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Comprehensive Water Planning

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MEMORANDUM

To: Bruce Grove – Kimley-Horn

Date: April 26, 2017

From: Greg Young
Kris Olof

Subject: Water Supply Evaluation for the Tierra Robles Project

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The purpose of this memorandum is to detail the assessment of availability and sufficiency of potable water to serve the water demands of proposed Tierra Robles development ("Proposed Project") located about 5 miles east of the City of Redding between the unincorporated communities of Bella Vista and Palo Cedro of Shasta County ("County"). Potable water will be provided by Bella Vista Water District ("District") as part of the District's historic and continued retail water service within the County - a service area serving potable supplies for suburban, rural residential, and agricultural demands. This analysis, therefore, relies upon information available from the District, including but not limited to, the Bella Vista Water District 2015 Urban Water Management Plan ("BVWD 2015 UWMP"), dated December 2016.[1]

As the lead agency under the California Environmental Quality Act ("CEQA"), the County is assessing the potential environmental impacts associated with the Proposed Project. This memorandum has been prepared to support the CEQA analysis regarding the availability and use of the District's potable water resources for the Proposed Project.

1.1 Applicability of Water Code 10910

Section 10912 of the California Water Code ("Water Code") requires the preparation and approval of a Water Supply Assessment ("WSA") for certain development projects. Triggers requiring the preparation of a WSA include residential developments of more than 500 dwelling units, shopping centers or business establishments employing more than 1,000 persons or having more than 500,000 square feet of floor space, commercial office buildings employing more than 1,000 persons or having more than 250,000 square

[1] Bella Vista Water District prepared and adopted its 2010 UWMP in May 2015. According to information available from the District, an update is expected to be completed sometime before the end of 2016.

feet of floor space, and projects that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project.[2]

As detailed later in this section, the Proposed Project does not meet the threshold for requiring a formal WSA. However, the CEQA analysis will need to evaluate the adequacy and potential impacts of water resources used to meet the Proposed Project's water needs. This memorandum provides a basis for the CEQA analysis in a manner that is similar to elements of a WSA.

This memorandum relies upon publicly available information published and adopted by the District along with specific Proposed Project information provided by the County, the applicant, and the District.

1.2 Water Supply Identification

Though this is not a formal WSA, the WSA statutes require that the lead agency (e.g. the County) identify any water system that is or may become, as a result of serving the Proposed Project, a "public water system"[3] that may serve the project. In this instance, the District is the public water system serving the Proposed Project within the meaning of the law, as its retail water service area includes the lands proposed for development.

As allowed under Water Code Section 10910:

> *"(c) (1) The city or county, at the time it makes the determination required under Section 21080.1 of the Public Resources Code, shall request each public water system identified pursuant to subdivision (b) to determine whether the projected water demand associated with a proposed project was included as part of the most recently adopted urban water management plan adopted pursuant to Part 2.6 (commencing with Section 10610).*
>
> *(2) If the projected water demand associated with the proposed project was accounted for in the most recently adopted urban water management plan, the public water system may incorporate the requested information from the urban water management plan in preparing the elements of the assessment required to comply with subdivisions (d), (e), (f), and (g)."*

Although the Proposed Project does not require a WSA, this memorandum documents an evaluation of the BVWD 2015 UWMP and other relevant published materials in a fashion similar to that allowed for a formal WSA as detailed in the Water Code sections above, which can be used to support the County's CEQA process.

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[2] Water Code § 10912, subdivision (a).

[3] A "public water system" is a system that provides water for human consumption that has 3,000 service connections.

As documented herein, the Proposed Project was found to be included within the demand forecasts of BVWD's 2015 UWMP, allowing the evaluation and conclusions of water supply availability and sufficiency in that document to represent an analysis of the water supply availability and sufficiency needed to meet demands of the Proposed Project.

