Appendix H
Water Supply Assessment

SB 610
WATER SUPPLY ASSESSMENT

FOR THE
BOGUE-STEWART
MASTER PLAN PROJECT

YUBA CITY

Bogue-Stewart Master Plan Project
SB 610 Water Supply Assessment

Prepared for:

YUBA CITY

Public Draft

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SECTION 1 – PROJECT INTRODUCTION

As the lead agency under the California Environmental Quality Act ("CEQA"), Yuba City ("City") is assessing the potential environmental effects associated with the proposed Bogue-Stewart Master Plan development ("Proposed Project"). To inform the CEQA analysis, this Water Supply Assessment ("WSA") has been prepared for the Proposed Project.

1.1 ANALYTICAL METHOD

This WSA estimates the Proposed Project's water demand through build-out, presents and discusses the availability of water sources identified to meet that demand, and assesses whether expected water sources will be sufficient to meet the projected water demand of the Proposed Project during normal, single dry, and multiple dry year conditions.

The above-referenced analytical method is derived from the Water Supply Assessment Law ("WSA Law") codified at Water Code section 10910 *et seq*. The WSA Law, sometimes referred to as "SB 610," outlines the information and analysis that must be included in a CEQA document prepared for certain projects of a specified size and composed of certain land-uses (e.g., subdivisions larger than 500 residential units).[1] For such covered projects, the WSA Law requires an assessment of whether projected water supplies identified to serve a proposed project will be sufficient to meet existing and planned water demands over a 20-year horizon. The WSA Law expressly anticipates events like the most recent drought by requiring assessment of water supply sufficiency in single dry years and multiple dry years—not just under normal, or average, hydrologic conditions.

The Proposed Project requires a WSA because it is a residential development of more than 500 dwelling units. The WSA will be incorporated into the CEQA document — an Environmental Impact Report (EIR) — being prepared for the Proposed Project (the Project EIR).[2]

1.2 DOCUMENT PREPARATION AND APPROVAL

The WSA law requires that the lead agency – in this case, the City – identify a "public water system"[3] and further requires the lead agency to request that each identified public water system prepare a WSA for the project. If the lead agency is not able to identify a public water system that may supply water for the project, the lead agency must prepare the WSA itself after consulting with "any entity serving domestic water supplies whose service area includes the

[1] Water Code § 10912(a).
[2] Water Code § 10911(b).
[3] A "public water system" is a system that provides water for human consumption that has at least 3,000 service connections.

project site, the local agency formation commission, and any public water system adjacent to the project site."[4]

In this case, the City has prepared the WSA because the City intends to serve the Proposed Project as an extension of its existing potable water services. This document provides the necessary information for the City to make its determinations and to comply with the assessment of water supply sufficiency as required by statute.

The governing body of the City is required to approve this WSA. The City will be required to determine, based on the entire record, whether projected water supplies will be sufficient to satisfy the demands for the Proposed Project, in addition to existing and planned future uses.

This document provides the necessary information for the City to make its determinations and to comply with the assessment of water supply sufficiency as required by statute.

1.3 DOCUMENT ORGANIZATION

The WSA is organized according to the following sections:

- **Section 1: Proposed Project Introduction**. This section provides an overview of the WSA's purpose and organization, along with a detailed description of the Proposed Project, including the land use elements that will create water demand.
- **Section 2: Proposed Project Estimated Water Demands**. This section describes the methodology used to estimate water demands of the Proposed Project and details the estimated water demands from initiation through build-out, including an overall 20-year horizon.
- **Section 3: Existing and Other Planned Water Demands.** This section details the other water demands currently served by the City, anticipated to be served based on information in the City's General Plan and other available documents, as well as known and planned modifications since the City's adoption of the General Plan.
- **Section 4: Water Supply Characterization**. This section characterizes the water sources identified to serve the Proposed Project. Water sources are characterized for their projected availability during normal, single dry, and multiple dry year conditions.
- **Section 5: Sufficiency Analysis**. This section assesses whether the projected availability of the identified water sources will be sufficient to meet the Proposed Project's water demand during normal, single dry, and multiple dry year conditions, in additions to the City's existing and planned future uses. The analysis integrates the demands detailed in Section 2 and Section 3 with the characterization of the Proposed Project's water sources detailed in Section 4.

[4] Water Code § 10910(b).

1.4 PROPOSED PROJECT DESCRIPTION

The Proposed Project is an approximately 740 acre mixed-use development with just over 2,500 dwelling units, nearly 1.3 million square feet of non-residential uses, along with parks, public spaces, and a school (see **Figure 1-1**). The Proposed Project's concept is anchored by the principle of access to neighborhood amenities (e.g., schools and parks) and activity centers (e.g., retail centers and employment centers) from the residential neighborhoods and from adjoining areas.[5]

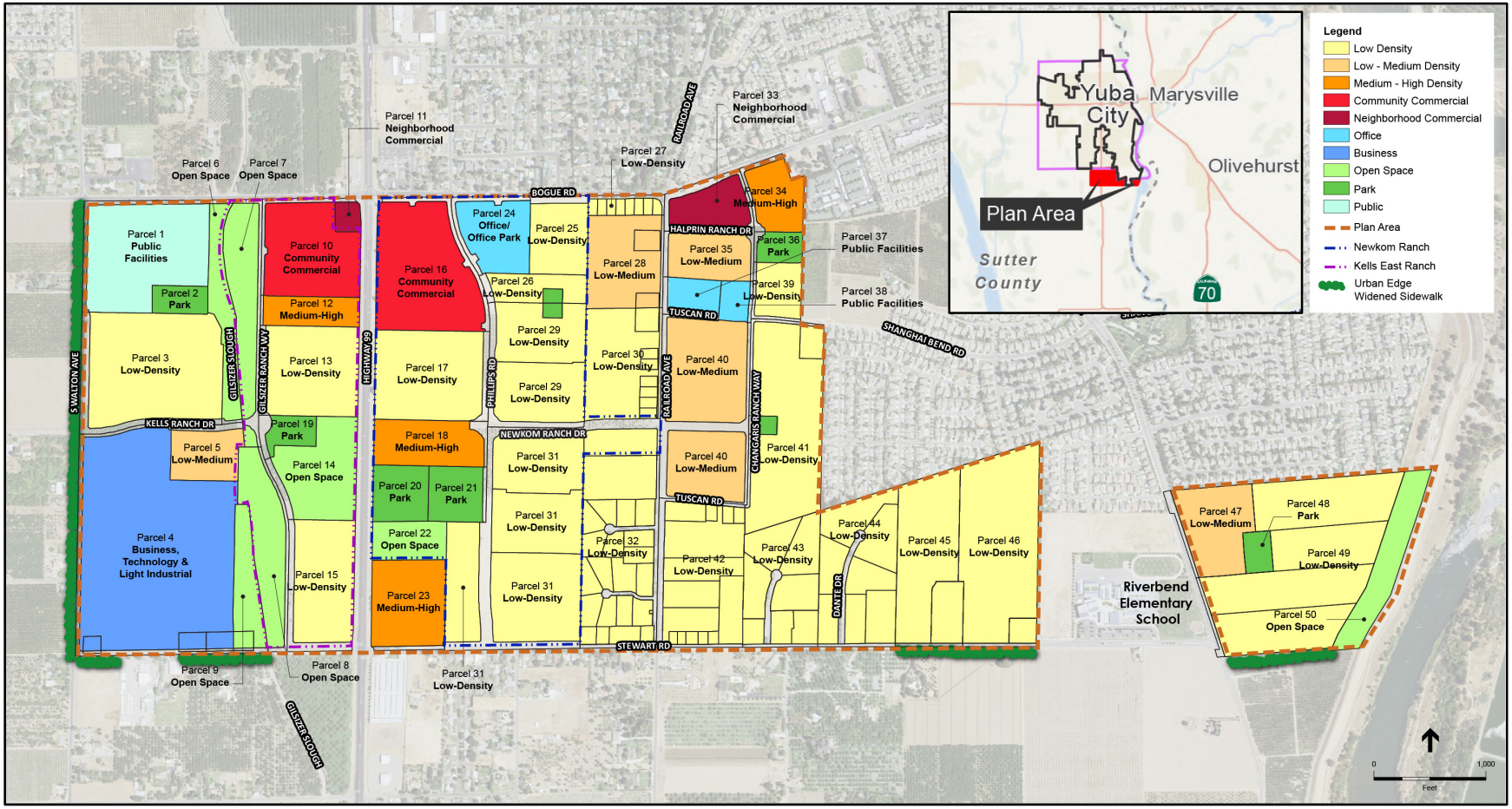
The Proposed Project's land-use and approximate phasing is presented in **Table 1-1**, providing detailed residential unit counts and non-residential acreage used to derive the demand forecast presented in Section 2. Residential units are categorized as "Newkom," "Kells East," or "Remainder" to reflect individual project proponents within the entire Bogue Stewart Master Plan area. Phasing is represented only to assist with incremental water demand projections. Actual phasing may differ than shown here.

