Nevada Irrigation District

2020 Urban Water Management Plan

Public Draft

June - 2021

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101 Parkshore Drive – Folsom, California

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List of Acronyms and Abbreviations

Act	Urban Water Management Act
AF	Acre-feet
AFY	Acre-feet per year
AMI	Automatic Metering Infrastructure
AMR	Automatic Meter Reading
AWWA	American Water Works Association
CABY	Cosumnes, American, Bear, Yuba Integrated Regional Water Management Group
CALGreen	California Green Building Standards Code
CII	Commercial, Industrial, and Institutional
CIMIS	California Irrigation Management Information System
CRC	California Railroad Commission
CWC	California Water Code
DEW	Drier, extreme warming scenario
District	Nevada Irrigation District
DMM	Demand Management Measure
DOF	California Department of Finance
DRA	Drought Risk Assessment
DWR	California Department of Water Resources
FERC	Federal Energy Regulatory Commission
ft	Feet/Foot
GCM	Global Climate Model
GPCD	Gallons per capita per day
Guidebook	Urban Water Management Plan Guidebook 2020
HET	High Efficiency Toilets
kWh	Kilowatt Hour
mgd	Million gallons per day
MWELO	Model Water Efficient Landscape Ordinance
N/A	Not Applicable
NCRDC	Nevada County Resource Conservation District
NID	Nevada Irrigation District
PCWA	Placer County Water Agency
PG&E	Pacific Gas and Electric
SMD	Sewer Maintenance District
SSWD	South Sutter Water District
SVI	Sacramento Valley Index
SWRCB	California State Water Resource Control Board
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
WMW	Wetter, moderate warming scenario
WRCC	Western Regional Climate Center
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

1 Urban Water Management Plan Introduction and Overview

This Urban Water Management Plan (UWMP) was prepared for the Nevada Irrigation District (NID or District) in cooperation with the District staff. The District was organized in 1921 under the California Irrigation District Act of 1897 as a nonprofit water agency and operates under Division 11 of the State Water Code.

The Urban Water Management Act (Act) became part of the California Water Code (CWC) with the passage of Assembly Bill 797 during the 1983-1984 regular session of the California Legislature. The CWC requires every urban water supplier providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually (AFY) to adopt and submit an Urban Water Management Plan every five years to the California Department of Water Resources (DWR). The specific planning requirements are in the CWC Division 6, Part 2.6 Urban Water Management Planning.

Subsequent legislation has been passed that updates and provides for additional requirements for the UWMPs and water management. In particular, SBX7- 7 Water Conservation, required the State to achieve a 20 percent reduction in urban per capita water use by December 31, 2020, known as 20x2020. Reporting of 20x2020 compliance is incorporated into the 2020 UWMP requirements. Other inclusions in the UWMP originating from legislative requirements include reporting on energy intensity, an expanded Water Shortage Contingency Plan, and a 5-Year Drought Risk Assessment.

The core requirements for the UWMP include:

- An overview description of reliability of supplies, projected supplies, and the strategy for meeting water needs.
- A description of the water service area.
- A description of the existing and planned supply sources.
- Estimates of past, present, and projected water use.
- 20x2020 analysis and target compliance.
- A description of water conservation Demand Management Measures (DMMs) already in place and planned, and other conservation measures.
- Inclusion of a 5-Year Drought Risk Assessment.
- A description of the Water Shortage Contingency Plan/Conservation Program.

The 2020 UWMP must submit data in specific tables to DWR. DWR has provided these tables and this UWMP utilizes the provided tables with minor changes to format or organization where applicable. NID's 2020 UWMP presents each required element per DWR's Urban Water Management Plan Guidebook 2020 (Guidebook). A copy of the DWR checklist for compliance is included in Appendix A.

1.1 Plan Summary

The District supplies treated and raw water to municipal and raw water customers. The majority of water use is by the raw water customers. Raw water customers include commercial agriculture, small-scale agriculture, and other irrigation uses that contribute to the community's rural character.

The water supply system relies on diverting snow-melt runoff and capturing runoff flows in District reservoirs for use during the irrigation summer when runoff is reduced. The District's water rights including diversion and storage total approximately 450,000 acre-feet, though the amount that is actually available for use is less due to temporal differences between water rights, runoff season, and irrigation season needs.

This plan utilizes recent customer connection statistics and California Department of Finance population projections to develop customer and demand projections. A pending new Federal Energy Regulatory Commission (FERC) license will also add significant environmental instream flow requirements that depending on the year type, could increase unrecoverable flow requirements from the existing 7,665 acre-feet up to 59,527 acre-feet. Total 2020 demands were 161,678 acre-feet. Overall water demands are projected to increase up to 50 percent through 2040 to a range of approximately 199,000-242,000 acre-feet per year. Without the new FERC requirements, projected demands only increase 18 percent, up to approximately 190,000 acre-feet.

The District's water supplies are sufficient to meet customer and other demands during normal hydrologic years. However, the District projects supply to demand shortages during single and 5-year drought periods due to projected reduced watershed runoff. To address these shortages, the District's Drought Plan identifies six drought stages that include actions for the District and customers to implement to either reduce demand and/or increase supplies. Drought year impacts can be significantly mitigated through purchase of supply from PGE. However, the PGE supply is a highly variable, making it unreliable during dry years. In addition, the District's supply strategy relies heavily on carry over storage in its reservoirs. Depending on management of the storage over year to year, supply shortages may vary from values reported in this Plan.

As a mostly rural area primarily dependent on its snowmelt-based supply, the District faces unique challenges in projecting its future supplies and demands. The character of the area and water management practices of the past may be different in the future. As such, the District is in the early stages of a long-term visioning and planning effort to better understand potential future conditions and needs, and identify management and operational practices to meet those needs. The process, Plan For Water, will identify optional water management practices when triggering points in supply, demand, regulatory, legal, and other events are reached. These practices may include supply projects, demand management efforts, policy changes, and others.

1.2 Basis for Preparing Plan

The District supplies treated water within portions of the District's service area. Based on the number of connections and total volume delivered, NID is considered an urban retail water supplier and is required to update the UWMP. Based on the small volume of wholesale water supplied to other water providers, the District is not considered an "urban wholesale water supplier" as defined by CWC §10608.12(t). Table 1-1 presents the public water system name and number for each of the District's public water systems.

Table 1-1. Public Water System Information

Public Water System Number	Public Water System Name	Number of Municipal Connections	Volume of Water Supplied 2020 (AF)
CA2910004	Nevada ID - E. George, Banner Mountain	6,288	2,757
CA2910006	Nevada ID - Loma Rica	5,015	1,939
CA2910014	Nevada ID - Lake of Pines	2,555	1,113
CA2910023	Nevada ID - Lake Wildwood	3,248	1,058
CA311026	Nevada ID - North Auburn	2,499	1,780
CA5810005	Nevada ID - Smartsville	43	10
	Total:	**17,093**	**8,657**

1.3 Coordination and Outreach

The District coordinated this UWMP with other agencies and the community. Notice to the cities of Grass Valley, Lincoln, and Nevada City, as well as Nevada, Placer, and Yuba counties were provided on December 11, 2020, regarding the District's intentions of updating the UWMP, fulfilling the requirement to provide notice at least 60 days prior to the public hearing. A summary of the outreach efforts is provided in. Table 2-2.

The District conducted *insert number* public workshops at Board of Directors meetings to review and discuss the Plan. A public hearing for the plan was held on *insert date*. Public notification regarding these workshops and the hearing were advertised on the District's website and news releases. For the public hearing, the District notified the cities of Grass Valley, Lincoln, and Nevada City, as well as Nevada, Placer, and Yuba counties, as well as official notification in a news publication. Outreach and notification materials are presented in Appendix B.

Add results from public workshop…

The public hearing and adoption were conducted on [DATE]. The NID Board of Directors Resolution XXX adopting this 2020 UWMP is included in Appendix C.

1.4 Plan Submittal and Availability

Pursuant to DWR requirements, this 2020 UWMP was submitted to the California State Library, cities of Grass Valley, Lincoln, and Nevada City, and the counties of Nevada, Placer, and Yuba on [DATE].

This 2020 UWMP and applicable submittal tables were electronically submitted to DWR on [DATE].

This 2020 UWMP is available to the public electronically on the District's website. Due to COVID 19, a hard copy at the District is not available for review.

Table 1-2. Summary of Coordination, Adoption, and Submittal Activities (not final until Board approved and submitted to State)

Potentially interested parties	Notified of UWMP preparation	Requested copy of draft	Commented on the draft/action taken by supplier	Notified of public hearing	Attended public hearing	Copy of UWMP sent (date sent)
Nevada County	X					
Placer County	X					
Yuba County	X					
City of Grass Valley	X					
City of Nevada City	X					
City of Lincoln	X					
Yuba Water Agency	X					
Placer County Water Agency	X					
Placer County Agricultural Commissioner	X					
Placer County Farm Bureau	X					
Nevada County Agricultural Commissioner	X					
Nevada County Farm Bureau	X					
General public	X					
District Website	12/11/2020	--	--	--	--	--

2 Water Service and System Description

This section contains a description of the service area and climate, historical and projected connections and population, as well as land uses within the service area.

2.1 General Description

Located on the western slope of the Sierra Nevada Mountain range, the District encompasses 287,000 acres and covers portions of three counties: Nevada, Placer, and Yuba as shown on Figure 2-1, below. The District's watershed is located on the upper reaches of the Yuba River, Bear River, and Deer Creek. The highest peak in the District is at 8,373-foot elevation at English Mountain. The District transports water from high elevation, mountain reservoirs to the lower elevation foothills and into portions of the northern Sacramento Valley near the City of Lincoln.

NID was established as an irrigation district in 1921 and is governed by a five-member Board, which is elected by District voters. Each Board member, representing a division with the District, serves a four-year term.

The District supplies treated water for municipal, domestic, and industrial purposes. Water management infrastructure includes storage, treatment, and conveyance facilities. Many areas and residents within the service area are not served NID water, receiving their water through private groundwater wells or other sources. NID does provide wholesale supply to Nevada City, Grass Valley, and Placer County Water Agency which maintain their own water treatment and distribution systems. The District also serves approximately 5,200 raw water customers with a total reported irrigated acreage of 32,323 acres in 2020.

The District's retail potable water system consists of six service areas. The retail water system connections are predominantly single-family, but also consist of multi-family, commercial, industrial, and institutional customers.

The District owns and operates hydroelectric generation and recreational facilities. The hydroelectric facilities have a capacity of 82.2 megawatts and produced an annual average of 319 MWh between 2016 and 2020. NID began producing power in 1966 with the completion of the Yuba-Bear Power Project, which includes Chicago Park, Dutch Flat, Bowman, and Rollins powerhouses. Recreational facilities owned by the District provide camping, fishing, and boating at Rollins Lake, Scotts Flat Reservoir, and Jackson Meadows – Bowman Lake areas.

2.2 Service Area Climate

Summers are generally dry with mild to hot temperatures. Winters are relatively wet, especially in the upper elevations around Nevada City and Grass Valley, with snow levels usually around 3,500 ft and occasionally as low as 1,000 ft. Based on the historical data obtained from the California Irrigation Management Information System (CIMIS) and the Western Regional Climate Center (WRCC), the District's service area average minimum and monthly maximum temperatures are 26.4 and 92.5 degrees Fahrenheit, respectively.

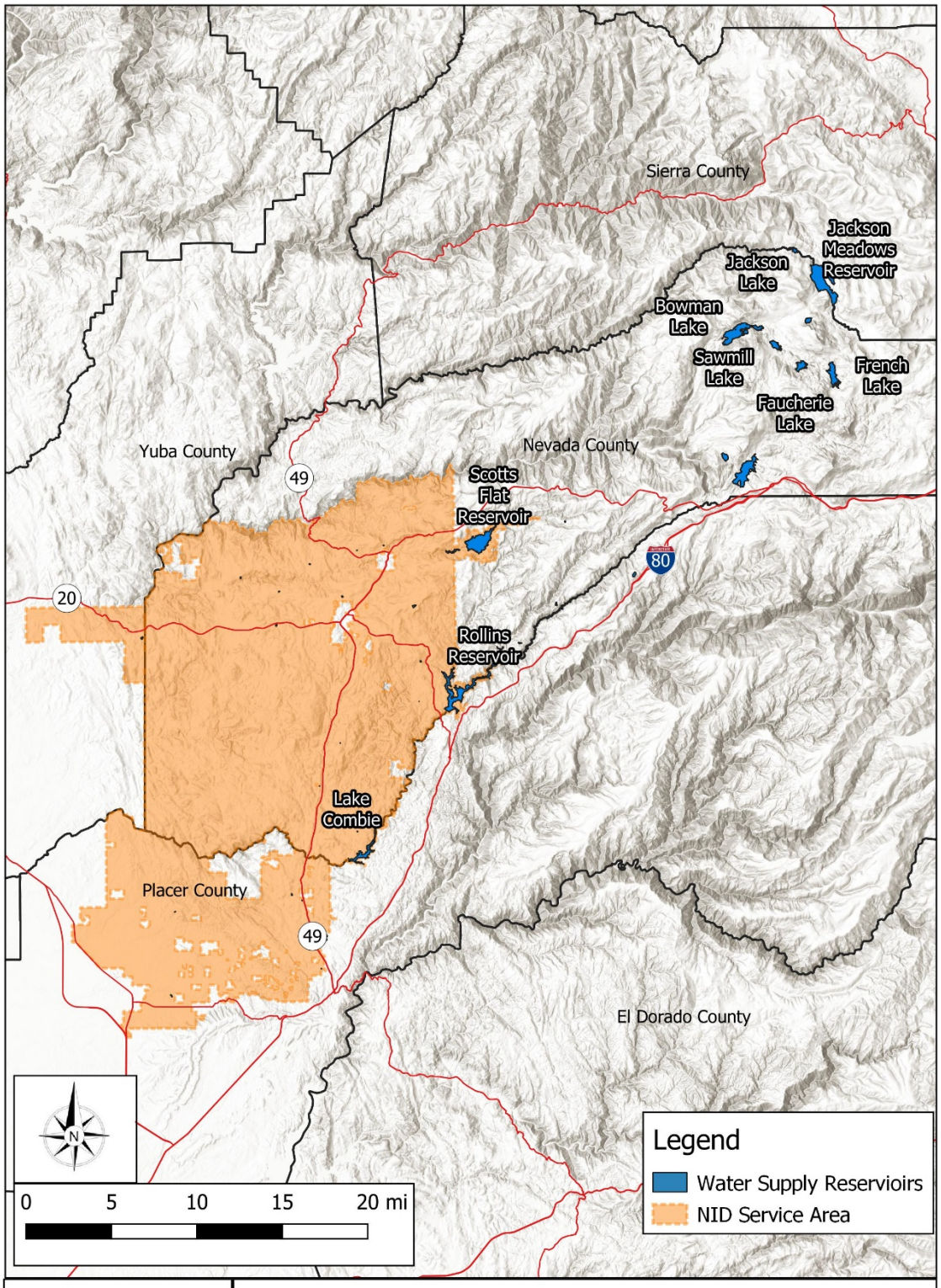

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Figure 2-1: NID Service Area and Raw Water System

2.3 Current and Projected Land Use

The NID service area includes mainly areas of Nevada County and Placer County, with a small portion in Yuba County. The service area is a unique blend of treated and raw water customers that includes urban, suburban, rural, and agricultural settings.

The Placer County General Plan indicates land uses for the portion of the service area within Placer County primarily consists of Agriculture/Timberland, except for the North Auburn Highway 49 corridor which mainly includes various densities of Residential[1] with scattered Rural Estate, Mixed-Use, and Professional Office. According to Placer County Goal 1.H (and supporting policies), Placer County "shall seek to ensure that new development and public works projects do not encourage expansion of urban uses into designated agricultural areas" (Placer County, 2013). NID assumes no major changes to current land use plans in Placer County for the near-term future.

A portion of the District's service area lies within the City of Lincoln's sphere of influence. As the City grows, land use is being modified and developments are actively moving through the planning process. Land use planning for this area is addressed through the City's General Plan and specific planning process. The City provided projected development and water demands to NID. Projected land-use and connections from the City are presented in Table 2-1. Water service options for the District's service are within the City of Lincoln continue to be investigated. At this time, NID will utilize the total water demand provided by the City to project supply needs. Pending ongoing investigations, this assumption should be revisited if alternative water service options are selected.

Table 2-1. City of Lincoln Land Use and Connection Projections Within NID Service Area

General Plan Land Use Category	2025 Additional Connections		2030 Additional Connections		2050 Additional Connections		Total Additional Connections	
	Dwelling Units	Acreage	Dwelling Units	Acreage	Dwelling Units	Acreage	Dwelling Units	Acreage
Country Estates	0	--	75	--	500	--	575	--
Low Density Residential	1,000	--	600	--	3,000	--	4,600	--
Medium Density Residential	200	--	0	--	500	--	700	--
High Density Residential	0	--	250	--	500	--	750	--
Total Residential	1,200	--	925	--	4,500	--	6,625	--
Neighborhood Commercial	--	5	--	10	--	0	--	15
Total Non-Residential	--	5	--	10	--	0	--	15

Note: Data provided by the City of Lincoln. Demand projections through the UWMP planning period as provided by Lincoln are presented in Chapter 3.

[1]Residential land use sub-groups include a mixture of Low Density (0.4-0.9 acre minimum), Low-Medium Density (2-5 dwelling units/acre), Medium Density (5-10 dwelling units/acre), Rural Low Density (0.9-2.3 acre minimum), and Rural (1-10 acre minimum).

Nevada County is primarily composed of residential, commercial, industrial, agricultural, and public land uses (Nevada County, 2020). Nevada County's Land Use Element of the General Plan reports 56 percent of the county is classified as "Forest" while 30 percent is classified as "Rural". These two land use designations are the two largest categories by acreage. Goal 1.3 of the Land Use Element states, "Within Rural Regions, maintain and enhance the County's pastoral character, existing land use pattern, rural lifestyle, and economy in their natural setting". This goal, and supporting policies, aim to provide related benefits for the conservation of a rural character and preservation of natural resources (Nevada County, 2020). As presented in Nevada County's Land Use Element, the predominant land use within the service area is Rural. Uses for this designation include rural residential, agricultural operations and supporting agricultural production, natural resource production and management, and low-intensity recreation.

