

Bay Area Clean Water Agencies

Group Annual Report

Nutrient Watershed Permit Annual Report

2024

April 1, 2025



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1 Introduction

Discharges of nutrients by Publicly Owned Treatment Works (POTWs) to San Francisco Bay are regulated by the San Francisco Bay Regional Water Quality Control Board (Regional Water Board) through a Nutrient Watershed Permit, also known as National Pollutant Discharge Elimination System (NPDES) Permit No. CA0038873. On July 10, 2024, the Regional Water Board reissued the third iteration of the Nutrient Watershed Permit by adopting Order R2-2024-0013 (Permit), National Pollutant Discharge Elimination System (NPDES) Permit No. CA0038873. This order replaced Order R2-2019-0017, which expired on June 30, 2024. The 2024 Permit became effective on October 1, 2024, and covers each municipal POTW that discharges to San Francisco Bay and its tributary Subembayments. As with previous Permits, POTWs are required to track and evaluate treatment plant performance and fund nutrient research and monitoring programs. The 2024 Permit is the first to include enforceable discharge total inorganic nitrogen (TIN) limits. The POTWs have until October 1, 2034, to comply with the final TIN load limits.

One of the requirements of the 2024 Permit is the reporting and analysis of influent and effluent nutrient concentrations and loading trends. Each agency's nutrient loads must also be compared to total POTW loads in their respective Subembayment, as defined in the Permit. An annual report is required to provide an ongoing record of these data and analyses.

The purpose of this Group Annual Report is to fulfill the reporting and analysis requirement of the Permit for the participating agencies for the period between October 1, 2012 and September 30, 2024. This report is focused on the addition of the most recent data from October 1, 2023 through September 30, 2024. This report includes the following sections:

- ◆ **Section 2 – Background.** This section includes relevant background information on the requirements of the Permit.
- ◆ **Section 3 – Approach.** This section presents the approach to obtain data, the constituents of interest, data confirmation, seasonality analysis, and statistical trending.
- ◆ **Section 4 – Influent Data Review Findings.** This section presents the influent data for each discharger as well as the annual and dry season averages for the Influent Flow, Total Ammonia, Nitrite plus Nitrate, Total Inorganic Nitrogen, Total Kjeldahl Nitrogen, Total Nitrogen, and Total Phosphorus. In addition, the contributing flows and loads for each discharger are presented in comparison to the other dischargers in its respective Subembayment.
- ◆ **Section 5 – Discharge Data Review Findings.** This section presents the discharge data for each discharger as well as the annual and seasonal averages for the Discharge Flow, Total Ammonia, Nitrite plus Nitrate, Total Inorganic Nitrogen, and Total Phosphorus. In addition, the contributing flows and loads for each discharger are presented in comparison to the other dischargers in its respective Subembayment.
- ◆ **Section 6 – Recycled Water Data Review Findings.** This section presents the recycled water flows and loads for each discharger as well as the annual and dry season averages. The flows are listed as million gallons per day (mgd). Furthermore, the nutrient load reductions associated with recycled water volumes are included for Total Ammonia, Nitrite plus Nitrate, Total Inorganic Nitrogen, and Total Phosphorus.

- ◆ **Section 7 – Discussion.** This section includes a discussion of the data presented in Sections 4, 5, and 6.
- ◆ **Section 8 – Summary.** This section provides a brief summary of the findings, discussion, and recommendations that will improve the data collection and analysis in future years.
- ◆ **Appendix A** contains data and information from each of the 34 Dischargers listed in the Permit (see Table 1 of the Permit), each of which independently conducts monitoring per the Permit's Monitoring and Reporting Program (Attachment E).
- ◆ **Appendix B** contains information about progress towards meeting the Permit's TIN effluent limitations, as required by the Permit's compliance schedule and reporting requirements found in Section 6.3.3 of the Permit. 30 Dischargers listed in the Permit representing 36 treatment plants are subject to this reporting requirement.

2 Background

The Permit applies to the municipal wastewater dischargers and specific facilities identified in Table 2-1. The location of each discharger is shown in Figure 2-1.

Table 2-1. Municipal Wastewater Dischargers Included in the Nutrient Watershed Permit

Discharger Name (Abbreviation)	POTW Facility Name	Minor / Major ^(a)
American Canyon, City of (American Canyon)	Wastewater Treatment and Reclamation Facility	Major
Benicia, City of (Benicia)	Benicia Wastewater Treatment Plant	Major
Burlingame, City of (Burlingame)	Burlingame Wastewater Treatment Plant	Major
Central Contra Costa Sanitary District (Central San)	Central Contra Costa Sanitary District Wastewater Treatment Plant	Major
Central Marin Sanitation Agency (CMSA)	Central Marin Sanitation Agency Wastewater Treatment Plant	Major
Crockett Community Services District (Port Costa)	Port Costa Wastewater Treatment Plant	Minor
Delta Diablo (Delta Diablo)	Delta Diablo Wastewater Treatment Plant	Major
East Bay Dischargers Authority (EBDA): Cities of Hayward and San Leandro; Oro Loma Sanitary District; Castro Valley Sanitary District; Union Sanitary District; Livermore-Amador Valley Water Management Agency; Dublin San Ramon Services District; and City of Livermore	EBDA Common Outfall	Major
	Hayward Water Pollution Control Facility	
	San Leandro Water Pollution Control Plant	
	Oro Loma/Castro Valley Sanitary Districts Water Pollution Control Plant	
	Raymond A. Boege Alvarado Wastewater Treatment Plant	
	Hayward Marsh	
	Livermore-Amador Valley Water Management Agency Export and Storage Facilities	
	Dublin San Ramon Services District Wastewater Treatment Plant	
	City of Livermore Water Reclamation Plant	
East Bay Municipal Utility District (EBMUD)	East Bay Municipal Utility District, Special District No. 1 Wastewater Treatment Plant	Major
Fairfield-Suisun Sewer District (FSSD)	Fairfield-Suisun Wastewater Treatment Plant	Major
Las Gallinas Valley Sanitary District (Las Gallinas)	Las Gallinas Valley Sanitary District Sewage Treatment Plant	Major
Marin County (Paradise Cove), Sanitary District No. 5 of	Paradise Cove Treatment Plant	Minor
Marin County (Tiburon), Sanitary District No. 5 of	Wastewater Treatment Plant	Minor
Millbrae, City of (Millbrae)	Water Pollution Control Plant	Major
Mt. View Sanitary District (Mt View)	Mt View Sanitary District Wastewater Treatment Plant	Major
Napa Sanitation District (Napa)	Soscol Water Recycling Facility	Major
Novato Sanitary District (Novato)	Novato Sanitary District Wastewater Treatment Plant	Major
Palo Alto, City of (Palo Alto)	Palo Alto Regional Water Quality Control Plant	Major

Discharger Name (Abbreviation)	POTW Facility Name	Minor / Major ^(a)
Petaluma, City of (Petaluma)	Municipal Wastewater Treatment Plant	Major
Pinole, City of (Pinole)	Pinole-Hercules Water Pollution Control Plant	Major
Rodeo Sanitary District (Rodeo)	Rodeo Sanitary District Water Pollution Control Facility	Major
San Francisco (San Francisco International Airport), City and County of (SFO Airport)	Mel Leong Treatment Plant, Sanitary Plant	Major
San Francisco (Southeast Plant), City and County of (SFPUC Southeast)	Southeast Water Pollution Control Plant	Major
San Jose/Santa Clara Water Pollution Control Plant and Cities of San Jose and Santa Clara (San Jose)	San Jose/Santa Clara Water Pollution Control Plant	Major
San Mateo, City of (San Mateo)	City of San Mateo Wastewater Treatment Plant	Major
Sausalito-Marín City Sanitary District (SMCSD)	Sausalito-Marín City Sanitary District Wastewater Treatment Plant	Major
Sewerage Agency of Southern Marin (SASM)	Sewerage Agency of Southern Marin Wastewater Treatment Plant	Major
Silicon Valley Clean Water (SVCW)	Silicon Valley Clean Water Wastewater Treatment Plant	Major
Sonoma Valley County Sanitary District (Sonoma Valley)	Municipal Wastewater Treatment Plant	Major
South San Francisco and San Bruno, Cities of (South SF)	South San Francisco and San Bruno Water Quality Control Plant	Major
Sunnyvale, City of (Sunnyvale)	Sunnyvale Water Pollution Control Plant	Major
Treasure Island Development Authority	Treasure Island Wastewater Treatment Plant	Major
Vallejo Flood and Wastewater District (Vallejo)	Vallejo Wastewater Treatment Plant	Major
West County Wastewater District (West County) and City of Richmond Municipal Sewer District (Richmond) ^(b)	West County Wastewater-City of Richmond Combined Outfall	Major
	West County Wastewater District Treatment Plant	
	Richmond Municipal Sewer District Water Pollution Control Plant	

(a) As defined in the watershed permit (Minor dischargers have a permitted average dry weather flow (ADWF) capacity <1 mgd; Major dischargers have a permitted ADWF capacity ≥1 mgd).

(b) Formerly West County Agency, a Joint Powers Authority that was dissolved effective December 31, 2024. West County Wastewater District and the City of Richmond now share responsibility for permit compliance.

The Permit has specific influent and effluent monitoring requirements. Each agency covered by the Permit is required to report the following constituents in their effluent:

1. Flow
2. Ammonia as Nitrogen
3. Nitrate/Nitrite as Nitrogen
4. Total Inorganic Nitrogen as Nitrogen (Calculated Value)
5. Total Phosphorus

Each agency with a facility design flow of more than 10 mgd is required to report the following constituents in their influent:

1. Flow
2. Ammonia as Nitrogen
3. Nitrate/Nitrite as Nitrogen
4. Total Kjeldahl Nitrogen
5. Total Phosphorus



Figure 2-1. Location of Dischargers

Note: All five Subembayments are shown with delineation by the dark blue solid line

Major municipal dischargers having a permitted or design flow greater than 10 mgd are required to sample effluent twice per month for nitrogen species and once per month for total phosphorus, and sample influent once per quarter for nitrogen species and twice per year for total phosphorus. Major municipal dischargers having a flow greater than or equal to 1 mgd but less than or equal to 10 mgd are required to sample effluent for nitrogen species once per month and total phosphorus once per quarter. Minor municipal discharges, defined as those with a flow less than 1 mgd, are required to monitor effluent twice per year for nitrogen species and once per year for total phosphorus. Dischargers are required to sample only during the months of the year when they discharge. The data collected must be submitted monthly using the State Water Board's California Integrated Water Quality System (CIWQS) online data reporting tool.

Prior to the sampling required by the first and subsequent Permits, the dischargers were required to perform similar sampling and data collection. This early data collection was required under the Regional Water Board's Section 13267 Letter, dated March 2, 2012.¹

Together, the Permits data and the Section 13267 Letter data form the dataset for the analysis and reporting in this Group Annual Report. Additional information regarding the data sources and data confirmation is included in Section 3.

Per Attachment E, Section 5.2.2., of the Permit, the Group Annual Report must include the following.

1. Documentation that the Discharger is complying with Provisions 6.3.2, 6.3.3, 6.3.5, and 6.3.6 of the Order. If reporting through a group report as described below, the Discharger shall submit certification that it has provided adequate support (i.e., contributed its portion of the required contribution) in accordance with Provision 6.3.2.
2. Summary tables depicting the Discharger's annual and monthly flows, nutrient concentrations, and nutrient mass loads, calculated as described in Attachment G section 8.1 (Arithmetic Calculations) of individual NPDES permits. The summary tables shall cover October 1 before the preceding year through September 30 of the preceding year and at least the previous five years of available data. Each Discharger shall document its nutrient loads relative to other facilities covered by this Order that discharge into the same Subembayment (i.e., Suisun Bay, San Pablo Bay, Central Bay, South Bay, and Lower South Bay). These Subembayment delineations may be refined through Provision 6.3.2 of the Order, in which case each Discharger shall document loads relative to the most recent delineation. Nutrient data from other Dischargers may be obtained from the State Water Board's California Integrated Water Quality System (CIWQS) website (<https://www.waterboards.ca.gov/ciwqs/index.html>).
3. Analysis of nutrient trends and load variability, and assessment as to whether nutrient mass discharges are increasing or decreasing.
4. A summary of the amount of water recycled annually by the Discharger, the corresponding decrease in the level of nutrients discharged to the Bay, and any updates to future water recycling plans.

¹ Wolfe, Bruce. (2012) Letter: Water Code Section 13267 Technical Report Order Requiring Submittal of Information on Nutrients in Wastewater Discharges. March 2, 2012.
https://www.waterboards.ca.gov/sanfranciscobay/board_decisions/adopted_orders/2019/R2-2019-0017.pdf

5. Status and plans for investigation if the trend analysis shows a significant change in nutrient loading. In such cases, the Discharger shall investigate the cause. In the annual reports, the Discharger shall set forth its plans for investigation and report its results, providing necessary updates in subsequent annual reports. The investigation shall include, at a minimum, whether treatment process changes, increasing or decreasing water reclamation, or changes in total influent flow related to water conservation, population growth, transient work community, new industry, or wet weather flows have reduced or increased nutrient discharges.

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3 Approach

The sources of data, as well as the approach for data confirmation, analysis of seasonality, and statistical trending are presented in the subsections herein.

3.1 Data Sources

Data from Oct 2012 to Sept 2024 were compiled from two different sources: the Section 13267 Letter data requirements and the subsequent Permits. The Section 13267 Letter data include the initial two years (Oct 2012 through June 2014) and the Permits data include the subsequent years (July 2014 through Sept 2024). The sampling requirements and frequency differ between the two datasets. The Permit data collection requirements were updated in the 2024 Permit. The sampling frequency requirements in the 2024 Permit are largely the same as the previous (2019) Permit's. However, the sampling frequency for total phosphorus has been reduced for all Dischargers. A comparison of the sampling requirements for each regulatory phase is provided in Table 3-1.

Table 3-1. Comparison of Sampling Requirements between the Section 13267 Letter and Nutrient Watershed Permits

Parameter	Section 13267 Letter Data	Nutrient Watershed Permit Data (R2-2014-0014)	Nutrient Watershed Permit Data (R2-2019-0017)	Nutrient Watershed Permit Data (R2-2024-0013)
Major Dischargers and Sampling Frequency	Permitted capacity ≥ 5 mgd: a. <i>Year-round dischargers: Sample twice per month and two additional samples each wet season during peak wet weather flow conditions</i> b. <i>Seasonal dischargers: Sample twice per month during discharge (wet) season; sample once during non-discharge (dry) season</i> Permitted capacity between 1 and 5 mgd: a. <i>Year-round dischargers: Sample twice per month and two additional samples each wet season during peak wet weather flow conditions</i> b. <i>Seasonal dischargers: Sample twice per month during discharge (wet) season; sample once during non-discharge (dry) season</i>	Permitted capacity > 10 mgd: a. <i>Sample effluent twice per month</i> Permitted capacity between 1 and 10 mgd: a. <i>Sample effluent once per month</i>	Permitted capacity > 10 mgd: a. <i>Sample effluent twice per month, and influent once per quarter.</i> Permitted capacity between 1 and 10 mgd: a. <i>Sample effluent once per month.</i>	Permitted capacity > 10 mgd: a. <i>Sample effluent twice per month for nitrogen species and once per month for total phosphorus</i> b. <i>Sample influent once per quarter for nitrogen species and twice per year for total phosphorus.</i> Permitted capacity between 1 and 10 mgd: a. <i>Sample effluent once per month for nitrogen species and once per quarter for total phosphorus</i>
Minor Dischargers and Sampling Frequency	Flows < 1 mgd permitted capacity a. <i>Year-round dischargers: Sample once per month</i> b. <i>Seasonal dischargers: Sample once per month</i>	Permitted capacity < 1 mgd: a. <i>Sample twice per year</i>	Permitted capacity < 1 mgd: a. <i>Sample twice per year</i>	Permitted capacity < 1 mgd: a. <i>Sample effluent twice per year for nitrogen species and</i>

Parameter	Section 13267 Letter Data	Nutrient Watershed Permit Data (R2-2014-0014)	Nutrient Watershed Permit Data (R2-2019-0017)	Nutrient Watershed Permit Data (R2-2024-0013)
	during discharge (wet) season; sample once during non-discharge (dry) season			once per year for total phosphorus
Non-Nutrient Sampling Parameters	Flow pH Temperature	Flow	Flow	Flow
Nitrogen Species and Sample Type	1) Total Ammonia ¹ 2) TDN ² , 3) TKN ³ 4) SKN ⁴ 5) Nitrate ⁵ 6) Nitrite ⁶ 7) Urea ⁷	1) Total Ammonia ¹ 2) TKN ³ 3) Nitrate ⁵ plus Nitrite ⁶ 4) TN ⁸	Influent and Effluent: 1) Total Ammonia ¹ 2) Nitrate ⁵ plus Nitrite ⁶ Influent Only: 1) TKN ³ Effluent Only: 1) TIN ⁹	Influent and Effluent: 1) Total Ammonia ¹ 2) Nitrate ⁵ plus Nitrite ⁶ Influent Only: 1) TKN ³ Effluent Only: 1) TIN ⁹
Phosphorus Species and Sample Type	1) TP ¹⁰ 2) STP ¹¹ 3) DOP ¹² 4) TOP ¹³	1) SRP ¹⁴ 2) TP ¹⁰	1) TP ¹⁰	1) TP ¹⁰
Recycled Water Volumes	Not required	Not required	Not required. Included in the Group Annual Report for Year 2021 and beyond.	