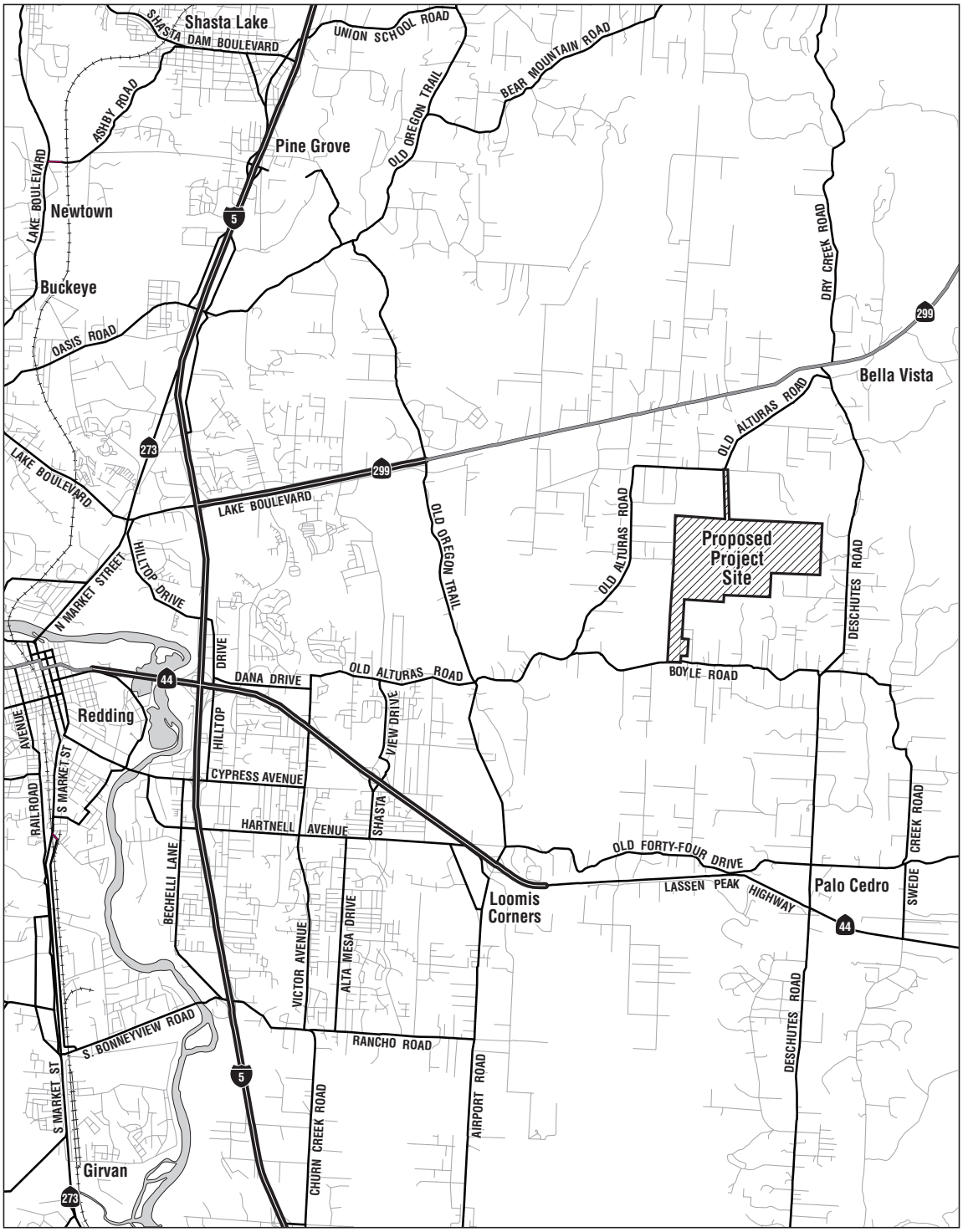
1.3 Proposed Project Description

The Proposed Project is located on the 715.4 acre Chatham Ranch site east of Redding with Boyle Road on the south, Deschutes Road on the east, and Old Alturas Road on the north and west (see **Figure 1**).

The currently vacant site will be developed into 166 residential lots with separate open space parcels, with 15 lots also including small secondary residences (hereafter referred to as "secondary units"). Residential lots will range from 1.38 acres to 6.81 acres, with defined development envelope limits on each lot, and privately owned open space outside of the development envelope. Building envelopes would total 138.2 acres with private open space making up another 124.6 acres. The secondary units constructed on 15 lots will be within the lot's development envelope. The 6 separate public open space parcels will total 192.7 acres. An additional 209.3 acres of Resource Management Area will also be left undeveloped like the open space. Additional land uses include 46.48 acres of road right-of-ways and 4.36 acres of secondary disposal area associated with the wastewater collection system. **Figure 2** presents the draft site plan detailing approximate lot locations and layouts.

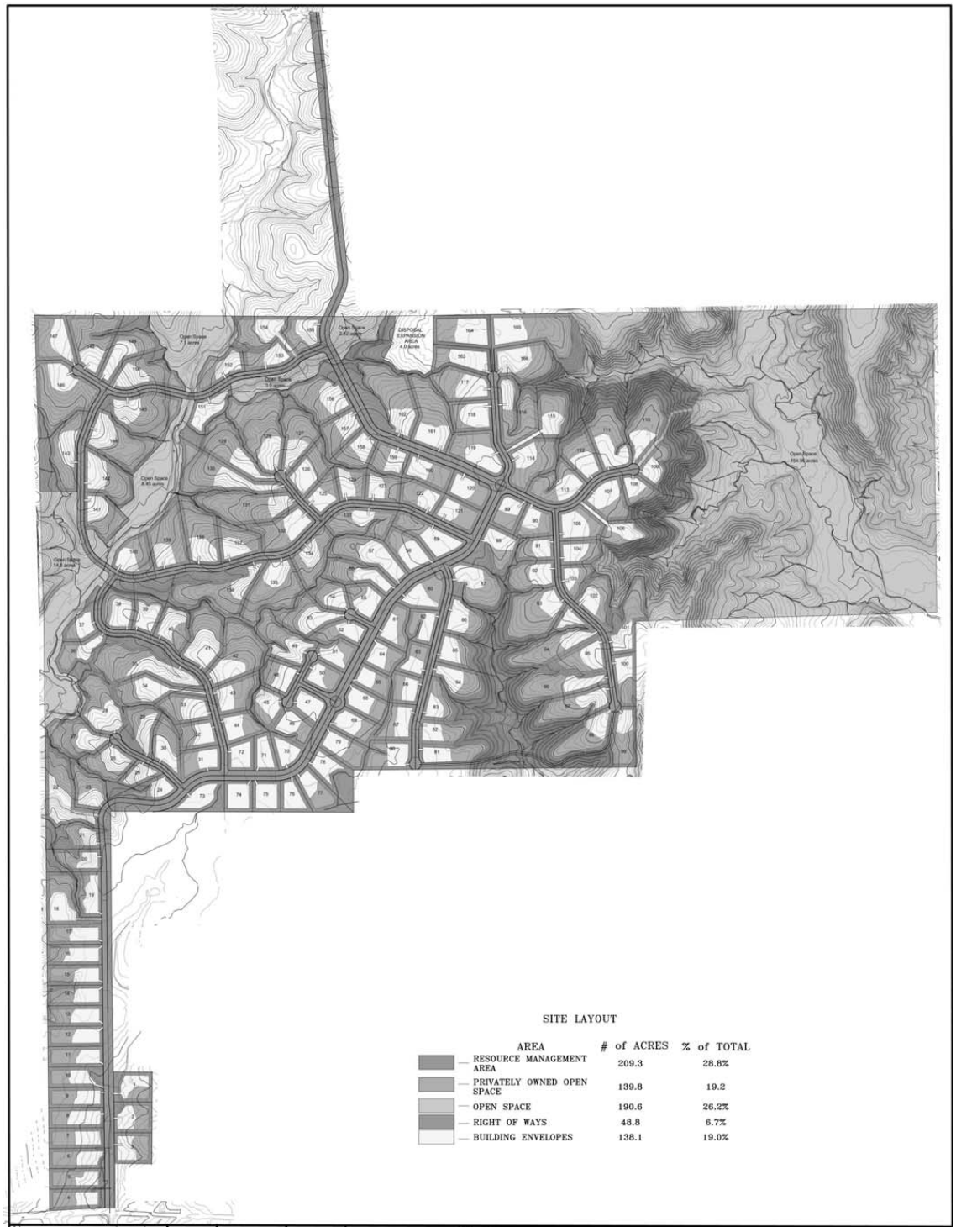
For purposes of this memorandum, infrastructure construction, such as roadways, bridges, and utilities, would be completed within two years after approval of the tentative map. Construction of custom homes would occur on a lot-by-lot basis, with build-out of anticipated to be completed within 15 years.

