Technical Memorandum

HydroScience
Strategic Water Solutions

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To: Tom DuBois, ARSA General Manager

From: Hydroscience Engineers, Inc.

Prepared By: Steven Whittlesey, PE

Reviewed By: Bill Slenter, PE

Subject: ARSA Water Balance Update

Date: November 25, 2024

This Technical Memorandum (TM) provides the water balance and supporting documentation for the Amador Regional Sanitation Agency (ARSA) disposal system in joint operation with the Castle Oaks Water Reclamation Facility (COWRF) and the Castle Oaks Golf Course (COGC) which receive secondary disinfected effluent from the Sutter Creek Wastewater Treatment Plant (WWTP). This TM is organized into the following sections:

- Background Information
- WWTP Flow & Population Data
- Climatological Data
- Storage Facilities Characterization
- Disposal Facilities Characterization
- Water Balance Results

Background Information

The ARSA, City of Ione (City), and Portlock International Ltd. (Portlock) are all permittees under the State Water Resources Control Board (SWRCB) Water Reclamation Requirement Order 93-240 (WRRs). The WRRs permit the ARSA system, the COWRF, and the COGC land application areas (LAAs). ARSA operates the storage and disposal facilities downstream of the Sutter Creek WWTP, however the City operates the COWRF and Portlock operates the COGC.

ARSA's system includes conveyance infrastructure, three storage reservoirs and two LAAs. The system receives secondary disinfected effluent from the Sutter Creek WWTP and disposes of it on the Bower's Ranch and Hoskin's Ranch LAAs. Storage is provided in the ARSA system by the Henderson Reservoir, Preston Forebay and Preston Reservoir. Remaining effluent that is not disposed in the ARSA system is conveyed to the COWRF to receive tertiary treatment before it is disposed at the COGC. ARSA also owns a siphon from Jackass Creek that may divert surface water to meet irrigation demands when inadequate volume of Sutter Creek WWTP effluent is available. The Jackass Creek siphon is in need of repair and ARSA continues to seek cost effective bids for the work expected to occur in 2025 at the earliest.

Under a 2007 contractual agreement with the City, the California Department of Corrections and Rehabilitation (CDCR) Mule Creek State Prison (MCSP) has sent effluent to the COWRF either through Preston Reservoir or directly via an interconnection pipe. The discharge from MCSP to the COWRF is not described in the WRRs and is an agreement between ARSA, the City, and the CDCR. This agreement is the three Parties' effort to manage the interconnected system to the maximum benefit possible. The flow diagram of the interconnected system is illustrated in Figure 1.

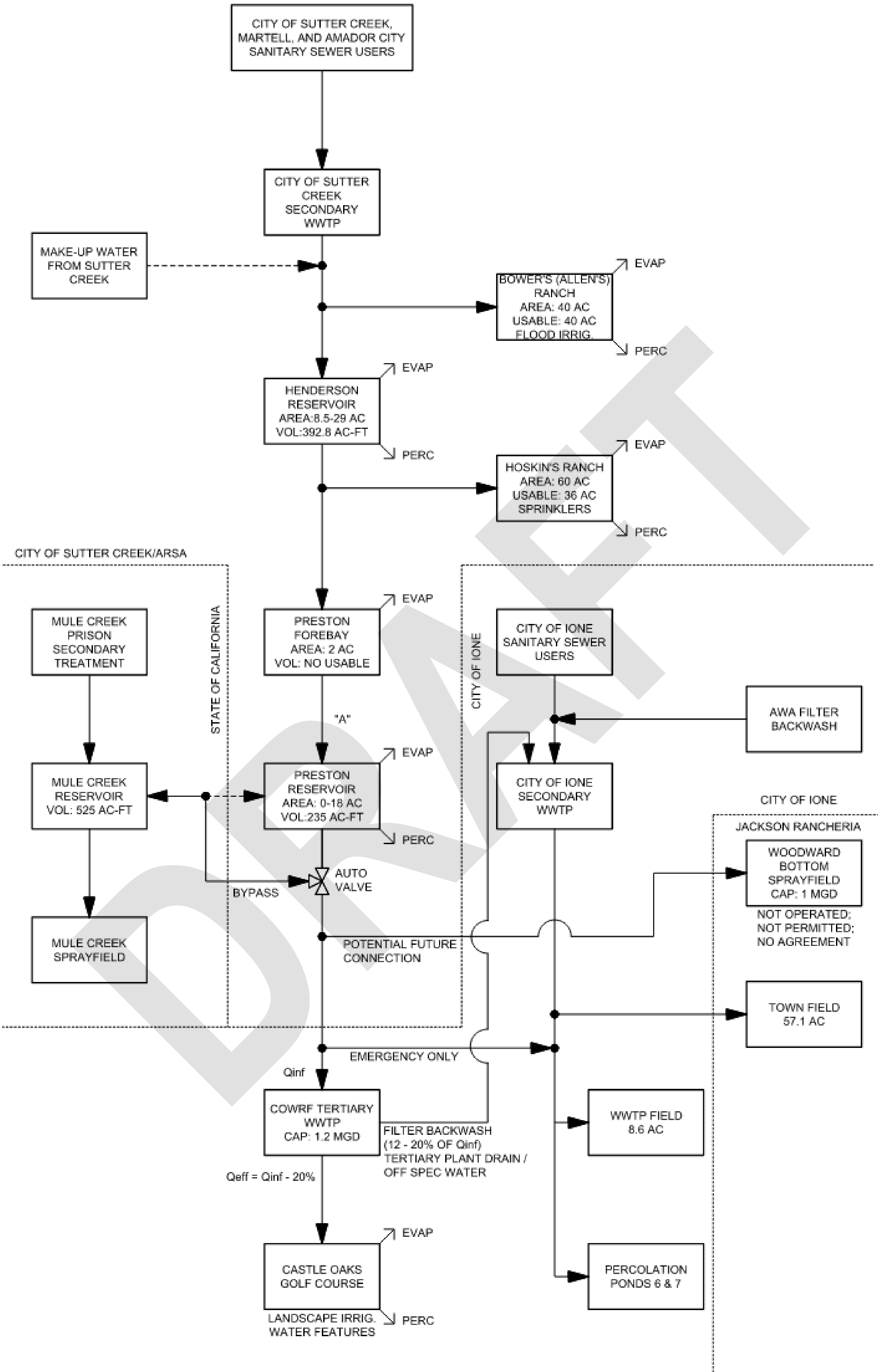

Figure 1: ARSA Storage and Disposal System Flow Diagram

On August 14, 2024, the SWRCB issued a Water Code Section 13267 Order to requiring ARSA, MCSP, and the City to verify their abilities and capacities to adequately convey, treat, and dispose of the wastewater generated by their own respective collection systems without impacting beneficial uses. This Order requires ARSA, the City, and Portlock to submit an updated water balance by December 13, 2024. This TM provides all required information in response to the August 14, 2024, Water Code Section 13267 Order.

WWTP Flow & Population Data

This section documents the existing wastewater flows to the Sutter Creek WWTP, and wastewater flows over the next 5 years based on population growth as required by the Water Code Section 13267 Order item 1.A. Daily flow data from January 2017 through September 2024 for the Sutter Creek WWTP and monthly status reports from January 2016 through July 2024 for ARSA facilities were provided by Sutter Creek and ARSA Staff. Population data was sourced from the California Department of Finance. Population and flow data is included as Attachment A for reference.

Current Flow Conditions

An analysis of the daily flow data indicates the Average Dry Weather Flow (average of flows from July through September) from 2017 through 2024 was typically 0.31 MGD.

Table 1: Sutter Creek WWTP ADWFs from 2017 Through 2024

Year	ADWF (MGD
2017	0.291
2018	0.305
2019	0.342
2020	0.269
2021	0.326
2022	0.327
2023	0.328
2024	0.318
Average	**0.313**

Throughout the months of December through April, Sutter Creek WWTP effluent flows can increase from infiltration and inflow (I/I) due to significant rainfall events. Precipitation data from the National Oceanic and Atmospheric Administration Sutter Hill CDF station was collected and compared to the Sutter Creek WWTP flow data. Data shown in Figure 2 indicates that once surface soils become saturated from initial rainfall, I/I increases significantly during subsequent rainfall events further into the periods of December through April.

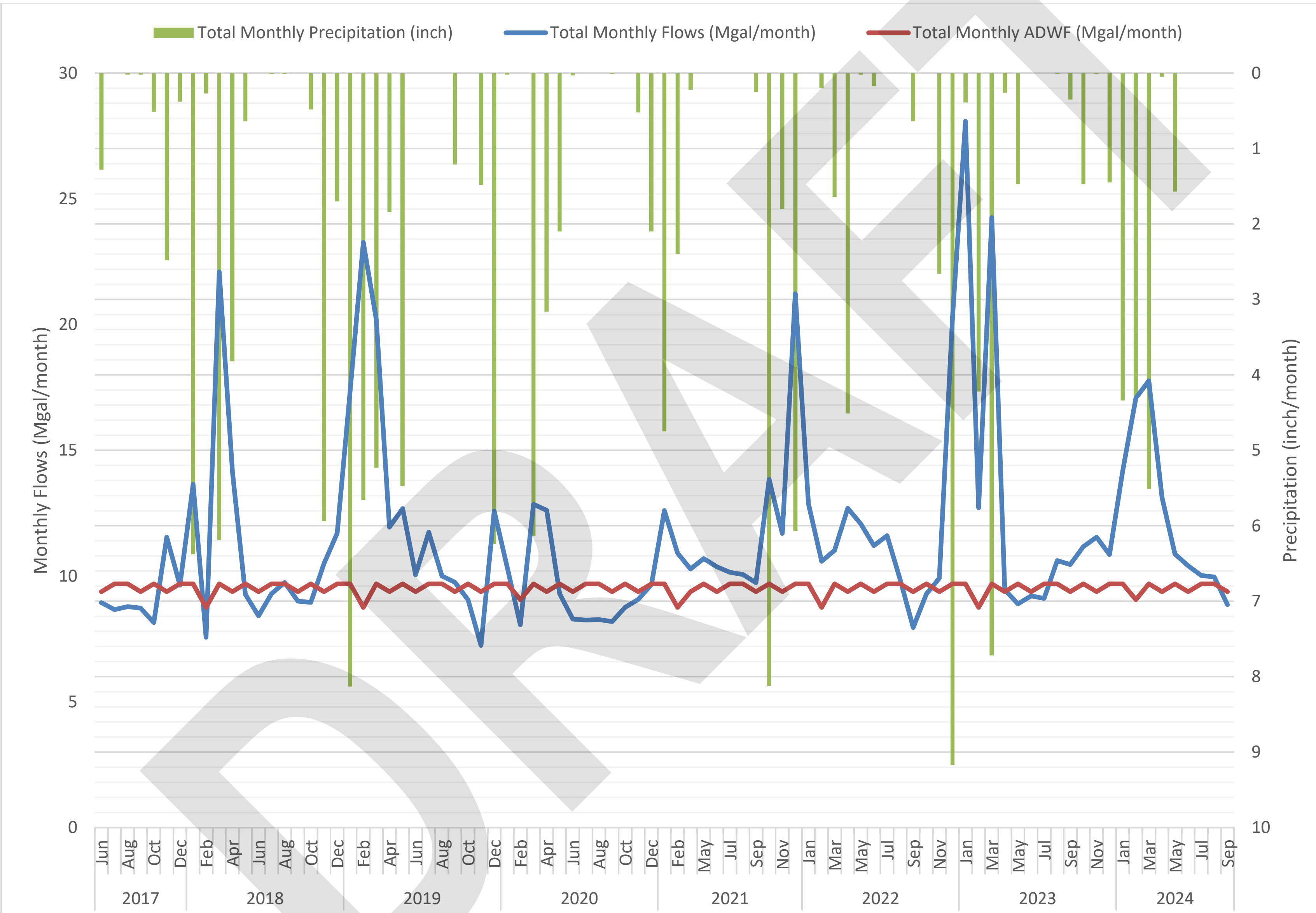

Figure 2: Sutter Creek WWTP Effluent Flows and Rainfall

To benchmark the Sutter Creek WWTP I/I, the historical wet years of 2016/17 and 2022/23 were compared to the estimated RP100 total wastewater flows. In 2016/17 water year there were 14.2 inches of precipitation from October through December before 15.1 inches of precipitation occurred in January when the peak flow of 94.8 Ac-ft also occurred. In the 2022/23 water year, there were 11.8 inches of precipitation in October through December and only 0.39" in Jan and the peak flow for the month of Jan resulted in 86.2 Ac-ft/month.

Due to the estimation of the I/I being a function of monthly precipitation, the first calibration step is adjustment of the monthly distribution of RP100 precipitation as described in the Climatological Data section. Next, to bring the modeled RP100 flows within range of the 2016/17 and 2022/23 flows, a 25% increase in I/I from December through April was applied. This results in a January modeled peak flow of 87.4 Ac-ft which is within 8% of the 2016/17 WY peak flow. Due to the high variance and potential errors in estimating the precipitation vs I/I data, this 25% multiplier during the wet months can be considered a calibration to adjust the modeled RP100 WY flows to be consistent with historical data. The uncalibrated and calibrated RP100 flows and their comparative 2016/17 and 2022/23 Sutter Creek WWTP effluent flows are illustrated in Figure 3 for reference.

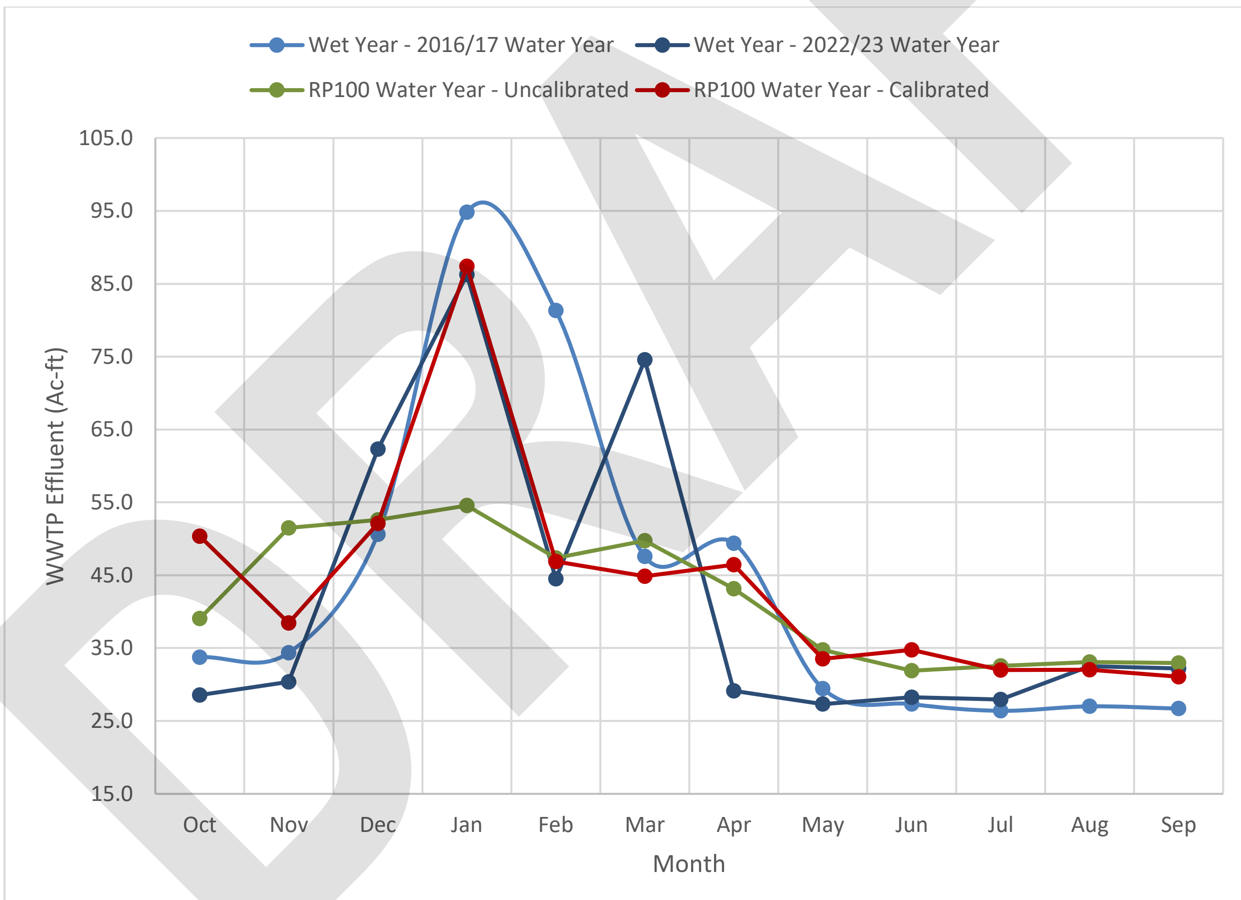

Figure 3: Calibration of Sutter Creek WWTP I/I for RP100 Conditions

Future Projected Flows & Population

In recent years the City of Sutter Creek has taken steps to reduce the I/I from the Sutter Creek WWTP collection system which included sealing of manholes within and adjacent to creek beds. Future I/I reduction efforts are expected to continue to be taken by the City of Sutter Creek, as documented in the Draft 2023 Sutter Creek WWTP I/I Analysis Update Technical Memorandum from Carollo Engineers provided as Attachment B for reference. This analysis involved flow monitoring of the collection system and modeling of the effects of I/I mitigation efforts on peak hour influent flows to the WWTP.

I/I mitigation efforts considered included manhole rehabilitation, sewer main rehabilitation or replacement and lateral rehabilitation that were recommended for sewer shed areas that have the highest I/I rates per foot of sewer pipe, which are 18% of the collection system by length. The Carollo Draft Technical Memorandum estimated the I/I reduction projects in the targeted 18% of the collection system may result in the peak hour influent flow to be reduced between 30% to 65%.

However, the results of I/I reduction projects may have a more modest effect upon the peak month flows because, unlike during a peak hour event, over a peak month there may be enough time for infiltration to occur at a low rate that may still result an increased monthly influent volume. To conservatively estimate the effect of the I/I reduction efforts on future I/I, it is assumed that the lower estimated 30% reduction in flow would occur. This reduction applies to 18% of the collection system, resulting in overall peak month flow reduction of 5.4%. To achieve the peak month flow reduction, an overall I/I reduction of approximately 8.18% is applied to future water balance calculations. The future total peak month flow reduction due to I/I reduction is also offset by ADWF increases due to population growth.

Population data provided by ARSA is sourced from the California Department of Finance population projections, which estimates in the next five years, by 2029, the population of Amador County will increase 2.17 percent.[1] The population of Sutter Creek, Martell, and Amador City are expected to increase proportionally to the projected Amador County population growth rate. The projected increases in population and flow are summarized in Table 2. ADWFs in 2029 are anticipated to reach 0.319 MGD, which is the basis of ADWF for Future Water Balance Results.

Table 2: Future Sutter Creek WWTP Flow Projections Based on Population Growth and I/I Reduction Projects

Year	ADWF (MGD)	Model Peak Month Flow (MGD)
2024	0.313	2.819
2029	0.319	2.687
Total Change	**+2.17%**	**-4.7%**

[1] CA Department of Finance Population Projections P-2A, November 2024: Projections | Department of Finance

Climatological Data

This section discusses the climatological data sources and their characteristics that were used for uncalibrated and calibrated water balance calculations. Statistical depth-duration-frequency data for the 1-in-100 Return Period (RP100) frequency at 1-Year duration are referenced from the California Department of Water Resources, Ione station (station number B00 4283 00).[2] Precipitation for the RP100 water year totals 41.11 inches based on the Ione station. Monthly precipitation patterns and totals are based on the Western Regional Climate Center Comparative Tables for Ione.[3] Average-year precipitation totals approximately 21.41 inches annually, resulting in a RP100 to average-year ratio of 1.92.

During initial water balance calculations, it became apparent that precipitation patterns during RP100 water years did not follow the same trend as the monthly precipitation distribution during average years. The most recent historical data of a water year similar to the RP100 is the 2016/17 water year which saw 105% of the RP100 total precipitation (43.37 inches) with 15.1 inches occurring in January 2017 alone. To better fit the historically significant 2016/17 data, the RP100 precipitation pattern was adjusted to fit the monthly pattern of the 2016/17 water year, but with reduced amounts to match the statistical RP100 precipitation of 41.11 inches. The adjusted data is illustrated in Figure 4. The adjustment of the distribution of monthly precipitation for the RP100 water year is a calibration element, as mentioned in the Water Balance Results section.

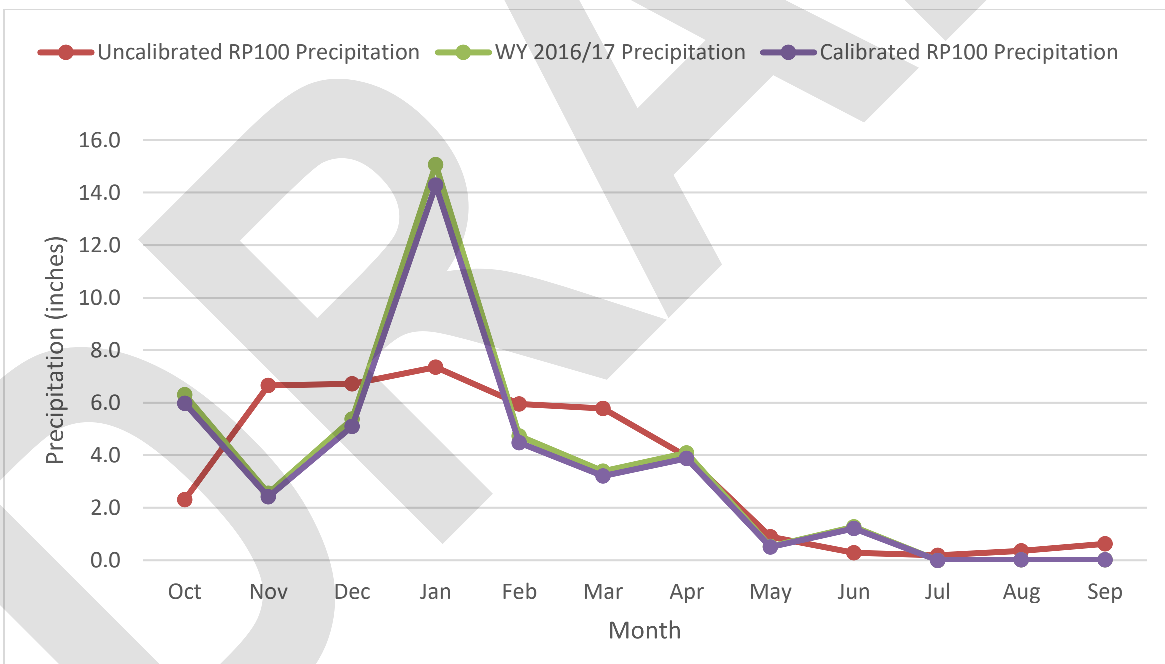

Figure 4: Calibration of RP100 Monthly Precipitation Patterns to Match 2016/17 Water Year

[2] Ione Rainfall Depth Duration Frequency Table, California Department of Water Resources, November 2024: DDF Ione CA

[3] Western Regional Climate Center Precipitation Comparative Tables, November 2024: WRCC: Precipitation Comparative Table (dri.edu)

Pan evaporation data stations within the project vicinity are limited, therefore the Camp Pardee station was the closest selected station from the Western Regional Climate Center Pan Evaporation Comparative Tables (located within approximately 9 miles from Ione and 10 miles from Sutter Creek).[4] Pan evaporation from the Camp Pardee station totaled 57.88 inches per year, and a typical pan coefficient of 0.75 was applied to the monthly pan evaporation data to estimate the effective lake evaporation from Henderson and Preston Reservoirs and the Preston Forebay. Additionally, a weather correction factor reduction of 25% was applied to the months of November through March during the RP100 water year to account for reduction in evaporation during a wet year wet season.

Reference evapotranspiration (Eto) data were acquired from the California Irrigation Management Information System (CIMIS) for the Shenandoah station 81, which is within 6.5 miles of Sutter Creek, and 9.5 miles of Ione and located within the Sierra Foothills, CIMIS Zone 13. The Shenandoah station reported an annual Eto total of 49.4 inches. Crop coefficients (Kc) consistent with pasture grasses for CIMIS Zone 13 were applied to the reference Eto of CIMIS station 81 to calculate crop evapotranspiration (Etc) rates at the LAAs.[5] Wet year Kc values were used to calculate the RP100 water year Etc, and typical year Kc values were used to calculate average year Etc values. The difference between the monthly rainfall depth and the Etc resulted in the agronomic crop irrigation demand values. Rainfall efficiency is conservatively estimated at 100%, meaning all precipitation over the LAAs reaches the ground surface and is not evaporated to atmosphere. Finally, the irrigation efficiency is estimated at 85% which approximates a highly efficient irrigation system minimizing potential for overestimation of irrigation demands.

A summary of the climatological data used for the uncalibrated and calibrated water balance calculations is provided in Table 3: Estimated Climatological Parameters for Water Balance Calculations.

[4] Western Regional Climate Center Pan Evaporation Comparative Tables, November 2024: WRCC: Pan Evap Comparative Table (dri.edu)
[5] California Crop and Soil Evapotranspiration, ITRC Report 03-001, January 2003, www.itrc.org/reports/pdf/californiacrop.pdf

Table 3: Estimated Climatological Parameters for Water Balance Calculations

Climatological Parameters	Units	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Precipitation – Avg. Year	Inch	1.20	3.47	3.50	3.83	3.10	3.01	2.06	0.47	0.15	0.10	0.19	0.33	21.41
Precipitation – Uncalibrated RP100	Inch	2.30	6.66	6.72	7.35	5.95	5.78	3.96	0.90	0.29	0.19	0.36	0.63	41.11
Precipitation - Calibrated RP100	Inch	5.98	2.42	5.10	14.28	4.48	3.21	3.88	0.50	1.21	0.00	0.02	0.02	41.11
Effective Lake Evap. – Avg. Year	Inch	2.83	1.05	0.54	0.54	0.84	1.74	3.14	5.28	7.07	8.38	7.13	4.88	43.41
Effective Lake Evap. – RP100	Inch	2.83	0.79	0.41	0.41	0.63	1.31	3.14	5.28	7.07	8.38	7.13	4.88	42.23
Reverence Evapotranspiration – CIMIS Station 81	Inch	3.60	1.75	1.21	1.19	1.83	3.10	4.42	5.67	6.88	7.56	7.02	5.17	49.40
Pasture Grass Agronomic Application – Avg. Year	Ft/Ac	0.05	0.00	0.00	0.00	0.00	0.00	0.09	0.46	0.63	0.69	0.64	0.41	2.96
Pasture Grass Agronomic Application – Uncalibrated RP100	Ft/Ac	0.09	0.00	0.00	0.00	0.00	0.00	0.06	0.54	0.69	0.72	0.65	0.45	3.21
Pasture Grass Agronomic Application – Calibrated RP100	Ft/Ac	0.00	0.00	0.00	0.00	0.00	0.17	0.07	0.58	0.60	0.74	0.69	0.51	3.36

Storage Facilities Characterization

This section describes the Henderson Reservoir, Preston Forebay and the Preston Reservoir, which are the ARSA system's effluent storage facilities as illustrated in the Figure 1 flow diagram. Detailed information including topographical survey data from November 7, 2008, for Henderson Reservoir, the stage-storage curve data (for Henderson and Preston Reservoirs) and dam embankment data sheets for the reservoirs are provided in Attachment C.

Henderson Reservoir

Henderson Reservoir is reported to have a variable usable storage volume with a minimum 2 feet of freeboard from spillway ranging from 27.5 ac-ft to 392.8 ac-ft, and surface area (8.5 ac to 29 ac) based on the reservoir being at a minimum pool (approximately 5 ft stage) at the end of the dry season and at a maximum at the end of the wet season. The reservoir is described as providing seasonal storage but never to be empty. Therefore, an initial volume in any scenario was assumed to be 27.5 ac-ft and the goal of the water balance is to reach 27.5 ac-ft at the end of the dry season.

Percolation and evaporation rates are functions of the water surface area of the reservoirs; however the percolation rates are uncertain and have not been recently studied. Reservoir surface area was back-calculated from the month-to-month accumulated storage volume in the reservoir and then multiplied by the evaporation or percolation rate. The reservoir also accumulates precipitation throughout the entire acreage of 29 acres. Sutter Creek is diverted around the reservoir but a catchment area of 4.3 acres is assumed to add runoff to the reservoir with a very conservative runoff coefficient of 1.

Since Henderson Reservoir is the first reservoir in the system, the operational strategy taken in the water balance is to retain as much effluent and precipitation runoff in the reservoir throughout the wet season until full, at which point effluent would be sent from Henderson to Preston Reservoir.

Preston Forebay

The disposal capacity of the Preston Forebay is calculated as if it were only a pass-through system as the water flows through the reservoir and it maintains a constant water surface elevation and surface area. The percolation rate is reportedly zero leaving only evaporation as a means of disposal. The surface area is 2 acres with no discernible runoff catchment area.

Preston Reservoir

Preston Reservoir is reported to have a variable usable storage volume with a minimum 2 feet of freeboard from spillway ranging from 0 ac-ft to 235 ac-ft, and surface area (0 ac to 18 ac) based on the reservoir often being empty at the end of the dry season. Therefore, the initial volume in water balance scenarios was assumed to be 0 ac-ft and the goal of the water balance is to reach 0 ac-ft storage at the end of the dry season.

Similar to the Henderson Reservoir calculations, percolation and evaporation rates are a function of the water surface area of the reservoir, however the percolation rates are assumed to be negligible due to a lack of percolation studies. Reservoir surface area was back-calculated from the month-to-month accumulated storage volume in the reservoir and then multiplied by the evaporation rate. The reservoir also accumulates precipitation throughout the entire acreage of 18 acres. Preston Reservoir also has a catchment area of 14 acres that adds runoff to the reservoir with a very conservative runoff coefficient of 1.

Since Preston Reservoir is the final reservoir in the system, the operational strategy taken in the water balance is to receive any excess effluent and precipitation runoff from upstream components when Henderson Reservoir does not have available storage capacity. As a result, Preston Reservoir quickly receives large effluent volumes later in the wet season but does not reach its maximum capacity in any evaluated scenario.

Disposal Facilities Characterization

This section describes the Bower's Ranch, Hoskin's Ranch and the COGC, which are the ARSA system's effluent disposal facilities as illustrated in the Figure 1 flow diagram. Disposal capacity of each site is evaluated based on the Climatological Data section. Although Noble Ranch is described, it is not currently in use as a LAA.

Bower's Ranch

ARSA has a 40 acre land application (flood irrigation) disposal easement upon Bower's Ranch. The disposal facility was recently expanded from 60% constructed (24 acres) to fully utilizing the 40 acre site. As Bower's Ranch is the first LAA in the ARSA system, it is often fully utilized to take almost all of the Sutter Creek WWTP effluent for the months of June through October. Due to the site topography, any tailwater from the site is received by Henderson Reservoir and there is little to no risk of tailwater leaving the site. The site primarily consists of pasture grass that is used for cattle grazing.

Hoskin's Ranch

ARSA has a 60 ac LAA at Hoskin's Ranch that is used for spray land application. The disposal facility was recently expanded from only 40% constructed (24 acres) to 60% constructed (36 acres). This LAA is primarily used for pasture grasses and for grazing cattle. Application rates are carefully monitored by ARSA Staff to prevent any overspray and to maintain but not exceed agronomic application rates.

Noble Ranch

Sutter Creek has an existing land application disposal easement for this site for 1,300 ac-ft/yr. This facility is not yet constructed nor is the site in use. Therefore, this site was not characterized or evaluated for water balance calculations.

Castle Oaks Golf Course

Disinfected secondary effluent from the ARSA system is exported from Preston Reservoir to the COWRF for tertiary treatment and subsequent water recycling at the COGC. The COGC includes a total irrigable acreage of 130 acres and contains nine lakes with only one lake (Lake I) totaling 3.1 acres that is typically filled with recycled water during the irrigation season. Demands to be met by ARSA's effluent include both the COGC irrigation demands and backwash flows at the COWRF which are necessary to maintain the COWRF system operation. These demands total approximately 420 Ac-ft during the RP100 water year and 478 Ac-ft during the average year. The capacity evaluation of the COWRF and COGC was completed by West Yost Engineers, and their 2024 COGC Recycled Water Demands Technical Memorandum is included as Attachment D for further reference.

Water Balance Results

This section discusses water balance calculations that were completed for uncalibrated current flow conditions, calibrated current flow conditions, and calibrated future flow conditions. All water balance calculations consist of evaluation of system operations during a RP100 water year followed by an average year water year.

As discussed in the WWTP Flow & Population Data section, calibration of the flow data included increasing the I/I volume by 25% from December through April to be consistent with 2016/17 and 2022/23 water year flow data. Calibration of precipitation in the Climatological Data involved adjusting the monthly distribution of RP100 annual precipitation based on 2016/17 water year precipitation data. These calibrations result in increased effluent reservoir storage volumes and increased flow I/I flow volumes. Calibrated future flow conditions account for I/I and climate calibrations and 2.17% population growth, as well as 5.4% peak month flow and general 8.18% I/I reduction discussed in the Future Projected Flows & Population section.

The strategy of the water balance calculations incorporates the following logic:

1) Fully meet all irrigation demands at the LAAs (Bower's Ranch, Hoskin's Ranch, and COGC) utilizing Sutter Creek WWTP effluent to the maximum agronomic rate for each given month.

2) Any shortfall of irrigation demands would be made up by diversion from the Jackass Creek siphon. Since these diversions are conveyed through the ARSA system to meet monthly irrigation demands, they are added to the inflows and storage volumes. These are figurative estimates of possible diversion volumes, however the current siphon is in need of repair so there may be an actual shortfall of irrigation demands (which is also an excess of LAA disposal capacity) if repairs are not completed.

3) Henderson Reservoir is assumed to maintain a minimum dead pool of 27.5 Ac-ft at 5 ft stage, whereas Preston Reservoir is allowed to reach 0 Ac-ft storage (empty).

4) Any excess of Sutter Creek WWTP effluent or precipitation / runoff not used to meet irrigation demands is stored in Henderson Reservoir first and then, once it reaches full capacity of 392.8 Ac-ft at 2 ft freeboard, any excess volume is sent to Preston Reservoir. Runoff and precipitation within Henderson Reservoir or its catchment area is retained in it. All other runoff and precipitation in the system in excess of monthly irrigation demand is retained in Preston Reservoir. The resulting final storage volumes for the month are then carried over as the beginning storage volume for the following month.

Water balance calculations completed for all scenarios indicate the ARSA system in combination with the COWRF and COGC can adequately contain and dispose of all Sutter Creek WWTP effluent, precipitation, and runoff for the RP100 water year without violation of storage capacity or agronomic application rates. Due to the I/I reduction efforts, the total future WWTP effluent flows during the RP100 water year are approximately 3 Ac-ft/year less than current flows despite the population growth.

The overall water balance results for each scenario are summarized in Table 4. Detailed water balance calculations are provided in Attachment E for further reference.

