Water Use Estimates

For Eel River Valley Groundwater Basin

Humboldt County Department of Public Works

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1. Introduction

1.1 Purpose

The purpose of this technical memorandum (TM) is to summarize the water use components of the Eel River Valley Groundwater Basin (ERVB) water budget, to be included in the Groundwater Sustainability Plan (GSP). The summary comprises data sources, monitored/recorded values, and an overview of derivation methodology. This technical memorandum focuses on consumptive surface and groundwater uses via inflows and outflows (inputs and outputs) of the ERVB's water budget. Non-consumptive elements of the water budget, such as streamflow, precipitation, and non-consumptive groundwater infiltration, are included in the water budget and discussed in Section 5 of the GSP.

1.2 Water Use Components

Consumptive surface water and groundwater elements of the water budget result from municipal, domestic, commercial, industrial, agricultural, and cannabis uses. Herein, consumptive uses for both surface water and groundwater are referred to as outflows or inflows. Evapotranspiration is a key component of the water budget. Evapotranspiration from urban landscape land uses is considered a surface water consumptive use, while evapotranspiration from irrigated crops is considered a groundwater consumptive use.

Surface water outflows consist of direct withdrawals for irrigation and municipal diversions. Surface water inflows consist of municipal returns of wastewater effluent discharge. Surface water consumption is a very small portion of the ERVB's overall surface water outflow budget, at 0.01% or less (Table 1). Similarly, surface water inflow (returns) are also very small portions of the overall surface water subsection of the water budget for the Basin at 0.01% for the 2011-2020 period. Evapotranspiration from surface water (urban landscape consumptive uses) encompasses a higher portion of the surface water outflow subsection of the water budget, at 0.39%.

Table 1. Summary of proportion of the surface water subsection of the Basin's water budget for surface water use components, 2011-2020

Surface Water Component	**Irrigation Diversions from Surface Waters**	**Municipal Diversions from Rio Dell and Scotia**	**Evapotranspiration from Surface Water (Urban Landscape)**	**Municipal Wastewater Effluent Returns**
Water Budget Component	Surface Water Outflow	Surface Water Outflow	Surface Water Outflow	Surface Water Inflow
Approximate Percent of Water Budget	< 0.001%	0.01%	0.39%	0.01%

Groundwater outflows result from pumping and evapotranspiration. Groundwater outflow from pumping includes municipal, domestic, commercial, industrial, agriculture irrigation, and cannabis uses. Groundwater pumping from the 2011 through 2020 period totals a slightly larger portion of all groundwater outflows in the groundwater subsection of the Basin's water budget, at 5.05% (Table 2). Evapotranspiration from groundwater (irrigated crops) results in the highest portion of the groundwater outflow subsection of the water budget compared to other consumptive groundwater uses, at 16.46%.

Groundwater inflow includes municipal returns of wastewater effluent discharge, as well as non-municipal infiltration returns from domestic and commercial users but exclude irrigation water returns. Groundwater inflow (returns) is proportionally smaller, totaling 0.46% of all groundwater inflow in the groundwater inflow subsection of the water budget and result from wastewater effluent infiltration (Table 3).

Table 2. Summary of proportion of groundwater subsection of the Basin's water budget for groundwater use outflow components, 2011-2020

Groundwater Component	Municipal Pumping	Domestic Pumping	Commercial / Industrial Pumping	Irrigation Pumping	Cannabis Pumping	Evapotranspiration from Groundwater	Total
Approximate Percent of Water Budget	0.6%	0.14%	0.01%	4.27%	0.03%	16.46%	**35.47%**

Table 3. Summary of proportion of groundwater subsection of the Basin's water budget for groundwater use inflow components, 2011-2020

Groundwater Component	Municipal Wastewater Effluent	Non-Municipal Wastewater Effluent	Total
Approximate Percent of Water Budget	0.31%	0.15%	**0.46%**

1.2.1 Surface Water

Within the Basin's water budget, surface water uses are described as both outflows and inflows (outputs and inputs). Direct agriculture irrigation diversions are derived from land use estimates for surface water irrigated crops and water use estimates per acre, as shown in the Agriculture Water Use TM, and are the smallest surface water outflow component of the water budget (< 0.001%, see Table 1), ranging from 63 to 88 acre-feet annually. Municipal pumping by the City of Rio Dell and the Scotia Community Services District (CSD) is also a small component of surface water outflow (< 1,000 acre-feet annually) and approximately 0.01% of the water budget (Table 1). The city and CSD provided measured surface water use data for input into the water budget.

Surface water returns (inflow) from wastewater effluent from Ferndale, Fortuna, Loleta, Rio Dell, and Scotia are also included in the water budget, averaging 833 acre-feet annually between 2011 and 2020. The combined wastewater effluent is a very small component of the surface water inflow water budget (0.01%, Table 1).

1.2.2 Groundwater

Within the Basin's water budget, groundwater water uses are described as both outflows and inflows (outputs and inputs). Consumptive groundwater use in the Basin is driven by groundwater pumping, which is categorized as an outflow in the water budget. Groundwater outflow in the Eel River Valley basin is accounted for in the water budget and includes pumping for municipal, domestic, agriculture irrigation, and cannabis uses, Bear River Band of the Rohnerville Rancheria, Del Oro (Ferndale), City of Fortuna, Hydesville Water Service District, Loleta CSD, Palmer Creek CSD, City of Rio Dell, Palmer Creek CSD, Riverside CSD, and unincorporated areas in Humboldt County. Groundwater outflows from service providers were input into the water budget from service provider recordkeeping. Municipal and irrigation uses are smaller groundwater outflow components of the water budget and show less variability among water year types. Combined, groundwater pumping totals 5.05% of all groundwater outflow in the ERVB's water budget, with the largest portion attributable to agriculture irrigation pumping (4.27%, Table 2). Groundwater use components of the ERVB's groundwater outflow water budget that result in groundwater returns include municipal and non-municipal wastewater effluent via land application or infiltration but exclude agricultural irrigation return flows. Combined wastewater effluent returns are also very small components of the ERVB's groundwater inflow budget, totaling approximately 0.46% (Table 3).

2. Surface Water Components

Consumptive surface water inflows and outflows captured in the ERVB's water budget include irrigation diversions, municipal diversions, and municipal wastewater effluent returns.

2.1 Irrigation Diversions

Within the water budget, irrigation diversions are considered surface water outflows. Within the ERVB, only four (4) parcels, totaling 126.3 acres of grazed pasture, use direct surface water diversion for agriculture irrigation purposes. The parcels are irrigated with a traveling gun, and the water source is Oil Creek, a tributary to the Eel River.

Surface water diversion for agriculture irrigation is a relatively small portion of the consumptive surface water use components in the water budget, averaging 117 acre-feet annually (Table 4). At 0.32 acre-feet per day, the equivalent annual average discharge withdrawn from surface waters is approximately 0.16 cubic feet per second (cfs). Diversions were lowest during the two Wet water years, in 2011 and 2017. The volume of water for this component was based upon mapped irrigation area and the annual irrigation water demand estimate, which was determined by the Humboldt County Resource Conservation District (RCD) and the County Department of Public Works (DPW) using flow meter data from several irrigated facilities during 2021. Demand rates are presented as a volume of water per land area.

Table 4. Total annual irrigation surface water diversion within the ERVB in acre-feet

2011 *Wet*	2012 *Below Normal*	2013 *Below Normal*	2014 *Critical*	2015 *Dry*	2016 *Above Normal*	2017 *Wet*	2018 *Above Normal*	2019 *Below Normal*	2020 *Dry*	2011-2020 Average
101	114	114	152	126	114	101	114	114	126	117

2.2 Municipal Diversions

Within the ERVB's water budget, municipal diversion is considered surface water outflow. The municipalities of Rio Dell and Scotia both pump water from the Eel River, via their water treatment plants, to supply their potable water demand. Water production records were provided by the municipalities. Data from Scotia is based on water use rates from the Town of Scotia CSD Municipal Service Review (Humboldt County DPW 2010). Scotia's annual average water usage is estimated to be 543 acre-feet. Monthly use estimates are made using scaled monthly records from the City of Fortuna's water usage as a point of reference.

From 2010 to 2020, total municipal diversion from the City of Rio Dell and Scotia CSD averaged 824 acre-feet annually (Table 5). At 2.26 acre-feet per day, the equivalent annual average discharge withdrawn from surface waters is approximately 1.14 cfs. Usage does not substantially vary based on water year conditions. Municipal diversion of surface waters represents a very small component of surface water outflow in the overall ERVB water budget, at 0.1%.

Table 5. Total annual municipal surface water diversion within the ERVB in acre-feet

2011 *Wet*	2012 *Below Normal*	2013 *Below Normal*	2014 *Critical*	2015 *Dry*	2016 *Above Normal*	2017 *Wet*	2018 *Above Normal*	2019 *Below Normal*	2020 *Dry*	2011-2020 Average
847	857	893	837	797	816	805	809	765	812	824

2.3 Municipal Wastewater Effluent Discharge to Surface Waters

Within the ERVB's water budget, municipal wastewater effluent discharge (returns) to the river is considered a surface water inflow. The water budget sums wastewater effluent returns from the communities of Rio Dell, Loleta, Scotia, Ferndale, Fortuna, and Palmer CSD (included with Fortuna).

Wastewater flows are estimated as a percentage of water use relative to streamflow in the Eel River. Municipal discharge to the Eel River is only allowable during periods of higher flows. Discharge records from the City of Fortuna help determine when effluent discharge to the river occurred or when effluent discharge was attributed to land application or infiltration (groundwater) discharge. Over the 2010 through 2020 period, total municipal effluent wastewater returns from the communities of Rio Dell, Loleta, Scotia, Ferndale, Fortuna, and Palmer CSD averaged 833 acre-feet. It should be noted that wastewater effluent includes water that was originally from both surface water diversion and groundwater. At 2.28 acre-feet per day, the equivalent annual average discharge return to surface waters is approximately 1.15 cfs. Return flows from municipal wastewater effluent do not substantially vary based on water year conditions.

Table 6. Total annual municipal wastewater effluent discharge to surface waters in acre-feet

2011 *Wet*	2012 *Below Normal*	2013 *Below Normal*	2014 *Critical*	2015 *Dry*	2016 *Above Normal*	2017 *Wet*	2018 *Above Normal*	2019 *Below Normal*	2020 *Dry*	2011-2020 Average
838	823	872	869	810	797	793	822	814	897	833

3. Groundwater Components

Consumptive groundwater outflow in the ERVB's water budget include pumping from municipal, domestic, commercial, industrial, agriculture irrigation, and cannabis water users. It should be noted that permitted cannabis water supply within the ERVB is primarily from groundwater, though within the larger watershed, but outside of the ERVB, surface water sources are more commonly used. These diversions of surface water from outside of the ERVB would be reflected in U.S. Geological Survey (USGS) stream flow gauges at the ERVB boundaries (Bridgeville and Scotia gauges). Groundwater inflows are limited to municipal wastewater effluent returns via land application and infiltration, as well as non-municipal and domestic wastewater effluent return (septic leach fields).

