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

An Appendix to the California Department of Water Resources 2015 Urban Water Management Planning Guidebook

Prepared by:

Tully & Young
Comprehensive Water Planning

Tully & Young, Inc.
3600 American River Drive, Suite 260
Sacramento, CA 95864

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 suppliers "*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.

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):

> *(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.*

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.

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 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 affects 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).

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 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.[2]

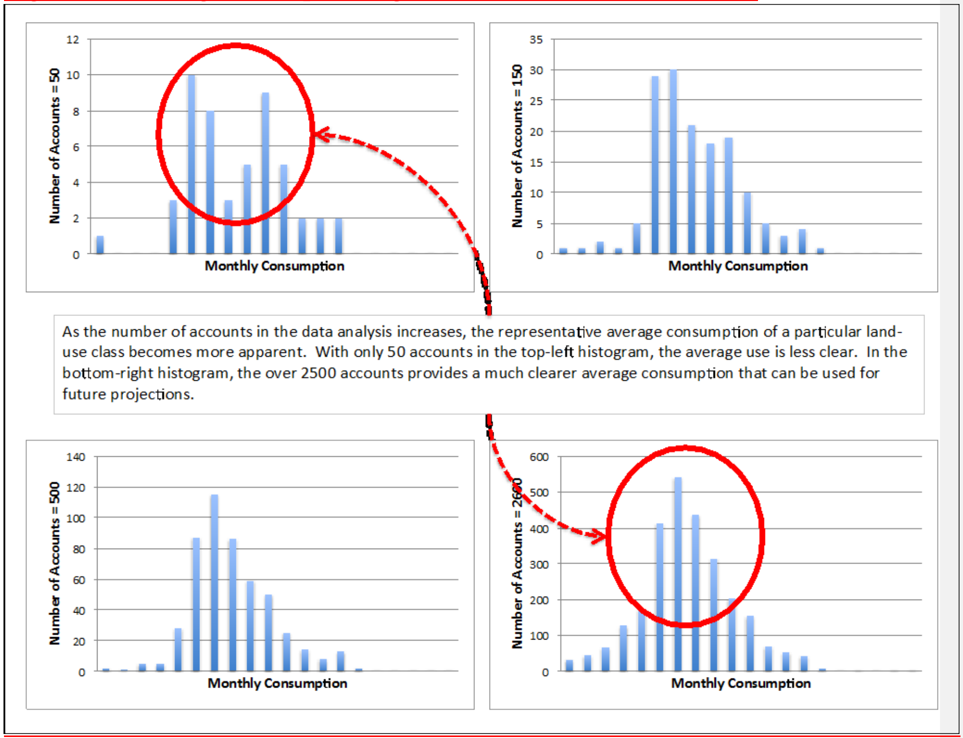
2. Download meter data – For each land-use classification, obtain a few years (minimum) of monthly customer meter data from at least one representative neighborhood [note: this step requires staff or consultant access to query the billing database or other source of records]. Typically, meter data will 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**. From this curve the erroneous meter sets can be eliminated. Meters with exceptionally high and exceptionally low use can be eliminated from the process so as to not inappropriately skew the analysis of "typical" water use characteristics. 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 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.

Comment [b1]: Including an example graph would help

[2] 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.

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



~~3.~~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).

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.[3] 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.

Comment [b2]: Greg- maybe we need a few sentences here or somewhere else in the document that talks about the differences between land based population estimates (planned subdivisions, infill etc) and growth projection estimates. From what I understand you can get different numbers. So whatever population estimate you are using, you have to be sure the housing connections match that estimate

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 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

[3] 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.

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.[4]

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.

[4] 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.