NID deliveries to customers in Yuba County are made pursuant to the California Railroad Commission (CRC) Order 15926. NID purchased the Excelsior Water And Power Company's Yuba County holdings in the 1920s and is required to deliver water to the area's customers. Treated water customers are supplied by the Smartsville WTP, while raw water customers are delivered water through the Meade, Town, Ousley Bar, and Farm canals. The Yuba County General Plan identifies this area served by NID as a "Rural Area". Goal CD9 (and supporting policies) aims to maintain the rural nature by preserving the existing character through strategic developmental designs and standards (Yuba County, 2011).

2.3.1 Planned Projects

Planned projects within the District's service area impact the projected number of customer connections and overall treated water demands. In addition to the City of Lincoln planned land use developments listed above. Table 2-2 lists the other planned projects the District is aware of that would connect to the treated water system when built. These projects include treated water service for domestic and commercial purposes as well as private fire services. Each project is at various levels of the planning and implementation process. The number of units, lots, and connections identified in Table 2-2 are subject to change as these are preliminary and based on current information. The District maintains a development and new connection procedure to evaluate each proposed project, approve, and coordinate the implementation with the respective project owner.

The project types listed in Table 2-2 include waterline extensions, potential waterline extensions, master meter, approved projects (not submitted), private fire services, and potential private fire services. Waterline extension projects are defined as projects requiring an extension of an existing waterline, while potential waterline extensions are waterline extension projects that are in a pre-planning phase (District has been made aware, although no City/County permitting has been achieved). Master meter projects are projects that will be provided a master meter, with individual meters yet to be installed. Approved Projects by City/County have been approved, although no application for water service has been submitted to the District. Private fire service projects will be provided water through dedicated meters for fire service, while potential fire service projects are in the pre-planning phase.

Table 2-2. Planned Projects within NID service area

Project Name/Location	No. of Units, Lots, or Connections [1]
Waterline Extension	
Blair Ct	5
Gracie Commons	49
Ridge Village	12
NJUHSD	1
Queen Lil Place	4 to 8
PCGC, Mercy (including PFS)	5
Loma Rica Ranch	240
Towntalk	11
Loma Rica DFWLE	20
American Hill Road	9
Timberwood Estates	45
Potential Waterline Extensions	
Red Dog Road	16
Rincon del Rio	346
The Grove	59
Maranatha DFWLE	21
Timberline at Auburn	858
PCGC	unknown
Table Meadow Road	21
Ali Lane DFWLE	8
Harris Road DFWLE	unknown
Idaho Maryland Mine	30
Master Meter	
Cashin's Field Affordable Housing	59
Brunswick Commons Apartments	41
Grass Valley RV Resort	150
Approved Projects by City/County (not submitted)	
Berriman Ranch	unknown
Atwood 80	65
Hidden Creek Subdivision	23
Kemper Woods Subdivision	17
Joeger 20 Subdivision	17
Kenny Ranch	100
Pendagio Vineyard Estates	95

Project Name/Location	No. of Units, Lots, or Connections [1]
Sunset Grove Homesites	5
Trees Resort at Darkhorse	34
Dorsey Marketplace	unknown
West Olympia Hotel	74 rooms
Private Fire Services	
ZAP Manufacturing	1
Timerline	1
Comfort Plumbing	1
Crown Point Ct	1
Brunswick Commons Apartments	1
Potential Private Fire Services	
Grass Valley RV Resort	1
Cashin's Field Affordable Housing	1

[1]Preliminary numbers, subject to change.

2.4 Social, Economic, and Demographic Factors

Social and demographic factors that affect water management planning include the uncertainty in estimating future customer connections and water use per customer.

Future customer connections for both treated water and raw water customers are impacted by both new construction and existing houses/parcels that currently are not customers. Potential future demand for NID water of existing water-using parcels is characterized as "latent demand". Latent demand affects the customer connection to population growth demand, uncoupling the usual direct relationship between the two. For example, from 2014 through 2020, approximately 60 percent of the new treated water customer connections were classified infill connections, adding new demand from existing housing stock. Latent demand analysis is an important element of NID's long-term water resources planning efforts and will be further addressed in NID's Plan for Water. For the purposes of this UWMP, projected connections are based on recent historic new customer rates, as further discussed below.

Treated water use per customer can be affected by many aspects, including plumbing codes, landscaping trends, and indirectly by the recent State-required water budgets. State Water Code now requires a water agency to remain below an overall water budget applied to their service area that consists of maximum allowable water uses for indoor and outdoor residential, landscape, non-residential uses, and water loss. For treated water customers, the indoor budget is set at 55 gallons per capita (gpcd), reducing to 50 gpcd in 2030. The residential outdoor budget is currently under development by DWR and will consist of estimated irrigated landscape areas and evapotranspiration-based water allowances. These regulatory requirements may impact future water use trends, affecting the overall future demands. Unit water use factors are further addressed in Chapter 3.

Raw water customers represent the largest customer by water volume for NID. Raw water customers include commercial agricultural, small agricultural, personal/hobby farms and gardens, golf courses, and other water uses that contribute to the rural character of the service area. Changes to the demographics of the raw water customer may also affect raw water use, depending on new or next-generation owners and their intended water use. Raw water customer unit water demands are further discussed in Chapter 3. Raw water use analysis and future unit demands are also an important element of NID's long-range water resources planning efforts and will be further addressed in NID's Plan for Water.

2.5 Current and Projected Connections

The current and projected number of connections is the basis for projected District water demands (treated and raw) for the planning horizon. Annual growth rates for the period 2014 through 2020 are developed and applied to the number of 2020 connections for each customer type to characterize the expected growth within NID's service area. NID's customer base includes retail and wholesale customers receiving treated and/or raw water. Additional information on each customer type is presented below.

2.5.1 Retail Customers

Retail services provided by the District make up the majority of customer connections as well as total use. The retail services provided by NID include treated water for consumption and raw water deliveries for various purposes (commercial agricultural, small agricultural, etc.). Retail treated customers consist of the following classifications:

- Single-Family
- Multi-Family
- Commercial
- Industrial
- Institutional and Governmental
- Landscape Irrigation
- Other

The District's retail treated water customer base increased from 18,900 in 2014 to 19,648 in 2020. During the same period, NID's retail raw water customers increased from 5,035 to 5,188. Table 2-3 presents the total number of treated and raw water connections, and corresponding growth rate, for the period 2014 through 2020.

Table 2-3. NID Retail Connections for Period 2014 through 2020

Retail Customers	2014	2015	2016	2017	2018	2019	2020	Average Annual Growth
Treated	18,900	19,044	19,132	19,287	19,437	19,524	19,648	0.6%
Raw	5,035	5,044	5,119	5,187	5,162	5,157	5,188	0.5%
District Total:	23,935	24,088	24,251	24,474	24,599	24,681	24,836	0.6%

New retail treated connections can be attributed to "in-fill" or "mainline extension" projects. "In-fill" projects include standby connections (see below), variances, and temporary service lines.

"Mainline extension" projects require infrastructure improvements and are associated with planned District projects and developer projects. For the period 2016 through 2020, 60 percent of the new meter installations are classified as "in-fill" projects, with the remaining 40 percent classified as "mainline extension" projects.

Single Family Customers

NID's treated customer base primarily consists of Single Family connections, which include various land-use zoning classifications with Placer, Nevada, and Yuba counties. Single Family customers make up 72 percent of NID's retail customer connections in 2020 while accounting for 60 percent of treated water demands. Proportionally, this customer class represents the largest with respect to treated water connections and use. Figure 2-2 illustrates the number of Single Family connections for the period 2014 through 2020. As seen on the figure, the connections increased from 17,366 (2014) to 17,824 (2020), representing an average annual growth rate of 0.4 percent. This growth rate is applied to the 2020 connections to project the number of Single Family connections out to 2040 (see Table 2-4).

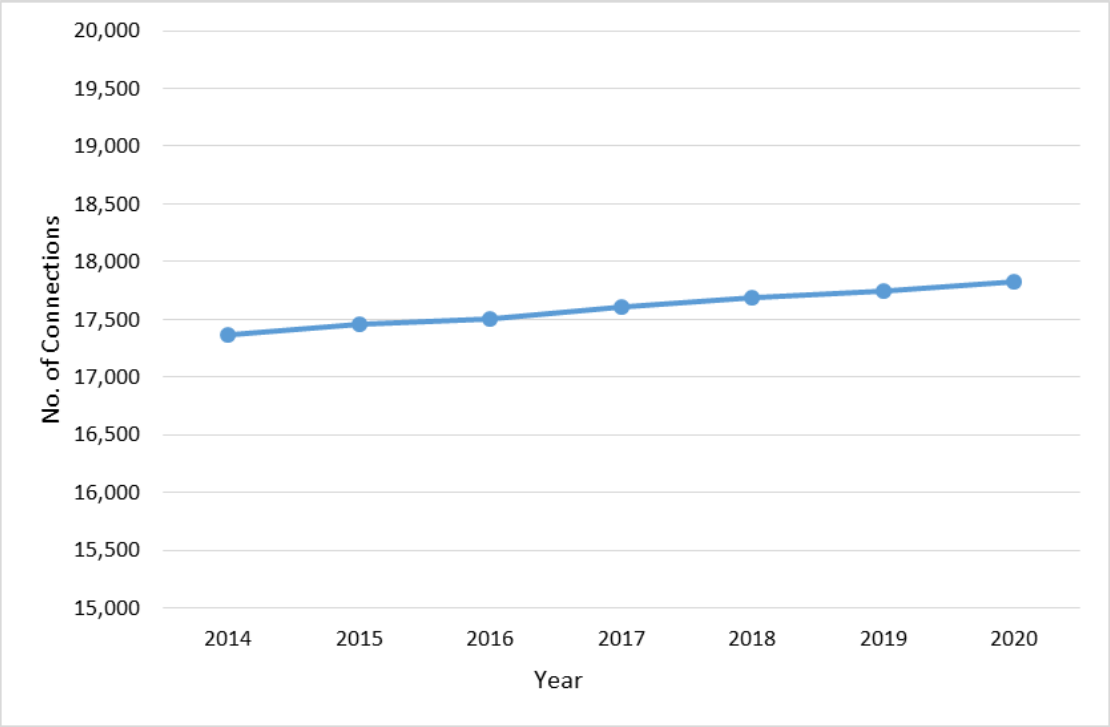

Figure 2-2. Number of Single Family Connections (2014-2020)

Multi-Family Customers: Multi-family connections make up approximately one percent of the District's 2020 total treated and raw water retail connections. The majority of the multi-family connections are located in North Auburn, specifically Auburn Greens, and have remained a constant 219 connections for the period 2014 through 2020. Based on the land-use projections and rural character of the service area, limited growth is anticipated with respect to the number of multi-family connections. However, planned residential projects, including Mercy First Housing, Loma Rica Ranch, and Rincon del Rio will increase the number of multi-family connections over the

planning horizon. The projected number of multi-family connections assumes an average annual growth of 0.7 percent, resulting in a total of 250 Multi-Family connections by 2040. Depending on the potential approval of future developments, this projection may change.

Commercial Customers: A total of 735 commercial customers were served in 2020, making up three percent of NID's retail customer connections. Commercial customers grew 0.61 percent annually from 2014 through 2020. This growth rate is applied to the 2020 connections to estimate the number of connections for the planning horizon. As shown on Table 2-4, this class is expected to grow to approximately 825 connections by 2040.

Industrial Customers: The District has maintained one industrial customer for the period 2014 through 2020. The District acknowledges the potential for a limited amount of industrial connections in the future and will identify as such when project plans are developed. No new industrial customers are assumed for the planning horizon.

Institutional and Governmental Customers: Institutional and governmental customer connections total 102 for 2020. This represents less than one percent of the District's retail customers. The average annual growth for the period 2014 through 2020 was 0.8 percent. This growth rate is applied to the number of 2020 connections to estimate the projected number of institutional and governmental connections for the planning horizon.

Landscape Customers: In 2020 there were 123 customers on dedicated landscape meters. The growth of these customer connections was two percent annually for the period 2014 through 2020. The recent growth rate reflects State requirements that mandate Commercial, Industrial, and Institutional (CII) accounts using water for irrigation purposes to transition to dedicated landscape meters. The two percent annual growth rate is applied to the 2020 connections to estimate the projected number of landscape customers for the planning horizon. The projected total number of connections for the planning period is presented in Table 2-4.

Other Customers: The other customer classification includes connections used for standby fire services. Per regulatory requirements, these connections are required for new and remodeled developments. There were a total of 644 other connections in 2020. The average annual growth rate for the period 2014 through 2020 is 6.3 percent, reflecting the implementation of the regulatory requirement regarding standby fire service connections. This same growth rate is assumed throughout the planning period.

Raw Water Customers: Retail raw water customers make up the majority of total water use while representing the second-largest retail customer class (by number of connections). NID provides retail service to its raw water customers during the irrigation season (April 15 through October 14), Fall/Winter, and annually. For Fall/Winter and annual service, the District requires irrigation season service. As a result of this policy, the number of Fall/Winter and annual customers are a subset of, and included in, the total number of irrigation season customers.

In 2020, a total of 5,188 customers ordered raw water service from the District, with 744 of those customers ordering deliveries during the Fall/Winter and 296 annually. In 2020 there were an additional 1,148 inactive raw water customer connections (those that did not order water). Figure 2-3 illustrates the total number of Raw Water customers (not including inactive) for the period 2014 through 2020. As seen on the figure, this customer base increased from 5,035 (2014) to 5,188

(2020), representing an average annual growth rate of 0.5 percent. This growth rate is applied to the total number of raw water customers for 2020 to estimate the total number of raw water customers for the planning horizon. Fall/Winter customers grew approximately 4.8 percent annually during the period 2014 through 2020. The number of annual customers, those that use raw water indoors, decreased 2.1 percent annually for the period 2017 through 2020. It is assumed that as these customers connect to the District's treated water system or drill a well, the number will continue to decrease, as District policy does not allow new annual raw water customers. These growth rates are applied to the number of 2020 connections for each raw water customer subset to estimate the District's Fall/Winter and annual raw water customers for the planning horizon. 2020 total connections, average annual growth rate applied, and projected number of connections for the District's raw water customers are presented in Table 2-4.

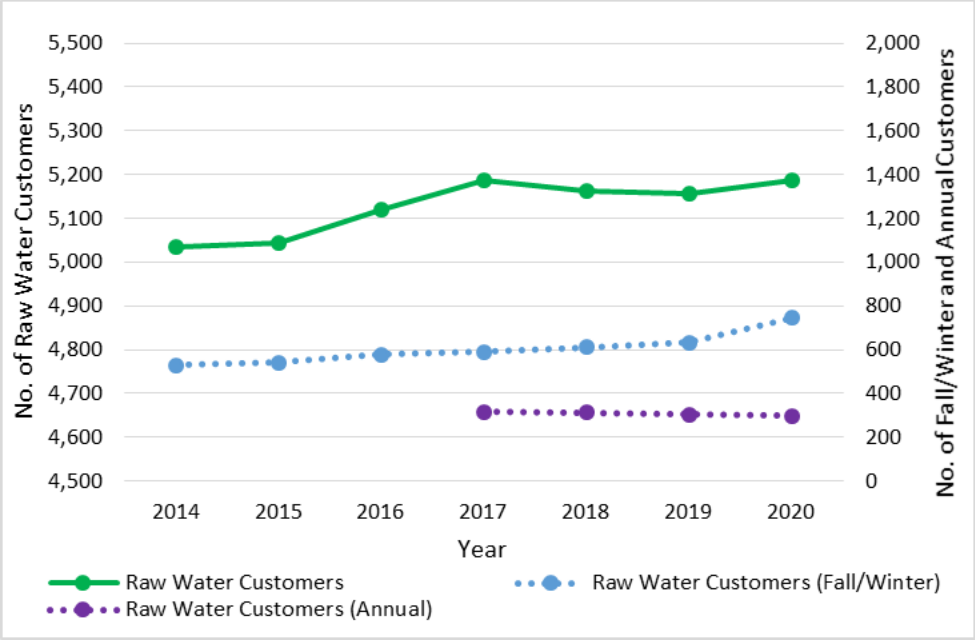

Figure 2-3. Number of Raw Water Customers (2014-2020)

Standby Customers: Standby customers represent parcels fronting treated water distribution lines but are not yet receiving service. At the end of 2020, there were a total of 1,639 standby connections. The total number of standby customers fluctuates throughout the year. Projections for these customers are assumed to be captured by the projections of other customer connections, as a standby customer is converted to a treated water customer. Therefore there are no projections for standby customer counts.

2.5.2 City of Lincoln

The City of Lincoln maintains its own retail water distribution system. In the past, the District has investigated constructing its own water treatment plant to serve its service area in the City of Lincoln. Currently, the District supplies raw water to Placer County Water Agency for treatment, who in turn provides the treated water to the City of Lincoln for retail. For the purposes of this

plan, it is assumed this operation will continue in the near future, and therefore is represented by one raw water wholesale connection to PCWA for the benefit of the City of Lincoln.

2.5.3 Wholesale Customers

Wholesale services include treated and raw water deliveries. Raw water wholesale connections include City of the Grass Valley WTP, Nevada City WTP, and Nevada City School of Arts. Treated water wholesale connections include City of Grass Valley and Lake Vera Mutual Water Company. For this analysis, the total number of wholesale customers is not expected to increase during the planning horizon.

2.5.4 Summary of Current and Projected Connections

As seen from Table 2-3 (above), the treated connections have increased from 18,900 in 2014 to 19,648 in 2020. This represents an increase of approximately four percent over the 2014 number of treated connections. The raw water customers have increased from 5,035 in 2014 to 5,188 in 2020, representing an increase of three percent over the 2014 number of raw water connections.

Table 2-4 presents the number of 2020 active connections by customer class, average annual growth rate applied, and the resulting number of projected connections for the period 2020 through 2040, in five-year increments. Average annual growth rates are developed based on the historical growth rate for each customer classification as described above.

Table 2-4. Current and Projected Connections

Service Area	2020[1]	Annual Growth Rate	2025	2030	2035	2040
NID Treated Retail Customers						
Single Family	17,824	0.4%	18,206	18,587	18,969	19,351
Multi Family	219	0.7%	227	235	242	250
Commercial	735	0.6%	758	780	803	825
Industrial	1	0.0%	1	1	1	1
Institutional/ Governmental	102	0.8%	106	110	115	119
Landscape	123	2.0%	136	148	161	173
Other	644	6.3%	847	1,049	1,252	1,454
Standby	1,639	included in other customer categories				
Retail Treated Water Total:	21,287		20,279	20,910	21,541	22,172
NID Treated Wholesale						
Lake Vera Mutual Water Company	1	n/a	1	1	1	1
Grass Valley	1	n/a	1	1	1	1
Lincoln NID Service Area – Raw Water Supplied to PCWA						
PCWA connection	1	n/a	1	1	1	1
NID Raw Water Customers						
Irrigation Season	5,188	0.5%	5,316	5,341	5,367	5,392
Fall/Winter Season (subset of total)	744	4.8%	924	960	996	1,032
Annual Use (subset of total)	296	-2.1%	264	258	252	245
NID Raw Water Wholesale						
Nevada City	1	n/a	1	1	1	1
Grass Valley	1	n/a	1	1	1	1
Nevada City School of Arts	1	n/a	1	1	1	1

[1]Number of active accounts.