3.1 Municipal Pumping

Within the ERVB's water budget, municipal groundwater pumping is a groundwater outflow, estimated based on available records, which vary by entity. Municipal water suppliers provided groundwater usage in a monthly or annual format. Municipal pumping ranges from 1,599 to 1,832 acre-feet annually (Table 7). Data provided by each municipality or CSD for incorporation into the ERVB's water budget is summarized as follows:

– Loleta CSD – annual groundwater production based on monthly water usage from 2015 through 2020; usage from 2011 through 2015 based on monthly average values of the 2015 through 2020 data
– Palmer Creek CSD – annual groundwater production from 2010 through 2020 summed from monthly production records
– Bear River Band of the Rohnerville Rancheria– annual groundwater production summed monthly from production records for the Tish Non and Spring Hill water production facilities, from 2014 through 2020

– City of Fortuna – annual groundwater production summed monthly from production records from municipal wells for the 2010 through 2020 period
– City of Rio Dell – groundwater production commenced in 2018; annual groundwater production data provided in gallons for 2018, 2019, and 2020 only; usage for 2011 through well production in 2018 was set at zero acre-feet
– Hydesville Community Water District – annual groundwater production summed monthly production records for 2010 through 2020
– Del Oro Water Company (Ferndale) – annual groundwater production summed monthly from production records for the Low Springs, High Springs, and Van Ness wells for 2010 through 2020
– Riverside CSD – annual groundwater production based on average annual water usage from 2005 through 2007, 2009 through 2013, and 2015; water use records for 2008, 2014, or 2016 through 2020 were unavailable; average annual usage modeled in place of unavailable pumping data, converted to monthly data based on the usage patterns of other ERVB municipalities that kept monthly usage records, as usage was not equivalent across all months

Table 7. Total annual municipal groundwater pumping in acre-feet

2011 *Wet*	2012 *Below Normal*	2013 *Below Normal*	2014 *Critical*	2015 *Dry*	2016 *Above Normal*	2017 *Wet*	2018 *Above Normal*	2019 *Below Normal*	2020 *Dry*	2011-2020 Average
1,772	1,727	1,764	1,814	1,599	1,660	1,673	1,729	1,758	1,832	1,733

3.2 Domestic (Non-Municipal) Pumping

Within the ERVB's water budget, domestic (residential wells) groundwater pumping is a groundwater outflow. Total non-municipal domestic pumping is estimated at 414 acre-feet annually, for all years, for parcels that are outside of municipal water supply systems. The amount of water pumped is based upon the number of dwelling units for the given parcels. Water use for the parcel is based upon data from several sources and includes land use zoning, parcel improvements, and parcel size. Six datasets were used to create the water/wastewater demand:

- Assessor Parcel data was received from the County of Humboldt in January 2021
- CSD boundaries were downloaded from the county GIS data portal and dated August 2020
- Del Oro Water Company and Riverside CSD boundaries were provided by Humboldt County in March 2021
- Bear River Band of the Rohnerville Rancheria parcels were identified using County parcel data
- City boundaries were downloaded from the county GIS data portal and dated July 2019
- Building outlines were provided by the County of Humboldt in March 2021

The city, CSD, and tribal boundaries are spatially joined to the parcel data based on the center point of each parcel boundary. For example, if the center point of a parcel falls within a city boundary, even though the entire boundary is not contained in the city boundary, then the parcel is considered within the city. In places where a CSD and city boundary overlap, both entities are listed. This produces a layer of parcels that note which entity may be providing water or wastewater services.

To calculate total square footage of buildings within each parcel, the building footprint layer is associated by the Assessor Parcel Number (APN). This gives a general sense of building sizes within each parcel.

Once all the layers are joined, data is exported from GIS to excel, and from there further assumptions can be made about water and wastewater demand. To determine which parcels, include domestic groundwater pumping, the following GIS analysis starts with all parcels in the entire ERVB:

1. Exclude all parcels with the word "vacant" in the description AND are assigned an improved value less than $5,000
2. Exclude roads, streets, etc.; these parcels had a value of "no" under the parcel attribute in the original parcel shapefile and were excluded on that basis
3. Determine the building footprint size on each parcel; the area is the sum of all buildings on the parcel (completed in GIS)
4. Initially, parcels within the Palmer Creek CSD areas were retained, but later excluded because the Palmer CSD provides water, and wastewater goes to the Fortuna wastewater treatment plant (WWTP), to avoid double counting with municipal data
5. Remove all non-residential parcels with buildings that would not have septic loads, such as storage sheds or hay barns; these are denoted as parcels with building footprint AND improved value equaling 0
6. Remove non-residential parcels with no buildings (description = Rural, Agricultural, Misc Imps, Unrestricted), as recommended by Humboldt County Planning Director John Ford, given undeveloped parcels would not result in any domestic water demand
7. Remove residential parcels with improvement values of less than $5,000, as recommended by Humboldt County Planning Director, John Ford, given unimproved parcels (<$5,0000) would not result in any domestic water demand

The pumping rates per parcel were based upon the number of dwelling units assigned to each parcel, the number of people per dwelling unit, and water demand per person. There were 1,498 parcels that had or had the potential to have a domestic dwelling. The number of dwelling units for each parcel was assigned based upon the zoning, zoning description and parcel improvements. Dwelling units per parcel ranged from 1 to 10. It was assumed that there were 2.4 persons per dwelling unit. This value was based upon the US Census website for Humboldt County. The water use per person was assumed to be 100 gallons per day per person. This value is conservative and is consistent with USGS Estimated Use of Water in the United States in 2015 (USGS 2017). This resulted in 240 gallons per dwelling unit per day. The yearly domestic water demand was calculated by multiplying the number of dwelling units per parcel by the water demand per dwelling unit by the number of days in the year. The yearly domestic water demand per parcel ranged from 0.27 to 2.69 acre-feet per year. The total domestic water demand is calculated by summing up the yearly domestic water demand for all selected parcels. This resulted in 414-acre feet per year for the basin.

3.3 Commercial and Industrial Pumping

Within the ERVB's water budget, commercial and industrial groundwater pumping is considered groundwater outflow for parcels that are outside of municipal water supply systems. Commercial and industrial users comprise public lands, schools, community buildings, motels, restaurants, heavy industry, wood products, miscellaneous commercial, and light industrial. The pumping for these parcels is estimated at 34 acre-feet annually for all years. Water use for the parcel is based upon land use zoning, parcel improvements, and parcel size. The GIS analysis used to determine domestic groundwater pumping is also applied to determine commercial and industrial pumping. As an exception, non-residential parcels are retained in the analysis and residential parcels excluded. Parcels identified as agriculturally irrigated parcels in the Humboldt County RCD irrigated acres databased are also excluded.

With commercial and industrial parcels identified, a pumping rate based on the equivalent number of dwelling units is applied to each unique parcel. The equivalent dwelling unit values are determined based on the building square footage. The County planning department provided water consumption per day per square foot (sf) of building for various types of zoning, as summarized in Table 8. The total water use per parcel ranges from 0.1 to 4.13 acre-feet per year. The data was provided as Excel files that were exported from the County parcels database.

Table 8. Commercial and industrial water use per square foot

Description	Assumed Building Category	Water Use (gallons per thousand sq ft per day)
Comm – Motel, Rest, Serv Stn	Lodging	189
Commercial Golf Course	Other	48.9
Commercial Mini-Warehouse	Warehouse and Storage	9.3
Commercial Office	Office	40
Commercial Retail, 2000 and above	Mercantile	34.3
Commercial Retail, to 1999 square feet	Mercantile	34.3
Commercial Warehouse	Warehouse and Storage	9.3
Commercial, Garage	Warehouse and Storage	9.3
Commercial, Misc	Other	48.9
Common Area, Commercial	Other	48.9
Full-Service Restaurant	Fast Food or Small Restaurant	68
Heavy Industrial, Wood Product	Other	48.9
Industrial – Light	Other	48.9
Misc Light Industrial	Other	48.9
Public Land, Schools, Non-Taxable Entities	Other	48.9
Public Utilities	Other	48.9

3.4 Agriculture Irrigation Pumping

Within the ERVB's water budget, groundwater pumping for irrigation is considered groundwater outflow. Irrigation pumping from groundwater is based upon mapped irrigation areas and the annual irrigation water demand estimate using direct measurement data, as documented in the Agricultural Water Use TM (Humboldt County 2021). Humboldt County determined the annual estimate using flow meter data from several irrigated facilities (Humboldt County, November 2021). These demand rates vary by water year type and are presented as a volume of water per land area. Irrigation pumping ranges from 10,694 to 14,848 acre-feet annually, higher during drier water year types (Table 9).

Table 9. Total annual irrigation groundwater pumping in acre-feet

2011 *Wet*	2012 *Below Normal*	2013 *Below Normal*	2014 *Critical*	2015 *Dry*	2016 *Above Normal*	2017 *Wet*	2018 *Above Normal*	2019 *Below Normal*	2020 *Dry*	2011-2020 Average
10,694	12,196	12,196	14,848	13,522	11,754	10,694	11,754	12,196	13,522	12,338

3.5 Cannabis Pumping

Within the ERVB's water budget, groundwater pumping for cannabis cultivation is considered a groundwater outflow. Water demand for cannabis irrigation is assumed to come from groundwater wells, developed by estimating the number of plants and irrigated areas based upon permitted cannabis cultivation sites within the ERVB as provided by the Humboldt County Planning and Building Department. In 2020, the Basin included approximately 50 sites with cannabis permits, primarily for outdoor or mixed-light cultivation. The indoor growing season was assumed to be year-round and the outdoor irrigation period was assumed to extend from June through October. Water demand per plant estimates is evaluated from several sources. Demand rates range from one (1) to 15 gallons per plant per day. For this analysis, a value of six (6) gallons per plant per day are used for outdoor plants (Bauer et al. 2015). Indoor cannabis has a much lower demand of 0.5 gallons per plant per day (Mills 2012). The demand for unpermitted cannabis sites is estimated as an additional 30% of the permitted demand. This is based upon California Department of Fish and Wildlife (CDFW) estimates for other north coast basins (Bauer et al. 2015). Cannabis pumping is assumed to be 98 acre-feet annually for all years, independent of water year type and including the additional 30% from unpermitted cannabis sites.