Table 4: Summary of Water Balance Calculation Results

Calculation Parameter	Water Balance Scenario Results					
	Uncalibrated Current Flows		Calibrated Current Flows		Calibrated Future Flows	
Climate Conditions	**RP100 (Year 1)**	**Avg Year (Year 2)**	**RP100 (Year 1)**	**Avg Year (Year 2)**	**RP100 (Year 1)**	**Avg Year (Year 2)**
Inflow Results						
WWTP Effluent (Ac-ft)	503.2	442.7	529.8	457.4	526.5	459.7
Precipitation and Runoff (Ac-ft)	230.6	120.1	230.6	120.1	230.6	120.1
Jackass Creek Siphon (Unmet Irrigation Demands) (Ac-ft)	73.6	162.7	83.2	188.3	77.5	188.8
Storage Facilities Results						
Henderson Reservoir Max Storage Volume (Ac-ft)	392.8	281.9	392.8	294.3	392.8	291.5
Preston Reservoir Max Storage Volume (Ac-ft)	135.2	47.3	166.1	51.4	157.3	51.4
Henderson Reservoir Evaporation (Ac-ft)	66.8	53.9	67.3	55.7	67.5	55.5
Preston Reservoir Evaporation (Ac-ft)	33.5	43.1	42.6	18.7	41.3	18.7
Disposal Results						
Bower's Ranch Irrigation Demands (Ac-ft)	128.3	118.6	128.3	118.6	128.3	118.6
Hoskin's Ranch Irrigation Demands (Ac-ft)	115.5	106.7	115.5	106.7	115.5	106.7
COWRF & COGC Irrigation Demands (Ac-ft)	419.0	476.8	419.0	476.8	419.0	476.8
Overall Calculation Results						
Total Inflows (Ac-ft)	733.9	562.8	760.4	577.5	757.2	579.8
Total Outflows (Ac-ft)	763.1	799.1	772.7	776.5	771.7	776.2
Jackass Creek Siphon (Unmet Irrigation Demands) (Ac-ft)	73.6	162.4	83.2	188.3	77.5	188.8
Maximum Storage Volume Required (Ac-ft)	528.0	412.3	558.9	430.6	550.1	428.0
Unutilized Storage Capacity at Peak Storage (Ac-ft)	99.8	215.5	68.9	197.2	77.7	199.8

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ATTACHMENT A

Amador Regional Sanitation Agency
2024 Individual Water Balance Update
Sutter Creek WWTP Population and Flow Data

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CA Department of Finance
Population Projection by County

Report P-2A: Total Estimated and Projected Population for California and Counties: July 1, 2020 to 2070

		Estimates				Projections						
FIPS	**Geography**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
6000	CALIFORNIA	39,541,722	39,246,702	39,146,273	39,109,070	39,119,734	39,155,670	39,243,572	39,340,965	39,451,269	39,568,558	39,694,960
6001	ALAMEDA	1,680,487	1,657,465	1,649,975	1,656,037	1,654,334	1,654,555	1,660,187	1,666,430	1,673,310	1,680,926	1,689,225
6003	ALPINE	1,202	1,180	1,175	1,165	1,163	1,163	1,165	1,170	1,174	1,172	1,176
6005	AMADOR	40,440	40,262	40,105	40,122	**40,198**	40,298	40,429	40,615	40,828	**41,070**	41,327

ARSA Facilities Monthly Status Reports - Provided by ARSA Staff

Date	Month	Sutter Creek WWTP (mg)	Sutter Creek WWTP (ac ft)	Bowers Irrigation (mg)	Bowers Volume irrigated (ac ft)	Henderson Freeboard	Volume in Henderson (af)	Capacity Remaining in Henderson (af)	Henderson Outflow (mg)	Henderson outflow (ac ft)	Hoskins Irrigation (mg)	Hoskins Volume irrigated (ac ft)	Mule Creek Inflow (mg)	Mule Creek Inflow (ac ft)	Preston Freeboard	Volume in Preston (af)	Capacity Remaining in Preston (ac ft)	Outflow to Ione (mg)	Outflow to Ione (ac ft)	TOTAL Ac Ft of Effluent in the system	TOTAL Remaining Capacity for Winter (ac ft)	TOTAL USED FOR IRRIGATION (ac ft)
2016																						
1/31/2016	Jan	19.0	58.3	0.0	0.0	12'1"	155.8	237.2	12.4	38.1	0.0	0.0	0.0	0.0	11'4"	94.7	140.3	3.9	12.0	250.47	377.5	12.0
2/29/2016	Feb	10.7	32.8	0.0	0.0	10'9'	180.9	212.1	17.8	54.6	0.0	0.0	0.0	0.0	8'7"	128.4	106.6	4.0	12.3	309.27	318.7	12.3
3/31/2016	Mar	17.7	54.3	0.0	0.0	8'7"	225.7	167.3	15.1	46.3	0.0	0.0	0.0	0.0	5'7"	171.0	64.0	3.4	10.4	396.64	231.4	10.4
4/30/2016	Apr	10.7	32.8	0.0	0.0	8'5"	229.3	163.7	13.7	42.0	0.0	0.0	0.0	0.0	5'7"	171.0	64.0	9.1	27.9	400.29	227.7	27.9
5/31/2016	May	9.3	28.5	0.0	0.0	9'9"	201.0	192.0	23.0	70.6	0.0	0.0	0.0	0.0	7'7"	141.9	93.1	27.3	83.8	342.85	285.2	83.8
6/30/2016	Jun	8.3	25.5	2.9	8.9	14'4"	117.6	275.4	32.2	98.8	2.2	6.8	0.0	0.0	9'8"	114.5	120.5	36.0	110.5	232.06	395.9	126.1
7/31/2016	Jul	9.0	27.6	9.0	27.6	20'1"	43.8	349.2	25.4	77.9	5.3	16.3	35.9	110.2	7'6"	143.1	91.9	40.9	125.5	186.84	441.2	169.4
8/31/2016	Aug	9.2	28.2	9.2	28.2	22'3"	24.9	368.1	8.7	26.7	3.2	9.8	32.9	101.0	8'3"	132.8	102.2	44.1	135.3	157.68	470.3	173.4
9/30/2016	Sep	8.3	25.5	6.3	19.3	25'8"	5.0	388.0	10.8	33.1	2.2	6.8	10.3	31.6	13'2"	75.1	159.9	37.5	115.1	80.06	547.9	141.2
10/31/2016	Oct	11.0	33.8	2.5	7.7	23'2"	18.4	374.6	5.9	18.1	0.0	0.0	4.0	12.3	14'4"	63.8	171.2	6.4	19.6	82.18	545.8	27.3
11/30/2016	Nov	11.2	34.4	0.0	0.0	20'8"	38.2	354.8	5.3	16.3	0	0.0	0.0	0.0	14'2"	65.4	169.6	0.0	0.0	103.6	524.4	0.0
12/31/2016	Dec	16.5	50.6	0.0	0.0	16'8"	83.5	309.5	10.4	31.9	0.0	0.0	0.0	0.0	11'6"	92.8	142.2	0.0	0.0	176.32	451.7	0.0
Total:		**140.9**	**432.4**	**29.9**	**91.8**				**180.7**	**554.5**	**12.9**	**39.6**	**83.1**	**255.0**				**212.6**	**652.4**			**783.8**
2017																						
1/31/2017	Jan	30.9	94.8	0.0	0.0	9'3"	211.4	181.6	10.7	32.8	0.0	0.0	0.0	0.0	6'8"	154.9	80.1	245.8	0.0	366.25	261.8	0.0
2/28/2017	Feb	26.5	81.3	0.0	0.0	4'1"	334.2	58.8	10.2	31.3	0.0	0.0	0.0	0.0	4'4"	190.6	44.4	136.3	0.0	524.72	103.3	0.0
3/31/2017	Mar	15.5	47.6	0.0	0.0	1'5"	408.4	43.6	14.1	43.3	0.0	0.0	0.0	0.0	1'5"	240.4	29.6	90.8	4.7	648.74	73.3	4.7
4/30/2017	Apr	16.1	49.4	0.0	0.0	1'6"	405.9	46.1	34.9	107.1	0.0	0.0	0.0	0.0	1'8"	235.9	34.1	104.6	18.2	641.82	80.2	18.2
5/31/2017	May	9.6	29.5	0.0	0.0	3'7"	347.5	45.5	38.0	116.6	2.7	8.3	0.0	0.0	1'2"	244.9	25.1	77.0	83.9	592.42	70.6	92.2
6/30/2017	Jun	8.9	27.3	8.0	24.6	6'7"	271.3	121.7	36.0	110.5	8.8	27.0	0.0	0.0	3'2"	209.8	25.2	77.3	111.2	481.07	146.9	162.8
7/31/2017	Jul	8.6	26.4	8.7	26.7	11'	176.1	216.9	35.0	107.4	10.7	32.8	0.0	0.0	6'11"	151.3	83.7	256.9	128.3	327.34	300.7	187.8
8/31/2017	Aug	8.8	27.0	8.7	26.7	13'9"	127.0	266.0	20.6	63.2	8.6	26.4	0.0	0.0	7'6"	143.1	91.9	282.0	37.3	270.02	358.0	90.4
9/30/2017	Sep	8.7	26.7	8.7	26.7	16'2"	90.3	302.7	18.3	56.2	11.9	36.5	0.0	0.0	6'10	152.5	82.5	253.2	0.0	242.81	385.2	63.2
10/31/2017	Oct	8.0	24.6	8.1	24.9	17'4"	74.8	318.2	13.8	42.4	9.4	28.8	0.0	0.0	9'7"	115.5	119.5	366.7	52.6	190.33	437.7	106.3
11/30/2017	Nov	11.5	35.3	0.9	2.8	14'10"	121.6	271.4	9.7	29.8	7.4	22.7	0.0	0.0	11'1"	97.5	137.5	422.0	83.5	219.1	408.9	109.0
12/31/2017	Dec	9.5	29.2	0.0	0.0	12'9"	143.9	249.1		0.0	6.3	19.3	0.0	0.0	10'6"	104.4	130.6	400.8	0.0	248.26	379.7	19.3
Total:		**162.6**	**499.0**	**43.1**	**132.3**				**241.3**	**740.5**	**65.8**	**201.9**	**0.0**	**0.0**				**2713.5**	**519.7**			**853.9**
2018																						
1/31/2018	Jan	13.6	41.7	0	0.0	9'7"	206.1	186.9	8.4	25.8	0	0.0	0	0.0	8'8"	128.4	106.6	0.0	0.0	334.5	293.5	0.0
2/28/2018	Feb	8.7	26.7	0	0.0	7'10"	240.4	152.6	5.1	15.7	0	0.0	0	0.0	8'3"	133.9	101.1	0.0	0.0	374.3	253.7	0.0
3/31/2018	Mar	22.1	67.8	0	0.0	4'1"	332.9	60.1	8.00	24.6	0	0.0	0	0.0	5'11"	164.1	70.9	0.0	0.0	497	131.0	0.0
4/30/2018	Apr	14.1	43.3	0	0.0	3'9"	342.6	50.4	23.8	73.0	6.0	18.4	0	0.0	3'3"	200.9	34.1	1.2	3.7	543.5	84.5	22.1
5/31/2018	May	9.3	28.5	0	0.0	3'10"	340.6	52.4	16.9	51.9	9.9	30.4	0	0.0	8'2"	133.9	101.1	27.7	85.0	474.5	153.5	115.4
6/30/2018	Jun	8.4	25.8	5.3	16.3	5'8"	295.1	97.9	21.2	65.1	9.6	29.5	0	0.0	15'1"	59.6	175.4	37.7	115.7	354.7	273.3	161.4
7/31/2018	Jul	9.3	28.5	9.2	28.2	10'0"	193.7	199.3	35.4	108.6	9.5	29.2	0	0.0	22'0"	17.0	218.0	42.9	131.7	210.7	417.3	189.0
8/31/2018	Aug	9.7	29.8	9.7	29.8	11'7"	163.6	229.4	12	36.8	5.8	17.8	0	0.0	20'9"	22.0	213.0	0.0	0.0	185.6	442.4	47.6
9/30/2018	Sep	9	27.6	9	27.6	13'11"	123.9	269.1	16	49.1	10.7	32.8	0	0.0	19'3"	36.2	198.8	0.0	0.0	160.1	467.9	60.5
10/31/2018	Oct	8.9	27.3	8.9	27.3	15'2"	106.0	287.0	16.2	49.7	10.0	30.7	0	0.0	11'	45.6	189.4	0.0	0.0	151.6	476.4	58.0
11/30/2018	Nov	10.5	32.2	5.8	17.8	15'1"	107.2	285.8	14.9	45.7	5.6	17.2	0	0.0	14'10"	60.9	174.1	0.0	0.0	168.1	459.9	35.0
12/31/2018	Dec	11.7	35.9	0	0.0	13'6"	131.2	261.8	15.2	46.6	0	0.0	0	0.0	11'2"	94.9	140.1	0.0	0.0	226.1	401.9	0.0
Total:		**135.3**	**415.2**	**47.9**	**147.0**				**193.1**	**592.6**	**67.1**	**205.9**	**0.0**	**0.0**				**109.5**	**336.0**			**689.0**
2019																						
1/31/2019	Jan	17.4	53.4	0	0.0	10'5"	185.4	207.6	36.7	112.6	0	0.0	0	0.0	8'3"	132.8	102.2	0	0.0	318.2	309.8	0.0
2/28/2019	Feb	23.3	71.5	0	0.0	6'6"	271.9	121.1	4.8	14.7	0	0.0	0	0.0	6'6"	157.3	77.7	0	0.0	429.22	198.8	0.0
3/31/2019	Mar	20.2	62.0	0	0.0	3'6"	350.4	42.6	7.6	23.3	0	0.0	0	0.0	4'8"	185.2	49.8	0	0.0	535.64	92.4	0.0
4/30/2019	Apr	11.9	36.5	0	0.0	2'9"	271.4	121.6	15.8	48.5	4.2	12.9	0	0.0	3'2"	209.8	25.2	2	6.1	481.19	146.8	19.0
5/31/2019	May	12.7	39.0	0	0.0	3'6"	350.4	42.6	24.0	73.7	5.8	17.8	0	0.0	4'8"	185.2	49.8	20.9	64.1	535.64	92.4	81.9
6/30/2019	Jun	10	30.7	5.2	16.0	5'10"	288.5	104.5	26.5	81.3	12.3	37.7	0	0.0	7'3"	146.6	88.4	29	89.0	435.06	192.9	142.7
7/31/2019	Jul	7.6	23.3	9.9	30.4	8'11"	217.9	175.1	22.9	70.3	13.8	42.4	0	0.0	14'7"	61.5	173.5	40.6	124.6	279.44	348.6	197.3
8/31/2019	Aug	10	30.7	10	30.7	10'7"	184.2	208.8	13.4	41.1	11.8	36.2	0	0.0	17'2"	40.3	194.7	6.2	19.0	224.52	403.5	85.9
9/30/2019	Sep	9.6	29.5	9.4	28.8	12'6"	148.3	244.7	13.7	42.0	10.4	31.9	0	0.0	17'1"	40.9	194.1	0	0.0	189.23	438.8	60.8
10/31/2019	Oct	9	27.6	9	27.6	14'3"	119.6	273.4		0.0	12.2	37.4	0	0.0	16'5"	46.0	189.0	0	0.0	165.61	462.4	65.1
11/30/2019	Nov	7.2	22.1	5.1	15.7	14'1"	121.6	271.4	9.3	28.5	5.7	17.5	0	0.0	14'11"	58.5	176.5	0	0.0	180.14	447.9	33.1
12/31/2019	Dec	12.6	38.7	0	0.0	12'3"	152.2	240.8	0	0.0	0	0.0	0	0.0	13'2"	75.1	159.9	0	0.0	227.3	400.7	0.0
Total:		**151.5**	**464.9**	**48.6**	**149.1**				**174.7**	**536.1**	**76.2**	**233.8**	**0.0**	**0.0**				**98.7**	**302.9**			**685.9**

Date		Sutter Creek WWTP Flow (mg)	Sutter Creek WWTP (ac ft)	Bowers Irrigation (mg)	Bowers Volume irrigated (ac ft)	Henderson Freeboard	Volume in Henderson (af)	Capacity Remaining in Henderson	Henderson Outflow (mg)	Henderson outflow (ac ft)	Hoskins Irrigation (mg)	Hoskins Volume irrigated (ac ft)	Mule Creek Inflow (mg)	Mule Creek Inflow (ac ft)	Preston Freeboard	Volume in Preston (af)	Capacity Remaining in Preston (ac ft)	Outflow to Ione (mg)	Volume sent to Ione (ac ft)	TOTAL Ac Ft of Effluent in the system	TOTAL Remaining Capacity for Winter (ac ft)	TOTAL USED FOR IRRIGATION N (ac ft)
2020																						
1/31/2020	Jan	10.3	31.6	0	0.0	11'2"	172.9	220.1	8.5	26.1	0	0.0	0	0.0	12'2"	85.5	149.5	0	0.0	258.4	369.6	0.0
2/29/2020.	Feb	8	24.6	0	0.0	10'7"	184.2	208.8	3.5	10.7	0	0.0	0	0.0	11'7"	91.9	143.1	0	0.0	276.08	351.9	0.0
3/31/2020	Mar	12.85	39.4	0	0.0	8'11"	214.9	178.1	7.4	22.7	0	0.0	0	0.0	10'1"	109.4	125.6	0	0.0	324.26	303.7	0.0
4/30/2020	Apr	12.61	38.7	0	0.0	7'8"	246.1	146.9	6.3	19.3	0	0.0	0	0.0	10'8"	102.4	132.6	8.84	27.1	348.5	279.5	27.1
5/31/2020	May	8.2	25.2	1.4	4.3	8'6"	227.5	165.5	4.2	12.9	7.5	23.0	0	0.0	13'11"	67.8	167.2	23.9	73.3	295.3	332.7	100.7
6/30/2020	Jun	8.3	25.5	8.3	25.5	11'6"	166.5	226.5	6.3	19.3	5.7	17.5	0	0.0	19'6"	25.1	209.9	28.9	88.7	191.6	436.4	131.7
7/31/2020	Jul	8.3	25.5	8.3	25.5	14'11"	108.5	284.5	19.2	58.9	3.9	12.0	0	0.0	15'10"	50.7	184.3	0	0.0	159.2	468.8	37.4
8/31/2020	Aug	8.3	25.5	8.3	25.5	17'11"	67.6	325.4	13.3	40.8	2.3	7.1	0	0.0	14'0"	67.0	168.0	0	0.0	134.56	493.4	32.5
9/30/2020	Sep	8.2	25.2	8.2	25.2	19'2"	53.3	339.7	8.4	25.8	2.3	7.1	14	43.0	13'0"	76.8	158.2	13.9	42.7	130.09	497.9	74.9
10/31/2020	Oct	8.8	27.0	8.8	27.0	21'2"	33.7	359.3	11.9	36.5	2.4	7.4	0	0.0	17'9"	36.2	198.8	23.4	71.8	69.86	558.1	106.2
11/30/2020	Nov	9.1	27.9	3.5	10.7	22'	26.8	366.2	7.62	23.4	2.3	7.1	0	0.0	18'8"	30.1	204.9	30.7	94.2	56.89	571.1	112.0
12/31/2020	Dec	9.9	30.4	0	0.0	21'0"	35.9	357.1	8.8	27.0	0	0.0	0	0.0	16'8"	44.1	190.9	0	0.0	79.97	548.0	0.0
Total:		**112.9**	**346.4**	**46.8**	**143.6**				**105.4**	**323.4**	**26.4**	**81.0**	**14.0**	**43.0**				**129.6**	**397.9**			**622.5**
2021																						
1/31/2021	Jan	12.6	38.7	0	0.0	17'6"	72.7	320.3	3.9	12.0	0	0.0	0	0.0	15'3"	55.6	179.4	0	0.0	128.3	499.7	0.0
2/28/2021	Feb	10.9	33.5	0	0.0	16'1"	91.5	301.5	2.6	8.0	0	0.0	0	0.0	14'9"	60.0	175.0	0	0.0	151.49	476.5	0.0
3/31/2021	Mar	11.9	36.5	0	0.0	13'1"	138.2	254.8	3.5	10.7	0	0.0	0	0.0	14'7"	61.5	173.5	0	0.0	199.65	428.4	0.0
4/30/2021	Apr	10.2	31.3	0	0.0	14'7"	113.7	279.3		0.0	0	0.0	0	0.0	16'11"	42.2	192.8	20.7	63.5	155.85	472.2	63.5
5/31/2021	May	10.7	32.8	6.6	20.3	19'10"	46.3	346.7	27.2	83.5	0	0.0	0	0.0	21'4"	15.7	219.3	36.2	111.1	61.97	566.0	131.3
6/30/2021	Jun	10.4	31.9	7.4	22.7	21'5"	31.6	361.4	8.7	26.7	0	0.0	0	0.0	20'10"	18.0	217.0	1.9	5.8	49.6	578.4	28.5
7/31/2021	Jul	10.2	31.3	7.1	21.8	22'1"	26.2	366.8	3.9	12.0	0.2	0.6	0	0.0	21'0'	17.2	217.8	0	0.0	43.39	584.6	22.4
8/31/2021	Aug	10.1	31.0	6.9	21.2	22'6"	23.0	370.0	5.6	17.2	2	6.1	0	0.0	21'6"	15.0	220.0	0	0.0	37.96	590.0	27.3
9/30/2021	Sep	9.7	29.8	5.2	16.0	23'8"	15.2	377.8	6.9	21.2	1.7	5.2	0	0.0	21'0"	17.2	217.8	0	0.0	32.38	595.6	21.2
10/31/2021	Oct	13.8	42.4	3.6	11.0	20'5"	40.6	352.4	5	15.3	0	0.0	0	0.0	19'1"	27.5	207.5	0	0.0	68.06	559.9	11.0
11/30/2021	Nov	11.7	35.9	0	0.0	18'11"	56.0	337.0	7.9	24.2	0	0.0	0	0.0	18'1"	33.9	201.1	0	0.0	89.89	538.1	0.0
12/31/2021	Dec	21.2	65.1	0	0.0	14'2"	120.2	272.8		0.0	0	0.0	0	0.0	14'8"	60.8	174.2	0	0.0	180.98	447.0	0.0
Total:		**143.4**	**440.1**	**36.8**	**112.9**				**75.2**	**230.8**	**3.9**	**12.0**	**0.0**	**0.0**				**58.8**	**180.5**			**305.4**
2022																						
1/31/2022	Jan	12.9	39.6	0	0.0	12'9"	142.9	250.1	6.2	19.0	0	0.0	0	0.0	13'9"	69.4	165.6	0	0.0	212.25	415.8	0.0
2/28/2022	Feb	10.6	32.5	0	0.0	12'0"	157.3	235.7	5.5	16.9	0	0.0	0	0.0	12'10"	78.5	156.5	0	0.0	235.79	392.2	0.0
3/31/2022	Mar	11	33.8	0	0.0	11'8"	163.4	229.6	2.7	8.3	0	0.0	0	0.0	12'1"	86.4	148.6	1.6	4.9	249.83	378.2	4.9
4/30/2022	Apr	12.7	39.0	0	0.0	11'3"	171.3	221.7	9.1	27.9	0	0.0	0	0	10'1"	109.4	125.6	0.1	0.3	280.62	347.4	0.3
5/31/2022	May	12.1	37.1	0	0.0	12'2"	154.3	238.7	11.7	35.9	0	0.0	0	0	9'0"	122.9	112.1	1.7	5.2	277.21	350.8	5.2
6/30/2022	Jun	11.2	34.4	10.1	31.0	14'3"	118.9	274.1	11.2	34.4	7.2	22.1	0	0	8'11"	124.0	111.0	5	15.3	242.9	385.1	68.4
7/31/2022	Jul	11.6	35.6	11.6	35.6	16'3"	89.2	303.8	9.4	28.8	8.1	24.9	0	0	9'3"	119.7	115.3	0	0.0	208.9	419.1	60.5
8/31/2022	Aug	9.8	30.1	9.8	30.1	18'1"	65.6	327.4	8.4	25.8	7.7	23.6	0	0	9'8"	114.5	120.5	0.5	1.5	180.1	447.9	55.2
9/30/2022	Sep	8.5	26.1	7.6	23.3	9'8"	48.9	344.1	8.6	26.4	6.5	19.9	0	0	9'9"	113.4	121.6	0.9	2.8	162.3	465.7	46.0
10/31/2022	Oct	9.3	28.5	9.3	28.5	22'0"	26.8	366.2	9.8	30.1	8.7	26.7	0	0	11'8"	91.0	144.0	4.5	13.8	117.8	510.2	69.0
11/30/2022	Nov	9.9	30.4	0	0.0	19'7"	48.8	344.2	3.3	10.1	0	0.0	0	0	15'2"	56.6	178.4	11.3	34.7	105.4	522.6	34.7
12/31/2022	Dec	20.3	62.3	0	0.0	13'10"	125.6	267.4	2.8	8.6	0	0.0	0	0	13'0"	76.8	158.2	0	0.0	202.41	425.6	0.0
Total:		**139.9**	**429.3**	**48.4**	**148.5**				**88.7**	**272.2**	**38.2**	**117.2**	**0.0**	**0.0**				**25.6**	**78.6**			**344.3**
2023																						
1/31/2023	Jan	28.1	86.2	0.0	0.0	7'6"	249.9	143.1	3.0	9.2	0.0	0.0	0.0	0.0	9'8"	114.5	120.5	0.0	0.0	364.4	263.6	0.0
2/28/2023	Feb	14.5	44.5	0.0	0.0	5'7"	295.7	97.3		0.0	0.0	0.0	0.0	0.0	9'4"	118.7	116.3	0.0	0.0	414.4	213.6	0.0
3/31/2023	Mar	24.3	74.6	0.0	0.0	3'9"	343.0	50.0	18.3	56.2	0.0	0.0	0.0	0.0	4'10"		235.0	0.0	0.0	343.0	285.0	0.0
4/30/2023	Apr	9.5	29.2	0.0	0.0	3'2"	358.8	34.2	8.2	25.2	6.3	19.3	0.0	0.0	5'0"	180.0	55.0	2.1	6.4	538.8	89.2	25.8
5/31/2023	May	8.9	27.3	0.0	0.0	3'8"	345.3	47.7	10.9	33.5	10.0	30.7	0.0	0.0	8'2"	133.9	101.1	18.8	57.7	479.2	148.8	88.4
6/30/2023	Jun	9.2	28.2	5.7	17.5	6'2"	281.3	111.7	21.5	66.0	9.7	29.8	0.0	0.0	11'1"	97.5	137.5	25.8	79.2	378.8	249.2	126.4
7/31/2023	Jul	9.1	27.9	9.1	27.9	11'4"	169.7	223.3	31.0	95.1	2.2	6.8	0.0	0.0	11'5"	93.8	141.2	29.5	90.5	263.5	364.5	125.2
8/31/2023	Aug	10.6	32.5	10.6	32.5	17'11"	67.6	325.4	29.6	90.8	4.9	15.0	0.0	0.0	13'6"	71.8	163.2	26.9	82.6	139.4	488.6	130.1
9/30/2023	Sep	10.5	32.2	10.5	32.2	20'0"	44.6	348.4	9.7	29.8	8.8	27.0	0.0	0.0	16'0"	49.3	185.7	5.3	16.3	93.9	534.1	75.5
10/31/2023	Oct	11.2	34.4	7.9	24.2	19'10"	46.3	346.7	5.4	16.6	3.2	9.8	0.0	0.0	16'2"	48.0	187.0	0.0	0.0	94.3	533.7	34.1
11/30/2023	Nov	10.3	31.6	0.0	0.0	18'7"	59.7	333.3	3.6	11.0	0.0	0.0	0.0	0.0	15'11"	50.0	185.0	0.0	0.0	109.7	518.3	0.0
12/31/2023	Dec	10.9	33.5	0.0	0.0	17'0"	79.1	313.9	5.2	16.0	0.0	0.0	0.0	0.0	15'1"	57.1	177.9	0.0	0.0	136.2	491.8	0.0
Total:		**157.1**	**482.1**	**43.8**	**134.4**				**146.4**	**449.3**	**45.1**	**138.4**	**0.0**	**0.0**				**108.4**	**332.7**			**605.5**

ARSA Facilities Monthly Status Reports - Provided by ARSA Staff

Date		Sutter Creek WWTP Flow (mg)	Sutter Creek WWTP (ac ft)	Bowers Irrigation (mg)	Bowers Volume irrigated (ac ft)	Henderson Freeboard	Volume in Henderson (af)	Capacity Remaining in Henderson	Henderson Outflow (mg)	Henderson outflow (ac ft)	Hoskins Irrigation (mg)	Hoskins Volume irrigated (ac ft)	Mule Creek Inflow (mg)	Mule Creek Inflow (ac ft)	Preston Freeboard	Volume in Preston (af)	Capacity Remaining in Preston (ac ft)	Outflow to Ione (mg)	Volume sent to Ione (ac ft)	TOTAL Ac Ft of Effluent in the system	TOTAL Remaining Capacity for Winter (ac ft)	TOTAL USED FOR IRRIGATIO N (ac ft)
2024																						
1/31/2024	Jan	14.2	43.6	0.0	0.0	14'3"	118.9	274.1		0.0	0.0	0.0	0.0	0.0	13'5"	71.8	163.2	0.0	0.0	190.7	437.3	0.0
2/29/2024	Feb	17.1	52.5	0.0	0.0	10'11"	177.7	215.3	4.4	13.5	0.0	0.0	0.0	0.0	11'9"	90.0	145.0	0.0	0.0	267.7	360.3	0.0
3/31/2024	Mar	17.8	54.6	0.0	0.0	8'5"	229.3	163.7	4.4	13.5	0.0	0.0	0.0	0.0	10'8"	102.4	132.6	0.0	0.0	331.7	296.3	0.0
4/30/2024	Apr	13.1	40.2	0.0	0.0	7'8"	246.1	146.9	3.0	9.2	0.0	0.0	0.0	0.0	9'7"	115.5	119.5	0.5	1.5	361.6	266.4	1.5
5/31/2024	May	10.9	33.5	0.0	0.0	9'0"	216.7	176.3	18.2	55.9	0.0	0.0	0.0	0.0	11'5"	93.8	141.2	18.9	58.0	310.5	317.5	58.0
6/30/2024	Jun	10.1	31.0	9.4	28.8	13'1"	138.2	254.8	24.6	75.5	1.7	5.2	0.0	0.0	15'7"	52.8	182.2	31.8	97.6	191.0	437.0	131.7
7/31/2024	Jul	10.0	30.7	10.0	30.7	19'11"	45.4	347.6	28.7	88.1	0.0	0.0	0.0	0.0	19'2"	27.0	208.0	31.8	97.6	72.4	555.6	128.3
8/31/2024	Aug				0.0			393.0		0.0		0.0	0.0	0.0			235.0		0.0	0.0	628.0	0.0
9/30/2024	Sep				0.0			393.0		0.0		0.0	0.0	0.0			235.0		0.0	0.0	628.0	0.0
10/31/2024	Oct				0.0			393.0		0.0		0.0	0.0	0.0			235.0		0.0	0.0	628.0	0.0
11/30/2024	Nov				0.0			393.0		0.0		0.0	0.0	0.0			235.0		0.0	0.0	628.0	0.0
12/31/2024	Dec				0.0			393.0		0.0		0.0	0.0	0.0			235.0		0.0	0.0	628.0	0.0
Total:		**93.2**	**286.0**	**19.4**	**59.5**				**83.3**	**255.6**	**1.7**	**5.2**	**0.0**	**0.0**				**83.0**	**254.7**			**319.5**

Date	Sutter Creek Effluent Flow (GPD)
6/1/2017	329,600
6/2/2017	315,000
6/3/2017	312,600
6/4/2017	292,400
6/5/2017	324,400
6/6/2017	297,400
6/7/2017	346,000
6/8/2017	311,400
6/9/2017	310,600
6/10/2017	284,600
6/11/2017	297,000
6/12/2017	296,000
6/13/2017	328,300
6/14/2017	301,700
6/15/2017	296,000
6/16/2017	293,000
6/17/2017	282,600
6/18/2017	269,400
6/19/2017	310,400
6/20/2017	304,200
6/21/2017	296,400
6/22/2017	311,600
6/23/2017	293,000
6/24/2017	260,000
6/25/2017	258,000
6/26/2017	314,200
6/27/2017	282,400
6/28/2017	289,600
6/29/2017	268,800
6/30/2017	267,600
7/1/2017	193,000
7/2/2017	353,800
7/3/2017	310,600
7/4/2017	242,800
7/5/2017	286,400
7/6/2017	295,600
7/7/2017	275,000
7/8/2017	232,400
7/9/2017	238,800
7/10/2017	280,200
7/11/2017	278,400
7/12/2017	262,000
7/13/2017	310,800
7/14/2017	338,000
7/15/2017	260,800
7/16/2017	256,200
7/17/2017	275,000
7/18/2017	283,200
7/19/2017	340,600
7/20/2017	293,400
7/21/2017	276,000
7/22/2017	265,200
7/23/2017	252,000
7/24/2017	307,300
7/25/2017	275,700
7/26/2017	276,800
7/27/2017	290,600
7/28/2017	291,400
7/29/2017	261,200
7/30/2017	260,600
7/31/2017	299,400
8/1/2017	290,000
8/2/2017	264,600
8/3/2017	293,400
8/4/2017	308,600
8/5/2017	257,200
8/6/2017	250,600
8/7/2017	348,800
8/8/2017	304,200
8/9/2017	
8/10/2017	
8/11/2017	266,000
8/12/2017	332,400
8/13/2017	346,000
8/14/2017	415,400
8/15/2017	416,200
8/16/2017	454,000
8/17/2017	315,000
8/18/2017	272,000

Compiled Sutter Creek WWTP Daily Effluent Flow Data - Provided by ARSA Staff

Date	Sutter Creek Effluent Flow (GPD)
8/19/2017	259,400
8/20/2017	254,200
8/21/2017	300,000
8/22/2017	255,600
8/23/2017	281,400
8/24/2017	271,400
8/25/2017	326,600
8/26/2017	271,000
8/27/2017	271,800
8/28/2017	296,000
8/29/2017	296,400
8/30/2017	289,200
8/31/2017	275,600
9/1/2017	303,600
9/2/2017	267,400
9/3/2017	249,800
9/4/2017	276,600
9/5/2017	248,800
9/6/2017	269,000
9/7/2017	300,200
9/8/2017	278,800
9/9/2017	279,000
9/10/2017	266,000
9/11/2017	307,200
9/12/2017	279,400
9/13/2017	300,400
9/14/2017	294,200
9/15/2017	288,600
9/16/2017	236,400
9/17/2017	235,200
9/18/2017	291,000
9/19/2017	279,200
9/20/2017	284,000
9/21/2017	268,200
9/22/2017	300,600
9/23/2017	313,000
9/24/2017	289,000
9/25/2017	314,000
9/26/2017	289,400
9/27/2017	304,600
9/28/2017	329,600
9/29/2017	482,000
9/30/2017	297,400
10/1/2017	280,000
10/2/2017	284,400
10/3/2017	261,800
10/4/2017	265,400
10/5/2017	304,600
10/6/2017	282,600
10/7/2017	315,500
10/8/2017	280,300
10/9/2017	276,400
10/10/2017	310,400
10/11/2017	273,600
10/12/2017	299,400
10/13/2017	268,600
10/14/2017	251,400
10/15/2017	274,000
10/16/2017	304,000
10/17/2017	267,800
10/18/2017	249,600
10/19/2017	263,600
10/20/2017	288,600
10/21/2017	233,600
10/22/2017	242,200
10/23/2017	17,600
10/24/2017	39,400
10/25/2017	226,000
10/26/2017	289,900
10/27/2017	239,500
10/28/2017	238,000
10/29/2017	243,800
10/30/2017	403,000
10/31/2017	377,000
11/1/2017	427,200
11/2/2017	442,800

Compiled Sutter Creek WWTP Daily Effluent Flow Data - Provided by ARSA Staff

Date	Sutter Creek Effluent Flow (GPD)
11/3/2017	390,600
11/4/2017	337,800
11/5/2017	321,400
11/6/2017	344,200
11/7/2017	360,400
11/8/2017	291,800
11/9/2017	319,000
11/10/2017	278,400
11/11/2017	226,800
11/12/2017	231,600
11/13/2017	265,600
11/14/2017	261,000
11/15/2017	437,600
11/16/2017	963,800
11/17/2017	476,000
11/18/2017	347,600
11/19/2017	278,000
11/20/2017	310,400
11/21/2017	309,000
11/22/2017	372,200
11/23/2017	304,000
11/24/2017	368,600
11/25/2017	354,600
11/26/2017	772,600
11/27/2017	642,200
11/28/2017	420,000
11/29/2017	341,400
11/30/2017	353,200
12/1/2017	319,000
12/2/2017	335,000
12/3/2017	335,200
12/4/2017	312,600
12/5/2017	344,400
12/6/2017	319,400
12/7/2017	370,600
12/8/2017	308,400
12/9/2017	297,600
12/10/2017	297,000
12/11/2017	306,800
12/12/2017	304,800
12/13/2017	320,200
12/14/2017	297,000
12/15/2017	287,800
12/16/2017	283,800
12/17/2017	280,200
12/18/2017	324,400
12/19/2017	347,000
12/20/2017	374,600
12/21/2017	322,800
12/22/2017	355,800
12/23/2017	288,400
12/24/2017	259,000
12/25/2017	244,000
12/26/2017	340,600
12/27/2017	325,400
12/28/2017	335,600
12/29/2017	284,800
12/30/2017	265,400
12/31/2017	252,400
1/1/2018	256,800
1/2/2018	321,600
1/3/2018	318,200
1/4/2018	301,000
1/5/2018	368,400
1/6/2018	400,000
1/7/2018	316,200
1/8/2018	1,023,000
1/9/2018	1,096,000
1/10/2018	630,800
1/11/2018	485,400
1/12/2018	455,400
1/13/2018	364,400
1/14/2018	348,200
1/15/2018	360,800
1/16/2018	360,400
1/17/2018	344,000