2.6 Current and Projected Customer Population

The NID retail service area covers multiple counties, cities, and other places identified in the census and California Department of Finance population analysis. Therefore, the population is represented by portions of multiple census places, tracts, and blocks. The California Department of Water Resources provides a tool for water agencies with similar service area issues to estimate customer population. The DWR population tool utilizes the census block data and treated water service area to parse the population count into the actual treated water service area. Using the number of single family and multi family connections, the tool provides a population per connection that is used to estimate the treated water customer population. As some of the population within NID's service area is served by private wells or other suppliers, the DWR population tool does not provide the

actual customer population but does provide the population per connection used to estimate the population.

In the 2015 UWMP, NID replicated the DWR methodology to develop the population per connection and subsequent population estimation. Results from the 2015 effort indicate the District's person-per-connection ratio of 2.84. For planning purposes, this ratio from the District's 2015 UWMP is utilized to estimate NID's 2020 customer population and projections. Current and projected treated water customer population is presented in Table 2-5. Multi-family connections are assumed to have an average of four dwelling units per connection. It is recommended NID revisit this metric after the release of the 2020 Census data, and update projections as applicable.

Table 2-5. Current and Projected Treated Water Customer Population

Population Served	2020	2025	2030	2035	2040
	52,733	53,839	54,927	56,016	57,104

Census year population estimates for the total service area and the District's treated customer base are presented in Table 2-6. The DWR population tool methodology reports the District's total service area population based on District boundary and census year block data as reported in the 2015 UWMP.

Table 2-6. Census Year Population Comparison

Year	Total Service Area Population	Treated Water Customer Population	% of Service Area Population
2000	82,941	39,374	47.5%
2010	93,690	49,023	52.3%
Ave Annual Growth Rate	1.2%	2.2%	--

The District's total service area population increased at a rate of 1.2 percent annually between the census years, while the treated water customer base increased annually by 2.2 percent. The different growth rates between the service area population and treated customers could be attributed to existing residents connecting to the NID treated water system, or new development prioritizing treated water connections versus private wells.

Population projections developed by the California Department of Finance (DOF) for Placer and Nevada counties are presented in Table 2-7. The projections incorporate historic populations and demographic trends, and are obtained from DOF's Table P-2A (Total Population for California and Counties, accessed 2021). According to DOF methodology, the previous year populations are used as a starting point, with factors such as births, deaths, and migration patterns applied to estimate the target year population. The total population for both counties is expected to increase by approximately 0.79 percent annually for the period 2020 through 2040.

Table 2-7. California Department of Finance Population Projections for Nevada and Placer Counties

County	2020	2025	2030	2035	2040
Nevada County	97,439	99,131	101,004	102,479	103,193
Average Annual Growth Rate from 2020	--	0.34%	0.36%	0.34%	0.29%
Placer County	397,469	414,544	437,655	458,999	476,434
Average Annual Growth Rate from 2020	--	0.84%	0.97%	0.96%	0.91%
Total	**494,908**	**513,675**	**538,659**	**561,478**	**579,627**
Average Annual Growth Rate from 2020	--	0.75%	0.85%	0.84%	0.79%

Source: California Department of Finance, Table P-2A (Total Population for California and Counties, accessed 2021).

In addition to the unincorporated areas of each county, the DOF county-wide projections include populations for the communities of Rocklin, Roseville, Lincoln, and Loomis (Placer County), as well as Grass Valley, Nevada City, and Truckee (Nevada County). Some of these communities are expecting higher growth, and therefore, the total population reported in Table 2-7 is likely not reflective of the expected level of growth and associated population estimates for the District's service area within Placer and Nevada counties. However, the county-wide population projections do provide a general level of understanding of county-wide growth, which is expected to affect the NID customer projections. It is recommended the District further analyze customers and population growth when the 2020 census data is available as part of the Plan For Water process.

3 Water Use Characterization and Projected Demands

This section presents the past treated and raw water system demands, demand characterization, and projected demands.

3.1 Historical Demands

The District's historical demands for the period 2014 through 2020 are described per service type. The customer types include treated retail, treated wholesale, raw retail, raw wholesale, and instream environmental. In summary, retail raw water demands make up the majority of total demands, averaging 94 percent for the period. 2020 total wholesale and retail treated water demands were the highest for the period and showed an increase of eight percent over 2019 demands. The increase in treated water use may be reflective of the recent pandemic resulting in customers staying at home.

3.1.1 Treated Water Retail Customers

The District serves treated water to retail customers. All of NID's treated retail customers are metered. Customer categories consist of single family and multi-family residential connections, as well as commercial, industrial, institutional and governmental, landscape, and "other" customer types. Demand information for each customer category is presented below, including unit factor demands (annual demand per connection type) developed for projecting future water demands. Historic treated water retail customer demands are summarized in Table 3-1.

Single Family: Single family customers averaged approximately five percent of total retail demands (including raw water demands) for the period 2014 through 2020, while averaging 74 percent of the total retail treated use for the same period. The single family customers are NID's largest retail treated customer base. The 2020 unit demand factor of 0.36 acre-feet per year per connection (AFY/connection) and is used for projecting demands. As discussed in Chapter 2, the state will soon mandate indoor and outdoor water budgets for residential. The indoor budget starts at 55 gallons per capita day (gpcd) in 2023, and reduces to 50 gpcd in 2030. Using the capita per connection from Chapter 2 of 2.84, 50 gpcd translates to 0.16 AFY. Therefore, approximately one third of the assumed unit demand factor of 0.36 AFY/connection is indoor demand. The District will revisit unit demand factors once the state has finalized the outdoor water use budgets.

Multi-Family: The multi-family customers primarily consist of residents in North Auburn, where the District provides water to 175 fourplexes. This customer base averaged eight percent of total treated retail demands for the period 2014 through 2020. The use per connection averaged 2.82 AFY/connection for the same period. This unit demand factor is utilized in projecting demands through 2040.

Commercial: Commercial demands averaged ten percent of treated retail demands for the period 2014 through 2020, representing the second largest customer base (by total use) for the District's treated retail customers. Total use per connection for the same period averaged 1.06 AFY/connection. This unit demand factor is utilized in projecting demands through 2040.

Industrial: Industrial water use is minimal within the District' retail service area. No use was reported from 2014 through 2019, with 0.22 AF reported in 2020. This unit demand factor is utilized in projecting demands through 2040.

Institutional/ Governmental: Institutional and governmental demands averaged six percent of treated retail demands for the period 2014 through 2020. Total use per connection for the same period averaged 4.70 AFY/connection. This unit demand factor is utilized in projecting demands through 2040.

Landscape: Dedicated landscape connections are utilized by various NID customers, including residential and non-residential commercial customers. Landscape water use averaged 2.5 percent of total treated retail use for the period 2014 through 2020. Total use per connection averaged 1.70 AFY/connection. This unit demand factor is utilized in projecting demands through 2040.

Other: The "other" category includes meters dedicated to fire services. Accordingly, this category averaged less than one percent of retail treated demands for the period 2014 through 2020 as water is only used for fire system testing and actual fires. It is believed some of these fire systems are being connected to in-house toilets to allow system flushing, which would increase demands if conducted regularly. NID will continue to monitor total demands for this connection category and update projections as necessary. The average usage per connection is 0.04 AFY/connection. This unit demand factor is utilized in projecting demands through 2040.

Table 3-1. Treated Water Retail Customer Historical Demands (AF)

Service Area	2014	2015	2016	2017	2018	2019	2020
Single Family	6,125	5,029	5,306	5,748	5,951	5,793	6,429
Multi Family	672	555	597	658	609	598	636
Commercial	778	708	700	761	825	814	759
Industrial	0	0	0	0	0	0	0.22
Institutional/ Governmental	523	393	406	459	511	520	476
Landscape	207	146	169	193	206	207	222
Other	19	17	19	20	22	23	28
Total:	8,324	6,848	7,197	7,839	8,124	7,955	8,550

3.1.2 Treated Water Wholesale Customers

NID serves treated water through master meters to wholesale customers per each respective agreement. Each customer agreement, historical usage, and projection assumptions are provided below and summarized in Table 3-2.

City of Grass Valley: NID provides treated water to the Broadview Heights area of Grass Valley. The water is metered through a master meter that NID then bills to Grass Valley. An agreement between the District and City of Grass Valley, dated April 2013, allows for supply as needed and as available from NID. The City of Grass Valley did not provide demand projections for this connection for the UWMP. The District assumes a future demand of 90 AFY, based on past usage, for the demand projections.

Lake Vera Mutual Water Company: NID provides treated water to Lake Vera Mutual Water Company. The water is metered through a master meter that NID then bills to the company. An agreement between the District and Lake Vera Mutual Water Company, dated June 1995, allows for

supply as needed from NID. As seen in Table 3-2, this demand has been increasing since 2014. The District assumes a future demand of 25 AFY for the demand projections.

Table 3-2. Treated Water Wholesale Customer Historical Demands (AF)

Service Area	2014	2015	2016	2017	2018	2019	2020
Grass Valley	65	65	53	75	74	37	86
Lake Vera Mutual Water Co.	14	16	18	18	22	24	22
Total:	79	81	71	93	96	61	108

3.1.3 Raw Water Wholesale Customers

NID provides raw water to wholesale customers per each respective agreement. Each customer agreement, historical usage, and projection assumptions are provided below and summarized in Table 3-3.

City of Grass Valley: NID sells surplus raw water to the City for use in their water treatment plant. Grass Valley operates a water treatment and distribution system, and is provided surplus raw water by NID. The agreement between the District and City of Grass Valley, dated April 2013, allows for supply as available from NID, there is no volume requirement. The City of Grass Valley did not provide demand projections for this supply for the UWMP. As seen in Table 3-3, this demand varied by approximately 200 AFY over the last six years. The District assumes a future demand of 1,000 AFY for the demand projections.

Nevada City: NID sells surplus raw water to Nevada City for use in their water treatment plant. Nevada City operates a water treatment and distribution system, and is provided surplus raw water by NID. The agreement is executed annually, with the annual volume to be delivered not exceeding 800 AFY. For the period 2014 through 2020, annual deliveries averaged approximately 260 AFY. During 2020, a total of 507 AF of raw water was delivered to Nevada City, marking the largest amount delivered from 2014 through 2020. The raw water is sold to Nevada City only if surplus to NID's needs, and the upper limit of 800 AFY is not a required supply delivery. Nevada City did not provide projected supply needs for this UWMP. For conservative projections purposes, this UWMP assumes a projected demand of 500 AFY for the future, to reflect the most recent 2020 demands.

Nevada City – School of Arts (raw water): The Nevada City School of Arts (formerly Bitney Springs LLC) is supplied raw water for on-site treatment and redistribution. The deliveries have been made in the past pursuant to an agreement since 1991, and is separate from the annual agreement with Nevada City (described above). As seen in Table 3-3, historical use has ranged from 5 to 7 AFY for the period 2014 through 2020. NID is contracted to provide up to 36 AFY for the School of Arts. Although the School of Arts has yet to exercise the full contractual amount, projected demands reported in this UWMP incorporate NID's contractual amount of 36 AFY.

Lincoln/PCWA: NID sells raw water to the Placer County Water Agency (PCWA) for treatment and subsequent delivery to customers within NID's service area located in the City of Lincoln. The demands associated with these customers ranged from 571 to 1,650 AFY for the period 2014 through 2020. The low usage in 2016 was likely due to the City's groundwater use. The City of

Lincoln provided NID with projected treated water demands for the NID service area within the City of Lincoln and these are used in the demand projections further below.

Table 3-3. Raw Water Wholesale Customer Historical Demands (AF)

Service Area	2014	2015	2016	2017	2018	2019	2020
Nevada City	299	254	187	267	214	114	507
Grass Valley	1,005	916	942	957	1,041	842	862
Nevada City School of Arts	5	5	5	5	6	7	5
Lincoln/PCWA	1,640	1,498	571	1,349	1,430	1,244	1,517
Total:	2,949	2,673	1,705	2,578	2,691	2,207	2,891

3.1.4 Raw Water Retail Customers

NID provides raw water to customers during three time-periods; (1) during the irrigation season (April 14 – October 15); (2) Fall/Winter period; and (3) annually. As described in Chapter 2, the Fall/Winter and annual customers are a subset of the irrigation season customers, as required by NID.

Actual raw water customer usage is difficult to quantify on an individual basis as customers order a maximum volume of water, but the actual amount diverted is based on customer practices. The raw water system infrastructure is used throughout NID to deliver water to raw water customers, water treatment plants, and wholesale customers, as well as incurring water loss, further complicating the quantification of actual retail raw water use. To maintain proper flow in the canals to ensure adequate delivery, the District supplies the canals with more water than actually ordered by customers. This "carriage water" is picked up by other canal systems or lost to the District. While the carriage water is not necessarily a consumptive demand, it is required to maintain ability to supply customers' ordered amounts, and is therefore built into the water demands. For the purposes of this UWMP, total supply required to serve raw water customers (total duty) is assumed to be the total volume diverted into the raw water system minus the water treatment plant and wholesale deliveries. Raw water system loss, including carriage water, seepage, evaporation, stockwater, theft, and other unknown uses, is therefore included in the total raw water retail customer duty. Table 3-4 presents the calculated customer duty from 2015 through 2020. This duty is divided by number of raw water customers to develop a proxy unit duty per raw water customer connection. Table 3-5 presents the amount of irrigation season, Fall/Winter, and annual water orders for comparison. The ordered amount in miner's inch is converted to volume assuming continuous flow over each respective time period. As stated earlier, the actual amount used is unknown as each customer manages their own raw water use strategies. However, comparing the amount ordered to the actual water duty provides a planning level correlation for future projections.

Table 3-4. Raw Water Customer Duty

NID Raw Water Customers	2014 AF	2015 AF	2016 AF	2017 AF	2018 AF	2019 AF	2020 AF
Total diverted into canals	140,447	132,452	133,682	136,219	144,786	141,482	152,947
- Water Treatment Plant Deliveries	(9,826)	(8,521)	(8,942)	(9,752)	(10,061)	(9,269)	(10,537)
- Raw Water Wholesale Deliveries	(1,309)	(1,175)	(1,134)	(1,229)	(1,261)	(963)	(1,374)
- PCWA/Lincoln Deliveries	(1,640)	(1,498)	(571)	(1,349)	(1,430)	(1,244)	(1,517)
Total raw water customer duty:	127,672	121,258	123,035	123,889	132,034	130,006	139,519
Raw water customer unit duty factor – AF/customer[1]	25.4	24.0	24.0	23.9	25.6	25.2	26.9

[1]Unit duty factor divides total water duty by number of raw water customers listed in Table 2-3.

Table 3-5. Raw Water Customer Orders

NID Raw Water Customers	2014 AF	2015 AF	2016 AF	2017 AF	2018 AF	2019 AF	2020 AF
Irrigation Season	109,335	110,304	113,941	113,921	113,651	112,075	111,515
Fall/Winter	4,711	4,788	4,978	4,078	4,216	3,184	5,321
Annual	3,656	3,593	3,527	3,538	3,395	3,262	3,309
Total Orders:	117,702	118,685	122,446	121,537	121,262	118,521	120,145

A subset of the retail raw water customer accounts are mutual water companies. The District serves these companies on a retail customer basis without separate sales contracts. Therefore, the number of connections and subsequent demands are included in the retail raw water projections. Table 3-6 lists each mutual water company the District serves.

Table 3-6. Retail Raw Water Mutual Water Company Customers

Iron Mountain Mutual Water Company	Flying R Ranch Water Association
Melody Oaks Mutual Water Company	Footehold Estates Water Association
Mount Vernon Estates Mutual Water Company	Gold Blossom-Rivera MWA
Mustang Valley Mutual Water	Greenpeace Water Association
Ophir Prison Estates Mutual Water	HDA Association
Ridge View Woodlands Mutual Water Company	Little Greenhorn Creek Water Association
Rough & Ready Ranch Estates Mutual Water Company	Meadow Hill Water Association
Running Water Inc.	Moonshine Water Company
Sierra Foothills Water Association	Oakcreek Water Association
Sky Pines Mutual Water Association	Perimeter Road Pipeline
Ali Lane Mutual Water Association	Quail Hill Acres Road
Big Oak Valley Mutual Water	Redbud Water Association
Blackford Ranch Water Association	Rudd Road Pipeline Association
Carmody Special Water District Company	6 B Estates Water Association
Chicago Park Water Association	Saddleback North Water Group
Chili Hill Farms Water Association	Saddleback Water Association
Clear Creek Water Association	Streeter Road Water Association
Cole Country Water Users Association	Vian Water Association
Countryside Ranch Water Association	Wilkes Pipeline Association
Fawn Hill Drive Water Association	

Other Water Sales

South Sutter Water District (raw): In years when there is a surplus of the District's wholesale water supply (described in Chapter 4) the District has sold some of the surplus supply to the South Sutter Water District (SSWD). Although this water sale occurred in 2011 through 2013, limited water was available to sell to SSWD, and only occurred in two months during 2016. For planning purposes, this UWMP projects a total of 0 AFY to be provided to the SSWD, although this water demand is subject to availability of future surplus supplies.

Out of Area Sales: In years of surplus water availability, the District provides water service to a small number of customers outside the service area boundaries. As of 2005, the District does not allow the establishment of any new outside District services, but recognizes those established before the 2005 cutoff when surplus is available.

3.2 Water Loss

Treated system loss includes losses associated with deliveries to retail and wholesale customers. The water loss includes water used for operational tasks such as system flushing, tank draining, as well as water lost to system leaks and meter inaccuracies. The District's treated system loss is annually audited and validated in accordance with American Water Works Association (AWWA) standards. Upon validation, the audit is submitted to DWR. Although the validated water loss audit for 2020 has not been completed, 2020 water loss is estimated based on the difference in the metered effluent from the District's water treatment plants and total treated water deliveries. Data for 2016 and 2017 is also estimated as the validated audit process began with 2018. This plan assumes a water loss of 10 percent in future projections as the District's water loss reduction and non-revenue water programs are assumed to reduce losses over time. The ten percent loss factor is applied to projected treated deliveries to retail and wholesale customers.