3.6 Municipal Wastewater Effluent Infiltration or Land Application Discharge

Within the Basin's water budget, municipal wastewater effluent infiltration or land application are considered groundwater inflow and account for wastewater effluent from the City of Rio Dell, Loleta CSD, City of Ferndale, Scotia CSD, City of Fortuna (which includes the Palmer CSD), and Bear River Band of the Rohnerville Rancheria based on records provided by each municipality for 2010 through 2020. The volume of wastewater effluent is based upon a percentage of water production (70%). This value is validated by wastewater flow records from Fortuna during months with little or no precipitation, when stormwater inflow an infiltration are not factors. Groundwater inflow from municipal wastewater averaged 895 acre-feet annually for 2011 through 2020 (Table 10). Additional details for each municipality are as follows:

– Loleta CSD – annual wastewater effluent discharge based on a percentage of water production; wastewater discharge to infiltration occurs in months when there is no discharge into the river, as described in Section 2.3 of this TM
– Bear River Band of the Rohnerville Rancheria – annual wastewater effluent discharge based on a percentage of water production; all Bear River wastewater goes to septic leach fields
– City of Fortuna – municipal wastewater effluent infiltration summed from monthly records at Strongs Creek near the City of Fortuna Waste Water Treatment Plant (WWTP) from 2010 through 2020; Fortuna's annual wastewater effluent land disposal volumes also summed from monthly records available from 2010 through 2020
– City of Rio Dell – annual wastewater effluent discharge based on a percentage of water production; wastewater discharge to infiltration occurs in months when there is no discharge into the river, as described in Section 2.3 of this TM
– City of Ferndale – annual wastewater effluent discharge based on monthly WWTP records from October 2012, when the new WWTP went into operation, through 2020; discharge to surface waters (Salt River) occurs from October 1 through May 14, annually, but otherwise, wastewater disposal

occurs via land discharge; average annual usage modeled in place of unavailable wastewater data (all months in 2011 and some months in 2012) prior to contemporary record keeping available for the new WWTP

Table 10. Total annual municipal wastewater effluent infiltration or land application discharge in acre-feet

2011 *Wet*	2012 *Below Normal*	2013 *Below Normal*	2014 *Critical*	2015 *Dry*	2016 *Above Normal*	2017 *Wet*	2018 *Above Normal*	2019 *Below Normal*	2020 *Dry*	2011-2020 Average
869	784	1,047	1,002	1,038	726	744	842	864	1,038	895

3.7 Non-Municipal Domestic and Commercial/Industrial Wastewater Effluent Infiltration

Within the Basin's water budget, non-municipal domestic, commercial, and industrial wastewater effluent (septic) are considered groundwater inflow. Non-municipal domestic, commercial, and industrial pumping is estimated for parcels outside of municipal water supply systems to be 426 acre-feet annually for 2011 through 2020. The amount of water pumped is based upon the number of dwelling units or industrial processes for given parcels. Water use for a parcel is based upon land use zoning, parcel improvements, and parcel size.

4. Consumptive Evapotranspiration

Within the ERVB's water budget, evapotranspiration from open water, riparian, and urban landscape land uses is considered surface water outflow, while evapotranspiration from irrigated crops and natural vegetation land uses is considered groundwater outflow. Within evapotranspiration, consumptive evapotranspiration results from irrigation via surface water and groundwater, waste water effluent returns, and the urban landscape. Evapotranspiration from urban landscape is assumed to draw water from sources of water that are accounted for in the municipal supply and not from rivers or open water. Evapotranspiration attributed to both surface water and groundwater is estimated using the California Department of Water Resources (DWR) Cal-SIMETAW model. In August 2019, DWR began operating a California Irrigation Management Information System (CIMIS) station in Ferndale which collects data that can be processed to generate site-specific estimates of evapotranspiration, which are likely to be more accurate than the Cal-SIMETAW modeling estimates. However, the CIMIS data were not used for the water budget because the water budget spans a period of ten years and the CIMIS data were available for only a small portion of this period. For additional information regarding the determination of land uses used to estimate evapotranspiration in the Cal-SIMETAW model, please see Section 2.5 of the Land Use Inventory for the Eel River Valley Basin (GHD 2021) and Agriculture Water Use Technical Memorandum for the Eel River Groundwater Basin (Humboldt County Department of Public Works, 2021).

4.1 Evapotranspiration from Urban Landscape

Evapotranspiration from urban landscape land uses is analyzed as surface water outflow in the ERVB's water budget, estimated using the DWRs Cal-SIMETAW model. The model produces monthly evapotranspiration rates for various crop types, native (or natural) vegetation, riparian, and open water. The land use areas are determined by combining the irrigated areas land use and remote image analysis. This produces the areas of natural vegetation, riparian, impervious surfaces, and open water, which is then used

with the Cal-SIMETAW evapotranspiration rates to calculate the monthly water demand. The monthly demand is then summed for each water year to calculate the annual amount.

Evapotranspiration from surface water attributable to urban landscape ranges from a minimum of 37,837 acre-feet in 2012 (Below Normal water year) to a maximum of 42,318-acre feet in 2017 (Wet water year, Table 11). Within the water budget, surface water outflows via evapotranspiration are substantially higher (factor of ten) than the sum of surface water outflows from irrigation and municipal diversions combined.

Table 11 Total Annual Evapotranspiration from Urban Landscape in Acre-Feet

2011 *Wet*	2012 *Below Normal*	2013 *Below Normal*	2014 *Critical*	2015 *Dry*	2016 *Above Normal*	2017 *Wet*	2018 *Above Normal*	2019 *Below Normal*	2020 *Dry*	2011-2020 Average
41,809	37,837	39,679	40,761	41,095	41,621	42,318	41,621	40,553	41,406	40,870

4.2 Evapotranspiration from Irrigated Crops

Several sources for estimating evapotranspiration for irrigated crops include DWRs Cal-SIMETAW model, DWRs California Irrigation Management Information System Ferndale Plains Station #259 (CIMIS # 259) (https://cimis.water.ca.gov/WSNReportCriteria.aspx), and DWRs average reference evapotranspiration for Zone 1 Coastal Plains Heavy Fog Belt of 32.9" (https://cimis.water.ca.gov/Content/pdf/CimisRefEvapZones.pdf). Evapotranspiration from irrigated crops is analyzed as groundwater outflow in the ERVB's water budget. DWRs Cal-SIMETAW model produces monthly evapotranspiration rates for various irrigated crop types, native (or natural) vegetation, riparian, and open water, land use areas determined by combining the irrigated areas, land use and remote image analysis, developed by the Humboldt County RCD and recently updated in the Land Use Technical Memorandum (GHD, 2021). These areas are used with the Cal-SIMETAW evapotranspiration rates to calculate the monthly crop evapotranspiration. The monthly demand due to evapotranspiration is summed for each water year to calculate the annual amount.

Evapotranspiration for irrigated crops sums irrigation from groundwater. Based on DWRs Cal-SIMETAW model results, evapotranspiration from groundwater averages 44,286 acre-feet and was variable over the 2011 through 2020 period, based on water year conditions. The value of the evapotranspiration of irrigated crops does not include the amount of water applied from irrigation supply wells, presented in Section 3.4. The total evapotranspiration of irrigated crops, which includes irrigation pumping (Table 9), wastewater irrigated crops, and surface water irrigated crop is presented in Table 12. Within the water budget, groundwater outflows via evapotranspiration are substantially higher than the sum of groundwater outflows from other groundwater consumptive uses, including irrigation pumping.

Table 12. Annual evapotranspiration from irrigated crops in acre-feet

2011 *Wet*	2012 *Below Normal*	2013 *Below Normal*	2014 *Critical*	2015 *Dry*	2016 *Above Normal*	2017 *Wet*	2018 *Above Normal*	2019 *Below Normal*	2020 *Dry*	2011-2020 Average
46,287	39,787	42,349	43,752	44,290	45,940	46,289	45,940	43,474	44,752	44,286

There is a significant difference between the reference evapotranspiration (ETo) used in the Cal-SIMETAW model and the ETo observed at the Ferndale Plain CIMIS station. For the period 2000-2015, the average annual ETo in the Cal-SIMETAW model was 46.52" (Min – 40.94"; Max – 50.81"). These values are much greater than the ETo values observed at the Ferndale Plain CIMIS station #259 for 2020 and 2021 of 35.08" and 33.71" respectively.

While the ETo from CIMIS #259 is significantly less than the reference evapotranspiration used in the Cal-SIMETAW model, the ETo from CIMIS #259 is consistent with DWRs average reference evapotranspiration for Zone 1 Coastal Plains Heavy Fog Belt of 32.9" (https://cimis.water.ca.gov/Content/pdf/CimisRefEvapZones.pdf).

Since the evapotranspiration for each land use type (ETc) is calculated by multiplying the ETo by the relevant crop coefficient (Kc), the ETo is the determining factor for evapotranspiration estimates. Because the Cal-SIMETAW model uses an ETo that is significantly higher than that observed at the Ferndale Plain CIMIS station #259, annual evapotranspiration is likely overestimated. Through collaboration with DWR and as more CIMIS data are available, the accuracy of estimated evapotranspiration is expected to improve.

5. References

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Appendix A

Municipal Water Use Data

Municipal Water Provider Raw Data

Municipal Water Provider Processed Data

Municipal Water Provider Summary

Loleta Raw Data			
Month	Year	Prouction in Gallons	Backwash In Gallons
July	2020	2,623,900	12,300
June		2,367,600	12,200
May		2,140,900	5,200
April		2,157,000	8,600
March		2,110,200	8,600
February		1,828,900	4,100
Jan		1,865,900	8,000
December	2019	1,872,900	4,100
November		1,795,000	8,000
October		1,823,300	4,000
September		2,144,300	10,300
August		2,341,900	5,100
July		2,362,400	10,300
June		2,048,000	5,100
May		1,851,000	10,200
April		1,966,700	9,500
March		2,003,300	9,400
February		1,754,700	4,700
January		1,939,900	9,500
December	2018	2,000,000	4,800
November		1,927,000	4,900
October		2,224,500	9,500
September		2,873,100	9,500
August		2,940,100	9,400
July		3,041,100	4,600
June		2,934,800	15,000
May		3,119,700	10,100
April		2,529,400	10,100
March		2,051,200	8,000
February		2,047,300	9,900
January		2,411,500	9,900
December	2017	2,349,000	9,800
November		2,383,300	9,900
October		2,465,300	9,900
September		2,420,600	9,800
August		2,578,400	9,800
July		2,389,500	10,400
June		2,177,200	5,500
May		2,108,600	11,200
April		1,978,800	5,800
March		2,225,900	5,900
February		1,665,700	6,000
January		1,930,000	3,700

Loleta Raw Data			
Month	Year	Prouction in Gallons	Backwash In Gallons
December	2016	1,789,000	8,700
November		1,961,200	5,600
October		1,793,700	5,700
September		1,948,100	13,600
August		2,088,100	5,900
July		1,995,600	6,100
June		1,479,200	6,200
May		2,631,400	13,800

Loleta Summary by Year											
	Units	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Water	Acre Feet / Year	75.6	75.6	75.6	75.6	75.6	67.1	76.8	95.6	75.4	63.2
Creek WW	Acre Feet / Year	26.5	29.3	21.9	23.2	33.8	28.7	25.7	33.5	21.1	27.6
Land WW	Acre Feet / Year	26.4	23.6	31.0	29.7	15.1	18.3	28.0	33.4	31.7	28.0

Fortuna Raw Data						
Note: Palmer Pumped = Palmer CSD wastewater conveyed to Fortuna						
Cal Year	Month	Water Year	Total Pumped (MG)	RKM Note	Pumped (AF)	Palmer Pumped (AF)
2010	10	2011	32.91	Average	101	0
2010	11	2011	28.97	Average	89	0
2010	12	2011	29.21	Average	90	0
2011	1	2011	30	Original script value = 7 MGD. Data different from other months; could be incomplete or format not yet standardized. Using average of remaining January values.	93	0
2011	2	2011	27	Original script value = 6 MGD. Data incomplete. Using average of remaining February values.	82	2
2011	3	2011	30	Original script printed error. no data in original file provided by City. Using average of remaining March values.	92	0
2011	4	2011	33		100	0
2011	5	2011	35		109	0
2011	6	2011	39		121	0
2011	7	2011	48		146	0
2011	8	2011	47		146	0
2011	9	2011	45		138	3
2011	10	2012	36		112	0
2011	11	2012	31		96	2
2011	12	2012	31		96	0
2012	1	2012	31		97	2
2012	2	2012	30		91	2
2012	3	2012	33		100	2
2012	4	2012	33		100	2
2012	5	2012	34	Original script value = 999 MGD. From original file provided by City, using 34.4	106	2
2012	6	2012	43		131	2
2012	7	2012	39		120	2
2012	8	2012	35	Original script value = 982 MGD. From original file provided by City, using 34.691	106	2
2012	9	2012	32		97	3
2012	10	2013	33		101	2
2012	11	2013	28		86	2
2012	12	2013	29		89	2
2013	1	2013	29		90	2