Figure 1 – Proposed Project Site[4]



[4] Image taken from the Preliminary Project Description.

Figure 2 – Site Plan[5]



[5] Image taken from the Preliminary Project Description.

2. Proposed Project Water Demands

This section describes the methodology, and provides the supporting evidence used to derive the Proposed Project's estimated annual water demand.

2.1 Demand Factor Development

As detailed in **Section 1**, the Proposed Project has specific residential land-uses with defined characteristics. To understand the water needs of the entire Proposed Project, unique demand factors that correspond with each unique project element are necessary. This subsection presents the methodology for determining the unit water demand factors that become the basis of the Proposed Project water demand estimates.

Values developed for each distinct group are based on several sources of information as detailed in the following subsections.

2.1.1 Current and Future Mandates

There are several considerations that affect the development of unit water demand factors, ranging from state landscape mandates to changes in the plumbing and building codes. The most important factors for this analysis are described below.

2.1.1.1 Water Conservation Objectives

On November 10, 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.[6] Since the Proposed Project is yet to be built and it may only have limited use by 2020, its effect on the District's reduction goal will likely not be noticeable.

The efforts undertaken by the District, the County, and throughout the State by other urban retail suppliers to comply with this statute, though not directly, will affect the Proposed Project's use of appliances, fixtures, landscapes and other water using features, through changes or additions to County ordinances as well as state law and/or through an emerging "conservation ethic" developing throughout the state.[7]

2.1.1.2 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")

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6 California Water Code § 10608.20

[7] In May 2016, Governor Brown issued Executive Order B-37-16 entitled "*Making Water Conservation a California Way of Life*." This further illustrates the growing water conservation ethic in the state.

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.[8] 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 MEWLO in response to emergency regulations adopted during the drought.[9]

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 in the following subsection.

2.1.1.3 California Model Water Efficient Landscape Ordinance and County Ordinances

The Water Conservation in Landscaping Act was enacted in 2006, requiring the California Department of Water Resources (DWR) to update the Model Water Efficient Landscape Ordinance (MWELO).[10] In 2009, the Office of Administrative Law (OAL) approved the updated MWELO, which required a retail water supplier or a county to adopt the provisions of the MWELO by January 1, 2010, or enact its own provisions equal to or more restrictive than the MWELO provisions.[11]

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.[12] The changes included a reduction to 55 percent for the maximum amount of water that may

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[8] 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.

[9] 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.*

[10] Gov. Code §§ 65591-65599

[11] 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.

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

be applied to a landscape for residential projects, which effectively reduces the landscape area that can be planted with high water use plants. The MWELO applies to all types of new construction with a landscape area greater than 500 square feet (the prior MWELO applied to landscapes greater than 2,500 sf).[13] For residential projects, the coverage of high water use plants is reduced due to the new 55 percent water maximum and turf is limited. For the purposes of this WSE it is assumed that the County will require landscaping plans to comply with MWELO as required by law.[14]

It is difficult to predict the ultimate impact of the MWELO requirements on future water demand. While the requirement is for development of a landscape design plan that uses plants and features that are estimated to use no more than 55 percent of evapotranspiration ("ETo," which represents a plants water use based on climate conditions), which is the MWELO's residential landscaping requirement, some provision must be made for the inherent tendency to over-water even with irrigation controllers installed, piecemeal changes in landscape design, and reductions in irrigation efficiency through product use.[15]

In addition to MWELO, the District also has water conservation measures it continually encourages to limit water waste and promote conservation, which will be updated to reflect the newly mandated state-wide prohibitions authorized under the Governor's Executive Order B-37-16.[16]

2.1.1.4 Metering, Volumetric Pricing, and Water Budgets

California Water Code §525 requires water purveyors to install meters on all new service connections after January 1, 1992. California Water Code §527 requires water purveyors to charge for water based upon the actual volume of water delivered if a meter has been installed. The District currently bills customers on a volumetric basis, though this action alone does not necessarily reduce water use.