Table 1-1 – Summary of Proposed Project Land Uses

Project Element	Unit Count				
	2020	2025	2030	2035	2040
Residential (Dwelling Units)					
Low Density (Newkom)	80	321	428	428	428
Low Density (Kells East)	37	74	147	147	147
Low Density (Remainder)		133	265	530	754
Low-Med Density			160	320	430
Med-High Density (Newkom)		108	108	216	216
Med-High Density (Kells East)			122	122	122
Med-High Density (Remainder)				200	420
Total Residential Units	117	635	1230	1963	2517
Non-Residential (Acres)					
Neighborhood Commercial				7	7
Community Commercial		18	36	36	36
Office & Office Park		8	8	8	8
Business, Technology & Light Ind.			11	27	55
Total Non-Res. Acres	0	26	55	78	106
Civic Amenities (Acres)					
Neighborhood Parks	6	13	13	13	13
Community Park		5	5	5	5
Elementary School		20	20	20	20
Public Facilities		25	25	25	25
Streetscapes	3	7	7	7	7
Open Space	51	51	51	51	51
Total Civic Acres	61	121	121	121	121

[5] Derived from the Notice of Preparation of an EIR for the Bogue Stewart Master Plan, January 4, 2017.

Figure 1-1 – Proposed Project Location



SECTION 2 – PROPOSED PROJECT ESTIMATED WATER DEMANDS

This section describes the methodology, provides the supporting evidence, and presents the estimated annual water demands for the Proposed Project. For the purpose of estimating annual water demand, the Proposed Project is planned to develop according to the phasing presented in **Table 1-1**.

2.1 DETERMINING UNIT WATER DEMAND FACTORS

As detailed in Section 1, the Proposed Project includes slightly over 2,500 residential units and accompanying infrastructure and improvements such as streetscapes, along with retail, office and technical center areas, civic amenities, parks, and an elementary school. To understand the water needs of the Proposed Project, two methods are employed: (1) using population projections in conjunction with the City's 2020 per-capita water use target identified in its 2015 Urban Water Management Plan (UWMP), and (2) using sector-specific water demand factors that correspond with the anticipated residential lots and other Proposed Project attributes. Using both methods allows the City to evaluate a range of plausible future demand conditions.

This subsection presents the foundational information for both methodologies that become the basis of the Proposed Project water demand estimate.

2.1.1 Using Per-capita Targets and Population

This method is often used to evaluate potential demand for an entire water purveyor's service area, such as the entire City, as it reflects a blend of existing and future residential and non-residential uses. It is less often used to forecast the water demand for a defined project. However, the Proposed Project is a blend of defined land-uses for the Newkom and Kells East portions, but more generalized for the remaining master planned area.[6] While Table 1-1 has specific residential unit counts, outside of the Newkom and Kells East portions, lot counts are based upon zoning and plausible housing densities only.

As suggested by the method title, this method estimates a future population, using residential lot counts in Table 1-1, and a specific anticipated per-capita demand factor established by the City in its adopted UWMP.

2.1.1.1 Per-capita Demand Target

In July 2016, the City adopted its 2015 UWMP, part of an on-going series of updates mandated by the State to occur every 5 years. In 2009, special State legislation added new requirements to the California Water Code requiring water purveyors to determine and adopt a per-capita water use target to be achieved by 2020, and formally adopt the new target in the 2010 and 2015

[6] Large areas of the Bogue Stewart Master Plan are defined for specific land-uses, such as residential, though do not have developed street layout and lot counts. In contrast the Newkom and Kells East subset of the BSMP area have more detailed land-use layouts identified.

UWMPs. As represented in the City's 2015 UWMP, the 2020 per-capita target is 192 gallons per person per day (gpcd).[7] While this represents a blended value reflecting a wide array of existing water customers and any new customers since the 2001-2010 baseline value was determined, it can be used to establish a conservative estimate of future demand of only the new customers anticipated with the Proposed Project.

2.1.1.2 Estimating the Proposed Project Population

As detailed in Table 1-1, the Proposed Project anticipates over 2,500 new residential units representing a combination of single-family homes and multi-family homes (e.g. apartments). For purposes of this WSA, the single-family housing assumes an average occupancy rate of 3.3 people per house, with medium/high-density classifications assuming 2 persons per house.[8]

Using the residential unit totals in Table 1-1, the population in the Proposed Project at build-out is estimated to be 7,320 people, with about 80 percent in single-family homes and 20 percent in multi-family housing.

2.1.2 Using Sector-Specific Demand Factors

Two distinct groups of demand factors are discussed in this subsection: (1) residential, and (2) non-residential. Values developed for each distinct group are based on several sources of information, details of which are provided in the following subsections.

2.1.2.1 Current and Future Mandates Affecting Water Use

There are several factors that affect the development of unit water demand factors, ranging from state and City landscape-specific mandates, to changes in the types of housing products being offered. These factors are incorporated into the determination of unit water demand factors and discussed below.

Water Conservation Objectives

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.[9] Since the Proposed Project is yet to be built, this legislation only indirectly applies.

However, the efforts undertaken throughout the City by urban retail suppliers to comply with this statute, though not directly, would affect the Proposed Project's use of appliances, fixtures, landscapes and other water using features, through changes or additions to ordinances and/or

[7] See the City's 2015 UWMP, Section 5, Table 5-1.

[8] The 3.3 person per house occupancy rate is higher than the average occupancy rate for the City (3.04) or the State Average (2.97) per the California Department of Finance census data (available from "*E-5 Population and Housing Estimates for Cities, Counties, and the State, 2011-2016 with 2010 Census Benchmark*" available at: http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-5/). However, those values are a blend of both multi-family occupancy and single family occupancy rates. This WSA's value is consistent with assumptions used for other Proposed Project analysis, including traffic and school needs assessments.

[9] California Water Code § 10608.20.

through a continuing "conservation ethic" developed in communities in and around the Proposed Project as a result of the most recent statewide drought conditions.

To respond to the recent drought conditions, Governor Brown issued Executive Order B-37-16 in May 2016 that specifically directed the development of new water use targets to build upon the existing law established by SBX7-7 (e.g. extended beyond the 20 percent reduction targets). While yet to be codified in statute, the actions currently underway to establish new targets likely will further influence future water use for development projects such as the Proposed Project.

Indoor Infrastructure Requirements

Beginning in January 2010, the California Building Standards Commission adopted the statewide mandatory Green Building Standards Code (hereafter the "CAL Green Code") requiring the installation of water-efficient indoor and outdoor infrastructure for all new projects after January 1, 2011. The CAL Green Code was incorporated as Part 11 into Title 24 of the California Code of Regulations, and was revised in 2013 and again in 2016 with the revisions taking effect on January 1 of the following year. However, these revisions have not had substantial implications to the water use already contemplated by the 2010 Cal Green Code.[10] The primary impact of the 2013 update was applicability of the Cal Green Code to re-models. The focus of the 2016 update was to address changes to the State's Model Water Efficient Landscape Ordinance (MWELO) in response to emergency regulations adopted during the drought.[11]

The CAL Green Code applies to the planning, design, operation, construction, use and occupancy of every newly constructed or remodeled building or structure. The Proposed Project must satisfy the indoor water use infrastructure standards necessary to meet the CAL Green Code as well as the outdoor requirements described by MWELO. The Proposed Project 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. Outdoor requirements are discussed below.

California Model Water Efficient Landscape Ordinance and City Ordinance

The Water Conservation in Landscaping Act was enacted in 2006, requiring the Department of Water Resources ("DWR") to update the Model Water Efficient Landscape Ordinance ("MWELO").[12] In 2009, the Office of Administrative Law (OAL) approved the updated

[10] The 2010 CAL Green Code was evaluated for updates during the 2012 Triennial Code Adoption Cycle. The State evaluated stakeholder input, changes in technology, implementation of sustainable building goals in California, and changes in statutory requirements. As such, the scope of CAL Green was increased to include both low-rise and high-residential structures, additions and alterations. Guide to the 2013 California Green Building Standards Code (Residential), California Department of Housing and Community Development, 2013.

[11] 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 Tier1 and Tier2 requirements. Additionally, the Code was updated to match the new Title 20 Appliance Efficiency Regulations. *2015 Report to the Legislature, Status of the California Green Building Standards Code.*

[12] Gov. Code §§ 65591-65599.

MWELO, which required a retail water supplier or a county to adopt the provisions of the MWELO by January 1, 2010, or to enact its own provisions equal to or more restrictive than the MWELO provisions.[13,14]

In response to the Governor's executive order dated April 1, 2015, (EO B-29-15), DWR updated the MWELO and the California Water Commission approved the adoption and incorporation of the updated State standards for MWELO on July 15, 2015.[15] The changes included a reduction to 55 percent for the maximum amount of water that may be applied to a landscape for residential projects, which effectively reduces the landscape area that can be planted with high water use plants, such a turf. For residential projects, the coverage of high water use plants is reduced to 25% of the landscaped area (down from 33%). The newly updated MWELO also now applies to new construction with a landscape area greater than 500 square feet (the prior MWELO applies to landscapes greater than 2,500 square feet).[16] The City has submitted information to the State demonstrating compliance with the revised MWELO.[17]

2.1.2.2 Residential Water Use Demand Factors

The Proposed Project anticipates three general lot-size designations. The size of the lot generally has the greatest impact on the annual per-lot demand for water as the irrigation needs for landscaping generally increase with larger landscaped areas. In contrast, indoor water demands remain relatively consistent regardless of lot size, but do vary slightly based on occupancy. For instance, the Proposed Project's medium-high density housing anticipates lower occupancy rates than single-family homes, resulting in a lower indoor demand forecast. Distinct demand factors are provided for the following residential uses:

- Indoor Residential Use – this category identifies the generally anticipated water use for the single and multi-family homes.
- Outdoor Residential Use – this category addresses the landscape water demands for the various planned lot sizes.

[13] California Code of Regulations (CCR), Tit. 23, Div. 2, Ch. 27, Sec. 492.4. The MWELO provides the local agency discretion to calculate the landscape water budget assuming a portion of landscape demand is met by precipitation, which would further reduce the outdoor water budget. For purposes of a conservative analysis, precipitation is not assumed to satisfy a portion of the outdoor landscape requirement because the determination of an appropriate effective precipitation factor is highly uncertain given the various landscape slopes, terrain composition, concurrent watering schedules, etc.