Fortuna Raw Data						
Note: Palmer Pumped = Palmer CSD wastewater conveyed to Fortuna						
Cal Year	Month	Water Year	Total Pumped (MG)	RKM Note	Pumped (AF)	Palmer Pumped (AF)
2013	2	2013	27		84	2
2013	3	2013	33		100	2
2013	4	2013	36		110	2
2013	5	2013	45		138	2
2013	6	2013	35		106	2
2013	7	2013	46	Original script value printed error. Original file provided by City has comments indicating meter reading issues. Using average of remaining July values.	141	3
2013	8	2013	38		116	3
2013	9	2013	42		128	2
2013	10	2014	35		106	2
2013	11	2014	31		96	2
2013	12	2014	33		102	2
2014	1	2014	33		100	2
2014	2	2014	29		88	1
2014	3	2014	32		100	1
2014	4	2014	33		101	2
2014	5	2014	37		114	2
2014	6	2014	48		147	3
2014	7	2014	47		145	2
2014	8	2014	42		128	2
2014	9	2014	36		109	2
2014	10	2015	32		97	2
2014	11	2015	27		84	1
2014	12	2015	27		83	2
2015	1	2015	31		95	1
2015	2	2015	25		77	1
2015	3	2015	27		84	1
2015	4	2015	27		83	2
2015	5	2015	32		97	2
2015	6	2015	36		109	2
2015	7	2015	40		123	2
2015	8	2015	38		117	3
2015	9	2015	33		101	2
2015	10	2016	32		99	2
2015	11	2016	28		86	2
2015	12	2016	29		89	2
2016	1	2016	32		99	2

Fortuna Raw Data						
Note: Palmer Pumped = Palmer CSD wastewater conveyed to Fortuna						
Cal Year	Month	Water Year	Total Pumped (MG)	RKM Note	Pumped (AF)	Palmer Pumped (AF)
2016	2	2016	25		77	2
2016	3	2016	28		84	2
2016	4	2016	28		85	2
2016	5	2016	31		94	2
2016	6	2016	37		115	2
2016	7	2016	40		123	2
2016	8	2016	43		132	3
2016	9	2016	40		123	2
2016	10	2017	31		95	2
2016	11	2017	27		84	2
2016	12	2017	28		86	2
2017	1	2017	30		91	2
2017	2	2017	26		80	2
2017	3	2017	30		93	2
2017	4	2017	27		84	1
2017	5	2017	35		108	2
2017	6	2017	35		107	2
2017	7	2017	45		137	3
2017	8	2017	45		137	2
2017	9	2017	38		116	2
2017	10	2018	36		110	2
2017	11	2018	29		89	2
2017	12	2018	29		89	2
2018	1	2018	29		90	2
2018	2	2018	26		79	2
2018	3	2018	29		89	1
2018	4	2018	27		82	2
2018	5	2018	31		96	2
2018	6	2018	37		114	2
2018	7	2018	47		144	2
2018	8	2018	43		132	3
2018	9	2018	39		121	3
2018	10	2019	32		100	2
2018	11	2019	30		91	2
2018	12	2019	29		88	1
2019	1	2019	28		86	2
2019	2	2019	24		75	2
2019	3	2019	28		86	1
2019	4	2019	28		85	2
2019	5	2019	36		111	4
2019	6	2019	39		121	2

Fortuna Raw Data						
Note: Palmer Pumped = Palmer CSD wastewater conveyed to Fortuna						
Cal Year	Month	Water Year	Total Pumped (MG)	RKM Note	Pumped (AF)	Palmer Pumped (AF)
2019	7	2019	47		143	3
2019	8	2019	48		147	3
2019	9	2019	38		117	2
2019	10	2020	33		101	2
2019	11	2020	31		96	2
2019	12	2020	30		92	2
2020	1	2020	30		93	2
2020	2	2020	28		87	2
2020	3	2020	31		94	2
2020	4	2020	33		102	1
2020	5	2020	37		112	2
2020	6	2020	41		126	2
2020	7	2020	53		163	3
2020	8	2020	52		159	3
2020	9	2020	44		134	3

Fortuna Wastewater Effluent Disposal to Surface Waters and Groundwater											
	Units	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Water	Acre Feet / Year	1,310	1,251	1,289	1,335	1,151	1,206	1,218	1,234	1,249	1,361
Creek WW	Acre Feet / Year	458.96	491.22	381.52	417.47	282.25	488.97	485.24	446.80	442.29	403.00
Land WW	Acre Feet / Year	459.67	398.99	538.16	533.45	538.52	371.61	383.52	433.80	450.71	567.74

Rio Dell Raw Data				
Year	MG		AF	
	Surface	Wells	Surface	Wells
2010	99.2	0.0	304.5	0.0
2011	99.1	0.0	304.1	0.0
2012	102.5	0.0	314.4	0.0
2013	114.2	0.0	350.5	0.0
2014	95.8	0.0	294.1	0.0
2015	82.9	0.0	254.4	0.0
2016	89.1	0.0	273.4	0.0
2017	85.4	0.0	262.0	0.0
2018	86.9	5.9	266.8	18.1
2019	72.4	13.2	222.2	40.6
2020	87.7	2.0	269.3	6.2

Rio Dell Summary by Month								
Month	Cal Year	Water Year	Percent of Annual Water Used in Month	Surface Water Pumped (AF)	Groundwater Pumped (AF)	Water Pumped (AF)	Discharge to Eel (AF)	Discharge to Fields (AF)
10	2010	2011	8%	23.9	0.0	23.9	10.0	6.7
11	2010	2011	7%	20.9	0.0	20.9	14.6	0.0
12	2010	2011	7%	20.8	0.0	20.8	14.6	0.0
1	2011	2011	7%	21.7	0.0	21.7	15.2	0.0
2	2011	2011	6%	19.1	0.0	19.1	13.4	0.0
3	2011	2011	7%	21.4	0.0	21.4	15.0	0.0
4	2011	2011	8%	23.2	0.0	23.2	16.3	0.0
5	2011	2011	8%	25.2	0.0	25.2	7.7	10.0
6	2011	2011	9%	28.1	0.0	28.1	0.0	19.7
7	2011	2011	11%	34.0	0.0	34.0	0.0	23.8
8	2011	2011	11%	33.8	0.0	33.8	0.0	23.7
9	2011	2011	11%	32.1	0.0	32.1	0.0	22.5
10	2011	2012	9%	28.1	0.0	28.1	11.8	7.9
11	2011	2012	8%	24.1	0.0	24.1	16.9	0.0
12	2011	2012	8%	24.2	0.0	24.2	16.9	0.0
1	2012	2012	8%	24.3	0.0	24.3	17.0	0.0
2	2012	2012	7%	22.8	0.0	22.8	16.0	0.0
3	2012	2012	8%	25.2	0.0	25.2	17.6	0.0
4	2012	2012	8%	25.1	0.0	25.1	17.6	0.0
5	2012	2012	8%	26.6	0.0	26.6	8.1	10.5
6	2012	2012	10%	33.0	0.0	33.0	0.0	23.1
7	2012	2012	10%	30.0	0.0	30.0	0.0	21.0
8	2012	2012	9%	26.7	0.0	26.7	0.0	18.7
9	2012	2012	8%	24.4	0.0	24.4	0.0	17.1
10	2012	2013	8%	27.4	0.0	27.4	5.7	13.4
11	2012	2013	7%	23.4	0.0	23.4	11.2	5.1
12	2012	2013	7%	24.1	0.0	24.1	16.3	0.5
1	2013	2013	7%	24.5	0.0	24.5	17.2	0.0
2	2013	2013	7%	22.9	0.0	22.9	16.1	0.0
3	2013	2013	8%	27.1	0.0	27.1	19.0	0.0
4	2013	2013	9%	30.1	0.0	30.1	16.2	4.8
5	2013	2013	11%	37.5	0.0	37.5	0.0	26.3
6	2013	2013	8%	28.8	0.0	28.8	0.0	20.2
7	2013	2013	11%	38.2	0.0	38.2	0.0	26.8
8	2013	2013	9%	31.6	0.0	31.6	0.0	22.1
9	2013	2013	10%	34.8	0.0	34.8	0.0	24.3
10	2013	2014	8%	23.4	0.0	23.4	3.1	13.2
11	2013	2014	7%	21.2	0.0	21.2	14.8	0.0
12	2013	2014	8%	22.4	0.0	22.4	15.7	0.0
1	2014	2014	7%	22.0	0.0	22.0	15.4	0.0
2	2014	2014	7%	19.4	0.0	19.4	13.6	0.0

Rio Dell Summary by Month								
Month	Cal Year	Water Year	Percent of Annual Water Used in Month	Surface Water Pumped (AF)	Groundwater Pumped (AF)	Water Pumped (AF)	Discharge to Eel (AF)	Discharge to Fields (AF)
3	2014	2014	7%	21.9	0.0	21.9	15.3	0.0
4	2014	2014	8%	22.2	0.0	22.2	12.5	3.0
5	2014	2014	9%	25.2	0.0	25.2	0.0	17.6
6	2014	2014	11%	32.3	0.0	32.3	0.0	22.6
7	2014	2014	11%	31.9	0.0	31.9	0.0	22.3
8	2014	2014	10%	28.2	0.0	28.2	0.0	19.7
9	2014	2014	8%	24.1	0.0	24.1	0.0	16.9
10	2014	2015	8%	21.5	0.0	21.5	0.0	15.1
11	2014	2015	7%	18.5	0.0	18.5	4.8	8.1
12	2014	2015	7%	18.3	0.0	18.3	12.0	0.8
1	2015	2015	8%	21.0	0.0	21.0	0.0	14.7
2	2015	2015	7%	17.1	0.0	17.1	11.7	0.3
3	2015	2015	7%	18.6	0.0	18.6	13.0	0.0
4	2015	2015	7%	18.3	0.0	18.3	12.8	0.0
5	2015	2015	8%	21.5	0.0	21.5	6.9	8.2
6	2015	2015	10%	24.2	0.0	24.2	0.0	16.9
7	2015	2015	11%	27.1	0.0	27.1	0.0	19.0
8	2015	2015	10%	25.8	0.0	25.8	0.0	18.0
9	2015	2015	9%	22.4	0.0	22.4	0.0	15.7
10	2015	2016	8%	22.4	0.0	22.4	13.4	2.3
11	2015	2016	7%	19.6	0.0	19.6	13.7	0.0
12	2015	2016	7%	20.1	0.0	20.1	14.1	0.0
1	2016	2016	8%	22.4	0.0	22.4	15.7	0.0
2	2016	2016	6%	17.5	0.0	17.5	12.2	0.0
3	2016	2016	7%	19.1	0.0	19.1	9.8	3.6
4	2016	2016	7%	19.2	0.0	19.2	6.7	6.7
5	2016	2016	8%	21.3	0.0	21.3	3.5	11.4
6	2016	2016	10%	26.0	0.0	26.0	0.0	18.2
7	2016	2016	10%	28.0	0.0	28.0	0.0	19.6
8	2016	2016	11%	29.9	0.0	29.9	9.9	11.0
9	2016	2016	10%	27.9	0.0	27.9	9.8	9.8
10	2016	2017	8%	20.4	0.0	20.4	12.2	2.1
11	2016	2017	7%	18.0	0.0	18.0	12.6	0.0
12	2016	2017	7%	18.6	0.0	18.6	13.0	0.0
1	2017	2017	7%	19.5	0.0	19.5	13.6	0.0
2	2017	2017	7%	17.3	0.0	17.3	12.1	0.0
3	2017	2017	8%	20.1	0.0	20.1	10.2	3.8
4	2017	2017	7%	18.0	0.0	18.0	6.3	6.3
5	2017	2017	9%	23.3	0.0	23.3	3.8	12.5
6	2017	2017	9%	22.9	0.0	22.9	0.0	16.0
7	2017	2017	11%	29.5	0.0	29.5	0.0	20.6