Table 3-7. Treated Water System Total Water Loss

	2016	2017	2018	2019	2020
Treated Water Loss (AF)	990	975	911	933	1,200
Treated water produced (AF)	8,404	9,124	9,387	8,611	9,858
Percent Loss	11.8	10.7	9.7	10.8	12.2

3.3 Environmental Instream Flow Requirements

The District's water supplies are subject to environmental instream flow requirements as per its water rights and from the District's Federal Energy Regulatory Commission (FERC) License No. 2266 (known as the Yuba-Bear Project). Instream flow requirements are flows the District must leave in the respective streams, using the District's supplies. The current total instream flow requirement is 7,665 AFY. In order to ensure compliance, the District actually uses a total of 9,410 AFY to meet the instream requirement.

The FERC license expired in July 2013, though the new license has not yet been issued. Until the new license is issued, the District continues to operate under the older requirements. The new proposed environmental flow requirements have been identified through the relicensing process. The current proposed instream flows will be based on a water year type, ranging from Wet to Extremely Dry year conditions. Details of the environmental instream flow requirements can be accessed on the FERC relicensing website at http://www.eurekasw.com/nid/default.aspx.

A majority of these environmental instream flow requirements are not recoverable downstream by NID, and therefore represent a demand on NID's total supplies. Table 3-8 presents the total unrecoverable volumes for each year type. These projected water demands associated with the new FERC requirements offer a high degree of uncertainty, as they depend on future water year types. For this UWMP, the range of potential demands are shown.

Table 3-8. Unrecoverable Environmental Flow Requirements by Water Year Type

Water Year Type	Unrecoverable Environmental Flow Requirement (AFY)
Wet	59,257
Above Normal	51,637
Below Normal	41,900
Dry	27,823
Critically Dry	22,674
Extremely Dry	16,359

3.4 Water Demand Projection Summary

Total treated and raw water demand projections for the period 2025 through 2040 are reported in Table 3-9 below. Normal year water demand projections are developed based on the customer type's projected number of connections (see Chapter 2) and the unit factors (or other method) as described above. The unit factors include current water use savings from California Green Building Standards Code (CALGreen), Model Water Efficient Landscape Ordinance (MWELO), and Land Use Elements from the respective counties. The normal water year demand projections can be reduced during drought periods through the Water Shortage Contingency Plan presented in Chapter 6. Unrecoverable environmental instream flow requirements are reported as a range and assume the FERC license will be issued by 2025. Although the District currently over-supplies the current environmental instream requirements by approximately 20 percent to ensure compliance, the future license unrecoverable instream flows are projected as listed, without any over-supply. The District should revisit this assumption once the license is finalized and implementation is started. Total 2040 projected demands with the current 7,665 AFY unrecoverable flows is approximately 190,000 AF, versus 199,000 AF- 242,000 AF with the new FERC license.

Table 3-9. Projected Water Demands by Customer Type

Service Area	2020 AF	2025 AF	2030 AF	2035 AF	2040 AF	2040 % increase over 2020
NID Treated Water Customers						
Single Family	6,429	6,567	6,705	6,842	6,980	9%
Multi Family	636	640	661	683	705	11%
Commercial	759	802	826	850	874	15%
Industrial	0.22	0.22	0.22	0.22	0.22	0%
Institutional/ Governmental	476	499	518	538	557	17%
Landscape	222	230	251	272	294	32%
Other	28	34	43	51	59	114%
NID Treated Wholesale						
Grass Valley	86	90	90	90	90	5%
Lake Vera Mutual Water Company	22	25	25	25	25	12%
Treated Subtotal:	8,658	8,887	9,119	9,351	9,584	11%
Water Loss	1,200	889	912	935	958	-20%
Total Treated:	9,858	9,775	10,031	10,287	10,542	7%
NID Raw Water Customers						
Raw Water Customer Duty	139,519	137,968	147,510	157,051	166,593	19%
NID Raw Water Wholesale						
Nevada City	507	500	500	500	500	-1%
Grass Valley	862	1,000	1,000	1,000	1,000	16%
Nevada City School of Arts	5	36	36	36	36	626%[2]
To PCWA for Lincoln	1,517	2,240	2,695	3,297	3,898	157%
Total Raw Water:	142,410	141,744	151,741	161,884	172,027	21%
Environmental Instream Requirements						
Unrecoverable Flows	7,665[1] (9,410)	16,359-59,527	16,359-59,527	16,359-59,527	16,359-59,527	113% - 533%
Total Water Demands:	161,678	167,879 - 211,047	178,131 - 221,299	188,530 - 231,698	198,928 - 242,096	23% - 50%

[1] The 2020 instream requirement is 7,665 AF, but NID diverted 9,410 AF to ensure compliance. 9,410 AF is used in the Total Water Demands calculation.

[2.] Nevada City School of Arts demand projection lists the maximum supply per the contract obligations.

Table 3-10 presents the summarized demands from Table 3-9 into retail and wholesale customers, and unrecoverable environmental flows. It should be noted that demand projections represent an average, and it is expected that demands will fluctuate from year to year. The Plan for Water process will further investigate annual fluctuations to develop potential ranges that can be used for triggering points to invoke alternative water resource management strategies.

Table 3-10. Summarized Projected Water Demands (AFY)

Demand Type	2020	2025	2030	2035	2040
Retail[1]	149,269	147,629	157,426	167,223	177,020
Wholesale	2,999	3,891	4,346	4,948	5,549
Unrecoverable Environmental	9,410	16,359-59,527	16,359-59,527	16,359-59,527	16,359-59,527
Total	161,678	167,879 - 211,047	178,131 - 221,299	188,530 - 231,698	198,928 - 242,096

[1]Retail includes treated customers, raw water customers, and all system losses.

3.5 Reliability Analysis Water Demand Projection

Demand projections are modified for use in the supply reliability analysis in Chapter 5. The supply reliability compares supplies and demands during a normal hydrologic year, a single dry year, and a multi-year drought. Customer demand during a normal hydrologic year is assumed to be as reported in Table 3-9. As it represents average hydrology, the Unrecoverable Environmental flows during a normal year are assumed to vary between the Wet to Below Normal year types in Table 3-9. Table 3-11 presents the projected demands during a normal hydrologic year.

Table 3-11. Reliability Analysis Normal Year Demand Projections Water Demands (AFY)

Demand Type	2025	2030	2035	2040
Retail[1]	147,629	157,426	167,223	177,020
Wholesale	3,891	4,346	4,948	5,549
Unrecoverable Environmental	41,900 - 59,527	41,900 - 59,527	41,900 - 59,527	41,900 - 59,527
Total	193,420 - 211,047	203,672 - 221,299	214,071 - 231,698	224,469 - 242,096

[1]Retail includes treated customers, raw water customers, and all system losses.

For the purposes of this analysis, it is assumed all demands increase ten percent during a dry year to account for increased irrigation and other uses earlier in the spring and later into the fall. For those wholesale contracts that include a maximum amount, the amount is not increased but remains as the maximum amount. The Unrecoverable Environmental flows during dry years are assumed to vary between Below Normal and Extremely Dry year types in Table 3-8. It is assumed dry year demands are the same for a single dry year and multiple dry years. Table 3-12 presents the projected demands during dry years. These demands use subsequently used in the supply reliability analysis in Chapter 5.

Table 3-12. Reliability Analysis Dry Year Demand Projections Water Demands (AFY)

Demand Type	2025	2030	2035	2040
Retail[1]	162,392	173,168	183,945	194,722
Wholesale	4,277	4,777	5,439	6,100
Unrecoverable Environmental	16,359 - 41,900	16,359 - 41,900	16,359 - 41,900	16,359 - 41,900
Total	183,028 - 208,569	194,304 - 219,845	205,743 - 231,284	217,181 - 242,722

[1]Retail includes treated customers, raw water customers, and all system losses.

3.6 Low Income Demand Projection

Lower income residential demands are included in the District's demand projections. Based on the Housing Element of the Nevada County General Plan (Nevada County Table 8.14, 2019), 44 percent of the population are low income. These include very-low and low-income dwelling units which are up to 80 percent of the median income. For Placer County, 33 percent of the population is very low and low income (Placer County Housing Element Table 18, 2020). The majority of the lower income households are located in urban cities that are densely populated or the rural locations in the northeast part of the county where population density is low.

3.7 SBX7 Compliance

Pursuant to California Water Code (CWC) §10608.24(b), the District must demonstrate its 2020 water use met the GPCD target adopted in its 2015 UWMP. As set forth in the 2015 UWMP, the District's 2020 GPCD target was established as 197 GPCD, derived as the "gross water use" divided by the population during a defined baseline period, and reduced pursuant to one of four methods defined under California Water Code Section 10608.20(b). The District's 2020 actual GPCD must use the same methodology to derive "gross water use" for 2020, then divide by the estimated 2020 population presented in Chapter 2.

As presented in the CWC, gross water use means, "the total volume of water, whether treated or untreated, entering the distribution system of an urban retail water supplier (§10608.12). This value corresponds to the total water diverted into the District's water treatment plants during 2020. NID's gross water use during 2020 was 10,537 AF, and represents both the customer deliveries from the District's WTPs and the distribution system water loss. As shown in Table 2-5, the District's population in 2020 was estimated to be 52,733. This results in a calculated 2020 compliance value of 178 GPCD, which is less than the established target. Thus, the District is in compliance with CWC Section 10608.24(b) and has met its 2020 GPCD Target. The District's compliance status for 2020 requirements are presented in Table 3-13 below.

Table 3-13. Demonstration of Compliance with 2020 GPCD Target

2020 Gross Water Use	10,537 AF
2020 Population	52,733
2020 Actual GPCD	178 GPCD
2020 Target GPCD	197 GPCD
Compliance Achieved?	YES

4 Water Supply Characterization

This section describes sources of available water, quantities, and future sources of water. In addition, this section presents possible impacts to supply availability due to climate change.

4.1 Surface Water Supply

The District's primary source of supply is local surface water derived principally from the Yuba River, Bear River, and Deer Creek watersheds that is diverted and stored under the Districts pre-1914 and post-1914 appropriative water rights. The water rights allow for diversion and/or storage of approximately 450,000 AF per year (AFY). Because of hydrologic variability and temporal water rights limitations, NID does not regularly exercise the full allotment of 450,000 AFY. The District has an extensive system of storage reservoirs that provides surface water supply to the District's six water treatment plants as well as to the raw water customers. The District also maintains a contract with PG&E to purchase surface water that originates from the same supply sources as the District water rights supply.

4.1.1 Water Rights

The District was originally organized for the purpose of storing and delivering irrigation water to farmers and ranchers. In the early 1920's the District acquired storage and regulating facilities in the upper reaches of the Middle and South Yuba Rivers. In 1926, the District acquired most of its Canyon Creek holdings including the Bowman, Sawmill, French, and Faucherie Reservoirs. Associated water rights were also obtained. Deer Creek water rights were obtained in the 1920's for the development of Scott's Flat Reservoir. The District's surface water supply water rights are divided into two main categories:

- Direct Diversions
- Diversions to Storage

Direct Diversions. This supply includes water rights to runoff from the District's watershed. Watershed runoff is the District's primary water supply. The amount of runoff and the manner in which it is used depends upon the amount of water contained in the snowpack and the rate at which the snowpack melts. District water rights include 22 pre-1914 rights acquired from mining interests, along with 28 post-1914 rights filed with the State of California to provide for domestic, municipal, industrial, recreational, power, and irrigation uses, and three riparian rights. These include rights for both consumptive and power purposes. The total water right volumes consist of storage rights, direct diversion rights, and some are a combination of both. The total quantity estimated for direct diversions and diversions to storage under current consumptive water rights is approximately 450,000 AF on an annual basis.

The system of storage reservoirs and conduits used to transport water to the District's service area boundary is referred to as the Upper Division. The Upper Division is operated in conjunction with PG&E under the terms of a joint agreement. Average runoff from the Upper Division watershed, including the watershed area feeding Scotts Flat Reservoir, is approximately 232,600 AFY. Over the last 30 years runoff has fluctuated from less than 78,000 AF in a dry year (2015) to over 541,100 AF in wet years (2017).

Due to provisions in the PG&E Coordinated Operations Agreement, hydrologic variability, and the fact that the District is not the senior water right holder, the historical runoff data evaluated to estimate the District's average runoff supply does not include supplies from the Bear River and the South Yuba River. The District is likely to receive some water from the Bear River and South Yuba River sources in dry years. Due to the uncertainty of the amount of supply available from these two sources, it has not been quantified in this UWMP. NID's Plan For Water process will investigate methods to track and monitor available runoff from the Bear and South Yuba Rivers.

The District's Yuba-Bear Project's Federal Energy Regulatory Commission (FERC) license (No. 2266) expired in July 2013. The Project is presently undergoing relicensing. The current proposed license includes increased environmental flow requirements, which reduces supply available to meet customer demands as discussed in Chapter 3.

Diversions to Storage. The second largest component of District's supply is diversions to storage, which contribute to the volume of water left in storage reservoirs at the end of the irrigation season, usually at the end of September. The District's main storage reservoirs can contain a maximum of 280,085 AF of water. Per the District's Water Shortage Contingency Plan, carryover storage should be held at a level not less than 78,000 AF. This includes a total 33,800 AF of minimum pool requirements reserved for environmental needs (not including new pending FERC requirements) and dead storage volume (includes siltation estimates) that cannot be counted upon as a supply resulting in an available storage capacity of 202,085 AF. As with most reservoirs, the District's reservoirs are slowly being filled with sediment. Through the District's Plan For Water process, the District will continue to monitor and consider removal of sediment from the District's reservoirs as a supply enhancement strategy.

The water supply is dependent on snowmelt and rain to fill storage reservoirs, and the District manages its system based on the timing of those events. While there is some natural runoff during normal summer months, the irrigation season (April 15–October 14) demand is met primarily with withdrawals from storage reservoirs. Careful management and operation of the storage reservoirs is required to capture the maximum amount of runoff, minimizing spillage from the reservoirs, through the variable spring snow melt season. Carryover storage is also affected by Winter/Fall customer demands. Fall water deliveries effectively use carryover storage, meaning less water could be available for the following irrigation season.

As part of NID's water supply strategy aimed at maintaining a reliable supply, a storage carry-over target is utilized. The end of September target amount of 130,000 AF is determined as 75 percent of historical end of September average. This storage within the District's supply reservoirs is used as a basis for identifying a water supply shortage (see Chapter 6 – Water Shortage Contingency Plan). The target is used by the District to identify necessary operational and strategic changes the District may employ in maintaining reliable supplies to meet expected customer demands. Carry-over storage supplies are relied upon by the District in meeting demands, including raw and treated water demands. It is anticipated that this water will also be utilized in meeting future FERC requirements during dry-months, as the natural portion of watershed runoff during this period may be insufficient.

4.1.2 Purchased or Imported Water

The hydropower potential of its water led the District to enter into an agreement with PG&E in 1924 to use of a portion of the District's water through PG&E facilities. At the same time the District secured the option to purchase PG&E water to augment its own supply. Over the years, this agreement has been modified to meet the changing conditions and requirements of both organizations. In 1963, the District and PG&E agreed to develop additional storage capacity on both Middle Yuba and the Bear River.

The PG&E contract has recently been renewed. The maximum amount available for District purchase is 54,361 AF with reductions based on the Sacramento Valley Index (SVI). However, purchase is only available in monthly allotments in which many of the months are during the winter, when the District would not need the supply. For planning purposes, the District assumes 7,500 AF is available on an average basis.

4.2 Groundwater

Most of the Sierra Nevada foothills located in the District's service area have a fractured rock groundwater system (CABY, 2020), including granitic and metavolcanic (USGS, 1984). NID views the fractured rock groundwater system as low yielding and unreliable for a District supply source. The District does not utilize groundwater as an existing or planned source of water supply or recharge due to limited groundwater availability. The majority of the District's service area has no groundwater aquifer per California Department of Water Resources Bulletin 118 with the exception of the very small portion of the District's service area in Lincoln, which is on the eastern boundary of the Sacramento River Basin, North American Sub-Basin. Although NID has no groundwater facilities and does not use groundwater, NID is a member of the local groundwater sustainability agency, the West Placer Groundwater Sustainability Agency. NID is aware there are private wells in the area used for domestic purposes, but NID does not track private groundwater well inventory or use at this time.

4.3 Stormwater

The District currently has a policy to not actively collect stormwater runoff as presented in the current stormwater policy (District Policy #6655). However, based on current system configurations, the District may incidentally divert stormwater into the canal system due to uncontrolled runoff outside of NID's control.

4.4 Wastewater and Recycled Water

Municipal recycled water is municipal wastewater that has been treated to a specified quality to enable it to be used again for beneficial purposes. For the purpose of this UWMP recycled water means only municipal recycled water, that is, water that has been treated and discharged from a municipal wastewater facility. This subsection describes the wastewater collection, treatment, and disposal and recycled water coordination within the District's water service area.

4.4.1 Wastewater Collection, Treatment, and Disposal

Wastewater collection, treatment, and discharge in the District's service area is the responsibility of Nevada City, Grass Valley, and Auburn. The District has no authority or control over wastewater

management in the District's service area. The District understands that reuse is an important element of integrated water supply planning and is open to investigations with any of the wastewater utilities to support further development of a reuse supply component.

Municipal wastewater is generated within the District from a combination of residential and commercial sources. The wastewater is collected by gravity and force mains in a series of main, trunk, and interceptor sewers owned and operated by the three municipalities within the District service area: the City of Grass Valley, Nevada City, and the City of Auburn. The wastewater treatment and discharge within the service area in 2020 is shown in Table 4-2. The District's use of recycled water within the service area is based on the April through October total effluent from the WWTPs.

- **City of Grass Valley**: The City of Grass Valley operates a tertiary wastewater treatment plant, and is permitted for treating 2.78 mgd. Grass Valley maintains 55 miles of pipeline within the collection system and six wastewater lift stations. Treated wastewater is discharged to Wolf Creek.

- **Nevada City**: Nevada City is permitted to collect and treat an average dry weather flow of 0.69 mgd. The plant went through a multi-million dollar upgrade which was completed in 2007. It is a tertiary treated activated sludge plant. The Nevada City Wastewater Treatment Plant's treated wastewater is discharged to Deer Creek.