1. NH₃ plus NH₄⁺ (reported as N) – Composite Sample
2. Total Dissolved Nitrogen (reported as N) – Composite Sample
3. Total Kjeldahl Nitrogen (reported as N) – Composite Sample
4. Soluble Kjeldahl Nitrogen (reported as N) – Composite Sample
5. NO₃⁻ (reported as N) – Composite Sample
6. NO₂⁻ (reported as N) – Composite Sample
7. Limited to 5 largest dischargers (reported as N) – Composite Sample
8. Total Nitrogen (calculated: TKN + Nitrate + Nitrite)
9. Total Inorganic Nitrogen (calculated: Total Ammonia + Nitrate + Nitrite)
10. Total Phosphorus (reported as P) – Composite Sample
11. Soluble Total Phosphorus (reported as P) – Composite Sample
12. Dissolved Orthophosphate (reported as P) – Composite or Grab Sample
13. Total Orthophosphate (reported as P) – Composite Sample
14. Soluble Reactive Phosphorus (reported as P) – Grab Sample

3.2 Measurement Methodologies

A list of the measurement methodologies is presented in Table 3-2. For measurements qualified as non-detect (ND), half of the method detection limit (MDL) is used for calculating loads. The 2024 Permit requires this method for calculating effluent TIN loads. For consistency, this method is applied to all other loads (influent and effluent) where monitoring data are available. Historical loads (prior to October 1, 2023) have not been revised to reflect this approach.

Table 3-2. List of Parameters, Methodology, and Sample Type

Parameter	Location	Measured or Calculated	Sample Type	Method (a,b)	Calculation
Flow	Influent, Effluent, and Recycled Water	Both (plant specific)	Continuous	--	--
Total Ammonia	Influent/Effluent	Measured ^(c)	24-hr Composite	4500-NH3 EPA 350.1	--
TKN	Influent Only	Both (plant-specific) ^(c)	24-hr Composite	4500-N(org)	--
NOx	Influent/Effluent	Measured ^(c)	24-hr Composite	4500-N	--
TIN	Effluent Only	Calculated ^(c)	24-hr Composite	Calculated	$TIN = Ammonia + NOx$
TN	Influent Only	Calculated ^(c)	24-hr Composite	Calculated	$TN = TKN + NOx$
TP	Influent/Effluent	Measured ^(c)	24-hr Composite	4500-P	--

- Standard Methods for the Examination of Water and Wastewater 2017-23rd Edition, American Public Health Association/American Water Works Association/Water Environment Federation, Washington, D.C.
- Dischargers may propose other U.S. EPA-approved analytical methods, if available, with detection limits low enough to quantify concentrations in wastewater.
- For plants with only flow and concentration values available, loads were manually calculated for daily values and/or using average monthly flow and concentration values.

3.3 Data Confirmation

Once the data from each discharger were collected and compiled, the data were summarized and provided to each participating discharger for review and confirmation. The data presented in this Group Annual Report reflect additions and corrections provided by the participating agencies.

3.4 Seasonality

The seasonal variations in the data were examined by dividing the data into a dry and wet season. Understanding seasonality is critical for the analysis of nutrient discharges because of the following factors.

- ◆ The dry season is reflective of the base sanitary flows and loads from residential population and industrial contributions to wastewater. In contrast, the increased flows during wet weather events are attributed to inflow and infiltration (I&I) during such events, which can bias the discharge results.
- ◆ Wastewater treatment facilities are typically better suited to remove nutrient loads (if deemed necessary) during the warmer, dry season when the biological treatment kinetics are more favorable and there are fewer (if any) peak flow events.
- ◆ The Nutrient Management Strategy science plan led by the San Francisco Estuary Institute (SFEI) is currently underway to evaluate San Francisco Bay's resilience to nutrients. San Francisco Bay is expected to be less sensitive to nutrients during the wet season because the water is cooler, light irradiance in the Bay is reduced, turbidity in the Bay is elevated, and the hydraulic residence time in the Bay is reduced.

Seasonality is defined in the Dischargers' NPDES permits in different ways; furthermore, not all the permits have a seasonal definition. To provide a consistent basis for the purposes of this Group

Annual Report, the seasonal definition presented in Section 5.2.6 of the 2024 Permit was used. The wet and dry seasons are defined as follows:

- ◆ Dry season: May 1 through September 30
- ◆ Wet season: October 1 through April 30

3.5 Subembayments

The historical delineation of Subembayments by geographic locations (specifically bridges) is used throughout this report. The Subembayment delineations are derived from the San Francisco Bay Basin Plan² and are not necessarily indicative of the Bay's hydraulics or ecosystems. Subembayments are included merely to describe the overall geographic distribution of flows and loads across the Bay.

3.6 Influent Data

Influent monitoring data were included for the first time as part of the 2020 Group Annual Report. The data are limited to the 15 facilities that have a permitted ADWF capacity of greater than 10 mgd (n = 15 POTW dischargers out of 34 POTW dischargers). These 15 plants with an ADWF permitted capacity of greater than 10 mgd represent approximately 90% of the overall Baywide discharge flow. The influent sampling has been required quarterly beginning in July 2019; however, the most recent Permit reduced the required influent total phosphorus sampling frequency to twice per year. Note: samples need only to be collected when discharging (i.e., seasonal Dischargers shall collect samples only during the discharge season). For instances where dischargers provided more than the minimum influent sampling data requested, that information is provided in this report.

3.7 Recycled Water

Recycled water volumes have been included since the 2022 Group Annual Report. Recycled water volumes are of interest in nutrient management across the Bay to identify nutrient loads diverted from Bay discharge. Data were obtained from the State Water Board's Recycled Water website for all 34 dischargers.³

Recycled water monthly volumes are listed as acre-feet and mgd. The volumes are not broken out by various recycled water user types within the main report because the data are limited to total volumes for monthly values. While the State Water Board site does provide a breakdown by recycled water user type, it is limited to volumes over an entire calendar year (not by monthly volumes). In order to better understand recycled water uses for each individual discharger, the individual plant reports in Appendix A present the various recycled water user volumes by calendar year. The various recycled water uses as defined by the State Water Resources Control Board are as follows⁴:

² State Water Resources Control Board. (2019) *Figure 2-2: Hydraulic Planning Areas*. [Chapter 2: Beneficial Uses \(ca.gov\)](#)

³ https://www.waterboards.ca.gov/water_issues/programs/recycled_water/volumetric_annual_reporting.html

⁴ State Water Resources Control Board. (2020) *Volumetric Annual Report of Wastewater and Recycled Water: Help Guide for Volumetric Annual Report in GeoTracker*. February 8, 2021. https://www.waterboards.ca.gov/water_issues/programs/recycled_water/docs/2020/var_helpguide.pdf

- ◆ Golf course: includes irrigation of golf courses, whether public or private. Water used to maintain aesthetic impoundments within golf courses is also included with golf course irrigation.
- ◆ Landscape irrigation: includes parks, sports fields, green belts, landscaped areas. Irrigation of parks, schools, cemeteries, churches, residential, streetscapes, slope protection, or public facilities. Golf course irrigation is not included. Water to maintain aesthetic impoundments within landscaped areas is included with landscape irrigation. Fill stations primarily used for public use should be classified as landscape irrigation.
- ◆ Commercial: includes dual-plumbed projects, fire protection, other uses at commercial facilities not included in other categories. Includes uses by commercial water users, except landscape irrigation. A commercial water user is a water user that provides or distributes a product or service. Examples of commercial water uses are commercial building use (toilets, HVAC, etc.), car washes, laundries, and retail nurseries. Landscape irrigation of commercial building areas is to be classified as landscape irrigation if it is separately metered or if landscape is the dominant use of mixed uses served by a single meter. Fill stations, if they are primarily used for commercial use, should be classified as commercial use.
- ◆ Industrial: includes cooling towers and process water (including process water at wastewater treatment plants). Includes uses by industrial water users, except landscape irrigation and geothermal energy production. An industrial user is a water user that is primarily a manufacturer or processor of materials. Examples of industrial water uses are cooling towers, oil refining, process water, and mining. Landscape irrigation of industrial building areas is to be classified as landscape irrigation if it is separately metered or if landscape is the dominant use of mixed uses served by a single meter.
- ◆ Agricultural: includes irrigation, frost protection, agricultural reservoir augmentation. Irrigation of food, fiber, and fodder crops, and pastureland. This also includes Christmas tree production, pasture for farm animals, and wholesale plant nurseries.
- ◆ Potable Reuse: represents groundwater recharge, surface water augmentation, or direct potable reuse.
- ◆ Other: represents any not listed

The total volumes for each month and overall are calculated.

3.8 Trend Analysis

The Permit requires trending analysis with each report for both influent and effluent. Influent trending analysis includes quarterly data from July 2019 through September 2024 (at least 21 quarterly samples across 62 months). Note: the influent sampling is limited to Dischargers with a permitted capacity greater than 10 mgd.

The discharge data were evaluated to identify evidence of trends since May 2013. Due to the changes in sampling frequency between the Section 13267 Letter data and the Nutrient Watershed Permit requirements, there is an inconsistency in the reporting of flows and loads during the wet season. Specifically, the Section 13267 Letter data required that in addition to normal monthly sampling, two additional samples be taken in the wet season during peak wet weather events. This requirement is not included in the Nutrient Watershed Permits. As a result, an artificial bias has been introduced that was expected to overestimate the wet season load. A sensitivity analysis was

performed in 2015 for each Subembayment to confirm this bias. Based on that analysis, it was confirmed that the peak wet weather events did impact the trend analysis because the dataset is not large enough to offset such a large load. For example, there are a few instances (e.g., Lower South Bay ammonia loading) where the Section 13267 Letter data was several times greater than the annual average values and disproportionately skewed the trending analysis. As a result, the trend analysis was limited to the dry season, which best represents the actual base sanitary wastewater flows and loads for each plant.

The approach used to evaluate trend significance was the slope of a regression line. The slope was determined using the method of least squares.⁵ The sample set size varies for influent versus discharge (n = 21 over 5.2 years of influent sampling; n = 60 over 11.4 years of discharge sampling). An alpha of 0.05 was assumed which denotes that a 5 percent risk of concluding that a difference exists when there is no actual difference (i.e., a false positive result). A trend was denoted significant if the p-value was less than alpha. Furthermore, the percent change with respect to average value was included to serve as a reference or baseline for the extent of change over time.

3.9 Compliance Schedule Milestones and Progress Reporting

The Permit has established a timeline for compliance milestones and requires this Group Annual Report to provide a summary of the progress toward meeting these milestones. The Permit requires all Dischargers, at minimum, to identify preliminary alternatives by April 1, 2025 (see Table 5 in the Permit). However, if a Discharger is an Early Actor (as defined by Provision 6.3.6 of the Permit), the Discharger is instead required to provide annual status updates. If a Discharger has already identified a compliance pathway, the Discharger is required to describe the pathway, begin implementation, and provide a status update by April 1, 2025.

To evaluate the compliance of the Dischargers with Provisions 6.3.2, 6.3.3, 6.3.5, and 6.3.6 of the Permit, a request for information (RFI) was distributed to each Discharger. The RFI requested that each Discharger provide information indicating whether the Discharger is an Early Actor, whether the Discharger has already identified a compliance pathway, or if the Discharger has identified preliminary alternatives for complying with the Permit. Additional information regarding the types of alternatives and compliance pathways was also collected and summarized. This information can be found in Appendix B.

⁵ Montgomery, D.C.; Peck, E.A.; Vining, G.G. (2012) Introduction to Linear Regression Analysis. Published by John Wiley and Sons, Inc. Hoboken, NJ. Pages 12-66.

4 Influent Data Review Findings

This section presents a data discussion for the following Influent parameters:

1. Influent Flow (reported as mgd)
2. Total Ammonia (reported as kg N/d)
3. Nitrate plus Nitrite (NO_x, reported as kg N/d)
4. Total Inorganic Nitrogen (TIN, reported as kg N/d)
5. Total Kjeldahl Nitrogen (TKN; reported as kg N/d)
6. Total Nitrogen (TN, reported as kg N/d)
7. Total Phosphorus (TP, reported as kg P/d)

The subsections that follow present data for each parameter as a historical plot for each Subembayment and the Bay, as well in a tabular format by POTW and for each of the five Subembayments. The data are presented for both the annual average (October 1 through September 30 of the following year) and dry season average (May 1 through September 30 of the same year).

There are several limitations for the overall influent dataset as follows:

- ◆ Small size of dataset (quarterly sampling began in July 2019; n = 21). Furthermore, the global pandemic impacts approximately one-third of the sampling quarters.
- ◆ The data is limited to dischargers with a permitted ADWF capacity of greater than 10 mgd (15 out of a possible 34 dischargers; the permitted capacity for such dischargers represents 92 percent of the Bay discharge permitted capacity).
- ◆ Quarterly sampling was not conducted by all Dischargers in the same month. To reconcile such time variance, a quarterly average was assumed while plotting loads (e.g., refer to Figure 4-2).
- ◆ There are a few instances where sampling for a particular nutrient did not occur (e.g., Palo Alto did not sample ammonia during the first quarter of sampling from July through September 2019).
- ◆ Analytical issues with the influent sampling matrix. Specifically, the effluent matrix is relatively cleaner compared to raw influent and is subsequently less prone to analytical issues. There are several instances in the 2020/2021 dataset where ammonia values were greater than TKN for the same sample. This indicates an analytical and/or sampling issue, since TKN is the sum of ammonia and organic nitrogen. Such analytical issues can skew the trending.

A discussion of the results is provided in Section 7.3.

4.1 Flow

The historical average monthly influent flows from July 2019 through September 2024 are presented in Figure 4-1. The annual average (i.e., twelve months from October 1 to September 30) and dry season average monthly (i.e., May 1 through September 30) influent flows were calculated based on reported flows in Table 4-1 and Table 4-2, respectively. In addition, the annual average and dry season average monthly influent flows for each Subembayment are provided in Table 4-3 and Table 4-4, respectively.