2.1.1.5 Project Specific Irrigated Landscape Area Restrictions

To preserve the natural resources, the Proposed Project has established "development envelopes" for each of the 166 residential lots. The designated development envelope for each individual lot would allow for the area to be cleared and graded for the construction of one single family residence and desired accessory buildings, as well as the

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

[14] Copies of County Certification of MEWLO compliance of landscaping plans are a condition of service from Bella Vista Water District. March 24, 2016 Bella Vista Water District Comment Letter, Requirement 1g. The County has adopted the MWELO and will follow the established criteria.

[15] The County of Shasta will be responsible for reviewing and approving the Proposed Project's landscape plan as part of its authorities authorized under the MWELO provisions and as a condition of service from Bella Vista Water District.

[16] Executive Order B-37-16 (issued in May 2016) includes a directive for the State Water Resources Control Board to permanently prohibit a defined set of practices that waste potable water.

establishment of irrigated landscaping. Fifteen of the lots will also have a secondary unit constructed within the development envelope. Each individual lot would be limited to less than 5,000 square feet of total landscape area, which would include turf area (lawns) as well as any ornamental trees, shrubs and bushes.

2.2 Residential Demand Factors

This subsection describes the methods used and the values estimated for unit water demand factors for the residential element of the Proposed Project. Residential unit demand factors are represented as the quantity of water in acre-feet per dwelling unit (DU) per year.

Residential unit demand reflects two distinct uses: indoor use and outdoor use. The design of the Project calls for 166 lots ranging from about 1.38 to 6.81 acres, consisting of single-family homes with individual landscaping (limited to 5,000 square feet within the building envelope). The indoor and outdoor components are ultimately combined into a total unit demand factor for residential uses.

2.2.1 Indoor Residential Demand

For purposes of this memorandum, the proposed homes are estimated to use 0.15 acre-feet per year (af/yr) for indoor water demand for primary residences, and 0.28 af/yr for the 15 lots with both primary and secondary units. This indoor unit demand factor is based upon an assumed value of 55 gallons per person per day (gpcd), with an assumed average occupancy rate of 2.5 people per home for primary residences, and 2 people per home for the secondary units.[17] 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 0.15 acre-feet per year for the 166 single family homes,[18] and 0.12 acre-feet per year for the 15 secondary units.

This 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.[19]

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[17] The occupancy rate is the average single family occupancy rate for Shasta County (2.5) 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/.

[18] Indoor demand for primary units = 2.5 people/house x 55 gallons per-person, per day x 365 days = 50,188 gallons/dwelling unit/year = 0.15 acre-feet/dwelling unit/year

[19] 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 0.15 af/yr value. Recently, the Governor issued Executive Order B-37-16 that, among other orders, directed state agencies to develop new urban water

2.2.2 Residential Outdoor

Outdoor demands for the Proposed Project are calculated based on regulations defined under the County's landscape ordinance discussed previously. The ordinance does not provide a specific calculation methodology for estimating landscape water demands, so for the purposes of this memorandum the MWELO method is used. 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:

> *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 evapotranspiration (ET). The methodology directs the use of ET from a reference crop, such as maintained grass – a value referred to as ETo. For this Project, the ETo value used is 56.22 inches per year.[20] The landscape area is the other primary factor. As noted previously, the Proposed Project has specified building envelopes for each lot, and is limiting irrigated landscaping to 5,000 square feet within each envelop.[21] This value is used to estimate the overall MAWA, which represents a conservative upper limit for outdoor residential demands. For the 15 lots that will also include a secondary unit, the 5,000 square foot landscape area is reduced by 1,500 square feet to reflect the footprint of the secondary structure and anticipated hardscapes such as extended driveway and patio areas.

Using the MAWA equation above, maximum permissible water demands per standard lot is 0.29 acre-feet per year.[22] For the 15 lots with secondary units, the maximum demand is estimated to be 0.21 acre-feet per year.

2.2.3 Summary of Residential Demand Factors

The indoor and outdoor residential demand factors are presented in Table 2-1. Combined, each lot is estimated to use 0.45 acre-feet per year for lots with only primary homes, and 0.48 for the 15 lots with secondary units.

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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 includes the suggested 55 gallons-per-person per day planning guidance.

[20] California Department of Water Resources reference ETo map zone 14.

[21] Per the Preliminary Project Description, individual lot owners could apply for permits from Tierra Robles Community Service District and BVWD to expand the landscape area above the 5,000sf limit but would need to provide justification as well as ensure MWELO compliance. Additionally, above 5,000sf, additional MWELO restrictions and requirements are triggered for residential landscapes including dedicated landscape irrigation meters and flow sensors to detect system malfunctions. Given the complexity of expanding beyond the 5,000sf limits and the other land use restrictions on each parcel it is not likely that property owners will opt to expand the landscape area. For the purposes of this memo, all parcels are expected to remain in the 5,000sf landscape limit.

[22] MAWA formula = 56.22 inches X 0.62 X 0.55 X 5,000 sf = 95,855 gallons = 0.29 acre-feet

Table 2-1 – Residential Unit Water Demand Factors

Water Demand Category by Dwelling Unit (du) Type	Indoor Factor	Outdoor Factor	Total Demand Factor (af/du)
Standard Homes	0.15	0.29	0.45
Homes with Secondary Units	0.28	0.21	0.48

2.3 Non-Residential Demand

This subsection discusses the non-residential elements of the Proposed Project. The Proposed Project includes two planned non-residential land uses with associated water demands: median landscaping, and the wastewater treatment facility. These are both addressed below.