[14] In response to the governor's executive order dated April 1, 2015, (EI B-29-15), DWR updated the MWELO and the California Water Commission approved the revised MWELO on July 15, 2015. The changes include a reduction to 55% for the maximum amount of water that may be applied to a landscape for residential projects, which reduces the landscape area that can be planted with high water use plants, such a turf. For residential projects, the coverage of high water use plants is reduced to 25% of the landscaped area (down from 33%).

[15] These updated changes have been incorporated into California Code of Regulations (CCR), Tit. 23, Div. 2, Ch. 27, Sec. 490-495.

[16] CCR Tit. 23, Div. 2, Ch. 27, Sec. 490.1.

[17] Agencies in compliance are listed here: http://www.water.ca.gov/wateruseefficiency/landscapeordinance/mwelo_reports.cfm

For purposes of this WSA, residential unit water demand factors are described as "the acre-feet of water use annually per dwelling unit" – or acre-feet/dwelling unit (af/du).

Indoor Residential Water Use Factors

The Proposed Project's residential elements would be built in accordance with all applicable building codes including the Cal Green Code discussed previously, as it may be further modified prior to Proposed Project implementation.

The Proposed Project's indoor demands are estimated using an assumed value of 55 gallons-per person per day, multiplied by the assumed occupancy rates for single-family and multi-family classifications. As discussed previously, and for purposes of this WSA, single-family housing assumes an average occupancy rate of 3.3 people per house, while multi-family occupancy assumes 2 persons per house. The assumed per-person rate of 55 gallons per day is derived from California Water Code Section 10608.20(b)(2)(A), which states a value of 55 gallons per capita (i.e., per person) per day (gpcd) be used for estimating indoor residential use targets. When multiplied, the per-person use results in a per-dwelling unit demand of 0.20 acre-feet per year for single-family homes and 0.12 for multi-family housing.

The 55 gpcd indoor use value has been confirmed through analyses of residential water meter data and is reflective of new suburban single-family dwelling units and older homes retrofitted with new water efficient fixtures and appliances.[18]

Outdoor Residential Water Use Factors

Outdoor water use is primarily a factor of lot size and the type and extent of landscaped area. The Proposed Project includes slightly more than 2,500 residential lots with three average lot sizes: low-density single family homes with an average density of 4.25 units per acre, low-medium density single family homes with an average density of 9 units per acre, and medium-high density multi-family homes with an average density of 24 units per acre.[19]

Outdoor demands for the Proposed Project are calculated based on a number of factors including the regulations and calculation methodologies contained in MWELO. The MWELO provides for determining the Maximum Applied Water Allowance ("MAWA") where the maximum is determined as 55 percent of the reference evapotranspiration for the area, resulting in the following equation:[20]

[18] With the increasingly stringent requirements of building codes as well as water and energy efficiency codes, it is likely that the actual indoor demand of the Proposed Project may be below the stated estimate. Recently, the Governor issued Executive Order B-37-16 that, among other orders, directed state agencies to develop new urban water use targets including a standard for indoor residential per-capita water use. These new targets are to "build upon the existing state law" that requires a 20% reduction in urban water use by 2020 – which already includes the suggested 55 gallons-per-person per day planning guidance.

[19] Certain lots may be slightly larger or smaller, depending on the grading and final layout of the Proposed Project. However, those variations will be nominal and will not materially affect the Proposed Project's total demand.

[20] This formula reflects the latest revision to the MAWA that became mandatory as of December 1, 2015.

MAWA = (ETo) (0.62)(0.55 x LA), where ETo is the reference evapotranspiration in inches per year, and LA is the landscape area. 0.62 is a conversion factor to gallons. The resulting value is in "gallons per year"

A primary factor in this calculation is reference evapotranspiration (ETo). The methodology directs the use of ET from a reference crop, such as maintained grass – a value referred to as ETo (see footnote under Section 2.2.1.3). For the Proposed Project, the ETo is 46.7 inches per year (or just under 4 feet per year).[21]

Besides the ETo value, the primary factor driving outdoor water use on a per-lot basis is the square footage of landscape area. Specifically, the project restricts turf to 25 percent of the landscaped area, and restricts plant choices to a majority of low and very-low water use species.

The calculations for water use are based on specific restrictions and the water efficient character of the Proposed Project as presented in the CSP. The Proposed Project utilizes individual calculations for each parcel type based on typical landscape areas, plant types, and average plant water use factors defined in the CSP. The following assumptions form the basis of the residential landscape unit demand factors:

Using these values and the MAWA equation, demand factors for each residential lot category are presented here;

- **Low Density Single-Family** – The proposed 1,329 lots of this designation will include single family dwellings with accessory structures. The average lot size is approximately 10,000 sf. For purposes of this WSA, an average of 40 percent of the lot is assumed to be landscaped, with 25 percent of this area turf, and the remainder mostly drought-tolerant and native or adaptive shrubs and trees. The resulting outdoor demand factor is forecast to be 0.29 acre-feet per dwelling unit.

- **Low-Medium Density Single-Family** – The proposed 430 single family dwellings will be built on lots averaging 5,000 square-feet. It should be noted that while this lot type is most consistent with traditional detached single family dwellings, the lot size is generally smaller than modern single family detached developments. For purposes of this WSA, an average of 30 percent of the lot is assumed to be landscaped, with 25 percent of this area turf, and the remainder mostly drought-tolerant and native or adaptive shrubs and trees. The resulting outdoor demand factor is forecast to be 0.07 acre-feet per dwelling unit.

[21] ETo is consistent with the California Departments of Water Resources MWELO, Appendix A reference table for Yuba City.

- **Medium-High Density Multi-Family** – The proposed 758 units will include a variety of attached and multi-story dwellings with an average density of 24 units per acre. This dwelling unit type is typically associated with community controlled outdoor spaces so the average outdoor demands are quite low per unit. For purposes of this WSA, an average of 20 percent, of an "equivalent" 2,000 sf lot size,[22] is assumed to be landscaped, with 25 percent of this area turf, and the remainder mostly drought-tolerant and native or adaptive shrubs and trees. The resulting outdoor demand factor is forecast to be 0.01 acre-feet per dwelling unit.

Summary of Residential Water Use Demand Factors

Table 2-1 provides a summary of the residential unit water demand factor used to estimate the Proposed Project's water use.

Table 2-1 – Summary of Residential Demand Factors

Category	Demand Factor (af/du)	
Low Density	0.20	(indoor)
	0.29	(outdoor)
Low-Med Density	0.20	(indoor)
	0.07	(outdoor)
Med-High Density	0.12	(indoor)
	0.02	(outdoor)

2.1.2.3 Non-Residential Water Use Demand Factors

The Proposed Project has several non-residential features as represented in Table 1-1. Many of these proposed land-uses are unique, requiring specific demand forecasts for each component.

For purposes of this WSA, the demand for non-residential classifications is described as either "the acre-feet of water use annually per acre of land," acre-feet/acre (af/ac), or as a single demand projection for a demand category such as the indoor uses for the elementary school, acre-feet/unit (af/unit), where the "unit" is equal to one. These values reflect indoor or outdoor water needs expected for typical non-residential use for each of the following classifications:

- Neighborhood and Community Commercial
- Professional Office
- Light Industry
- Public Facilities
- Elementary School
- Parks

[22] Most apartment complexes are multistory, with parking areas and centralized amenities. While each unit does not have a designated lot, for purposes of this WSA, subdividing the total area by the number of lots would give an equivalent allocation of lot per unit. This allocation would include a portion of the common hardscape (e.g. parking and walkways) and landscape areas.

- Street Landscaping
- Other miscellaneous uses, including temporary construction water.

The method and basis for determining the unit water demand factor for each of these classifications is detailed in the following subsections.

Neighborhood and Community Commercial

The Proposed Project is anticipated to include just over 470,000 square feet (sf) of commercial space on approximately 42 acres. Water uses will primarily include local neighborhood retail areas as well as a few larger community developments with larger anchor tenants, both meant to serve the daily convenience needs of the Proposed Project's residents. Based upon meter studies conducted on existing neighborhood commercial facilities elsewhere in California, coupled with the on-going commitment toward more efficient water use, the indoor unit demand factor for this classification is estimated at 1.2 acre-feet/acre for neighborhood commercial and 1.0 acre-feet/acre for community commercial.[23]

Professional Office

The Proposed Project anticipates approximately 108,000 sf of office space on about 8 acres. This land class generally has lower use than retail commercial establishments, primarily because it includes general businesses that do not have the water demand of restaurants, grocery stores, hair salons and other retail businesses often located in commercial centers. For purposes of this WSA, this classification is estimated to use 0.80 acre-feet per acre.[24]

Light Industry

Approximately 55 acres of the Proposed Project will be designated for various light industrial uses. Water use can vary significantly with the actual industry in place, but for purposes of this WSA, a demand factor of 2.0 acre-feet per acre is assumed.

Public Facilities

The Proposed Project includes 25 acres to serve utility service locations. This land use class is anticipated to include water demands from safety facilities such as fire stations, utilities, local government offices and facilities, community centers, and other similar uses. Meter analysis of similar uses in other communities in the Central Valley result in a demand factor of 2.80 acre-feet per acre, annually. Absent information from the City on similar use, this value is assumed for purposes of this WSA.