Rio Dell Summary by Month								
Month	Cal Year	Water Year	Percent of Annual Water Used in Month	Surface Water Pumped (AF)	Groundwater Pumped (AF)	Water Pumped (AF)	Discharge to Eel (AF)	Discharge to Fields (AF)
8	2017	2017	11%	29.5	0.0	29.5	9.8	10.9
9	2017	2017	10%	25.0	0.0	25.0	8.7	8.7
10	2017	2018	9%	23.7	1.6	25.3	10.6	7.1
11	2017	2018	7%	19.3	1.3	20.6	14.5	0.0
12	2017	2018	7%	19.2	1.3	20.5	14.4	0.0
1	2018	2018	7%	19.4	1.3	20.7	14.5	0.0
2	2018	2018	6%	17.2	1.2	18.3	12.8	0.0
3	2018	2018	7%	19.2	1.3	20.5	14.3	0.0
4	2018	2018	7%	17.8	1.2	19.0	13.3	0.0
5	2018	2018	8%	20.8	1.4	22.2	6.7	8.8
6	2018	2018	9%	24.6	1.7	26.3	0.0	18.4
7	2018	2018	12%	31.1	2.1	33.2	0.0	23.2
8	2018	2018	11%	28.5	1.9	30.4	0.0	21.3
9	2018	2018	10%	26.1	1.8	27.8	0.0	19.5
10	2018	2019	8%	17.7	3.2	21.0	8.8	5.9
11	2018	2019	7%	16.2	3.0	19.1	13.4	0.0
12	2018	2019	7%	15.7	2.9	18.5	13.0	0.0
1	2019	2019	7%	15.3	2.8	18.0	12.6	0.0
2	2019	2019	6%	13.3	2.4	15.8	11.0	0.0
3	2019	2019	7%	15.3	2.8	18.0	12.6	0.0
4	2019	2019	7%	15.2	2.8	18.0	12.6	0.0
5	2019	2019	9%	19.7	3.6	23.3	7.1	9.2
6	2019	2019	10%	21.4	3.9	25.4	0.0	17.8
7	2019	2019	11%	25.5	4.6	30.1	0.0	21.1
8	2019	2019	12%	26.1	4.8	30.8	0.0	21.6
9	2019	2019	9%	20.9	3.8	24.7	0.0	17.3
10	2019	2020	7%	20.0	0.5	20.4	2.7	11.6
11	2019	2020	7%	18.9	0.4	19.3	13.5	0.0
12	2019	2020	7%	18.2	0.4	18.6	13.0	0.0
1	2020	2020	7%	18.5	0.4	18.9	13.2	0.0
2	2020	2020	6%	17.3	0.4	17.7	12.4	0.0
3	2020	2020	7%	18.7	0.4	19.1	13.4	0.0
4	2020	2020	8%	20.3	0.5	20.7	11.7	2.8
5	2020	2020	8%	22.2	0.5	22.7	0.0	15.9
6	2020	2020	9%	24.9	0.6	25.5	0.0	17.8
7	2020	2020	12%	32.3	0.7	33.0	0.0	23.1
8	2020	2020	12%	31.5	0.7	32.2	0.0	22.6
9	2020	2020	10%	26.6	0.6	27.2	0.0	19.0

Rio Dell Summary by Year											
	Units	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Surface	Acre Ft / Year	304	314	350	294	254	273	262	267	222	269
Groundwater	Acre Ft / Year	0	0	0	0	0	0	0	18	41	6
Eel Discharge	Acre Ft / Year	106.6	121.8	101.7	90.4	61.3	108.7	102.4	101.1	91.1	80.0
Field Discharge	Acre Ft / Year	106.3	98.3	143.6	115.4	116.8	82.6	81.0	98.3	92.8	112.9

Ferndale Raw Data					
Month	Year	Water Year	Low Springs (gal)	High Springs (gal)	Van Ness Well (gal)
10	2010	2011	2,944,100	1,317,100	0
11	2010	2011	2,386,600	1,283,900	0
12	2010	2011	2,362,700	1,368,800	0
1	2011	2011	2,352,300	1,363,600	0
2	2011	2011	2,105,900	1,227,400	0
3	2011	2011	2,123,200	1,387,400	0
4	2011	2011	2,059,400	1,346,300	0
5	2011	2011	2,587,900	1,427,300	0
6	2011	2011	2,589,300	1,338,300	0
7	2011	2011	2,946,600	1,358,500	1,240,000
8	2011	2011	2,922,000	1,349,800	1,696,000
9	2011	2011	2,814,900	1,298,000	858,000
10	2011	2012	2,918,500	1,330,800	0
11	2011	2012	2,523,600	1,266,200	0
12	2011	2012	2,559,600	1,319,100	0
1	2012	2012	2,765,400	1,347,900	0
2	2012	2012	2,567,900	1,267,400	0
3	2012	2012	2,797,300	1,321,000	0
4	2012	2012	2,888,700	1,326,200	276,000
5	2012	2012	2,928,900	1,351,700	1,317,000
6	2012	2012	2,737,000	1,310,000	1,026,000
7	2012	2012	2,799,900	1,329,000	903,000
8	2012	2012	2,737,400	1,299,800	2,543,100
9	2012	2012	2,630,000	1,236,000	1,844,200
10	2012	2013	2,743,400	1,277,700	956,400
11	2012	2013	2,807,800	1,252,400	455,000
12	2012	2013	2,893,900	1,337,700	238,400
1	2013	2013	2,985,100	1,326,200	264,200
2	2013	2013	2,617,800	1,202,400	0
3	2013	2013	2,670,800	1,341,000	0
4	2013	2013	2,765,400	1,285,100	0
5	2013	2013	2,762,600	1,274,000	1,227,200
6	2013	2013	2,613,000	1,208,100	1,713,700
7	2013	2013	2,735,900	1,232,000	2,823,000
8	2013	2013	2,922,900	1,172,300	3,013,100
9	2013	2013	2,854,100	1,141,200	1,254,500
10	2013	2014	2,948,800	1,215,900	0
11	2013	2014	2,846,600	1,180,100	0
12	2013	2014	2,931,900	1,213,400	479,800
1	2014	2014	2,914,700	1,198,600	465,200
2	2014	2014	2,661,000	1,064,300	0
3	2014	2014	3,020,900	1,180,200	0
4	2014	2014	2,893,000	1,124,900	329,400

Ferndale Raw Data					
Month	Year	Water Year	Low Springs (gal)	High Springs (gal)	Van Ness Well (gal)
5	2014	2014	2,853,300	1,140,000	1,851,400
6	2014	2014	2,744,900	1,087,700	2,090,000
7	2014	2014	2,811,800	1,103,700	2,829,100
8	2014	2014	2,784,100	1,087,300	2,581,200
9	2014	2014	2,681,200	1,037,900	1,165,200
10	2014	2015	2,837,800	1,083,600	924,100
11	2014	2015	2,801,200	1,044,600	483,400
12	2014	2015	2,936,900	1,108,100	712,400
1	2015	2015	3,048,000	1,104,600	469,400
2	2015	2015	2,645,800	1,010,400	260,000
3	2015	2015	2,967,400	1,086,300	455,800
4	2015	2015	2,877,500	1,100,600	634,900
5	2015	2015	2,727,900	1,094,100	1,410,500
6	2015	2015	2,695,200	1,024,500	1,618,100
7	2015	2015	2,731,600	1,026,600	2,501,800
8	2015	2015	2,662,800	1,009,100	3,113,300
9	2015	2015	2,581,100	964,800	1,538,600
10	2015	2016	2,654,600	970,300	1,036,500
11	2015	2016	2,594,600	944,700	682,800
12	2015	2016	2,768,700	973,300	1,327,100
1	2016	2016	3,059,600	1,035,500	70,500
2	2016	2016	2,924,700	958,800	0
3	2016	2016	3,138,900	1,025,900	0
4	2016	2016	3,032,300	962,200	0
5	2016	2016	2,994,000	975,100	1,183,900
6	2016	2016	2,812,000	897,000	2,240,400
7	2016	2016	2,837,500	908,900	3,171,700
8	2016	2016	2,825,300	997,200	2,634,500
9	2016	2016	2,707,800	926,300	2,132,900
10	2016	2017	2,885,100	968,000	299,600
11	2016	2017	2,907,100	945,000	425,400
12	2016	2017	3,030,100	1,019,200	0
1	2017	2017	3,099,600	1,070,400	0
2	2017	2017	2,228,100	1,201,200	0
3	2017	2017	2,874,300	1,321,000	0
4	2017	2017	2,632,600	1,266,400	0
5	2017	2017	3,123,000	1,277,800	0
6	2017	2017	3,080,600	1,224,800	687,000
7	2017	2017	3,126,200	1,247,500	1,719,900
8	2017	2017	3,064,400	1,249,400	2,876,400
9	2017	2017	2,940,300	1,198,500	2,664,000
10	2017	2018	3,025,100	1,252,000	986,100
11	2017	2018	2,953,000	1,220,000	0

Ferndale Raw Data					
Month	Year	Water Year	Low Springs (gal)	High Springs (gal)	Van Ness Well (gal)
12	2017	2018	2,841,100	1,261,900	0
1	2018	2018	2,611,700	1,288,000	0
2	2018	2018	2,398,900	1,137,700	0
3	2018	2018	2,601,000	1,300,100	0
4	2018	2018	2,412,100	1,262,600	0
5	2018	2018	2,752,800	1,276,900	0
6	2018	2018	2,648,000	1,225,900	1,138,000
7	2018	2018	2,614,400	1,299,800	2,434,900
8	2018	2018	2,523,100	1,279,600	2,778,200
9	2018	2018	2,151,600	1,230,500	1,873,600
10	2018	2019	2,433,200	1,269,500	955,300
11	2018	2019	2,479,600	1,233,000	476,900
12	2018	2019	2,696,500	1,268,800	736,100
1	2019	2019	2,744,800	1,277,200	0
2	2019	2019	2,413,400	1,194,800	0
3	2019	2019	2,689,500	1,348,000	0
4	2019	2019	2,695,700	1,244,200	0
5	2019	2019	2,801,300	1,337,800	499,200
6	2019	2019	2,600,900	1,303,700	1,417,600
7	2019	2019	2,623,400	1,337,100	2,029,400
8	2019	2019	2,581,600	1,322,800	3,223,100
9	2019	2019	2,477,000	1,261,600	1,625,500
10	2019	2020	2,355,500	1,277,200	1,259,400
11	2019	2020	2,425,700	1,231,300	898,100
12	2019	2020	2,603,700	1,278,700	971,200
1	2020	2020	2,595,100	1,278,800	1,147,600
2	2020	2020	2,456,300	1,194,000	1,133,100
3	2020	2020	2,509,400	1,259,300	1,536,700
4	2020	2020	2,532,500	1,201,800	1,763,900
5	2020	2020	2,568,000	1,238,800	2,302,900
6	2020	2020	2,441,900	1,192,600	883,900
7	2020	2020	2,503,200	1,218,900	2,187,900
8	2020	2020	2,482,100	1,202,600	2,009,700
9	2020	2020	2,388,500	1,156,200	1,586,200