A summary of the influent data review findings is as follows (**new findings for 2023/2024 in bold**):

- ◆ The 2018/2019 dataset is limited to July 2019 through September 2019. As a result, annual average values were excluded for 2018/2019.
- ◆ All the dischargers with ADWF permitted capacity greater than 10 mgd provide average monthly data for each month evaluated (July 2019 through September 2024; see Table 4-1 and Table 4-2).
- ◆ As expected, the largest average monthly influent flows occur during the wet season (October 1 through April 30 of the following year; refer to Figure 4-1). **The relatively large wet weather events this past year resulted in relatively large increases in average monthly flows, especially during February 2024. The elevated wet season flows carried through to the dry season flows as those were higher than the last several dry seasons.**
- ◆ **Average Annual Flows:** from 2023 to 2024, the average annual flows decreased from 487 mgd to 469 mgd. Of the large POTWs, San Jose (Lower South Bay Discharger) increased from 100 to 110 mgd while SFPUC Southeast (South Bay Discharger) decreased from 64.4 to 61.3 mgd. Other large POTWs (EBMUD, EBDA, and Central San) observed decreases of 3.8 to 7 mgd average annual flows. Most other POTWs experienced either no significant change or nominal 0.5 to 3.1 mgd increases in average annual flows.
- ◆ **Dry Season Flows:** the 2024 dry season average flows are highest recorded since sampling began in July 2019. The largest POTW (San Jose, Lower South Bay Discharger) had a nearly 9% increase in influent flow compared to 2023 (approximately 8.8 mgd increase). Other large POTWs (EBMUD and SFPUC Southeast) observed flow decreases of 1.5 and 0.1 mgd. Other POTWs experienced increases or decreases in flow of around 0.1 to 1.7 mgd.
- ◆ **Dry Season Trending:** this is the second year where dry season trending analysis was performed for influent flows. Trending analysis suggests that there is no observable trend for all Subembayments (except San Pablo Bay) over the 6-year dry season dataset. This trending is based on the least-squares correlation test selected as the basis for trends analysis over the entire dry season dataset since sampling began in 2019 (see Section 3.8).
- ◆ The South Bay and Lower South Bay together account for over half of the influent flows, regardless of season (see Table 4-3 and Table 4-4).

A discussion of the results is provided in Section 7.4.

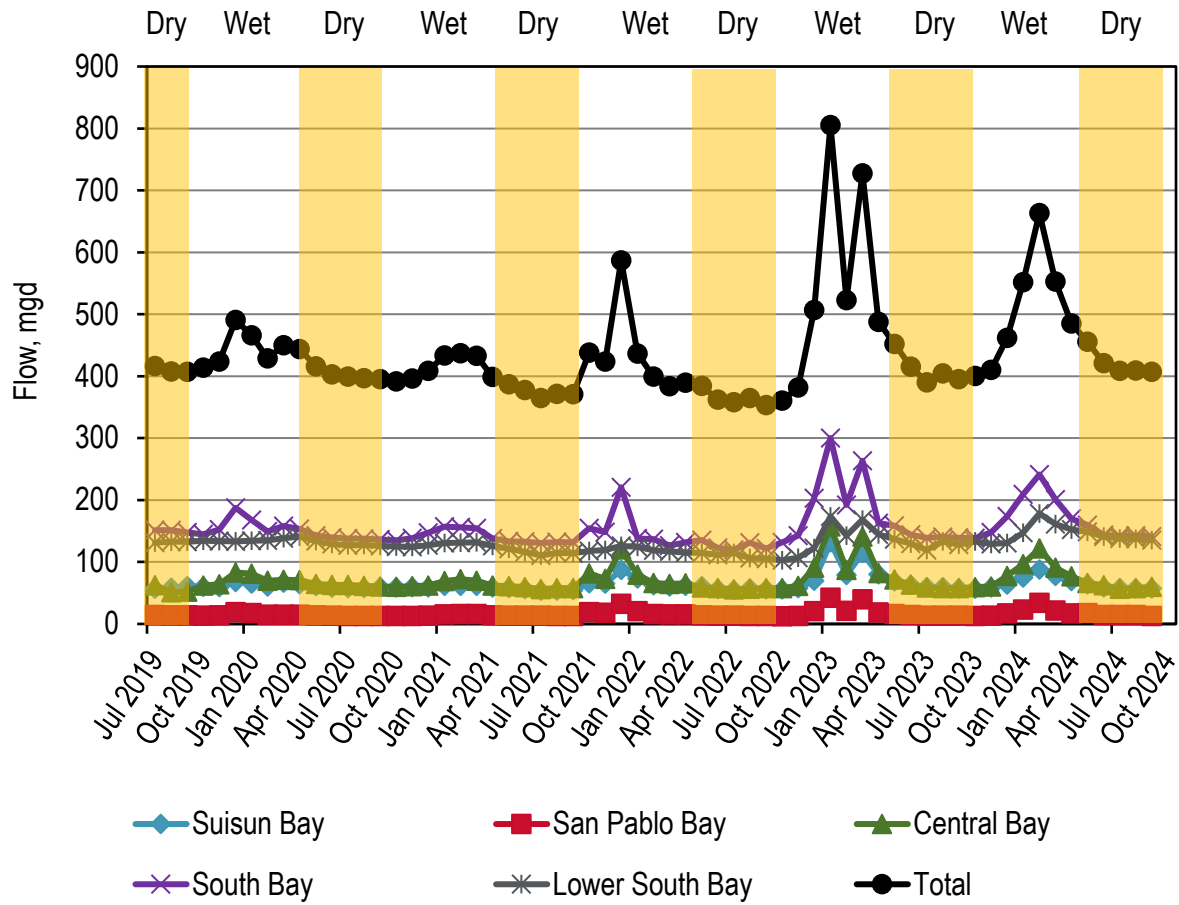


Figure 4-1. Influent: Historical Average Monthly Flow Values

Table 4-1. Influent: Annual Average Flows to each Plant (mgd)*

Discharger	Subembayment	Permitted Capacity ^(a)	2018/2019 ^{(a), (b)}	2019/2020 ^(b)	2020/2021 ^(b)	2021/2022 ^(b)	2022/2023 ^(b)	2023/2024 ^(b)
American Canyon	San Pablo Bay	2.5	*	--	--	--	--	--
Benicia	San Pablo Bay	4.5	*	--	--	--	--	--
Burlingame	South Bay	5.5	*	--	--	--	--	--
Central San	Suisun Bay	53.8	*	36.1	32.9	35.4	43.9	36.9
CMSA	Central Bay	10	*	--	--	--	--	--
Port Costa	San Pablo Bay	0.033	*	--	--	--	--	--
Delta Diablo	Suisun Bay	19.5	*	12.7	13.2	14.1	14.3	13.7
EBDA	South Bay	107.8	*	65.5	64.1	64.2	74.4	70.6
EBMUD	Central Bay	120	*	53.8	49.4	54.9	64.3	57.3
FSSD	Suisun Bay	23.7	*	12.6	11.9	13.9	16.6	14.7
Las Gallinas ^(c)	San Pablo Bay	2.92	*	--	--	--	--	--
Paradise Cove	Central Bay	0.04	*	--	--	--	--	--
Tiburon	Central Bay	0.98	*	--	--	--	--	--
Millbrae	South Bay	3	*	--	--	--	--	--
Mt. View	Suisun Bay	3.2	*	--	--	--	--	--
Napa ^(c)	San Pablo Bay	15.4	*	6.27	6.04	7.44	9.05	8.19
Novato	San Pablo Bay	7	*	--	--	--	--	--
Palo Alto	Lower South Bay	39	*	17.6	16.6	16.9	20.3	20.3
Petaluma ^(c)	San Pablo Bay	6.7	*	--	--	--	--	--
Pinole	San Pablo Bay	4.06	*	--	--	--	--	--
Rodeo	San Pablo Bay	1.14	*	--	--	--	--	--
SFO Airport	South Bay	2.2	*	--	--	--	--	--
SFPUC Southeast	South Bay	85.4	*	54.3	48.1	52.6	64.4	61.3
San Jose	Lower South Bay	167	*	102	94.3	86.7	100	110
San Mateo	South Bay	15.7	*	10.6	9.55	10.4	13.3	12.1
SMCSD	Central Bay	1.8	*	--	--	--	--	--
SASM	Central Bay	3.6	*	--	--	--	--	--
SVCW	South Bay	29	*	12.8	12.0	13.8	15.4	14.9
Sonoma Valley ^(c)	San Pablo Bay	3	*	--	--	--	--	--
South SF	South Bay	13	*	7.35	6.71	7.66	8.90	8.60
Sunnyvale	Lower South Bay	29.5	*	12.9	12.4	12.3	13.5	13.6
Treasure Island	Central Bay	2	*	--	--	--	--	--
Vallejo	San Pablo Bay	15.5	*	8.29	7.85	9.55	10.8	9.67
West County	Central Bay	28.5	*	14.1	12.9	14.9	18.0	16.6
Total ^(d)		827	* ^(e)	427	398	415	487	469

* Values for 2018/2019 are not shown as they are limited to July 2019 through September 2019.

- Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data not required as such dischargers have a permitted capacity of less than 10 mgd, whereas a "0" indicates a value of zero.
- No discharge during a portion or all of the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- Totals not provided due to an incomplete dataset.

Table 4-2. Influent: Dry Season Average Flows to each Plant (mgd)*

Discharger	Subembayment	Permitted Capacity ^(a)	2019 (a), (b), *	2020 (a), (b)	2021 ^{(a),} (b)	2022 (a), (b)	2023 (a), (b)	2024 (a), (b)
American Canyon	San Pablo Bay	2.5	--	--	--	--	--	--
Benicia	San Pablo Bay	4.5	--	--	--	--	--	--
Burlingame	South Bay	5.5	--	--	--	--	--	--
Central San	Suisun Bay	53.8	34.7	33.8	30.7	31.5	34.6	33.5
CMSA	Central Bay	10	--	--	--	--	--	--
Port Costa	San Pablo Bay	0.033	--	--	--	--	--	--
Delta Diablo	Suisun Bay	19.5	12.6	13.0	13.2	13.5	13.6	13.5
EBDA	South Bay	107.8	69.4	64.3	63.0	60.8	66.1	66.1
EBMUD	Central Bay	120	50.9	49.6	46.6	45.7	48.7	47.2
FSSD	Suisun Bay	23.7	11.4	12.0	11.3	12.0	13.4	12.1
Las Gallinas ^(c)	San Pablo Bay	2.92	--	--	--	--	--	--
Paradise Cove	Central Bay	0.04	--	--	--	--	--	--
Tiburon	Central Bay	0.98	--	--	--	--	--	--
Millbrae	South Bay	3	--	--	--	--	--	--
Mt. View	Suisun Bay	3.2	--	--	--	--	--	--
Napa ^(c)	San Pablo Bay	15.4	6.28	5.50	5.60	5.94	6.33	6.26
Novato	San Pablo Bay	7	--	--	--	--	--	--
Palo Alto	Lower South Bay	39	18.5	16.3	16.0	16.5	18.2	19.4
Petaluma ^(c)	San Pablo Bay	6.7	--	--	--	--	--	--
Pinole	San Pablo Bay	4.06	--	--	--	--	--	--
Rodeo	San Pablo Bay	1.14	--	--	--	--	--	--
SFO Airport	South Bay	2.2	--	--	--	--	--	--
SFPUC Southeast	South Bay	85.4	51.6	45.3	42.4	44.4	48.2	48.0
San Jose	Lower South Bay	167	101	99.8	87.9	82.3	99.1	108
San Mateo	South Bay	15.7	9.38	9.93	9.15	9.17	10.5	10.4
SMCSD	Central Bay	1.8	--	--	--	--	--	--
SASM	Central Bay	3.6	--	--	--	--	--	--
SVCW	South Bay	29	12.5	12.1	11.1	11.9	11.9	13.6
Sonoma Valley ^(c)	San Pablo Bay	3	--	--	--	--	--	--
South SF	South Bay	13	7.29	6.97	6.45	7.17	7.56	7.56
Sunnyvale	Lower South Bay	29.5	12.6	12.6	12.1	11.7	12.1	12.9
Treasure Island	Central Bay	2	--	--	--	--	--	--
Vallejo	San Pablo Bay	15.5	7.74	7.75	7.66	7.42	7.77	8.62
West County	Central Bay	28.5	12.6	12.9	11.8	11.8	13.3	13.4
Total ^(d)		827	419	402	375	372	411	420

* 2019 dataset limited to July through September compared against May through September for 2020 and beyond.

- Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data not required as such dischargers have a permitted capacity of less than 10 mgd, whereas a "0" indicates a value of zero.
- No discharge during a portion or all of the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.

Table 4-3. Influent: Annual Average Flows by Subembayment, Flow (mgd)*

Subembayment	Permitted Capacity ^(a)	2018/ 2019 ^(a)	2019/ 2020 ^(a)	2020/ 2021 ^(a)	2021/ 2022 ^(a)	2022/ 2023 ^(a)	2023/ 2024 ^(a)
Suisun Bay	100	*	61.4	58.0	63.4	74.7	65.3
San Pablo Bay	62.8	*	14.6	13.9	17.0	19.9	17.9
Central Bay	167	*	67.9	62.3	69.8	82.3	74.0
South Bay	262	*	151	141	149	176	167
Lower South Bay	236	*	133	123	116	134	144
Total	827	*	427	398	415	487	469

* Values for 2018/2019 are not shown as they are limited to July 2019 through September 2019.

- a. Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.

Table 4-4. Influent: Dry Season Average Flows by Subembayment, Flow (mgd)*

Subembayment	Permitted Capacity ^(a)	2019 ^{(a),*}	2020 ^(a)	2021 ^(a)	2022 ^(a)	2023 ^(a)	2024 ^(a)	Trend ^(b,c)
Suisun Bay	100	58.7	58.8	55.2	57.0	61.5	59.1	None
San Pablo Bay	62.8	14.0	13.2	13.3	13.4	14.1	14.9	Up (1.4%/yr)
Central Bay	167	63.6	62.6	58.4	57.5	62.0	60.6	None
South Bay	262	150	139	132	133	144	146	None
Lower South Bay	236	132	129	116	110	129	140	None
Total	827	419	402	375	372	411	420	None

* 2019 dataset limited to July through September compared against May through September for 2020 and beyond.

- a. Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- b. Trend analysis is based on average monthly values. Discernible trends were identified based on the slope of a regression line determined using the method of least squares to fit the data ($\alpha = 0.05$). Sample size is at a minimum 21. Where "None" is stated, the limited dataset does not indicate a statistically relevant trend.
- c. The percent change represents the change per year as a percentage of the average value over the entire dataset (2019-2024) (not considered if trend is "None").

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4.2 Total Ammonia

The historical average quarterly influent ammonia loads from July 2019 through September 2024 are presented in Figure 4-2. The annual average (i.e., twelve months from October 1 to September 30) and dry season average monthly (i.e., May 1 through September 30) influent loads were calculated based on reported flows and concentrations in Table 4-5 and Table 4-6, respectively.

A summary of the influent data review findings is as follows (**new findings for 2023/2024 in bold**):

- ◆ The 2018/2019 dataset is limited to July 2019 through September 2019. As a result, annual average values were excluded.
- ◆ There are a few instances of missing data per plant (see Table 4-5 and Table 4-6; primarily from 2019). Despite missing data in 2019, the average annual loads from 2019/2020 and dry season loads from 2019 represent the largest loads.
- ◆ The quarterly sampling makes it challenging to infer any impacts on influent nutrient loads from the relatively large wet weather events in December 2022, January 2023, and March 2023.
- ◆ **Average Annual Loads: overall increase since last year of approximately 3,500 kg N/d. The largest increase was from San Jose (Lower South Bay Discharger; 3,300 kg N/d increase compared to the previous year), followed by EBDA (South Bay Discharger; 350 kg N/d increase compared to the previous year). In contrast, EBMUD's (Central Bay Discharger) average annual load decreased approximately 350 kg N/d.**
- ◆ **Dry Season Loads: the 2023 dry season loads increased by 1,900 kg N/d compared to the previous year. San Jose (Lower South Bay Discharger) and EBDA (South Bay Discharger) had the largest increases (1,500 kg N/d and 220 kg N/d, respectively).**
- ◆ **Dry Season Trending: this is the second year when dry season trending analysis was performed for the influent ammonia loads. Trending analysis suggests that all the Subembayments and Baywide have no emerging trend over the 6-year dry season dataset.** This trending is based on the least-squares correlation test selected as the basis for trends analysis over the entire dry season dataset since sampling began in 2019 (see Section 3.8).
- ◆ Similar to flow, the South Bay and Lower South Bay together account for over half of the influent ammonia loads, regardless of season (see Table 4-7 and Table 4-8).