[23] Tully & Young, Inc. has performed several meter studies in California's Central Valley, including recently in the City of Lincoln. Specific small and large mixed-use commercial developments were analyzed and found to range from 0.78 af/ac/yr to 1.22 af/ac/yr for the total indoor and outdoor area water demands (when including parking and sidewalk areas, planting strips and store footprints). Smaller, neighborhood commercial water use is generally higher due to a smaller percentage of the parcel as parking or hardscape compared to larger retail shopping centers.

[24] Professional services such as dentistry will use more water than a standard "office" space. But the overall demand in this category are nominal compared to the residential uses and therefore the demand factor used is appropriate given the likely blend of business enterprises occupying the professional office land area.

Elementary School

The Proposed Project includes an elementary school located on approximately 20 acres. Based upon meter studies for existing elementary schools, total school use – indoor and outdoor – is approximately 2.6 acre-feet per acre. Depending on the schools' landscape design and operation, 60 to 70 percent of this demand is used to meet outdoor needs. This unit demand factor would reflect all administrative, teacher, student, cafeteria, landscape, and janitorial uses for the school, averaged on a per-student basis.

Neighborhood and Community Parks

The Proposed Project includes about 13 acres of neighborhood parks located throughout the various neighborhoods, and a 5 acre community park, envisioned as a multi-use sporting field. Similar to the residential outdoor demand factor, park demand is based primarily on the MWELO's MAWA. However, for public park spaces, the MWELO allows for 100 percent of ETo, rather than limiting to 55 percent as required for residential landscapes. As presented earlier, the ETo for the City is estimated at 46.7 inches per year, resulting in a demand factor of 3.89 acre-feet per acre of park.

Street Landscaping

The Proposed Project includes landscaping along street corridors and at entrances to particular residential areas. A unit water demand for this category is derived from the MWELO (see prior discussion under "residential land-uses"). To provide flexibility to the Proposed Project to landscape as needed, the entire landscaped area is assumed to demand the maximum use allowed by MWELO, and uses the previously discussed equation for MAWA and the ETo value of 46.7 inches. Non-residential landscaping is limited under MWELO to 45 percent of the reference evapotranspiration and turf is not allowed. The resulting demand factor is 1.75 acre-feet per acre.

Summary of Non-Residential Water Use Demand Factors

Table 2-2 provides a summary of the non-residential unit water demand factor used to estimate the Proposed Project's water use.

Table 2-2 – Summary of Non-Residential Landscape Demand Factors

Category	Demand Factor (af/ac)
Neighborhood commercial	1.20
Community Commercial	1.00
Professional Office	0.80
Light Industry	2.00
Public Facilities	2.80
Elementary School	2.60
Parks	3.89
Street Landscaping	1.75

2.1.2.4 Other Miscellaneous Uses

The Proposed Project has two primary additional miscellaneous land uses with water demands – albeit only temporary demands. These uses have minimal impacts to the overall forecast water use due to their limited duration.

Construction Water

The Proposed Project would include site grading and infrastructure installation during early phases of construction that will require dust suppression and other incidental water uses. These would not continue beyond the construction phases of the Proposed Project. For purposes of identifying incremental water demands, construction water is conservatively assumed for purposes of this WSA to be 4 acre-feet per year (this is about 1,200,000 gallons – or about 300 fill-ups of a 4,000-gallon water truck per year).

2.2 PROPOSED PROJECT WATER DEMAND PROJECTION

2.2.1 Using Per-capita Targets and Population

As described above, a conservative method to estimate the Proposed Project's demand is simply multiplying the population by a per-capita water use factor. The per-capita factor used in this forecast is the City's 2020 Target value as adopted in its 2015 UWMP. **Table 2-3** presents the resulting demand forecast in 5-year increments, related to the phasing depicted in **Table 1-1**. Using this method, the Proposed Project is forecast to demand 1,574 acre-feet annually.

Table 2-3 – Per-Capita Based Demand Forecast

Population						Demand (af/year)				
2020	2025	2030	2035	2040	GPCD	2020	2025	2030	2035	2040
386	1,955	3,761	5,779	7,320	192	83	420	809	1,243	1,574

2.2.2 Using Sector-Specific Demand Factors

Combining the Proposed Project's land use details and phasing as summarized in **Table 1-1** and with the demand factors presented in **Table 2-1** and **Table 2-2**, the water demands for the Proposed Project from initiation to build-out can be estimated using the sector-specific method. At completion, the Proposed Project is estimated to need approximately 1,255 acre-feet of water annually (prior to considerations of non-revenue water, described in the next subsection) and approximately 1,394 acre-feet when considering non-revenue water, as shown in **Table 2-4**.

2.2.2.1 Non-Revenue Water Demands

The demand factors presented earlier in this section represent the demand for water at the customer meter for each category. To fully represent the Proposed Project's demand on water resources, non-revenue water also needs to be included. Non-revenue water represents all of the water necessary to deliver to the customer accounts and reflects distribution system leaks, water demands from potentially un-metered uses such as fire protection, hydrant flushing, and

unauthorized connections, and inescapable inaccuracies in meter readings.[25] In most instances, the predominant source of non-revenue water is from system leaks – the loss from fittings and connections from water sources through treatment plants, tanks, pumping plants, major delivery system back-bone pipelines, and community distribution systems. Because the delivery system distributing water within the Proposed Project will be new, the percentage of non-revenue water is estimated to meet the 10 percent goal set forth by the American Water Works Association. Therefore, the Proposed Project's potable water delivery system is expected to require about an additional 139 acre-feet per year at build-out to serve the Proposed Project's potable needs. These values are included as the "loss factor" in **Table 2-4** and are considered to return to the groundwater system through percolation.

2.2.3 Comparison of Demand Forecast Methods

Comparing the two forecasts demonstrates that the sector-specific method estimates future demand to be about 90 percent of the demand estimated using the per-capita method. For purposes of this WSA, the City has chosen the higher demand forecast of 1,574 acre-feet per year to provide a conservative assumption of future demand for the Proposed Project. This value will be used during the sufficiency analysis presented in Section 5.

[25] The American Water Works Association and the California Urban Water Conservation Council recognize the inherent non-revenue water that is either lost or not accounted for in urban treated water distribution systems, and suggest purveyors strive for conveyance losses equal to 10% of all water delivered to customers. Obtaining this value depends on numerous factors including the age and extent of distribution system infrastructure, meter rehabilitation programs, and how a purveyor tracks fire flows and hydrant flushing.

Table 2-4 – Sector-specific Based Demand Forecast

Category	2020	2025	2030	2035	2040	Demand Factor (af/du or af/ac)		Demand (af/year) 2020	2025	2030	2035	2040
Residential			**Units**									
Low Density (Newkom)	80	321	428	428	428	0.20	(indoor)	16	65	87	87	87
						0.29	(outdoor)	24	95	126	126	126
Low Density (Kells East)	37	74	147	147	147	0.20	(indoor)	7	15	30	30	30
						0.29	(outdoor)	11	22	43	43	43
Low Density (Remainder)	0	133	265	530	754	0.20	(indoor)	0	27	54	108	153
						0.29	(outdoor)	0	39	78	156	222
Low-Med Density	0	0	160	320	430	0.20	(indoor)	0	0	33	65	87
						0.07	(outdoor)	0	0	12	24	32
Med-High Density (Newkom)	0	108	108	216	216	0.12	(indoor)	0	13	13	27	27
						0.02	(outdoor)	0	2	2	4	4
Med-High Density (Kells East)	0	0	122	122	122	0.12	(indoor)	0	0	15	15	15
						0.02	(outdoor)	0	0	2	2	2
Med-High Density (Remainder)	0	0	0	200	420	0.12	(indoor)	0	0	0	25	52
						0.02	(outdoor)	0	0	0	4	8
							Indoor Subtotal	24	120	232	356	451
							Outdoor Subtotal	34	157	264	360	438
Total Unit Count	117	635	1230	1963	2517		Residential Subtotal	58	278	496	716	889
Non-Residential			**Acres**									
Neighborhood Commercial	0	0	0	7	7	1.20		0	0	0	8	8
Community Comm. (Newkom)	0	11	21	21	21	1.00		0	11	21	21	21
Community Comm. (Kells East)	0	7	15	15	15	1.00		0	7	15	15	15
Office & Office Park (Newkom)	0	5	5	5	5	0.80		0	4	4	4	4
Office & Office Park (Kells East)	0	3	3	3	3	0.80		0	3	3	3	3
Business, Technology & Light Ind.	0	0	11	27	55	2.00		0	0	22	55	109
							Non-Res Subtotal	0	25	64	105	160
Civic			**Acres**									
Neighborhood Parks	6	13	13	13	13	3.89		25	49	49	49	49
Community Park	0	5	5	5	5	3.89		0	21	21	21	21
Elementary School	0	20	20	20	20	2.60		0	53	53	53	53
Public Facilities	0	25	25	25	25	2.80		0	71	71	71	71
Streetscapes	3	7	7	7	7	1.75		6	12	12	12	12
							Civic Subtotal	31	206	206	206	206
Other Miscellaneous Uses												
Construction Water	10	10	10	10	0	1		10	10	10	10	0
							Misc. Subtotal	10	10	10	10	0
							Project subtotal prior to non-revenue loss	99	518	776	1,037	1,255
							Non-revenue water @ 10%	11	58	86	115	139
							Total Proposed Project Demand	**110**	**576**	**862**	**1,152**	**1,394**