- **City of Auburn**: The City of Auburn's treatment plant is located west of Auburn in the Ophir area. The plant is permitted to discharge its treated effluent into Auburn Ravine Creek to a maximum flow of 1.67 mgd. The effluent is treated to tertiary levels. The City of Auburn also maintains over 65 miles of wastewater collection lines throughout Auburn. This network of pipes collects sewage from residences and businesses within the City of Auburn and transports it to the treatment plant.

The amount of wastewater collected within NID's service area is reported as the influent of the three waste water treatment plants (WWTPs) listed in Table 4-1. Estimated wastewater flows generated within the District in 2020 are presented in Table 4-1. Table 4-2 lists the treatment and discharge volumes for 2020.

Table 4-1. Wastewater Collected within Service Area in 2020

Name of Wastewater Collection Agency	Metered or Estimated?	Volume of Wastewater Collected from UWMP Service Area 2020 (AF)	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located within UWMP Area?
City of Grass Valley	Estimated	1,553	City of Grass Valley	Grass Valley Wastewater Plant	Yes
Nevada City	Estimated	511	Nevada City	Nevada City Wastewater Treatment Facility	Yes
City of Auburn	Estimated	1,429	City of Auburn	Auburn Wastewater Treatment Plant	Yes
	Total	3,493	--	--	--

Table 4-2. Wastewater Treatment and Discharge within Service Area in 2020

Wastewater Treatment Plant Name	Discharge Location	Discharge Location Description	Method of Disposal	Does this plant treat wastewater generated outside of service area?	Treatment Level	Wastewater Treated (AF)	Discharged Treated Wastewater (AF)[1]	Recycled within Service Area (AF)	Recycled outside of service area[2] (AF)
City of Grass Valley	Wolf Creek	Wolf Creek	River or creek outfall	Yes	Tertiary	1,553	1,466	673	--
Nevada City	Deer Creek	Deer Creek	River or creek outfall	Yes	Tertiary	511	386	187	--
City of Auburn	Auburn Ravine	Auburn Ravine	River or creek outfall	Yes	Tertiary	1,429	1,137	549	--
					Totals[3]	3,493	2,989	1,408	

[1]Information obtained from Grass Valley, Nevada City, and Auburn.
[2]Amount of recycled use outside of service area is not tracked by NID.
[3]Totals may not add due to rounding.

4.4.2 Recycled Water System Description

All wastewater treated within the District service area is discharged to local watercourses. Once discharged, the flow is available for appropriation by the District. Recycled water discharge mixes with District water being transported in those watercourses. The combined waters are then diverted from the creeks into canals. This supply of water augments the District's overall water supply. The District uses recycled water exclusively for deliveries to the District's raw water customers. Below is a description of the use of recycled water from each of the three wastewater treatment municipalities within the District service area.

The District utilizes recycled wastewater effluent from the Nevada City sewage treatment plant for raw water system customers through its diversion at Deer Creek. The District utilizes recycled sewage effluent from the Grass Valley sewage treatment plant for raw water system customers through its diversion at Wolf Creek. The District utilizes recycled sewage effluent from the Auburn sewage treatment plant for raw water system customers through its diversions located along Auburn Ravine.

4.4.3 Potential, Current, and Projected Recycled Water Uses

Due to current system configurations, potential uses for recycled water are limited to deliveries to raw water customers, and mainly occur during the summer months. There are no facilities in place to distribute recycled water to other customers or end-users. The District actively monitors the viability of such facility improvements as opportunities arise.

Table 4-3 presents the current and projected reuse water demands in the District's service area. The extent to which recycled water is available in the future is dependent upon the capacity and regulatory environment of the three WWTPs, and the District's current recycled water strategy. Recycled water supplies could potentially be reduced based on the assumption that discharges to natural waterways from the wastewater treatment facilities would be reduced. The projected recycled water supply assumes 2020 is representative of future conditions with respect to recycled water utilized by the District. The projected recycled water use reported in the table may not reflect the potential for increases originating from a change in the District's current recycled water strategy. The amount of potential uses of recycled water is the five-year average of recycled water discharged by the WWTP's.

Table 4-3. Recycled Water Direct Beneficial Uses within Service Area

Beneficial Use Type	Amount of Potential Uses of Recycled Water (AF)[1]	Level of Treatment	2020 (AF)[2]	2025 (AF)[2]	2030 (AF)[2]	2035 (AF)[2]	2040 (AF)[2]
Irrigation	3,836	Tertiary	1,408	1,408	1,408	1,408	1,408

[1]Amount of potential uses of recycled water based on average of total effluent for the period 2016 through 2020.
[2]Projected recycled use subject to change based on the District's recycled water strategy.

Table 4-4 provides a comparison of recycled water use projected to occur in 2020 in the 2015 UWMP with the actual 2020 recycled water use. As seen in Table 4-4, the projected volume of recycled water utilized by the District was 2,321 AF while the actual use was 1,408 AF. The less than anticipated recycled use may be attributed to less than projected effluent discharge during the

irrigation season and the decommissioning of the Sewer Maintenance District (SMD) WWTP in 2016, which decreased the available supply to the District.

Table 4-4. 2015 UWMP Recycled Water Use Projection Compared to 2020

Beneficial Use Type	2015 Projection for 2020 (AF)	2020 Actual Use (AF)
Agricultural Irrigation	2,321	1,408

Note: 2015 Projections from Table 5-4 of NID's 2015 UWMP

4.4.4 Actions to Encourage and Optimize Future Recycled Water Uses

The District does not have the authority or control to optimize the use of reclaimed water. Therefore, the District does not have an optimization reuse plan. The District utilizes recycled water to meet raw water demands exclusive of the potable distribution service area. This is more cost effective than the installation of a dual distribution system within its retail potable water system. Recirculating uses of water will continue to occur within the District service area. The District does not maintain incentives to use reclaimed water.

4.5 Desalinated Water Opportunities

The District has no sources of ocean water, brackish water, or groundwater that provide viable opportunities for development of desalinated water as a long term supply.

4.6 Water Exchange and Transfers

The District will consider the feasibility of water transfers on a short-term basis as opportunities arise. There were no exchanges or transfers from 2016 through 2020.

4.7 Future Water Projects

As a mostly rural area primarily dependent on its snowmelt-based supply, the District faces unique challenges in projecting its future supplies and demands. The character of the area and water management practices of the past may be different in the future. As such, the District is in the early stages of a long-term visioning and planning effort to better understand potential future conditions and needs, and identify management and operational practices to meet those needs. The process, Plan For Water, will identify optional water management practices as triggering points in supply, demand, regulatory, legal, and other events are reached. These practices may include supply projects, demand management efforts, policy changes, and others.

The District does anticipate studying the expansion of reservoir capacity as part of the Plan For Water process. Additional reservoir capacity would offer the District greater reliability with respect to dry-year supplies. In addition, recent climate modeling indicate a temporal shift in expected watershed runoff. The expanded reservoir capacity could be used to capture more runoff for subsequent use by the District.

Depending on growth, some of the District's water treatment plants are expected to be expanded. Once capacity triggering points are neared, the District will begin the planning process for capacity expansion. The anticipated water treatment plant expansions are summarized in Table 4-5. This

table also provides an estimated quantification of each project's normal-year yield, single dry-year yield, and multiple dry-year yields. The WTP expansion projects do not increase the District's raw water supply; however, they do increase the amount of treated water available for the District's treated water customers.

Table 4-5. Expected Future Water Supply Projects or Programs

Name of Future Project/Program	Joint Project with other suppliers?	Planned Implementation Year[1]	Planned for Use in Year Type	Expected Increase in Water Supply to Supplier (AF)[2]
Loma Rica WTP 4 mgd expansion	No	tbd	Average year/single-dry year/multiple-dry year	1,792
E. George WTP 6 mgd expansion	No	tbd	Average year/single-dry year/multiple-dry year	2,688
Lake Wildwood WTP 4 mgd expansion	No	tbd	Average year/single-dry year/multiple-dry year	1,792
North Auburn WTP 4 mgd expansion	No	tbd	Average year/single-dry year/multiple-dry year	1,792

[1] Planned implementation to be determined at a later date and depend on capacity requirements.
[2] The expected increase in water supply available as a result of the water treatment plant capacity is assumed to equal the expansion capacity divided by two.

4.8 Summary of Existing and Planned Sources of Water

The District's primary supply comes from surface water, including watershed runoff and carryover storage. The District assumes purchased an average of 7,500 AFY of the PG&E supplies (HDR, 2020). The PG&E supply availability is subject to hydrologic variability and available District funding. As stated earlier, the projected recycled water supply assumes 2020 is representative of future conditions with respect to recycled water utilized by the District. A summary of actual supply sources and quantities in 2020 are provided in Table 4-6. The water supplies projected from 2020 through 2040 are provided in Table 4-7. Projected direct diversion and storage values are based on the year 2000 values as the assumed average year conditions.

Table 4-6. Water Supplies – 2020 Actual

Water Supply	Description	Actual Volume (AF)	Water Quality	Total Right/ Contract (AF)
Purchased Water	PG&E	0	Raw water	54,361
Surface Water	Watershed runoff	119,500	Raw water	450,000[2]
Surface Water	Carryover Storage	163,000[1]	Raw water	
Recycled Water		1,408	Tertiary treated	as available
	Total:	290,908	--	--

[1] End of 2020 storage.
[2] Combined total of the District's water rights.

Table 4-7. Water Supplies – Projected

Water Supply	Addition Detail on Water Supply	Reasonably Available Volume (AF)			
		2025	2030	2035	2040
Purchased Water[1]	PG&E	7,500	7,500	7,500	7,500
Surface Water[2]	Watershed Runoff	233,066	233,066	233,066	233,066
Surface Water[3]	Carryover Storage	143,968	143,968	143,968	143,968
Recycled Water[4]	Tertiary treated	1,408	1,408	1,408	1,408
	Total:	385,942	385,942	385,942	385,942

[1] Average year availability, subject to hydrologic conditions (HDR, 2020).
[2] Average year availability assumed as year 1989 conditions.
[3] Average year availability assumed as year 1989 conditions.
[4] Assumes 2020 recycled water supplies utilized by the District.

4.9 Special Conditions

Special conditions that may impact District supplies are presented in the following subsections, including climate change effects and regulatory conditions and project development.

4.9.1 Climate Change Effects

Climate change is increasingly at the forefront of water resource management discussions. The District's snowpack-based supply and delivery strategy could be extensively impacted by changing temperatures and precipitation. As such, the District undertook an analysis of climate change impacts to future supplies. The analysis included projecting future hydrologic conditions and their potential effect on the District's water supplies, specifically watershed runoff. The approach, State and Global Climate Model (GCM) datasets incorporated, assumptions, and results of the analysis are documented in the technical memorandum titled, "Hydrologic Analysis Technical Memorandum – Final Report" (HDR, 2020). The reader is referred to this reference for detailed description of the modeling effort and assumptions.

The modeling and analysis produced hydrologic data sets that represent historic and projected climate change condition for the year 2070 that can be used to quantify how much of the projected watershed runoff is available to be used as District water supply.

Table 4-8 presents the projected 2070 runoff values at four locations in the District's watershed under the various climate scenarios compared to the historical average runoff at each location. Results from the modeling and analysis indicated that changes in runoff volume are not directly proportional to changes in precipitation volume between scenarios. Variation of temperature, rainfall intensity, and rainfall duration impact the projected runoff. The detailed monthly model results also indicated a shifting of runoff to earlier in the year, as is expected with predicted warmer temperatures.

Table 4-8. Percent of Average Annual Historic Runoff

Location	Percent of Average Annual Historical Runoff at Each Location		
	2070 DEW[1]	2070 Median	2070 WMW[2]
Middle Yuba River at Milton Diversion Dam	92%	104%	126%
Canyon Creek at Bowman Dam	92%	104%	125%
Bear River at Rollins Dam	90%	109%	148%
Deer Creek at Scotts Flat Dam	90%	108%	147%

[1]DEW – Drier, extreme warming scenario
[2]WMW – Wetter, moderate warming scenario

The analysis also evaluated runoff projections under drought condition. A five-year historic drought (1987-1991) was input into the hydrology, with results presented in Table 4-9. Note the projected runoff values are solely based on the hydrologic characteristics of the five-year drought selected, and a different five-year period will result in different results. Results indicate the watershed is significantly impacted in this drought condition, with runoff reducing up to 75 percent in the early drought period, and 50 percent in later drought period. The average year 2070 runoff projected in the hydrologic model (383,500 AF) includes additional subbasins that are not included in the Upper Division dataset that lists an average historical runoff of 232,600 AFY in Section 4.1.1.

Table 4-9. Projected Watershed Runoff during Historical Five-Year Drought (1987-1991)

2070 Projected Average Year Runoff, AF	Drought Year 1, AF	Drought Year 2, AF	Drought Year 3 AF	Drought Year 4, AF	Drought Year 5, AF
383,500	97,200	95,200	315,900	158,200	166,700

Projected runoff not necessarily available to the District due to temporal water rights restrictions and FERC in-stream flow requirements.

The annual precipitation as measured at the NID Bowman Lake rain gage from 1987 through 1991 is presented in Table 4-10.

Table 4-10. 1987-1991 Annual Precipitation - Bowman Lake Rain Gage

1987	1988	1989	1990	1991
45.5 in.	49.1 in.	62.4 in.	44.8 in.	54.0 in.

4.9.2 Climate Change Impacts

The modeling results indicate NID should expect changes to the existing runoff patterns. In addition to NID's own supply and demand impacts, climate change could also affect NID with respect to state-wide needs and local agriculture.

As evidenced by the modeling results, runoff will be affected under the modeled climate conditions. However, the State's water management strategies also rely heavily on snowpack. It is expected similar changes will affect state-wide supplies and operations. Resulting policies, regulations, and legal impacts could likely impact NID's supply availability for local use.

Local climate change impacts will likely affect current supply source options. There are approximately 52,000 parcels in the District's service area. Only approximately 25,000 receive NID treated or raw water. It is assumed the remaining 25,000 parcels are served by fractured rock wells or are undeveloped. A prolonged drought, or increased winter runoff could reduce the amount of water that percolates into the rock fractures, reducing the amount of fractured rock groundwater. This in turn could cause private wells to be insufficient for use. Failing wells will likely cause an increase in the NID customers and subsequent demands, as existing residences will need to connect to the water system. Some of these users may be too far from existing infrastructure making it potentially cost prohibitive to connect, however, the District does expect new customers in the "soft service areas", which are areas near existing infrastructure.

Local climate changes could also affect the community's long-standing agriculture presence. Changing temperatures and precipitation patterns could affect crop types and irrigation demands, open up higher elevations to plantings, affect crop yields, change agronomic practices, and others. Each of these will have an effect on NID supply requirements, operational strategies, and infrastructure requirements.

In addition to supply and demand issues, NID also expects impacts to its other responsibilities. Watershed impacts will affect forest management practices, implementation of the FERC license requirements, and increase catastrophic fire risk. Existing recreation opportunities may be altered or not available under certain conditions. Hydropower generation, which provides significant revenue to the District, may be shifted into less beneficial market pricing periods. Hydropower generation may also decrease as the normal high revenue summertime generation period may not have the water supply to generate as in the past.

Enhancing climate change resiliency is an important element for all levels of water resources planning across the state. The State is pursuing numerous avenues to quantify potential issues and develop mitigation alternatives. NID will follow these efforts and participate as available.

Regionally, groups of agencies and other stakeholders are also addressing these issues and developing mitigation efforts, such as American River Basin Study, Association of California Water Agencies Headwaters initiatives, and others. Locally, NID is committed to controlling its own water resources in a self-determining manner per its strategic plan. The Plan for Water is NID's vehicle to assess climate change impacts and develop and implement mitigation strategies and modifications to operate within climate change.

4.9.3 Regulatory Conditions and Project Development

Regulatory conditions and projects that may directly/indirectly impact District supplies include:

- Water Use Objectives
- Bay-Delta Plan Update
- State Water Resource Control Board (SWRCB) Mandatory Conservation Orders
- FERC Project No. 2266 Relicensing

It is anticipated that effects from these regulatory conditions and projects could impact the amount of supply available to the District, although the magnitude of such impacts are not yet fully understood. More information on each is presented below.

Water Use Objectives

The State DWR and SWRCB will develop and regulate water agencies to a Water Use Objectives, or water budget. The water budget will be built up from components such as residential indoor use, landscape irrigation, commercial and industrial targets, water loss limits, and other elements. Though currently the water agency will be regulated on the overall water budget, each component will be developed separately for each agency. The individual components have not yet been finalized, but current status is summarized below.

Residential indoor water use is set at 55 gpcd beginning in 2023. It will reduce to 52.5 gpcd from 2025 through 2029, and further reduce to 50 gpcd in 2030. Residential outdoor irrigation will be based on a DWR estimate of irrigated landscape and irrigation coefficients from the Model Water Efficient Landscape Ordinance (MWELO). Commercial, Industrial, Institutional, and other variances are still under development. It is noted, the State may impose residential indoor water use standards that are more prescriptive than presented above, pending additional legislation, regulatory actions, or executive order.

Water Agencies are to report annually their Water Use Objective performance starting in 2024. The SWRCB can begin issuing violation and corrective orders in 2026.

2006 Bay-Delta Plan Update

The 2006 Bay-Delta Plan Update is currently being developed by the SWRCB. Proposed changes have the potential to impact District surface water supplies. In general, the SWRCB is recommending new and modified flow requirements for the Sacramento River (and its tributaries), Delta interior flows and outflows, cold water habitat, and ecosystem protection. Information on the 2006 Bay-Delta Plan Update can be accessed at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/.

SWRCB Mandatory Conservation Orders and Water Rights Curtailment

In response to the California drought from 2014 through 2016, the Governor issued various executive orders that required mandatory conservation and curtailments on some water rights, including prohibitions on water waste and certain uses. Impacts to urban water suppliers included mandatory reduction in potable water production and submission of monthly monitoring reports.

The restrictions were imposed during the recent drought that occurred during 2014 through 2016. In 2015, the SWRCB required a 36 percent reduction from 2013 water use for treated water customers from May through September. Additionally, the SWRCB required a 33 percent reduction from 2013 water use during 2016. Further, NID was prohibited, based on priority, from exercising their water rights due to mandated curtailment. The District expects conservation and water rights curtailment orders in the future as well which will limit the amount of supply available and/or utilized to meet customer demands.

FERC Project No. 2266 Relicensing

The District is currently relicensing their Federal Energy Regulatory Commission (FERC) license (FERC Project No. 2266), which requires the District to maintain prescribed environmental in-stream flows at compliance points located throughout the service area. The current total water rights and FERC license environmental in-stream flow requirements is approximately 7,600 AFY and will increase substantially for most year types as described in Section 3.3. Most of these flows are unrecoverable by the District and therefore they represent a demand on the District's supplies.