Compiled Sutter Creek WWTP Daily Effluent Flow Data - Provided by ARSA Staff

Date	Sutter Creek Effluent Flow (GPD)
1/18/2018	417,600
1/19/2018	442,600
1/20/2018	353,800
1/21/2018	336,800
1/22/2018	385,600
1/23/2018	353,000
1/24/2018	511,600
1/25/2018	567,600
1/26/2018	474,000
1/27/2018	413,600
1/28/2018	390,200
1/29/2018	364,400
1/30/2018	516,000
1/31/2018	370,800
2/1/2018	357,200
2/2/2018	328,600
2/3/2018	332,000
2/4/2018	302,200
2/5/2018	340,000
2/6/2018	332,800
2/7/2018	366,200
2/8/2018	322,400
2/9/2018	332,800
2/10/2018	299,800
2/11/2018	264,800
2/12/2018	282,800
2/13/2018	323,600
2/14/2018	269,000
2/15/2018	289,600
2/16/2018	277,200
2/17/2018	265,600
2/18/2018	249,400
2/19/2018	274,200
2/20/2018	275,800
2/21/2018	301,400
2/22/2018	306,000
2/23/2018	313,600
2/24/2018	283,800
2/25/2018	275,600
2/26/2018	
2/27/2018	
2/28/2018	
3/1/2018	734,400
3/2/2018	983,800
3/3/2018	872,600
3/4/2018	597,800
3/5/2018	499,000
3/6/2018	451,600
3/7/2018	404,400
3/8/2018	409,200
3/9/2018	356,800
3/10/2018	325,600
3/11/2018	352,200
3/12/2018	443,800
3/13/2018	1,304,400
3/14/2018	1,205,800
3/15/2018	1,243,200
3/16/2018	1,391,400
3/17/2018	934,600
3/18/2018	745,600
3/19/2018	700,600
3/20/2018	659,000
3/21/2018	1,046,000
3/22/2018	1,412,200
3/23/2018	931,400
3/24/2018	728,600
3/25/2018	656,200
3/26/2018	566,200
3/27/2018	476,600
3/28/2018	457,200
3/29/2018	427,200
3/30/2018	393,000
3/31/2018	391,800
4/1/2018	355,000

Date	Sutter Creek Effluent Flow (GPD)
4/2/2018	377,200
4/3/2018	384,200
4/4/2018	393,600
4/5/2018	448,600
4/6/2018	1,042,800
4/7/2018	1,126,600
4/8/2018	745,800
4/9/2018	640,600
4/10/2018	556,500
4/11/2018	503,300
4/12/2018	479,400
4/13/2018	451,000
4/14/2018	431,000
4/15/2018	420,400
4/16/2018	497,800
4/17/2018	466,000
4/18/2018	447,000
4/19/2018	418,400
4/20/2018	375,800
4/21/2018	362,000
4/22/2018	359,800
4/23/2018	409,800
4/24/2018	379,800
4/25/2018	364,000
4/26/2018	371,000
4/27/2018	350,200
4/28/2018	317,800
4/29/2018	309,000
4/30/2018	365,400
5/1/2018	353,400
5/2/2018	344,400
5/3/2018	337,600
5/4/2018	293,000
5/5/2018	272,400
5/6/2018	265,600
5/7/2018	313,000
5/8/2018	297,200
5/9/2018	181,000
5/10/2018	308,200
5/11/2018	291,000
5/12/2018	260,400
5/13/2018	316,200
5/14/2018	238,400
5/15/2018	284,200
5/16/2018	307,600
5/17/2018	291,600
5/18/2018	300,200
5/19/2018	286,800
5/20/2018	254,600
5/21/2018	323,800
5/22/2018	325,600
5/23/2018	311,200
5/24/2018	319,600
5/25/2018	330,200
5/26/2018	297,800
5/27/2018	294,600
5/28/2018	324,800
5/29/2018	310,200
5/30/2018	298,200
5/31/2018	342,183
6/1/2018	296,200
6/2/2018	273,800
6/3/2018	272,400
6/4/2018	287,600
6/5/2018	295,800
6/6/2018	296,600
6/7/2018	278,800
6/8/2018	288,400
6/9/2018	249,800
6/10/2018	266,400
6/11/2018	299,800
6/12/2018	314,800
6/13/2018	305,800
6/14/2018	324,800
6/15/2018	299,800
6/16/2018	283,400

Date	Sutter Creek Effluent Flow (GPD)
6/17/2018	241,400
6/18/2018	294,200
6/19/2018	313,600
6/20/2018	285,200
6/21/2018	275,000
6/22/2018	274,400
6/23/2018	234,600
6/24/2018	229,200
6/25/2018	282,600
6/26/2018	298,800
6/27/2018	190,000
6/28/2018	293,800
6/29/2018	317,400
6/30/2018	257,200
7/1/2018	267,200
7/2/2018	325,600
7/3/2018	321,400
7/4/2018	259,000
7/5/2018	319,200
7/6/2018	336,400
7/7/2018	262,000
7/8/2018	271,800
7/9/2018	273,400
7/10/2018	305,400
7/11/2018	302,200
7/12/2018	301,000
7/13/2018	305,400
7/14/2018	271,000
7/15/2018	276,800
7/16/2018	317,200
7/17/2018	328,800
7/18/2018	310,600
7/19/2018	311,200
7/20/2018	329,800
7/21/2018	272,400
7/22/2018	281,500
7/23/2018	300,500
7/24/2018	292,800
7/25/2018	290,600
7/26/2018	306,000
7/27/2018	345,800
7/28/2018	285,400
7/29/2018	288,200
7/30/2018	313,800
7/31/2018	322,600
8/1/2018	295,800
8/2/2018	314,200
8/3/2018	311,800
8/4/2018	281,800
8/5/2018	313,400
8/6/2018	328,600
8/7/2018	311,200
8/8/2018	337,800
8/9/2018	350,200
8/10/2018	318,200
8/11/2018	295,600
8/12/2018	322,400
8/13/2018	336,400
8/14/2018	331,000
8/15/2018	360,000
8/16/2018	297,400
8/17/2018	314,200
8/18/2018	294,600
8/19/2018	283,800
8/20/2018	342,800
8/21/2018	351,400
8/22/2018	364,800
8/23/2018	335,000
8/24/2018	298,600
8/25/2018	291,400
8/26/2018	277,000
8/27/2018	302,200
8/28/2018	275,400
8/29/2018	299,600

Date	Sutter Creek Effluent Flow (GPD)
8/30/2018	295,200
8/31/2018	317,600
9/1/2018	209,800
9/2/2018	244,200
9/3/2018	284,200
9/4/2018	316,600
9/5/2018	306,000
9/6/2018	334,000
9/7/2018	354,400
9/8/2018	294,000
9/9/2018	272,400
9/10/2018	321,600
9/11/2018	304,600
9/12/2018	303,400
9/13/2018	318,200
9/14/2018	263,200
9/15/2018	263,800
9/16/2018	280,600
9/17/2018	329,200
9/18/2018	246,800
9/19/2018	276,800
9/20/2018	274,800
9/21/2018	298,400
9/22/2018	246,000
9/23/2018	333,800
9/24/2018	355,800
9/25/2018	404,200
9/26/2018	355,000
9/27/2018	356,400
9/28/2018	331,000
9/29/2018	257,000
9/30/2018	268,000
10/1/2018	273,200
10/2/2018	258,000
10/3/2018	286,200
10/4/2018	322,200
10/5/2018	304,800
10/6/2018	256,000
10/7/2018	266,600
10/8/2018	337,600
10/9/2018	298,200
10/10/2018	266,000
10/11/2018	236,600
10/12/2018	270,200
10/13/2018	236,800
10/14/2018	232,200
10/15/2018	252,200
10/16/2018	299,800
10/17/2018	303,800
10/18/2018	305,000
10/19/2018	279,400
10/20/2018	258,800
10/21/2018	291,800
10/22/2018	330,400
10/23/2018	336,600
10/24/2018	316,600
10/25/2018	313,000
10/26/2018	305,600
10/27/2018	290,600
10/28/2018	293,600
10/29/2018	321,800
10/30/2018	300,200
10/31/2018	305,600
11/1/2018	303,800
11/2/2018	287,600
11/3/2018	287,400
11/4/2018	301,800
11/5/2018	296,400
11/6/2018	263,600
11/7/2018	305,000
11/8/2018	289,000
11/9/2018	299,000
11/10/2018	251,200
11/11/2018	255,200
11/12/2018	304,000
11/13/2018	253,600

Date	Sutter Creek Effluent Flow (GPD)
11/14/2018	302,400
11/15/2018	313,400
11/16/2018	278,800
11/17/2018	270,000
11/18/2018	269,600
11/19/2018	312,800
11/20/2018	310,400
11/21/2018	365,600
11/22/2018	386,400
11/23/2018	591,200
11/24/2018	453,600
11/25/2018	367,600
11/26/2018	338,800
11/27/2018	329,200
11/28/2018	470,200
11/29/2018	794,800
11/30/2018	647,600
12/1/2018	616,800
12/2/2018	480,000
12/3/2018	472,000
12/4/2018	407,400
12/5/2018	384,200
12/6/2018	373,600
12/7/2018	280,800
12/8/2018	270,200
12/9/2018	280,000
12/10/2018	298,600
12/11/2018	326,000
12/12/2018	299,000
12/13/2018	298,800
12/14/2018	298,200
12/15/2018	272,400
12/16/2018	338,000
12/17/2018	427,000
12/18/2018	375,600
12/19/2018	309,000
12/20/2018	327,400
12/21/2018	378,000
12/22/2018	352,800
12/23/2018	325,800
12/24/2018	673,600
12/25/2018	593,600
12/26/2018	457,000
12/27/2018	451,400
12/28/2018	370,000
12/29/2018	317,000
12/30/2018	313,400
12/31/2018	342,200
1/1/2019	277,000
1/2/2019	365,800
1/3/2019	342,800
1/4/2019	200,200
1/5/2019	470,800
1/6/2019	612,000
1/7/2019	647,800
1/8/2019	628,400
1/9/2019	821,200
1/10/2019	576,900
1/11/2019	532,100
1/12/2019	367,600
1/13/2019	348,600
1/14/2019	394,000
1/15/2019	582,600
1/16/2019	1,117,000
1/17/2019	1,489,200
1/18/2019	905,200
1/19/2019	621,200
1/20/2019	889,000
1/21/2019	707,200
1/22/2019	586,000
1/23/2019	514,800
1/24/2019	467,200
1/25/2019	449,600
1/26/2019	478,800
1/27/2019	398,200
1/28/2019	418,400

Date	Sutter Creek Effluent Flow (GPD)
1/29/2019	393,600
1/30/2019	370,200
1/31/2019	385,600
2/1/2019	387,000
2/2/2019	666,400
2/3/2019	1,032,600
2/4/2019	1,338,200
2/5/2019	988,600
2/6/2019	752,200
2/7/2019	646,400
2/8/2019	540,600
2/9/2019	966,000
2/10/2019	980,600
2/11/2019	694,200
2/12/2019	759,400
2/13/2019	1,284,600
2/14/2019	1,395,400
2/15/2019	1,479,400
2/16/2019	1,139,200
2/17/2019	1,157,600
2/18/2019	889,200
2/19/2019	830,200
2/20/2019	778,000
2/21/2019	596,200
2/22/2019	609,400
2/23/2019	487,000
2/24/2019	443,200
2/25/2019	419,000
2/26/2019	521,200
2/27/2019	771,000
2/28/2019	720,600
3/1/2019	642,000
3/2/2019	1,206,200
3/3/2019	1,674,000
3/4/2019	1,128,000
3/5/2019	966,200
3/6/2019	1,169,000
3/7/2019	1,258,600
3/8/2019	1,017,200
3/9/2019	703,800
3/10/2019	607,600
3/11/2019	559,000
3/12/2019	497,600
3/13/2019	487,600
3/14/2019	458,000
3/15/2019	408,000
3/16/2019	379,800
3/17/2019	369,000
3/18/2019	376,800
3/19/2019	431,600
3/20/2019	434,200
3/21/2019	405,800
3/22/2019	492,400
3/23/2019	742,000
3/24/2019	514,400
3/25/2019	481,600
3/26/2019	483,600
3/27/2019	531,400
3/28/2019	487,800
3/29/2019	491,200
3/30/2019	412,400
3/31/2019	397,400
4/1/2019	469,200
4/2/2019	657,400
4/3/2019	544,800
4/4/2019	494,200
4/5/2019	499,600
4/6/2019	462,600
4/7/2019	385,200
4/8/2019	400,600

Date	Sutter Creek Effluent Flow (GPD)
4/9/2019	381,600
4/10/2019	378,800
4/11/2019	379,400
4/12/2019	338,400
4/13/2019	302,800
4/14/2019	313,800
4/15/2019	376,200
4/16/2019	529,800
4/17/2019	445,600
4/18/2019	406,800
4/19/2019	424,200
4/20/2019	349,400
4/21/2019	353,000
4/22/2019	389,800
4/23/2019	366,200
4/24/2019	361,600
4/25/2019	370,000
4/26/2019	331,200
4/27/2019	304,400
4/28/2019	303,800
4/29/2019	327,200
4/30/2019	295,000
5/1/2019	318,600
5/2/2019	316,200
5/3/2019	288,200
5/4/2019	284,400
5/5/2019	293,200
5/6/2019	347,400
5/7/2019	356,800
5/8/2019	256,000
5/9/2019	302,200
5/10/2019	275,800
5/11/2019	270,200
5/12/2019	272,800
5/13/2019	344,600
5/14/2019	339,200
5/15/2019	420,200
5/16/2019	596,800
5/17/2019	441,600
5/18/2019	463,000
5/19/2019	739,000
5/20/2019	566,600
5/21/2019	687,800
5/22/2019	602,400
5/23/2019	546,400
5/24/2019	482,400
5/25/2019	413,600
5/26/2019	419,800
5/27/2019	410,600
5/28/2019	436,800
5/29/2019	416,800
5/30/2019	375,600
5/31/2019	398,600
6/1/2019	334,200
6/2/2019	349,600
6/3/2019	404,000
6/4/2019	411,800
6/5/2019	396,600
6/6/2019	404,800
6/7/2019	421,000
6/8/2019	367,600
6/9/2019	287,800
6/10/2019	339,800
6/11/2019	315,600
6/12/2019	344,800
6/13/2019	351,600
6/14/2019	353,800
6/15/2019	276,800
6/16/2019	292,200
6/17/2019	352,800

Date	Sutter Creek Effluent Flow (GPD)
6/18/2019	336,600
6/19/2019	363,400
6/20/2019	343,200
6/21/2019	352,400
6/22/2019	292,800
6/23/2019	294,800
6/24/2019	350,000
6/25/2019	329,600
6/26/2019	270,400
6/27/2019	271,600
6/28/2019	316,800
6/29/2019	259,400
6/30/2019	263,000
7/1/2019	323,800
7/2/2019	325,400
7/3/2019	327,800
7/4/2019	257,200
7/5/2019	325,400
7/6/2019	304,600
7/7/2019	271,200
7/8/2019	332,000
7/9/2019	348,400
7/10/2019	320,400
7/11/2019	322,200
7/12/2019	310,800
7/13/2019	268,200
7/14/2019	280,200
7/15/2019	330,600
7/16/2019	314,400
7/17/2019	330,200
7/18/2019	316,000
7/19/2019	314,000
7/20/2019	289,200
7/21/2019	275,600
7/22/2019	299,600
7/23/2019	449,600
7/24/2019	353,400
7/25/2019	420,000
7/26/2019	792,600
7/27/2019	1,661,600
7/28/2019	245,400
7/29/2019	303,800
7/30/2019	290,200
7/31/2019	441,600
8/1/2019	316,894
8/2/2019	347,800
8/3/2019	294,100
8/4/2019	306,256
8/5/2019	331,544
8/6/2019	338,231
8/7/2019	334,719
8/8/2019	334,744
8/9/2019	317,500
8/10/2019	291,093
8/11/2019	284,319
8/12/2019	348,694
8/13/2019	333,312
8/14/2019	313,575
8/15/2019	357,100
8/16/2019	312,713
8/17/2019	270,562
8/18/2019	299,213
8/19/2019	328,606
8/20/2019	324,094
8/21/2019	323,544
8/22/2019	348,787
8/23/2019	338,456
8/24/2019	296,269
8/25/2019	287,588
8/26/2019	336,987

Date	Sutter Creek Effluent Flow (GPD)
8/27/2019	326,088
8/28/2019	332,343
8/29/2019	361,444
8/30/2019	363,513
8/31/2019	303,081
9/1/2019	300,675
9/2/2019	320,369
9/3/2019	356,425
9/4/2019	324,681
9/5/2019	379,031
9/6/2019	327,956
9/7/2019	302,738
9/8/2019	311,125
9/9/2019	371,812
9/10/2019	339,725
9/11/2019	370,425
9/12/2019	324,888
9/13/2019	334,875
9/14/2019	299,744
9/15/2019	295,018
9/16/2019	378,163
9/17/2019	350,325
9/18/2019	353,050
9/19/2019	329,987
9/20/2019	308,100
9/21/2019	268,657
9/22/2019	268,425
9/23/2019	304,762
9/24/2019	323,081
9/25/2019	322,988
9/26/2019	322,275
9/27/2019	325,500
9/28/2019	296,056
9/29/2019	284,419
9/30/2019	361,569
10/1/2019	305,318
10/2/2019	325,925
10/3/2019	315,919
10/4/2019	322,756
10/5/2019	269,619
10/6/2019	289,581
10/7/2019	317,882
10/8/2019	337,718
10/9/2019	172,068
10/10/2019	243,851
10/11/2019	332,738
10/12/2019	281,721
10/13/2019	262,562
10/14/2019	317,314
10/15/2019	312,843
10/16/2019	325,946
10/17/2019	302,608
10/18/2019	281,119
10/19/2019	269,859
10/20/2019	278,593
10/21/2019	333,014
10/22/2019	339,241
10/23/2019	291,573
10/24/2019	315,899
10/25/2019	313,845
10/26/2019	244,313
10/27/2019	195,000
10/28/2019	220,800
10/29/2019	288,800
10/30/2019	289,800
10/31/2019	350,600
11/1/2019	221,400
11/2/2019	155,200
11/3/2019	177,600
11/4/2019	209,600

Date	Sutter Creek Effluent Flow (GPD)
11/5/2019	103,600
11/6/2019	146,000
11/7/2019	241,200
11/8/2019	134,600
11/9/2019	119,400
11/10/2019	182,800
11/11/2019	268,600
11/12/2019	258,600
11/13/2019	209,000
11/14/2019	280,400
11/15/2019	289,000
11/16/2019	237,000
11/17/2019	244,800
11/18/2019	305,000
11/19/2019	232,600
11/20/2019	188,000
11/21/2019	222,600
11/22/2019	237,000
11/23/2019	216,800
11/24/2019	239,200
11/25/2019	276,400
11/26/2019	366,000
11/27/2019	410,800
11/28/2019	368,800
11/29/2019	379,600
11/30/2019	319,400
12/1/2019	695,200
12/2/2019	556,400
12/3/2019	424,000
12/4/2019	674,200
12/5/2019	647,000
12/6/2019	553,800
12/7/2019	685,400
12/8/2019	627,000
12/9/2019	464,000
12/10/2019	388,600
12/11/2019	367,600
12/12/2019	387,400
12/13/2019	424,600
12/14/2019	421,200
12/15/2019	354,000
12/16/2019	348,600
12/17/2019	264,600
12/18/2019	304,000
12/19/2019	296,000
12/20/2019	327,200
12/21/2019	289,000
12/22/2019	330,000
12/23/2019	386,600
12/24/2019	307,200
12/25/2019	256,800
12/26/2019	319,800
12/27/2019	310,600
12/28/2019	258,800
12/29/2019	283,900
12/30/2019	309,100
12/31/2019	322,000
1/1/2020	261,400
1/2/2020	334,200
1/3/2020	309,600
1/4/2020	247,000
1/5/2020	269,200
1/6/2020	296,000
1/7/2020	300,800
1/8/2020	288,600
1/9/2020	373,600
1/10/2020	335,600
1/11/2020	337,000
1/12/2020	286,200
1/13/2020	342,400

Date	Sutter Creek Effluent Flow (GPD)
1/14/2020	334,800
1/15/2020	357,200
1/16/2020	466,800
1/17/2020	353,000
1/18/2020	300,400
1/19/2020	305,600
1/20/2020	340,200
1/21/2020	326,600
1/22/2020	354,600
1/23/2020	393,200
1/24/2020	303,600
1/25/2020	261,400
1/26/2020	382,800
1/27/2020	368,200
1/28/2020	346,800
1/29/2020	410,000
1/30/2020	398,400
1/31/2020	331,400
2/1/2020	208,000
2/2/2020	181,200
2/3/2020	238,200
2/4/2020	231,000
2/5/2020	245,200
2/6/2020	295,000
2/7/2020	297,000
2/8/2020	204,200
2/9/2020	179,800
2/10/2020	227,600
2/11/2020	294,600
2/12/2020	281,600
2/13/2020	280,400
2/14/2020	296,200
2/15/2020	227,000
2/16/2020	193,400
2/17/2020	269,400
2/18/2020	324,000
2/19/2020	303,400
2/20/2020	286,400
2/21/2020	297,800
2/22/2020	236,600
2/23/2020	223,800
2/24/2020	280,800
2/25/2020	286,800
2/26/2020	314,400
2/27/2020	306,200
2/28/2020	456,200
2/29/2020	594,400
3/1/2020	266,000
3/2/2020	282,200
3/3/2020	318,000
3/4/2020	229,000
3/5/2020	208,400
3/6/2020	208,200
3/7/2020	222,200
3/8/2020	201,600
3/9/2020	190,200
3/10/2020	173,000
3/11/2020	243,400
3/12/2020	201,000
3/13/2020	201,000
3/14/2020	489,200
3/15/2020	1,035,200
3/16/2020	1,767,400
3/17/2020	995,600
3/18/2020	725,000
3/19/2020	545,600
3/20/2020	501,400
3/21/2020	380,600
3/22/2020	341,100
3/23/2020	353,100

Date	Sutter Creek Effluent Flow (GPD)
3/24/2020	399,600
3/25/2020	411,200
3/26/2020	380,000
3/27/2020	339,800
3/28/2020	309,000
3/29/2020	310,800
3/30/2020	313,800
3/31/2020	308,200
4/1/2020	328,600
4/2/2020	309,400
4/3/2020	285,400
4/4/2020	366,800
4/5/2020	1,285,200
4/6/2020	1,192,200
4/7/2020	730,200
4/8/2020	615,800
4/9/2020	492,600
4/10/2020	436,000
4/11/2020	402,000
4/12/2020	351,400
4/13/2020	369,000
4/14/2020	373,800
4/15/2020	362,600
4/16/2020	376,400
4/17/2020	350,000
4/18/2020	299,800
4/19/2020	295,000
4/20/2020	314,600
4/21/2020	363,200
4/22/2020	142,800
4/23/2020	360,800
4/24/2020	421,200
4/25/2020	336,200
4/26/2020	271,200
4/27/2020	298,800
4/28/2020	317,600
4/29/2020	319,800
4/30/2020	244,600
5/1/2020	308,400
5/2/2020	186,200
5/3/2020	190,800
5/4/2020	269,800
5/5/2020	264,000
5/6/2020	295,400
5/7/2020	272,200
5/8/2020	300,200
5/9/2020	196,000
5/10/2020	181,200
5/11/2020	303,700
5/12/2020	258,700
5/13/2020	259,000
5/14/2020	286,000
5/15/2020	307,200
5/16/2020	276,400
5/17/2020	482,000
5/18/2020	568,400
5/19/2020	400,800
5/20/2020	358,000
5/21/2020	297,800
5/22/2020	315,200
5/23/2020	215,400
5/24/2020	232,800
5/25/2020	536,800
5/26/2020	313,800
5/27/2020	328,600
5/28/2020	281,225
5/29/2020	273,750
5/30/2020	244,375
5/31/2020	296,600
6/1/2020	275,926

Date	Sutter Creek Effluent Flow (GPD)
6/2/2020	283,875
6/3/2020	288,700
6/4/2020	257,844
6/5/2020	269,481
6/6/2020	252,138
6/7/2020	255,143
6/8/2020	279,525
6/9/2020	319,150
6/10/2020	346,282
6/11/2020	349,493
6/12/2020	277,100
6/13/2020	224,119
6/14/2020	233,694
6/15/2020	270,525
6/16/2020	290,887
6/17/2020	288,213
6/18/2020	267,006
6/19/2020	285,231
6/20/2020	234,675
6/21/2020	237,857
6/22/2020	294,843
6/23/2020	264,125
6/24/2020	272,688
6/25/2020	279,044
6/26/2020	271,718
6/27/2020	285,432
6/28/2020	255,162
6/29/2020	279,756
6/30/2020	305,013
7/1/2020	303,906
7/2/2020	295,369
7/3/2020	253,137
7/4/2020	242,244
7/5/2020	243,131
7/6/2020	296,675
7/7/2020	270,719
7/8/2020	307,300
7/9/2020	264,431
7/10/2020	282,819
7/11/2020	231,225
7/12/2020	235,994
7/13/2020	263,062
7/14/2020	262,188
7/15/2020	282,919
7/16/2020	276,762
7/17/2020	290,019
7/18/2020	239,025
7/19/2020	238,775
7/20/2020	287,419
7/21/2020	269,837
7/22/2020	286,063
7/23/2020	273,256
7/24/2020	268,450
7/25/2020	224,531
7/26/2020	219,900
7/27/2020	269,694
7/28/2020	271,019
7/29/2020	276,075
7/30/2020	283,112
7/31/2020	243,594
8/1/2020	230,856
8/2/2020	226,550
8/3/2020	267,894
8/4/2020	289,819
8/5/2020	279,743
8/6/2020	278,988
8/7/2020	276,481
8/8/2020	233,275
8/9/2020	230,250
8/10/2020	284,106

Date	Sutter Creek Effluent Flow (GPD)
8/11/2020	286,438
8/12/2020	298,706
8/13/2020	280,106
8/14/2020	269,150
8/15/2020	235,600
8/16/2020	242,194
8/17/2020	293,288
8/18/2020	274,731
8/19/2020	287,756
8/20/2020	267,800
8/21/2020	281,413
8/22/2020	243,206
8/23/2020	248,406
8/24/2020	299,638
8/25/2020	279,450
8/26/2020	248,300
8/27/2020	291,737
8/28/2020	271,082
8/29/2020	239,951
8/30/2020	253,157
8/31/2020	278,472
9/1/2020	282,828
9/2/2020	305,253
9/3/2020	288,473
9/4/2020	268,512
9/5/2020	237,345
9/6/2020	233,074
9/7/2020	262,933
9/8/2020	258,364
9/9/2020	284,871
9/10/2020	272,706
9/11/2020	278,049
9/12/2020	245,169
9/13/2020	243,672
9/14/2020	278,430
9/15/2020	284,736
9/16/2020	278,000
9/17/2020	293,689
9/18/2020	290,178
9/19/2020	253,719
9/20/2020	251,135
9/21/2020	280,676
9/22/2020	270,898
9/23/2020	291,187
9/24/2020	282,218
9/25/2020	282,218
9/26/2020	270,501
9/27/2020	255,724
9/28/2020	284,200
9/29/2020	292,003
9/30/2020	287,510
10/1/2020	267,834
10/2/2020	293,377
10/3/2020	260,220
10/4/2020	259,539
10/5/2020	313,763
10/6/2020	295,309
10/7/2020	292,223
10/8/2020	293,897
10/9/2020	313,689
10/10/2020	253,814
10/11/2020	250,657
10/12/2020	301,911
10/13/2020	284,219
10/14/2020	291,862
10/15/2020	314,592
10/16/2020	273,453
10/17/2020	255,828
10/18/2020	279,360
10/19/2020	296,243

Date	Sutter Creek Effluent Flow (GPD)
10/20/2020	284,813
10/21/2020	276,816
10/22/2020	273,359
10/23/2020	282,595
10/24/2020	252,864
10/25/2020	254,138
10/26/2020	295,106
10/27/2020	287,533
10/28/2020	294,847
10/29/2020	264,719
10/30/2020	314,751
10/31/2020	280,261
11/1/2020	274,027
11/2/2020	288,375
11/3/2020	292,317
11/4/2020	314,937
11/5/2020	274,844
11/6/2020	311,819
11/7/2020	267,570
11/8/2020	275,514
11/9/2020	315,828
11/10/2020	289,649
11/11/2020	348,509
11/12/2020	301,677
11/13/2020	316,301
11/14/2020	315,305
11/15/2020	248,126
11/16/2020	315,461
11/17/2020	400,499
11/18/2020	363,183
11/19/2020	352,203
11/20/2020	329,683
11/21/2020	267,070
11/22/2020	273,569
11/23/2020	296,704
11/24/2020	305,833
11/25/2020	318,445
11/26/2020	258,846
11/27/2020	298,103
11/28/2020	267,831
11/29/2020	276,827
11/30/2020	309,586
12/1/2020	290,509
12/2/2020	326,588
12/3/2020	297,709
12/4/2020	302,287
12/5/2020	268,266
12/6/2020	277,938
12/7/2020	311,359
12/8/2020	326,519
12/9/2020	331,662
12/10/2020	338,725
12/11/2020	345,331
12/12/2020	307,379
12/13/2020	382,590
12/14/2020	358,269
12/15/2020	319,150
12/16/2020	356,022
12/17/2020	374,312
12/18/2020	331,969
12/19/2020	296,250
12/20/2020	304,547
12/21/2020	333,037
12/22/2020	326,010
12/23/2020	346,231
12/24/2020	304,397
12/25/2020	273,734
12/26/2020	319,816
12/27/2020	297,800
12/28/2020	347,553

Date	Sutter Creek Effluent Flow (GPD)
12/29/2020	325,675
12/30/2020	340,431
12/31/2020	
1/1/2021	279,313
1/2/2021	292,900
1/3/2021	298,087
1/4/2021	366,316
1/5/2021	345,616
1/6/2021	331,493
1/7/2021	316,872
1/8/2021	347,813
1/9/2021	280,087
1/10/2021	291,472
1/11/2021	309,563
1/12/2021	347,518
1/13/2021	303,747
1/14/2021	324,031
1/15/2021	337,257
1/16/2021	294,359
1/17/2021	293,966
1/18/2021	342,437
1/19/2021	352,825
1/20/2021	295,385
1/21/2021	331,337
1/22/2021	351,828
1/23/2021	300,053
1/24/2021	377,778
1/25/2021	430,388
1/26/2021	414,559
1/27/2021	822,560
1/28/2021	1,414,122
1/29/2021	852,506
1/30/2021	519,659
1/31/2021	438,585
2/1/2021	439,775
2/2/2021	563,225
2/3/2021	453,168
2/4/2021	396,282
2/5/2021	386,634
2/6/2021	329,603
2/7/2021	333,075
2/8/2021	355,313
2/9/2021	345,437
2/10/2021	359,625
2/11/2021	482,263
2/12/2021	526,731
2/13/2021	438,431
2/14/2021	390,775
2/15/2021	515,769
2/16/2021	420,425
2/17/2021	387,050
2/18/2021	382,556
2/19/2021	385,513
2/20/2021	358,762
2/21/2021	335,063
2/22/2021	356,056
2/23/2021	343,281
2/24/2021	340,913
2/25/2021	328,400
2/26/2021	357,268
2/27/2021	301,350
2/28/2021	301,132
4/1/2021	334,987
4/2/2021	331,419
4/3/2021	313,606
4/4/2021	293,125
4/5/2021	372,182
4/6/2021	331,162
4/7/2021	336,813
4/8/2021	372,456

Date	Sutter Creek Effluent Flow (GPD)
4/9/2021	300,725
4/10/2021	290,637
4/11/2021	309,938
4/12/2021	356,075
4/13/2021	340,575
4/14/2021	395,031
4/15/2021	368,725
4/16/2021	365,669
4/17/2021	326,031
4/18/2021	335,638
4/19/2021	364,281
4/20/2021	343,088
4/21/2021	347,887
4/22/2021	345,650
4/23/2021	337,181
4/24/2021	307,250
4/25/2021	328,519
4/26/2021	375,500
4/27/2021	376,187
4/28/2021	349,275
4/29/2021	353,369
4/30/2021	373,581
5/1/2021	293,107
5/2/2021	335,143
5/3/2021	354,963
5/4/2021	355,581
5/5/2021	357,444
5/6/2021	410,531
5/7/2021	343,819
5/8/2021	328,969
5/9/2021	310,068
5/10/2021	387,657
5/11/2021	374,737
5/12/2021	375,150
5/13/2021	357,444
5/14/2021	370,081
5/15/2021	322,038
5/16/2021	327,493
5/17/2021	355,232
5/18/2021	355,412
5/19/2021	333,663
5/20/2021	345,825
5/21/2021	356,875
5/22/2021	299,381
5/23/2021	313,612
5/24/2021	347,744
5/25/2021	366,044
5/26/2021	372,175
5/27/2021	363,056
5/28/2021	363,944
5/29/2021	298,475
5/30/2021	304,131
5/31/2021	318,075
6/1/2021	351,063
6/2/2021	361,562
6/3/2021	344,575
6/4/2021	353,444
6/5/2021	310,831
6/6/2021	313,938
6/7/2021	375,737
6/8/2021	349,156
6/9/2021	354,863
6/10/2021	370,287
6/11/2021	336,738
6/12/2021	325,525
6/13/2021	308,956
6/14/2021	373,081
6/15/2021	383,625
6/16/2021	359,482
6/17/2021	370,050

Date	Sutter Creek Effluent Flow (GPD)
6/18/2021	341,418
6/19/2021	311,463
6/20/2021	312,152
6/21/2021	351,487
6/22/2021	348,915
6/23/2021	361,912
6/24/2021	365,716
6/25/2021	355,226
6/26/2021	304,982
6/27/2021	337,139
6/28/2021	355,487
6/29/2021	332,677
6/30/2021	346,808
7/1/2021	366,675
7/2/2021	349,132
7/3/2021	290,578
7/4/2021	280,508
7/5/2021	319,094
7/6/2021	350,209
7/7/2021	347,771
7/8/2021	375,469
7/9/2021	333,906
7/10/2021	285,509
7/11/2021	285,791
7/12/2021	339,873
7/13/2021	358,260
7/14/2021	346,276
7/15/2021	329,902
7/16/2021	338,827
7/17/2021	291,967
7/18/2021	294,703
7/19/2021	313,600
7/20/2021	362,271
7/21/2021	348,297
7/22/2021	331,852
7/23/2021	339,969
7/24/2021	295,907
7/25/2021	293,597
7/26/2021	341,681
7/27/2021	319,928
7/28/2021	346,766
7/29/2021	355,681
7/30/2021	318,806
7/31/2021	298,833
8/1/2021	301,740
8/2/2021	352,868
8/3/2021	338,704
8/4/2021	342,360
8/5/2021	321,581
8/6/2021	353,714
8/7/2021	304,658
8/8/2021	290,787
8/9/2021	342,657
8/10/2021	306,073
8/11/2021	366,997
8/12/2021	316,761
8/13/2021	360,258
8/14/2021	322,623
8/15/2021	303,580
8/16/2021	330,653
8/17/2021	326,306
8/18/2021	352,595
8/19/2021	330,844
8/20/2021	354,722
8/21/2021	303,719
8/22/2021	311,914
8/23/2021	324,441
8/24/2021	336,601
8/25/2021	329,938
8/26/2021	352,046