2.3 WATER DEMANDS DURING SINGLE- AND MULTIPLE-DRY YEAR CONDITIONS

To adequately assess the sufficiency of available water supplies – discussed in Section 5 – the Proposed Project's normal-year water demand is modified to reflect anticipated increases in demand during drier conditions. Conservative modifications to the Proposed Project's water demand to reflect conditions expected during dry conditions are as follows (see **Table 2-5**):

Single dry year: Landscape irrigation demands would increase to reflect the generalized earlier start of the landscape irrigation season due to limited rainfall in the single driest year. Since this increase only applies to the outdoor portion of a customer's demand, an adjustment factor of 5 percent is applied to the total normal-year water demand values to conservatively reflect the expected increase in demand for water.[26]

Multiple dry years: During multiple dry years, demands are also expected to increase during the first in a series of dry years – as discussed above for the single dry year condition. However, during the second, third or more consecutive dry years, demands also are expected to reflect water shortage contingency plans implemented by the City.[27] During the second year, the City is assumed to request a reduction target of 20 percent. To be conservative, this WSA assumes a resulting demand reduction of 10 percent to accommodate conservatively low participation by customers. Thus, the already higher expected demand increase of 5 percent during dry conditions is decreased by 10 percent to reflect conservation – resulting in a 5 percent reduction compared to the original normal condition demand forecast. During the third year or additional years, the City is expected to set a conservation target of 30 percent. For this analysis, the demands in the third year are reduced by 20 percent, to be conservative. Thus, during multiple dry conditions, demands initially increase due to reduced effective precipitation, but then decreases due to short-term conservation measures, with a net effect of a 15 percent reduction from the forecasted normal condition.

Table 2-5 –Proposed Project Water Demands under Dry-Year Conditions

		Multiple Dry Year		
	Single Dry	Year 1	Year 2	Year 3 +
% Increase (reduction)	5%	5%	-5%	-15%
Resulting Potable Demand (af/yr)	1,653	1,653	1,496	1,338

[26] Based on meter studies and work with DWR on "weather normalization" of per capita water use values, Tully & Young has demonstrated that urban water use increases during low rainfall months. Based on conversations with urban water purveyors, DWR and landscape water professionals, it appears common for landscape irrigation timers to be turned on "early" when February and March are unusually dry.

[27] This WSA anticipates the City will apply its water shortage contingency plan presented in its 2015 UWMP to address drought conditions.

SECTION 3 – EXISTING AND OTHER PLANNED FUTURE USES

This section details the other water demands currently served or anticipated to be served by the City. As stated in this excerpt from Water Code Section 10910(b)(3): *"[T]he water supply assessment for the project shall include a discussion with regard to whether the public water system's total projected water supplies available…will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses…"*

While the Proposed Project is outside of the City's current sphere of influence and water service area, and anticipates annexation, the City's planning has anticipated on-going growth, inclusive of new annexations such as the Proposed Project. Therefore, this WSA evaluates the City's "existing and planned future uses" as the increment of growth in addition to the anticipated population associated with the Proposed Project.

3.1 EXPECTED POPULATION GROWTH

The City's 2015 UWMP projected a future population to 2040 based upon a 3 percent annual growth rate. That assumption grew the population from approximately 71,000 in 2015 to over 148,000 in 2040. To accommodate this population, the City would need to construct housing at a concurrent rate. Using the net population increase in the 2015 UWMP of over 77,000 people, and an average occupancy rate of 3 people per house (representing a blend of the single family occupancy of 3.3 and multi-family of 2 discussed in the prior section), the City would need to add over 25,000 new housing units in 25 years – or about 1,000 units per year.

Historic permit data for new single-family dwellings is shown in **Table 3-1**. While a few years early in the 2000's added nearly 1,000 units (and may have exceeded 1,000 when considering multi-family units), the majority of years are significantly lower, with only 12 new permits issued in 2011. For comparison, the Proposed Project anticipates 2,500 new units, which would reflect 125 new housing units annually between 2020 and 2040. Given this data, the City recognizes that the 3 percent growth rate assumed in the 2015 UWMP is unrealistic.

For purposes of this WSA, the City chose to reflect a modified annual growth rate reflecting the period of 2006 through 2016. According to City data, the population during this period increased at an average rate of 1.4 percent, slowing to less than 0.5 percent since 2010. While growth rates are affected by many factors, using 1.4 percent will accommodate future variations in growth rate – reflecting an annual average of about 300 new units annually. The resulting population estimates on 5-year increments from 2020 to 2040 are shown in **Table 3-2**. For comparison, this revised population forecast of

approximately 95,000 is much lower than the 2015 UWMP's projection of 148,000, and is more realistically attainable.

Table 3-1 – Permits Issued for Single Family Dwellings
(source: Yuba City, Community Development Department)

Calendar Year	Permits Issued for SF Dwellings
2003	750
2004	991
2005	869
2006	254
2007	158
2008	53
2009	31
2010	18
2011	12
2012	14
2013	50
2014	50
2015	41
2016	47

Table 3-2 – Projected Population

Projected Population				
2020	2025	2030	2035	2040
71,944	77,123	82,675	88,626	95,006

3.2 EXISTING AND OTHER PLANNED FUTURE USES

To be consistent with the method used to forecast the Proposed Project's demand, water needs to meet all existing and other planned future uses is also estimated using the population and the 2020 per-capita target. While the 2020 target of 192 gpcd may be low for all existing users, it is likewise high for future residents subject to more stringent landscape requirements, and that will be built with more efficient water using fixtures and appliances.

To keep the Proposed Project separate from a forecast for this category, the estimated population from the Proposed Project is subtracted from the City-wide population projection presented in **Table 3-2**. The remaining population is multiplied by the 192 gpcd per-capita target to derive an estimated future demand for each of the 5-year increments. The results are presented in **Table 3-3**.

Table 3-3 – All Other Existing and Planned Future Uses

	Population				
	2020	2025	2030	2035	2040
City-wide	71,944	77,123	82,675	88,626	95,006
Proposed Project	386	1,955	3,761	5,779	7,320
Existing and Other Planned Future	71,558	75,168	78,914	82,847	87,686
	Demand (af/year)				
	2020	2025	2030	2035	2040
Existing and Other Planned Future	15,390	16,166	16,972	17,818	18,858

3.3 TOTAL ESTIMATED DEMAND

The other existing and planned future water demands described in this section represent the total demands anticipated *in addition to* the water demands of the Proposed Project. Combining the estimated Proposed Project water demands of 1,574 acre-feet annually (see **Table 2-3**) with the estimated Existing and Planned Future water demands of approximately 18,858 acre-feet annually (see **Table 3-3**), a total estimated demand for City water supplies by 2040 is determined. Estimated existing and planned future water demands, inclusive of non-revenue water needs, for each 5-year increment to 2040 are presented in **Table 3-4**. The estimated demand for City Water supplies in 2040 is approximately 20,433 acre-feet.

Table 3-4 – Total Estimated Water Demands

	Demand (af/year)				
	2020	2025	2030	2035	2040
Proposed Project	83	420	809	1,243	1,574
Existing and Other Planned Future	15,390	16,166	16,972	17,818	18,858
Total	15,473	16,587	17,781	19,061	20,433

Of note is that the estimated water demand for 2040 presented in **Table 3-4** is significantly lower than the 2015 UWMP demand forecast to be approximately 32,000 acre-feet per year. The difference is due primarily to the use of a smaller growth rate of 1.4 percent compared to the UWMP's rate of 3 percent. This difference is important when evaluating the sufficiency of water supplies and comparing to the 2015 UWMP's analysis and conclusions (see Section 5).

SECTION 4 – WATER SUPPLY CHARACTERIZATION

This section characterizes the intended water supplies that will be used to serve the estimated water demands of the Proposed Project as detailed in Section 2, as well as the existing and other planned City uses described in Section 3.[28]

The water supplies historically and projected to be served by the City within its existing and likely future water service area are derived from multiple surface water rights and contracts, as well as the City's rights to groundwater. All water supplies derived from these sources are managed in order to best meet the City's demands in different year types, reduce delivery costs, manage water quality issues, and handle drought and emergency situations. As such, water deliveries from each identified source may fluctuate in any given year because of management decisions, regulatory constraints, and hydrological conditions. Nevertheless, the City will provide retail water to meet the Proposed Project's needs as well as all other existing and planned future uses from the water supplies discussed in this section.

4.1 CURRENT WATER SUPPLIES

The City has the following water supply sources, each with unique characteristics that affect use and management under varying hydrologic circumstances:

1. SWRCB License 13855
2. SWRCB Permit 18558
3. North Yuba Water District Agreement
4. State Water Project Contract
5. Groundwater

[28] Water Code Section 10910(d)(1) requires that "The assessment... include an identification of any existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project, and a description of the quantities of water received in prior years by the public water system...under existing water supply entitlements, water rights, or water service contracts. (2) An identification of existing water supply entitlements, water rights, or water service contracts held by the public water system...shall be demonstrated by providing information related to all of the following: (A) Written contracts or other proof of entitlement to an identified water supply. (B) Copies of a capital outlay program for financing the delivery of a water supply that has been adopted by the public water system. (C) Federal, state, and local permits for construction of necessary infrastructure associated with delivering the water supply. (D) Any necessary regulatory approvals that are required in order to be able to convey or deliver the water supply."