A discussion of the results is provided in Section 7.4.

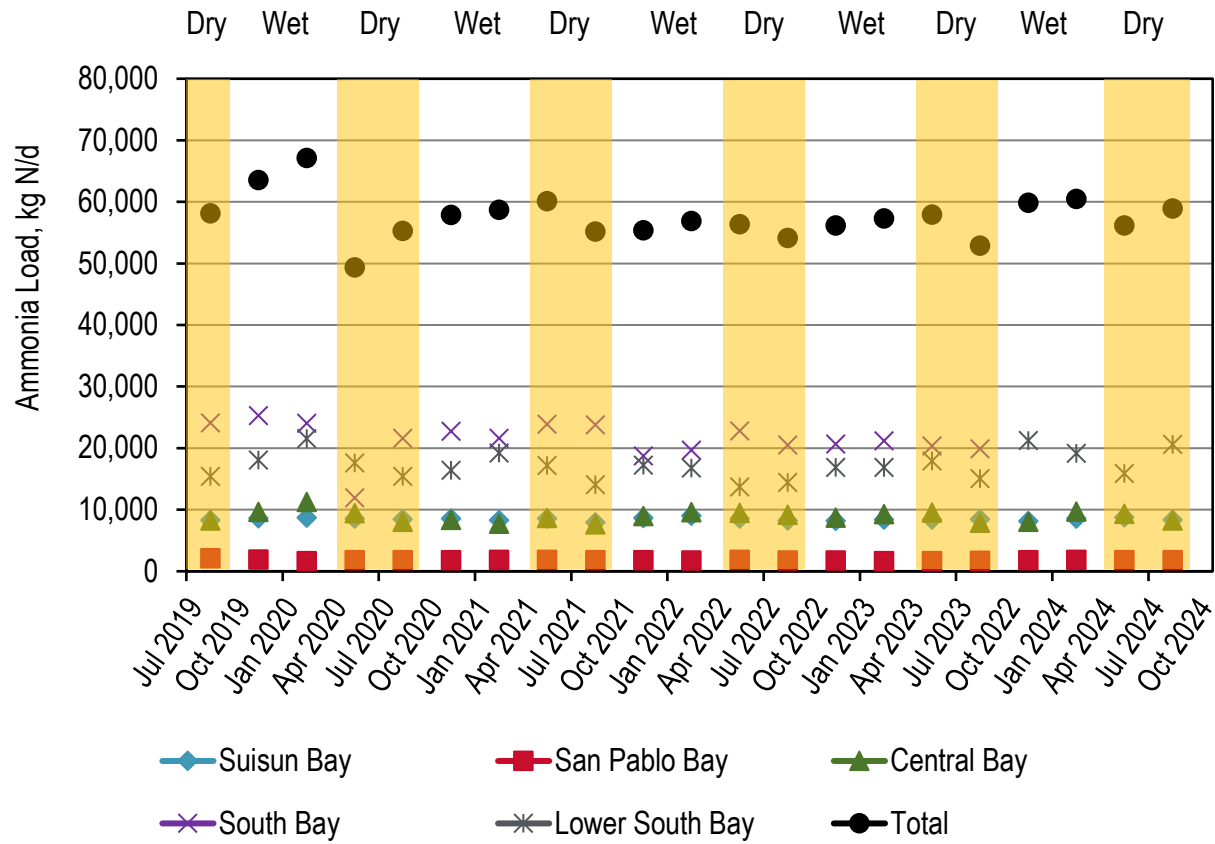


Figure 4-2. Influent: Historical Average Monthly Total Ammonia Loads

Table 4-5. Influent: Annual Average Loads to each Plant, Total Ammonia (kg N/d)

Discharger	Subembayment	Permitted Capacity ^(a)	2018/2019 ^{(a), (b)}	2019/2020 ^(b)	2020/2021 ^(b)	2021/2022 ^(b)	2022/2023 ^(b)	2023/2024 ^(b)
American Canyon	San Pablo Bay	2.5	*	--	--	--	--	--
Benicia	San Pablo Bay	4.5	*	--	--	--	--	--
Burlingame	South Bay	5.5	*	--	--	--	--	--
Central San	Suisun Bay	53.8	*	5,100	4,920	4,830	4,790	4,660
CMSA	Central Bay	10	*	--	--	--	--	--
Port Costa	San Pablo Bay	0.033	*	--	--	--	--	--
Delta Diablo	Suisun Bay	19.5	*	1,840	1,830	2,040	1,920	2,130
EBDA	South Bay	107.8	*	9,390	9,530	9,600	9,180	9,530
EBMUD	Central Bay	120	*	7,460	6,340	7,490	7,000	6,660
FSSD	Suisun Bay	23.7	*	1,640	1,600	1,760	1,640	1,600
Las Gallinas ^(c)	San Pablo Bay	2.92	*	--	--	--	--	--
Paradise Cove	Central Bay	0.04	*	--	--	--	--	--
Tiburon	Central Bay	0.98	*	--	--	--	--	--
Millbrae	South Bay	3	*	--	--	--	--	--
Mt. View	Suisun Bay	3.2	*	--	--	--	--	--
Napa ^(c)	San Pablo Bay	15.4	*	820	876	877	808	879
Novato	San Pablo Bay	7	*	--	--	--	--	--
Palo Alto	Lower South Bay	39	*	2,300	2,210	2,380	2,530	2,640
Petaluma ^(c)	San Pablo Bay	6.7	*	--	--	--	--	--
Pinole	San Pablo Bay	4.06	*	--	--	--	--	--
Rodeo	San Pablo Bay	1.14	*	--	--	--	--	--
SFO Airport	South Bay	2.2	*	--	--	--	--	--
SFPUC Southeast	South Bay	85.4	*	8,750	8,820	5,570	6,160	6,170
San Jose	Lower South Bay	167	*	14,300	13,200	11,700	12,600	15,900
San Mateo	South Bay	15.7	*	1,590	1,440	1,490	1,410	1,450
SMCSD	Central Bay	1.8	*	--	--	--	--	--
SASM	Central Bay	3.6	*	--	--	--	--	--
SVCW	South Bay	29	*	2,410	2,490	2,600	2,400	2,330
Sonoma Valley ^(c)	San Pablo Bay	3	*	--	--	--	--	--
South SF	South Bay	13	*	1,030	971	1,170	1,300	1,100
Sunnyvale	Lower South Bay	29.5	*	1,500	1,390	1,500	1,550	1,760
Treasure Island	Central Bay	2	*	--	--	--	--	--
Vallejo	San Pablo Bay	15.5	*	966	954	926	872	954
West County	Central Bay	28.5	*	1,850	1,760	1,760	1,840	1,690
Total ^(d)		827	* ^(e)	61,000	58,300	55,700	56,000	59,500

* Values for 2018/2019 are not shown as they are limited to July 2019 through September 2019.

- Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data not required as such dischargers have a permitted capacity of less than 10 mgd, whereas a "0" indicates a value of zero.
- No discharge during a portion or all of the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- Totals not provided due to an incomplete dataset.

Table 4-6. Influent: Dry Season Average Loads to each Plant, Total Ammonia (kg N/d)*

Discharger	Subembayment	Permitted Capacity ^(a)	2019 ^{(b), *}	2020 ^(b)	2021 ^(b)	2022 ^(b)	2023 ^(b)	2024 ^(b)
American Canyon	San Pablo Bay	2.5	--	--	--	--	--	--
Benicia	San Pablo Bay	4.5	--	--	--	--	--	--
Burlingame	South Bay	5.5	--	--	--	--	--	--
Central San	Suisun Bay	53.8	4,810	4,980	4,700	4,790	4,680	4,590
CMSA	Central Bay	10	--	--	--	--	--	--
Port Costa	San Pablo Bay	0.033	--	--	--	--	--	--
Delta Diablo	Suisun Bay	19.5	1,820	1,910	1,830	1,880	2,010	2,090
EBDA	South Bay	107.8	6,580	8,880	9,420	9,370	9,260	9,480
EBMUD	Central Bay	120	6,530	6,760	6,410	7,540	6,780	6,500
FSSD	Suisun Bay	23.7	1,680	1,530	1,710	1,720	1,730	1,560
Las Gallinas ^(c)	San Pablo Bay	2.92	--	--	--	--	--	--
Paradise Cove	Central Bay	0.04	--	--	--	--	--	--
Tiburon	Central Bay	0.98	--	--	--	--	--	--
Millbrae	South Bay	3	--	--	--	--	--	--
Mt. View	Suisun Bay	3.2	--	--	--	--	--	--
Napa ^(c)	San Pablo Bay	15.4	1,050	770	897	919	861	932
Novato	San Pablo Bay	7	--	--	--	--	--	--
Palo Alto	Lower South Bay	39	^(e)	2,110	2,240	2,470	2,540	2,570
Petaluma ^(c)	San Pablo Bay	6.7	--	--	--	--	--	--
Pinole	San Pablo Bay	4.06	--	--	--	--	--	--
Rodeo	San Pablo Bay	1.14	--	--	--	--	--	--
SFO Airport	South Bay	2.2	--	--	--	--	--	--
SFPUC Southeast	South Bay	85.4	10,000	8,330	9,750	6,250	6,040	6,510
San Jose	Lower South Bay	167	13,600	12,100	10,600	10,300	10,800	12,300
San Mateo	South Bay	15.7	1,440	1,430	1,390	1,320	1,430	1,490
SMCSD	Central Bay	1.8	--	--	--	--	--	--
SASM	Central Bay	3.6	--	--	--	--	--	--
SVCW	South Bay	29	2,550	2,090	2,660	2,460	2,250	2,260
Sonoma Valley ^(c)	San Pablo Bay	3	--	--	--	--	--	--
South SF	South Bay	13	1,020	988	909	1,310	1,190	1,030
Sunnyvale	Lower South Bay	29.5	1,820	1,180	1,340	1,530	1,670	1,750
Treasure Island	Central Bay	2	--	--	--	--	--	--
Vallejo	San Pablo Bay	15.5	1,060	988	908	883	891	954
West County	Central Bay	28.5	1,720	1,750	1,720	1,790	1,770	1,730
Total ^(d)		827	58,200	55,800	56,400	54,500	53,900	55,800

* 2019 dataset limited to July through September compared against May through September for 2020 and beyond.

- Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data not required as such dischargers have a permitted capacity of less than 10 mgd, whereas a "0" indicates a value of zero.
- No discharge during a portion or all of the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- Permit required data not provided.

Table 4-7. Influent: Annual Average Total Ammonia Loads by Subembayment (kg N/d)^{*,**}

Subembayment	2018/2019 (a)	2019/2020 (a)	2020/2021 (a)	2021/2022 (a)	2022/2023 (a)	2023/2024 (a)
Suisun Bay	*	8,580	8,350	8,620	8,350	8,380
San Pablo Bay	*	1,790	1,830	1,800	1,680	1,830
Central Bay	*	9,310	8,100	9,310	8,840	8,340
South Bay	*	23,200	23,200	20,400	20,500	20,600
Lower South Bay	*	18,200	16,800	15,500	16,700	20,300
Total	*	61,000	58,300	55,700	56,000	59,500

* Values for 2018/2019 are not shown as they are limited to July 2019 through September 2019.

** Refer to Table 4-5 for a list of dischargers that did not sample for each timeframe.

- a. Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.

Table 4-8. Influent: Dry Season Average Total Ammonia Loads by Subembayment (kg N/d)^{*,**}

Subembayment	2019 (a),*	2020 (a)	2021 (a)	2022 (a)	2023 (a)	2024 (a)	Trend (b)
Suisun Bay	8,300	8,420	8,240	8,380	8,420	8,240	None
San Pablo Bay	2,100	1,760	1,810	1,780	1,750	1,890	None
Central Bay	8,250	8,520	8,130	9,330	8,540	8,240	None
South Bay	24,100	21,700	24,100	20,700	20,200	20,800	None
Lower South Bay	15,400	15,400	14,100	14,300	15,000	16,600	None
Total	58,200	55,800	56,400	54,500	53,900	55,800	None

* 2019 dataset limited to July through September compared against May through September for 2020 and beyond.

** Refer to Table 4-6 for a list of dischargers that did not sample for each timeframe.

- a. Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- b. Trend analysis is based on average monthly values. Discernible trends were identified based on the slope of a regression line determined using the method of least squares to fit the data ($\alpha = 0.05$). Sample size is at a minimum 21. Where "None" is stated, the limited dataset does not indicate a statistically relevant. Trend analysis based on the approach discussed in Section 3.8. The percent change represents the change per year as a percentage of the average value over the entire dataset (2019-2024) (not listed if trend is "None").

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4.3 Nitrate + Nitrite (NO_x)

The historical average quarterly influent NO_x loads from July 2019 through September 2024 are presented in Figure 4-3. The annual average (i.e., twelve months from October 1 to September 30) and dry season average monthly (i.e., May 1 through September 30) influent loads were calculated based on reported flows and concentrations in Table 4-9 and Table 4-10, respectively.

A summary of the influent data review findings is as follows (**new findings for 2023/2024 in bold**):

- ◆ Influent NO_x loads and concentrations have the smallest relative contribution of the nitrogen species measured. On average, the influent NO_x loads contribute less than 2 percent to the influent total nitrogen loads (data not shown).
- ◆ The 2018/2019 dataset is limited to July 2019 through September 2019. As a result, annual average values were excluded.
- ◆ There are a few instances of missing data per plant (see Table 4-9 and Table 4-10; primarily from 2019). Despite missing data in 2019, the Baywide average annual loads from 2019/2020 and dry season loads from 2019 represent the largest loads. As previously noted, seasonal dischargers only need to collect samples when discharging (e.g., Napa typically does not discharge during the dry season and as such does not have influent NO_x data).
- ◆ **Average Annual:** the total load decreased by 130 kg N/d compared to the previous year. San Jose (Lower South Bay Discharger) experienced the largest increase in load (150 kg N/d). The other POTWs had individual nominal increases/decreases of less than 100 kg N/d.
- ◆ **Dry Season:** overall increase since last year of approximately 600 kg N/d, with San Jose (Lower South Bay Discharger) experiencing the most profound increase (approximately 970 kg N/d). Despite the increase, the dry season loads are approximately half of the load observed in the first year of sampling (2018/2019).
- ◆ **Dry Season Trending:** this is the second year when dry season trending analysis was performed for the influent NO_x loads. Trending analysis suggests the South Bay Subembayment has a downward trend over the 6-year dry season dataset. The other Subembayments and Baywide did not have any emerging trends. This trending is based on the least-squares correlation test selected as the basis for trends analysis over the entire dry season dataset since sampling began in 2019 (see Section 3.8).
- ◆ The Central Bay and Lower South Bay together account for over half of the influent NO_x loads, regardless of season (see Table 4-11 and Table 4-12).

A discussion of the results is provided in Section 7.4.