Date	Sutter Creek Effluent Flow (GPD)
8/27/2021	310,319
8/28/2021	271,333
8/29/2021	278,539
8/30/2021	294,292
8/31/2021	332,011
9/1/2021	321,174
9/2/2021	386,317
9/3/2021	340,084
9/4/2021	309,136
9/5/2021	290,694
9/6/2021	322,330
9/7/2021	333,232
9/8/2021	315,738
9/9/2021	315,206
9/10/2021	357,460
9/11/2021	286,506
9/12/2021	297,434
9/13/2021	314,063
9/14/2021	342,290
9/15/2021	325,647
9/16/2021	348,313
9/17/2021	315,186
9/18/2021	298,817
9/19/2021	289,381
9/20/2021	341,325
9/21/2021	331,781
9/22/2021	337,775
9/23/2021	352,069
9/24/2021	327,609
9/25/2021	304,235
9/26/2021	289,665
9/27/2021	354,413
9/28/2021	316,941
9/29/2021	341,828
9/30/2021	328,565
10/1/2021	329,547
10/2/2021	281,556
10/3/2021	298,847
10/4/2021	327,678
10/5/2021	360,454
10/6/2021	334,984
10/7/2021	370,084
10/8/2021	338,941
10/9/2021	306,412
10/10/2021	303,319
10/11/2021	327,603
10/12/2021	342,350
10/13/2021	328,785
10/14/2021	356,000
10/15/2021	327,653
10/16/2021	302,494
10/17/2021	335,737
10/18/2021	368,750
10/19/2021	348,122
10/20/2021	350,081
10/21/2021	380,769
10/22/2021	380,356
10/23/2021	354,678
10/24/2021	1,731,788
10/25/2021	1,480,584
10/26/2021	657,094
10/27/2021	558,809
10/28/2021	440,660
10/29/2021	441,797
10/30/2021	407,003
10/31/2021	373,781
11/1/2021	384,791
11/2/2021	410,665
11/3/2021	419,153
11/4/2021	363,603

Date	Sutter Creek Effluent Flow (GPD)
11/5/2021	325,991
11/6/2021	340,128
11/7/2021	336,219
11/8/2021	410,072
11/9/2021	575,972
11/10/2021	426,734
11/11/2021	423,175
11/12/2021	426,022
11/13/2021	375,734
11/14/2021	383,819
11/15/2021	422,750
11/16/2021	369,656
11/17/2021	406,957
11/18/2021	393,918
11/19/2021	398,819
11/20/2021	344,000
11/21/2021	360,200
11/22/2021	395,756
11/23/2021	398,000
11/24/2021	372,632
11/25/2021	332,575
11/26/2021	369,156
11/27/2021	357,519
11/28/2021	374,031
11/29/2021	384,231
11/30/2021	414,419
12/1/2021	428,287
12/2/2021	380,682
12/3/2021	385,881
12/4/2021	380,244
12/5/2021	365,518
12/6/2021	375,707
12/7/2021	407,237
12/8/2021	390,519
12/9/2021	502,362
12/10/2021	380,275
12/11/2021	352,257
12/12/2021	711,600
12/13/2021	1,276,425
12/14/2021	1,073,893
12/15/2021	824,369
12/16/2021	855,506
12/17/2021	604,663
12/18/2021	502,887
12/19/2021	471,282
12/20/2021	485,262
12/21/2021	441,494
12/22/2021	572,437
12/23/2021	1,376,307
12/24/2021	937,900
12/25/2021	1,110,175
12/26/2021	989,600
12/27/2021	1,566,568
12/28/2021	919,132
12/29/2021	898,475
12/30/2021	677,037
12/31/2021	583,794
1/1/2022	493,656
1/2/2022	465,925
1/3/2022	493,331
1/4/2022	478,807
1/5/2022	481,300
1/6/2022	466,056
1/7/2022	489,287
1/8/2022	425,194
1/9/2022	421,525
1/10/2022	449,363
1/11/2022	441,975
1/12/2022	418,343
1/13/2022	419,532

Date	Sutter Creek Effluent Flow (GPD)
1/14/2022	409,137
1/15/2022	388,450
1/16/2022	398,944
1/17/2022	431,831
1/18/2022	387,338
1/19/2022	410,393
1/20/2022	407,788
1/21/2022	385,519
1/22/2022	358,850
1/23/2022	353,250
1/24/2022	383,600
1/25/2022	386,037
1/26/2022	376,569
1/27/2022	404,219
1/28/2022	357,887
1/29/2022	345,069
1/30/2022	359,319
1/31/2022	381,456
2/1/2022	370,912
2/2/2022	386,488
2/3/2022	394,781
2/4/2022	368,188
2/5/2022	354,606
2/6/2022	514,081
2/7/2022	420,944
2/8/2022	440,106
2/9/2022	438,150
2/10/2022	376,506
2/11/2022	372,432
2/12/2022	351,631
2/13/2022	354,744
2/14/2022	416,537
2/15/2022	384,075
2/16/2022	371,456
2/17/2022	362,771
2/18/2022	359,552
2/19/2022	338,289
2/20/2022	349,258
2/21/2022	369,009
2/22/2022	362,382
2/23/2022	344,981
2/24/2022	372,675
2/25/2022	372,924
2/26/2022	336,096
2/27/2022	333,406
2/28/2022	371,913
3/1/2022	359,463
3/2/2022	363,627
3/3/2022	375,536
3/4/2022	379,576
3/5/2022	358,708
3/6/2022	354,003
3/7/2022	387,659
3/8/2022	363,116
3/9/2022	382,587
3/10/2022	361,466
3/11/2022	107,911
3/12/2022	268,566
3/13/2022	276,454
3/14/2022	320,623
3/15/2022	373,206
3/16/2022	379,536
3/17/2022	345,794
3/18/2022	367,818
3/19/2022	332,534
3/20/2022	346,611
3/21/2022	395,014
3/22/2022	376,457
3/23/2022	385,324
3/24/2022	394,829

Date	Sutter Creek Effluent Flow (GPD)
3/25/2022	404,906
3/26/2022	338,553
3/27/2022	358,991
3/28/2022	406,297
3/29/2022	385,162
3/30/2022	386,941
3/31/2022	387,570
4/1/2022	376,909
4/2/2022	353,132
4/3/2022	366,156
4/4/2022	395,156
4/5/2022	378,730
4/6/2022	388,825
4/7/2022	385,340
4/8/2022	375,060
4/9/2022	339,312
4/10/2022	352,500
4/11/2022	417,411
4/12/2022	391,230
4/13/2022	390,286
4/14/2022	477,253
4/15/2022	411,956
4/16/2022	522,683
4/17/2022	386,847
4/18/2022	414,356
4/19/2022	429,510
4/20/2022	436,942
4/21/2022	1,044,439
4/22/2022	291,487
4/23/2022	499,078
4/24/2022	463,902
4/25/2022	502,116
4/26/2022	466,175
4/27/2022	427,656
4/28/2022	423,709
4/29/2022	278,107
4/30/2022	305,768
5/1/2022	349,169
5/2/2022	346,794
5/3/2022	397,462
5/4/2022	398,419
5/5/2022	405,453
5/6/2022	407,956
5/7/2022	371,529
5/8/2022	365,334
5/9/2022	393,484
5/10/2022	394,850
5/11/2022	417,991
5/12/2022	418,812
5/13/2022	400,919
5/14/2022	376,813
5/15/2022	377,889
5/16/2022	409,436
5/17/2022	412,543
5/18/2022	410,954
5/19/2022	400,490
5/20/2022	375,816
5/21/2022	390,222
5/22/2022	372,575
5/23/2022	421,722
5/24/2022	407,084
5/25/2022	391,378
5/26/2022	395,588
5/27/2022	387,512
5/28/2022	364,266
5/29/2022	343,718
5/30/2022	358,444
5/31/2022	415,572
6/1/2022	391,506
6/2/2022	421,750

Date	Sutter Creek Effluent Flow (GPD)
6/3/2022	387,944
6/4/2022	376,828
6/5/2022	369,913
6/6/2022	413,197
6/7/2022	381,400
6/8/2022	393,437
6/9/2022	425,181
6/10/2022	321,085
6/11/2022	313,178
6/12/2022	344,140
6/13/2022	437,785
6/14/2022	373,159
6/15/2022	339,710
6/16/2022	381,390
6/17/2022	408,535
6/18/2022	342,743
6/19/2022	339,425
6/20/2022	405,247
6/21/2022	379,806
6/22/2022	368,888
6/23/2022	374,000
6/24/2022	372,869
6/25/2022	317,234
6/26/2022	324,934
6/27/2022	387,107
6/28/2022	375,025
6/29/2022	376,290
6/30/2022	366,657
7/1/2022	406,743
7/2/2022	323,085
7/3/2022	315,340
7/4/2022	346,357
7/5/2022	411,731
7/6/2022	408,787
7/7/2022	419,057
7/8/2022	370,093
7/9/2022	337,194
7/10/2022	352,888
7/11/2022	420,612
7/12/2022	382,988
7/13/2022	380,062
7/14/2022	389,150
7/15/2022	324,287
7/16/2022	364,788
7/17/2022	325,675
7/18/2022	400,081
7/19/2022	392,219
7/20/2022	383,806
7/21/2022	370,944
7/22/2022	392,106
7/23/2022	339,925
7/24/2022	354,019
7/25/2022	381,569
7/26/2022	417,456
7/27/2022	389,663
7/28/2022	399,575
7/29/2022	378,268
7/30/2022	356,519
7/31/2022	369,994
8/1/2022	403,181
8/2/2022	426,325
8/3/2022	368,156
8/4/2022	324,050
8/5/2022	349,005
8/6/2022	338,105
8/7/2022	347,596
8/8/2022	297,895
8/9/2022	304,456
8/10/2022	167,125
8/11/2022	390,944

Date	Sutter Creek Effluent Flow (GPD)
8/12/2022	351,310
8/13/2022	324,330
8/14/2022	343,763
8/15/2022	367,595
8/16/2022	430,865
8/17/2022	327,828
8/18/2022	324,980
8/19/2022	306,059
8/20/2022	262,434
8/21/2022	257,371
8/22/2022	268,292
8/23/2022	304,686
8/24/2022	297,028
8/25/2022	286,939
8/26/2022	305,556
8/27/2022	252,858
8/28/2022	268,216
8/29/2022	292,654
8/30/2022	298,215
8/31/2022	292,000
9/1/2022	296,299
9/2/2022	306,621
9/3/2022	235,865
9/4/2022	237,366
9/5/2022	260,255
9/6/2022	282,911
9/7/2022	277,756
9/8/2022	297,989
9/9/2022	309,174
9/10/2022	258,772
9/11/2022	274,229
9/12/2022	274,770
9/13/2022	297,913
9/14/2022	271,269
9/15/2022	322,007
9/16/2022	283,719
9/17/2022	271,362
9/18/2022	298,075
9/19/2022	315,002
9/20/2022	305,254
9/21/2022	288,111
9/22/2022	304,769
9/23/2022	284,827
9/24/2022	252,032
9/25/2022	278,408
9/26/2022	296,369
9/27/2022	290,591
9/28/2022	283,201
9/29/2022	
9/30/2022	
10/1/2022	266,252
10/2/2022	284,550
10/3/2022	317,787
10/4/2022	316,272
10/5/2022	321,424
10/6/2022	320,433
10/7/2022	308,322
10/8/2022	278,628
10/9/2022	281,053
10/10/2022	289,007
10/11/2022	293,530
10/12/2022	332,945
10/13/2022	294,405
10/14/2022	293,564
10/15/2022	281,669
10/16/2022	299,866
10/17/2022	313,506
10/18/2022	325,562
10/19/2022	309,321
10/20/2022	326,790

Date	Sutter Creek Effluent Flow (GPD)
10/21/2022	307,678
10/22/2022	274,571
10/23/2022	281,454
10/24/2022	307,600
10/25/2022	271,382
10/26/2022	310,317
10/27/2022	296,894
10/28/2022	320,256
10/29/2022	254,547
10/30/2022	290,251
10/31/2022	323,289
11/1/2022	335,830
11/2/2022	351,931
11/3/2022	318,169
11/4/2022	316,572
11/5/2022	319,862
11/6/2022	318,629
11/7/2022	364,009
11/8/2022	530,594
11/9/2022	361,781
11/10/2022	344,207
11/11/2022	331,418
11/12/2022	290,044
11/13/2022	294,750
11/14/2022	326,156
11/15/2022	330,103
11/16/2022	333,353
11/17/2022	321,716
11/18/2022	326,762
11/19/2022	292,322
11/20/2022	309,747
11/21/2022	348,847
11/22/2022	341,531
11/23/2022	352,169
11/24/2022	266,331
11/25/2022	293,181
11/26/2022	290,713
11/27/2022	301,537
11/28/2022	330,632
11/29/2022	334,762
11/30/2022	335,056
12/1/2022	574,341
12/2/2022	377,250
12/3/2022	1,015,050
12/4/2022	632,497
12/5/2022	526,737
12/6/2022	453,050
12/7/2022	371,647
12/8/2022	416,928
12/9/2022	379,544
12/10/2022	1,337,988
12/11/2022	1,337,787
12/12/2022	653,360
12/13/2022	681,731
12/14/2022	388,422
12/15/2022	415,093
12/16/2022	401,988
12/17/2022	374,609
12/18/2022	394,607
12/19/2022	387,831
12/20/2022	411,265
12/21/2022	386,663
12/22/2022	404,703
12/23/2022	385,075
12/24/2022	352,366
12/25/2022	317,753
12/26/2022	454,306
12/27/2022	1,370,588
12/28/2022	640,537
12/29/2022	727,638

Date	Sutter Creek Effluent Flow (GPD)
12/30/2022	2,057,212
12/31/2022	1,662,733
1/1/2023	1,166,036
1/2/2023	990,525
1/3/2023	913,794
1/4/2023	825,312
1/5/2023	1,407,831
1/6/2023	1,154,582
1/7/2023	1,025,135
1/8/2023	1,227,827
1/9/2023	1,509,094
1/10/2023	1,287,631
1/11/2023	941,500
1/12/2023	744,381
1/13/2023	1,466,875
1/14/2023	2,130,232
1/15/2023	1,521,593
1/16/2023	1,603,325
1/17/2023	1,024,725
1/18/2023	829,019
1/19/2023	664,556
1/20/2023	580,888
1/21/2023	562,018
1/22/2023	529,225
1/23/2023	455,244
1/24/2023	507,425
1/25/2023	507,425
1/26/2023	449,325
1/27/2023	434,188
1/28/2023	404,187
1/29/2023	392,613
1/30/2023	398,893
1/31/2023	428,682
2/1/2023	392,631
2/2/2023	420,625
2/3/2023	407,350
2/4/2023	431,712
2/5/2023	489,613
2/6/2023	448,556
2/7/2023	453,431
2/8/2023	411,482
2/9/2023	417,087
2/10/2023	405,281
2/11/2023	369,744
2/12/2023	372,350
2/13/2023	366,544
2/14/2023	378,131
2/15/2023	353,925
2/16/2023	362,438
2/17/2023	359,493
2/18/2023	335,663
2/19/2023	354,487
2/20/2023	394,750
2/21/2023	380,813
2/22/2023	348,656
2/23/2023	378,063
2/24/2023	779,656
2/25/2023	601,737
2/26/2023	914,332
2/27/2023	1,387,218
2/28/2023	
3/1/2023	1,004,413
3/2/2023	697,493
3/3/2023	612,105
3/4/2023	595,808
3/5/2023	862,405
3/6/2023	654,217
3/7/2023	612,267
3/8/2023	680,162
3/9/2023	1,272,686

Date	Sutter Creek Effluent Flow (GPD)
3/10/2023	1,636,981
3/11/2023	911,705
3/12/2023	852,385
3/13/2023	1,193,776
3/14/2023	1,581,664
3/15/2023	839,272
3/16/2023	676,145
3/17/2023	553,194
3/18/2023	514,082
3/19/2023	734,558
3/20/2023	684,725
3/21/2023	711,058
3/22/2023	760,066
3/23/2023	639,870
3/24/2023	579,913
3/25/2023	515,196
3/26/2023	509,883
3/27/2023	471,305
3/28/2023	855,556
3/29/2023	801,413
3/30/2023	685,729
3/31/2023	560,935
4/1/2023	435,400
4/2/2023	392,200
4/3/2023	368,800
4/4/2023	404,200
4/5/2023	376,200
4/6/2023	309,600
4/7/2023	326,400
4/8/2023	341,200
4/9/2023	273,000
4/10/2023	323,200
4/11/2023	338,600
4/12/2023	386,200
4/13/2023	298,400
4/14/2023	304,400
4/15/2023	253,600
4/16/2023	258,000
4/17/2023	294,400
4/18/2023	266,400
4/19/2023	287,400
4/20/2023	308,000
4/21/2023	272,400
4/22/2023	255,600
4/23/2023	280,400
4/24/2023	348,000
4/25/2023	299,800
4/26/2023	254,800
4/27/2023	299,200
4/28/2023	400,316
4/29/2023	239,800
4/30/2023	259,400
5/1/2023	254,600
5/2/2023	315,200
5/3/2023	289,400
5/4/2023	276,800
5/5/2023	303,000
5/6/2023	376,000
5/7/2023	293,000
5/8/2023	305,800
5/9/2023	308,400
5/10/2023	299,000
5/11/2023	292,800
5/12/2023	258,400
5/13/2023	215,200
5/14/2023	235,600
5/15/2023	286,800
5/16/2023	291,000
5/17/2023	285,400
5/18/2023	300,200

Date	Sutter Creek Effluent Flow (GPD)
5/19/2023	322,600
5/20/2023	297,000
5/21/2023	325,600
5/22/2023	286,800
5/23/2023	297,200
5/24/2023	329,400
5/25/2023	265,000
5/26/2023	261,400
5/27/2023	239,800
5/28/2023	231,800
5/29/2023	248,000
5/30/2023	264,000
5/31/2023	343,400
6/1/2023	325,200
6/2/2023	345,200
6/3/2023	325,800
6/4/2023	259,800
6/5/2023	278,600
6/6/2023	311,200
6/7/2023	318,800
6/8/2023	313,200
6/9/2023	354,400
6/10/2023	310,600
6/11/2023	315,400
6/12/2023	349,400
6/13/2023	304,000
6/14/2023	299,400
6/15/2023	348,400
6/16/2023	299,800
6/17/2023	266,600
6/18/2023	263,600
6/19/2023	304,400
6/20/2023	292,200
6/21/2023	313,000
6/22/2023	289,600
6/23/2023	309,200
6/24/2023	265,800
6/25/2023	281,200
6/26/2023	303,800
6/27/2023	324,600
6/28/2023	314,000
6/29/2023	321,000
6/30/2023	298,200
7/1/2023	241,400
7/2/2023	255,800
7/3/2023	288,200
7/4/2023	245,800
7/5/2023	307,200
7/6/2023	323,800
7/7/2023	319,200
7/8/2023	259,400
7/9/2023	270,200
7/10/2023	319,400
7/11/2023	300,400
7/12/2023	319,000
7/13/2023	310,400
7/14/2023	293,000
7/15/2023	276,800
7/16/2023	286,400
7/17/2023	327,800
7/18/2023	325,800
7/19/2023	300,400
7/20/2023	302,800
7/21/2023	318,000
7/22/2023	270,800
7/23/2023	289,200
7/24/2023	301,000
7/25/2023	306,400
7/26/2023	296,800
7/27/2023	308,400

Date	Sutter Creek Effluent Flow (GPD)
7/28/2023	303,000
7/29/2023	267,800
7/30/2023	273,200
7/31/2023	304,200
8/1/2023	290,800
8/2/2023	286,000
8/3/2023	296,000
8/4/2023	259,200
8/5/2023	286,200
8/6/2023	318,200
8/7/2023	336,000
8/8/2023	358,350
8/9/2023	385,425
8/10/2023	378,662
8/11/2023	353,788
8/12/2023	332,825
8/13/2023	338,800
8/14/2023	378,363
8/15/2023	378,363
8/16/2023	401,075
8/17/2023	355,650
8/18/2023	376,512
8/19/2023	320,800
8/20/2023	337,757
8/21/2023	362,168
8/22/2023	377,482
8/23/2023	354,637
8/24/2023	359,775
8/25/2023	326,881
8/26/2023	324,582
8/27/2023	329,843
8/28/2023	355,275
8/29/2023	345,082
8/30/2023	343,493
8/31/2023	369,644
9/1/2023	369,513
9/2/2023	326,625
9/3/2023	322,412
9/4/2023	350,219
9/5/2023	358,594
9/6/2023	384,312
9/7/2023	393,844
9/8/2023	373,031
9/9/2023	330,994
9/10/2023	324,681
9/11/2023	346,131
9/12/2023	410,394
9/13/2023	367,538
9/14/2023	395,925
9/15/2023	366,131
9/16/2023	329,431
9/17/2023	337,150
9/18/2023	375,000
9/19/2023	336,669
9/20/2023	354,794
9/21/2023	355,331
9/22/2023	364,544
9/23/2023	310,920
9/24/2023	313,092
9/25/2023	354,719
9/26/2023	152,456
9/27/2023	350,838
9/28/2023	362,006
9/29/2023	379,569
9/30/2023	357,618
10/1/2023	328,650
10/2/2023	371,857
10/3/2023	357,300
10/4/2023	331,900
10/5/2023	382,500

Date	Sutter Creek Effluent Flow (GPD)
10/6/2023	341,518
10/7/2023	339,182
10/8/2023	332,425
10/9/2023	366,537
10/10/2023	355,913
10/11/2023	340,081
10/12/2023	345,512
10/13/2023	406,375
10/14/2023	352,307
10/15/2023	339,981
10/16/2023	314,575
10/17/2023	350,287
10/18/2023	353,850
10/19/2023	353,007
10/20/2023	362,706
10/21/2023	328,937
10/22/2023	506,369
10/23/2023	392,419
10/24/2023	418,100
10/25/2023	396,216
10/26/2023	359,859
10/27/2023	368,548
10/28/2023	336,450
10/29/2023	325,877
10/30/2023	358,976
10/31/2023	350,410
11/1/2023	349,656
11/2/2023	386,860
11/3/2023	381,792
11/4/2023	342,374
11/5/2023	356,019
11/6/2023	392,784
11/7/2023	349,712
11/8/2023	340,591
11/9/2023	356,977
11/10/2023	345,601
11/11/2023	312,927
11/12/2023	978,804
11/13/2023	978,804
11/14/2023	346,300
11/15/2023	346,423
11/16/2023	366,622
11/17/2023	359,661
11/18/2023	379,770
11/19/2023	337,479
11/20/2023	323,533
11/21/2023	323,459
11/22/2023	353,200
11/23/2023	276,494
11/24/2023	349,589
11/25/2023	310,689
11/26/2023	310,469
11/27/2023	307,228
11/28/2023	340,780
11/29/2023	326,094
11/30/2023	311,853
12/1/2023	373,780
12/2/2023	312,299
12/3/2023	301,146
12/4/2023	313,904
12/5/2023	374,850
12/6/2023	330,667
12/7/2023	379,150
12/8/2023	318,986
12/9/2023	370,272
12/10/2023	300,353
12/11/2023	335,086
12/12/2023	307,483
12/13/2023	370,579
12/14/2023	400,929

Date	Sutter Creek Effluent Flow (GPD)
12/15/2023	385,392
12/16/2023	364,776
12/17/2023	304,889
12/18/2023	422,652
12/19/2023	421,495
12/20/2023	414,610
12/21/2023	350,150
12/22/2023	359,398
12/23/2023	325,638
12/24/2023	265,559
12/25/2023	234,094
12/26/2023	290,817
12/27/2023	307,976
12/28/2023	401,904
12/29/2023	387,304
12/30/2023	534,061
12/31/2023	295,246
1/1/2024	273,164
1/2/2024	483,243
1/3/2024	536,383
1/4/2024	415,064
1/5/2024	418,583
1/6/2024	392,136
1/7/2024	353,686
1/8/2024	343,916
1/9/2024	340,165
1/10/2024	364,006
1/11/2024	374,913
1/12/2024	356,625
1/13/2024	582,800
1/14/2024	483,900
1/15/2024	444,819
1/16/2024	570,618
1/17/2024	538,875
1/18/2024	478,391
1/19/2024	384,847
1/20/2024	535,591
1/21/2024	758,193
1/22/2024	818,591
1/23/2024	543,072
1/24/2024	566,200
1/25/2024	500,615
1/26/2024	420,860
1/27/2024	383,553
1/28/2024	387,366
1/29/2024	330,590
1/30/2024	354,338
1/31/2024	449,575
2/1/2024	734,827
2/2/2024	911,148
2/3/2024	662,887
2/4/2024	765,447
2/5/2024	797,644
2/6/2024	648,284
2/7/2024	818,903
2/8/2024	632,163
2/9/2024	597,144
2/10/2024	438,196
2/11/2024	418,891
2/12/2024	419,916
2/13/2024	404,978
2/14/2024	472,015
2/15/2024	458,629
2/16/2024	412,696
2/17/2024	489,907
2/18/2024	750,768
2/19/2024	858,460
2/20/2024	774,306
2/21/2024	708,300
2/22/2024	563,875

Date	Sutter Creek Effluent Flow (GPD)
2/23/2024	513,141
2/24/2024	453,909
2/25/2024	433,656
2/26/2024	448,275
2/27/2024	405,113
2/28/2024	396,119
2/29/2024	693,868
3/1/2024	1,520,063
3/2/2024	1,233,994
3/3/2024	1,156,906
3/4/2024	798,325
3/5/2024	664,225
3/6/2024	535,956
3/7/2024	500,600
3/8/2024	482,288
3/9/2024	447,937
3/10/2024	416,900
3/11/2024	430,063
3/12/2024	466,581
3/13/2024	409,294
3/14/2024	416,112
3/15/2024	390,319
3/16/2024	374,130
3/17/2024	387,676
3/18/2024	427,131
3/19/2024	414,757
3/20/2024	412,043
3/21/2024	394,913
3/22/2024	593,356
3/23/2024	667,988
3/24/2024	676,487
3/25/2024	540,838
3/26/2024	481,762
3/27/2024	488,575
3/28/2024	511,350
3/29/2024	578,200
3/30/2024	523,369
3/31/2024	420,000
4/1/2024	472,475
4/2/2024	473,312
4/3/2024	459,750
4/4/2024	640,463
4/5/2024	673,637
4/6/2024	492,794
4/7/2024	455,444
4/8/2024	129,200
4/9/2024	741,737
4/10/2024	420,132
4/11/2024	404,768
4/12/2024	407,069
4/13/2024	653,963
4/14/2024	501,925
4/15/2024	452,193
4/16/2024	428,200
4/17/2024	409,913
4/18/2024	395,044
4/19/2024	383,612
4/20/2024	354,000
4/21/2024	357,644
4/22/2024	382,481
4/23/2024	416,506
4/24/2024	406,569
4/25/2024	417,094
4/26/2024	369,919
4/27/2024	339,337
4/28/2024	331,156
4/29/2024	351,444
4/30/2024	409,563
5/1/2024	250,000
5/2/2024	204,400

Date	Sutter Creek Effluent Flow (GPD)
5/3/2024	247,600
5/4/2024	332,600
5/5/2024	256,400
5/6/2024	340,200
5/7/2024	464,400
5/8/2024	411,600
5/9/2024	379,000
5/10/2024	233,200
5/11/2024	279,400
5/12/2024	276,800
5/13/2024	235,200
5/14/2024	253,200
5/15/2024	292,400
5/16/2024	286,000
5/17/2024	240,000
5/18/2024	222,600
5/19/2024	271,000
5/20/2024	229,600
5/21/2024	295,800
5/22/2024	231,000
5/23/2024	1,371,400
5/24/2024	320,200
5/25/2024	275,200
5/26/2024	255,200
5/27/2024	340,000
5/28/2024	1,159,200
5/29/2024	222,200
5/30/2024	276,400
5/31/2024	420,000
6/1/2024	357,060
6/2/2024	329,509
6/3/2024	384,351
6/4/2024	388,477
6/5/2024	386,655
6/6/2024	372,454
6/7/2024	392,656
6/8/2024	329,524
6/9/2024	317,214
6/10/2024	353,788
6/11/2024	319,672
6/12/2024	358,449
6/13/2024	330,927
6/14/2024	281,070
6/15/2024	303,452
6/16/2024	285,869
6/17/2024	325,500
6/18/2024	321,651
6/19/2024	303,523
6/20/2024	368,003
6/21/2024	352,665
6/22/2024	295,968
6/23/2024	310,856
6/24/2024	354,438
6/25/2024	335,048
6/26/2024	329,302
6/27/2024	670,097
6/28/2024	297,337
6/29/2024	322,211
6/30/2024	329,786
7/1/2024	329,786
7/2/2024	339,692
7/3/2024	325,353
7/4/2024	323,780
7/5/2024	316,123
7/6/2024	293,202
7/7/2024	305,367
7/8/2024	318,019
7/9/2024	335,375
7/10/2024	374,305
7/11/2024	337,884

Date	Sutter Creek Effluent Flow (GPD)
7/12/2024	347,164
7/13/2024	294,373
7/14/2024	313,094
7/15/2024	323,982
7/16/2024	323,982
7/17/2024	332,486
7/18/2024	338,955
7/19/2024	345,831
7/20/2024	297,508
7/21/2024	306,319
7/22/2024	285,671
7/23/2024	313,341
7/24/2024	338,246
7/25/2024	319,393
7/26/2024	333,719
7/27/2024	297,572
7/28/2024	298,759
7/29/2024	322,761
7/30/2024	353,793
7/31/2024	335,279
8/1/2024	337,500
8/2/2024	320,636
8/3/2024	303,335
8/4/2024	296,478
8/5/2024	292,559
8/6/2024	338,372
8/7/2024	314,666
8/8/2024	303,796
8/9/2024	324,710
8/10/2024	344,862
8/11/2024	359,366
8/12/2024	344,050
8/13/2024	341,181
8/14/2024	350,203
8/15/2024	341,257
8/16/2024	294,968
8/17/2024	306,650
8/18/2024	323,035
8/19/2024	359,618
8/20/2024	362,507
8/21/2024	346,531
8/22/2024	332,459
8/23/2024	206,957
8/24/2024	248,371
8/25/2024	279,047
8/26/2024	325,313
8/27/2024	362,806
8/28/2024	382,816
8/29/2024	318,390
8/30/2024	311,982
8/31/2024	284,215
9/1/2024	283,072
9/2/2024	276,463
9/3/2024	349,118
9/4/2024	362,841
9/5/2024	327,491
9/6/2024	299,496
9/7/2024	266,019
9/8/2024	304,866
9/9/2024	317,990
9/10/2024	312,947
9/11/2024	283,641
9/12/2024	320,209
9/13/2024	291,066
9/14/2024	262,034
9/15/2024	286,750
9/16/2024	315,710
9/17/2024	306,706
9/18/2024	299,606
9/19/2024	307,391

Date	Sutter Creek Effluent Flow (GPD)
9/20/2024	310,740
9/21/2024	263,616
9/22/2024	262,938
9/23/2024	286,134
9/24/2024	312,700
9/25/2024	286,053
9/26/2024	284,784
9/27/2024	273,932
9/28/2024	252,803
9/29/2024	259,765
9/30/2024	294,210

ATTACHMENT B

Amador Regional Sanitation Agency
2024 Individual Water Balance Update
Draft 2023 Sutter Creek WWTP I/I Analysis Update
by Carollo Engineers

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PROJECT MEMORANDUM

CITY OF SUTTER CREEK

Wastewater Treatment Plant Upgrade Project

Project No.: 12029A60

Date: October 10, 2023

Prepared By: Michael Wetterau, PE

Reviewed By: Ryan Orgill, PE; Louis Lefebvre, PE; Christina Romano, PE

Subject: Infiltration and Inflow Analysis Update

Background and Purpose

As part of the 2020 to 2021 Project Report efforts, Carollo Engineers (Carollo) developed a simple model of the collection system to estimate wet weather flow (WWF) design criteria. This information was used to conceptually size project alternative facilities evaluated in the Project Report. A typical peak wet weather flow (PWWF) factor ranges from three to six times the average daily flow (ADF). By comparison the City of Sutter Creek's (City's) PWWF is approximately 16, an order of magnitude higher than typical.

The City has been implementing infiltration and inflow (I/I) mitigation projects with the goal of reducing I/I impacts on its wastewater system. In the winter of 2023, the City performed sewer flow monitoring to help determine the areas with the highest I/I flows to further focus I/I reduction efforts. Some of the most common sources of I/I are shown on Figure 1.

Carollo was asked to review the data collected and incorporate it into the wastewater treatment plant (WWTP) project rescoping efforts. This memorandum includes the following:

- Verification of existing WWF factors.
- Identification of potential priority zones within the existing wastewater collection system for potential future I/I reduction projects.
- Development of ranges of possible WWF reduction if I/I reduction projects are implemented.

These three items are important because they could affect the size and cost of the WWTP upgrade project, as well as optimize the value of any future I/I reduction efforts. WWF factors could be used to size pumping facilities, sewage screens and grinders (i.e., headworks facilities, equalization tanks and sewer pipes). With lower WWFs, these facilities could be smaller and less costly. Understanding the areas that could be prioritized for I/I mitigation projects will increase the value of resources spent on those projects while decreasing the amount of time to observe benefits (i.e., reduced WWFs). Furthermore, I/I mitigation projects have the potential to increase the service life of existing sewers without costly replacement. Lastly, understanding the range of WWF reduction the City could see by undertaking future I/I reduction projects sets the level of expected benefit. The analysis considered historical WWTP influent flow along with temporary flow monitoring data to determine the expected WWTP influent flow during a design storm event.

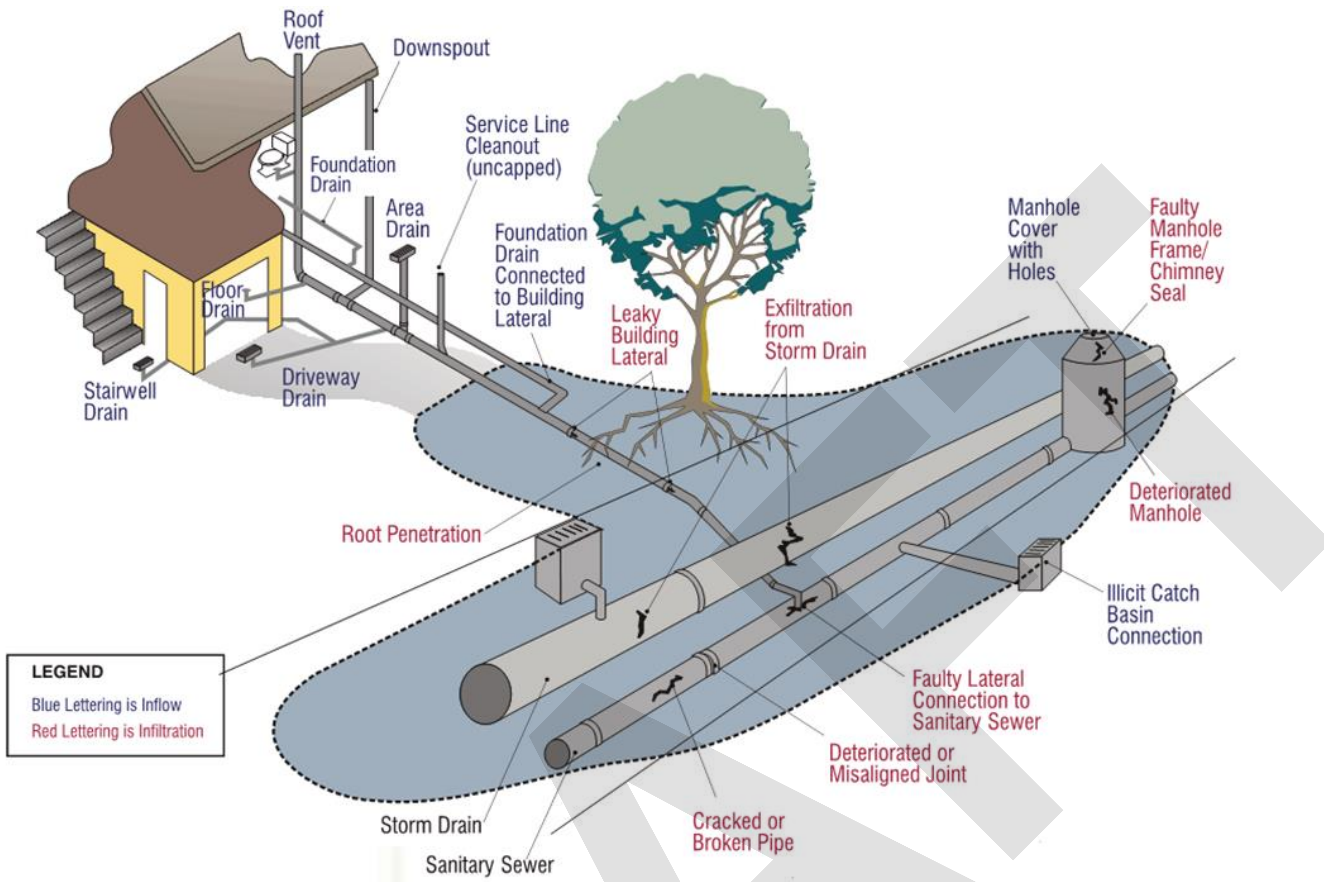

Figure 1 Typical Sources of I/I

Methods

Historical influent plant data was used to determine the dry weather flow (DWF) and WWF conditions during the monitoring period. A hydraulic model was developed using InfoSWMM[1] to model the influent flow at the WWTP for historical events. The hydraulic model's parameters were adjusted to match historical flow monitoring data.