4.10 Energy Intensity

Among the statutory changes enacted with new requirements for 2020 UMWPs, an urban supplier shall include information it can readily obtain related to the energy use to produce, treat and deliver water. The energy intensity is defined as the net amount of energy required to deliver water supplies. Table 4-11 presents the District's energy usage, volume entering the District's WTPs, and resulting energy intensity for the period January 2018 through December 2018, considered to be representative of average usage.

The District recently implemented an energy generation and tariff strategy with PGE in which the District utilizes its renewable energy generated at the Scotts Flat Powerhouse to supply nearly all of the District's energy needs.

Table 4-11. Energy Intensity (2018)

Year	Energy Usage (kWh)	Volume Entering Process, (AF)	Energy Intensity (kWh/AF)
2018	3,254,118	10,061	323

5 Water Supply Reliability and Drought Risk Assessment

Information on the District's supply and service reliability is presented in this section. Longer-term reliability is assessed using the Water Service Reliability Assessment, where drought conditions are assumed for over the planning horizon. Near-term reliability is assessed using the Drought Risk Assessment (DRA), which assumes the next five years are considered drought conditions.

5.1 Water Supply Reliability Assessment

The water service reliability assessment aims to report the District's ability to meet customer water demands under various conditions, including Normal Year, Single Dry, and Five-Consecutive-Year Drought scenarios. NID's assessment of water service reliability can be used to direct management actions, provide insight on funding allocations, and allows for project prioritization aimed at increasing service reliability under all scenarios. Constraints on water sources and a description of available management tools and options aimed at maximizing local resources is also included in the following subsections.

5.1.1 Constraints on Water Sources

Water supply reliability is an important component of the water management planning process. Factors contributing to inconsistency in the District's water supplies include legal limitations due to water rights and contracts limiting the quantity of water available to the District, regulatory and environmental constraints, and reductions in availability due to climatic factors. The surface water supply to the District is subject to reductions during single and multiple dry years (seasonal and climatic shortages). The District holds senior water rights to the majority of its supply and has the ability to manage carryover storage quantities based on domestic, municipal and irrigation needs.

Constraints on the District's water supply sources due to climate change and regulatory conditions are described in Section 4.9. Recent climate modeling indicates a temporal shift in the timing and duration of watershed runoff. Regulatory conditions that may impact the District's water supply include Water Use Objectives, the 2006 Bay-Delta Plan Update, SWRCB Mandatory Conservation Orders and Water Rights Curtailments, as well as the District's FERC Project No. 2266 Relicensing. Although these regulations have been identified to potentially affect NID's supply, the magnitude of each impact will vary between regulation and year types.

The District's contracted water supply from PG&E is dependent on the SVI, and therefore, is subject to reduction based on the Sacramento Valley Index (SVI).

Regulations governing drinking water quality with which the District must comply for its treated water supply are established at the Federal and State levels. One of those requirements is to prepare a Watershed Sanitary Survey every five years. As summarized in the District's 2017 Watershed Sanitary Survey Update (Starr Consulting et al., 2017) the District expects no loss of water used for urban purposes due to water quality impacts. The PG&E purchased water is similar in quality as the District's supply since it originates from the same sources and is co-mingled with the District supply.

The following primary observations were listed in the 2017 Watershed Sanitary Survey Update field assessment of the watershed. The District is able to address these potential raw water quality issues

through the treatment process at the water treatment plants. The District is placing a priority on converting open canals that convey water to a WTP to closed pipeline conveyances.

- Areas in the upper watersheds are, in general, minimally impacted by current human activities. However, previous mining era activities have had an impact.
- Current and historic mining operations distributed over large areas in the watersheds have a combined high potential to impact raw water quality.
- Marijuana cultivation chemicals and trash can impact raw water quality.
- During summer months, recreation in the upper watersheds, including body contact recreation, motorized recreation, camping, and hiking, bring large numbers of visitors into the area. This increases the potential for source water contamination.
- Major highways, local access roads, and railroads are located throughout the watersheds increasing the risks to source water quality.
- Various licensed pesticides and herbicides are used for weed control in and around the District's canals, however, during the application period, the treatment plants are bypassed.
- Most canals are open; they receive untreated drainage including influence from animals from the uphill slopes and are not protected from vandalism or other sources of contamination.

Natural disasters can also impact water quality. The quality of water supplies can be dramatically affected by fire. Storm damage to the District conveyance facilities may consist of the following elements:

- Damage to parts of canal intakes,
- Collapse or weakening of some sections of canal flumes,
- Erosion and sedimentation of, and landslides into, sections of the canals.
- Damage by falling trees
- Flying debris into the canals
- Filling of reservoirs by sediments through runoff

The above-listed damages can cause some temporary adverse water quality effects, and some short-term losses of the District's water supplies in extreme cases. Of greater concern to overall water quality are flood and precipitation related damage occurrences that could cause longer term adverse water quality impacts such as excessive runoff and loading of surface contaminants (such as livestock manure, petroleum products, pesticides, and mineral wastes).

The District's watershed runoff water supply sources are covered by a combination of pre-1914 water rights, post 1914- water rights, and riparian water rights. In some California watersheds including the Sacramento River watershed, drought has resulted in diversion curtailment orders being issued in 2014, 2015, and 2016 on water rights going back to a 1903 priority date.

5.1.2 Reliability by Type of Year

Reliability by year type addresses three hydrologic conditions. For consistency, the same years are selected for all supply sources. The normal year represents average supply availability. The year 1989 is selected as normal year based on historical watershed runoff data. 1977 is selected as the single dry year as it represents 19 percent of historic annual watershed runoff. The 1987-1991 drought is selected as the five-year consecutive drought as it represents recent watershed conditions and the variable drought conditions predicted throughout the state with climate change impacts.

Tables 5-1 through Table 5-3 display the District's available supplies for a normal year (average), single-dry year, and a drought lasting five consecutive years. The PG&E Supply is subject to hydrologic conditions and available funding. The amount of watershed runoff utilized by the District is dependent on hydrologic and regulatory conditions. Carryover storage is dependent on hydrologic conditions to a degree and the District's ability to manage the supplies in the reservoir system.

Table 5-1. Basis of Water Year Data (Reliability Assessment) – PG&E Supply

Year Type	Base Year	Volume Available (AF)	% of Average Supply
Average Year	1989	4,312	100%
Single-Dry Year	1977	19,464	451%
Consecutive Dry Years 1st Year	1987	3,883	90%
Consecutive Dry Years 2nd Year	1988	11,534	267%
Consecutive Dry Years 3rd Year	1989	4,312	100%
Consecutive Dry Years 4th Year	1990	1,672	39%
Consecutive Dry Years 5th Year	1991	1,568	36%

These values represent supply that was purchased, not necessarily available. Volumes purchased are depending on many factors, including NID's available budget at that time, projected needs, existing carryover storage, etc.

Table 5-2. Basis of Water Year Data (Reliability Assessment) – Watershed Runoff Supply

Year Type	Base Year	Volume Available (AF)	% of Average Supply
Average Year	1989	233,066	100%
Single-Dry Year	1977	44,387	19%
Consecutive Dry Years 1st Year	1987	107,608	46%
Consecutive Dry Years 2nd Year	1988	104,473	45%
Consecutive Dry Years 3rd Year	1989	233,066	100%
Consecutive Dry Years 4th Year	1990	126,866	54%
Consecutive Dry Years 5th Year	1991	136,264	58%

Table 5-3. Basis of Water Year Data (Reliability Assessment) – Carryover Storage Supply

Year Type	Base Year	Volume Available (AF)	% of Average Supply
Average Year	1989	143,968	100%
Single-Dry Year	1977	27,956	19%
Consecutive Dry Years 1st Year	1987	67,652	47%
Consecutive Dry Years 2nd Year	1988	60,623	42%
Consecutive Dry Years 3rd Year	1989	143,968	100%
Consecutive Dry Years 4th Year	1990	125,658	87%
Consecutive Dry Years 5th Year	1991	145,088	101%

Table 5-4 presents normal year anticipated supply and demand totals in five-year increments through 2040.

Table 5-4. Normal Year Supply and Demand Totals

Category	2025 AF	2030 AF	2035 AF	2040 AF
Supply Totals[1]	385,942	385,942	385,942	385,942
Demand Totals[2]	193,420 - 211,047	203,672 - 221,299	214,071 - 231,698	224,469 - 242,096
Difference	192,522 - 174,895	182,270 - 164,643	171,871 - 154,244	161,473 - 143,846

[1]From Table 4-7.
[2]From Table 3-11.

Table 5-5 presents the single dry year supply and demand totals in five-year increments through 2040.

Table 5-5. Single Dry Year Supply and Demand Comparison

Category	2025 AF	2030 AF	2035 AF	2040 AF
Supply Totals[1]	91,807	91,807	91,807	91,807
Demand Totals[2]	183,028 - 208,569	194,304 - 219,845	205,743 - 231,284	217,181 - 242,722
Difference	(91,221) - (116,762)	(102,497) - (128,038)	(113,936) - (139,477)	(125,374) - (150,915)

[1]Total of each supply from Tables 5-1, 5-2, and 5-3.
[2]From Table 3-12.

Table 5-6 presents the multiple dry year supply and demand totals in five-year increments through 2040.

Table 5-6. Multiple Dry Years Supply and Demand Comparison

Category		2025	2030	2035	2040
First Year	Supply Totals[1]	179,143	179,143	179,143	179,143
	Demand Totals	183,028 - 208,569	194,304 - 219,845	205,743 - 231,284	217,181 - 242,722
	Difference	(3,885) - (29,426)	(15,161) - (40,702)	(26,600) - (52,141)	(38,038) - (63,579)
Second Year	Supply Totals[1]	176,630	176,630	176,630	176,630
	Demand Totals	183,028 - 208,569	194,304 - 219,845	205,743 - 231,284	217,181 - 242,722
	Difference	(6,398) - (31,939)	(17,674) - (43,215)	(29,113) - (54,654)	(40,551) - (66,092)
Third Year	Supply Totals[1]	381,346	381,346	381,346	381,346
	Demand Totals	183,028 - 208,569	194,304 - 219,845	205,743 - 231,284	217,181 - 242,722
	Difference	198,319 - 172,778	187,042 - 161,501	175,603 - 150,062	164,165 - 138,624
Fourth Year	Supply Totals[1]	254,196	254,196	254,196	254,196
	Demand Totals	183,028 - 208,569	194,304 - 219,845	205,743 - 231,284	217,181 - 242,722
	Difference	71,169 - 45,628	59,892 - 34,351	48,453 - 22,912	37,015 - 11,474
Fifth Year	Supply Totals[1]	282,920	282,920	282,920	282,920
	Demand Totals	183,028 - 208,569	194,304 - 219,845	205,743 - 231,284	217,181 - 242,722
	Difference	99,893 - 74,352	88,616 - 63,075	77,177 - 51,636	65,739 - 40,198

[1]Total of each supply from Tables 5-1, 5-2, and 5-3.

Table 5-4 indicates there is ample supply during normal hydrologic years. However, as shown in Tables 5-5 and 5-6, demand exceeds supplies during single dry year and multiple dry year scenarios. This illustrates the highly variable reliability of a snowpack-based supply system during drought periods. There are numerous management and operational efforts available to NID to address supply shortfall during drought periods. Demand reductions, carryover storage strategies, system operational strategies, supplemental supplies, increased storage, and others are all options to evaluate in creating the District's future water resources management supply strategy in the Plan for Water process.

5.2 Drought Risk Assessment

This subsection provides the approach for conducting NID's Drought Risk Assessment (DRA). The near-term planning exercise is used to address the District's ability to meet customer demands based on the assumption the next five years are considered drought conditions. Data used for conducting the DRA include projected supplies and demands 2021 through 2025. Projected supplies and demands are compared and used for identification of a supply shortage condition.

Similar to the drought analysis in Section 5.1, the dry year demands are assumed to be increased ten percent and the new environmental in-stream flow requirements associated with FERC Project No. 2266 are included. The simulated five-year drought assumes the same drought as utilized in Section 5.1. Table 5-7 presents the comparison of total supply and demand for the DRA.

Table 5-7. Five-Year Drought Risk Assessment

Category	2021 AF	2022 AF	2023 AF	2024 AF	2025 AF
Total Water Use	173,770 - 199,311	176,084 - 201,625	178,398 - 203,939	180,713 - 206,254	183,028 - 208,569
Total Supplies	179,143	176,630	381,346	254,196	282,920
Surplus/Shortfall w/o WSCP Action	5,373 - (20,168)	546 - (24,995)	202,948 - 177,407	73,483 - 47,942	99,893 - 74,352
Planned WSCP Action	up to Stage 2	up to Stage 2	n/a	n/a	n/a
WSCP – Supply Augmentation Benefit	as available	as available	n/a	n/a	n/a
WSCP – Use Reduction Savings Benefit	0 - 20,168	0 - 24,995	n/a	n/a	n/a
Revised Surplus/(Shortfall)	0	0	n/a	n/a	n/a
Resulting % Use Reduction from WSCP Action	0% - 11%	0% - 14%	n/a	n/a	n/a

As Table 5-7 indicates, the DRA projects supply shortfalls in the planning period. Drought stages from the Water Shortage Contingency Plan (see Chapter 6) are required to address the supply shortfalls. It should be noted both the demand and supply projections include assumptions that may not actually materialize during the next five years, or may not be as large as projected. For example, customer demands may not increase as projected, or the new FERC license environmental instream flow requirements may not take affect either. Or, supplies may actually be more available than projected from the sample drought. NID will monitor these conditions closely and through the annual assessment process update its supply and demand projections to plan for near-term conditions.

6 Drought Plan

This Drought Plan (Plan) presents Nevada Irrigation District's (NID, or District) approach for identifying and mitigating various water shortage conditions, pursuant to California Water Code (CWC) §10632. The Plan identifies drought action levels, appropriate agency responses, water demand reduction goals, and provides recommended demand management measures to assist customers in water conservation. For compliance with CWC §10632, the terms Drought Plan and Water Shortage Contingency Plan are considered synonymous.

This Drought Plan is included in the District's 2020 Urban Water Management Plan (UWMP), although this Drought Plan can be amended, as needed, without the requirement to amend the UWMP. It is noted, the CWC does not exclude the District from taking actions not specifically contained in its Drought Plan in response to supply shortage conditions.

This Plan applies to any shortage condition identified or incurred by the District, including shortages identify by the annual assessment. Further, the Plan shortage levels are also applicable to catastrophic interruption in supplies, including but not limited to, an earthquake, a regional power outage, and other emergency events.

6.1 Legal Authorities

NID is organized under the Irrigation District Law (CWC §§20500-29978) and is authorized to do any act necessary to furnish sufficient water in the district for any beneficial use (CWC §22075), and is therefore granted the authority to enforce its rules and regulations. As a public entity, the District is authorized to "adopt and enforce a water conservation program to reduce the quantity of water used by those persons for the purpose of conserving the water supplies of the public entity" (CWC §375). For the ordinance or resolution regarding the adoption of a conservation plan, the ordinance/resolution is made effective upon adoption (CWC §376).

The aforementioned powers derived from NID's organizing statutes are in addition to general powers granted to water distributors in CWC §§350-359. CWC §350 authorizes the governing body of a distributor of a public water supply to declare a water shortage emergency whenever it finds and determines that the ordinary demands and requirements of water consumers cannot be satisfied without depleting the water supply of the distributor to the extent there would be insufficient water for human consumption, sanitation, and fire protection. Upon a finding of such an emergency condition, the distributor can adopt such regulations and restrictions on the delivery and consumption of water as will conserve the water supply for the greatest public benefit, with particular regard to domestic use, sanitation, and fire protection (CWC §353). The regulations and restrictions remain in force and effect until the supply of water available for distribution within such area has been replenished or augmented, and restrictions may include the right to deny new service connections and discontinue service for willful violations (CWC §355 and §356).

The District will vote to adopt its UWMP and Drought Plan as stated in Resolutions/Ordinances XXXX and XXXX, respectfully. The two Resolutions authorize the implementation and enforcement of this Drought Plan, which is included in the 2020 UWMP.

NID will also coordinate with the City of Grass Valley, Nevada City, Auburn, as well as Placer, Nevada, and Yuba counties for the possible proclamation of a "local emergency" under California Government Code, California Emergency Services Act (Article 2, Section 8558).

6.2 Resilience Planning

NID conducts ongoing analysis of its supply reliability and reports on current understanding through its various planning efforts including the Urban Water Management Plan, Plan for Water, Staff Reports to Board, Raw Water Master Plan, and others. Plan for Water is the District's overarching integrated water resources planning effort. As part of the Plan for Water process, NID has developed a climate change hydrologic model to project and analyze supply availability under different climate change scenarios. Findings from this process will then be used to identify and evaluate mitigation measures. Mitigation measures could include the following:

- Data gathering and information analysis enhancement to further inform decision making
- Hydrologic modeling enhancements
- Demand reduction measures
- Supply augmentation opportunities
- Policy enhancements

The Plan for Water process is ongoing and has not yet begun the mitigation measure evaluation phase. The Plan for Water process is a deliberate, phased approach including customer and stakeholder involvement, and will continue for many months. Once the process develops mitigation strategies and decision support frameworks, NID will update the resiliency planning efforts in the next UWMP. As the Plan for Water process is developing mitigation measures for drought resiliency, NID will continue to implement its current drought and water shortage contingency efforts as described in this Plan.

6.3 Water Supply Reliability Analysis

The District's snow-melt based water supplies are vulnerable to drought and are expected to be further impacted by climate change. The District holds senior water rights to the majority of its supply and can manage carry over storage quantities based on domestic, municipal, and irrigation needs. However, the supply system relies on spring and summer snowmelt runoff, as well as capture and storage in reservoirs to release during the irrigation season. During droughts and periods of warmer winters when there is less snowpack, runoff is reduced, and the District must manage its storage and customer demands to meet requirements. The supply availability reduction is dependent on the severity and length of the drought. In addition to the hydrologic impacts on NID's supplies, there can be regulatory reduction, as during the last drought the State mandated supply curtailments and NID was not able to access its available supply.

As part of NID's UWMP, reliability planning was conducted to evaluate the District's ability to meet demands. Two separate efforts were conducted to characterize both long- and near-term reliability scenarios. The Water Reliability Assessment is conducted for a normal, single dry year, and a drought lasting five consecutive years and is used to evaluate long-term supplies with demands over

the next 25 years, in five-year increments. The Drought Risk Assessment assumes the occurrence of a drought over the next five years and aims to assess the District's near-term reliability.