4.1.1 – SWRCB License 13855

This Feather River water right has a seniority date of March 5, 1958, and was licensed by the State Water Resources Control Board (SWRCB) as of December 2011. The right is limited to 15.6 cubic feet per second (cfs) – equivalent to about 925 acre-feet per month if diverted at the limit – with an annual limit of 6,500 acre-feet. The City is allowed to divert the water directly from the Feather River except during the months of July and August. The City uses this source to meet full demands, or as otherwise constrained by the diversion limit, during the early months of each calendar year. The right includes Term 91 provisions, which curtail the City's diversions when the SWRCB invokes this condition. Term 91 will occur during hydrologically dry conditions, potentially as early as March or April, and also potential limit diversions into October or November. During the recent drought (2014 through 2016), Term 91 limited diversions more extensively than has been experienced in the past several decades. For instance, Term 91 was in affect from May 1, 2015 to December 15, 2015, severely limiting the City's diversion under this license. Representative reliability of this supply is presented in Section 4.2.

4.1.2 – SWRCB Permit 18558

This Feather River water right has a seniority date of May 31, 1978, and is still only a permitted use (meaning the City has yet to fully utilize the right). The right is limited to 21 cfs – equivalent to about 1,250 acre-feet per month if diverted at the limit – with an annual limit of 9,000 acre-feet. The City is allowed to divert the water directly from the Feather River except during the months of July, August, and September, but is also subject to Term 91 restrictions discussed under the City's licensed right. The City began diverting under this right in 2000.

4.1.3 – North Yuba Water District Agreement

The City originally entered into a contract for surface water supplies with North Yuba Water District (NYWD)[29] in December 1980. Prior to expiration in 2010, the City and NYWD entered into an amended agreement that continued the availability of up to 4,500 acre-feet annually to be delivered into the Feather River for diversion by the City at its Feather River water treatment plant intake. The current agreement expires in 2035 and includes the provision that *"[r]epresentatives of the District and city will meet some time between December 31, 2030 and June 1, 2031 to discuss the potential to further extend*" the agreement.[30]

While the agreement allows for the monthly delivery to be varied based on discussions each year between the City and NYWD, if the full 4,500 acre-feet are requested, the monthly volumes are limited to the following:

[29] North Yuba Water District was formerly named Yuba County Water District.
[30] NYWD/City *Amended Agreement for Sale of Surplus Water*, paragraph 2, Final, May 20, 2010.

April	= 181 acre-feet
May	= 492 acre-feet
June	= 893 acre-feet
July	= 922 acre-feet
August	= 922 acre-feet
September	= 714 acre-feet
October	= 376 acre-feet

These monthly limits are used during the assessment of water supply availability and reliability discussed in Section 4.2. The City relies on this supply during summer months, in conjunction with the SWP water (discussed below) to address the constraints in its licensed and permitted water rights. For purposes of this WSA, the agreement providing the full 4,500 acre-feet is assumed to be renewed, and this supply will continue to be available well beyond 2040.

4.1.4 – SWP Contract

The City entered into a contract with the State of California for water from the State Water Project (SWP) in 1963. The contract remains in effect through 2035, with specified renewal provisions that provide long-term reliability for this supply well beyond 2040. Each SWP contract defines a "Table A" quantity available for to the contractor. Each spring, DWR determines the percentage of Table A quantities that will be available during the coming months, based upon hydrology, forecast runoff, storage levels and contractor demands. The City's Table A quantity is 9,600 acre-feet.

As a result of a recent settlement,[31] SWP contractors "north of the Delta," which includes the City, have a defined "north of Delta allocation" (NOD Allocation) Table A allocation that can be greater than the baseline allocation available to SWP contractors south of the Delta. As an example of the incremental increase in the Table A allocations, the NOD Allocation was: 0% (2014), 5% (2015), and 15% (2016) above the baseline allocation in each year. During normal water supply conditions, the NOD Allocation likely will include a 10% increase over the baseline Table A allocation. For instance, normal year Table A allocations have been suggested as 65% of a SWP contractor's Table A quantity. The NOD Allocation would increase this to 75% for the City. For purposes of this WSA, the normal year Table A allocation is assumed to be 75% of the 9,600 Table A maximum – or 7,200 acre-feet.

4.1.4.1 SWP Carryover Water

SWP Carryover water is Table A water unused during one allocation season that is "stored" in a SWP reservoir. The Carryover water can supplement a future year's Table

[31] *Area of Origin Settlement, City of Yuba City Contract Amendment*, December 31, 2013.

A allocation, so long as the SWP reservoir has not "spilled" the carryover supply.[32] The amount of the City's Table A allocation that can be stored each year is governed by Article 56 of the SWP contract. There is no contractual limit on the cumulative volume that can be stored, though the SWP reservoirs would likely "spill" if all SWP contractor carryover volumes became excessive. Carryover water is spilled equally among all those with carryover. For purposes of this WSA, the City is expected to add to its Carryover supply during normal conditions when it uses less than the assumed 7,200 acre-feet annual allocation. The City is expected to develop and maintain 6,000 acre-feet as Carryover supply, which becomes available to help offset shortages during dry conditions. This is further discussed under Section 4.2.

4.1.4.2 SWP Advanced Table A

The 2013 settlement also included a unique provision for the north of Delta SWP contractors termed "Advanced Table A" (ATA). The ATA is supplemental SWP water that can be used to make up shortages in the NOD Allocation under certain defined circumstances. The City's ATA is limited to 5,000 acre-feet, and is only accessible when the SWP base allocation exceeds 20% and all of the City's available SWP Table A and Carryover water is used. For purposes of this WSA, the ATA becomes available under multiple dry-year conditions after the City's exhausted its Carryover reserves. This is further discussed in Section 4.2.

4.1.5 – Groundwater

If a project's water supply includes groundwater, the WSA must include a description of any groundwater basin or basins from which the proposed project will be supplied, a detailed description and analysis of historical and projected groundwater pumping, and an analysis of the sufficiency of the groundwater from the basin from which the proposed project will be supplied.[33]

Prior to 1969, the City relied entirely on groundwater. However, surface supplies were substituted beginning in 1969 to address poor groundwater quality. Since that time, the City has maintained nominal groundwater infrastructure to provide drought and emergency supplies. The City maintains one well, located at its water treatment plant, that can produce 2.9 million gallons per day (mgd). The groundwater is treated and blended with available surface water. During the recent drought, the City has used approximately 2,000 acre-feet, 1,100 acre-feet and 400 acre-feet in 2014, 2015 and 2016 respectively, to augment limited surface water supplies. For purposes of this WSA, the well is assumed to functionally provide up to 200 acre-feet per month when needed (equivalent to about 2.2 mgd continuously pumped during a month).

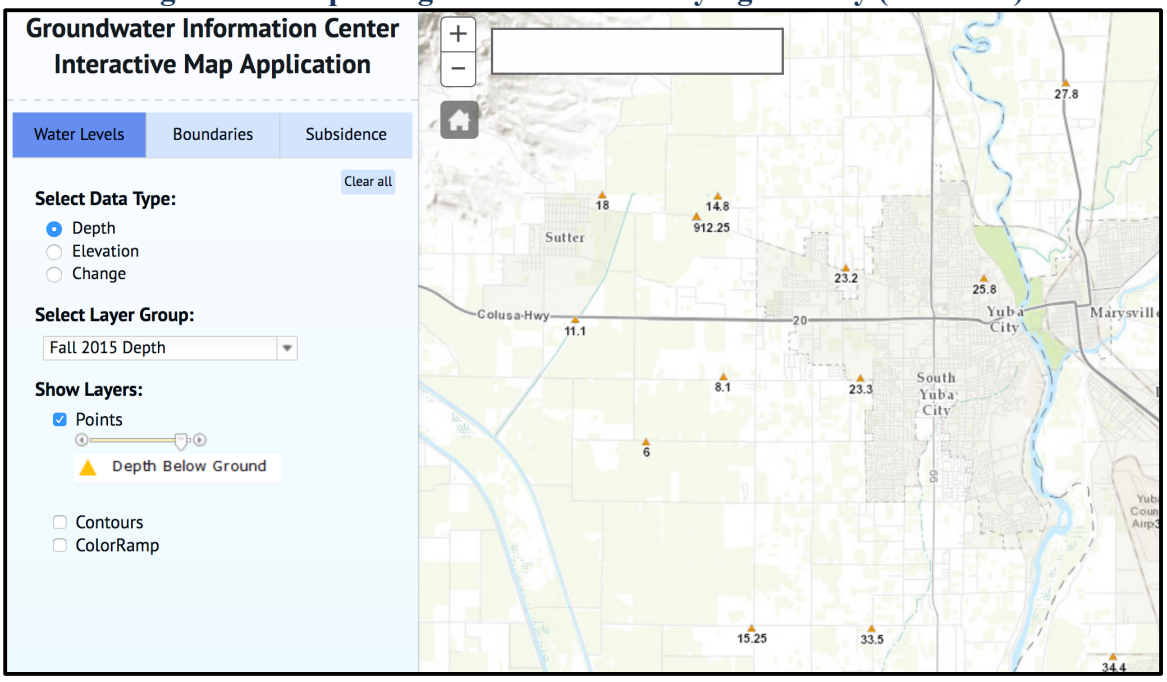
[32] Carryover water in a SWP reservoir theoretically spills when the stored water is displaced by higher priority new SWP water during the current allocation period.
[33] Water Code § 10910(f).