For this project, DWF monitoring was determined based on historical plant data. Figure 2 shows the weekday and weekend hourly DWF multipliers for the entire system. A multiplier equal to 0.5 indicates at that hour of the day the flow is equal to one-half of the ADF.

[1] InfoSWMM is a fully dynamic, geospatial wastewater and stormwater modeling and management software application, which is built to run within the ESRI ArcGIS software platform. The hydraulic modeling engine for the InfoSWMM software package uses the Environmental Protection Agency's (EPA) Storm Water Management Model (SWMM), which is widely used throughout the world for planning, analysis, and design related to stormwater runoff, combined sewers, sanitary sewers, and other drainage systems. InfoSWMM routes flows through the model using the Dynamic Wave method, which solves the complete Saint Venant, one dimensional equations of fluid flow.

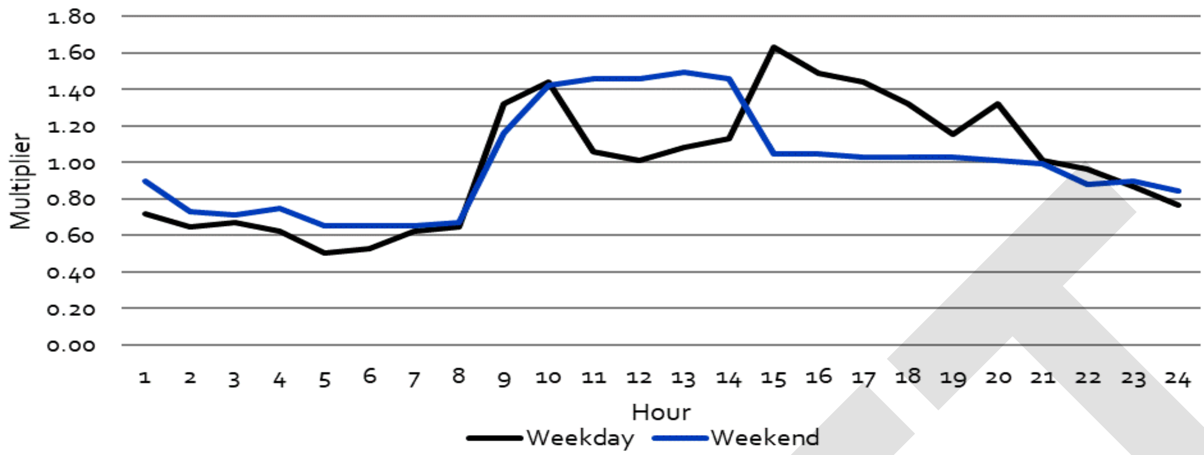

Figure 2 Weekday and Weekend DWF Hourly Multiplier

The WWF calibration consists of using actual influent WWTP flow data recorded during wet weather events, for which we have rainfall data, and adjusting model parameters so that the modeled flows match the actual flows. The model parameters are discussed later. The WWF calibration consisted of five periods with storm events. The amount of I/I is essentially the difference between the WWF and DWF components. The storm events were identified between the following dates:

- Period 1: January 2, 2017, through January 15, 2017.
- Period 2: February 5, 2017, through February 12, 2017.
- Period 3: March 12, 2018, through March 24, 2018.
- Period 4: March 1, 2019, through March 8, 2019.
- Period 5: March 9, 2023, through March 16, 2023.

The main step in the WWF calibration process includes creating a custom unit hydrograph for the City service area using the "RTK Method," which is widely used in collection system master planning. Using the RTK Method, the I/I unit hydrograph is the summation of three separate triangular hydrographs (short term, medium term, and long term), which are each defined by three parameters: R, T, and K. R represents the fraction of rainfall over the sewer basin that enters the collection system; T represents the time to peak of the hydrograph; K represents the ratio from time to peak to time of end of hydrograph. Therefore, there are a total of nine separate variables associated with a unit hydrograph. Figure 3 shows the shape of an example unit hydrograph. The WWF calibration sheets show figures comparing the measured data and model results for flow in response to rainfall. The WWF calibration sheets are included in Attachment A.

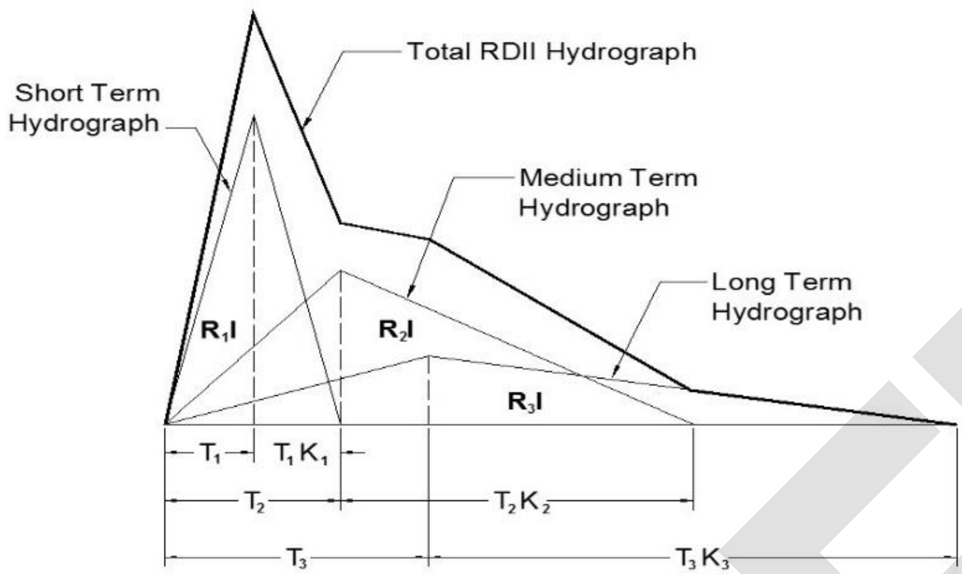

Figure 3 Example Rainfall Dependent Infiltration and Inflow (RDII) Unit Hydrograph

Design Storm

Design storms are rainfall events used to analyze the performance of a collection system under select wet weather events. The City's design storm was routed through the collection system model to determine PWWFs. The first step in the development of the design storm is to define its recurrence interval and rainfall duration. The recurrence interval is based on the probability that a given rainfall event will occur or be exceeded in any given year. For example, a "100-year storm" means there is a 1 in 100 chance that a storm as large as or larger than this event will occur at a specific location in any year.

Duration is the length of time in which the rainfall occurs. It is industry standard in California to use the 10-year, 24-hour design storm for analyzing wastewater collection system performance during PWWF conditions and for sizing some WWTP facilities (e.g., equalization tanks and pump stations). The 10-year, 24-hour design storm depth is 3.98 inches as document by National Oceanic and Atmospheric Administration (NOAA) Atlas 14.

Once the design storm recurrence interval, duration, and associated rainfall volume have been determined, the next step in defining the design storm is to distribute the total rainfall over the duration of the storm. The Natural Resources Conservation Service (NRCS) Type 1A rainfall distribution was used. Figure 4 shows the 10-year, 24-hour design storm.

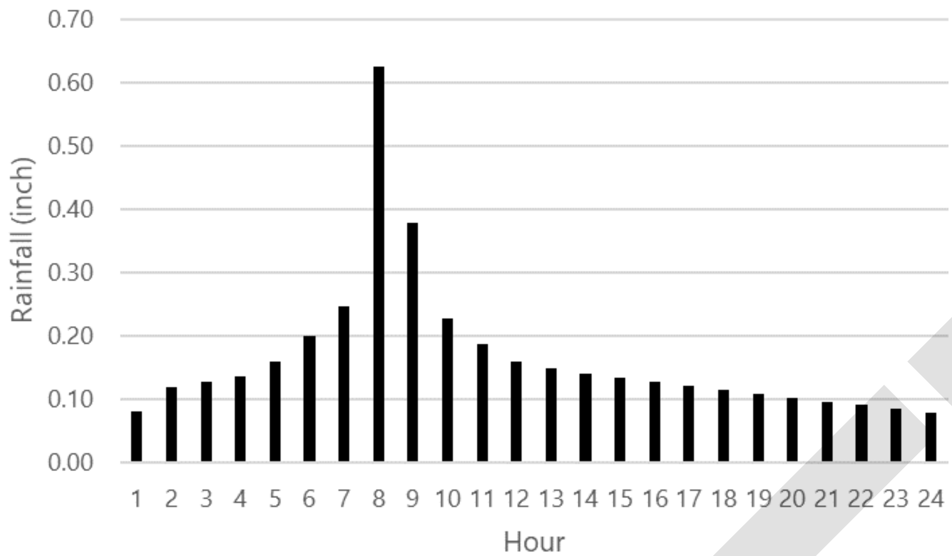

Figure 4 10-year 24-hour Design Storm Event

Hydraulic Evaluation

Following the DWF and WWF calibration of the model the design storm was applied to forecast sewer flow. The hydraulic analysis assumes all flow is conveyed to the WWTP and no flow is restricted or escapes the collection system. Figure 5 shows the peak influent flow based on the design storm at the WWTP. The model predicts that a peak hour WWF of 5.36 million gallons per day (mgd) could be observed if there were no restrictions in the collection system and if no wastewater escapes the collection system. Additionally, the model predicts that a peak day WWF of 3.16 mgd could be observed at the WWTP as a result of the 10-year, 24-hour design storm event.

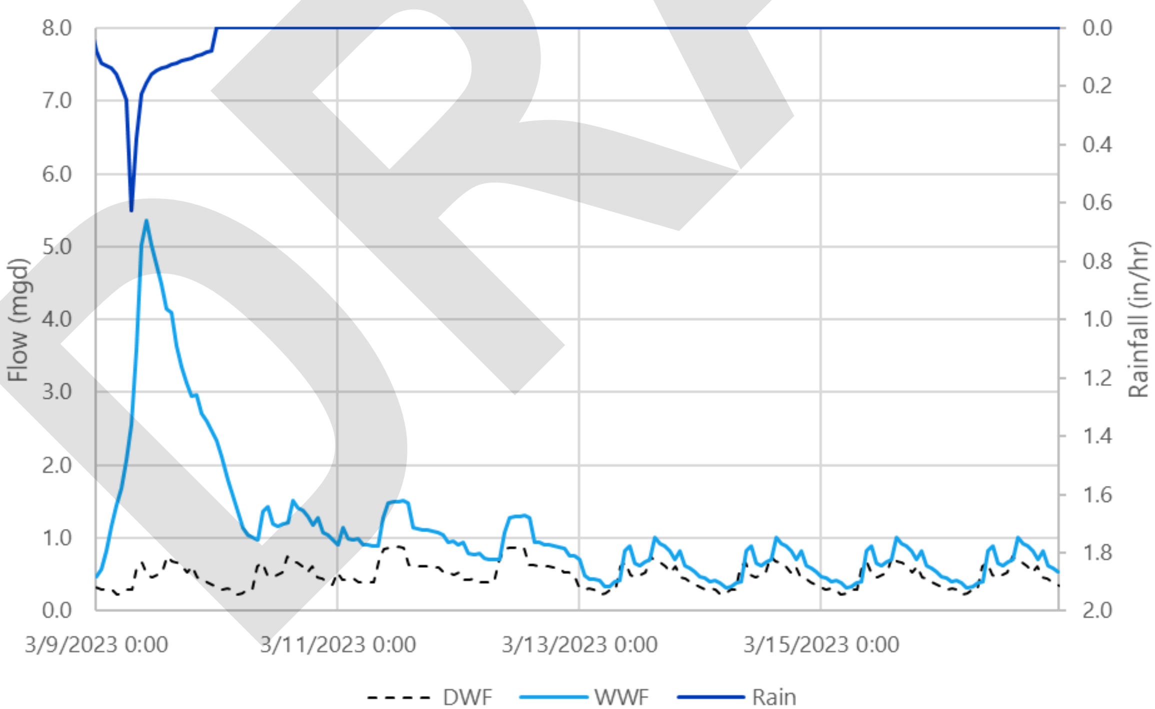

Figure 5 Modeled Influent PWWF - 10-year, 24-hour Design Storm

Temporary Flow Monitoring Program

The City completed a temporary flow monitoring program between March 8, 2023, and April 6, 2023. The flow monitoring program consisted of ten flow meters installed throughout the collection system in hopes of identifying areas in the collection system with high amounts of I/I. Table 1 summarizes the measured flow data.

Table 1 Temporary Flow Monitoring Data Summarized

Basin	Measured DWF (mgd)	Measured Peak Flow (mgd)	Peaking Factor	Pipe Length (feet)
1	0.04	0.17	4.1	0
2	0.23	1.97	8.5	18,670
3	0.07	0.16	2.3	8,010
4	0.07	0.21	3.1	7,000
5	0.01	0.13	17.9	2,960
6	0.01	0.12	9.6	3,470
7	0.18	0.76	4.1	14,480
8	0.07	0.33	5.0	4,300
9	0.08	0.46	5.5	7,020
10	0.02	0.10	5.4	10,900

Notes:
(1) Source: Flow monitoring program March 8, 2023, through April 6, 2023.

I/I Reduction

The adverse effects of I/I are that it increases both the flow volume and peak flow rate. If the City were to implement an I/I reduction program this may allow for reducing the size of some WWTP facilities (e.g., pump stations and equalization tanks). An efficient I/I reduction program will target rehabilitating the portions of the sewer collection system with the highest I/I rates. The City's sewer collection system was broken down into portions, referred to as basins (see Figure 6). I/I rates within the different basins were calculated per length of pipe in that basin. Basins 5, 6, 8, and 9 have the highest I/I rates per foot of sewer pipe and could be targeted for I/I reduction efforts. Collectively these basins account for approximately 18 percent of the total sewer collection system by length.

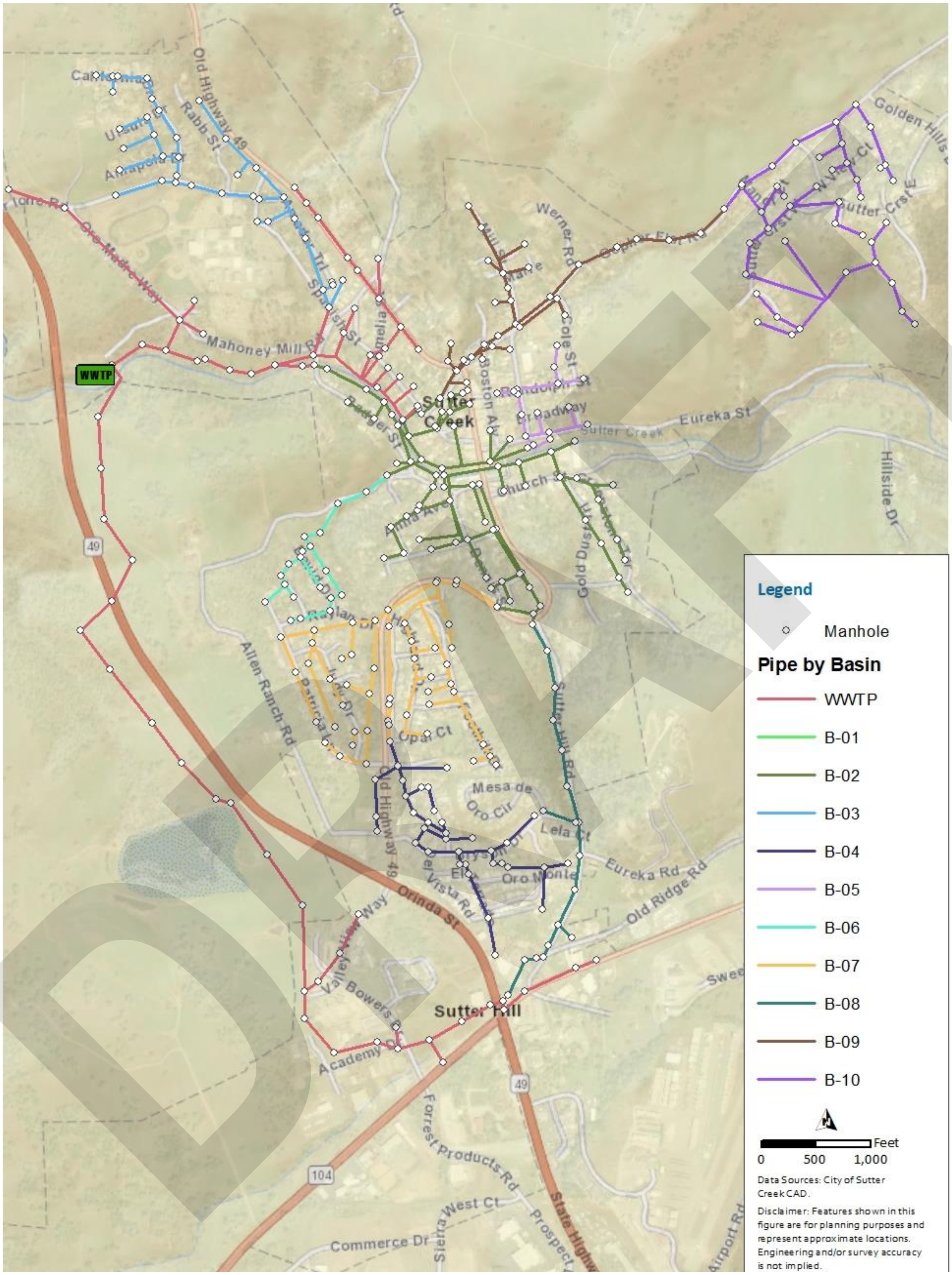

Figure 6 Meter Basins Map

There are a variety of I/I reduction techniques that can be used. I/I reduction projects can range from manhole rehabilitation to sewer main replacement/rehabilitation and lateral rehabilitation. Implementing an I/I reduction program is no guarantee that the desired I/I reduction will be achieved. However, there is a baseline benefit to rehabbing existing facilities because it would extend their life. For this analysis 30 percent and 65 percent I/I reduction in the selected basins was assumed to estimate the potential reduction in peak flows. Table 2 summarizes the potential reduction of peak influent flow at the WWTP for the range of I/I reduction assumed. Based on a review of historical literature and Carollo's experience in order to achieve an I/I reduction of 65 percent, the City may need to incorporate pipe, manhole, and service laterals rehabilitation.

Table 2 Peak Influent Flows

Scenario	Peak Influent Flow (mgd)
No Reduction	5.36
30% Reduction in Basins 5, 6, 8, and 9	4.74
65% Reduction in Basins 5, 6, 8, and 9	4.03

Conclusion

This memorandum verified existing WWFs, identified basins with highest I/I, and identified potential reductions in WWFs if I/I reduction projects are implemented in the priority basins. The planned WWTP upgrade project could expect a peak hour flow of 5.36 mgd and a peak day flow of 3.16 mgd as a result of the 10-year, 24-hour design storm.

Basins 5, 6, 8, and 9 could be prioritized for I/I reductions because I/I rates are highest in these basins. Approximately 18 percent of the total sewer collection system length is in these basins. If I/I is reduced in these basins between 30 percent and 65 percent a reduction in peak hour flow between 0.62 mgd and 1.33 mgd could be realized.

ATTACHMENT C

Amador Regional Sanitation Agency
2024 Individual Water Balance Update
ARSA Storage Reservoirs Supporting Documentation

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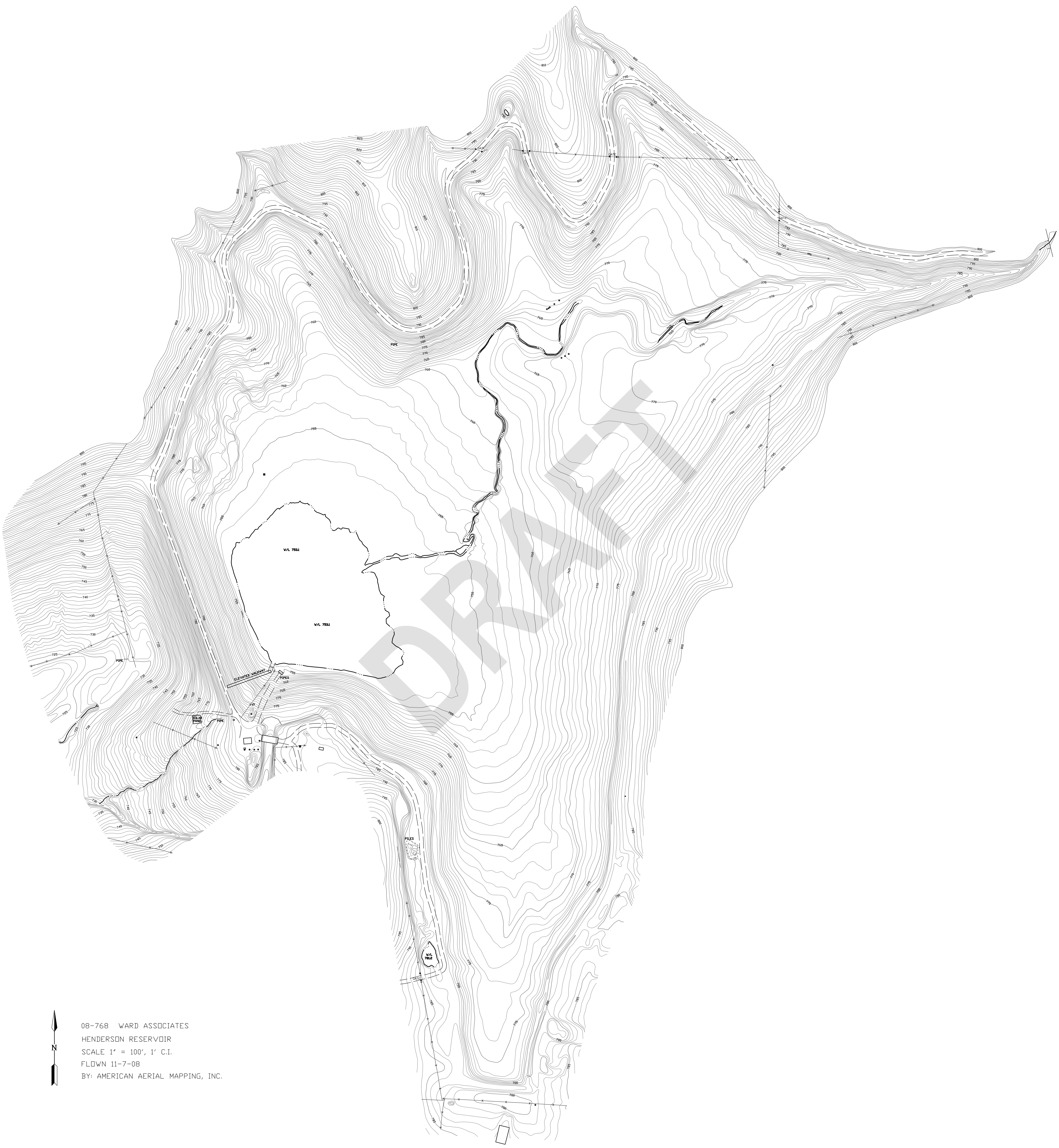
HENDERSON RESERVOIR AERIAL TOPOGRAPHIC SURVEY DATA
PROVIDED BY ARSA STAFF AND GARY GHIO



SITE PLAN

LEGEND:

WATERSHED RUNOFF AREA, (4.3 ACRES)

0 300 600

Weber, Ghio & Associates, Inc.

Professional Engineers

394 East Saint Charles
P.O. Box 251
SAN ANDREAS, CALIFORNIA 95249

PROJECT NAME:

HENDERSON RESERVOIR RUNOFF AREA

PROJECT No.: 2457

Plot Aug 09, 2017 at 9:35am M:\Projects\ARSA\2457\Reservoirs\Runoff Areas.dwg

SITE PLAN

LEGEND:

WATERSHED RUNOFF AREA,
(14.0 ACRES)

N

0 300 600

Weber, Ghio & Associates, Inc.
Professional Engineers
394 East Saint Charles
P.O. Box 251
SAN ANDREAS, CALIFORNIA 95249

PROJECT NAME:

PRESTON RESERVOIR RUNOFF AREA

PROJECT No.: 2457

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State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES
Division of Safety of Dams

Dam Information Summary

Preston Dam, No. 2029.003, Area 6, Amador County

Amador Regional Sanitation Authority

Dam Dimensions

Dam Height, Ft	40.00
Crest Width, Ft	20.00
Dam Length, Ft	647.00
Crest Elevation, Ft	360.00
Volume, CY	86,519.00
Barrier Height, Ft	35.00
MPWS Elev., Ft	355.00
MPWS Capacity, AF	268.00
Parapet Code	None
Parapet Height, Ft	0.00
Total Freeboard, Ft	5.00
Oper. Freeboard, Ft	5.00

Certificate Information

Max Cert. Elev., Ft	355.00
Issue Date	10/6/1980

Reservoir

Name	Primary Reservoir
Duration	Year Round
Surface Area, Ac	17.00
Storage Capacities, AF	
at Cert Elev.	268.00
at Dam Crest	0.00
at SW Crest	0.00

Primary Spillway

Crest Elev, Ft	355.00
Type	(Unselected)
Gates	Ungated

Dam Information

Type	Earth
Status	Certified
Purpose(s)	STO
Use(s)	SEW, IRR

Location

Year Built	1949
Latitude	38.3698°
Longitude	-120.9398°
Stream	Tr Mule Creek
Tributary To	
US Public Land Survey System	-¼, S24, T6N, R9E, MD B&M
Quad Book	2C-37A3
Quad Map	IONE
National Forest	N.I.N.F.
NID Number	CA00012

Hazard Potential

Hazard Class	2B
Total Class Weight	14
Fed. Hazard Class	Significant

Jurisdiction

FERC Number	
Exempt Desc.	(Unselected)

Attributes

Inoperable	No
Receives Spillway Letter	No
Instrumentation	No

Hydrology

Estimate Date	8/18/1948
Est. Type	DWR
Drainage Area, Sq Mi	0.12
Mean Annual Precip, In	0.00
Peak Inflow, cfs	
Peak Outflow, cfs	
Max Stage, Ft	
Residual Freeboard, Ft	0.00

Seismic Parameters

Estimate Date	
Fault	
Max Magnitude	
Deterministic Level	
Peak Ground Acc., g	
Arias Intensity, m/s	
Shear Wave Vel., m/s	

Outlet Works

Type	
Drawdown Estimates, Days	
Short Term	
Long Term	

Restrictions

Restriction	None
Duration	
Restricted Elev., Ft	
Reason	
Start Date	

Printed: Tuesday, February 28, 2017, by: Dhillon, Param

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES
Division of Safety of Dams

Dam Information Summary

Preston Forebay Dam, No. 2029.002, Area 6, Amador County

Amador Regional Sanitation Authority

Dam Dimensions

Dam Height, Ft	40.00
Crest Width, Ft	0.00
Dam Length, Ft	176.00
Crest Elevation, Ft	624.00
Volume, CY	22,400.00
Barrier Height, Ft	36.00
MPWS Elev., Ft	620.00
MPWS Capacity, AF	30.00
Parapet Code	None
Parapet Height, Ft	0.00
Total Freeboard, Ft	4.00
Oper. Freeboard, Ft	4.00

Certificate Information

Max Cert. Elev., Ft	620.00
Issue Date	10/6/1980

Reservoir

Name	Primary Reservoir
Duration	Year Round
Surface Area, Ac	2.00
Storage Capacities, AF	
at Cert Elev.	30.00
at Dam Crest	0.00
at SW Crest	0.00

Primary Spillway

Crest Elev, Ft	620.00
Type	(Unselected)
Gates	Ungated

Dam Information

Type	Earth
Status	Certified
Purpose(s)	REG
Use(s)	SEW, IRR

Location

Year Built	1892
Latitude	38.3754°
Longitude	-120.9233°
Stream	Offstream
Tributary To	
US Public Land Survey System	-¼, S18, T6N, R10E, MD B&M
Quad Book	2C-37A1
Quad Map	IRISH HILL
National Forest	N.I.N.F.
NID Number	CA00006

Hazard Potential

Hazard Class	1C
Total Class Weight	6
Fed. Hazard Class	Low

Jurisdiction

FERC Number	
Exempt Desc.	(Unselected)

Attributes

Inoperable	No
Receives Spillway Letter	No
Instrumentation	No

Hydrology

Estimate Date	4/19/1940
Est. Type	1000
Drainage Area, Sq Mi	0.00
Mean Annual Precip, In	0.00
Peak Inflow, cfs	20.00
Peak Outflow, cfs	20.00
Max Stage, Ft	2.20
Residual Freeboard, Ft	2.20

Seismic Parameters

Estimate Date	
Fault	
Max Magnitude	
Deterministic Level	
Peak Ground Acc., g	
Arias Intensity, m/s	
Shear Wave Vel., m/s	

Outlet Works

Type	
Drawdown Estimates, Days	
Short Term	
Long Term	

Restrictions

Restriction	None
Duration	
Restricted Elev., Ft	
Reason	
Start Date	

Printed: Tuesday, February 28, 2017, by: Dhillon, Param

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES
Division of Safety of Dams

Dam Information Summary

Henderson Dam, No. 2029.000, Area 6, Amador County

Amador Regional Sanitation Authority

Dam Dimensions

Dam Height, Ft	56.00
Crest Width, Ft	8.00
Dam Length, Ft	630.00
Crest Elevation, Ft	86.50
Volume, CY	70,000.00
Barrier Height, Ft	53.00
MPWS Elev., Ft	83.50
MPWS Capacity, AF	500.00
Parapet Code	None
Parapet Height, Ft	0.00
Total Freeboard, Ft	3.00
Oper. Freeboard, Ft	3.00

Certificate Information

Max Cert. Elev., Ft	83.50
Issue Date	10/6/1980

Reservoir

Name	Primary Reservoir
Duration	Year Round
Surface Area, Ac	31.00
Storage Capacities, AF	
at Cert Elev.	500.00
at Dam Crest	595.00
at SW Crest	500.00

Primary Spillway

Crest Elev, Ft	83.50
Type	Sharp Crested Weir
Gates	Ungated

Dam Information

Type	Earth
Status	Certified
Purpose(s)	STO
Use(s)	SEW, IRR

Location

Year Built	1923
Latitude	38.3856°
Longitude	-120.8771°
Stream	Jackass Creek
Tributary To	
US Public Land Survey System	-¼, S9, T6N, R10E, MD B&M
Quad Book	2C-37A1
Quad Map	IRISH HILL
National Forest	N.I.N.F.
NID Number	CA00005

Hazard Potential

Hazard Class	2B
Total Class Weight	12
Fed. Hazard Class	Significant

Jurisdiction

FERC Number	
Exempt Desc.	(Unselected)

Attributes

Inoperable	No
Receives Spillway Letter	No
Instrumentation	No

Hydrology

Estimate Date	5/2/1971
Est. Type	1000
Drainage Area, Sq Mi	1.00
Mean Annual Precip, In	0.00
Peak Inflow, cfs	752.00
Peak Outflow, cfs	489.00
Max Stage, Ft	785.30
Residual Freeboard, Ft	1.30

Seismic Parameters

Estimate Date	
Fault	
Max Magnitude	
Deterministic Level	
Peak Ground Acc., g	
Arias Intensity, m/s	
Shear Wave Vel., m/s	

Outlet Works

Type	
Drawdown Estimates, Days	
Short Term	
Long Term	

Restrictions

Restriction	None
Duration	
Restricted Elev., Ft	
Reason	
Start Date	

HENDERSON RESERVOIR STAGE-STORAGE DATA

BASED ON AERIAL TOPOGRAPHIC SURVEY DATA
PROVIDED BY ARSA STAFF AND GARY GHIO

AMADOR REGIONAL SANITATION AUTHORITY

HENDERSON RESERVOIR VOLUME

4/21/2015

Elev (ft)	Area (ac)	Volume (ac-ft)	Cumulative Volume (ac-ft)	Cumulative Volume (MG)	Incremental Volume Increase (ac-ft)	
780	30.06	14.96	451.83	147.22	14.96	Spillway
779.5	29.80	14.84	436.86	142.34	14.84	
779	29.57	14.70	422.02	137.51	14.70	
778.5	29.22	14.53	407.33	132.72	14.53	
778	28.88	14.34	392.80	127.99	14.34	2 ' Freeboard
777.5	28.47	14.14	378.46	123.31	14.14	
777	28.07	13.92	364.33	118.71	13.92	
776.5	27.62	13.70	350.41	114.17	13.70	
776	27.17	13.47	336.71	109.71	13.47	
775.5	26.69	13.23	323.24	105.32	13.23	
775	26.23	12.97	310.01	101.01	12.97	
774.5	25.67	12.69	297.04	96.78	12.69	
774	25.11	12.39	284.34	92.65	12.39	
773.5	24.46	12.10	271.95	88.61	12.10	
773	23.96	11.83	259.84	84.66	11.83	
772.5	23.34	11.53	248.02	80.81	11.53	
772	22.78	11.20	236.49	77.05	11.20	
771.5	22.01	10.86	225.29	73.41	10.86	
771	21.41	10.54	214.44	69.87	10.54	
770.5	20.73	10.18	203.90	66.44	10.18	
770	19.99	9.85	193.72	63.12	9.85	
769.5	19.40	9.55	183.87	59.91	9.55	
769	18.79	9.24	174.33	56.80	9.24	
768.5	18.17	8.94	165.09	53.79	8.94	
768	17.57	8.64	156.15	50.88	8.64	
767.5	16.97	8.33	147.51	48.06	8.33	
767	16.34	8.03	139.19	45.35	8.03	
766.5	15.79	7.79	131.15	42.73	7.79	
766	15.36	7.57	123.37	40.20	7.57	
765.5	14.93	7.36	115.80	37.73	7.36	
765	14.52	7.16	108.43	35.33	7.16	
764.5	14.11	6.96	101.28	33.00	6.96	
764	13.73	6.74	94.32	30.73	6.74	
763.5	13.25	6.53	87.57	28.53	6.53	
763	12.86	6.34	81.05	26.41	6.34	
762.5	12.51	6.16	74.71	24.34	6.16	
762	12.13	5.91	68.55	22.34	5.91	
761.5	11.52	5.67	62.64	20.41	5.67	
761	11.15	5.47	56.97	18.56	5.47	
760.5	10.75	5.26	51.50	16.78	5.26	
760	10.30	5.03	46.23	15.06	5.03	
759.5	9.83	4.80	41.20	13.42	4.80	
759	9.37	4.57	36.40	11.86	4.57	
758.5	8.91	4.35	31.83	10.37	4.35	

758	8.48	4.12	27.48	8.96	4.12
757.5	8.00	3.89	23.36	7.61	3.89
757	7.57	3.65	19.47	6.34	3.65
756.5	7.03	3.40	15.82	5.16	3.40
756	6.59	3.15	12.42	4.05	3.15
755.5	6.01	2.88	9.27	3.02	2.88
755	5.49	2.55	6.39	2.08	2.55
754.5	4.70	2.20	3.85	1.25	2.20
754	4.12	1.34	1.64	0.54	1.34
753.5	1.23	0.31	0.31	0.10	0.31
753	0	0.00	0.00	0.00	0.00

* spillway elevation = 780'
Volume established from 11-07-08 aerial topo

PRESTON RESERVOIR STAGE-STORAGE DATA PROVIDED BY ARSA STAFF AND GARY GHIO

Preston Reservoir				
Elevation	Area (AC)	Capacity (AC-FT)	Elevation	
325	0	0	325	
330	3	5	330	
335	6	25	335	
340	8	60	340	
345	12	110	345	
350	16	175	350	
353	18	235	353	2' Freeboard
355	20	270	355	Spillway

ATTACHMENT D

Amador Regional Sanitation Agency
2024 Individual Water Balance Update
Draft 2024 COGC Recycled Water Demands TM
by West Yost Engineers

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westyost.com

TECHNICAL MEMORANDUM

DATE: October 14, 2024

Project No.: 988-50-24-10
SENT VIA: EMAIL

TO:

CC:

FROM: Allie Ahern

REVIEWED BY: Kathryn Gies, PE, RCE #65022

SUBJECT: Castle Oaks Golf Course Recycled Water Demands

This technical memorandum (TM) provides information and supporting documentation related to water needs of the Castle Oaks Golf Course (golf course), which received recycled water from the Castle Oaks Water Reclamation Facility (COWRF). The purpose of this TM is to inform development of a water balance for the Amador Regional Sanitation Authority (ARSA) wastewater disposal system. The following topics are addressed:

- Background Information
- Golf Course Irrigable Acreage
- Golf Course Storage Ponds
- Golf Course Agronomic Water Demands
- COWRF Influent Flows
- Golf Course Tailwater and Overspray Control and Monitoring

BACKGROUND INFORMATION

This section provides background information relevant to this TM. The following topics are addressed:

- Regulatory History
- Applicable Regulatory Standards for Water Balances
- Golf Course Demands vs. COWRF Influent Flows

Regulatory History

The City of Ione (City), Amador Regional Sanitation Authority (ARSA) and Portlock International Ltd. (Portlock) are the three entities permitted under Water Reclamation Requirement Order 93-240 (WRRs), which permits the land application of recycled water from the COWRF to the golf course. The City owns and operates the COWRF that provides the recycled water to the golf course. The City also owns the golf course, which is leased and operated by Portlock. ARSA is permitted to supply water to the COWRF to meet the irrigation needs of the golf course.