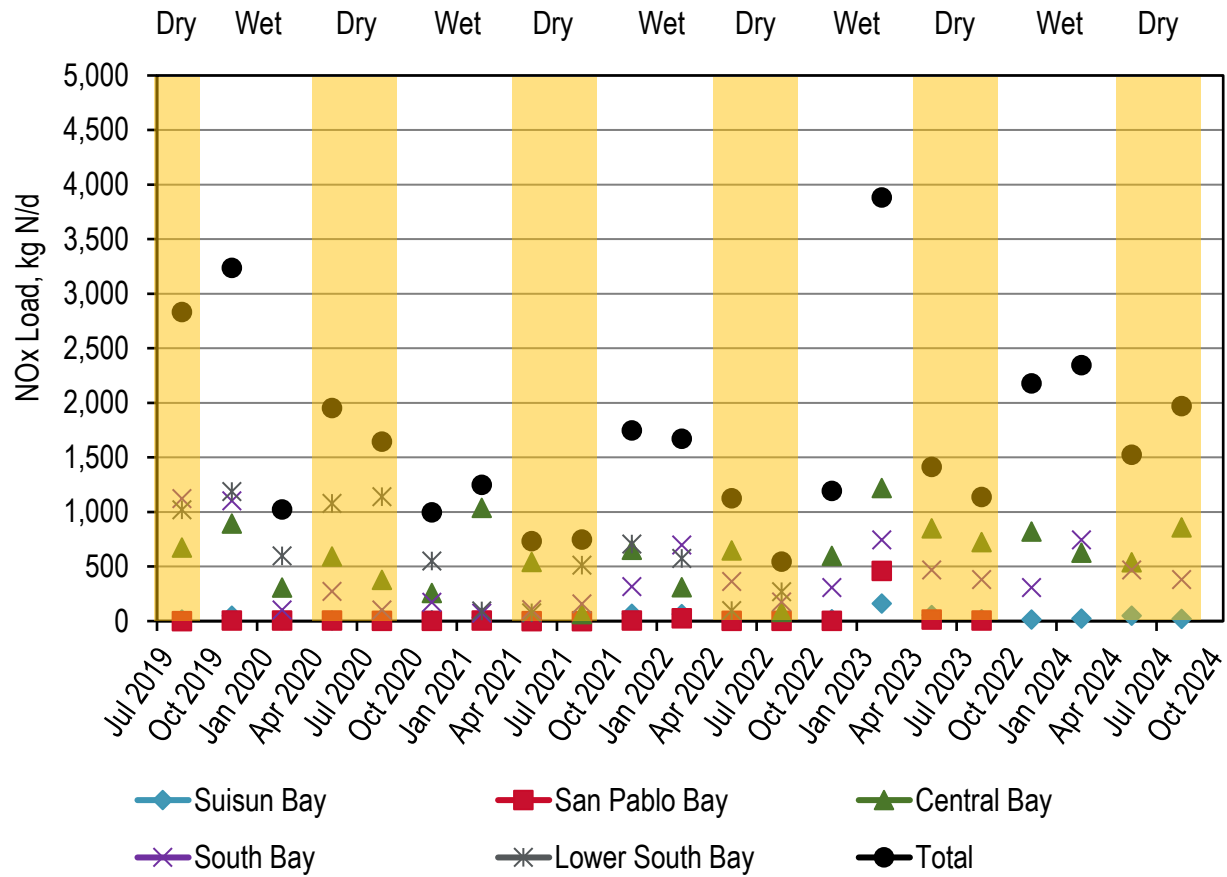


Figure 4-3. Influent: Historical Average Monthly NOx Loads

Table 4-9. Influent: Annual Average Loads to each Plant, NO_x (kg N/d)*

Discharger	Subembayment	Permitted Capacity ^(a)	2018/2019 ^{(a), (b)}	2019/2020 ^(b)	2020/2021 ^(b)	2021/2022 ^(b)	2022/2023 ^(b)	2023/2024 ^(b)
American Canyon	San Pablo Bay	2.5	*	--	--	--	--	--
Benicia	San Pablo Bay	4.5	*	--	--	--	--	--
Burlingame	South Bay	5.5	*	--	--	--	--	--
Central San	Suisun Bay	53.8	*	1.89	2.94	7.58	45.1	7.99
CMSA	Central Bay	10	*	--	--	--	--	--
Port Costa	San Pablo Bay	0.033	*	--	--	--	--	--
Delta Diablo	Suisun Bay	19.5	*	12.8	5.31	24.3	9.65	3.62
EBDA	South Bay	107.8	*	46.9	84.0	114	195	115
EBMUD	Central Bay	120	*	520	450	390	838	799
FSSD	Suisun Bay	23.7	*	7.24	8.47	7.78	7.78	7.78
Las Gallinas ^(c)	San Pablo Bay	2.92	*	--	--	--	--	--
Paradise Cove	Central Bay	0.04	*	--	--	--	--	--
Tiburon	Central Bay	0.98	*	--	--	--	--	--
Millbrae	South Bay	3	*	--	--	--	--	--
Mt. View	Suisun Bay	3.2	*	--	--	--	--	--
Napa ^(c)	San Pablo Bay	15.4	*	2.30	1.54	3.34	16.3	0.605
Novato	San Pablo Bay	7	*	--	--	--	--	--
Palo Alto	Lower South Bay	39	*	16.4	7.29	34.1	31.9	9.44
Petaluma ^(c)	San Pablo Bay	6.7	*	--	--	--	--	--
Pinole	San Pablo Bay	4.06	*	--	--	--	--	--
Rodeo	San Pablo Bay	1.14	*	--	--	--	--	--
SFO Airport	South Bay	2.2	*	--	--	--	--	--
SFPUC Southeast	South Bay	85.4	*	295	41.7	218	182	169
San Jose	Lower South Bay	167	*	982	299	375	362	512
San Mateo	South Bay	15.7	*	22.3	4.61	7.59	66.2	16.3
SMCSD	Central Bay	1.8	*	--	--	--	--	--
SASM	Central Bay	3.6	*	--	--	--	--	--
SVCW	South Bay	29	*	47.0	4.95	47.9	16.9	65.2
Sonoma Valley ^(c)	San Pablo Bay	3	*	--	--	--	--	--
South SF	South Bay	13	*	6.48	3.73	2.39	13.0	11.6
Sunnyvale	Lower South Bay	29.5	*	2.87	2.98	2.00	6.25	9.94
Treasure Island	Central Bay	2	*	--	--	--	--	--
Vallejo	San Pablo Bay	15.5	*	2.01	1.37	6.36	108	8.07
West County	Central Bay	28.5	*	23.7	25.7	34.5	25.7	56.8
Total ^(d)		827	* ^(e)	1,990	944	1,270	1,920	1,790

* Values for 2018/2019 are not shown as they are limited to July 2019 through September 2019.

- Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data not required as such dischargers have a permitted capacity of less than 10 mgd, whereas a "0" indicates a value of zero.
- No discharge during a portion or all of the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- Totals not provided due to an incomplete dataset.

Table 4-10. Influent: Dry Season Average Loads to each Plant, NO_x (kg N/d)*

Discharger	Subembayment	Permitted Capacity ^(a)	2019 ^{(a), (b), *}	2020 ^{(a), (b)}	2021 ^{(a), (b)}	2022 ^{(a), (b)}	2023 ^{(a), (b)}	2024 ^{(a), (b)}
American Canyon	San Pablo Bay	2.5	--	--	--	--	--	--
Benicia	San Pablo Bay	4.5	--	--	--	--	--	--
Burlingame	South Bay	5.5	--	--	--	--	--	--
Central San	Suisun Bay	53.8	2.71	2.11	1.79	2.32	25.6	3.29
CMSA	Central Bay	10	--	--	--	--	--	--
Port Costa	San Pablo Bay	0.033	--	--	--	--	--	--
Delta Diablo	Suisun Bay	19.5	2.93	3.12	3.32	3.28	4.87	2.77
EBDA	South Bay	107.8	^(e)	55.0	63.5	76.6	159	109
EBMUD	Central Bay	120	649	467	290	352	785	548
FSSD	Suisun Bay	23.7	7.18	11.1	6.76	7.78	7.78	7.78
Las Gallinas ^(c)	San Pablo Bay	2.92	--	--	--	--	--	--
Paradise Cove	Central Bay	0.04	--	--	--	--	--	--
Tiburon	Central Bay	0.98	--	--	--	--	--	--
Millbrae	South Bay	3	--	--	--	--	--	--
Mt. View	Suisun Bay	3.2	--	--	--	--	--	--
Napa ^(c)	San Pablo Bay	15.4	--	--	--	--	--	--
Novato	San Pablo Bay	7	--	--	--	--	--	--
Palo Alto	Lower South Bay	39	^(e)	2.68	6.83	44.1	7.51	4.85
Petaluma ^(c)	San Pablo Bay	6.7	--	--	--	--	--	--
Pinole	San Pablo Bay	4.06	--	--	--	--	--	--
Rodeo	San Pablo Bay	1.14	--	--	--	--	--	--
SFO Airport	South Bay	2.2	--	--	--	--	--	--
SFPUC Southeast	South Bay	85.4	1,080	28.0	88.5	134	217	98.9
San Jose	Lower South Bay	167	1,020	1,130	501	261	3.33 ^(f)	971
San Mateo	South Bay	15.7	7.98	5.10	1.73	3.43	1.84	4.63
SMCSD	Central Bay	1.8	--	--	--	--	--	--
SASM	Central Bay	3.6	--	--	--	--	--	--
SVCW	South Bay	29	37.1	22.5	9.90	47.4	7.84	65.5
Sonoma Valley ^(c)	San Pablo Bay	3	--	--	--	--	--	--
South SF	South Bay	13	1.11	5.75	2.45	1.94	12.8	7.45
Sunnyvale	Lower South Bay	29.5	^(e)	2.94	0.407	1.41	1.93	1.46
Treasure Island	Central Bay	2	--	--	--	--	--	--
Vallejo	San Pablo Bay	15.5	^(e)	1.09	<1	1.40	4.25	1.05
West County	Central Bay	28.5	25.2	18.3	13.2	14.0	14.4	20.8
Total^(d)		827	2,830	1,760	990	950	1,250	1,850

* 2019 dataset limited to July through September compared against May through September for 2020 and beyond.

- Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data not required as such dischargers have a permitted capacity of less than 10 mgd, whereas a "0" indicates a value of zero.
- No discharge during a portion or all of the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- Permit required data not provided.
- Atypically low 2023 nitrate plus nitrite load for San Jose attributed to the new autosampler plugging issue.

Table 4-11. Influent: Annual Average NOx Loads by Subembayment (kg N/d)*,**

Subembayment	2018/2019 (a)	2019/2020 (a)	2020/2021 (a)	2021/2022 (a)	2022/2023 (a)	2023/2024 (a)
Suisun Bay	*	22.0	16.7	39.6	62.6	19.4
San Pablo Bay	*	4.31	2.91	9.70	125	8.68
Central Bay	*	543	476	425	864	856
South Bay	*	418	139	390	472	377
Lower South Bay	*	1,000	309	411	400	531
Total	*	1,990	944	1,270	1,920	1,790

* Values for 2018/2019 are not shown as they are limited to July 2019 through September 2019.

** Refer to Table 4-9 for a list of dischargers that did not sample for each timeframe.

- a. Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.

Table 4-12. Influent: Dry Season Average NOx Loads by Subembayment (kg N/d)*,**

Subembayment	2019 (a),*	2020 (a)	2021 (a)	2022 (a)	2023 (a)	2024 (a)	Trend (b)
Suisun Bay	12.8	16.3	11.9	13.4	38.2	13.8	None
San Pablo Bay	<1	1.09	<1	1.40	4.25	1.05	None
Central Bay	674	485	303	366	799	569	None
South Bay	1,120	116	166	263	398	285	Down (-24%/yr)
Lower South Bay	1,020	1,140	508	306	12.8 (c)	978	None
Total	2,830	1,760	990	950	1,250	1,850	None

* 2019 dataset limited to July through September compared against May through September for 2020 and beyond.

** Refer to Table 4-10 for a list of dischargers that did not sample for each timeframe.

- a. Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- b. Trend analysis is based on average monthly values. Discernible trends were identified based on the slope of a regression line determined using the method of least squares to fit the data ($\alpha = 0.05$). Sample size is at a minimum 21. Where "None" is stated, the limited dataset does not indicate a statistically relevant. Trend analysis based on the approach discussed in Section 3.8. The percent change represents the change per year as a percentage of the average value over the entire dataset (2019-2024) (not listed if trend is "None").
- c. Atypically low 2023 nitrate plus nitrite load for San Jose attributed to the new autosampler plugging issue.

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4.4 Total Inorganic Nitrogen (TIN)

TIN is calculated by adding the ammonia and NO_x concentrations. The historical average quarterly influent TIN loads from July 2019 through September 2024 are presented in Figure 4-4. The annual average (i.e., twelve months from October 1 to September 30) and dry season average monthly (i.e., May 1 through September 30) influent loads were calculated based on reported flows and concentrations in Table 4-13 and Table 4-14, respectively.

A summary of the influent data review findings is as follows (**new findings for 2023/2024 in bold**):

- ◆ Influent TIN loads and concentrations contribute on average approximately two-thirds of the total nitrogen concentrations and loads (data not shown).
- ◆ The 2018/2019 dataset is limited to July 2019 through September 2019. As a result, annual average values were excluded.
- ◆ There are a few instances of missing data per plant that inform the TIN calculation (TIN = ammonia + nitrate + nitrite; refer Table 4-13 and Table 4-14). Specifically, EBDA, Palo Alto, and Vallejo failed to report. As such, the dry season TIN total loads for 2019 appear to be the lowest. Since failing to report in 2019, all dischargers required to report values have provided such data. As previously noted, seasonal dischargers only need to collect samples when discharging (e.g., Napa typically does not discharge during the dry season and as such does not have influent TIN data).
- ◆ **Average Annual Loads:** this past year's load increased approximately 3,200 kg N/d since last year. The increase is primarily due to San Jose (3,500 kg N/d; Lower South Bay Discharger). In contrast, EBMUD (Central Bay Discharger) saw a decrease of approximately 390 kg N/d since last year.
- ◆ **Dry Season Loads:** this past year's load increased by 2,600 kg N/d compared to last year. The largest individual load increases were for San Jose (Lower South Bay Discharger) and SFPUC Southeast (South Bay Discharger) with approximately 2,500 kg N/d and 350 kg N/d, respectively. In contrast, most other POTWs experienced minor decreases in load.
- ◆ **Dry Season Trending:** this is the second year when dry season trending analysis was performed for the influent TIN loads. Trending analysis suggests that all the Subembayments, including Baywide, have no emerging trends over the 6-year dry season dataset. This trending is based on the least-squares correlation test selected as the basis for trends analysis over the entire dry season dataset since sampling began in 2019 (see Section 3.8).
- ◆ Similar to flow and ammonia loads, the South Bay and Lower South Bay accounts for over half of the influent TIN loads, regardless of season (see Table 4-15 and Table 4-16).

A discussion of the results is provided in Section 7.4.