Ferndale Wastewater Effluent Disposal to Surface Waters and Groundwater					
Month	Year	Water Year	Total Pumped (AF)	Discharge to Salt (AF)	Discharge to Land (AF)
10	2010	2011	13.07803	5.48	3.68
11	2010	2011	11.26512	7.89	0.00
12	2010	2011	11.45233	8.02	0.00
1	2011	2011	11.40446	7.98	0.00
2	2011	2011	10.23022	7.16	0.00
3	2011	2011	10.77437	7.54	0.00
4	2011	2011	10.45242	7.32	0.00
5	2011	2011	12.32304	3.75	4.88
6	2011	2011	12.05418	0.00	8.44
7	2011	2011	17.01845	0.00	11.91
8	2011	2011	18.31575	0.00	12.82
9	2011	2011	15.25617	0.00	10.68
10	2011	2012	13.04151	5.46	3.67
11	2011	2012	11.63126	8.14	0.00
12	2011	2012	11.9041	8.33	0.00
1	2012	2012	12.62411	8.84	0.00
2	2012	2012	11.77091	8.24	0.00
3	2012	2012	12.63946	8.85	0.00
4	2012	2012	13.78301	9.65	0.00
5	2012	2012	17.17957	5.22	6.80
6	2012	2012	15.56953	0.00	10.90
7	2012	2012	15.44339	0.00	10.81
8	2012	2012	20.19558	0.00	14.14
9	2012	2012	17.52515	0.00	12.27
10	2012	2013	15.27643	3.20	7.49
11	2012	2013	13.85758	6.65	3.05
12	2012	2013	13.71886	9.31	0.30
1	2013	2013	14.04265	9.83	0.00
2	2013	2013	11.72456	8.21	0.00
3	2013	2013	12.3126	8.62	0.00
4	2013	2013	12.43138	6.71	1.99
5	2013	2013	16.15511	0.00	11.31
6	2013	2013	16.98683	0.00	11.89
7	2013	2013	20.84193	0.00	14.59
8	2013	2013	21.81606	0.00	15.27
9	2013	2013	16.11214	0.00	11.28
10	2013	2014	12.78187	1.72	7.23
11	2013	2014	12.35833	8.65	0.00
12	2013	2014	14.19488	9.94	0.00
1	2014	2014	14.05186	9.84	0.00
2	2014	2014	11.4333	8.00	0.00

Ferndale Wastewater Effluent Disposal to Surface Waters and Groundwater					
Month	Year	Water Year	Total Pumped (AF)	Discharge to Salt (AF)	Discharge to Land (AF)
3	2014	2014	12.89358	9.03	0.00
4	2014	2014	13.34228	7.51	1.83
5	2014	2014	17.93795	0.00	12.56
6	2014	2014	18.17703	0.00	12.72
7	2014	2014	20.69983	0.00	14.49
8	2014	2014	19.80365	0.00	13.86
9	2014	2014	14.99039	0.00	10.49
10	2014	2015	14.87131	0.00	10.41
11	2014	2015	13.28673	3.46	5.84
12	2014	2015	14.60092	9.59	0.63
1	2015	2015	14.18536	0.00	9.93
2	2015	2015	12.0192	8.23	0.18
3	2015	2015	13.84009	9.69	0.00
4	2015	2015	14.15774	9.91	0.00
5	2015	2015	16.05905	5.15	6.09
6	2015	2015	16.38222	0.00	11.47
7	2015	2015	19.21254	0.00	13.45
8	2015	2015	20.82443	0.00	14.58
9	2015	2015	15.60482	0.00	10.92
10	2015	2016	14.30629	8.56	1.46
11	2015	2016	12.95803	9.07	0.00
12	2015	2016	15.55756	10.89	0.00
1	2016	2016	12.78463	8.95	0.00
2	2016	2016	11.91884	8.34	0.00
3	2016	2016	12.78217	6.52	2.42
4	2016	2016	12.25951	4.29	4.29
5	2016	2016	15.81505	2.59	8.48
6	2016	2016	18.25928	0.00	12.78
7	2016	2016	21.23232	0.00	14.86
8	2016	2016	19.81716	6.55	7.32
9	2016	2016	17.69948	6.19	6.19
10	2016	2017	12.74504	7.62	1.30
11	2016	2017	13.12806	9.19	0.00
12	2016	2017	12.42769	8.70	0.00
1	2017	2017	12.79813	8.96	0.00
2	2017	2017	10.52485	7.37	0.00
3	2017	2017	12.87578	6.57	2.44
4	2017	2017	11.96641	4.19	4.19
5	2017	2017	13.50648	2.22	7.24
6	2017	2017	15.32216	0.00	10.73
7	2017	2017	18.70185	0.00	13.09

Ferndale Wastewater Effluent Disposal to Surface Waters and Groundwater					
Month	Year	Water Year	Total Pumped (AF)	Discharge to Salt (AF)	Discharge to Land (AF)
8	2017	2017	22.06742	7.29	8.16
9	2017	2017	20.87845	7.31	7.31
10	2017	2018	16.15327	6.77	4.54
11	2017	2018	12.80734	8.97	0.00
12	2017	2018	12.5925	8.81	0.00
1	2018	2018	11.96856	8.38	0.00
2	2018	2018	10.85417	7.60	0.00
3	2018	2018	11.97285	8.38	0.00
4	2018	2018	11.27801	7.89	0.00
5	2018	2018	12.36754	3.76	4.90
6	2018	2018	15.382	0.00	10.77
7	2018	2018	19.486	0.00	13.64
8	2018	2018	20.19742	0.00	14.14
9	2018	2018	16.13025	0.00	11.29
10	2018	2019	14.29585	5.99	4.02
11	2018	2019	12.85798	9.00	0.00
12	2018	2019	14.42905	10.10	0.00
1	2019	2019	12.34391	8.64	0.00
2	2019	2019	11.07391	7.75	0.00
3	2019	2019	12.39148	8.67	0.00
4	2019	2019	12.09193	8.46	0.00
5	2019	2019	14.23539	4.33	5.64
6	2019	2019	16.33434	0.00	11.43
7	2019	2019	18.38358	0.00	12.87
8	2019	2019	21.87498	0.00	15.31
9	2019	2019	16.46294	0.00	11.52
10	2019	2020	15.01433	2.02	8.49
11	2019	2020	13.98004	9.79	0.00
12	2019	2020	14.89617	10.43	0.00
1	2020	2020	15.41147	10.79	0.00
2	2020	2020	14.68072	10.28	0.00
3	2020	2020	16.28278	11.40	0.00
4	2020	2020	16.87451	9.50	2.31
5	2020	2020	18.75126	0.00	13.13
6	2020	2020	13.86741	0.00	9.71
7	2020	2020	18.13836	0.00	12.70
8	2020	2020	17.47666	0.00	12.23
9	2020	2020	15.74723	0.00	11.02

Ferndale Summary by Year											
	Units	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Water	Acre Ft / Year	160.2	153.6	173.3	185.3	182.7	185.0	185.4	176.9	171.2	176.8
To Salt	Acre Ft / Year	55.1	62.7	52.5	54.7	46.0	72.0	69.4	60.6	62.9	64.2
To Land	Acre Ft / Year	52.4	58.6	77.2	73.2	83.5	57.8	54.4	59.3	60.8	69.6

Scotia Summary by Month						
Month	Cal Year	Water Year	Percent of Annual Water Used in Month	Water Pumped (AF)	Discharge to Eel (AF)	Discharge to Log Pond (AF)
10	2010	2011	8%	42.68	17.9	12.0
11	2010	2011	7%	37.20	26.0	0.0
12	2010	2011	7%	37.08	26.0	0.0
1	2011	2011	7%	38.65	27.1	0.0
2	2011	2011	6%	34.04	23.8	0.0
3	2011	2011	7%	38.21	26.7	0.0
4	2011	2011	8%	41.44	29.0	0.0
5	2011	2011	8%	45.01	13.7	17.8
6	2011	2011	9%	50.13	0.0	35.1
7	2011	2011	11%	60.65	0.0	42.5
8	2011	2011	11%	60.33	0.0	42.2
9	2011	2011	11%	57.23	0.0	40.1
10	2011	2012	9%	48.48	20.3	13.6
11	2011	2012	8%	41.60	29.1	0.0
12	2011	2012	8%	41.68	29.2	0.0
1	2012	2012	8%	41.88	29.3	0.0
2	2012	2012	7%	39.34	27.5	0.0
3	2012	2012	8%	43.50	30.5	0.0
4	2012	2012	8%	43.27	30.3	0.0
5	2012	2012	8%	45.84	13.9	18.2
6	2012	2012	10%	56.86	0.0	39.8
7	2012	2012	10%	51.84	0.0	36.3
8	2012	2012	9%	46.16	0.0	32.3
9	2012	2012	8%	42.18	0.0	29.5
10	2012	2013	8%	42.40	8.9	20.8
11	2012	2013	7%	36.20	17.4	8.0
12	2012	2013	7%	37.30	25.3	0.8
1	2013	2013	7%	37.94	26.6	0.0
2	2013	2013	7%	35.52	24.9	0.0
3	2013	2013	8%	42.01	29.4	0.0
4	2013	2013	9%	46.52	25.1	7.5
5	2013	2013	11%	58.12	0.0	40.7
6	2013	2013	8%	44.65	0.0	31.3
7	2013	2013	11%	59.17	0.0	41.4
8	2013	2013	9%	48.98	0.0	34.3
9	2013	2013	10%	53.84	0.0	37.7
10	2013	2014	8%	43.14	5.8	24.4
11	2013	2014	7%	39.04	27.3	0.0
12	2013	2014	8%	41.33	28.9	0.0
1	2014	2014	7%	40.55	28.4	0.0
2	2014	2014	7%	35.74	25.0	0.0
3	2014	2014	7%	40.45	28.3	0.0