On August 14, 2024, the Central Valley Water Quality Control Board (Regional Board) issued a 13267 Order Letter to the three WRRs permittees that requires the submission of an updated water balance for the ARSA system to the Regional Board by December 13, 2024. The letter specifies six items (A through F) that must be provided. This TM addresses the requirements under Item B of this letter, which states:

> *The acreage and agronomic rate at which recycled water can be applied to the Castle Oaks Golf Course without violating setback requirements, Title 22 requirements, impacting groundwater, or causing runoff to surface water. These numbers and calculations should be provided and certified by Ione and Portlock International LTD. Supporting documentation and references must be included in the submittal. Information regarding tailwater control/return and monitoring plans for compliance with applicable land application area requirements must also be included.*

Applicable Regulatory Standards for Water Balances

The 13267 Order also states that the water balance must be in compliance with the requirements and guidance of the Regional Board's guidance document, *Requirements for Water Balance Update and Calibration*, which is provided as Attachment A to the 13267 Order. Several of the procedures defined in this guidance document are applicable to the development of this TM, as follows:

Requirements for Water Balance Update and Calibration, Section 4:

> *The normal operations and maintenance of land application areas should be considered. O&M Manuals should be referenced as well as historical monitoring data (i.e. percolation rates, observed standing water). Specific conditions of the WDRs should also be taken into account. The following should be taken into consideration:*
>
> *A. Recycling area/land application area/disposal system hydraulic loading rates should be distributed monthly in accordance with expected seasonal variations based on crop evapotranspiration rates.*
>
> *B. The distribution of precipitation (i.e. storm intensity, light rain over a lot of days or heavy rain over a few days), as well as other factors such as wind and saturated conditions must be taken into account when determining the number of days a disposal system can be operated each month. The most reliable way to estimate this is based off of historical records from a water year of intensity similar to that which is being modeled.*
>
> *C. It should be specified whether the tailwater is collected, and if so if it is returned to the sprayfields directly or to one of the ponds.*
>
> *D. If applicable, storm water runoff shall be accounted for in the tailwater return calculations.*

E. Maximum disposal capacity of land application areas should be based on soil studies, cropping plans, percolation studies, and/or operator notes.

Requirements for Water Balance Update and Calibration, Section 5:

A. All water balances shall start on 1 October and end on 30 September.

…

C. The water balance should include an assessment of the facility's capacity and performance during a normal water year and during a year with a total annual precipitation for a return period of 100 years.

D. Local precipitation data for the 100-year annual return period, distributed monthly in accordance with mean monthly precipitation patterns shall be used. However, periods of high intensity storms should also be considered in the calculations.

E. All water balances should be based on all available data. All data should also be quality controlled and used with discretion.

…

G. For each wastewater treatment, storage, or disposal pond and containment structure, provide the following information:

a. Identification (name) and function of the pond.

b. Surface area, depth, and volumetric capacity at two feet of freeboard.

c. Height (relative to surrounding grade), crest width, interior slope, and exterior slope of each berm or levee.

d. Materials used to construct each berm or levee.

e. Description of engineered liner, if any. Include a copy of the Construction Quality

f. Estimated steady state percolation rate for each unlined pond.

g. Depth to shallow groundwater below the base and pond inverts.

h. Precipitation and evapotranspiration data shall be from recognized stations. The source of this information shall be provided, including a link to the data.

i. Overfilling/overflow prevention features.

j. Operation and maintenance procedures.

Golf Course Demands vs. COWRF Influent Flows

The influent flow to the COWRF needs to be greater than the agronomic water demand of the golf course to accommodate the losses due to filter backwash. During the tertiary treatment process, a fraction of the influent to the COWRF is discarded as filter backwash and sent to the City of Ione's Wastewater Treatment Plant (WWTP). The remaining influent to the COWRF is treated to tertiary standards and recycled at the golf course. Therefore, the ARSA water balances need to include the portion of influent that is sent as filter backwash from the COWRF to the WWTP.

The City of Ione is also in the process of preparing a water balance for its WWTP in accordance with a separate 13267 Order. This WWTP water balance will need to account for in the COWRF backwash flows. Accordingly, this TM presents calculations that define both the COWRF influent flows needed to meet the golf course agronomic demands for use in the ARSA water balance and the backwash flow from the COWRF to the WWTP for use in the WWTP water balance.

GOLF COURSE IRRIGABLE ACREAGE

The irrigable acreage of the golf course was determined based on inspection of the golf course irrigation system and discussions with staff. This area was mapped and quantified using GIS mapping and data processing tools. The map created can be seen on Figure 1. The following areas of the golf course were not included in the calculated irrigable acreage:

- "natural" areas surrounding Mule Creek and Sutter Creek
- areas abutting residences surrounding the golf course; some of these areas are irrigated by residents while others remain unirrigated
- hardscape and permanent water features

The total irrigable area of the golf course was determined to be 130 acres.

GOLF COURSE STORAGE PONDS

The Golf Course has nine (9) lakes that can be filled with recycled water during the irrigation season that act as water hazards on the Golf Course and store recycled water to supply the irrigation system. The lakes are hydraulically connected to each other and fed via gravity from the highest elevation lake or Lake A to the lowest elevation lake called Lake I. Floats between the lakes control the elevation of the water between the lakes. Lake A or Lake I are able to receive recycled water directly from the WWTP/COWRP. Lake A can also receive water via the irrigation system to assist in moving water within the system. Lake I feeds into the booster pumps that provides pressure for irrigation.

The Lakes also serve as rainwater catchment and have potential for overflow during heavy rain events. Therefore, recycled water is only delivered to the Golf Course for the irrigation season between April to October. Prior to the rain season beginning, the volume of recycled water in the lakes is removed.

Due to the complexities with managing the stormwater system, recycled water is only delivered to Lake I. The other Lakes only received stormwater during the non-irrigation season. Details regarding Lake I are as follows:

- Total Area = 3.1 acres

AS MUCH OF THIS INFORMATION, AS POSSIBLE, WILL BE INCLUDED IN THE FINAL DRAFT

b. depth, and volumetric capacity at two feet of freeboard.

c. Height (relative to surrounding grade), crest width, interior slope, and exterior slope of each berm or levee.

d. Materials used to construct each berm or levee.

e. Description of engineered liner, if any. Include a copy of the Construction Quality

f. Estimated steady state percolation rate for each unlined pond.

g. Depth to shallow groundwater below the base and pond inverts.

h. Precipitation and evapotranspiration data shall be from recognized stations. The source of this information shall be provided, including a link to the data.

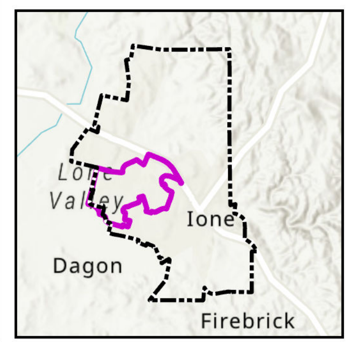
i. Overfilling/overflow prevention features.

j. Operation and maintenance procedures.

COGC_TM_Fig1: W:\Clients\988 City of Ione\50-23-05 Title 22 Update\GIS\Title 22 Update\Title 22 Update.aprx - aahern - 10/10/2024

Golf Course Irrigable Area

City of Ione Boundary



Prepared by:

WEST YOST

0 2 4 Miles

N

Prepared for:

City of Ione

Water Balance Information for Castle Oaks Golf Course

Castle Oaks Golf Course

Irrigable Area

Figure 1

GOLF COURSE AGRONOMIC WATER DEMANDS

Calculation Procedures

The steps and major assumptions used to determine the rate at which recycled water can be supplied to the golf course are described below.

Climate Data

a. Rainfall data reported by the Ione National Climate Data Center (NCDC) weather station was used to define the average annual rainfall, 1-in-100-year annual rainfall, and the monthly distributions of rainfall, as follows:
   - The average rainfall year was defined as having a total rainfall of 22.1 inches.
   - The 1-in-100 rainfall year was defined as having a total rainfall of 44.1 inches.
   - The monthly distributions were defined based on the 1906 to 1997 monthly normal rainfall distribution values.

These values were defined by the California Department of Water Resources (DWR). This information is documented in Attachment A and summarized in Table 1.

b. Reference Evapotranspiration (ET) for each month is based on long-term monthly average ET values for the Plymouth California Irrigation Management Information System (CIMIS) Station (#227), located approximately 13 miles northeast of the golf course. This information is documented in Attachment A and summarized in Table 1.

Table 1. Applicable Climate Data

Month	Average Rainfall[(a)], inches	1-in-100 Year Rainfall[(a)], inches	Reference ET [(b)], inches
October	1.15	2.15	3.24
November	2.81	5.24	1.68
December	3.54	6.58	1.21
January	5.09	9.48	1.48
February	3.14	5.86	1.95
March	3.2	5.95	3.02
April	1.75	3.26	4.57
May	0.63	1.18	5.97
June	0.23	0.43	7.19
July	0.07	0.13	7.64
August	0.13	0.24	6.98
September	0.33	0.62	4.99
Total	**22.1**	**41.1**	**49.9**

(a) NCDC weather station (#044283)
(b) Plymouth CIMIS station (#227)

Crop ET

a. Monthly crop ET for the golf course was calculated by multiplying the reference ET values by a representative crop coefficient. According to the 2003 Recycled Water Distribution and Use Engineering Report, grasses grown on the golf course include:

- perennial rye grass
- poa annua
- creeping bent grass
- tall fescue
- Bermuda grass

Apart from Bermuda grass, all grasses used on the golf course are considered cool season grasses. Monthly crop coefficients for cool season grasses in Riverside, CA were determined by Meyer and Gibeault in 1986 (Attachment B, Table 3). The average of the monthly crop coefficients for April to October, calculated to be 0.88, was used as a representative crop coefficient.

Pond ET

a. Monthly ET for the storage pond, Lake I, was set equal to the monthly reference ET values.

Historical Recycled Water Demand

a. To properly maintain the greens, recycled water is delivered to the COWRF and golf course solely based on golf course demands.

b. Golf course flow data is tracked by golf course and is shown in Table 2. Data for the months of May 2023 and January to June 2024 was not available for this Draft TM but will be included in future calculations as it is made available.

c. The average monthly historical recycled water delivered was used to calibrate and confirm the theoretical recycled water demand for the golf course.

Table 2. Historical Golf Course Recycled Water Demand

Month	Volume of Recycled Water Used, million gallons (MG)[a]									Average, acre-feet
	2017	2018	2019	2020	2021	2022	2023	2024	Average	
October	16.5	8.4	16.7	14.5	8.2	9.1	11.9		12.2	37.4
November	0	3.2	13.9	6.1	0	9.1	0		4.6	14.1
December	0	0	0	0	0	0	0		0	0
January	0	0	0	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0	0	0	0
March	0	0	0	0	0	0	0	0	0	0
April	0	0	0	1.1	12.7	8.1	0.9	-	3.3	10.0
May	18.1	19.1	15.1	14.1	25.2	12.1[b]	-	-	18.3	56.3
June	25.6	26.5	21.1	19.6	21.4	10.8[b]	22.0	-	22.7	69.7
July	29.4	29.0	27.2	26.6	31.7	20.4	25.1	29.0	27.3	83.8
August	29.1	29.8	26.5	25.8	23.3	21.0	22.0	26.8	25.5	78.4
September	23.0	24.1	24.1	16.2	9.0[c]	15.7	15.0	-	19.7	60.4
Total, MG	**141.7**	**140.2**	**144.6**	**123.9**	**131.5**	**106.3**	**97.0**	**55.8**	**133.6**	**410.2**

(a) "-"indicate data that is currently unavailable.

(b) Values excluded from average calculation. There was limited recycled water supply from ARSA during the period of May to June 2022. In general, water deliveries to the COWRF are made according to golf course irrigation demand, but there are times when there are not sufficient water deliveries to the COWRF to meet golf course demands.

(c) Value is excluded from average because it is anomalous when compared with September recycled water use volumes of other years. Operations staff responsible for this data are not available to confirm its accuracy.

Theoretical Recycled Water Demands

a. Theoretical agronomic demands for the golf course are calculated by multiplying the difference between the calculated monthly crop ET and monthly rainfall values by the total area of the golf course (130 acres) and dividing by an irrigation efficiency factor.
   - For months with more precipitation than ET, the irrigation demand was set equal to zero.
   - Irrigation efficiencies for solid set spray irrigation systems like that used on the golf course can range from 60 to 85 percent (Attachment C, Table 8.2b). A calibration process, described below, has been used to define the irrigation efficiency for this site.

b. Theoretical agronomic demands for the storage ponds are calculated by multiplying the difference between the reference ET and monthly rainfall values by the total area of the impoundment.
   - As noted previously, recycled water is only sent to and pumped from Lake I. Therefore, only losses from Lake I (3.1 acres) are included.
   - Losses are only calculated for months when recycled water is delivered to the golf course.
   - There have been no attempts to quantify percolation losses from Lake I. Therefore, percolation losses are assumed to be zero (0).

c. Total theoretical demands are the sum of the theoretical monthly golf course agronomic demands and the theoretical monthly evaporative losses from Lake I.

Average Year Theoretical Recycled Water Demand Calibration

a. The site-specific irrigation efficiency factor used to calculate the theoretical irrigation demand is determined by adjusting the irrigation efficiency value used in the average-year theoretical recycled water demand calculation, so the demand matches the historical recycled water supplied.

b. The resulting irrigation efficiency is 85 percent, which falls at the upper end of the typical range for spray irrigation cited above. ***This calibration process demonstrates that the golf course irrigation system is very efficient and experiences limited losses.***

1-in-100 Year Recycled Water Demand

a. The 100-year theoretical recycled water demand is calculated using the procedures described above but applying 1-in-100-year rainfall values.

Agronomic Water Demands

The calculated average rainfall year theoretical demand to be used in the water balance analysis is shown in Table 3. The calculated average 1-in-100-year theoretical demand to be used in the water balance analysis is shown in Table 4.

As shown, the historical data indicates that there have been irrigation demands in November. However, the theoretical demands do not indicate there is a need for irrigation water in this month. This discrepancy likely reflects the fact that rainfall typically does not begin until late November in this area, while there are still irrigation demands early in the month. Despite this discrepancy, the annual theorical demand matches closely to the historical values for the average year. Therefore, the methodology applied provides an accurate estimate for purposes of developing an annual water balance.

Table 3. Monthly Golf Course Recycled Water Demand for an Average Rainfall Year

	(1)	(2)	(3)	(4)	(5)	(6)
	Climate Values, inches		Historical Demand, acre-feet	Theoretical Average-Year Demand, acre-feet		
Month	Rainfall	Reference ET		Irrigation Demand	Pond Losses	Total Demand
October	1.15	3.24	37.4	21.7	0.50	22.2
November	2.81	1.68	14.1	0	0	0
December	3.54	1.21	0	0	0	0
January	5.09	1.48	0	0	0	0
February	3.14	1.95	0	0	0	0
March	3.2	3.02	0	0	0	0
April	1.75	4.57	10.0	29.0	0.70	29.7
May	0.63	5.97	56.3	58.9	1.40	60.3
June	0.23	7.19	69.7	77.7	1.80	79.5
July	0.07	7.64	83.8	84.8	2.00	86.8
August	0.13	6.98	78.4	76.6	1.80	78.4
September	0.33	4.99	60.4	51.8	1.20	53.0
Total,acre-feet per year (AFY)	**22.1**	**49.9**	**410.1**	**400.5**	**9.4**	**409.9**

Notes:
(1) 1906-1977 monthly rainfall normals for Ione NCDC weather station (#044283)
(2) Long-term monthly average reference ET from Plymouth CIMIS station (#227)
(3) Average of monthly irrigation volumes applied to the golf course from 2017 to 2022
(4) = (irrigated area of 130 acres) x [Col. 2 x (crop coefficient of 0.88) - Col. 1] / (irrigation efficiency of 0.85) / 12
(5) = (storage pond area of 2.5 acres) x (Col. 2 - Col. 1) / 12
(6) = Col. 4 + Col. 5

Table 4. Monthly Golf Course Recycled Water Demand for a 1-in-100 Rainfall Year

	(1)	(2)	(3)	(4)	(5)
	Climate Values, inches		Theoretical 100-Year Demand, acre-feet		
Month	Rainfall	Reference ET	Irrigation Demand	Pond Losses	Total Demand
October	2.15	3.24	8.9	0.3	9.2
November	5.24	1.68	0	0	0
December	6.58	1.21	0	0	0
January	9.48	1.48	0	0	0
February	5.86	1.95	0	0	0
March	5.95	3.02	0	0	0
April	3.26	4.57	9.7	0.3	10.0
May	1.18	5.97	51.9	1.2	53.1
June	0.43	7.19	75.2	1.7	76.9
July	0.13	7.64	84.0	1.9	85.9
August	0.24	6.98	75.2	1.7	76.9
September	0.62	4.99	48.1	1.1	49.2
Total, AFY	**41.1**	**49.9**	**353.0**	**8.2**	**361.2**

Notes:
(1) = 100-year return period annual total distributed monthly in proportion to 1906-1997 monthly normals for Ione NCDC weather station (#044283)
(2) Long-term monthly average reference ET from Plymouth CIMIS station (#227)
(3) = (irrigated area of 130 acres) x [Col. 2 x (crop coefficient of 0.88) - Col. 1] / (irrigation efficiency of 0.85) / 12
(4) = (storage pond area of 2.5 acres) x (Col. 2 - Col. 1) / 12
(5) = Col. 4 + Col. 5

COWRF INFLUENT FLOWS

Calculation Procedures

The theoretical rate at which the COWRF can receive influent, accounting for backwash losses, without exceeding the agronomic water demand of the golf course are defined below.

Historical COWRF Flows

a. Historical monthly influent flows to the COWRF are shown in Table 5. Influent flows beginning in April 2022 are reported in the monthly COWRF discharge monitoring reports (DMRs). Prior to 2022, COWRF DMRs did not present influent flows. However, the influent flows were determined from available golf course demand data and backwash flow data.[1].
b. Historical monthly filter backwash flows from the COWRF are shown in Table 6.

[1] To determine influent flows prior to April 2022, monthly COWRF effluent flows from the DMRs were compared to golf course flows and filter backwash flows. If the reported COWRF effluent flow was larger than the golf course flow, it was confirmed to be actual influent flow by verifying that it was equal to the sum of the golf course influent flow and the filter backwash flow. If the reported COWRF effluent flow was equivalent to the golf course flow, the COWRF influent flow was calculated by summing the COWRF effluent flow and filter backwash flow. 2017 COWRF influent flows were calculated by summing monthly golf course influent flows and filter backwash flows because COWRF DMRs were not available.

Table 5. Historical COWRF Influent Flows

Month	Volume of COWRF Influent Flow (MG)[a]								
	2017	2018	2019	2020	2021	2022	2023	2024	Average
October	19.5	10.3	20.7	17.9	10.5	10.9	19.2		15.6
November	0	4.8	15.8	7.8	0	11.3	0		5.7
December	0	0	0	0	0	0	0		0
January	0	0	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0	0	0
March	0	0	0	0	0	0	0	0	0.3
April	0	0	0	0.9	14.4	12.7	2.1	-	4.3
May	20.4	21.6	17.1	16.8	29.1	14.0	-	-	19.8
June	29.1	30.1	23.7	23.0	24.7	13.1	25.8	-	24.2
July	34.1	33.5	31.2	30.2	35.7	23.1	29.5	32.1	31.2
August	33.3	36.9	33.3	30.1	27.0	23.2	27.4	29.6	30.1
September	27.1	27.7	28.1	20.2	11.2	18.5	21.4	-	22.0
Total, MG	**163.4**	**164.9**	**169.7**	**146.7**	**152.7**	**128.8**	**125.4**	**61.7**	**153.1**

(a) "-" indicate data that is currently unavailable.

Table 6. Historical COWRF Filter Backwash Flows

Month	Volume of COWRF Filter Backwash Flow (MG)[a]								
	2017	2018	2019	2020	2021	2022	2023	2024	Average
October	3.0	1.9	4.0	3.4	2.4	-	7.5		3.9
November	0	1.1	1.9	1.7	0	-	0		0.9
December	0	0	0	0	0	0	0		0.0
January	0	0	0	0	0	0	0	0	0.0
February	0	0	0	0	0	0	0	0	0.0
March	0	0	0	0	0	0	0	0	0.0
April	0	0	0	0	2.0	2.0	-	-	0.8
May	2.2	2.5	1.9	2.7	3.9	1.9	-	-	2.6
June	3.4	3.6	2.5	3.8	3.4	2.0	-	-	3.0
July	4.7	4.4	3.9	3.6	4.0	2.7	4.4	3.8	3.8
August	4.2	3.9	3.9	4.3	3.8	2.7	5.4	4.7	4.1
September	4.1	3.5	4.0	4.0	2.6	-	6.6	-	4.1
Total, MG	**21.7**	**20.9**	**22.1**	**23.4**	**21.9**	**11.3**	**23.9**	**8.4**	**23.2**

(a) "-" indicate data that is unavailable.

Filter Backwash Flow Percentage

a. The percentage of COWRF influent flow that was discarded as backwash flow to the WWTP each month was calculated by dividing the backwash flow by the influent flow.

b. Table 7 shows the results of this calculation. From these percentages, a monthly average was calculated. Monthly average backwash percentages range from 12 to 20 percent.

Table 7. Historical COWRF Filter Backwash Flow Percentage

Month	Filter Backwash Flow as a Percentage of Influent Flow (percent)[a][b]								
	2017	2018	2019	2020	2021	2022	2023	2024	Average
October	15	18	19	19	23	-	39[c]		19
November		23	12	22		-			19
December									-
January									-
February									-
March									-
April					14	16	-	-	15
May	11	12	11	16	13	13	-	-	13
June	12	12	11	16	14	15	-	-	13
July	14	13	13	12	11	12	15	12	13
August	13	11	12	14	14	12	20	16	14
September	15	13	14	20	23	-	31[c]	-	17

(a) Blank cells indicate there were no flows to the COWRF
(b) "-" indicate data that is unavailable.
(c) Anomalous value not used in calculated average.

Theoretical COWRF Influent Flow

The theoretical influent flow to the COWRF is calculated for each month using the following formula:

Golf Course Irrigation Demand/(1-backwash percentage)

Theoretical COWRF Influent Flow

The calculated average rainfall year theoretical flow to the COWRF to be used in the water balance analysis is shown in Table 8. The calculated average 1-in-100-year theoretical flow to the COWRF to be used in the water balance analysis is shown in Table 9.

Table 8. Monthly COWRF Influent Demand for an Average Rainfall Year			
Month	Average-Year Golf Course Recycled Water Demand[(a)], acre-feet	COWRF Backwash Flow as a Percentage of Influent Flow[(b)], Percent	Average-Year COWRF Influent Flow[(c)], acre-feet
October	22.2	19	27.4
November	0	19	0
December	0	-	0
January	0	-	0
February	0	-	0
March	0	-	0
April	29.7	15	34.9
May	60.3	13	69.3
June	79.5	13	91.4
July	86.8	13	99.8
August	78.4	14	91.2
September	53.0	17	63.9
Total, AFY	**409.9**	**-**	**477.9**

(a) From Table 3
(b) From Table 7
(c) =Col. 1/(1 - Col. 2)

Table 9. Monthly COWRF Influent Capacity for a 1-in-100 Rainfall Year			
Month	1-in-100-Year Golf Course Recycled Water Demand[(a)], acre-feet	COWRF Backwash Flow as a Percentage of Influent Flow[(b)], Percent	1-in-100-Year COWRF Influent Flow[(c)], acre-feet
October	9.2	19	11.4
November	0	19	-
December	0	-	-
January	0	-	-
February	0	-	-
March	0	-	-
April	10.0	15	11.8
May	53.1	13	61.0
June	76.9	13	88.4
July	85.9	13	98.7
August	76.9	14	89.4
September	49.2	17	59.3
Total, AFY	**361.2**	**-**	**420.0**

(a) From Table 4
(b) From Table 7
(c) Col. 1 / (1 - Col. 2)

Theoretical COWRF Backwash Flow

The calculated average rainfall year theoretical backwash flow from the COWRF to the WWTP to be used in the water balance analysis for the Ione WWTP is shown in Table 8. The calculated average 1-in-100-year theoretical flow from the COWRF to the WWTP to be used in the water balance analysis for the Ione WWTP is shown in Table 9.

Table 10. Monthly COWRF Influent Demand for an Average Rainfall Year

Month	Average-Year COWRF Influent Flow[a], acre-feet	COWRF Backwash Flow as a Percentage of Influent Flow[b], Percent	Average-Year COWRF Backwash to WWTP[c], acre-feet
October	27.4	19	5.2
November	0	19	0.0
December	0	-	0.0
January	0	-	0.0
February	0	-	0.0
March	0	-	0.0
April	34.9	15	5.2
May	69.3	13	9.0
June	91.4	13	11.9
July	99.8	13	13.0
August	91.2	14	12.8
September	63.9	17	10.9
Total, AFY	**477.9**	**-**	**68.0**

(a) From Table 8
(b) From Table 7
(c) =Col. 1x Col. 2

Table 11. Monthly COWRF Influent Capacity for a 1-in-100 Rainfall Year

Month	1-in-100-Year COWRF Influent Flow[a], acre-feet	COWRF Backwash Flow as a Percentage of Influent Flow[b], Percent	1-in-100-Year COWRF Backwash to WWTP[c], acre-feet
October	11.4	19	2.2
November	-	19	0.0
December	-	-	0.0
January	-	-	0.0
February	-	-	0.0
March	-	-	0.0
April	11.8	15	1.8
May	61.0	13	7.9
June	88.4	13	11.5
July	98.7	13	12.8
August	89.4	14	12.5
September	59.3	17	10.1
Total, AFY	**420.0**	**-**	**58.8**

(a) From Table 9
(b) From Table 7
(c) Col. 1 x Col. 2

GOLF COURSE TAILWATER AND OVERSPRAY CONTROL AND MONITORING

THIS SECTION WILL BE INCLUDED IN THE FINAL DRAFT

Describe the BMPs based on discussion with Courtney. Monitoring would include daily inspections during irrigation periods, looking for off-site runoff or damage to tailwater system.

REFERENCES

Meyer, J.L. and Gibeault, V.A., 1986. *"Turfgrass Performance under Reduced Irrigation."* California Agriculture, Vol. 40, Issue 7, p. 19-20.

California Department of Water Resources (DWR), University of California Cooperative Extension, 2000. *A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California.* August 2000.

Attachment A

Rainfall and Reference ET Data

IONE, CALIFORNIA (044283)

Period of Record Monthly Climate Summary

Period of Record : 03/01/1906 to 06/30/1977

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	Insufficient Data												
Average Min. Temperature (F)	Insufficient Data												
Average Total Precipitation (in.)	5.08	3.14	3.19	1.75	0.63	0.23	0.07	0.13	0.33	1.15	2.81	3.53	22.04
Average Total SnowFall (in.)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 0% Min. Temp.: 0% Precipitation: 99.9% Snowfall: 99.9% Snow Depth: 99.8%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

D

Rainfall Depth Duration Frequency at Ione

Station Number	Station	County	Latitude	Longitude	Elevation	Years Recorded
B00 4283 00	Ione	Amador	38.348	-120.938	284.0	89

Rainfall Statistics	1-Day	2-Day	3-Day	4-Day	5-Day	6-Day	8-Day	10-Day	15-Day	20-Day	30-Day	60-Day	1-Year
Pr=0.5	1.92	2.55	3.01	3.38	3.70	3.99	4.48	4.91	5.79	6.51	7.68	10.19	21.28
Pr=0.2	2.55	3.37	3.98	4.47	4.89	5.27	5.92	6.48	7.64	8.58	10.11	13.39	27.84
Pr=0.1	2.92	3.87	4.55	5.11	5.60	6.02	6.76	7.40	8.71	9.78	11.52	15.23	31.54
Pr=0.04	3.36	4.44	5.22	5.86	6.40	6.89	7.73	8.45	9.94	11.16	13.13	17.32	35.70
Pr=0.02	3.66	4.83	5.67	6.36	6.96	7.48	8.39	9.17	10.78	12.09	14.22	18.74	38.51
Pr=0.01	3.94	5.19	6.10	6.84	7.47	8.04	9.01	9.84	11.57	12.97	15.23	20.06	41.11
Pr=0.005	4.21	5.54	6.51	7.29	7.96	8.56	9.59	10.48	12.31	13.79	16.19	21.31	43.57
Pr=0.002	4.54	5.97	7.01	7.85	8.58	9.22	10.33	11.28	13.23	14.82	17.40	22.87	46.64
Pr=0.001	4.79	6.29	7.38	8.26	9.02	9.69	10.85	11.85	13.90	15.57	18.26	23.99	48.84
Pr=0.0001	5.53	7.26	8.50	9.52	10.39	11.15	12.48	13.62	15.96	17.87	20.94	27.46	55.66

Annual Maxima	1-Day	2-Day	3-Day	4-Day	5-Day	6-Day	8-Day	10-Day	15-Day	20-Day	30-Day	60-Day	1-Year
2007	---	---	---	---	---	---	---	---	---	---	---	---	---
2006	---	---	---	---	---	---	---	---	---	---	---	---	---
2005	---	---	---	---	---	---	---	---	---	---	---	---	---
2004	---	---	---	---	---	---	---	---	---	---	---	---	---
2003	---	---	---	---	---	---	---	---	---	---	---	---	---
2002	---	---	---	---	---	---	---	---	---	---	---	---	---
2001	---	---	---	---	---	---	---	---	---	---	---	---	---
2000	1.85	2.80	4.29	4.74	4.99	4.99	5.22	5.79	7.52	9.05	10.35	11.82	21.39
1999	2.02	2.44	3.42	3.42	3.42	3.42	3.42	4.17	5.51	5.72	8.41	10.90	15.39
1998	2.37	3.55	4.11	4.36	4.98	5.85	6.61	7.31	8.07	10.05	14.21	21.25	30.46
1997	2.37	3.55	4.11	4.36	4.98	5.85	6.61	7.31	8.07	10.05	14.21	21.25	43.59
1996	3.75	3.85	3.85	3.85	3.85	3.85	3.85	3.85	4.74	5.27	6.16	11.53	22.80
1995	2.90	4.71	5.05	5.33	5.58	5.71	7.45	8.02	9.08	9.83	12.42	16.90	35.50
1994	1.27	1.70	1.95	2.05	2.15	2.42	2.55	2.55	3.45	3.67	5.27	5.87	15.52
1993	1.81	2.26	2.26	2.84	3.18	4.50	4.91	5.13	7.10	7.52	10.16	16.58	29.21
1992	2.30	3.18	3.18	3.24	4.11	5.17	5.97	6.06	6.98	7.16	9.13	10.62	20.43
1991	1.60	2.28	2.88	3.52	3.52	3.52	4.08	5.15	6.28	7.38	10.07	11.94	16.59
1990	1.82	2.35	2.37	2.37	2.37	2.37	2.37	2.37	2.90	2.90	3.33	6.23	17.33
1989	1.05	1.90	2.05	2.06	2.26	2.41	2.52	2.82	3.36	3.75	5.85	7.67	16.85
1988	1.55	1.90	1.90	1.90	1.90	1.90	2.05	2.13	2.75	3.47	4.78	6.57	11.67
1987	1.81	2.43	2.54	2.54	2.87	2.87	3.38	3.62	3.62	5.31	5.31	9.80	13.86
1986	2.75	4.85	5.65	6.65	6.85	6.95	7.90	8.00	8.00	9.45	12.97	18.47	33.02
1985	---	---	---	---	---	---	---	---	---	---	---	---	17.93
1984	---	---	---	---	---	---	---	---	---	---	---	---	23.39
1983	---	---	---	---	---	---	---	---	---	---	---	---	41.81
1982	---	---	---	4.62	5.24	5.24	5.53	5.53	7.29	8.43	9.95	15.59	39.56
1981	2.04	2.94	3.80	4.17	4.32	5.01	6.02	6.02	6.21	6.21	6.62	11.24	17.15
1980	---	---	---	---	---	---	---	---	---	---	---	---	26.42