- *Median Landscaping:* The Proposed Project anticipates about 50 acres of road right-of-ways internal to the project and externally, connecting to other major roadways. Portions of these right-of-ways will be landscaped with drought tolerant plantings designed to fit in with the natural vegetation, but that will still require nominal irrigation. Irrigation demands are anticipated to be met with water recycled from a Community Wastewater Treatment System (CWTS). The CWTS intends to dispose of effluent through subsurface drip lines to 30-foot wide medians constructed within portions of the internal roadways. This will be the only intended source of water. While these median plantings do create a demand, they will not be served with potable water supplied by the District, and are therefore not included as part of the estimated potable demand assessed in this memorandum.

- Community Wastewater Treatment System: Although each of the 166 lots will be equipped with an individual septic system, the individual systems will be connected to a community collection system[23] that directs effluent to a community treatment system. The treatment system will be contained within a small building, which will be equipped with a restroom. Process water associated with operating the treatment system as well as water for the restroom will include a very minor demand. For purposes of this memorandum, the treatment facility is assumed to demand 0.10 acre-feet annually – equivalent to approximately half of the assumed annual residential indoor demands. This is a very nominal demand

[23] Effluent from the individual septic tanks will flow from the tank into a small diameter (2 inches to 4 inches) pressurized sewer main located in the street right-of-way and be conveyed to a centralized treatment system. (as described in the Preliminary Project Description).

and, for purposes of this memorandum, is not considered in the estimate of potable water demand.

Additionally, extensive open space is included as part of the Proposed Project. However, these parcels will be kept undisturbed from current conditions and also do not have an associated demand for potable water.

2.4 Other Water Demands

In addition to the residential and non-residential project elements, the Proposed Project entails two other incidental water demands:

- *Construction Water*: Initiation of the Proposed Project will include site grading and infrastructure installation. These and other construction elements will require dust suppression and other incidental water uses. These are estimated to be nominal, and do not continue beyond the construction phases. For purposes of identifying incremental water demands, construction water is assumed to be 2 acre-feet per year (this is about 600,000 gallons – or over 150 fill-ups of a 4,000-gallon water truck per year). The Proposed Project is anticipated to be operating at full capacity and fully built within 15 years of breaking ground, therefore construction water is only included in the initial years of the project.

- *Non-revenue Water*: The Proposed Project demand represents the demand for water at the project location (e.g. at the customer's location). To fully represent the demand, distribution system losses must also be included. Often, distribution system losses represent water that is lost due to system leaks, fire protection, unauthorized connections, and inaccurate meters. Essentially, this is the water that is produced by the District's that does not make it to its customers – either as a real loss or an apparent loss (e.g. such as may result when a customer meter underreports actual use). In most instances, the predominant source of distribution system losses is from leaks that inevitably exist throughout the many miles of pipes and fitting that bring water to the District's customers.

  The District calculated a 6 percent loss factor to be representative of non-revenue water based on its historical data.[24] This value is used to represent the additional water the District must treat, convey and deliver to assure the Proposed Project's customer demands are satisfied. As shown in **Table 2-2**, non-revenue demand is estimated to be approximately 5 acre-feet per year.

[24] Bella Vista 2010 Urban Water Management Plan (May 2015), Table 15, p. 3-13.

2.5 Water Demand Projection

Using the indoor and outdoor demands developed in the prior subsections, the overall Proposed Project potable water demand is represented in **Table 2-2** with a total forecast demand of 80 acre-feet per year at build-out.

Table 2-2 – Estimated Potable Water Demand

	Unit Count or Acreage					Demand Factor	Demand (af/yr)				
Category	2020	2025	2030	2035	2040	(af/du or af/ac)	2020	2025	2030	2035	2040
Residential											
Standard lots (indoor)	0	73	151	151	151	0.15	0	11	23	23	23
Standard lots (outdoor)	0	73	151	151	151	0.29	0	21	44	44	44
With Secondary Unit (indoor)	0	7	15	15	15	0.28	0	2	4	4	4
With Secondary Unit (outdoor)	0	7	15	15	15	0.21	0	1	3	3	3
						Residential Total	0	36	75	75	75
Other Project Demands											
Median Landscaping	20	46	46	46	46	n/a	(Met w/ recycled water)				
Wastewater Facility	0	1	1	1	1	0.10	(Nominal, not included)				
Construction Water	1	1	0	0	0	2	2	2	0	0	0
						Non-Residential Total	2	2	0	0	0
						Indoor Subtotal	0	13	27	27	27
						Outdoor Subtotal	2	25	48	48	48
						Project Subtotal	2	38	75	75	75
						Indoor Non-revenue water 6%	0	1	2	2	2
						Outdoor Non-revenue water 6%	0	2	3	3	3
						Total Indoor	0	14	29	29	29
						Total Outdoor	2	27	51	51	51
						Total Proposed Project Demand	**2**	**41**	**80**	**80**	**80**

3. WATER SUPPLY AND RELIABILITY

The forecast water supplies presented in the prior section are expected to be fully met by potable water supplies provided by the Bella Vista Water District. Although the Proposed Project's description discusses the use of on-site residential grey water systems (to aid with meeting landscape water demands)[25], for purposes of this memorandum, this source is not included. Rather, to be conservative, the entire forecast demand of 80 acre-feet annually is expected to be served by the District.