Scotia Summary by Month						
Month	Cal Year	Water Year	Percent of Annual Water Used in Month	Water Pumped (AF)	Discharge to Eel (AF)	Discharge to Log Pond (AF)
4	2014	2014	8%	41.01	23.1	5.6
5	2014	2014	9%	46.50	0.0	32.6
6	2014	2014	11%	59.64	0.0	41.7
7	2014	2014	11%	58.79	0.0	41.2
8	2014	2014	10%	52.03	0.0	36.4
9	2014	2014	8%	44.42	0.0	31.1
10	2014	2015	8%	45.96	0.0	32.2
11	2014	2015	7%	39.42	10.3	17.3
12	2014	2015	7%	39.04	25.6	1.7
1	2015	2015	8%	44.87	0.0	31.4
2	2015	2015	7%	36.49	25.0	0.6
3	2015	2015	7%	39.59	27.7	0.0
4	2015	2015	7%	39.06	27.3	0.0
5	2015	2015	8%	45.96	14.7	17.4
6	2015	2015	10%	51.55	0.0	36.1
7	2015	2015	11%	57.84	0.0	40.5
8	2015	2015	10%	54.99	0.0	38.5
9	2015	2015	9%	47.85	0.0	33.5
10	2015	2016	8%	44.36	26.5	4.5
11	2015	2016	7%	38.87	27.2	0.0
12	2015	2016	7%	39.98	28.0	0.0
1	2016	2016	8%	44.48	31.1	0.0
2	2016	2016	6%	34.70	24.3	0.0
3	2016	2016	7%	38.01	19.4	7.2
4	2016	2016	7%	38.16	13.4	13.4
5	2016	2016	8%	42.33	6.9	22.7
6	2016	2016	10%	51.59	0.0	36.1
7	2016	2016	10%	55.52	0.0	38.9
8	2016	2016	11%	59.31	19.6	21.9
9	2016	2016	10%	55.34	19.4	19.4
10	2016	2017	8%	42.28	25.3	4.3
11	2016	2017	7%	37.20	26.0	0.0
12	2016	2017	7%	38.45	26.9	0.0
1	2017	2017	7%	40.36	28.3	0.0
2	2017	2017	7%	35.83	25.1	0.0
3	2017	2017	8%	41.59	21.2	7.9
4	2017	2017	7%	37.34	13.1	13.1
5	2017	2017	9%	48.29	7.9	25.9
6	2017	2017	9%	47.45	0.0	33.2
7	2017	2017	11%	61.02	0.0	42.7
8	2017	2017	11%	61.13	20.2	22.6
9	2017	2017	10%	51.69	18.1	18.1

Scotia Summary by Month						
Month	Cal Year	Water Year	Percent of Annual Water Used in Month	Water Pumped (AF)	Discharge to Eel (AF)	Discharge to Log Pond (AF)
10	2017	2018	9%	48.24	20.2	13.6
11	2017	2018	7%	39.33	27.5	0.0
12	2017	2018	7%	39.08	27.4	0.0
1	2018	2018	7%	39.40	27.6	0.0
2	2018	2018	6%	34.91	24.4	0.0
3	2018	2018	7%	39.00	27.3	0.0
4	2018	2018	7%	36.21	25.3	0.0
5	2018	2018	8%	42.27	12.9	16.7
6	2018	2018	9%	50.03	0.0	35.0
7	2018	2018	12%	63.20	0.0	44.2
8	2018	2018	11%	57.94	0.0	40.6
9	2018	2018	10%	53.01	0.0	37.1
10	2018	2019	8%	43.33	18.1	12.2
11	2018	2019	7%	39.51	27.7	0.0
12	2018	2019	7%	38.25	26.8	0.0
1	2019	2019	7%	37.25	26.1	0.0
2	2019	2019	6%	32.57	22.8	0.0
3	2019	2019	7%	37.25	26.1	0.0
4	2019	2019	7%	37.14	26.0	0.0
5	2019	2019	9%	48.15	14.6	19.1
6	2019	2019	10%	52.37	0.0	36.7
7	2019	2019	11%	62.17	0.0	43.5
8	2019	2019	12%	63.65	0.0	44.6
9	2019	2019	9%	51.00	0.0	35.7
10	2019	2020	7%	40.23	5.4	22.8
11	2019	2020	7%	38.09	26.7	0.0
12	2019	2020	7%	36.69	25.7	0.0
1	2020	2020	7%	37.23	26.1	0.0
2	2020	2020	6%	34.81	24.4	0.0
3	2020	2020	7%	37.67	26.4	0.0
4	2020	2020	8%	40.85	23.0	5.6
5	2020	2020	8%	44.76	0.0	31.3
6	2020	2020	9%	50.21	0.0	35.1
7	2020	2020	12%	65.09	0.0	45.6
8	2020	2020	12%	63.48	0.0	44.4
9	2020	2020	10%	53.53	0.0	37.5

Scotia Summary by Year											
	Units	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Eel	Acre Ft / Year	190.2	210.1	157.5	166.9	130.7	215.8	212.1	192.6	188.2	157.5
Log Ponds	Acre Ft / Year	189.7	169.7	222.3	213.0	249.2	164.0	167.8	187.2	191.7	222.3

Bear River Raw Data				
Month	Cal Year	Water Year	Water Pumped (gal)	Water Pumped (AF)
1	2014	2014	1,429,335	4.4
2	2014	2014	1,334,935	4.1
3	2014	2014	1,426,000	4.4
4	2014	2014	1,475,214	4.5
5	2014	2014	1,643,461	5.0
6	2014	2014	1,751,782	5.4
7	2014	2014	1,777,157	5.5
8	2014	2014	1,681,744	5.2
9	2014	2014	1,409,166	4.3
10	2014	2015	1,348,850	4.1
11	2014	2015	1,125,100	3.5
12	2014	2015	1,066,160	3.3
1	2015	2015	1,136,990	3.5
2	2015	2015	1,034,960	3.2
3	2015	2015	1,394,470	4.3
4	2015	2015	1,217,200	3.7
5	2015	2015	2,056,460	6.3
6	2015	2015	1,296,230	4.0
7	2015	2015	1,680,220	5.2
8	2015	2015	1,590,370	4.9
9	2015	2015	1,488,550	4.6
10	2015	2016	1,467,890	4.5
11	2015	2016	1,327,590	4.1
12	2015	2016	1,390,080	4.3
1	2016	2016	1,400,930	4.3
2	2016	2016	1,120,510	3.4
3	2016	2016	1,196,310	3.7
4	2016	2016	1,215,140	3.7
5	2016	2016	1,065,880	3.3
6	2016	2016	1,274,870	3.9
7	2016	2016	1,147,960	3.5
8	2016	2016	1,272,930	3.9
9	2016	2016	1,048,420	3.2
10	2016	2017	1,273,420	3.9
11	2016	2017	1,116,820	3.4
12	2016	2017	1,183,540	3.6
1	2017	2017	995,910	3.1
2	2017	2017	850,900	2.6
3	2017	2017	901,350	2.8
4	2017	2017	967,110	3.0
5	2017	2017	995,010	3.1
6	2017	2017	1,133,650	3.5

Bear River Raw Data				
Month	Cal Year	Water Year	Water Pumped (gal)	Water Pumped (AF)
7	2017	2017	1,401,840	4.3
8	2017	2017	1,365,080	4.2
9	2017	2017	1,328,370	4.1
10	2017	2018	988,280	3.0
11	2017	2018	886,610	2.7
12	2017	2018	811,280	2.5
1	2018	2018	1,263,691	3.9
2	2018	2018	1,263,691	3.9
3	2018	2018	1,263,691	3.9
4	2018	2018	1,263,691	3.9
5	2018	2018	1,263,691	3.9
6	2018	2018	1,263,691	3.9
7	2018	2018	1,263,691	3.9
8	2018	2018	1,263,691	3.9
9	2018	2018	1,263,691	3.9
10	2018	2019	1,263,691	3.9
11	2018	2019	1,263,691	3.9
12	2018	2019	1,263,691	3.9
1	2019	2019	1,298,960	4.0
2	2019	2019	1,190,020	3.7
3	2019	2019	1,079,600	3.3
4	2019	2019	1,075,730	3.3
5	2019	2019	1,287,570	4.0
6	2019	2019	1,704,410	5.2
7	2019	2019	1,762,840	5.4
8	2019	2019	1,981,270	6.1
9	2019	2019	1,601,320	4.9
10	2019	2020	1,659,740	5.1
11	2019	2020	1,444,900	4.4
12	2019	2020	1,284,400	3.9
1	2020	2020	1,324,400	4.1
2	2020	2020	1,726,340	5.3
3	2020	2020	1,073,290	3.3
4	2020	2020	828,300	2.5
5	2020	2020	1,268,600	3.9
6	2020	2020	1,511,980	4.6
7	2020	2020	2,001,210	6.1
8	2020	2020	1,859,460	5.7
9	2020	2020	1,670,800	5.1

Bear River Summary by Year											
	Units	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Water Pumped	Acre Ft / Year	49.0	49.0	49.0	53.9	50.4	45.8	41.5	43.1	51.5	54.2
Land Application	Acre Ft / Year	34.3	34.3	34.3	37.7	35.3	32.1	29.0	30.2	36.0	37.9

Hydesville Raw Data					
Month/Year	Month	Calendar Year	Water Year	Monthly Total Pumped (gal)	Water Pumped (AF)
Oct-09	10	2009	2010	3,042,415	9.3
Nov-09	11	2009	2010	2,855,939	8.8
Dec-09	12	2009	2010	2,965,670	9.1
Jan-10	1	2010	2010	2,692,950	8.3
Feb-10	2	2010	2010	2,712,772	8.3
Mar-10	3	2010	2010	3,780,242	11.6
Apr-10	4	2010	2010	3,088,567	9.5
May-10	5	2010	2010	2,923,558	9.0
Jun-10	6	2010	2010	4,212,212	12.9
Jul-10	7	2010	2010	5,201,666	16.0
Aug-10	8	2010	2010	4,582,770	14.1
Sep-10	9	2010	2010	4,136,963	12.7
Oct-10	10	2010	2011	804,900	2.5
Nov-10	11	2010	2011	3,942,708	12.1
Dec-10	12	2010	2011	3,185,507	9.8
Jan-11	1	2011	2011	3,200,841	9.8
Feb-11	2	2011	2011	3,060,068	9.4
Mar-11	3	2011	2011	3,390,384	10.4
Apr-11	4	2011	2011	3,368,917	10.3
May-11	5	2011	2011	3,691,005	11.3
Jun-11	6	2011	2011	4,275,343	13.1
Jul-11	7	2011	2011	4,986,467	15.3
Aug-11	8	2011	2011	5,904,263	18.1
Sep-11	9	2011	2011	5,724,219	17.6
Oct-11	10	2011	2012	5,094,254	15.6
Nov-11	11	2011	2012	4,896,108	15.0
Dec-11	12	2011	2012	4,539,612	13.9
Jan-12	1	2012	2012	4,608,054	14.1
Feb-12	2	2012	2012	4,480,146	13.8
Mar-12	3	2012	2012	3,083,704	9.5
Apr-12	4	2012	2012	3,013,467	9.2
May-12	5	2012	2012	3,152,745	9.7
Jun-12	6	2012	2012	3,264,795	10.0
Jul-12	7	2012	2012	3,350,815	10.3
Aug-12	8	2012	2012	3,968,663	12.2
Sep-12	9	2012	2012	3,635,504	11.2
Oct-12	10	2012	2013	3,125,069	9.6
Nov-12	11	2012	2013	2,340,866	7.2
Dec-12	12	2012	2013	2,277,360	7.0
Jan-13	1	2013	2013	2,496,076	7.7
Feb-13	2	2013	2013	2,309,375	7.1