1979	1.54	2.28	2.83	3.82	3.82	3.82	4.02	4.97	5.49	6.53	7.09	12.65	20.87
1978	1.54	2.28	2.83	3.82	3.82	3.82	4.02	4.97	5.49	6.53	7.09	12.65	20.87
1977	0.92	1.03	1.09	1.12	1.12	1.12	1.24	1.26	1.26	1.26	2.18	3.32	8.73
1976	0.78	1.23	1.70	1.70	1.91	2.06	2.06	2.06	2.18	3.21	3.73	5.00	11.87
1975	1.97	2.56	3.14	3.27	3.38	3.52	4.84	6.08	7.82	8.47	8.50	15.06	28.24
1974	---	---	---	---	---	---	---	---	---	---	---	---	33.80
1973	2.48	2.76	3.51	4.54	4.86	4.86	6.09	7.38	8.60	9.26	12.09	19.82	35.95
1972	3.05	3.88	3.92	3.98	3.98	5.03	5.90	5.96	6.05	6.73	7.92	9.62	16.80
1971	3.05	4.40	5.02	5.13	6.25	6.57	6.57	7.61	8.20	8.22	9.81	13.34	21.20
1970	2.94	2.94	3.48	3.48	3.72	3.72	4.97	5.90	6.37	7.01	9.55	12.27	21.13
1969	2.75	3.15	3.15	3.23	3.31	3.54	5.63	6.09	8.33	8.80	9.89	16.66	30.23
1968	1.76	2.12	2.12	2.43	2.43	2.48	2.51	3.20	3.20	3.49	4.61	8.77	17.12
1967	2.52	4.13	4.15	4.63	4.97	4.99	5.38	6.53	7.36	7.36	7.89	11.44	29.07
1966	1.79	1.95	2.46	2.48	3.27	3.74	4.03	4.13	5.17	5.17	5.17	9.69	16.47
1965	---	3.43	---	---	---	---	---	7.18	8.10	---	---	---	25.01
1964	1.98	2.44	2.86	3.06	3.06	3.06	3.25	3.45	5.45	6.58	6.84	9.13	18.12
1963	2.88	3.52	4.20	4.65	4.65	4.65	4.65	4.65	6.07	6.38	6.38	10.35	24.44
1962	1.25	2.08	2.93	3.02	4.05	4.53	6.47	7.17	7.61	7.75	9.09	11.98	18.00
1961	1.38	1.68	2.16	2.16	2.16	2.26	2.40	2.77	2.93	3.23	4.81	6.51	13.82
1960	1.33	1.53	1.86	1.86	2.09	2.42	2.82	3.25	3.67	5.03	6.18	7.86	16.68
1959	1.65	2.09	2.09	2.55	2.88	3.22	3.68	4.01	4.01	4.75	6.13	10.54	13.45
1958	---	---	---	---	---	---	---	---	---	---	---	---	41.69
1957	---	---	---	---	---	---	---	---	---	---	---	---	18.93
1956	---	---	---	---	---	---	---	---	---	---	---	---	28.58
1955	---	---	---	---	---	---	---	---	---	---	---	---	18.28
1954	---	---	---	---	---	---	---	---	---	---	---	---	16.40
1953	---	---	---	---	---	---	---	---	---	---	---	---	15.10
1952	2.21	3.15	3.68	3.77	3.77	3.77	3.77	4.06	4.68	6.56	7.47	13.11	27.05
1951	4.65	5.30	5.30	5.30	5.55	5.70	6.24	6.25	6.25	8.87	10.85	14.60	28.76
1950	2.70	2.70	2.70	3.97	3.97	3.97	3.97	5.05	5.05	5.55	9.52	10.41	18.30
1949	1.76	2.71	3.14	3.14	3.14	3.14	3.72	3.86	4.87	5.45	6.93	10.49	17.23
1948	1.28	1.41	1.70	1.83	2.03	2.03	2.43	2.43	4.08	4.39	6.67	8.68	17.76
1947	2.16	3.12	3.20	3.20	3.91	3.91	3.91	4.13	4.13	4.13	4.82	7.33	14.54
1946	1.90	1.90	3.20	3.38	4.37	4.98	5.16	5.42	5.70	6.31	7.49	11.80	20.14
1945	2.68	3.88	4.78	4.78	4.98	5.27	5.27	5.27	5.66	5.66	5.66	9.58	23.66
1944	2.25	2.41	2.53	2.53	3.23	3.39	3.93	4.28	5.68	5.68	7.47	10.20	19.25
1943	2.05	2.78	3.58	3.81	4.43	4.77	5.38	5.42	7.10	8.03	10.13	15.90	27.61
1942	2.00	3.48	4.20	4.60	5.32	5.81	5.91	5.91	7.68	8.17	8.17	12.92	26.67
1941	1.85	2.40	2.46	3.46	5.46	5.46	4.17	4.52	7.17	8.59	11.13	14.00	25.17
1940	1.65	2.72	3.46	3.76	4.20	4.79	5.24	5.54	5.95	6.00	8.96	16.37	24.86
1939	1.72	2.40	2.55	2.80	2.80	2.80	2.80	2.80	2.80	3.17	3.42	5.93	14.01
1938	2.30	3.65	4.05	4.55	4.80	4.80	5.25	6.95	9.40	10.35	12.10	16.00	27.25
1937	4.40	4.65	5.85	6.15	6.60	6.95	7.70	8.15	8.70	9.50	10.10	19.90	34.99
1936	2.00	2.30	3.50	4.20	4.35	4.50	6.05	6.40	10.33	10.33	13.28	19.99	28.29
1935	2.50	2.72	2.72	2.72	3.25	4.30	4.52	4.52	5.22	5.65	6.35	9.47	23.94
1934	1.70	2.85	2.85	4.05	4.52	4.52	4.52	4.52	4.52	6.40	8.77	9.67	17.86

1933	1.20	1.72	1.72	1.72	2.32	3.12	3.12	3.82	3.82	3.82	5.07	7.87	12.77
1932	1.75	1.92	2.59	3.58	3.75	3.80	4.49	4.97	5.58	5.88	6.60	10.05	19.99
1931	1.65	1.65	1.65	2.53	2.53	2.53	2.65	2.65	2.65	2.65	3.92	6.39	12.62
1930	1.39	2.25	2.25	2.57	2.57	2.78	3.35	3.71	5.17	5.33	5.62	10.86	17.07
1929	1.91	2.98	3.49	3.49	3.49	3.49	3.49	3.57	4.07	4.07	4.07	6.57	15.52
1928	1.68	2.60	3.40	4.06	4.79	4.92	4.92	4.92	5.92	6.10	6.27	9.09	18.80
1927	1.50	3.00	3.00	4.25	4.25	4.51	5.46	5.96	6.26	6.91	7.41	10.51	24.11
1926	2.55	2.80	2.90	3.55	3.55	4.55	5.10	5.10	6.48	8.99	10.04	10.29	21.54
1925	1.95	3.05	3.27	3.27	3.52	3.74	4.27	5.79	5.94	7.79	8.41	11.84	28.60
1924	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	2.35	3.00	3.00	4.95	10.50
1923	2.20	3.00	4.30	5.30	5.30	5.30	5.50	6.10	6.70	6.70	9.30	14.15	26.07
1922	2.17	2.52	3.45	3.95	3.95	3.95	3.95	4.44	7.09	7.16	9.46	14.80	24.30
1921	3.85	3.95	4.50	4.72	4.72	4.72	4.72	5.72	6.62	7.02	7.72	13.51	26.57
1920	2.10	3.55	3.90	4.05	4.20	4.20	4.20	4.31	4.82	5.19	7.04	9.26	15.46
1919	2.25	3.55	3.90	4.00	4.05	4.40	4.60	4.70	5.00	6.45	8.15	10.35	18.75
1918	1.60	2.35	2.35	2.35	3.45	4.25	4.70	4.70	6.50	6.50	8.10	11.30	15.50
1917	1.30	2.30	2.60	2.90	3.25	3.55	4.10	4.35	4.55	4.55	5.35	7.25	17.70
1916	---	---	---	---	---	---	---	---	---	---	---	---	20.00
1915	1.50	1.95	2.15	2.30	2.83	3.03	3.88	4.20	5.88	6.20	7.77	10.87	22.80
1914	2.26	3.11	3.49	3.61	3.99	3.99	3.99	4.48	5.47	6.96	9.81	13.52	22.90
1913	1.20	1.84	2.22	2.72	2.95	3.36	3.36	3.55	4.01	4.01	4.01	4.86	14.26
1912	0.69	1.04	1.15	1.22	1.30	1.45	1.86	2.16	2.47	2.86	3.43	5.36	12.68
1911	2.17	3.57	5.27	6.12	6.45	7.30	7.80	8.42	10.82	15.51	18.06	24.30	30.46
1910	2.00	3.00	3.00	3.45	3.88	3.88	3.93	3.93	4.00	4.69	5.92	8.90	20.89
1909	1.45	2.60	3.80	4.42	4.54	5.07	5.99	6.39	7.99	9.21	12.66	19.24	26.01
1908	1.30	1.60	1.60	1.78	1.78	1.78	1.83	3.03	3.63	3.63	5.51	9.04	14.27
1907	4.37	6.79	7.38	7.53	8.38	8.53	8.53	8.53	8.53	10.60	12.20	18.04	33.82
1906	2.40	2.54	3.22	3.62	3.85	3.85	3.85	5.03	7.47	9.20	10.45	15.43	30.93
1905	2.90	2.90	2.90	3.20	4.20	4.20	4.55	4.85	5.55	5.55	5.50	9.65	25.95
1904	1.51	2.62	3.12	3.15	3.15	3.25	3.75	4.86	6.07	6.42	7.20	12.05	21.42
1903	1.85	2.92	3.58	4.10	5.01	5.03	5.03	5.53	5.53	7.54	9.71	10.34	22.39
1902	1.21	1.79	2.09	2.61	3.01	3.41	3.87	4.41	5.03	6.03	7.72	9.29	20.19
1901	2.05	2.79	3.61	4.03	4.03	4.72	5.54	5.52	5.54	7.35	7.69	11.29	25.48
1900	1.85	2.34	2.41	2.80	2.86	2.86	2.86	3.88	4.82	5.66	6.45	9.69	21.51
1899	1.93	2.56	3.20	3.54	4.04	4.04	4.94	7.17	7.80	7.93	9.00	9.22	20.03
1898	3.60	4.47	4.64	4.64	4.64	4.64	4.64	4.76	5.11	5.11	5.23	7.30	13.77
1897	---	---	---	---	---	---	---	---	---	---	---	---	---
1896	---	---	---	---	---	---	---	---	---	---	---	---	---
1895	---	---	---	---	---	---	---	---	---	---	---	---	---
1894	---	---	---	---	---	---	---	---	---	---	---	---	---
1893	---	---	---	---	---	---	---	---	---	---	---	---	---
1892	---	---	---	---	---	---	---	---	---	---	---	---	---
1891	---	---	---	---	---	---	---	---	---	---	---	---	---
1890	---	---	---	---	---	---	---	---	---	---	---	---	---
1889	---	---	---	---	---	---	---	---	---	---	---	---	---
1888	---	---	---	---	---	---	---	---	---	---	---	---	---

Monthly Average ETo Report

California Irrigation Management Information System (CIMIS)

Rendered in ENGLISH Units.

Printed on Wednesday, August 31, 2022

Average ETo Values by Station

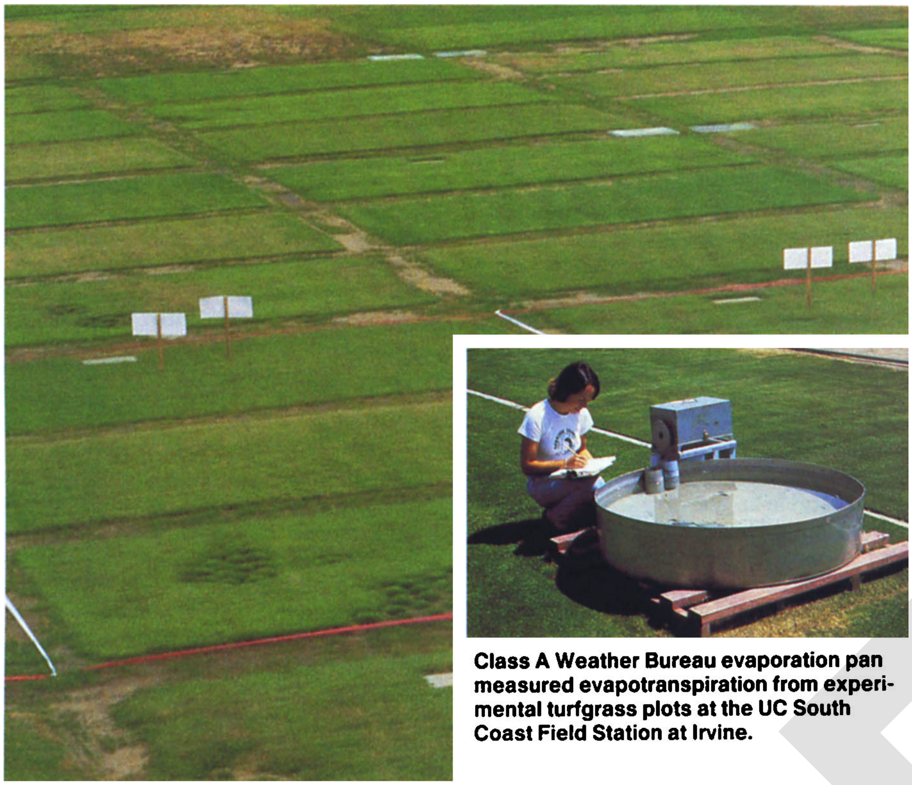
Stn Id	Stn Name	CIMIS Region	Jan (in)	Feb (in)	Mar (in)	Apr (in)	May (in)	Jun (in)	Jul (in)	Aug (in)	Sep (in)	Oct (in)	Nov (in)	Dec (in)	Total (in)
227	Plymouth	SFH	1.48	1.95	3.02	4.57	5.97	7.19	7.64	6.98	4.99	3.24	1.68	1.21	49.92

CIMIS Region Abbreviations		
BIS - Bishop	CCV - Central Coast Valleys	ICV - Imperial/Coachella Valley
LAB - Los Angeles Basin	MBY - Monterey Bay	NCV - North Coast Valleys
NEP - Northeast Plateau	SAV - Sacramento Valley	SBE - San Bernardino
SFB - San Francisco Bay	SJV - San Joaquin Valley	SFH - Sierra Foothill
SCV - South Coast Valleys		

Attachment B

Turfgrass Performance Under Reduced Irrigation

Meyer and Gibeault



Class A Weather Bureau evaporation pan measured evapotranspiration from experimental turfgrass plots at the UC South Coast Field Station at Irvine.

Turfgrass performance under reduced irrigation

Jewell L. Meyer □ Victor A. Gibeault

Turfgrass in California requires irrigation during all or most of the year. Water restrictions imposed during the drought in 1976 and 1977 forced turf managers to reexamine many concepts about irrigation. Turfgrass managers had to make drastic cuts in water use and hope that the turf would survive. One significant result of the drought was the realization that lower levels of turf quality were acceptable in many situations and that large water savings could be achieved. No information was available, however, on the best conservation practices or on the minimum amounts of water needed to keep the turf alive.

Research was begun in 1979 to produce irrigation methodology that could be used to develop water-saving irrigation practices anywhere in California and in other arid and semiarid regions. The three-year study showed that major savings of water can be achieved, especially with warm-season grasses, with no appreciable loss of turf quality.

Turf-irrigation study

Specifically, the objectives of the research were to: (1) investigate the effects of applying reduced amounts of irrigation water calculated as a percentage of evapotranspiration of applied water on cool-season and warm-season turfgrasses; (2) evaluate a below-ground system as a potentially more efficient method of turf irrigation than standard sprinkler application; and (3) develop a set of crop coefficients that California turfgrass managers can use to determine on-site water use by both cool- and warm-season turfgrasses.

The study was conducted at the University of California South Coast Field Station, Irvine. The variables tested included: two irrigation methods, sprinkler application of water and a subterranean or buried trickle/drip water application (8-inch depth, 23-inch spacing); three irrigation regimes, 100, 80, and 60 percent of calculated evapotranspiration; and six commonly used turfgrasses, three cool-season varieties (Kentucky bluegrass, perennial ryegrass, and tall fescue) and three warm-season types (hybrid bermudagrass, zoysiagrass, and Seashore Paspalum).

The field plot was a randomized split-block design. The area was divided into two turf blocks, one for cool-season grasses and the other for warm-season grasses. Each block consisted of four replications, and within each replication were six randomized irrigation plots measuring 15 by 24 feet. Irrigation plots were divided into three turf subplots of 8 by 15 feet. The three sprinkler and three subterranean irrigation plots per replication were installed in September 1979 for above- and below-ground water application. Each sprinkler irrigation plot contained six high-pop brass sprinkler heads designed to apply 10 gallons of water per minute at a pressure of 35 pounds per square inch. The coefficient of uniformity was 87 percent.

Tensiometers at 3- and 6-inch depths in the cool-season grasses and 8- and 12-inch depths in the warm-season grasses indicated soil water status; neutron probe access tubes were installed in plots to a depth of 4 feet in the cool-season and 6 feet in the warm-season grasses. Scheduling was by the water budget technique calculated weekly using wind-modified pan evaporation data. State-of-the-art controllers were programmed with this irrigation scheduling information. The amount of irrigation was modified so that water did not pass below the 4-foot and 6-foot depths of the neutron probe access tubes during the irrigation season.

Annual crop coefficients, determined from previous research using applied water and evaporation pan data, were 0.7 annually for warm-season grasses and 0.8 for cool-season grasses. Monthly crop coefficients were developed in this experiment to evaluate responses of the six turfgrass species to 60 percent and 80 percent of replacement evapotranspiration for water conservation.

Turf performance

Overhead sprinkler irrigation provided acceptable performance of some turfgrass species, even when less than the optimum amount of water was applied. Subterranean irrigation did not provide acceptable turf with the shallow-rooted cool-season species, at the system depth and spacing used in this study. The very deeply rooted hybrid bermudagrass was the best-performing species with subterranean irrigation.

Under sprinkler irrigation, there was no significant difference in cool-season grass performance between the 100 percent and 80 percent regimes (table 1). This could be described as a potential level of water conservation amounting to 21.1 percent savings (77.2 inches versus 61 inches). The savings could be tenuous, however, because of more weed and disease activity (such as Gerlachia patch on Kentucky bluegrass) when irrigated with less than the optimum amount of water. The 60 percent regime significantly reduced the turf quality of the three cool-season grasses tested.

In the warm-season grasses, the appearance of hybrid bermudagrass and Seashore Paspalum was not significantly different under any of the irrigation regimes. As irrigation amounts were reduced, zoysiagrass appearance ratings declined because of nematode activity observed on the roots. Both Santa Ana hybrid bermudagrass and Adalayd (Excalibre) Seashore Paspalum had very good color, density, texture, uniformity, and freedom from weeds and diseases, irrespective of irrigation regimes. Clearly there is potential for considerable water savings with these grasses. This study showed a 40 percent reduction in actual water applied between the optimum and lowest irrigation regime (65.5 versus 39 inches).

Because of the field plot design necessary for this study, it wasn't possible to compare statistically the turf performance results between the warm- and cool-season grasses. Hybrid bermuda and Seashore Paspalum performed very well, however, with 52.7 inches of water applied (60 percent irrigation regime), whereas the cool-season grasses needed at least 82.4 inches (80 percent irrigation regime). Thirty-six percent less water was applied to the warm-season species than to the cool-season species for acceptable turf quality. If applied water in the 60 percent irrigation treatment in warm-season grasses (52.7 inches) is compared with that in the 100 percent treatment in cool-season grasses (104.4 inches), the saving in water is 49.5 percent.

Water application

The cool-season grass in the 100 percent regime received 43 inches of water in 1982 (table 2). Warm-season grasses received only 34 inches. Rainfall of 18.45 inches occurred primarily from November to March. The soil profile held about 10 inches depth of water in the top 6 feet. Rainfall did not appreciably affect the applied water during the primary growing season, April through November. Likewise, the 34 inches applied to the warm-season grasses was not appreciably affected by, nor was there evidence of, deep percolation during the primary growing season, when only 4 inches of rain fell. The rainfall is subtracted from the original evaporation pan reading and is therefore reasonably accounted for in the calculated applications.

In 1983, a higher than normal rainfall of 32 inches occurred. The soil profile was filled during the winter, however, and only 9 inches of rain fell from April to October 30, of which 4 inches occurred in early April. Water moved below the root zone only on June 29, August 29, October 5, and October 17 in all plots of 100 and 80 percent irrigation in 1983. Even during a season of higher than normal rainfall, the applied water, 38.7 inches in cool-season grasses (1983), was similar to that of the drier year (1982) with 43 inches applied. Most of the 5 inches of implied higher use by cool-season grasses may have moved through deep percolation.

The water applied to warm-season grasses was 34 inches in 1982 and 33 inches in 1983. This small difference indicates that managers can schedule carefully and conserve water in a wet or dry season.

Conclusions

The monthly crop coefficients (table 3) calculated and used for nearly three years proved to be very accurate for both warm- and cool-season turfgrasses. Crop coefficients can be used with reference evapotranspiration from the Department of Water Resources California Irrigation Management Information System (CIMIS) program. Turfgrass managers can use these crop coefficients to determine on-site water use by turfgrasses from either a Class A Weather Bureau evaporation pan or from a computerized weather station that gives reference evapotranspiration with the equation given in table 3.

In conclusion, warm-season turfgrasses have a greater potential for water conservation than do cool-season turfgrasses. Under the conditions of this study, sprinkler irrigation was superior to subterranean irrigation for water conservation and turfgrass performance. And lastly, a well-designed, uniform irrigation system is necessary to maximize water conservation in turfgrass management.

TABLE 1. Cool- and warm-season turfgrass appearance ratings and water applied for the duration of the study (August 1981 to December 1983).

Irrigation regime	Turf appearance 8/81 - 12/83*			Water application (actual)	ET_{grass}†
% of ET				*in.*	
Cool season	Ken. blue	Per. rye	Tall fesc.		
100	5.5 y	6.2 y	5.8 y	104.4	77.3
80	5.3 y	5.9 y	5.7 yz	82.4	61.0
60	4.8 z	5.0 z	5.3 z	62.7	46.4
Warm season	Bermuda	Paspalum	Zoysia		
100	6.5 ns‡	5.8 ns	5.6 x	88.4	65.5
80	6.5	5.8	4.8 y	69.4	51.4
60	6.4	5.4	4.2 z	52.7	39.0

* Rated on a scale of 1 to 9, with 1 indicating worst appearance and 9 best. Values followed by common letters are not significantly different at the 5% level of probability.
† ET_{grass} equals the actual applied water divided by the extra water factor (EWF_{90}), which is 1.35.
‡ No significant difference.

TABLE 2. Actual water applied in 1982 (1/1/82 to 12/31/82) and 1983 (1/1/83 to 12/31/83)

Sprinkler plots	1982		1983	
	Water applied*	Rainfall	Water applied†	Rainfall
% of ET	*inches*			
Cool season				
100	43.2	18.45	38.7	31.78
80	35.0		31.9	
60	26.6		24.5	
Warm season				
100	34.0		33.0	
80	27.4		25.8	
60	21.6		19.6	

* Class A pan evaporation 55.0 inches for 1982.
† Class A pan evaporation 55.63 inches for 1983.

TABLE 3. Turfgrass crop coefficients (Kp and Kc) of warm- and cool-season grasses.

Month	Kp*		Kc†	
	Warm	Cool	Warm	Cool
J	.44	.49	.55	.61
F	.43	.51	.54	.64
M	.61	.60	.76	.75
A	.58	.83	.72	1.04
M	.63	.76	.79	.95
J	.54	.70	.68	.88
J	.57	.75	.71	.94
A	.57	.69	.71	.86
S	.50	.59	.62	.74
O	.43	.60	.54	.75
N	.46	.55	.58	.69
D	.44	.48	.55	.60

* Monthly crop coefficient (Kp) is used with a Class A Weather Bureau evaporation pan with the equation $ET_{grass} = ET_{pan} \times Kp$
† The crop coefficient Kc is used with reference evapotranspiration (ETo) from a CIMIS weather station with the equation $ET_{grass} = ETo \times Kc$.

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Attachment C

Water Application Efficiency,

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Irrigation Chapter 8 - Irrigation Efficiencies

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Water Application **Efficiency**

The ability to manage an irrigation system is contingent on an accurate estimate of the percentage of water pumped that becomes available for crop use. No irrigation system delivers water at 100 percent efficiency. Water may be lost through delivery systems or pipelines and some water may remain in the **soil**, but not be used by the crop. Some water may run off the soil surface into lowland areas. Still other water may be lost to evaporation in the air, or from the soil and plant surfaces. *Figures 8.1a* and *8.1b* show the major losses for sprinkler and surface irrigation systems. To know how much water to pump, these losses must be totaled and added to the amount of water needed by the crop.

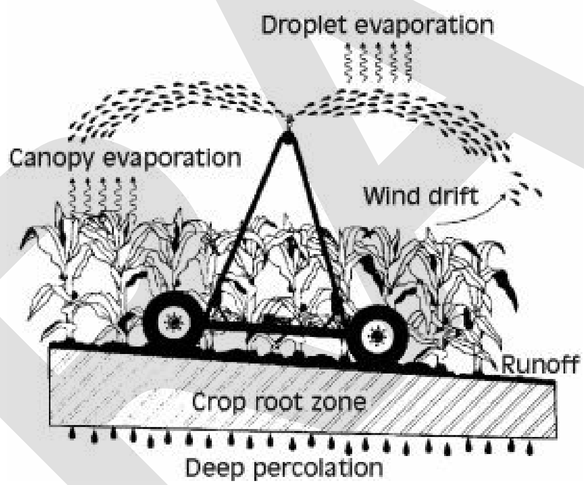

Figure 8.1. a) Potential water losses during irrigation with a center pivot. b) Potential water losses during irrigation with a **furrow irrigation** system.

In most cases, the goal is to insure that all areas of the field receive a **set** amount of uniformly applied water. Consider the catch can test data shown in *Figure 8.2.* The cans recording application depths below the horizontal line are not receiving enough water — catches are less than the desired 0.85 inches. Another application will be needed to insure that the entire field receives at least 0.85 inches of water. This will require using more water and energy than is necessary. If this pattern occurs during each irrigation, plants in the areas receiving less than 0.85 inches eventually could experience water stress. The cans recording application depths above the line receive at least 0.85 inches of water. Any extra water applied could lead to surface **runoff** or deep **percolation**.

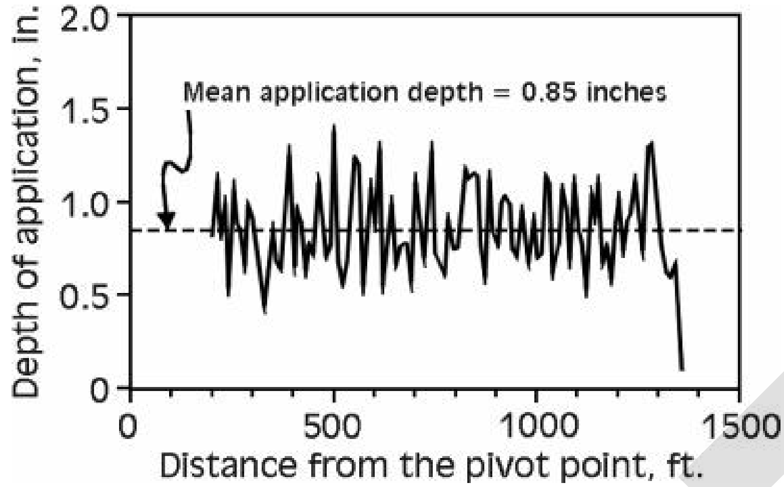

Figure 8.2. Example of catch-can data from a center pivot with low pressure spray nozzle, mounted at 10 foot intervals and 7 feet above the soil surface.

Water application efficiency accounts for how uniformly the water is applied and can be used for other assessments. If the center pivot owner is trying to decide whether switching to a new sprinkler package would be economical, the change in water application efficiency could be a major factor. If water becomes limited, changing to a system with a higher water application efficiency will provide more useable water to the crop and reduce pumping costs.

To maximize irrigation water use, it must be uniformly applied in the right amount and at the right time. Reaching these objectives requires knowledge of water delivery characteristics, field soils and slopes, and the expected crop water use rates.

Mathematical relationships have been developed to help quantify the amount of applied water that becomes available for plant use.

Water application efficiency refers to the amount of water applied that is stored in the crop root zone. This value is determined by water distribution characteristics, system management, soil conditions, the crop, and weather conditions. Water application efficiency pertains to an individual irrigation event.

Equation 8.1 is used to determine water application efficiency.

Equation 8.1 E_a **= [*Depth of water stored in the rootzone* (d_s) *x 100*** ***Depth of water pumped*** **(d_p)]**

where:

E_a = Average water application efficiency, %

Depth of water stored in the rootzone (d_s) = Average depth of water stored in the rootzone, inches

Depth of water pumped (d_p) = Average depth of water delivered from source, inches

Irrigation efficiency refers to the amount of water removed from the water source that is used by the crop. This value is determined by irrigation system management, water distribution characteristics, crop water use rates, weather and soil conditions. Irrigation efficiency pertains to the use of water for an entire growing season.

Depth Stored

The depth of water stored in the root zone can be estimated based on field observation of what happens to the water during an application event. Field observation reports should note if runoff occurs and estimate the amount of runoff. With experience, you'll begin to know where and when runoff is likely to occur. For example, runoff from center pivot systems will likely occur first near the outside edge of the irrigated area because the water application rate is greatest there. Other factors include low **infiltration** rate soils, steep slopes and lack of plant residue cover.

Another more accurate method is to record the **soil water** content before and after an irrigation event using one of the methods discussed in *Chapter 3, Soil Water*. If the hand-feel method is used, the **soil water content** will need to be recorded at enough locations to develop accurate estimates of the water stored in the crop root zone. The depth of water applied is found by subtracting the reading taken before the irrigation.

Equation 8.2 d_s **= *["After" reading – "Before" reading]***

Where:

d_s = Depth of water stored in the rootzone

Example 8.1

A center pivot irrigation system is supplied with enough water to apply 1.1 inches of water to an irrigated area. Soil water content readings recorded before the irrigation event showed an average water content of 3.5 inches in the top 3 feet of soil. Soil water content readings after the irrigation showed an average of 4.4 inches in the top 3 feet of soil. To find the average depth of water stored in the crop rootzone we subtract the before irrigation reading from the after irrigation reading.

Using *Equation 8.2* d_s = ["After" reading – "Before" reading]

d_s = [4.4 inches – 3.5 inches]

d_s = 0.9 inches

Depth Pumped

The depth of water pumped can be determined using the procedures presented in *Chapter 7, Flow Measurements and Basic Water Calculations*. The information needed includes an accurate estimate of the pumping rate in gallons per minute. This information can be recorded using a flow meter installed as part of the system or periodically using an attached flow meter (ultrasonic flow meter, pilot tube type meter, etc.).

The average flow rate can be determined by recording the accumulator reading prior to and after each irrigation event. Subtracting the reading recorded prior to the irrigation from the reading after the irrigation event will result in the total volume of water pumped. Taking the total volume and dividing by the irrigation time will give the average pumping rate. For this estimate to be accurate, the irrigation time must be accurate to the nearest hour if possible. A more precise record of the total irrigation time will improve the estimate of the pumping flow rate. (The hour meter on the motor or center pivot is accurate enough to estimate the pumping time.) *Equations 8.3* and *8.4* are used to make these calculations. The following example shows how to incorporate field data into the equations.

Equation 8.3 Pumping rate = [Reading 2 – Reading 1] / [Time]

where:

Pumping rate = Water deliver rate, gallons per minute or acre-inches per minute

Reading 1 = Totalizer reading before the irrigation event, gallons or acre-inches

Reading 2 = Totalizer reading after the irrigation event, gallons or acre-inches

Time = Time required to complete the irrigation event, minutes

Example 8.2

The meter also has an accumulator at the bottom that registers total gallons pumped. Before the irrigation event, the accumulator reading was 6,553,300 gallons, and after the irrigation event the meter read 10,167,500 gallons. The irrigation event required 77 hours and 15 minutes.

Using *Equation 8.3*

Pumping rate = [Reading 2-Reading 1] / [Time]

Pumping rate = $\frac{[\ 10{,}167{,}500 - 6{,}553{,}300\ ]\text{ gallons}}{[(77\text{ hr} \times 60\text{ min/hr}) + 15\text{ min}]}$

Pumping rate = [3,614,200] gallons / [4620 + 15] minutes

Pumping rate = 780 gallons per minute

If the accumulator records flow in acre-inches, the same process is used unless the desire is to determine the flow rate in gallons per minute. To convert acre-inches per minute to gallons per minute, multiply the result from *Equation 8.3* in acre-inches per minute by 27,154 gallons per acre-inch.

To convert the flow rate in gallons per minute to the gross depth of water pumped, we use *Equation 8.4.* If the result from *Equation 8.3* is in acre-inches per minute, the constant 27,154 gallons per acre-inch is not used.

Equation 8.4 d_p ***= [flow rate x time] / [area irrigated x 27,154]***

where:

d_p = Depth pumped = Average depth of water pumped, *inches*

Flow rate = Average water delivery rate, *gallons per minute*

Time = Total irrigation time, *minutes*

Area irrigated = Total irrigated area, *acres*

27,154 = Conversion factor, *gallons per acre-inch or gal / ac-in*

Example 8.3

Let's assume that the field area for Example 8.2 was 123 acres. We calculated the flow rate at 780 gallons per minute and the total irrigation time at 4635 minutes. Using *Equation 8.3*:

Depth pumped (d_p) = [Flow rate x time] / [Area irrigated x 27,154]

Depth pumped (d_p) = $\frac{[\ 780\ \textit{gal/min} \times 4635\ \textit{minutes}\ ]}{[\ 123\ \textit{acres} \times 27154\ \textit{gal / ac-in}\ ]}$

Depth pumped (d_p) = [3,615,300]*gallons* / [3,339,942] *gallons / inch*

Depth pumped (d_p) = 1.08 inches

To complete the calculation of the water application efficiency, use *Equation 8.1* to compare the amount of water pumped with the increase in water stored in the crop rootzone.

Example 8.4

From Example 8.1 we found that 0.9 inches of water was stored in the three-foot crop rootzone. From Example 8.3 we found that 1.08 inches of water was pumped from the water source into the center pivot. To find the application efficiency we use *Equation 8.1.*

E_a = [Depth of water stored in the rootzone (d_s) x 100 Depth of water pumped (d_p)]

E_a = [0.9 inches / 1.08 inches] x 100

E_a = 83%

In these examples it was determined that only 83 percent of the water pumped from the irrigation source reached the soil and was usable by the crop. That means that 17 percent of the water was lost during application.

Potential Delivery Losses

The amount of water loss due to irrigation depends of the type of irrigation system — sprinkler or surface. In addition, the magnitude of each type of loss may be different. Let's begin by listing some major sources of water loss during irrigation. To keep the losses for surface and sprinkler irrigation separate, *Table 8.1* lists the potential losses for each type of system.

Table 8.1. Potential sources of water loss during an irrigation event for surface and sprinkler irrigation systems.

Sources of water losses	Surface Irrigation	Sprinkler irrigation
Distribution system	Yes	Yes
Air evaporation	No	Yes
Plant interception	No	Yes
Soil evaporation	Yes	Yes
Deep percolation	Yes	Yes
Runoff	Yes	Yes

Surface Irrigation Systems

The major losses for surface irrigation systems are deep percolation and surface runoff. These two losses could cause the water application efficiency to be reduced to less than 50 percent if the system is not managed properly. Ways to minimize these losses are discussed in *Chapter 11, Furrow Irrigation Management* (https://passel2.unl.edu/view/lesson/bda727eb8a5a/11).

Another source of water loss is in the distribution system. If the water flows across the head of the field in an open ditch, each foot of ditch loses water to soil infiltration and water surface evaporation. The best way to eliminate these losses is to transport the water through an enclosed pipeline. For many furrow irrigated fields this will require a small pumping plant to overcome the friction loss associated with forcing water through the pipeline.

Surface irrigation implies that surface evaporation will contribute to water loss. One way to limit soil evaporation loss is to wet less of the soil surface. For fields with slopes less than 1 percent, irrigating every other furrow is a viable option. This effectively cuts surface evaporation losses by nearly 50 percent without sacrificing crop production. Irrigating every other furrow also will reduce the amount of water lost to deep percolation and surface runoff.

Pipelines can have losses too. Worn gaskets or loose fitting pipeline connections could produce leaks at each joint. These losses are usually small in comparison to other losses, but by their sheer number could add up to substantial water losses. This kind of loss is the easiest to eliminate by replacing gaskets.

Sprinkler Irrigation Systems

Sprinkler irrigation systems, especially center pivots, typically have greater water application efficiencies than surface systems. While they may have more potential sources of loss, the magnitude of each loss is generally quite low. *Table 8.1* shows that sprinkler irrigation systems may experience loss from all six of the potential water loss sources while surface irrigation systems lose water from only four. This is because most sprinkler irrigation systems spray water into the air to deliver water to the entire soil surface with an upright crop canopy located between the sprinkler and soil.

Developments in sprinkler technology have reduced the amount of water lost between the sprinkler/nozzle and soil surface. The irrigation time or the accumulated time that water is applied to the crop canopy causes the major loss during sprinkler irrigation events. Applied water evaporates off the leaves of the crop canopy. Thus, the longer water droplets are delivered to the crop, the greater the total evaporation loss. Lowering the sprinkler/nozzle pressure reduces the wetted diameter of the sprinkler/nozzle thus reducing irrigation time and total canopy evaporation losses. In addition, lower wetted diameters reduce water evaporation losses in the air and wind drift losses.

Proper management of sprinkler irrigation systems can greatly reduce deep percolation losses. An irrigation system managed to keep the soil profile completely full at all times will experience some deep percolation losses. This is because the system does not apply water at 100 percent uniformity. Some areas will receive more water than others due to sprinkler pressure differences caused by soil elevation differences. Pressure regulators or flow control nozzles help insure that water delivered to the soil surface is as uniform as possible. Other portions of the field could be affected when wind distorts the water application pattern. Such distortion can be reduced by avoiding operation when winds exceed 10 mph.

How do I Evaluate Losses?