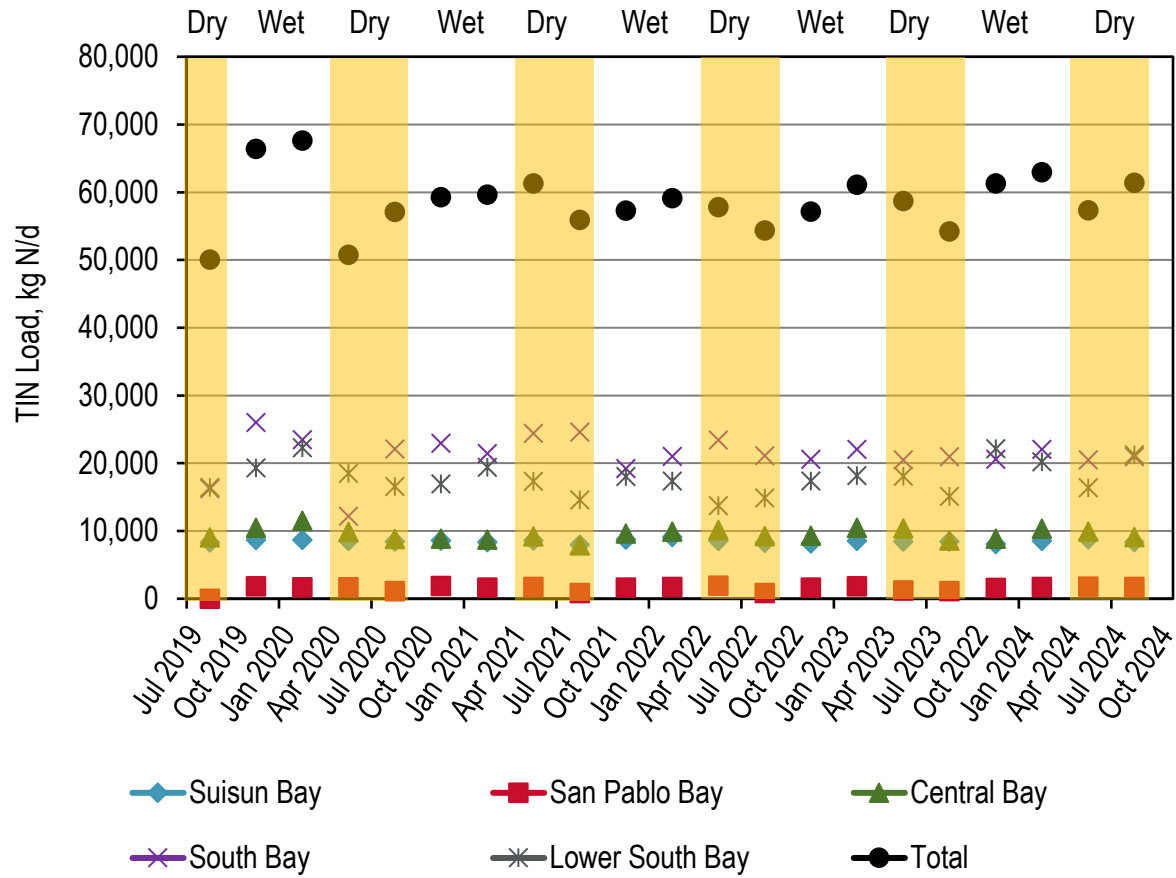


Figure 4-4. Influent: Historical Average Monthly TIN Loads

Table 4-13. Influent: Annual Average Loads to each Plant, TIN (kg N/d)*

Discharger	Subembayment	Permitted Capacity ^(a)	2018/ 2019 ^{(a), (b)}	2019/ 2020 ^(b)	2020/ 2021 ^(b)	2021/ 2022 ^(b)	2022/ 2023 ^(b)	2023/ 2024 ^(b)
American Canyon	San Pablo Bay	2.5	*	--	--	--	--	--
Benicia	San Pablo Bay	4.5	*	--	--	--	--	--
Burlingame	South Bay	5.5	*	--	--	--	--	--
Central San	Suisun Bay	53.8	*	5,100	4,930	4,840	4,840	4,670
CMSA	Central Bay	10	*	--	--	--	--	--
Port Costa	San Pablo Bay	0.033	*	--	--	--	--	--
Delta Diablo	Suisun Bay	19.5	*	1,850	1,840	2,060	1,930	2,130
EBDA	South Bay	107.8	*	9,250	9,780	10,100	9,380	9,640
EBMUD	Central Bay	120	*	8,260	6,830	7,880	7,840	7,450
FSSD	Suisun Bay	23.7	*	1,640	1,610	1,760	1,650	1,600
Las Gallinas ^(c)	San Pablo Bay	2.92	*	--	--	--	--	--
Paradise Cove	Central Bay	0.04	*	--	--	--	--	--
Tiburon	Central Bay	0.98	*	--	--	--	--	--
Millbrae	South Bay	3	*	--	--	--	--	--
Mt. View	Suisun Bay	3.2	*	--	--	--	--	--
Napa ^(c)	San Pablo Bay	15.4	*	815	871	859	706	886
Novato	San Pablo Bay	7	*	--	--	--	--	--
Palo Alto	Lower South Bay	39	*	2,330	2,270	2,490	2,670	2,580
Petaluma ^(c)	San Pablo Bay	6.7	*	--	--	--	--	--
Pinole	San Pablo Bay	4.06	*	--	--	--	--	--
Rodeo	San Pablo Bay	1.14	*	--	--	--	--	--
SFO Airport	South Bay	2.2	*	--	--	--	--	--
SFPUC Southeast	South Bay	85.4	*	9,050	8,860	5,790	6,340	6,340
San Jose	Lower South Bay	167	*	15,300	13,500	12,000	13,000	16,500
San Mateo	South Bay	15.7	*	1,610	1,450	1,500	1,470	1,470
SMCSD	Central Bay	1.8	*	--	--	--	--	--
SASM	Central Bay	3.6	*	--	--	--	--	--
SVCW	South Bay	29	*	2,460	2,490	2,660	2,420	2,400
Sonoma Valley ^(c)	San Pablo Bay	3	*	--	--	--	--	--
South SF	South Bay	13	*	1,010	1,020	1,160	1,350	1,110
Sunnyvale	Lower South Bay	29.5	*	1,510	1,400	1,500	1,560	1,810
Treasure Island	Central Bay	2	*	--	--	--	--	--
Vallejo	San Pablo Bay	15.5	*	978	891	887	934	836
West County	Central Bay	28.5	*	1,910	1,850	1,850	1,870	1,750
Total ^(d)		827	* ^(e)	63,100	59,600	57,400	57,900	61,100

* Values for 2018/2019 are not shown as they are limited to July 2019 through September 2019.

- Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data not required as such dischargers have a permitted capacity of less than 10 mgd, whereas a "0" indicates a value of zero.
- No discharge during a portion or all of the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- Totals not provided due to an incomplete dataset.

Table 4-14. Influent: Dry Season Average Loads to each Plant, TIN (kg N/d)*

Discharger	Subembayment	Permitted Capacity ^(a)	2019 ^{(a), (b), *}	2020 ^{(a), (b)}	2021 ^{(a), (b)}	2022 ^{(a), (b)}	2023 ^{(a), (b)}	2024 ^{(a), (b)}
American Canyon	San Pablo Bay	2.5	--	--	--	--	--	--
Benicia	San Pablo Bay	4.5	--	--	--	--	--	--
Burlingame	South Bay	5.5	--	--	--	--	--	--
Central San	Suisun Bay	53.8	4,810	4,980	4,700	4,790	4,710	4,570
CMSA	Central Bay	10	--	--	--	--	--	--
Port Costa	San Pablo Bay	0.033	--	--	--	--	--	--
Delta Diablo	Suisun Bay	19.5	1,820	1,910	1,850	1,870	2,020	2,100
EBDA	South Bay	107.8 ^(e)	9,330	9,830	9,920	9,670	9,620	9,620
EBMUD	Central Bay	120	7,180	7,450	6,700	7,890	7,560	7,050
FSSD	Suisun Bay	23.7	1,690	1,540	1,710	1,720	1,740	1,560
Las Gallinas ^(c)	San Pablo Bay	2.92	--	--	--	--	--	--
Paradise Cove	Central Bay	0.04	--	--	--	--	--	--
Tiburon	Central Bay	0.98	--	--	--	--	--	--
Millbrae	South Bay	3	--	--	--	--	--	--
Mt. View	Suisun Bay	3.2	--	--	--	--	--	--
Napa ^(c)	San Pablo Bay	15.4	--	--	--	--	--	847
Novato	San Pablo Bay	7	--	--	--	--	--	--
Palo Alto	Lower South Bay	39	^(e)	2,050	2,270	2,500	2,630	2,550
Petaluma ^(c)	San Pablo Bay	6.7	--	--	--	--	--	--
Pinole	San Pablo Bay	4.06	--	--	--	--	--	--
Rodeo	San Pablo Bay	1.14	--	--	--	--	--	--
SFO Airport	South Bay	2.2	--	--	--	--	--	--
SFPUC Southeast	South Bay	85.4	11,100	8,350	9,840	6,390	6,260	6,610
San Jose	Lower South Bay	167	14,600	13,200	11,100	10,600	10,800	13,300
San Mateo	South Bay	15.7	1,440	1,430	1,390	1,330	1,440	1,500
SMCSD	Central Bay	1.8	--	--	--	--	--	--
SASM	Central Bay	3.6	--	--	--	--	--	--
SVCW	South Bay	29	2,590	2,110	2,670	2,510	2,250	2,340
Sonoma Valley ^(c)	San Pablo Bay	3	--	--	--	--	--	--
South SF	South Bay	13	1,070	989	1,150	1,180	1,200	1,040
Sunnyvale	Lower South Bay	29.5	1,820	1,180	1,340	1,530	1,670	1,790
Treasure Island	Central Bay	2	--	--	--	--	--	--
Vallejo	San Pablo Bay	15.5	^(e)	1,140	849	840	1,110	919
West County	Central Bay	28.5	1,900	1,900	1,850	1,800	1,780	1,750
Total^(d)		827	50,100	57,600	57,200	54,800	54,900	57,500

* 2019 dataset limited to July through September compared against May through September for 2020 and beyond.

- Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data not required as such dischargers have a permitted capacity of less than 10 mgd, whereas a "0" indicates a value of zero.
- No discharge during a portion or all of the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- Permit required data not provided.

Table 4-15. Influent: Annual Average TIN Loads by Subembayment (kg N/d)**

Subembayment	2018/2019 (a)	2019/2020 (a)	2020/2021 (a)	2021/2022 (a)	2022/2023 (a)	2023/2024 (a)
Suisun Bay	*	8,600	8,370	8,660	8,410	8,410
San Pablo Bay	*	1,790	1,760	1,750	1,640	1,720
Central Bay	*	10,200	8,680	9,730	9,700	9,200
South Bay	*	23,400	23,600	21,200	21,000	21,000
Lower South Bay	*	19,200	17,100	16,000	17,200	20,800
Total	*	63,100	59,600	57,400	57,900	61,100

* Values for 2018/2019 are not shown as they are limited to July 2019 through September 2019.

** Refer to Table 4-13 for a list of dischargers that did not sample for each timeframe.

a. Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.

Table 4-16. Influent: Dry Season Average TIN Loads by Subembayment (kg N/d)*,**

Subembayment	2019 (a),*	2020 (a)	2021 (a)	2022 (a)	2023 (a)	2024 (a)	Trend (b)
Suisun Bay	8,310	8,430	8,260	8,390	8,460	8,230	None
San Pablo Bay	0	1,140	849	840	1,110	1,770	None
Central Bay	9,080	9,350	8,550	9,690	9,340	8,800	None
South Bay	16,200	22,200	24,900	21,300	20,800	21,100	None
Lower South Bay	16,500	16,500	14,700	14,600	15,100	17,600	None
Total	50,100	57,600	57,200	54,800	54,900	57,500	None

* 2019 dataset limited to July through September compared against May through September for 2020 and beyond.

** Refer to Table 4-14 for a list of dischargers that did not sample for each timeframe.

a. Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.

b. Trend analysis is based on average monthly values. Discernible trends were identified based on the slope of a regression line determined using the method of least squares to fit the data ($\alpha = 0.05$). Sample size is at a minimum 21. Where "None" is stated, the limited dataset does not indicate a statistically relevant trend. The percent change represents the change per year as a percentage of the average value over the entire dataset (2019-2024) (not considered if trend is "None").

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4.5 Total Kjeldahl Nitrogen (TKN)

The TKN represents the sum of the total ammonia and organic nitrogen species. The historical average quarterly influent TKN loads from July 2019 through September 2024 are presented in Figure 4-5. The annual average (i.e., twelve months from October 1 to September 30) and dry season average monthly (i.e., May 1 through September 30) influent loads were calculated based on reported flows and concentrations in Table 4-17 and Table 4-18, respectively.

A summary of the influent data review findings is as follows (**new findings for 2022/2023 in bold**):

- ◆ Influent TKN loads and concentrations have the largest relative contribution for the nitrogen species measured. On average, the influent TKN loads contribute greater than 92 percent to the influent total nitrogen loads (data not shown).
- ◆ The 2018/2019 dataset is limited to July 2019 through September 2019. As a result, annual average values were excluded.
- ◆ Similar to NO_x and TIN, there are a few instances of missing data per plant (Table 4-17 and Table 4-18; primarily from 2019). Since failing to report in 2019, all dischargers required to report values have provided such data. As previously noted, seasonal dischargers only need to collect samples when discharging (e.g., Napa typically does not discharge during the dry season and as such does not have influent TKN data).
- ◆ There are concerns that SFPUC Southeast data since 2021 might have a sampling artifact as there are ELAP-certified samples for which the TKN < Ammonia.
- ◆ **Average Annual Loads: the overall load increased by 1000 kg N/d compared to the previous year. San Jose (Lower South Bay Discharger) experienced a large increase of 5,300 kg N/d that was largely negated by decreases at most other POTWs. For example, EBMUD (Central Bay Discharger) and West County (Central Bay Discharger) experienced decreases of 1,300 kg N/d and 880 kg N/d, respectively.**
- ◆ **Dry Season Loads: the dry season load increased by 3,800 kg N/d compared to the previous year. The two largest contributors to this increase since last year are San Jose (Lower South Bay Discharger) and SVCW (South Bay Discharger), with increases of 6,600 kg N/d and 450 kg N/d, respectively. POTWs experiencing significant decreases include SFPUC Southeast (1,270 kg N/d; South Bay Discharger), West County (750 kg N/d; Central Bay Discharger), and EBDA (900 kg N/d; South Bay Discharger).**
- ◆ **Dry Season Trending: this is the second year when dry season trending analysis was performed for the influent TKN loads. Trending analysis suggests that Suisun Bay had an emerging trend, which is a downward trend over the 6-year dry season dataset.** This trending is based on the least-squares correlation test selected as the basis for trends analysis over the entire dry season dataset since sampling began in 2019 (see Section 3.8).
- ◆ Similar to flow, ammonia, and TIN loads, the South Bay and Lower South Bay accounts for over half of the influent TKN loads, regardless of season (see Table 4-19 and Table 4-20).

A discussion of the results is provided in Section 7.4.