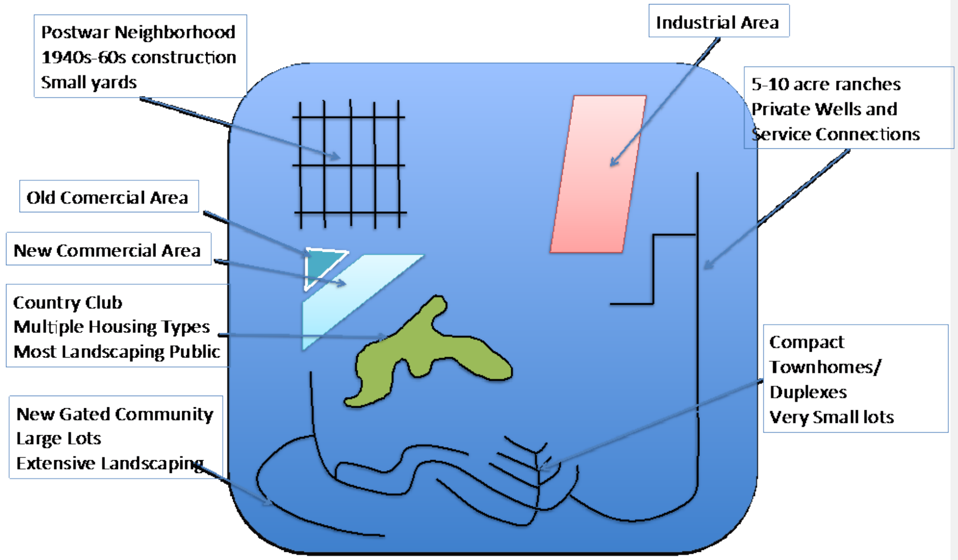
Section 3 – Implementation Examples

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.[5] 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

[5] 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.[6]

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

[6] 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. 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.

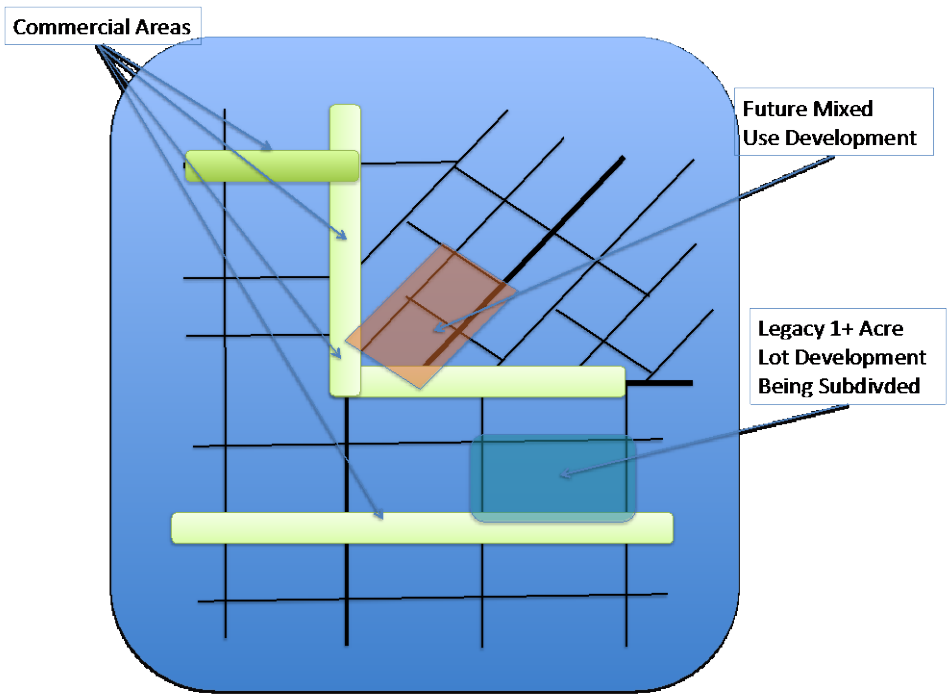
To understand the potential rate of growth for the new large-lot development, Water Supplier A looks to the local land-use planning agency’s adopted documents – such as a development specific plan, or simply a general plan – and can directly incorporate or adjust growth rates and housing absorption schedules. 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. [7]

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 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.

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



[7] 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 and rapid growth (as was being experienced at the time). Current development projects are trending toward more dense housing and slower growth rates.

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. 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.[8] 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

[8] 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),[9] 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,[10] but the water purveyor will need to extrapolate this to

[9] Turf Removal and Replacement: Lessons Learned; March 2015; California Urban Water Conservation Council [http://www.cuwcc.org/Resources/Publications-and-Reports].
[10] 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.[11]

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.[12]

[11] Examples of tools can be found at https://www.cuwcc.org/Resources/Planning-Tools-and-Models and http://www.allianceforwaterefficiency.org/Tracking-Tool.aspx.

[12] 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.)

4.5 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.

4.6 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.