The reliability analysis indicates demand exceeds supplies during single dry year and multiple dry year scenarios, with the single dry year representing approximately 50 percent supply shortfall. This illustrates the highly variable reliability of a snowpack-based supply system during drought periods. There are numerous management and operational efforts available to NID to address supply shortfall during drought periods. Demand reductions, carryover storage strategies, system operational strategies, supplemental supplies, increased storage, and others are all options to evaluate in creating the District's future water resources management supply strategy in the Plan for Water process.

6.4 Annual Water Supply and Demand Assessment

NID conducts an annual analysis of supply and demand projections to help inform water resources management decisions for the coming year. The analysis incorporates various data sources used as evaluation criteria to project probable demands and supply availability for the coming year. Data sources to consider include:

- Projected weather conditions
    - Precipitation versus historical monthly
    - Snow survey results
- Projected Unconstrained Demand
    - Production versus historic monthly
    - New customer growth
    - Water use objective monthly tracking versus goal
    - Identify demand for treated water-supplied water features separate from swimming pools and parks
- Projected Supply Availability (assuming no constraints)
    - Reservoir storage
    - Forecasted runoff
    - PGE contract water
    - Recycled water

The general procedure is listed below. NID may modify this process based on available data, significant events, process restrictions, or other external factors that may impact the process.

1. Dry Year Projection
Compile existing weather data to characterize the past 12 months' conditions. Considering recent conditions and available forecasts, select a projected dry year scenario from the historical precipitation record. Dry year scenario to be at least 60 percent of normal precipitation at the Bowman Lake Reporting Station.

2. Demand Projection
Project unconstrained monthly demand for the next 12 months factoring in existing demands, water use budgets, weather projections, and growth projections.

3. Project Supply Availability
Utilize the existing conditions coupled with historic availability and other known conditions to project probable monthly availability. Summarize the current supply availability over the next 12 months assuming no supply restrictions. Project next year supply availability over the next 12 months assuming the next year is a dry year as selected in Step 1.

4. Supply Infrastructure Restraints
Identify and describe any projected infrastructure restrictions to delivering supply in the next 12 months.

5. Project Next Year Supply Deliverability
Using results from Steps 3 and 4, identify the current conditions normal year and dry year projected supply delivery for the next 12 months.

6. Projected Dry Year Supply to Demand Comparison
Compare the projected next year's unconstrained demand to the next year's dry-year projected supply deliverability. Identify any projected seasonal shortfall in supply to meet the unconstrained demand, cross-referencing the condition to one of the six water shortage levels identified below in this Plan.

7. Develop and propose water resource management strategies to address the projected demand to supply comparison, including reference to one of the water shortage stages identified in this Plan.

8. The annual water supply-demand assessment is presented to the Board of Directors for discussion and questions. Staff will modify/update the assessment per direction from the Board. The Board will approve the assessment and its findings, and can also provide direction to implement specific management strategies at that time. The general proposed timeline is as follows:

- Begin assessment by staff – February
- Present assessment to Board – no later than April
- Submit to State per CWC §10632.1 – by July 1

6.5 Water Shortage Stages and Responses

NID maintains this Drought Plan to identify and respond to potential and actual water shortage conditions. Six water shortage levels are presented per CWC Section 10632(a)(3). Proposed alternative response actions for each stage are identified with each respective projected impact on demand reduction or supply augmentation listed. NID will evaluate each specific shortage condition and select the appropriate response action(s) for implementation.

The District maintains a water conservation program that is ongoing, even during periods of normal water supply. The District has found this program to be effective in reducing overall water consumption and managing demands during periods of normal water supply and water shortage conditions. The District will rely on its regular conservation program as well as additional measures to respond to the range of water supply shortages that may arise.

6.5.1 Normal Water Supply

Under Normal Water Supply conditions, the District's water supply and distribution system is expected to be able to meet all the water demands of its customers in the immediate future. Regulations for Normal Water Supply are contained in the District's Water Service Rules and Regulations. The following is a list of water usage that the District may consider waste and therefore unreasonable use during all stages, including Normal Water Supply.

Treated Water

- Washing down paved surfaces unless for safety or sanitation, in which case a bucket, a hose with a shut-off nozzle, or a low-volume/high-pressure water broom must be used.
- Watering or irrigating landscapes or vegetation of any kind that creates excessive water flow or runoff onto pavement, gutters, or ditches.
- Washing of vehicle with a hose unless equipped with a water shut-off nozzle (does not apply to commercial car washes).
- Cleaning of gutters by flooding with water.
- Landscape watering during the heat of the day (between 10am and 6pm).
- Use of fountains and water features that do not re-circulate water.
- Failure to repair leaks, breaks, or malfunctions in a timely manner once found or after receiving a notice from the District.
- Outdoor watering during periods of rain.
- Any infraction of mandatory measures in place during the implementation of the District's Drought Plan.

Raw Water

- Failure to repair leaks, breaks, or malfunctions in a timely manner once found, or after receiving notice from the District.
- Water is not confined to the customer's property and being allowed to run off and cause damage to adjoining properties or the roadside ditch or gutter.
- Any infraction of mandatory measures in place during the implementation of this Drought Plan.

Further, the District's Water Service Rules and Regulations prohibit water use outside the District, except when it is deemed surplus to the needs of the District and the Board has declared the water surplus and approved the agreement for sale.

Stage 1 – 10% Supply Shortage
Forecast April 1 Available Supply: 234,999 to 211,500 AF Actions include normal rules and regulations plus those listed below
Treated Water and Municipal Water Customers - Actions to Reduce Demand up to 10 Percent • Encourage customers to limit outdoor irrigation to every other day. • Request fire department limit practices drills and hydrant flow testing.
Raw Water Customers - Actions to Reduce Demand up to 10 Percent • Allow Ag customers to voluntarily reduce purchase allotment for the year while reserving their right to return to their previous allotment in the following year if water supply is available.
District Actions • Communicate conservation regulations as identified in Section 3.05 of District Rules and Regulations. • Declare no new or increased surplus water availability. • Leak repair receives higher priority. • Increase drought awareness through additional public outreach measures that notify the public and customers for declared stage, requirements, and available conservation program support. • Standard rates in effect.
Enforcement Measures • Standard measures per District Rules and Regulations.

Stage 2 – 20% Supply Shortage

Forecast April 1 Available Supply: 211,499 to 188,000 AF
Actions include Stage 1 plus those listed below

Treated Water and Municipal Water Customers - Actions to Reduce Demand up to 20 Percent

- Outdoor irrigation is limited to every other day and a maximum of three days per week.
- Odd address numbers can irrigate outdoors on Tuesday, Thursday, and Saturday.
- Even address numbers can irrigate outdoors on Wednesday, Friday, and Sunday.
- Customers shall adjust irrigation controllers to reduce usage for each zone by 20 percent.
- Corresponding to Fall Daylight Saving Time, customers shall strive to limit outdoor irrigation to only once per week.

Raw Water Customers - Actions to Reduce Demand up to 20 Percent

- Limit new water sales and increases to 1 miner's inch.
- Required to change delivery schedule developed by the District, aimed at achieving 20 percent demand reduction.

District Actions

- Declare no new or increased surplus water availability.
- Declare no new or increase in Fall/Winter deliveries.
- Communicate mandatory reduction targets to customers.
- Inform Municipal customers of the mandatory 20 percent reduction requirement.
- Distribution system flushing only for public health & safety.
- Organize Drought Hardship Committee.
- Purchase available Contract water to achieve a target carryover of 110,000-acre-feet.
- Implement Stage 2 conservation rates.

Enforcement Measures

- A written warning will be issued for a first violation.
- A District imposed fine of $250 for a second violation, and any subsequent violation, and doubling with each subsequent violation up to a maximum of $1,000 for any single violation.
- Upon a fourth violation or an earlier violation, the General Manager determines to create a significant threat to the goals of the stage, the General Manager may order the installation of a flow restrictor on service lines in question.
- Similar penalties, fines, and charges may be implemented by the District as needed to enforce the restrictions on specific prohibited water uses.

Stage 3 – 30% Supply Shortage
Forecast April 1 Available Supply: 187,999 to 164,500 AF Actions include Stage 2 plus those listed below
Treated Water and Municipal Water Customers - Actions to Reduce Demand up to 30 Percent • Outdoor irrigation is limited to two days per week. • Odd address numbers can irrigate outdoors on Thursday and Sunday. • Even address numbers can irrigate outdoors on Wednesday and Saturday. • Customers shall adjust irrigation controllers to reduce usage for each zone by 30 percent. • Irrigation of ornamental turf in public street medians with treated water is prohibited.
Raw Water Customers - Actions to Reduce Demand up to 30 Percent • Limit new water sale and increases to ½ miner's inch. • Required to change delivery schedule developed by the District, aimed at achieving 30 percent demand reduction.
District Actions • Declare no surplus water availability for exterior boundary customers. • Declare no Fall water availability. • Communicate mandatory reduction targets to customers. • Inform Municipal customers of the mandatory 30 percent reduction requirement. • Purchase available Contract water to achieve a target carryover of 100,000 acre-feet. • Implement Stage 3 conservation rates. • Dedicate additional staff for increased water waste patrols.
Enforcement Measures • A written warning will be issued for a first violation. • A District imposed fine of $250 for a second violation, and any subsequent violation, and doubling with each subsequent violation up to a maximum of $1,000 for any single violation. • Upon a fourth violation or an earlier violation the General Manager determines to create a significant threat to the goals of the stage, the General Manager may order the installation of a flow restrictor on service lines in question. • Similar penalties, fines, and charges may be implemented by the District as needed to enforce the restrictions on specific prohibited water uses.

Stage 4 – 40% Supply Shortage
Forecast April 1 Available Supply: 163,499 to 141,000 AF Actions include Stage 3 plus those listed below
Treated Water and Municipal Water Customers - Actions to Reduce Demand up to 40 Percent • Outdoor irrigation is limited to one day per week. • Customers shall adjust irrigation controllers to reduce usage for each zone by 40 percent.
Raw Water Customers - Actions to Reduce Demand up to 40 Percent • Required to change delivery schedule developed by the District, aimed at achieving 40 percent demand reduction.
District Actions • Declare no new or increased raw water sales. • Communicate mandatory reduction targets to customers. • Inform Municipal customers of the mandatory 40 percent reduction requirement. • Purchase available Contract water to achieve a target carryover of 90,000 acre-feet. • Implement Stage 4 conservation rates.
Enforcement Measures • A written warning will be issued for a first violation. • A District imposed fine of $250 for a second violation, and any subsequent violation, and doubling with each subsequent violation up to a maximum of $1,000 for any single violation. • Upon a fourth violation, or an earlier violation the General Manager determines to create a significant threat to the goals of the stage, the General Manager may order the installation of a flow restrictor on service lines in question. • Similar penalties, fines, and charges may be implemented by the District as needed to enforce the restrictions on specific prohibited water uses.

Stage 5 – 50% Supply Shortage
Forecast April 1 Available Supply: 140,999 to 117,500 AF Actions include Stage 4 plus those listed below
Treated Water and Municipal Water Customers - Actions to Reduce Demand up to 50 Percent • Outdoor irrigation is prohibited.
Raw Water Customers - Actions to Reduce Demand up to 50 Percent • Required to change delivery schedule developed by the District, aimed at achieving 50 percent demand reduction.
District Actions • Communicate mandatory reduction targets to customers. • Inform Municipal customers of the mandatory 50 percent reduction requirement. • Purchase available Contract water to achieve a target carryover of 80,000 acre-feet. • Implement Stage 4 conservation rates.
Enforcement Measures • A written warning will be issued for a first violation. • A District imposed fine of $250 for a second violation, and any subsequent violation, and doubling with each subsequent violation up to a maximum of $1,000 for any single violation. • Upon a fourth violation or an earlier violation the General Manager determines to create a significant threat to the goals of the stage, the General Manager may order the installation of a flow restrictor on service lines in question. • Similar penalties, fines, and charges may be implemented by the District as needed to enforce the restrictions on specific prohibited water uses.

Stage 6 – Over 50% Supply Shortage
Forecast April 1 Available Supply: less than 117,500 AF Actions include Stage 5 plus those listed below
Treated Water and Municipal Water Customers - Actions to Reduce Demand greater than 50 Percent • Health and safety use of water only.
Raw Water Customers - Actions to Reduce Demand greater than 50 Percent • Required to change delivery schedule developed by the District, aimed at achieving target demand reduction.
District Actions • Communicate the mandatory reduction targets to customers. • Inform Municipal customers of the mandatory health and safety use only. • Purchase available Contract water to achieve a target carryover of 75,000 acre-feet. • Implement Stage 4 conservation rates. • Other actions as identified specific to the shortage condition.
Enforcement Measures • A written warning will be issued for a first violation. • A District imposed fine of $250 for a second violation, and any subsequent violation, and doubling with each subsequent violation up to a maximum of $1,000 for any single violation. • Upon a fourth violation or an earlier violation the General Manager determines to create a significant threat to the goals of the stage, the General Manager may order the installation of a flow restrictor on service lines in question. • Similar penalties, fines, and charges may be implemented by the District as needed to enforce the restrictions on specific prohibited water uses.

6.6 Enforcement and Variances

NID was formed as an irrigation district under the California Water Code and therefore is granted the authority to enforce its rules and regulations, as well as levy and collect fines. NID will declare a water shortage emergency within its service area boundaries when it determines through its best judgment that normal demands and requirements of its customers cannot be met with the projected supplies.

Once a water shortage stage has been declared, NID will enforce compliance through a multitude of measures commensurate with each reduction goal. The District will either implement measures per this Plan or will provide further discrete requirements through ordinances.

Measures will be enforced through the following procedures, in addition to any enforcement measures identified in ordinances. NID will modify and adjust the compliance strategy as necessary for each respective situation.

- A written warning will be issued for a first violation.
- A District imposed fine of $250 for a second violation, and any subsequent violation, and doubling with each subsequent violation up to a maximum of $1,000 for any single violation.
- Upon a fourth violation or an earlier violation the General Manager determines to create a significant threat to the goals of the ordinance, the General Manager may order the installation of a flow restrictor on service lines in question.
- Similar penalties, fines, and charges may be implemented by the District as needed to enforce the restrictions on specific prohibited water uses.

Upon declaration of a Stage 2 shortage (or higher), NID will appoint and convene the Drought Hardship Committee. The Drought Hardship Committee is an advisory body and shall consist of one appointee from each director's division and the Water and Hydroelectric Operations (WHO) Board Committee. District Operation's staff will work closely with the committee.

The Drought Hardship Committee's purpose is to review the applications and determine whether additional water can be provided to the applicant. Before any appeal for a variance can be heard by the Drought Hardship Committee, raw water customers must submit a Drought Hardship Application and provide proof the water is being used for commercial agricultural purposes.

For the purposes of this Plan, the definition of commercial agriculture is an agricultural producer engaged in a for-profit operation with a minimum gross annual sales of $3,000 and a minimum capital investment of $15,000. Commercial agricultural producers file a Schedule F with the Internal Revenue Service for their farming or ranching operation.

Variances may be approved for increases in raw water deliveries, seasonal variances, relief from regulations regarding treated water customers, or other protocols as determined by the Drought Hardship Committee. No such variance or appeal, however, shall be granted if the Board of Directors finds that the variance or appeal will adversely affect the public health or safety of others and is not in the public's best interest.

Under the California Water Code, in critical water supply situations, there is a priority that shall be allocated as follows:

1. Human Consumption
2. Livestock and Animals
3. Perennial Crops
4. Annual Crops

Upon granting a Drought Hardship Variance or appeal, the Board may impose any other conditions it deems to be just and proper.

6.7 Communication Protocols

NID maintains an established and effective communications program to inform its customers, neighbors, and other stakeholders of issues, updates, and policies. Implementation of the Drought Plan will utilize the existing communication program structure to inform customers and others of the declared shortage stage and respective actions and restrictions in place.

The Board meetings addressing the Annual Water Supply and Demand Assessment and/or a potential water-shortage declaration will be noticed per normal Board meeting public notification procedures. The meeting will also be announced through regular press release protocols.

Once a shortage stage has been declared by the Board of Directors, NID will notify its customers and others through a range of efforts. The stage and restrictions will be identified in a press release, as well as customer billing statements. The District's website will be updated to feature the shortage declaration, restrictions, and resources available to customers from the District and other entities to help meet the restrictions. Subsequent Board of Directors meetings will include a review of the shortage condition, customer response results, and discussion and recommendations for potential modifications.

6.8 Financial Consequences of Drought Plan

Implementing any stage of the Drought Plan is expected to impact the District's financial status, including enforcement of excessive residential water use during a drought (compliance with Chapter 3.3, Division 1 of the CWC). As experienced during previous droughts, it is expected that revenues will decrease with decreasing usage, and expenses will increase with additional monitoring and enforcement responsibilities, as well as additional costs for replacement supplies if needed.

The District maintains a rate structure that includes a fixed meter charge plus increasing volumetric block rates for residential customers and volumetric rates for irrigation customers. Volumetric revenue is approximately 53 percent of total revenue. The drought rate structure is set to offset the revenue loss from mandatory demand reduction up to 40 percent. Demand reduction above 40 percent will reduce revenue accordingly. Actual impacts will vary depending on customer response.

Enforcement, enhanced outreach, and increase of customer data tracking can add to the District's costs around a water shortage condition. Oftentimes, these additional efforts are prioritized for current staff, and other normal work efforts are delayed or reassigned. If conditions warrant, the District will seek assistance through additional staffing or third-party service providers. These costs depend on the level of support and will be evaluated on a case-by-case basis. An increase in costs can also be associated with additional equipment obtained to support the District's outreach, enforcement, tracking, and management efforts.

Depending on the situation, the District may also be able to obtain supplemental water supplies to mitigate the water shortage condition. These supplies are expected to be more costly than regular supplies and will be evaluated for each specific opportunity.

It is reasonable to expect financial impacts or changes in cash flow during a prolonged water shortage condition. The District will enact a range of management and financial resources depending on the specific situation that includes:

- Drought rate surcharge
- Utilizing financial reserves
- Capital project deferment
- Operational and maintenance expense deferment
- Increased revenue from penalties
- And others as identified

6.9 Monitoring, Reporting, and Refinement

The Drought Plan aims to ensure demands are reduced and/or supply is augmented to balance supply and demand. The District will enact various actions commensurate with each respective stage. The District will then monitor results to maintain the supply/demand balance. Similar to the supply and demand projections used to establish a shortage condition in the annual assessment procedure, the District will monitor the same data to determine effectiveness and efficacy. District staff will report to the Board of Directors at least monthly on status and results. Data reporting will include:

- Actual demands to projected demands per customer class and on total
- Actual supply availability and utilized to projected availability per each supply source
- Projected supply availability for next 12 months per supply source
- Any specific requirements identified by the State in the future

Data will also be submitted to the State per any future reporting requirements.