There are two main ways to evaluate water loss during irrigation: 1) take detailed field measurements; and 2) visually estimate losses. In some cases it may be necessary to combine these methods to develop an accurate estimate of where losses occur and how significant they are to the system's application efficiency. For example, to estimate water losses during irrigation, measure the flow rate of water entering the system with a flow meter. Visually estimate how much of the water is lost to runoff. This amount, however, will not account for other potential losses. *Table 8.2* presents the potential magnitude of some of these losses for different irrigation systems. For furrow irrigation systems record how long it takes for the water to reach a certain point in the field or record flow rates into the furrow and how long it takes water to reach the end of the furrow. When coupled with soil types and furrow slopes, a computer model can be used to estimate how efficiently the water is being applied.

Table 8.2a. Percent irrigation water losses for different furrow irrigation systems.

Type of irrigation system	Distribution system	Air evaporation	Soil evaporation	Canopy evaporation	Deep percolation	Surface runoff	Overall efficiency
Every row	1-5	<1.0	1--5	0.0	10-20	10-35	40-75
W/Surge valve	1-5	<1.0	1-5	0.0	5-15	5-15	60-85
W/Reuse	1-5	1-2	1-5	0.0	10-20	0	55-90
Siphon tube	5-10	1-2	1-5	0.0	15-25	15-25	40-75
Alternate row	1-5	<0.5	1-5	0.0	5-15	10-20	60-85

Table 8.2b. Percent irrigation water losses for different Sprinkler Irrigation systems.

Type of irrigation system	Distribution system	Air evaporation	Soil evaporation	Canopy evaporation	Deep percolation	Surface runoff	Overall efficiency
Handmove	<1.0	3-5	1-5	10-15	5-10	0-5	60-80
Solid set	<1.0	3-5	1-5	10-15	0-10	0-5	60-85
Traveler	<1.0	1-3	1-5	1-5	0-5	5-10	55-75
High pressure impact	<0.5	1-3	0-1	1-5	0-5	0-5	70-80
Low pressure impact	<0.5	1-3	0-1	1-3	0.5	0-10	75-85
Low pressure spray	<0.5	1-3	0-1	1-3	0-5	0-20	70-90
Low pressure bubble	<0.5	0.0	0-0.5	0.0	0-5	20-40	60-95
Drip irrigation	<0.5	0.0	0.0	0.0	5-30	0.0	70-95

ATTACHMENT E

Amador Regional Sanitation Agency
2024 Individual Water Balance Update
Draft 2024 ARSA Detailed Water Balance Calculations

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Water Balance Update - ARSA Storage & Disposal Facilities

Scenario 1: Current Flows & Facilities, Uncalibrated

November 2024 By: Bill Slenter/Steven Whittlesey, HydroScience

WASTEWATER INFLUENT FLOW	MAX STORAGE CAPACITIES		OTHER INPUTS	
	Henderson Reservoir	392.8 ac-ft		
Daily Average Wastewater Influent Flow 312,636 gpd	Preston Reservoir	235.0 ac-ft	100-YR Multiplier	1.92 unitless
	Total System	627.8 ac-ft	Pan Evap Coefficient	0.75 unitless

100-YEAR ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	2.30	6.66	6.72	7.35	5.95	5.78	3.96	0.90	0.29	0.19	0.36	0.63	41.11
2016/2017 WY Precipitation	in	6.31	2.55	5.38	15.07	4.73	3.39	4.09	0.53	1.28	0.00	0.02	0.02	43.37
Pan Evaporation	in	3.77	1.40	0.72	0.72	1.12	2.32	4.18	7.04	9.43	11.17	9.50	6.51	57.88
Effective Water Surface Evaporation	in	2.83	0.79	0.41	0.41	0.63	1.31	3.14	5.28	7.07	8.38	7.13	4.88	42.23
WASTEWATER GENERATION														
Facility Wastewater Effluent (ADWF)	MG	9.7	9.4	9.7	9.7	8.8	9.7	9.4	9.7	9.4	9.7	9.7	9.4	114.1
I/I Contributions	MG	3.0	7.4	7.5	8.1	6.7	6.5	4.7	1.6	1.0	0.9	1.1	1.4	49.9
TOTAL Wastewater Effluent	ac-ft	39.1	51.5	52.6	54.6	47.4	49.7	43.2	34.7	31.9	32.6	33.1	33.0	503.2
2016/2017 WY Effluent Flow Values	ac-ft	33.8	34.3	50.6	94.9	81.3	47.6	49.4	29.5	27.3	26.5	33.8	33.8	542.8
WATERSHED CONTRIBUTING AREAS														
Precipitation into Henderson Reservoir	ac-ft	5.5	16.0	16.2	17.7	14.3	13.9	9.5	2.2	0.7	0.5	0.9	1.5	98.9
Run-off into Henderson Reservoir	ac-ft	0.8	2.4	2.4	2.7	2.2	2.1	1.4	0.3	0.1	0.1	0.1	0.2	14.8
Precipitation into Preston Forebay	ac-ft	0.4	1.1	1.1	1.2	1.0	1.0	0.7	0.2	0.0	0.0	0.1	0.1	6.9
Precipitation into Preston Reservoir	ac-ft	3.5	10.0	10.1	11.0	8.9	8.7	5.9	1.4	0.4	0.3	0.5	1.0	61.7
Run-off into Preston Reservoir	ac-ft	2.7	7.8	7.9	8.6	7.0	6.8	4.7	1.1	0.3	0.2	0.4	0.7	48.3
STORAGE RESERVOIRS														
Henderson Reservoir Volume	ac-ft	27.5	53.1	122.3	193.0	267.3	329.9	392.7	392.8	315.5	192.1	57.5	27.5	
Henderson Reservoir Evaporation	ac-ft	-1.8	-0.6	-0.5	-0.7	-1.3	-2.9	-7.5	-12.6	-15.6	-14.2	-6.1	-3.0	
Henderson Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Preston Reservoir Volume	ac-ft	0.0	6.5	25.3	44.2	64.9	81.4	96.8	135.2	132.8	127.0	120.2	34.3	
Preston Reservoir Evaporation	ac-ft	0.0	-0.2	-0.2	-0.2	-0.4	-1.0	-2.8	-5.0	-6.5	-7.4	-5.9	-3.9	
Preston Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Beginning Water Storage	ac-ft	27.5	59.6	147.6	237.3	332.2	411.3	489.5	528.0	448.3	319.1	177.7	61.8	
Reservoir Evaporation	ac-ft	-1.8	-0.9	-0.7	-0.9	-1.7	-3.9	-10.3	-17.6	-22.1	-21.6	-12.0	-6.9	-100.3
Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LAND APPLICATION DISPOSAL DEMANDS														
Bowers' Ranch	ac-ft	-3.6	0.0	0.0	0.0	0.0	0.0	-2.5	-21.5	-27.5	-28.9	-26.1	-18.2	-128.3
2016/2017 WY Bower's Ranch	ac-ft	-7.7	0	0	0	0	0	0	0	-24.6	-26.7	-26.7	-26.7	-112.4
Hoskins' Ranch	ac-ft	-3.3	0.0	0.0	0.0	0.0	0.0	-2.3	-19.4	-24.7	-26.0	-23.5	-16.4	-115.5
2016/2017 WY Hoskin's Ranch	ac-ft	0	0	0	0	0	0	0	-8.3	-27	-32.8	-26.4	-36.5	-131.0
Castle Oaks Golf Course	ac-ft	-11.2	0.0	0.0	0.0	0.0	0.0	-11.8	-61.0	-88.4	-98.7	-89.4	-58.6	-419.0
RAW WATER MAKE-UP														
Blend Raw Water	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	59.2	14.4	73.6
MONTHLY STORAGE BALANCE														
Total Inflows (including Raw Water)	ac-ft	52.0	88.9	90.3	95.8	80.8	82.2	65.4	39.8	33.5	33.6	94.3	50.9	807.5
Total Outflows	ac-ft	-19.8	-0.9	-0.7	-0.9	-1.7	-3.9	-26.9	-119.5	-162.7	-175.1	-151.0	-100.1	-763.1
Beginning Storage Volume	ac-ft	27.5	59.6	147.6	237.3	332.2	411.3	489.5	528.0	448.3	319.1	177.7	121.0	
Change in Water Volume	ac-ft	32.1	88.0	89.7	94.9	79.1	78.2	38.5	-79.7	-129.2	-141.5	-56.6	-49.1	
Final Storage Volume	ac-ft	59.6	147.6	237.3	332.2	411.3	489.5	528.0	448.3	319.1	177.7	121.0	71.9	

Maximum Seasonal Storage Used (ac-ft)	**528.0**	172.0 Mgal
Henderson Unutilized Capacity (ac-ft)	**0.0**	0.0 Mgal
Preston Unutilized Capacity (ac-ft)	**99.8**	32.5 Mgal

AVERAGE ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	1.20	3.47	3.50	3.83	3.10	3.01	2.06	0.47	0.15	0.10	0.19	0.33	21.41
2016/2017 WY Precipitation	in													
Pan Evaporation	in	3.77	2.10	1.50	1.50	2.20	3.70	5.60	7.40	8.60	9.40	8.30	6.60	60.67
Effective Water Surface Evaporation	in	2.83	1.05	0.54	0.54	0.84	1.74	3.14	5.28	7.07	8.38	7.13	4.88	43.41
WASTEWATER GENERATION														
Facility Wastewater Effluent (ADWF)	MG	9.7	9.4	9.7	9.7	8.8	9.7	9.4	9.7	9.4	9.7	9.7	9.4	114.1
I/I Contributions	MG	1.9	4.2	4.2	4.6	3.8	3.7	2.8	1.2	0.9	0.8	0.9	1.1	30.1
TOTAL Wastewater Effluent	ac-ft	35.7	41.7	42.7	43.7	38.6	41.2	37.3	33.4	31.5	32.3	32.6	32.0	442.7
2016/2017 WY Effluent Flow Values	ac-ft													
WATERSHED CONTRIBUTING AREAS														
Precipitation into Henderson Reservoir	ac-ft	2.9	8.4	8.4	9.2	7.5	7.2	5.0	1.1	0.4	0.2	0.5	0.8	51.5
Run-off into Henderson Reservoir	ac-ft	0.4	1.3	1.3	1.4	1.1	1.1	0.7	0.2	0.1	0.0	0.1	0.1	7.7
Precipitation into Preston Forebay	ac-ft	0.2	0.6	0.6	0.6	0.5	0.5	0.3	0.1	0.0	0.0	0.0	0.1	3.6
Precipitation into Preston Reservoir	ac-ft	1.8	5.2	5.3	5.7	4.7	4.5	3.1	0.7	0.2	0.2	0.3	0.5	32.1
Run-off into Preston Reservoir	ac-ft	1.4	4.1	4.1	4.5	3.6	3.5	2.4	0.6	0.2	0.1	0.2	0.4	25.2
STORAGE RESERVOIRS														
Henderson Reservoir Volume	ac-ft	27.5	33.8	84.4	136.3	189.9	235.7	281.9	276.8	196.7	77.0	27.5	27.5	
Henderson Reservoir Evaporation	ac-ft	-1.8	-0.7	-0.6	-0.7	-1.4	-3.3	-6.5	-10.9	-12.1	-8.3	-4.4	-3.0	
Henderson Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Preston Reservoir Volume	ac-ft	0.0	1.2	10.2	19.7	30.1	38.1	44.9	47.3	42.8	35.7	0.0	0.0	
Preston Reservoir Evaporation	ac-ft	-2.2	-0.8	-0.5	-0.5	-0.8	-1.8	-3.4	-5.8	-7.5	-8.5	-6.8	-4.4	
Preston Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Beginning Water Storage	ac-ft	27.5	35.1	94.7	156.0	220.0	273.8	326.8	324.1	239.5	112.7	27.5	27.5	
Reservoir Evaporation	ac-ft	-4.0	-1.5	-1.0	-1.2	-2.2	-5.1	-9.9	-16.7	-19.7	-16.8	-11.2	-7.5	-97.0
Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LAND APPLICATION DISPOSAL DEMANDS														
Bowers' Ranch	ac-ft	-2.0	0.0	0.0	0.0	0.0	0.0	-3.5	-18.2	-25.3	-27.6	-25.6	-16.3	-118.6
2016/2017 WY Bower's Ranch	ac-ft													
Hoskins' Ranch	ac-ft	-1.8	0.0	0.0	0.0	0.0	0.0	-3.2	-16.4	-22.8	-24.9	-23.1	-14.6	-106.7
2016/2017 WY Hoskin's Ranch	ac-ft													
Castle Oaks Golf Course	ac-ft	-27.1	0.0	0.0	0.0	0.0	0.0	-34.9	-69.3	-91.4	-99.8	-91.2	-63.1	-476.8
RAW WATER MAKE-UP														
Blend Raw Water	ac-ft	85.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.9	39.6	10.4	162.4
MONTHLY STORAGE BALANCE														
Total Inflows (including Raw Water)	ac-ft	127.9	61.1	62.4	65.2	56.0	58.1	48.9	36.1	32.3	59.7	73.2	44.3	725.2
Total Outflows	ac-ft	-34.8	-1.5	-1.0	-1.2	-2.2	-5.1	-51.5	-120.6	-159.2	-169.1	-151.2	-101.5	-799.1
Beginning Storage Volume	ac-ft	27.5	120.6	180.2	241.6	305.6	359.3	412.3	409.7	325.1	198.2	88.8	10.9	
Change in Water Volume	ac-ft	93.1	59.6	61.3	64.0	53.8	53.0	-2.6	-84.6	-126.9	-109.4	-78.0	16.6	
Final Storage Volume	ac-ft	120.6	180.2	241.6	305.6	359.3	412.3	409.7	325.1	198.2	88.8	10.9	27.5	

Maximum Seasonal Storage Used (ac-ft)	**412.3**	134.4 Mgal
Henderson Unutilized Capacity (ac-ft)	**110.9**	36.1 Mgal
Preston Unutilized Capacity (ac-ft)	**187.7**	61.2 Mgal

Water Balance Update - ARSA Storage & Disposal Facilities

Scenario 2: Current Flows & Facilities, Calibrated

November 2024 By: Bill Slenter/Steven Whittlesey, HydroScience

WASTEWATER INFLUENT FLOW	MAX STORAGE CAPACITIES	OTHER INPUTS
Daily Average Wastewater Influent Flow **312,636** gpd	Henderson Reservoir 392.8 ac-ft	100-YR Multiplier 1.92 unitless
	Preston Reservoir 235.0 ac-ft	Pan Evap Coefficient 0.75 unitless
	Total System 627.8 ac-ft	

100-YEAR ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	5.98	2.42	5.10	14.28	4.48	3.21	3.88	0.50	1.21	0.00	0.02	0.02	41.11
2016/2017 WY Precipitation	in	6.31	2.55	5.38	15.07	4.73	3.39	4.09	0.53	1.28	0.00	0.02	0.02	43.37
Pan Evaporation	in	3.77	1.40	0.72	0.72	1.12	2.32	4.18	7.04	9.43	11.17	9.50	6.51	57.88
Effective Water Surface Evaporation	in	2.83	0.79	0.41	0.41	0.63	1.31	3.14	5.28	7.07	8.38	7.13	4.88	42.23
WASTEWATER GENERATION														
Facility Wastewater Effluent (ADWF)	MG	9.7	9.4	9.7	9.7	8.8	9.7	9.4	9.7	9.4	9.7	9.7	9.4	114.1
I/I Contributions	MG	6.7	3.1	7.3	18.8	6.5	4.9	5.8	1.2	1.9	0.7	0.7	0.7	58.5
TOTAL Wastewater Effluent	ac-ft	50.3	38.4	52.1	87.4	46.9	44.9	46.5	33.5	34.7	32.0	32.0	31.1	529.8
2016/2017 WY Effluent Flow Values	ac-ft	33.8	34.3	50.6	94.9	81.3	47.6	49.4	29.5	27.3	26.5	33.8	33.8	542.8
WATERSHED CONTRIBUTING AREAS														
Precipitation into Henderson Reservoir	ac-ft	14.4	5.8	12.3	34.4	10.8	7.7	9.3	1.2	2.9	0.0	0.0	0.0	98.9
Run-off into Henderson Reservoir	ac-ft	2.2	0.9	1.8	5.2	1.6	1.2	1.4	0.2	0.4	0.0	0.0	0.0	14.8
Precipitation into Preston Forebay	ac-ft	1.0	0.4	0.8	2.4	0.7	0.5	0.6	0.1	0.2	0.0	0.0	0.0	6.9
Precipitation into Preston Reservoir	ac-ft	9.0	3.6	7.6	21.4	6.7	4.8	5.8	0.8	1.8	0.0	0.0	0.0	61.7
Run-off into Preston Reservoir	ac-ft	7.0	2.8	6.0	16.8	5.3	3.8	4.6	0.6	1.4	0.0	0.0	0.0	48.3
STORAGE RESERVOIRS														
Henderson Reservoir Volume	ac-ft	27.5	74.5	118.9	184.6	310.9	368.8	392.8	392.8	313.2	195.2	59.3	27.5	
Henderson Reservoir Evaporation	ac-ft	-1.8	-0.8	-0.5	-0.7	-1.4	-3.1	-7.5	-12.6	-15.5	-14.3	-6.2	-3.0	
Henderson Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Preston Reservoir Volume	ac-ft	0.0	17.0	23.6	38.0	78.4	90.6	125.4	166.1	160.8	155.5	145.3	55.8	
Preston Reservoir Evaporation	ac-ft	0.0	-0.2	-0.1	-0.2	-0.5	-1.1	-3.4	-6.7	-8.8	-10.2	-8.3	-3.1	
Preston Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Beginning Water Storage	ac-ft	27.5	91.5	142.5	222.6	389.3	459.4	518.2	558.9	474.0	350.7	204.7	83.3	
Total Reservoir Evaporation	ac-ft	-1.8	-1.0	-0.7	-0.9	-1.9	-4.2	-10.8	-19.3	-24.3	-24.5	-14.5	-6.1	-109.9
Total Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LAND APPLICATION DISPOSAL DEMANDS														
Bowers' Ranch	ac-ft	-3.6	0.0	0.0	0.0	0.0	0.0	-2.5	-21.5	-27.5	-28.9	-26.1	-18.2	-128.3
2016/2017 WY Bower's Ranch	ac-ft	-7.7	0	0	0	0	0	0	0	-24.6	-26.7	-26.7	-26.7	-112.4
Hoskins' Ranch	ac-ft	-3.3	0.0	0.0	0.0	0.0	0.0	-2.3	-19.4	-24.7	-26.0	-23.5	-16.4	-115.5
2016/2017 WY Hoskin's Ranch	ac-ft	0	0	0	0	0	0	0	-8.3	-27	-32.8	-26.4	-36.5	-131.0
Castle Oaks Golf Course	ac-ft	-11.2	0.0	0.0	0.0	0.0	0.0	-11.8	-61.0	-88.4	-98.7	-89.4	-58.6	-419.0
RAW WATER MAKE-UP														
Blend Raw Water	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.7	2.5	83.2
MONTHLY STORAGE BALANCE														
Total Inflows (including Raw Water)	ac-ft	83.9	52.0	80.7	167.5	72.0	62.9	68.2	36.3	41.5	32.0	112.8	33.7	843.6
Total Outflows	ac-ft	-19.8	-1.0	-0.6	-0.9	-1.9	-4.2	-27.5	-121.2	-164.9	-178.1	-153.5	-99.2	-772.7
Beginning Storage Volume	ac-ft	27.5	91.5	142.5	222.6	389.3	459.4	518.2	558.9	474.0	350.7	204.7	163.9	
Change in Water Volume	ac-ft	64.1	51.0	80.1	166.7	70.2	58.7	40.7	-84.8	-123.3	-146.1	-40.7	-65.5	
Final Storage Volume	ac-ft	91.5	142.5	222.6	389.3	459.4	518.2	558.9	474.0	350.7	204.7	163.9	98.4	

Maximum Seasonal Storage Used (ac-ft)	**558.9**	182.1 Mgal
Henderson Unutilized Capacity (ac-ft)	**0.0**	0.0 Mgal
Preston Unutilized Capacity (ac-ft)	**68.9**	22.5 Mgal

AVERAGE ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	1.20	3.47	3.50	3.83	3.10	3.01	2.06	0.47	0.15	0.10	0.19	0.33	21.41
2016/2017 WY Precipitation	in													
Pan Evaporation	in	3.77	2.10	1.50	1.50	2.20	3.70	5.60	7.40	8.60	9.40	8.30	6.60	60.67
Effective Water Surface Evaporation	in	2.83	1.05	0.54	0.54	0.84	1.74	3.14	5.28	7.07	8.38	7.13	4.88	43.41
WASTEWATER GENERATION														
Facility Wastewater Effluent (ADWF)	MG	9.7	9.4	9.7	9.7	8.8	9.7	9.4	9.7	9.4	9.7	9.7	9.4	114.1
I/I Contributions	MG	1.9	4.2	5.3	5.7	4.8	4.7	3.5	1.2	0.9	0.8	0.9	1.1	34.9
TOTAL Wastewater Effluent	ac-ft	35.7	41.7	46.0	47.2	41.6	44.1	39.5	33.4	31.5	32.3	32.6	32.0	457.4
2016/2017 WY Effluent Flow Values	ac-ft													
WATERSHED CONTRIBUTING AREAS														
Precipitation into Henderson Reservoir	ac-ft	2.9	8.4	8.4	9.2	7.5	7.2	5.0	1.1	0.4	0.2	0.5	0.8	51.5
Run-off into Henderson Reservoir	ac-ft	0.4	1.3	1.3	1.4	1.1	1.1	0.7	0.2	0.1	0.0	0.1	0.1	7.7
Precipitation into Preston Forebay	ac-ft	0.2	0.6	0.6	0.6	0.5	0.5	0.3	0.1	0.0	0.0	0.0	0.1	3.6
Precipitation into Preston Reservoir	ac-ft	1.8	5.2	5.3	5.7	4.7	4.5	3.1	0.7	0.2	0.2	0.3	0.5	32.1
Run-off into Preston Reservoir	ac-ft	1.4	4.1	4.1	4.5	3.6	3.5	2.4	0.6	0.2	0.1	0.2	0.4	25.2
STORAGE RESERVOIRS														
Henderson Reservoir Volume	ac-ft	27.5	33.8	84.4	139.5	196.6	245.3	294.3	291.2	210.9	90.6	27.5	27.5	
Henderson Reservoir Evaporation	ac-ft	-1.8	-0.7	-0.6	-0.8	-1.4	-3.4	-6.7	-11.2	-12.6	-9.1	-4.4	-3.0	
Henderson Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Preston Reservoir Volume	ac-ft	0.0	3.4	13.2	23.0	33.6	41.6	48.5	51.4	48.5	44.2	0.0	0.0	
Preston Reservoir Evaporation	ac-ft	0.0	-0.1	-0.1	-0.3	-0.8	-1.6	-3.0	-4.2	-4.8	-3.8	0.0	0.0	
Preston Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Beginning Water Storage	ac-ft	27.5	37.3	97.6	162.5	230.2	286.9	342.9	342.6	259.4	134.8	27.5	27.5	
Total Reservoir Evaporation	ac-ft	-1.8	-0.8	-0.7	-1.1	-2.2	-5.0	-9.7	-15.4	-17.4	-12.9	-4.4	-3.0	-74.4
Total Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LAND APPLICATION DISPOSAL DEMANDS														
Bowers' Ranch	ac-ft	-2.0	0.0	0.0	0.0	0.0	0.0	-3.5	-18.2	-25.3	-27.6	-25.6	-16.3	-118.6
2016/2017 WY Bower's Ranch	ac-ft													
Hoskins' Ranch	ac-ft	-1.8	0.0	0.0	0.0	0.0	0.0	-3.2	-16.4	-22.8	-24.9	-23.1	-14.6	-106.7
2016/2017 WY Hoskin's Ranch	ac-ft													
Castle Oaks Golf Course	ac-ft	-27.1	0.0	0.0	0.0	0.0	0.0	-34.9	-69.3	-91.4	-99.8	-91.2	-63.1	-476.8
RAW WATER MAKE-UP														
Blend Raw Water	ac-ft	87.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.9	32.8	14.8	188.3
MONTHLY STORAGE BALANCE														
Total Inflows (including Raw Water)	ac-ft	130.1	61.1	65.6	68.7	58.9	61.0	51.0	36.1	32.3	85.8	66.4	48.7	765.8
Total Outflows	ac-ft	-32.6	-0.8	-0.7	-1.0	-2.2	-5.0	-51.3	-119.3	-156.9	-165.2	-144.4	-97.0	-776.5
Beginning Storage Volume	ac-ft	27.5	125.0	185.4	250.3	317.9	374.7	430.6	430.4	347.2	222.6	143.1	65.2	
Change in Water Volume	ac-ft	97.5	60.3	64.9	67.7	56.7	56.0	-0.2	-83.2	-124.6	-79.4	-78.0	-48.4	
Final Storage Volume	ac-ft	125.0	185.4	250.3	317.9	374.7	430.6	430.4	347.2	222.6	143.1	65.2	16.8	

Maximum Seasonal Storage Used (ac-ft)	**430.6**	140.3 Mgal
Henderson Unutilized Capacity (ac-ft)	**98.5**	32.1 Mgal
Preston Unutilized Capacity (ac-ft)	**183.6**	59.8 Mgal

Water Balance Update - ARSA Storage & Disposal Facilities

Scenario 3: Future Flows & Facilities, Calibrated

November 2024 By: Bill Slenter/Steven Whittlesey, HydroScience

WASTEWATER INFLUENT FLOW	***MAX STORAGE CAPACITIES***		***OTHER INPUTS***	
	Henderson Reservoir	392.8 ac-ft	I/I Reduction Factor	8.18% unitless
Daily Average Wastewater Influent Flow **319,420** gpd	Preston Reservoir	235.0 ac-ft	100-YR Multiplier	1.92 unitless
	Total System	627.8 ac-ft	Pan Evap Coefficient	0.75 unitless

100-YEAR ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	5.98	2.42	5.10	14.28	4.48	3.21	3.88	0.50	1.21	0.00	0.02	0.02	41.11
2016/2017 WY Precipitation	in	6.31	2.55	5.38	15.07	4.73	3.39	4.09	0.53	1.28	0.00	0.02	0.02	43.37
Pan Evaporation	in	3.77	1.40	0.72	0.72	1.12	2.32	4.18	7.04	9.43	11.17	9.50	6.51	57.88
Effective Water Surface Evaporation	in	2.83	0.79	0.41	0.41	0.63	1.31	3.14	5.28	7.07	8.38	7.13	4.88	42.23
WASTEWATER GENERATION														
Facility Wastewater Effluent (ADWF)	MG	9.9	9.6	9.9	9.9	8.9	9.9	9.6	9.9	9.6	9.9	9.9	9.6	116.6
I/I Contributions	MG	6.2	2.9	6.7	17.2	6.0	4.5	5.3	1.4	2.2	0.8	0.9	0.9	55.0
TOTAL Wastewater Effluent	ac-ft	49.3	38.3	50.9	83.31	45.8	44.3	45.6	34.7	36.2	32.9	33.0	32.0	526.5
2016/2017 WY Effluent Flow Values	ac-ft	33.8	34.3	50.6	94.9	81.3	47.6	49.4	29.5	27.3	26.5	33.8	33.8	542.8
WATERSHED CONTRIBUTING AREAS														
Precipitation into Henderson Reservoir	ac-ft	14.4	5.8	12.3	34.4	10.8	7.7	9.3	1.2	2.9	0.0	0.0	0.0	98.9
Run-off into Henderson Reservoir	ac-ft	2.2	0.9	1.8	5.2	1.6	1.2	1.4	0.2	0.4	0.0	0.0	0.0	14.8
Precipitation into Preston Forebay	ac-ft	1.0	0.4	0.8	2.4	0.7	0.5	0.6	0.1	0.2	0.0	0.0	0.0	6.9
Precipitation into Preston Reservoir	ac-ft	9.0	3.6	7.6	21.4	6.7	4.8	5.8	0.8	1.8	0.0	0.0	0.0	61.7
Run-off into Preston Reservoir	ac-ft	7.0	2.8	6.0	16.8	5.3	3.8	4.6	0.6	1.4	0.0	0.0	0.0	48.3
STORAGE RESERVOIRS														
Henderson Reservoir Volume	ac-ft	27.5	73.5	117.7	182.2	304.4	361.3	392.8	392.8	314.4	197.9	62.9	27.5	
Henderson Reservoir Evaporation	ac-ft	-1.8	-0.8	-0.5	-0.7	-1.4	-3.0	-7.5	-12.6	-15.5	-14.4	-6.4	-3.0	
Henderson Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Preston Reservoir Volume	ac-ft	0.0	17.0	23.6	38.0	78.4	90.6	117.3	157.3	152.3	147.2	137.3	52.4	
Preston Reservoir Evaporation	ac-ft	0.0	-0.2	-0.1	-0.2	-0.5	-1.1	-3.2	-6.5	-8.5	-9.9	-8.1	-2.9	
Preston Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Beginning Water Storage	ac-ft	27.5	90.5	141.3	220.2	382.8	452.0	510.1	550.1	466.7	345.1	200.2	79.9	
Total Reservoir Evaporation	ac-ft	-1.8	-1.0	-0.7	-0.9	-1.9	-4.2	-10.7	-19.1	-24.0	-24.3	-14.4	-6.0	-108.8
Total Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LAND APPLICATION DISPOSAL DEMANDS														
Bowers' Ranch	ac-ft	-3.6	0.0	0.0	0.0	0.0	0.0	-2.5	-21.5	-27.5	-28.9	-26.1	-18.2	-128.3
2016/2017 WY Bower's Ranch	ac-ft	-7.7	0	0	0	0	0	0	0	-24.6	-26.7	-26.7	-26.7	-112.4
Hoskins' Ranch	ac-ft	-3.3	0.0	0.0	0.0	0.0	0.0	-2.3	-19.4	-24.7	-26.0	-23.5	-16.4	-115.5
2016/2017 WY Hoskin's Ranch	ac-ft	0	0	0	0	0	0	0	-8.3	-27	-32.8	-26.4	-36.5	-131.0
Castle Oaks Golf Course	ac-ft	-11.2	0.0	0.0	0.0	0.0	0.0	-11.8	-61.0	-88.4	-98.7	-89.4	-58.6	-419.0
RAW WATER MAKE-UP														
Blend Raw Water	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.3	0.2	77.5
MONTHLY STORAGE BALANCE														
Total Inflows (including Raw Water)	ac-ft	82.9	51.8	79.5	163.5	71.0	62.3	67.4	37.5	43.1	32.9	110.4	32.4	834.7
Total Outflows	ac-ft	-19.8	-1.0	-0.6	-0.8	-1.8	-4.2	-27.3	-121.0	-164.6	-177.9	-153.4	-99.1	-771.7
Beginning Storage Volume	ac-ft	27.5	90.5	141.3	220.2	382.8	452.0	510.1	550.1	466.7	345.1	200.2	157.2	
Change in Water Volume	ac-ft	63.0	50.8	78.9	162.6	69.1	58.1	40.0	-83.4	-121.6	-144.9	-43.0	-66.7	
Final Storage Volume	ac-ft	90.5	141.3	220.2	382.8	452.0	510.1	550.1	466.7	345.1	200.2	157.2	90.5	

Maximum Seasonal Storage Used (ac-ft) **550.1** 179.3 Mgal
Henderson Unutilized Capacity (ac-ft) **0.0** 0.0 Mgal
Preston Unutilized Capacity (ac-ft) **77.7** 25.3 Mgal

AVERAGE ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	1.20	3.47	3.50	3.83	3.10	3.01	2.06	0.47	0.15	0.10	0.19	0.33	21.41
2016/2017 WY Precipitation	in													
Pan Evaporation	in	3.77	2.10	1.50	1.50	2.20	3.70	5.60	7.40	8.60	9.40	8.30	6.60	60.67
Effective Water Surface Evaporation	in	2.83	1.05	0.54	0.54	0.84	1.74	3.14	5.28	7.07	8.38	7.13	4.88	43.41
WASTEWATER GENERATION														
Facility Wastewater Effluent (ADWF)	MG	9.9	9.6	9.9	9.9	8.9	9.9	9.6	9.9	9.6	9.9	9.9	9.6	116.6
I/I Contributions	MG	1.8	3.9	4.9	5.2	4.4	4.3	3.2	1.4	1.0	0.9	1.1	1.2	33.2
TOTAL Wastewater Effluent	ac-ft	35.8	41.2	45.3	46.5	40.9	43.6	39.2	34.6	32.5	33.3	33.6	33.1	459.7
2016/2017 WY Effluent Flow Values	ac-ft													
WATERSHED CONTRIBUTING AREAS														
Precipitation into Henderson Reservoir	ac-ft	2.9	8.4	8.4	9.2	7.5	7.2	5.0	1.1	0.4	0.2	0.5	0.8	51.5
Run-off into Henderson Reservoir	ac-ft	0.4	1.3	1.3	1.4	1.1	1.1	0.7	0.2	0.1	0.0	0.1	0.1	7.7
Precipitation into Preston Forebay	ac-ft	0.2	0.6	0.6	0.6	0.5	0.5	0.3	0.1	0.0	0.0	0.0	0.1	3.6
Precipitation into Preston Reservoir	ac-ft	1.8	5.2	5.3	5.7	4.7	4.5	3.1	0.7	0.2	0.2	0.3	0.5	32.1
Run-off into Preston Reservoir	ac-ft	1.4	4.1	4.1	4.5	3.6	3.5	2.4	0.6	0.2	0.1	0.2	0.4	25.2
STORAGE RESERVOIRS														
Henderson Reservoir Volume	ac-ft	27.5	34.0	84.2	138.6	194.9	243.0	291.5	288.2	209.0	89.9	27.5	27.5	
Henderson Reservoir Evaporation	ac-ft	-1.8	-0.7	-0.6	-0.8	-1.4	-3.4	-6.6	-11.1	-12.6	-9.1	-4.4	-3.0	
Henderson Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Preston Reservoir Volume	ac-ft	0.0	3.4	13.2	23.0	33.6	41.6	48.5	51.4	48.5	44.2	0.0	0.0	
Preston Reservoir Evaporation	ac-ft	0.0	-0.1	-0.1	-0.3	-0.8	-1.6	-3.0	-4.2	-4.8	-3.8	0.0	0.0	
Preston Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Beginning Water Storage	ac-ft	27.5	37.4	97.3	161.5	228.4	284.6	340.0	339.6	257.6	134.1	27.5	27.5	
Total Reservoir Evaporation	ac-ft	-1.8	-0.8	-0.7	-1.1	-2.2	-5.0	-9.7	-15.3	-17.3	-12.9	-4.4	-3.0	-74.2
Total Reservoir Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LAND APPLICATION DISPOSAL DEMANDS														
Bowers' Ranch	ac-ft	-2.0	0.0	0.0	0.0	0.0	0.0	-3.5	-18.2	-25.3	-27.6	-25.6	-16.3	-118.6
2016/2017 WY Bower's Ranch	ac-ft													
Hoskins' Ranch	ac-ft	-1.8	0.0	0.0	0.0	0.0	0.0	-3.2	-16.4	-22.8	-24.9	-23.1	-14.6	-106.7
2016/2017 WY Hoskin's Ranch	ac-ft													
Castle Oaks Golf Course	ac-ft	-27.1	0.0	0.0	0.0	0.0	0.0	-34.9	-69.3	-91.4	-99.8	-91.2	-63.1	-476.8
RAW WATER MAKE-UP														
Blend Raw Water	ac-ft	87.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.3	31.7	15.9	188.8
MONTHLY STORAGE BALANCE														
Total Inflows (including Raw Water)	ac-ft	130.5	60.7	64.9	67.9	58.3	60.4	50.8	37.2	33.3	87.1	66.4	50.9	768.6
Total Outflows	ac-ft	-32.6	-0.8	-0.7	-1.0	-2.2	-5.0	-51.3	-119.2	-156.8	-165.2	-144.4	-97.0	-776.2
Beginning Storage Volume	ac-ft	27.5	125.3	185.2	249.5	316.4	372.5	428.0	427.5	345.5	222.0	143.9	66.0	
Change in Water Volume	ac-ft	97.9	59.9	64.2	66.9	56.1	55.5	-0.5	-82.0	-123.5	-78.1	-78.0	-46.2	
Final Storage Volume	ac-ft	125.3	185.2	249.5	316.4	372.5	428.0	427.5	345.5	222.0	143.9	66.0	19.8	

Maximum Seasonal Storage Used (ac-ft) **428.0** 139.4 Mgal
Henderson Unutilized Capacity (ac-ft) **101.3** 33.0 Mgal
Preston Unutilized Capacity (ac-ft) **183.6** 59.8 Mgal