projections.

K.4.5 Including Citations

As required in the statute, a water supplier 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 supplier to easily revisit approaches and assumptions made in the 2020 UWMP when it is undertaken the 2025 UWMP. Internal trends published in an annual report, such as submitted by suppliers to the State's Division of Drinking Water also serve as a useful and reliable citation for preparing State document.

K.5 Conclusions

To enable the most reasonable representation of codes, standards, ordinances, or transportation and land-use plans within 2020 UWMPs, water suppliers are strongly encouraged to transition to land-use-based demand projections. Further, land-use-based demands should separate existing customer demands from future customers anticipated to be added in each of the five-year forecast increments.

Water suppliers should view the 2020 UWMP as an opportunity to garner a better understanding of where its overall use may be relevant to pending urban water-use objectives (see Water Code Section 10609.25). And, if there is a perceived risk of not achieving the to-be-determined objectives, 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 supplier into a false sense of success.

Importantly, a water supplier must indicate in its 2020 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 Water Code section 10631(d)(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 supplier.

References

California Water Efficiency Partnership/California Urban Water Conservation Council. 2015. *Turf Removal and Replacement: Lessons Learned*. Author: Briana Seapy. 29 pp. Viewed online at: http://toolbox.calwep.org/w/images/9/98/Turf_Removal_%26_Replacement_-_Lessons_Learned.pdf. Accessed: August 10, 2020.