Therefore, to fully assess the reliability of the District's supplies to serve the Proposed Project, a review and assessment of the District's supply and demand characterization is necessary. This section includes discussions of the District's forecast demands, characterizations of its supplies, and discussions of water supply shortages under dry conditions.

3.1 Bella Vista Water District Forecast Water Demand

The overall water demand for the District is developed and presented within the BVWD 2015 UWMP. In that document, the District provides in-depth discussion regarding its customer types and determinations of overall demand based on historic trends and projected growth.[26] A summary of the demands calculated by the District is presented in **Table 3-1**. The District assumes "residential" customers will grow at a 0.9% annual rate from an average use values calculated for the period 1995 to 2015. The average use values are also shown in Table 3-1. The Proposed Project, considered rural residential by the District, is assumed to be represented within the growth reflected in the BVWD 2015 UWMP. Specifically, the rural classification is expected to grow approximately 830 acre-feet by 2040, or approximately 40 acre-feet per year. Given the Proposed Project's estimated demand of 80 acre-feet at build-out, it is assumed to represent about 10% of the overall growth in this category of over 800 acre-feet.

[25] As described in the Preliminary Project Description
[26] BVWD 2015 UWMP, Section 4.2.

Table 3-1: Projected Demand's from BVWD 2015 UWMP

Use Type	Water Demand (acre-feet/year)					
	95-'15 avg.	2020	2025	2030	2035	2040
Residential	2,858	3,282	3,432	3,589	3,754	3,926
Rural	2,223	2,552	2,669	2,791	2,919	3,053
Commercial	572	657	687	719	752	786
Public/Institutiona	949	1,089	1,139	1,191	1,246	1,303
Construction	16	18	19	20	21	22
Agriculture	5,702	6,547	6,847	7,161	7,489	7,832
Aquaculture	634	727	761	796	832	870
Unmetered	323	371	388	406	424	444
Losses	970	1,114	1,165	1,218	1,274	1,332
Total	14,247	16,357	17,107	17,891	18,711	19,568

3.2 Bella Vista Water District's Water Supply

The District has two primary water supply sources: surface water and groundwater.

3.2.1 Surface Water

The District has two sources of surface water: (1) a Bureau of Reclamation (Reclamation) contract for Central Valley Project (CVP) supplies, and (2) a multi-year transfer agreement with Anderson-Cottonwood Irrigation District (ACID), both of which are summarized in **Table 3-2**.

Table 3-2: Supply Projections[27]

Source	Water Supply (acre-feet/year)				
	2020	2025	2030	2035	2040
CVP Contract	24,578	24,578	24,578	24,578	24,578
ACID Long-Term Transfer	1,536	1,536	1,536	1,536	1,536
Groundwater	5,010	5,010	5,820	5,820	6,630
Total	31,124	31,124	31,934	31,934	32,744

3.2.1.1 Bureau of Reclamation Water Contract

The District entered into a long-term renewal contract with Reclamation that authorizes the District to divert from the Sacramento River a specified quantity of the water supply created by the CVP.[28] The contract allows the District to divert up to 24,578 acre-feet per

[27] BVWD 2015 UWMP, Table 6-5, p. 67.
[28] Letter from Bella Vista Water District (BVWD), dated March 24, 2016.

year of CVP water for agricultural (irrigation) and municipal and industrial (M&I) purposes, subject to shortages pursuant to Reclamation's M&I Shortage Policy. The percent reduction is applied to the historical average of the District's actual M&I water usage over the prior three unconstrained water years. Agricultural use can be reduced by as much as 100 percent in shortage years. The contract is effective through February 28, 2030. The contract includes a permanent assignment of 578 acre-feet annually of CVP water from Shasta County Water Agency.[29] In 2015, the M&I portion of the CVP supply was reduced to only 25 percent of the historical average use during the prior three unconstrained years.

3.2.1.2 Anderson-Cottonwood Irrigation District Transfer Agreement

The District's transfer agreement with ACID is a long-term agreement that is effective until February 28, 2045. It provides 1,536 acre-feet annually from ACID's CVP water contract. This transfer water is subject to shortage curtailment and the transfer is only available from April 1 through October 31 each year.[30]

3.2.2 Groundwater

The District's service area overlays the northern portion of the Redding Area Groundwater Basin, where the District's five groundwater wells are located. The operation of the wells has been limited lately due to the recent drought periods. Overall, when all five wells are in operation, they can collectively produce up to 4,200 acre-feet annually. The District plans to expand groundwater production into the future, constructed a new well every 10 years starting in 2020. Each well is expected to increase groundwater by 810 acre-feet annually per well.[31]

3.3 District Water Supply Sufficiency

To fully assess the District's water supply, the potential available supply must be considered under normal, dry year, and multi-dry year conditions. As presented in the BVWD 2015 UWMP, the District has ample supply to meet its projected demands in average conditions – essentially when the CVP contract is unconstrained – and under its designated multi-dry year condition.[32] However, during single-dry year conditions, the District has significant shortages, causing it to ration water to its customers on an

[29] Information regarding the USBR contract is based on the summary discussion of the supply in the Bella Vista 2010 Urban Water Management Plan (May 2015), Section 4.1.1, p.4-2.
[30] Information regarding the USBR contract is based on the summary discussion of the supply in the Bella Vista 2010 Urban Water Management Plan (May 2015), Section 4.1.2, p.4-3.
[31] BVWD 2015 UWMP, footnote 3, Table 6-5, p. 67.
[32] See representation of multi-dry years in the BVWD 2015 UWMP in Table 7-2, p. 73. BVWD uses the series of years 2009 through 2011 to reflect its multi-dry year planning scenario. During these years, BVWD's overall water supplies equate to about 70% of water supply available when BVWD would receive 100% of its CVP allocation.

allocation basis tied to each customers' historic use. The BVWD 2015 UWMP representations of supply sufficiency are represented in the following subsections.