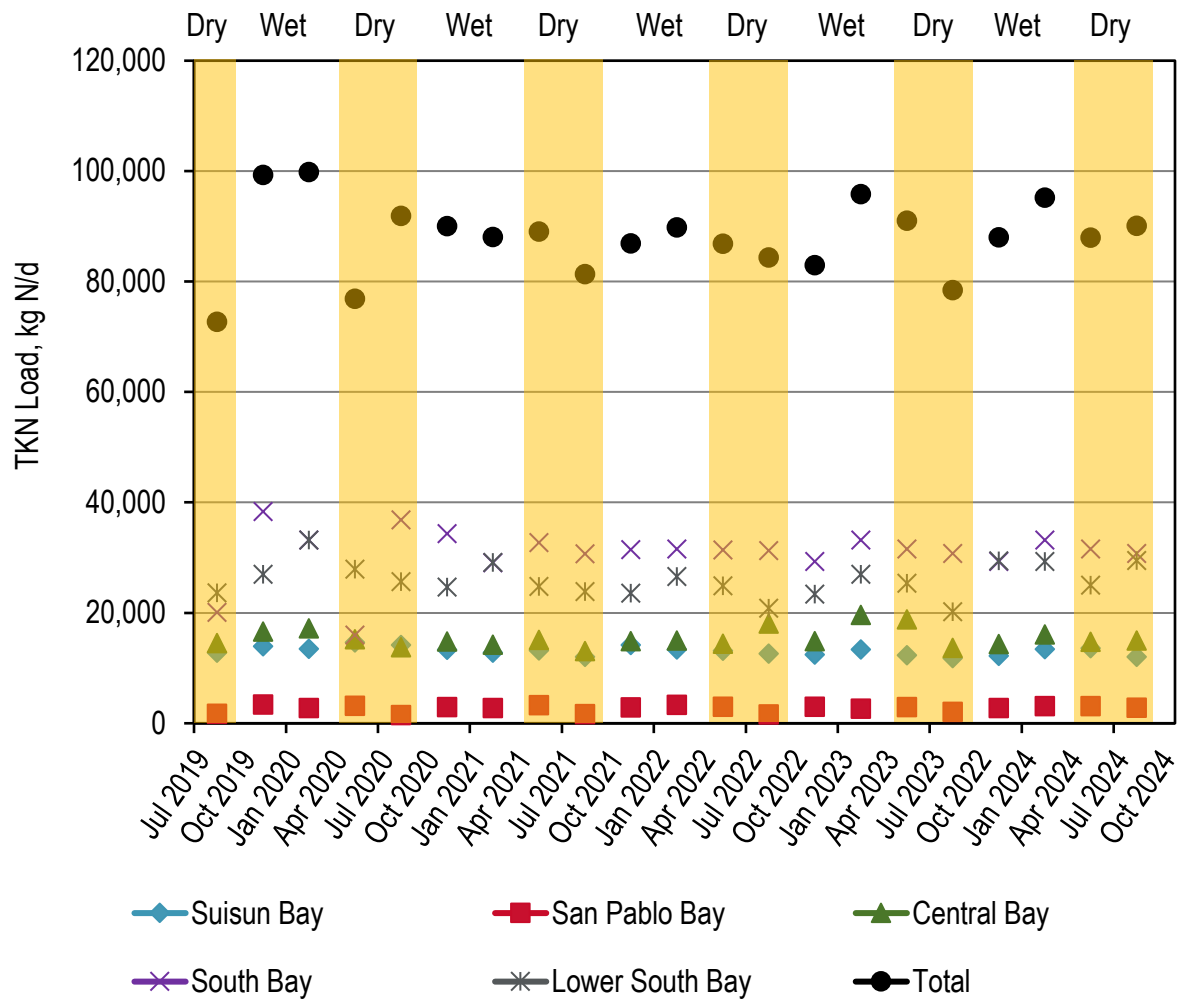


Figure 4-5. Influent: Historical Average Monthly TKN Loads

Table 4-17. Influent: Annual Average Loads to each Plant, TKN (kg N/d)*

Discharger	Subembayment	Permitted Capacity ^(a)	2018/ 2019 ^{(a), (b)}	2019/ 2020 ^(b)	2020/ 2021 ^(b)	2021/ 2022 ^(b)	2022/ 2023 ^(b)	2023/ 2024 ^(b)
American Canyon	San Pablo Bay	2.5	*	--	--	--	--	--
Benicia	San Pablo Bay	4.5	*	--	--	--	--	--
Burlingame	South Bay	5.5	*	--	--	--	--	--
Central San	Suisun Bay	53.8	*	7,440	6,870	7,010	6,730	6,470
CMSA	Central Bay	10	*	--	--	--	--	--
Port Costa	San Pablo Bay	0.033	*	--	--	--	--	--
Delta Diablo	Suisun Bay	19.5	*	3,530	3,210	3,420	3,060	3,030
EBDA	South Bay	107.8	*	16,600	15,100	15,500	14,300	14,000
EBMUD	Central Bay	120	*	12,500	11,400	12,800	13,500	12,200
FSSD	Suisun Bay	23.7	*	3,100	2,730	2,910	2,700	2,420
Las Gallinas ^(c)	San Pablo Bay	2.92	*	--	--	--	--	--
Paradise Cove	Central Bay	0.04	*	--	--	--	--	--
Tiburon	Central Bay	0.98	*	--	--	--	--	--
Millbrae	South Bay	3	*	--	--	--	--	--
Mt. View	Suisun Bay	3.2	*	--	--	--	--	--
Napa ^(c)	San Pablo Bay	15.4	*	1,480	1,370	1,410	1,340	1,300
Novato	San Pablo Bay	7	*	--	--	--	--	--
Palo Alto	Lower South Bay	39	*	4,070	3,490	3,730	3,770	3,220
Petaluma ^(c)	San Pablo Bay	6.7	*	--	--	--	--	--
Pinole	San Pablo Bay	4.06	*	--	--	--	--	--
Rodeo	San Pablo Bay	1.14	*	--	--	--	--	--
SFO Airport	South Bay	2.2	*	--	--	--	--	--
SFPUC Southeast	South Bay	85.4	*	12,000	10,100	8,670	9,530	8,980
San Jose	Lower South Bay	167	*	22,000	20,000	18,100	17,700	23,000
San Mateo	South Bay	15.7	*	2,500	2,090	2,340	2,320	2,010
SMCSD	Central Bay	1.8	*	--	--	--	--	--
SASM	Central Bay	3.6	*	--	--	--	--	--
SVCW	South Bay	29	*	2,840	2,980	3,210	3,160	3,340
Sonoma Valley ^(c)	San Pablo Bay	3	*	--	--	--	--	--
South SF	South Bay	13	*	1,420	1,400	1,590	1,760	1,830
Sunnyvale	Lower South Bay	29.5	*	2,360	2,180	2,090	2,480	2,650
Treasure Island	Central Bay	2	*	--	--	--	--	--
Vallejo	San Pablo Bay	15.5	*	1,600	1,630	1,660	1,640	1,480
West County	Central Bay	28.5	*	3,200	2,910	2,810	3,650	2,770
Total ^(d)		827	* ^(e)	96,600	87,500	87,300	87,700	88,700

* Values for 2018/2019 are not shown as they are limited to July 2019 through September 2019.

- Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data not required as such dischargers have a permitted capacity of less than 10 mgd, whereas a "0" indicates a value of zero.
- No discharge during a portion or all of the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- Totals not provided due to an incomplete dataset.

Table 4-18. Influent: Dry Season Loads to each Plant, TKN (kg N/d)*

Discharger	Subembayment	Permitted Capacity ^(a)	2019 ^{(a), (b), *}	2020 ^{(a), (b)}	2021 ^{(a), (b)}	2022 ^{(a), (b)}	2023 ^{(a), (b)}	2024 ^{(a), (b)}
American Canyon	San Pablo Bay	2.5	--	--	--	--	--	--
Benicia	San Pablo Bay	4.5	--	--	--	--	--	--
Burlingame	South Bay	5.5	--	--	--	--	--	--
Central San	Suisun Bay	53.8	6,890	6,950	6,760	6,770	6,370	6,710
CMSA	Central Bay	10	--	--	--	--	--	--
Port Costa	San Pablo Bay	0.033	--	--	--	--	--	--
Delta Diablo	Suisun Bay	19.5	3,250	3,980	3,070	3,280	3,040	3,070
EBDA	South Bay	107.8	^(e)	18,500	15,300	14,900	14,900	14,000
EBMUD	Central Bay	120	10,800	11,400	11,200	13,500	11,900	11,300
FSSD	Suisun Bay	23.7	2,630	3,110	2,690	2,820	2,480	2,170
Las Gallinas ^(c)	San Pablo Bay	2.92	--	--	--	--	--	--
Paradise Cove	Central Bay	0.04	--	--	--	--	--	--
Tiburon	Central Bay	0.98	--	--	--	--	--	--
Millbrae	South Bay	3	--	--	--	--	--	--
Mt. View	Suisun Bay	3.2	--	--	--	--	--	--
Napa ^(c)	San Pablo Bay	15.4	--	--	--	1,610	--	1,310
Novato	San Pablo Bay	7	--	--	--	--	--	--
Palo Alto	Lower South Bay	39	^(e)	3,950	3,620	3,660	3,820	3,490
Petaluma ^(c)	San Pablo Bay	6.7	--	--	--	--	--	--
Pinole	San Pablo Bay	4.06	--	--	--	--	--	--
Rodeo	San Pablo Bay	1.14	--	--	--	--	--	--
SFO Airport	South Bay	2.2	--	--	--	--	--	--
SFPUC Southeast	South Bay	85.4	13,800	12,000	9,970	8,960	8,680	7,410
San Jose	Lower South Bay	167	20,800	19,000	18,200	15,600	13,600	20,200
San Mateo	South Bay	15.7	1,720	2,260	1,970	1,990	2,240	1,990
SMCSD	Central Bay	1.8	--	--	--	--	--	--
SASM	Central Bay	3.6	--	--	--	--	--	--
SVCW	South Bay	29	3,090	2,590	2,920	3,200	2,840	3,290
Sonoma Valley ^(c)	San Pablo Bay	3	--	--	--	--	--	--
South SF	South Bay	13	1,500	1,400	1,480	1,790	1,810	1,580
Sunnyvale	Lower South Bay	29.5	2,820	2,120	2,210	2,180	2,550	2,680
Treasure Island	Central Bay	2	--	--	--	--	--	--
Vallejo	San Pablo Bay	15.5	1,690	1,500	1,670	1,580	2,040	1,660
West County	Central Bay	28.5	3,760	3,120	2,860	2,750	3,610	2,860
Total ^(d)		827	72,700	91,900	83,900	84,600	79,900	83,700

* 2019 dataset limited to July through September compared against May through September for 2020 and beyond.

- Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data not required as such dischargers have a permitted capacity of less than 10 mgd, whereas a "0" indicates a value of zero.
- No discharge during a portion or all of the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- Permit required data not provided.

Table 4-19. Influent: Annual Average TKN Loads by Subembayment (kg N/d)*,**

Subembayment	2018/2019 (a)	2019/2020 (a)	2020/2021 (a)	2021/2022 (a)	2022/2023 (a)	2023/2024 (a)
Suisun Bay	*	14,100	12,800	13,300	12,500	11,900
San Pablo Bay	*	3,090	3,010	3,070	2,990	2,790
Central Bay	*	15,700	14,300	15,600	17,100	15,000
South Bay	*	35,300	31,700	31,300	31,100	30,200
Lower South Bay	*	28,400	25,700	23,900	24,000	28,900
Total	*	96,600	87,500	87,300	87,600	88,700

* Values for 2018/2019 are not shown as they are limited to July 2019 through September 2019.

** Refer to Table 4-17 for a list of dischargers that did not sample for each timeframe.

- a. Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.

Table 4-20. Influent: Dry Season Average TKN Loads by Subembayment (kg N/d)*,**

Subembayment	2019 (a), *	2020 (a)	2021 (a)	2022 (a)	2023 (a)	2024 (a)	Trend (b)
Suisun Bay	12,800	14,000	12,500	12,900	11,900	11,900	Down (-2.3%/yr)
San Pablo Bay	1,690	1,500	1,670	3,190	2,040	2,980	None
Central Bay	14,600	14,500	14,100	16,200	15,500	14,100	None
South Bay	20,100	36,700	31,700	30,800	30,500	28,200	None
Lower South Bay	23,600	25,100	24,000	21,400	20,000	26,400	None
Total	72,700	91,900	83,900	84,600	79,600	83,700	None

* 2019 dataset limited to July through September compared against May through September for 2020 and beyond.

** Refer to Table 4-18 for a list of dischargers that did not sample for each timeframe.

- a. Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- b. Trend analysis is based on average monthly values. Discernible trends were identified based on the slope of a regression line determined using the method of least squares to fit the data ($\alpha = 0.05$). Sample size is at a minimum 21. Where "None" is stated, the limited dataset does not indicate a statistically relevant trend. The percent change represents the change per year as a percentage of the average value over the entire dataset (2019-2024) (not considered if trend is "None").

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4.6 Total Nitrogen (TN)

Total nitrogen is included as a metric for the influent (but not discharge) as it captures the organic nitrogen loading into the plant. The majority of influent organic nitrogen is oxidized to ammonia in the treatment plant. The historical average quarterly influent TN loads from July 2019 through September 2024 are presented in Figure 4-6. A relatively small portion of this organic nitrogen leaves with discharge as residual organic nitrogen (typically about 1.5 to 3.5 mg N/L). While this represents a relatively small proportion of discharge, it is an important component for the nitrogen balance within the treatment plant. It is calculated by adding the TKN and NO_x concentrations.

The annual average (i.e., twelve months from October 1 to September 30) and dry season average monthly (i.e., May 1 through September 30) influent loads were calculated based on reported flows and concentrations in Table 4-21 and Table 4-22, respectively.

A summary of the influent data review findings is as follows (**new findings for 2023/2024 in bold**):

- ◆ The 2018/2019 dataset is limited to July 2019 through September 2019. As a result, annual average values were excluded.
- ◆ Similar to NO_x, TIN, and TKN, there are a few instances of missing data per plant that inform the TN calculation (TN = TKN + nitrate + nitrite; refer Table 4-21 and Table 4-22). Since failing to report in 2019, all dischargers required to report values have provided such data. As previously noted, seasonal dischargers only need to collect samples when discharging (e.g., Napa typically does not discharge during the dry season and as such does not have influent TN data).
- ◆ As previously noted, the SFPUC Southeast data in 2021 had a sampling artifact as there are ELAP-certified samples for which the TKN < Ammonia. This issue was limited to the 2021 dry season and it has since been reconciled. Such values impacted TN values in 2021 as TN equals the sum of TKN and Nitrite+Nitrate.
- ◆ **Average Annual Loads:** the overall load increased 700 kg N/d since last year. Despite this year's increase, the loads are still approximately 8,400 kg N/d less than the 2019/2020 load. San Jose's (Lower South Bay Discharger) load increased by 5,200 kg N/d while EBMUD's (Central Bay Discharger) decreased by 1,300 kg N/d.
- ◆ **Dry Season Loads:** the overall dry season load increased by 4,200 kg N/d compared to the previous year. San Jose (Lower South Bay Discharger) experienced a large increase of 7,600 kg N/d while most other POTWs experienced decreases, the largest of which was SFPUC Southeast (1,350 kg N/d).
- ◆ **Dry Season Trending:** this is the second year when dry season trending analysis was performed for the influent TN loads. Trending analysis suggests that only Suisun Bay had an emerging trend, which is a downward trend over the 6-year dry season dataset. This trending is based on the least-squares correlation test selected as the basis for trends analysis over the entire dry season dataset since sampling began in 2019 (see Section 3.8).
- ◆ Similar to flow, ammonia, TIN, and TKN loads, the South Bay and Lower South Bay accounts for over half of the influent TKN loads, regardless of season (see Table 4-23 and Table 4-24).

A discussion of the results is provided in Section 7.4.