4.1.5.1 Groundwater Management in the Subbasin

In California, regulation of groundwater has largely been left to local authorities. There are a variety of methods available for managing groundwater resources in California and the degree of groundwater management in any basin is often dependent on water availability and demand.[34] Typically, local groundwater management strategies include monitoring groundwater levels and production amounts, and conjunctive use of groundwater and surface water supplies. The City overlies the Sutter subbasin of the defined Sacramento Valley groundwater basin.[35] The Sutter subbasin is not an adjudicated groundwater basin. As defined by the Department of Water Resources (DWR), "*Sutter Subbasin lies in the eastern central portion of the Sacramento Valley Groundwater Basin. It is bounded on the north by the confluence of Butte Creek and the Sacramento River and Sutter Buttes, on the west by the Sacramento River, on the south by the confluence of the Sacramento River and the Sutter Bypass, and on the east by the Feather River. The subbasin lies entirely within the Sacramento River watershed with the most notable hydrological features being the Sacramento and Feather Rivers*."[36]

Groundwater levels are generally shallow underlying the City, with levels generally within 10 to 30 feet below the ground. **Figure 4-1** provides a representative sample of groundwater levels measured in the fall of 2015, during the peak of the recent drought.

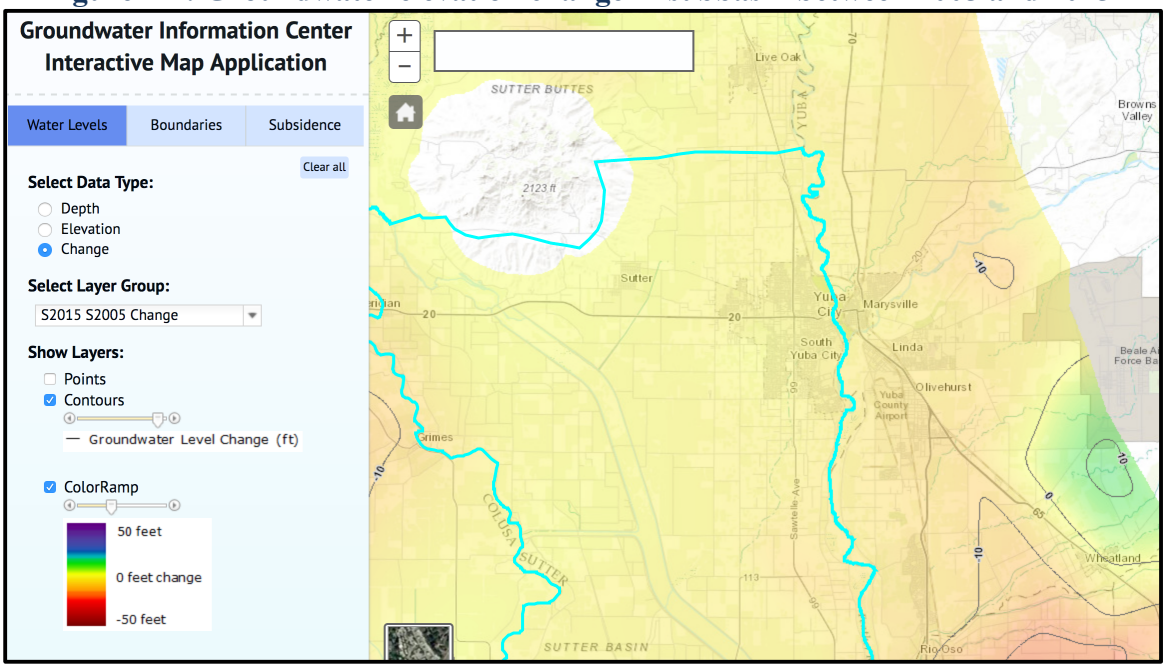
Figure 4-1: Depth to groundwater underlying the City (Fall 2015)



[34] Department of Water Resources, Bulletin 118 (2003), Ch. 2.
[35] DWR Subbasin 5-021.62, as represented in the 2016 basin boundaries available here: https://gis.water.ca.gov/app/gicima/
[36] DWR Bulletin 118, last update January 20, 2006.

Because of ample surface water sources available to meet local demands and providing recharge benefits, groundwater levels have remained fairly stable underlying the City, even with the City's increased use during the drought. **Figure 4-2** represents groundwater level changes occurring between spring 2005 measurements and spring 2015 measurements. As indicated by the color contours, the Sutter subbasin has seen little variation over the past decade.

Figure 4-2: Groundwater elevation change in subbasin between 2005 and 2015



4.2 REPRESENTATIVE WATER SUPPLY RELIABILITY

The previous section discussed the array of water supplies available to the City to manage various hydrologic, contractual, and customer demand considerations. As required by the Water Code, the WSA "*shall include a discussion with regard to whether the public water system's total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses*."[37]

But, since each year does not fit exactly within the desired hydrologic constraints, assumptions regarding the reliability of the aforementioned supplies for specific hydrologic conditions need to be assumed by this WSA. The following assumptions are made for each supply source, as represented in Table 4-1 through 4-3, and become the source for integration with the estimated demands.

[37] California Water Code Section 10910(c)(3).

1. License 13855:

    a. Normal year – fully available within limits of right; fully able to meet build-out demand in early months; shared with the Permit supply at the direction of operators throughout the allowed diversion months

    b. Single-dry year – Assumed to be constrained by Term 91 conditions beginning mid-April through November, but otherwise limited by rate of diversion limits or customer demands

    c. Multiple dry years – the first of a series of three years is assumed to mimic a single-dry year; subsequent years have Term 91 beginning June 1 through mid-October; license cap is limiting on an annual basis, even with Term 91 limits.

2. Permit 18558:

    a. Normal year – fully available within limits of right; fully able to meet build-out demand in early months; shared with the Permit supply at the direction of operators throughout the allowed diversion months

    b. Single-dry year – Assumed to be constrained by Term 91 conditions beginning mid-April through November, but otherwise limited by rate of diversion limits or customer demands

    c. Multiple dry years – the first of a series of three years is assumed to mimic a single-dry year; subsequent years have Term 91 beginning June 1 through mid-October; license cap is limiting on an annual basis, even with Term 91 limits.

3. North Yuba Water District contract:

    a. Normal year – full contract amount is not needed due to ample License and Permit water; fully use monthly quantities per contract from July through September

    b. Single-dry year – Fully use contract maximum to compensate for limits on License and Permit; match monthly contract limits

    c. Multiple dry years – Use slightly less than contract maximum due to additional License and Permit water with assumed delay in Term 91 conditions.

4. SWP Contract:

    a. Normal year – assume 75% of Table A is available, equal to 7,200 acre-feet; with ample License and Permit water, only use 5,200 acre-feet, with remaining 2,000 added to Carryover account (assume a full Carryover of 7,500 acre-feet for dry-year contingency)

    b. Single-dry year – Allocation is limited to 10% (960 acre-feet); begin using in April or May when License and Permit are constrained; balance use with available Carryover

    c. Multiple dry years – Allocation is limited to 35% (3,360 acre-feet); begin using in June with NYWD supplies; likely exhaust supply by August

5. SWP Carryover:

    a. Normal year – no Carryover is used, however excess SWP Table A allocation is added to the account; City set objective to maintain 6,000 acre-feet minimum in account and adds anytime allocations exceed 60%

    b. Single-dry year – use a significant portion of Carryover supply in first dry year (with assumed significant constraints on License and Permit, and only 10% SWP allocation); intent is to use 5,500 acre-feet from April through November.

    c. Multiple dry years – use remaining 2,000 acre-feet held over from first single dry year; SWP allocation is higher and slightly more License and Permit water is available; zero Carryover will be available in third year of dry cycle.

6. SWP Advanced Table A

    a. Normal year – no ATA is used

    b. Single-dry year – no ATA is used; use is contractually constrained until all SWP Allocation and Carryover water is used

    c. Multiple dry years – assume small increment (100 to 200 acre-feet) is used in latter part of second dry year; assume 1,500 to 2,000 acre-feet is used in third year as there will be limited Table A allocation and zero Carryover.

7. Groundwater:

    a. Normal year – no groundwater is used, although well may be periodically operated for maintenance purposes

b. Single-dry years – groundwater use begins in May to complement NYWD and SWP Table A supplies; maximum of 200 acre-feet is used from June through November for annual total of 1,200 to 1,400 acre-feet.

c. Multiple dry years – groundwater is maximized at 200 acre-feet from June through October, with minor additional pumping as needed. First year after the Single-dry event is assumed to pump from 1,000 to 1,200 acre-feet. Third year in the dry series uses less than 1,000 due to demand constraints from the City's Water Shortage Contingency Plan.

Table 4-1: Normal Year Water Supplies

Supply Source (values in acre-feet/yr)	2020	2025	2030	2035	2040	2045
License 13855	6,500	6,500	6,500	6,500	6,500	6,500
Permit 18558	6,000	6,000	6,000	6,000	6,000	6,000
NYWD Agreement	3,180	3,180	3,180	3,180	3,180	3,180
SWP Contract	5,280	5,280	5,280	5,280	5,280	5,280
SWP Carryover	0	0	0	0	0	0
Groundwater	0	0	0	0	0	0
Total Supply	20,960	20,960	20,960	20,960	20,960	20,960

Table 4-2: Single-dry Year Water Supplies

Supply Source (values in acre-feet/yr)	2020	2025	2030	2035	2040	2045
License 13855	4,160	4,160	4,160	4,160	4,160	4,160
Permit 18558	1,080	1,080	1,080	1,080	1,080	1,080
NYWD Agreement	4,500	4,500	4,500	4,500	4,500	4,500
SWP Contract	960	960	960	960	960	960
SWP Carryover	5,500	5,500	5,500	5,500	5,500	5,500
Groundwater	1,350	1,350	1,350	1,350	1,350	1,350
Total Supply	17,550	17,550	17,550	17,550	17,550	17,550