3.3.1 Normal Year

During an average water year, when the District receives a normal supply, it is anticipated to have sufficient water to meet demands. As seen in **Table 3-3**, the District is shown to have a surplus of over 9,000AF through 2040.[33] Therefore, under normal supply conditions, the Proposed Project's demand of approximately 80 acre-feet annually would be met and would not have any negative impacts on the availability of supply for all the District's existing and other planned future customers.

Table 3-3: Normal Year Supply and Demand[34]

	Sufficiency Analysis (acre-feet/year)				
	2020	2025	2030	2035	2040
Supply Totals	24,290	24,960	26,470	27,203	28,779
Demand Totals	16,363	17,113	17,897	18,718	19,575
Difference	7,927	7,847	8,573	8,485	9,204

3.3.2 Single Dry Year

During single dry year conditions, the District's supplies are projected to be insufficient to meet their demand. According to the BVWD 2015 UWMP, this shortfall is projected to exceed 7,000 acre-feet (see **Table 3-4**). The BVWD 2015 UWMP, however, does include the following caveat:

> "*Demand reductions due to water rationing and water conservation efforts are not included in the demand estimates. The agricultural demands are included in total demands to show the impact of single and multiple-dry years for the consideration of the supplemental supply program offered by the District. As a result, the 'Difference' in the table below shows how much water needs to be made up through conservation, land fallowing, and water transfers…*" (BVWD 2015 UWMP, p. 74)

Even with those caveats, though, to balance supply and demand, the District would need to reduce agricultural demands by nearly 100 percent (agricultural demand is

[33] BVWD 2015 UWMP, Table 33, p. 5-15. However, the District's CVP contract can actual increase to meet demands up to 24,000 acre-feet, which would result in substantially more "surplus" supply if presented in the 2015 UWMP. In the normal year, CVP supplies reflect the amount provided in 2004, which was 12,665 acre-feet (see Table 7-2, p. 73, BVWD 2015 UWMP).
[34] BVWD 2015 UWMP, Table 7-3, p. 74.

approximately 7,800 acre-feet by 2040) and use the full potential supply from groundwater (approximately 4,200 acre-feet as was assumed for the single-year supply/demand comparison), or undertake significant demand reductions.

Table 3-4: Single Dry Year Supply and Demand[35]

	Sufficiency Analysis (acre-feet/year)				
	2020	2025	2030	2035	2040
Supply Totals	10,122	10,246	11,185	11,320	12,271
Demand Totals	16,363	17,113	17,897	18,718	19,575
Difference	-6,241	-6,867	-6,712	-7,398	-7,304

3.3.3 Multi-Dry Year

Under multi-dry year dry conditions, the District's CVP supply is still subject to shortages, with specific reductions of about 25 to 50 percent anticipated in each of the assess three years represented in the BVWD 2015 UMWP. The resulting assumptions from the District are included in **Table 3-5**.[36]

Table 3-5 demonstrates that during a multi-dry year period, the District would be short over 6,000 acre-feet from being able to adequately meet its demand. And although the supply deficit decreases in the second and third dry years, it still maintains a supply shortage of several thousand acre-feet. In light of this potential for a shortage in supply, particularly given the drought condition from the last few years, is should be assumed that a multi-dry condition requires the District to place demand restrictions on its customers.

[35] BVWD 2015 UWMP, Table 7-4, p. 75.
[36] BVWD 2015 UWMP, Table 35, P. 5-17.

Table 3-5: Multi-Dry Year Supply and Demand[37]

		Sufficiency Analysis (acre-feet/year)				
		2020	2025	2030	2035	2040
Year 1	Supply totals	16,652	16,995	18,164	18,540	19,743
	Demand totals	16,363	17,113	17,897	18,718	19,575
	Difference	289	-118	267	-178	168
Year 2	Supply totals	17,189	17,677	18,997	19,530	20,898
	Demand totals	16,363	17,113	17,897	18,718	19,575
	Difference	826	564	1,100	812	1,325
Year 3	Supply totals	16,617	17,078	18,371	18,875	20,213
	Demand totals	16,363	17,113	17,897	18,718	19,575
	Difference	254	-35	474	157	638

[37] Bella Vista 2010 Urban Water Management Plan (May 2015), Table 35, P. 5-17.

4. MITIGATING SUPPLY RELIABILITY

As presented in **Section 2**, the Proposed Project is estimated to need 80 acre-feet of potable water annually at build-out. For purposes of this memorandum, the annual demand is expected to occur within 15 years.