Hydesville Raw Data					
Month/Year	Month	Calendar Year	Water Year	Monthly Total Pumped (gal)	Water Pumped (AF)
Mar-13	3	2013	2013	2,457,254	7.5
Apr-13	4	2013	2013	2,579,852	7.9
May-13	5	2013	2013	3,660,263	11.2
Jun-13	6	2013	2013	4,052,215	12.4
Jul-13	7	2013	2013	5,004,195	15.4
Aug-13	8	2013	2013	4,560,648	14.0
Sep-13	9	2013	2013	3,381,334	10.4
Oct-13	10	2013	2014	2,719,802	8.3
Nov-13	11	2013	2014	2,433,244	7.5
Dec-13	12	2013	2014	2,644,554	8.1
Jan-14	1	2014	2014	2,655,474	8.1
Feb-14	2	2014	2014	2,128,583	6.5
Mar-14	3	2014	2014	2,189,171	6.7
Apr-14	4	2014	2014	2,428,980	7.5
May-14	5	2014	2014	3,358,445	10.3
Jun-14	6	2014	2014	4,460,698	13.7
Jul-14	7	2014	2014	4,310,649	13.2
Aug-14	8	2014	2014	3,552,626	10.9
Sep-14	9	2014	2014	3,074,728	9.4
Oct-14	10	2014	2015	2,493,981	7.7
Nov-14	11	2014	2015	1,819,734	5.6
Dec-14	12	2014	2015	2,331,590	7.2
Jan-15	1	2015	2015	2,217,745	6.8
Feb-15	2	2015	2015	1,784,354	5.5
Mar-15	3	2015	2015	2,184,758	6.7
Apr-15	4	2015	2015	2,275,640	7.0
May-15	5	2015	2015	2,433,094	7.5
Jun-15	6	2015	2015	3,211,462	9.9
Jul-15	7	2015	2015	3,548,886	10.9
Aug-15	8	2015	2015	3,161,272	9.7
Sep-15	9	2015	2015	3,216,998	9.9
Oct-15	10	2015	2016	2,577,609	7.9
Nov-15	11	2015	2016	2,153,118	6.6
Dec-15	12	2015	2016	2,809,338	8.6
Jan-16	1	2016	2016	2,307,280	7.1
Feb-16	2	2016	2016	1,894,085	5.8
Mar-16	3	2016	2016	2,064,180	6.3
Apr-16	4	2016	2016	2,285,446	7.0
May-16	5	2016	2016	2,591,396	8.0
Jun-16	6	2016	2016	3,496,951	10.7
Jul-16	7	2016	2016	3,656,747	11.2

Hydesville Raw Data					
Month/Year	Month	Calendar Year	Water Year	Monthly Total Pumped (gal)	Water Pumped (AF)
Aug-16	8	2016	2016	3,882,344	11.9
Sep-16	9	2016	2016	3,366,448	10.3
Oct-16	10	2016	2017	2,301,895	7.1
Nov-16	11	2016	2017	2,234,212	6.9
Dec-16	12	2016	2017	2,377,592	7.3
Jan-17	1	2017	2017	2,442,145	7.5
Feb-17	2	2017	2017	1,980,479	6.1
Mar-17	3	2017	2017	2,200,017	6.8
Apr-17	4	2017	2017	1,901,490	5.8
May-17	5	2017	2017	2,426,063	7.4
Jun-17	6	2017	2017	2,970,682	9.1
Jul-17	7	2017	2017	3,495,179	10.7
Aug-17	8	2017	2017	3,770,443	11.6
Sep-17	9	2017	2017	3,635,354	11.2
Oct-17	10	2017	2018	2,872,320	8.8
Nov-17	11	2017	2018	2,407,064	7.4
Dec-17	12	2017	2018	2,151,996	6.6
Jan-18	1	2018	2018	2,419,929	7.4
Feb-18	2	2018	2018	2,048,572	6.3
Mar-18	3	2018	2018	2,282,372	7.0
Apr-18	4	2018	2018	2,290,000	7.0
May-18	5	2018	2018	2,471,000	7.6
Jun-18	6	2018	2018	3,372,058	10.3
Jul-18	7	2018	2018	4,610,061	14.1
Aug-18	8	2018	2018	4,110,000	12.6
Sep-18	9	2018	2018	3,763,861	11.6
Oct-18	10	2018	2019	2,712,024	8.3
Nov-18	11	2018	2019	2,446,184	7.5
Dec-18	12	2018	2019	2,463,613	7.6
Jan-19	1	2019	2019	2,691,977	8.3
Feb-19	2	2019	2019	2,220,588	6.8
Mar-19	3	2019	2019	2,580,407	7.9
Apr-19	4	2019	2019	2,508,044	7.7
May-19	5	2019	2019	2,878,753	8.8
Jun-19	6	2019	2019	3,629,703	11.1
Jul-19	7	2019	2019	4,578,280	14.1
Aug-19	8	2019	2019	4,476,780	13.7
Sep-19	9	2019	2019	3,561,452	10.9
Oct-19	10	2019	2020	2,607,902	8.0
Nov-19	11	2019	2020	2,448,578	7.5
Dec-19	12	2019	2020	3,224,553	9.9

Hydesville Raw Data					
Month/Year	Month	Calendar Year	Water Year	Monthly Total Pumped (gal)	Water Pumped (AF)
Jan-20	1	2020	2020	2,895,284	8.9
Feb-20	2	2020	2020	2,154,390	6.6
Mar-20	3	2020	2020	2,414,394	7.4
Apr-20	4	2020	2020	2,668,116	8.2
May-20	5	2020	2020	2,771,041	8.5
Jun-20	6	2020	2020	3,520,387	10.8
Jul-20	7	2020	2020	4,598,704	14.1
Aug-20	8	2020	2020	4,235,176	13.0
Sep-20	9	2020	2020	3,644,256	11.2
Oct-20	10	2020	2021	3,052,588	9.4
Nov-20	11	2020	2021	2,676,344	8.2
Dec-20	12	2020	2021	2,555,168	7.8

Hydesville Summary by Year											
	Units	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Water	Acre Ft / Year	139.8	144.5	117.4	110.4	94.2	101.5	97.4	106.8	112.8	114.1

Riverside Raw Data	
Water Source : Upland Well	
Year	Water Use (AF/Y)
2005	38.15
2006	26.29
2007	26.05
2008	NA
2009	31.53
2010	33.2
2011	31.88
2012	32.36
2013	34.8
2014	NA
2015	23.51

Riverside Summary by Year											
	Units	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Water	Acre Ft / Year	31.9	32.4	34.8	30.9	23.5	30.9	30.9	30.9	30.9	30.9

Palmer CSD Raw Data				
Month	Cal Year	Water Year	Water Pumped (CF)	Water Pumped (AF)
10	2010	2011	0	0
11	2010	2011	0	0
12	2010	2011	0	0
1	2011	2011	0	0
2	2011	2011	73,797	2
3	2011	2011	0	0
4	2011	2011	0	0
5	2011	2011	0	0
6	2011	2011	0	0
7	2011	2011	0	0
8	2011	2011	0	0
9	2011	2011	145,855	3
10	2011	2012	0	0
11	2011	2012	78,074	2
12	2011	2012	0	0
1	2012	2012	76,336	2
2	2012	2012	74,470	2
3	2012	2012	71,791	2
4	2012	2012	72,590	2
5	2012	2012	85,027	2
6	2012	2012	92,250	2
7	2012	2012	93,716	2
8	2012	2012	102,040	2
9	2012	2012	135,027	3
10	2012	2013	98,128	2
11	2012	2013	108,288	2
12	2012	2013	90,508	2
1	2013	2013	81,551	2
2	2013	2013	65,642	2
3	2013	2013	67,781	2
4	2013	2013	80,481	2
5	2013	2013	90,642	2
6	2013	2013	88,235	2
7	2013	2013	122,995	3
8	2013	2013	118,182	3
9	2013	2013	88,770	2
10	2013	2014	89,705	2
11	2013	2014	66,845	2
12	2013	2014	75,936	2
1	2014	2014	90,241	2

Palmer CSD Raw Data				
Month	Cal Year	Water Year	Water Pumped (CF)	Water Pumped (AF)
2	2014	2014	62,165	1
3	2014	2014	56,952	1
4	2014	2014	79,813	2
5	2014	2014	87,433	2
6	2014	2014	109,224	3
7	2014	2014	104,545	2
8	2014	2014	103,074	2
9	2014	2014	94,652	2
10	2014	2015	75,401	2
11	2014	2015	61,764	1
12	2014	2015	77,139	2
1	2015	2015	65,107	1
2	2015	2015	51,737	1
3	2015	2015	64,405	1
4	2015	2015	72,995	2
5	2015	2015	72,727	2
6	2015	2015	80,882	2
7	2015	2015	105,080	2
8	2015	2015	112,968	3
9	2015	2015	103,075	2
10	2015	2016	85,160	2
11	2015	2016	67,914	2
12	2015	2016	75,936	2
1	2016	2016	68,048	2
2	2016	2016	76,871	2
3	2016	2016	67,914	2
4	2016	2016	75,000	2
5	2016	2016	75,267	2
6	2016	2016	102,540	2
7	2016	2016	87,116	2
8	2016	2016	132,085	3
9	2016	2016	104,812	2
10	2016	2017	98,262	2
11	2016	2017	78,743	2
12	2016	2017	68,582	2
1	2017	2017	66,444	2
2	2017	2017	75,530	2
3	2017	2017	71,930	2
4	2017	2017	45,720	1
5	2017	2017	77,670	2

Palmer CSD Raw Data				
Month	Cal Year	Water Year	Water Pumped (CF)	Water Pumped (AF)
6	2017	2017	89,050	2
7	2017	2017	118,180	3
8	2017	2017	107,880	2
9	2017	2017	91,850	2
10	2017	2018	81,280	2
11	2017	2018	84,500	2
12	2017	2018	84,890	2
1	2018	2018	87,170	2
2	2018	2018	72,720	2
3	2018	2018	62,030	1
4	2018	2018	78,070	2
5	2018	2018	81,290	2
6	2018	2018	86,630	2
7	2018	2018	106,420	2
8	2018	2018	120,320	3
9	2018	2018	113,230	3
10	2018	2019	89,310	2
11	2018	2019	82,620	2
12	2018	2019	61,040	1
1	2019	2019	89,230	2
2	2019	2019	68,980	2
3	2019	2019	59,090	1
4	2019	2019	87,430	2
5	2019	2019	164,170	4
6	2019	2019	107,487	2
7	2019	2019	124,600	3
8	2019	2019	133,690	3
9	2019	2019	99,470	2
10	2019	2020	83,960	2
11	2019	2020	85,290	2
12	2019	2020	89,170	2
1	2020	2020	75,410	2
2	2020	2020	80,340	2
3	2020	2020	100,000	2
4	2020	2020	64,300	1
5	2020	2020	87,710	2
6	2020	2020	94,380	2
7	2020	2020	134,500	3
8	2020	2020	136,890	3
9	2020	2020	110,700	3

Palmer CSD Summary by Year											
	Units	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Water	Acre Ft / Year	5.0	20.2	25.3	23.4	21.7	23.4	22.7	24.3	26.8	26.2