Table 4-3: Multiple Dry Year Water Supplies

Supply Source (values in acre-feet/yr)	2020	2025	2030	2035	2040	2045
Multi-dry Year 1 (same as "Single-dry")						
License 13855	4,160	4,160	4,160	4,160	4,160	4,160
Permit 18558	1,080	1,080	1,080	1,080	1,080	1,080
NYWD Agreement	4,500	4,500	4,500	4,500	4,500	4,500
SWP Contract	960	960	960	960	960	960
SWP Carryover	5,500	5,500	5,500	5,500	5,500	5,500
Groundwater	1,350	1,350	1,350	1,350	1,350	1,350
Total Supply	17,550	17,550	17,550	17,550	17,550	17,550
Multi-dry Year 2						
License 13855	6,500	6,500	6,500	6,500	6,500	6,500
Permit 18558	2,340	2,340	2,340	2,340	2,340	2,340
NYWD Agreement	4,000	4,000	4,000	4,000	4,000	4,000
SWP Contract	3,360	3,360	3,360	3,360	3,360	3,360
SWP Carryover	2,000	2,000	2,000	2,000	2,000	2,000
Groundwater	1,200	1,200	1,200	1,200	1,200	1,200
Advanced Table A	150	150	150	150	150	150
Total Supply	19,550	19,550	19,550	19,550	19,550	19,550
Multi-dry Year 3						
License 13855	6,500	6,500	6,500	6,500	6,500	6,500
Permit 18558	2,340	2,340	2,340	2,340	2,340	2,340
NYWD Agreement	4,000	4,000	4,000	4,000	4,000	4,000
SWP Contract	3,360	3,360	3,360	3,360	3,360	3,360
SWP Carryover	0	0	0	0	0	0
Groundwater	1,000	1,000	1,000	1,000	1,000	1,000
Advanced Table A	1,800	1,800	1,800	1,800	1,800	1,800
Total Supply	19,000	19,000	19,000	19,000	19,000	19,000

SECTION 5 – SUFFICIENCY ANALYSIS

This section assesses whether sufficient water supplies exist to meet the estimated water demand of the Proposed Project.[38] The WSA provides a reasoned analysis of the likely availability of the identified supplies to serve the Proposed Project, while considering the demands of existing and other planned future land uses.[39] This section includes:

- Analysis of sufficiency of identified water supplies to serve the Proposed Project, considering variations in supply and demand characteristics under normal, single-dry and multi-dry hydrologic conditions.
- Analysis of conclusions for purposes of determining water supply sufficiency.

5.1 WATER SUPPLY SUFFICIENCY ANALYSIS

The sufficiency analysis integrates the water demands detailed in Section 2 and Section 3 with the water supplies characterized in Section 4, especially the supply reliability represented in **Table 4-1** through **Table 4-3** and the demands presented in **Table 3-4**.

5.1.1 Normal Year Reliability

Under normal year conditions, the City has ample supplies to meet projected future demands. **Table 5-1** presents the comparison of supply and demand for 5-year increments to 2040. While the excess supply in 2040 shown in the table is limited, actual supplies available to the City are greater. However, as described in Section 4.2, all available supplies are not utilized under normal conditions. Thus, supplies could actually exceed demand by several thousand acre-feet.

5.1.2 Single-dry Year Reliability

Table 5-2 represents the comparison of projected demands to supplies under the single-dry year scenario. As described previously, supplies available under this scenario include several very conservative assumptions (see Section 4.2). Forecast citywide demand also is increased over the forecast normal condition to reflect trends of increased landscape irrigation when rainfall is limited. Since this increase only applies to the outdoor portion

[38] CWC § 10910 (c)(4) provides that "the water supply assessment for the project shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during normal, single dry, and multiple dry water years during a 20-year projection, will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses."

[39] *Vineyard Area Citizens for Responsible Growth, Inc*. v. *City of Rancho Cordova* (2007) 40 Cal.4th 412, 430-32.

of a customer's demand, an adjustment factor of 5% is applied to the total normal-year demand values to conservatively reflect the expected increase in demand for water.[40]

Table 5-1: Normal Year Reliability

(acre-feet/yr)	2020	2025	2030	2035	2040
Supplies	20,960	20,960	20,960	20,960	20,960
Demands	15,470	16,590	17,780	19,060	20,430
Difference	5,490	4,370	3,180	1,900	530

Note: This table presents the same supply for all years, resulting in excess supply shown. However, actual operations will only use the supplies needed to meet demand, providing the City with additional flexibility in how it manages available sources. Also, this table does not reflect the operational and water asset restrictions that can affect availability on a daily and month-by-month basis. The comparison of annually available supplies and annual demand therefore should not be considered representative of availability in a particular month.

Table 5-2: Single-dry Year Reliability

(acre-feet/yr)	2020	2025	2030	2035	2040
Supplies	17,550	17,550	17,550	17,550	17,550
Demands	16,200	17,400	18,700	20,000	21,500
Difference	1,350	150	(1,150)	(2,450)	(3,950)

Note: This table does not reflect the operational and water asset restrictions that can affect availability on a daily and month-by-month basis. The comparison of annually available supplies and annual demand therefore should not be considered representative of availability in a particular month.

The results of the conservative supply assumptions and increased demand is a predicted shortage of about 6% beginning in 2030. By 2040, the shortage during a single-dry year condition is predicted to increase to 18% of demand – or about 4,000 acre-feet.

5.1.3 Multiple Dry Year Reliability

Demand, will also vary across this hydrologic planning scenario. This variance is represented by setting the forecast demands for the first of three years equal to the demand used in the single-dry year scenario. In the second year, the City would anticipate that its water shortage contingency plan would be triggered, resulting in a demand reduction for that year. A resulting 5% reduction from the projected normal year demand is anticipated. Similarly, in the third year, the City would expect further reductions resulting from implementing further Water Shortage Contingency Plan

[40] Based on meter studies and work with DWR on "weather normalization" of per capita water use values, Tully & Young has demonstrated that urban water use increases during low rainfall months. Based on conversations with urban water purveyors, DWR and landscape water professionals, it appears common for landscape irrigation timers to be turned on "early" when February and March are unusually dry.

(WSCP) actions.[41] For this third year, the reduction is assumed to be 15% lower than the normal year forecast demand. As a result of the demand reduction efforts imposed by the City's WSCP, the City does not anticipate any shortfall during the second and third year of a multiple year dry condition. Circumstances during 2015 and 2016, which followed an initial dry year in 2014, reflect the City's WSCP implementation to manage demands to match available supplies. The City achieved demand reductions well in excess of 20% compared to 2013 demand conditions.

Table 5-3 presents the supply and demand comparison for this scenario. The first year of the multiple dry year scenario is similar to a single-dry year event. As discussed previously, the City anticipates a supply shortfall of about 20% due partly to the 5% expected increase in demand, but more a result of severely constrained License and Permit supplies, as well as only a 10% SWP Table A allocation.

Table 5-3: Multiple Dry Year Reliability

	(acre-feet/yr)	2020	2025	2030	2035	2040
Year 1	Supplies	17,550	17,550	17,550	17,550	17,550
	Demands	16,200	17,400	18,700	20,000	21,500
	Difference	1,350	150	(1,150)	(2,450)	(3,950)
Year 2		2020	2025	2030	2035	2040
	Supplies	19,550	19,550	19,550	19,550	19,550
	Demands	14,700	15,700	16,900	18,100	19,500
	Difference	4,850	3,850	2,650	1,450	50
Year 3		2020	2025	2030	2035	2040
	Supplies	19,000	19,000	19,000	19,000	19,000
	Demands	13,900	14,900	16,000	17,100	18,400
	Difference	5,100	4,100	3,000	1,900	600

Note: This table does not reflect the operational and water asset restrictions that can affect availability on a daily and month-by-month basis. The comparison of annually available supplies and annual demand therefore should not be considered representative of availability in a particular month.

[41] All urban water suppliers are required by the Urban Water Management Planning Act (specifically, Water Code Section 10632(a)) to have an adopted Water Shortage Contingency Plan that addresses demand management actions taken under increasingly restricted water supply circumstances.

5.2 SUFFICIENCY ANALYSIS CONCLUSIONS

As detailed in this WSA, the City has adequate water supplies to meet the Proposed Project's demand as well as existing and future planned uses under most circumstances. As shown in Table 5-2, shortages begin to occur around 2030 during the assumed single-dry year condition – a shortfall of about 6%. By 2040, the single-dry year shortage increases to about 18% of the demand – or about 4,000 acre-feet. The City is pursuing specific actions to mitigate this predicted rare occurrence including:

- Assuring sufficient Carryover supplies are maintained when SWP allocations are sufficient.
- Constructing interties with water purveyors in Marysville to provide more flexibility to alternative supplies.
- Investigating additional groundwater wells to increase current pumping capacity.
- Investigating the use of local groundwater banking to store available water assets for later use (e.g. such as with an Aquifer Storage and Recovery well).
- Pursuit of water transfer or supply augmentation options that trigger under certain hydrologic or SWP allocation conditions (e.g. an increased dry-year supply from NYWD).

The conclusion that sufficient water is available to meet the Project water demands in all but the single-dry year scenario rests on the following:

- The Proposed Project is constructed following the water-efficiency design and low-water use objectives articulated in the Bogue Stewart Master Plan.
- The City adequately manages a SWP Carryover quantity sufficient to meet at least 25% of annual demand for one year.
- The NYWD and SWP contracts are renewed beyond 2035.
- The existing customers continue to achieve lasting demand reductions such that, in combination with new customers, the blended per-capita demand reaches the 2020 target established by the City.

Under the assumptions presented in this WSA, there is not sufficient water available during an assumed single-dry year condition at full build-out to meet the Proposed Project's demand as well as existing and other planned future uses.

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