As defined in Section 3, the District's Reclamation contract has shortage provisions as defined in Reclamation's M&I shortage policy agreements with each purveyor (Shortage Policy). Under non-shortage conditions, when Reclamation declares 100 percent allocations to its contractors, the District has ample water supplies for all its existing and forecast future customers, including the Proposed Project. When Reclamation declares a shortage, the Shortage Policy sets forth an available volume for the District based upon the District's actual diverted volume during the prior three years when allocations were 100 percent (do not have to be consecutive years).[38] The shortage allocation is a percentage of the average of quantities delivered during those three years.[39]

However, until such time as the Proposed Project's demands are able to be included in the District's baseline diverted quantities during 100 percent allocation conditions, Reclamation's calculation for deliveries to the District will not include the Proposed Project's demands as part of the baseline (note: the actual time required to become established within the District's baseline use is unknown and subject to continually changing operational and regulatory constraints placed on CVP supplies).

As a result, during shortage conditions, the Proposed Project would be served with water supplies made available to the District calculated based upon water use prior to the Proposed Project's use being included in Reclamation's formulas. Thus, the Proposed Project would essentially be receiving water that reduces the supplies available to other existing District customers during shortage conditions (until such time as the Proposed Project's demands are included during three 100-percent, unconstrained allocation years).

To mitigate this effect, the District may require the Proposed Project to provide an alternative water supply during shortage conditions until such time as the Proposed Project's demands have existed for three 100-percent, unconstrained allocation years.[40]

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[38] Reclamation's Shortage Policy also provides Reclamation the greatest degree of flexibility in allocating available CVP supplies during shortage conditions, including provisions that Reclamation does not make any guarantees of supply, even for existing users.

[39] Note that while CVP allocations in 2016 ultimately were placed at 100% by Reclamation, on-going State mandated conservation requirements placed upon the District are constraining customer use. As such, the use of 2016 in any averaging under Reclamation's Shortage Policy will need to adjust for the inability for the District to allow 100% customer use.

[40] Based upon communications with the District during the summer of 2016, the District currently does not have a formal policy for mitigating the impact of future demands, but anticipates an agreement with the Proposed Project applicant (or with the County) will reflect the strategy presented in this memo. The District's Board of Directors make these determinations on a project-by-project basis.

Potential mitigation language to address this impact could state:[41]

> "*Prior to the issuance of a building permit, the project applicant shall demonstrate to the satisfaction of the County that an Agreement has been secured with the District to provide the District with adequate water supplies on an annual basis during identified shortage conditions in a quantity that represents a minimum of 90 percent of the project's prior year water usage. Shortage conditions shall be defined to exist when the District has been notified by Reclamation that it will receive less than a 100 percent (full) allocation of its CVP water supplies for the coming delivery season, as that determination has been announced by Reclamation as of April 15 of each year. The augmenting water supplies shall be made available to the District through the Agreement until such time as the District has completed three years of full CVP water allocation following build-out of the project. For any shortage condition that occurs after three years of full CVP allocation, the project applicant shall no longer be required to provide the District with augmenting water supplies, but the project's customers shall then individually be fully subjected to the shortage provisions administered by the District to all its customers. The project applicant shall demonstrate that any water supply provided to the District under the Agreement satisfies all CEQA and NEPA compliance requirements, as well as any other permitting or regulatory approvals, as may be associated with a water supply identified in the Agreement*."

The analysis discussed below provides a representation of the potential frequency and quantity of water the Proposed Project will need to make available to the District to mitigate dry-year water supply impacts in the interim period under this potential mitigation approach. Because hydrology, climate and other factors affecting Reclamation's annual supply allocation determinations are difficult to predict, an analysis of potential mitigation conditions uses historical data as a representative surrogate of future conditions.[42]

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[41] The following suggested language places the mitigation as 90% of "normal condition" demand. This assumes that during dry conditions, the District will be encouraging or mandating conservation for all its customers, thus the Proposed Project's demand would also be expected to be reduced and would not need to supply its otherwise full demand.

[42] A review of historic hydrologic conditions is useful for determining dry and multiple dry year type designations. However, Central Valley Project (CVP) operations and water supply allocations have been significantly impacted by regulatory actions associated with the Endangered Species Act (ESA), related regulatory actions and the Water Quality Control Plan (Adopted as D1641 in 2000), including but not limited to the Operations Criteria and Plan (OCAP) Biological Opinions implementation, the Trinity River Restoration Plan, Delta Smelt Biological Opinion, Salmon Biological Opinion and Shasta Temperature Management Plan for the Sacramento River.
Future regulatory proceedings and actions are likely to further reduce CVP yield and water supply allocations to the District including, but not limited to, additional listings of threatened and endangered species and flow criteria proceedings by the State Water Resources Control Board.

Based upon a review of historic allocation data, the most severe period of shortage conditions prior to three years of 100 percent allocation occurred from 1990 to 1998 – a period of 9 years. Considering the Proposed Project will be constructing homes, and increasing total customer use, incrementally for 15 years prior to build-out, a worst-case condition should at least be contemplated – a condition that would represent 9 years after full project build-out prior to achieving the three years of 100 percent allocation. Under such a worst-case scenario, the Project's demands would not be recognized as part of the District's supply baseline until the 10th year following build-out, a total of 25 years following project approval (assuming the 15-year build-out schedule). Although conditions may vary from this, the scenario allows consideration of a worst case condition. In this scenario, the applicant would be responsible for mitigating impacts for customer demands until the 25th year. However, since houses – and associated customer demands at each house – will occur incrementally, portions of the Proposed Project demand may also incrementally become part of the District's baseline demand as recognized in Reclamation's shortage calculations. The dynamics of growth in demand combined with the variances in Reclamation allocations over time could be reflected in an agreement in a manner that would reflect the incremental shifting of a portion of the project's demand between being part of mitigation volumes to being part of the District's baseline.