Progress and efficacy will be summarized from the results data. The District will evaluate the need for any changes or modifications to the declared water shortage stage or actions based on the results. The District may determine to enact additional measures, develop ordinances, or update the Drought Plan as a whole. Any Plan update or modification will be conducted through the Board of Directors meeting process unless specific conditions require otherwise.

6.10 Response Action Estimates

The following table presents the individual estimated demand savings of each response action. Actual savings will likely vary greatly based on external influences, shortage stage level, and general customer understanding of drought severity. It is assumed the savings estimates are not necessarily additive, but when implemented together as a program with all the actions in each respective stage, they are intended and estimated to eliminate each stage's identified supply to demand shortage gap.

Table 6-1. Shortage Response Action Measures Estimates

Stage	Shortage Response Action	Potential Shortage Gap Reduction
1	Treated Customers – Encouraged to limit outdoor irrigation to every other day.	0 – 3%
1+	Treated Customers – Fire departments limit practice drills and hydrant flow testing.	0 – 1%
1	Raw Water Customers – Asked to voluntarily reduce purchase allotment for the year while reserving their right to return to their previous allotment in the following year if water supply is available.	0 – 10%
1+	District – Communicate conservation regulations as identified in Section 3.05 of District's Rules and Regulations.	0 – 1%
1+	District – Declare no new or increased surplus water availability.	0 – 2%
1+	District – Leak repair receives higher priority.	0 – 2%
1+	District – Increase drought awareness through additional public outreach measures that notify public and customers of declared stage, requirements, and available conservation program support.	0 – 3%
2	Treated Customers – Outdoor irrigation is limited to every other day and a maximum of three days per week.	1 – 3%
2	Treated Customers – Corresponding to Fall Daylight Savings Time, customers shall strive to limit outdoor irrigation to only once per week.	1 – 2%
2	Raw Water Customers – New water sales and increases limited to one miner's inch.	2 – 5%
2	Raw Water Customers – Required to change delivery schedule developed by the District aimed at achieving a 20 percent demand reduction.	10 - 20%
2	District – Declare no new or increase in Fall/Winter deliveries.	0 – 2%
2	District – Communicate mandatory reduction targets to customers.	4 – 8%
2	District – Inform Municipal customers of the mandatory 20 percent reduction requirement.	1 – 2%
2+	District – Distribution system flushing only for public health and safety.	1 – 2%
2	District – Purchase available Contract water to achieve a target carryover of 110,000 acre-feet.	5 – 20%
2	District – Implement Stage 2 conservation rates.	3 – 5%
2+	District – Enhanced enforcement measures.	1 – 3%
3	Treated Customers – Outdoor irrigation is limited to two days per week.	2 – 3%
3	Treated Customers – Adjust irrigation controllers to reduce usage for each zone by 30 percent.	2 – 3%
3+	Treated Customers – Irrigation of ornamental turf in public street medians with treated water is prohibited.	1 – 2%
3	Raw Water Customers – New water sales and increases limited to 1/2 miner's inch.	3 – 6%

Stage	Shortage Response Action	Potential Shortage Gap Reduction
3	Raw Water Customers – Required to change delivery schedule developed by the District aimed at achieving a 30 percent demand reduction.	15 - 30%
3	District – Declare no surplus water availability for exterior boundary customers.	1 - 2%
3+	District – Declare no Fall water availability.	5 - 10%
3	District – Inform Municipal customers of the mandatory 30 percent reduction requirement.	2 – 3%
3	District – Purchase available Contract water to achieve a target carryover of 100,000 acre-feet.	5 – 20%
3	District – Implement Stage 3 conservation rates.	5 – 7%
3	District – Dedicate additional staff for increased water waste patrols.	0 – 3%
4	Treated Customers – Outdoor irrigation is limited to one day per week.	3 – 6%
4	Treated Customers – Adjust irrigation controllers to reduce usage for each zone by 40 percent.	3 – 6%
4	Raw Water Customers – Required to change delivery schedule developed by the District aimed at achieving a 40 percent demand reduction.	25 – 40%
4	District – Declare no new or increased raw water sales.	1 – 5%
4	District – Inform Municipal customers of the mandatory 40 percent reduction requirement.	3 – 4%
4	District – Purchase available Contract water to achieve a target carryover of 90,000 acre-feet.	5 – 20%
4+	District – Implement Stage 4 conservation rates.	6 – 8%
5	Treated Customers – Outdoor irrigation is prohibited.	10 – 25%
5	Raw Water Customers – Required to change delivery schedule developed by the District aimed at achieving a 50 percent demand reduction.	20 – 30%
5	District – Inform Municipal customers of the mandatory 50 percent reduction requirement.	4 – 6%
5	District – Purchase available Contract water to achieve a target carryover of 80,000 acre-feet.	5 – 20%
6	Treated Customers – Health and safety use of water only.	6 – 10%
6	Raw Water Customers – Required to change delivery schedule developed by the District aimed at achieving target demand reduction.	varies
6	District – Inform Municipal customers of the mandatory health and safety use only.	6 – 9%
6	District – Purchase available Contract water to achieve a target carryover of 75,000 acre-feet.	5 – 20%
6	District – Other actions as identified specific to the shortage condition.	varies

6.11 Plan Adoption, Submittal, and Availability

The Drought Plan (including subsequent updates) shall be adopted in accordance with standard District procedures, including requirements for public participation (public hearing), and approval by the NID Board of Directors. Upon adoption, the Drought Plan will be provided to the City of Grass Valley, Nevada City, Placer, Nevada, and Yuba counties, and submitted to DWR within 30 days. The adopted Drought Plan will be available on the District's website, as well as at the District office.

6.12 Seismic Risk Assessment and Mitigation

Nevada and Placer counties have completed Local Hazard Mitigation Plans under the federal Disaster Mitigation Act of 2000 (Public Law 106-390). Per DWR requirements, a copy of the most recent adopted plan by each County will be submitted as part of the UWMP submittal to DWR.

7 Demand Management Measures

The District is dedicated to responsible stewardship of water supplies and conducts an active and ongoing water conservation program aimed thereto. Water conservation is achieved through managing the water supply and water demand for all customer sectors. Through reduction in loss and waste within the District's production and delivery systems, supply management is used to improve the overall system efficiency. NID relies on demand management and conservation programs to educate and encourage water conservation. Demand management measures (DMMs) are intended to facilitate NID's management and reduction of customer demands, and aid in maintaining supply reliability. The District has utilized these DMMs to meet customer use targets, including SBX7-7 and drought conservation targets. NID anticipates that DMMs will serve as tools to rely on when meeting compliance with future water use targets, including Water Use Objectives. All of the DMMs presented below have been implemented over the previous five years.

7.1 Water Waste Prevention Ordinances

Water waste prohibition is an ongoing component of the District's water conservation program. The District has adopted regulations which state that "a water user who wastes water, either willfully, carelessly, or due to defective or inadequate private facilities, may be subject to fines, reduction, or termination of service" (Water Service Regulations, Section 3.05 Water Conservation).

NID has an established and active water waste reporting program. Customers can report water waste through the Districts website or by telephone. The primary tool to address reported customer waste is outreach and education. Contact is made with the customer as a follow up to the water waste report. They are informed of the report and advised of ways to correct as necessary. Per the District's water service rules and regulations, continued violations may lead to a fine, reduction in service, or termination of service. The District's Water Efficiency Technician monitors leak alerts and contacts customers alerting them of the unusually high use. In addition, the District is currently conducting a pilot program for customers equipped with a Badger meter. The pilot program includes water use software that monitors flows and sends alerts to customers with unusual increases in usage patterns. This notification has historically been sufficient to prompt immediate corrective actions for most NID customers.

NID anticipates continually implementing this DMM, as it provides a proactive approach for addressing water waste by District customers.

7.2 Metering

The District is fully metered and all treated water connections are billed based on the volume of water used. The metered connections allow the District to better monitor customer use during drought conditions when tracking is required. NID is actively replacing automatic meter reading (AMR) meters with automatic metering infrastructure (AMI) meters. Existing AMR meters are replaced when components fail, and currently 9,800 meters have been replaced. The AMI meters will allow real time water use comparisons and leak reporting. It is anticipated that District customers will have access to their usage through NID's website. NID projects that the meter replacement program will be completed in the next five years.

This DMM is fully implemented and the District will continue to install and read meters on all new services. Additionally, the District has begun the replacement of its meters to cellular read. The District's AMR/AMI program allows the District to automatically identify customer with high usage rates for potential leak issues. It is anticipated that the District will continue to implement large meter replacement (upgrading to AMI) during 2021.

7.3 Conservation Pricing

The District began implementing an inclining block rate structure for all urban water customer sectors in 1996. All customer sectors and meter sizes receive a monthly Tier 1 allocation of five hundred cubic feet. Usage above the Tier 1 allocation is billed at a higher block rate. The District's inclining rate structure is applicable to the District's Commercial and Non-commercial customers.

The implementation of this DMM is ongoing as it promotes efficient use of the resource. The District plans to continue implementing its inclining block rate to facilitate the District's goal of conservation. Effectiveness of this DMM is evaluated by comparison of the District water use before and following the implementation of conservation pricing. The District can monitor the number of violators who use water more than their established allotment.

7.4 Public Education and Outreach

Public information is an ongoing component of the District's water conservation program. The Water Efficiency Technician leads the effort to promote water conservation and awareness through a variety of methods. NID prepares and distributes public information through bill inserts, newsletters, brochures, community speakers, advertising, web page, library, and many special events throughout the year. Periodically, the District prepares news releases and public announcements through local media, including local radio stations, relating to water conservation issues.

The District also publishes and distributes a newsletter four times a year. The newsletter contains articles and information on water conservation. Previously, the District published a booklet entitled "Water Conservation Gardening" to assist its customers in implementing applicable conservation measures. The "Lawn Watering Guide" was published by the District in 1989 and is updated or reprinted as needed. The District also partners with the UC Cooperative Extension Master Gardeners which produce "Water Wise Landscaping" periodicals annually. The District offers this information to customers and makes it publicly available on the District's water efficiency webpage.

Detailed information on the District's public outreach programs are presented below. In addition to event flyers, District presentations, and media release, Appendix D contains samples of public information distributed by the District.

Mulch Magic Giveaway: This program entails partnering with Nevada County Resource Conservation District (NCRDC) to educate the community of the multiple benefits of mulch, including water savings. To date, over 650 cubic yards of shredded cedar has been given away to Nevada and Placer County residents.

Irrigation Efficiency Workshops: Another program that involves partnership with NCRCD is the Irrigation Efficiency Workshops. The workshops focus on irrigated pasture management and crop

efficiency. Two or more workshops were completed each year from 2011-2019 with an average of 40 participants per workshop.

NID Landscaping Project: NID's Water Wise Irrigation Project consisted of removing a portion of turf at the District's headquarters office and replacing with planting and irrigation systems for a demonstration on how to provide water efficient landscaping. Since the project was completed, NID performs regular maintenance to the garden, and anticipates conducing irrigation tours in the future.

Water Conservation School Assemblies: NID worked with South Yuba River Citizens League to provide multiple water conservation school assemblies known as "The Great Water Mystery". The assembly was offered at schools located within the District's service area and was completed in 2016.

Nevada County Building Fair: NID's Water Efficiency Technician and Business Services Technician attend the Nevada County Building Fair. There, they coordinate a booth with information and giveaways for attendees aimed at increasing efficiency awareness.

Farm Days: Farms Days is targeted to educate approximately 500 2nd and 3rd graders in Nevada County about the importance of Agriculture, including the importance of responsible water use practices. NID's booth consisted of interactive educational materials and activities for the children. As this event is aimed at public education and outreach, the District anticipates participating in this annual event for the foreseeable future.

Lincoln Creek Fest: NID offered a booth at the Lincoln Creek Fest, bringing awareness to members of the Lincoln Community of NID's role in the area. Coasters, seed packets, magnets, toilet tabs, and informational pamphlets were given away to attendees. The Lincoln Creek Fest is aimed at educating the public about local creeks and waterways and included a "Creek Clean-Up" activity for participants.

Sustainable Food and Farm Conference: NID has hosted educational booths at this conference for the past three years. Educational information on water efficient plants, NID's service area, and raw water were provided.

Table Tents: NID distributes "Water Served Upon Request" table tents to restaurants within the District's service area. This program is aimed at promoting public awareness of water conservation, and offers individuals a way to actively contribute toward the overall goal of conservation.

Poster/Slogan Contests: NID works with schools within the service are to promote a poster/slogan contest. Possible incentives include a gift card drawing for teachers who have students participating with 1st, 2nd and 3rd place winners for each age group. Winners are honored at District Board meetings and posters are displayed in the District office and/or local businesses. Due to the COVID pandemic, this program was delayed during 2020, although the District expects to employ the program when the opportunity arises. The District anticipates ongoing implementation of this program.

Implementation of the District's public outreach and education program is active and ongoing, although some activities have been limited due to the COVID pandemic. The District plans to continue to develop information and activities aimed at conservation messaging and awareness to

the public. The water savings from these programs are not directly quantified, and are considered passive.

7.5 Programs to Assess and Manage Distribution System Real Loss

Ongoing leak detection and repair within the system, focused on the high probability leak areas, is used to asses and manage the system's real losses. This includes a continuing meter calibration and replacement program for all production and distribution meters. The District conducts annual water audits and leak detection and repair on an ongoing basis. The District conducted a water loss audits during 2016 through 2020 as described in Chapter 3. Because the District maintains records on all leaks repaired on its treated water system, the information is annually reviewed and used to determine which pipelines should be considered for replacement as part of the annual budgeted project list. The ongoing budget for repair and replacement of leaking treated water distribution pipes amounts to approximately $1 million annually.

The program for leak detection and repair began in 1985. The District will continue to audit their water distribution systems, per American Water Works Association (AWWA) guidelines, by comparing water produced and water delivered. Each system is audited at least annually. The District will continue its leak detection program and will schedule surveys on high water loss systems as determined by the annual water audits and leak history records. The District will continue rehabilitating its water distribution system by replacing water mains with extensive leak histories. Water Efficiency staff continue to work with various departments to improve and refine data collection aimed at improving the District's validity score where appropriate.

Effectiveness of NID's programs to assess and manage the Distribution system real loss is evaluated by tracking leak detection and leak repair and comparison of prior water use to future water use. The District maintains records of numbers and locations of leaks that are detected and repaired each year. The District implemented an asset management program beginning in 2015 to be able to better track repairs.

7.6 Water Conservation Program Coordination and Staffing Support

Since 2011 the District has staffed a full-time water conservation coordinator water efficiency technician. The conservation coordinator performs a variety of highly responsible technical duties in support of the District's water conservation program, including water distribution and production activities. The conservation coordinator plans, organizes, tracks, implements and reports on various water efficiency, distribution and production programs, conducts public outreach/education activities regarding the District's water efficiency, and investigates reports of water waste. The conservation coordinator identifies, recommends, and implements programs and activities that will improve water use efficiency by NID customers. The conservation coordinator develops programs to efficiently communicate to NID customer base, and has established a toilet rebate program, a retrofit program at the local fair grounds, and mulch giveaway events.

The implementation of the District's water conservation program is ongoing. Recent budget allotments have averaged $271,000 per year, which includes programmatic and staff costs. Water savings from this DMM cannot be directly quantified. Effectiveness of this DMM is evaluated by the overall success of the District's water conservation program.

7.7 Other Demand Management Measures

In addition to the DMMs presented above, NID also undertakes various programs and provides rebates aimed at increasing water use efficiency and reducing waste. Information on these additional DMMs employed by the District is presented below.

Leak Detection: Starting with the new cellular read (Badger) meters, leak detection was a new project beginning in 2017. The Badger meters are actively monitored and NID is notified of water usage at a property for more than 24 hours. The Water Efficiency Technician monitors the leaks and makes contact with the customer regarding the apparent leak.

High Efficiency Toilet Rebate Program: NID's Toilet Rebate Program was developed to provide a financial incentive to encourage customers to replace older, inefficient toilets with High Efficiency Toilets (HET). The HETs are rated at 1.28 gallons per flush or less, and implementation of this program is estimated to conserve up to 3.4 million gallons of water annually. To date, NID has sent out 71 rebate applications, and approved 27 toilet rebates. Since implementation of this program, no rebate application has been denied.

Large Landscape Conservation Program Incentives: NID promotes informed landscape water management to encourage conservation through a Demonstration Garden located at the Grass Valley office. At the Demonstration Garden, NID has prepared and makes available irrigation educational information for all customers. As presented earlier, the District's newsletter is published four times a year and informs the public of the District's Demonstration Garden. The large landscape conservation program consists of actions for dedicated irrigation accounts as well as mixed metered or non-metered CII accounts to implement. NID advertises and hosts irrigation seminars annually to reduce water usage, improve irrigation scheduling, and create more efficient irrigation systems. The educational seminars are applicable to large landscape customers, including raw water and treated customers. Appendix D contains information on the irrigation seminars provided by the District.

CII Accounts Surveys: All of the District's 838 CII accounts are metered. The District has sorted these accounts to market and target those with the largest meters and highest consumption. As needed, the District will be working with those customers to reduce usage and identify inefficiencies.

Agricultural Water Conservation: In 2015 and 2020, the District prepared an Agricultural Water Management Plan in compliance with the Agricultural Water Management Planning Act. The Agricultural Water Management Planning Act calls for agricultural water suppliers to report on which efficient water management practices they have implemented and plan to implement and to describe the associated water use efficiency improvements. The District continues to implement water measurement and volume based pricing with an incentive pricing structure for all agricultural customers. Gaging stations to help monitor flows at intermediate locations along the canals as well as automating reading stations will continued to be installed annually. The District holds water efficiency workshops annually (on hold during the pandemic). The District actively inspects and maintains raw water supply pumps, conducts pump efficiency tests, and replaces pumps as necessary and as funding allows. The District continues to work with PG&E to increase the flexibility in the timing and location of the PG&E supply so that the District can more efficiently manage the water supply. The District's agricultural efficient water management practices are described in detail in the recently adopted 2020 Agricultural Water Management Plan.