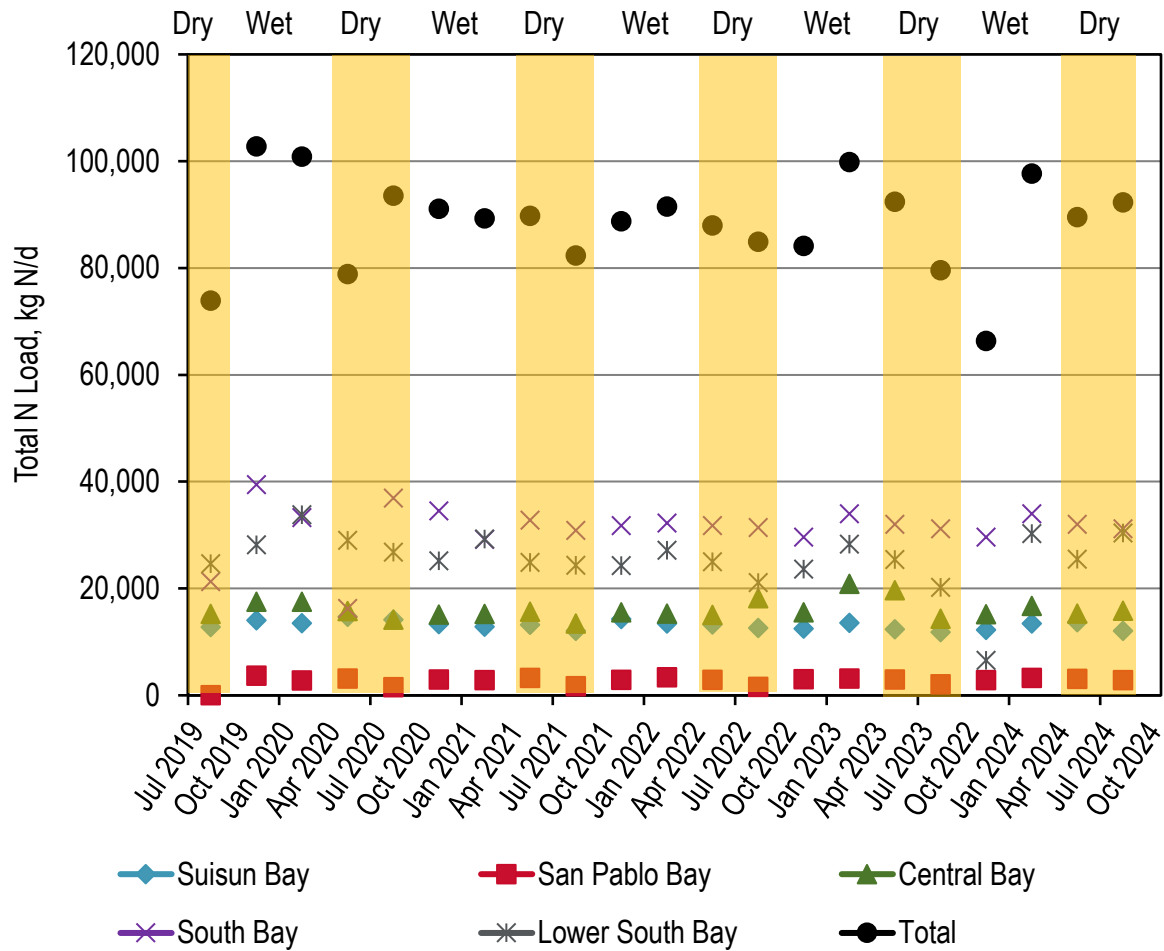


Figure 4-6. Influent: Historical Average Monthly Total N Loads

Table 4-21. Influent: Annual Average Loads to each Plant, TN (kg N/d)*

Discharger	Subembayment	Permitted Capacity ^(a)	2018/ 2019 ^{(a), (b)}	2019/ 2020 ^(b)	2020/ 2021 ^(b)	2021/ 2022 ^(b)	2022/ 2023 ^(b)	2023/ 2024 ^(b)
American Canyon	San Pablo Bay	2.5	*	--	--	--	--	--
Benicia	San Pablo Bay	4.5	*	--	--	--	--	--
Burlingame	South Bay	5.5	*	--	--	--	--	--
Central San	Suisun Bay	53.8	*	7,440	6,870	7,020	6,780	6,470
CMSA	Central Bay	10	*	--	--	--	--	--
Port Costa	San Pablo Bay	0.033	*	--	--	--	--	--
Delta Diablo	Suisun Bay	19.5	*	3,540	3,210	3,460	3,070	3,030
EBDA	South Bay	107.8	*	16,600	15,200	15,600	14,500	14,100
EBMUD	Central Bay	120	*	13,000	11,800	13,200	14,300	13,000
FSSD	Suisun Bay	23.7	*	3,110	2,740	2,920	2,710	2,420
Las Gallinas ^(c)	San Pablo Bay	2.92	*	--	--	--	--	--
Paradise Cove	Central Bay	0.04	*	--	--	--	--	--
Tiburon	Central Bay	0.98	*	--	--	--	--	--
Millbrae	South Bay	3	*	--	--	--	--	--
Mt. View	Suisun Bay	3.2	*	--	--	--	--	--
Napa ^(c)	San Pablo Bay	15.4	*	1,570	1,380	1,370	1,360	1,280
Novato	San Pablo Bay	7	*	--	--	--	--	--
Palo Alto	Lower South Bay	39	*	4,090	3,500	3,770	3,800	3,230
Petaluma ^(c)	San Pablo Bay	6.7	*	--	--	--	--	--
Pinole	San Pablo Bay	4.06	*	--	--	--	--	--
Rodeo	San Pablo Bay	1.14	*	--	--	--	--	--
SFO Airport	South Bay	2.2	*	--	--	--	--	--
SFPUC Southeast	South Bay	85.4	*	12,300	10,100	8,890	9,710	9,170
San Jose	Lower South Bay	167	*	23,000	20,300	18,500	18,100	23,300
San Mateo	South Bay	15.7	*	2,520	2,090	2,350	2,380	2,030
SMCSD	Central Bay	1.8	*	--	--	--	--	--
SASM	Central Bay	3.6	*	--	--	--	--	--
SVCW	South Bay	29	*	2,890	2,980	3,260	3,170	3,410
Sonoma Valley ^(c)	San Pablo Bay	3	*	--	--	--	--	--
South SF	South Bay	13	*	1,430	1,410	1,590	1,780	1,840
Sunnyvale	Lower South Bay	29.5	*	2,370	2,180	2,090	2,490	2,620
Treasure Island	Central Bay	2	*	--	--	--	--	--
Vallejo	San Pablo Bay	15.5	*	1,600	1,630	1,670	1,750	1,490
West County	Central Bay	28.5	*	3,220	3,010	2,850	3,680	2,830
Total ^(d)		827	* ^(e)	98,700	88,500	88,500	89,600	90,300

* Values for 2018/2019 are not shown as they are limited to July 2019 through September 2019.

- Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data not required as such dischargers have a permitted capacity of less than 10 mgd, whereas a "0" indicates a value of zero.
- No discharge during a portion or all of the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- Totals not provided due to an incomplete dataset.

Table 4-22. Influent: Dry Season Average Loads to each Plant, TN (kg N/d)*

Discharger	Subembayment	Permitted Capacity ^(a)	2019 ^{(a), (b), *}	2020 ^{(a), (b)}	2021 ^{(a), (b)}	2022 ^{(a), (b)}	2023 ^{(a), (b)}	2024 ^{(a), (b)}
American Canyon	San Pablo Bay	2.5	--	--	--	--	--	--
Benicia	San Pablo Bay	4.5	--	--	--	--	--	--
Burlingame	South Bay	5.5	--	--	--	--	--	--
Central San	Suisun Bay	53.8	6,890	6,950	6,760	6,780	6,380	6,710
CMSA	Central Bay	10	--	--	--	--	--	--
Port Costa	San Pablo Bay	0.033	--	--	--	--	--	--
Delta Diablo	Suisun Bay	19.5	3,250	3,980	3,070	3,340	3,050	3,070
EBDA	South Bay	107.8	^(e)	18,500	15,400	15,000	15,000	14,100
EBMUD	Central Bay	120	11,400	11,800	11,500	13,900	12,700	11,800
FSSD	Suisun Bay	23.7	2,640	3,120	2,700	2,830	2,490	2,180
Las Gallinas ^(c)	San Pablo Bay	2.92	--	--	--	--	--	--
Paradise Cove	Central Bay	0.04	--	--	--	--	--	--
Tiburon	Central Bay	0.98	--	--	--	--	--	--
Millbrae	South Bay	3	--	--	--	--	--	--
Mt. View	Suisun Bay	3.2	--	--	--	--	--	--
Napa ^(c)	San Pablo Bay	15.4	--	--	--	--	--	1,190
Novato	San Pablo Bay	7	--	--	--	--	--	--
Palo Alto	Lower South Bay	39	^(e)	3,950	3,620	3,700	3,830	3,490
Petaluma ^(c)	San Pablo Bay	6.7	--	--	--	--	--	--
Pinole	San Pablo Bay	4.06	--	--	--	--	--	--
Rodeo	San Pablo Bay	1.14	--	--	--	--	--	--
SFO Airport	South Bay	2.2	--	--	--	--	--	--
SFPUC Southeast	South Bay	85.4	14,900	12,000	10,100	9,090	8,890	7,540
San Jose	Lower South Bay	167	21,800	20,200	18,700	15,900	13,600	21,200
San Mateo	South Bay	15.7	1,720	2,260	1,970	1,990	2,240	2,000
SMCSD	Central Bay	1.8	--	--	--	--	--	--
SASM	Central Bay	3.6	--	--	--	--	--	--
SVCW	South Bay	29	3,130	2,610	2,930	3,250	2,850	3,360
Sonoma Valley ^(c)	San Pablo Bay	3	--	--	--	--	--	--
South SF	South Bay	13	1,510	1,410	1,480	1,790	1,830	1,580
Sunnyvale	Lower South Bay	29.5	2,820	2,120	2,210	2,180	2,550	2,580
Treasure Island	Central Bay	2	--	--	--	--	--	--
Vallejo	San Pablo Bay	15.5	^(e)	1,500	1,670	1,580	2,050	1,660
West County	Central Bay	28.5	3,790	3,140	3,020	2,760	3,630	2,880
Total ^(d)		827	73,900	93,600	85,100	84,000	81,100	85,300

* 2019 dataset limited to July through September compared against May through September for 2020 and beyond.

- Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data not required as such dischargers have a permitted capacity of less than 10 mgd, whereas a "0" indicates a value of zero.
- No discharge during a portion or all of the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- Permit required data not provided.

Table 4-23. Influent: Annual Average TN Loads by Subembayment (kg N/d)*,**

Subembayment	2018/2019 (a)	2019/2020 (a)	2020/2021 (a)	2021/2022 (a)	2022/2023 (a)	2023/2024 (a)
Suisun Bay	*	14,100	12,800	13,400	12,600	11,900
San Pablo Bay	*	3,170	3,010	3,030	3,110	2,770
Central Bay	*	16,200	14,900	16,000	18,000	15,800
South Bay	*	35,700	31,800	31,700	31,600	30,600
Lower South Bay	*	29,400	26,000	24,400	24,400	29,200
Total	*	98,700	88,500	88,500	89,600	90,300

* Values for 2018/2019 are not shown as they are limited to July 2019 through September 2019.

** Refer to Table 4-21 for a list of dischargers that did not sample for each timeframe.

- a. Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.

Table 4-24. Influent: Dry Season Average TN Loads by Subembayment (kg N/d)*,**

Subembayment	2019 (a),*	2020 (a)	2021 (a)	2022 (a)	2023 (a)	2024 (a)	Trend (b)
Suisun Bay	12,800	14,100	12,500	12,900	11,900	12,000	Down (-2.3%/yr)
San Pablo Bay	--*	1,500	1,670	1,580	2,050	2,850	None
Central Bay	15,200	15,000	14,500	16,600	16,300	14,700	None
South Bay	21,300	36,800	31,800	31,100	30,900	28,500	None
Lower South Bay	24,600	26,200	24,500	21,800	20,000	27,300	None
Total	73,900	93,600	85,100	84,000	81,100	85,300	None

* 2019 dataset limited to July through September compared against May through September for 2020 and beyond. Neither San Pablo Bay discharger that monitors influent parameters (Napa and Vallejo) measured TN during the 2019 dry season.

** Refer to Table 4-22 for a list of dischargers that did not sample for each timeframe.

- a. Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- b. Trend analysis is based on average monthly values. Discernible trends were identified based on the slope of a regression line determined using the method of least squares to fit the data ($\alpha = 0.05$). Sample size is at a minimum 21. Where "None" is stated, the limited dataset does not indicate a statistically relevant trend. The percent change represents the change per year as a percentage of the average value over the entire dataset (2019-2024) (not considered if trend is "None").

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4.7 Total Phosphorus (TP)

The historical average quarterly influent TP loads from July 2019 through September 2024 are presented in Figure 4-7. The annual average (i.e., twelve months from October 1 to September 30) and dry season average monthly (i.e., May 1 through September 30) influent loads were calculated based on reported flows and concentrations in Table 4-25 and Table 4-26, respectively.

A summary of the influent data review findings is as follows (**new findings for 2023/2024 in bold**):

- ◆ The 2018/2019 dataset is limited to July 2019 through September 2019. As a result, annual average values were excluded.
- ◆ Similar to NO_x, TIN, TKN, and TN, there are a few instances of missing data per plant (refer to Table 4-25 and Table 4-26; primarily from 2019). Since failing to report in 2019, all dischargers required to report values have provided such data. As previously noted, seasonal dischargers only need to collect samples when discharging (e.g., Napa typically does not discharge during the dry season and as such does not have influent TP data).
- ◆ **Average Annual Loads: the overall load is comparable with the previous year as evidenced by a modest increase of approximately 400 kg P/d. Despite an increase compared to last year, this past year's loads were still less than the 2019/2020 average annual load. The largest contributor to this year's increase is San Jose (Lower South Bay Discharger) whose load increased 490 kg P/d.**
- ◆ **Dry Season Loads: the change in dry season total load was similar to the change in the average annual load, with an increase of 380 kg P/d. The largest contributor to the increase compared to last year is San Jose (Lower South Bay Discharger) with an increase of approximately 340 kg P/d.**
- ◆ **Dry Season Trending: this is the second year when dry season trending analysis was performed for the influent ammonia loads. Trending analysis suggests that only Suisun Bay had an emerging trend, which is a downward trend over the 6-year dry season dataset.** This trending is based on the least-squares correlation test selected as the basis for trends analysis over the entire dry season dataset since sampling began in 2019 (see Section 3.8).
- ◆ Similar to flow, ammonia, TIN, TKN, and TN loads, the South Bay and Lower South Bay accounts for over half of the influent TP loads, regardless of season (see Table 4-27 and Table 4-28).

A discussion of the results is provided in Section 7.4.

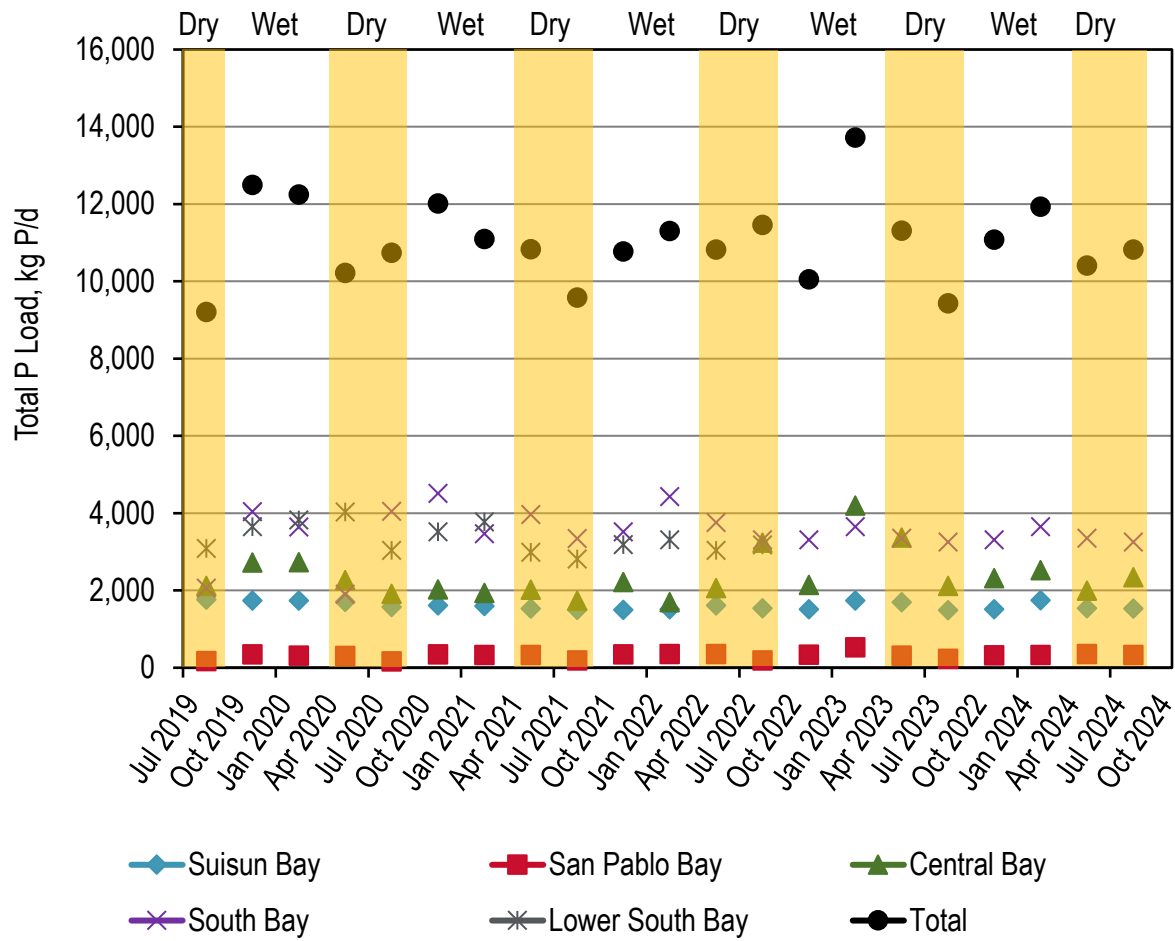


Figure 4-7. Influent: Historical Average Monthly Total P Loads for Evaluation Period

Table 4-25. Influent: Annual Average Loads to each Plant, TP (kg P/d)

Discharger	Subembayment	Permitted Capacity ^(a)	2018/ 2019 ^{(a), (b)}	2019/ 2020 ^(b)	2020/ 2021 ^(b)	2021/ 2022 ^(b)	2022/ 2023 ^(b)	2023/ 2024 ^(b)
American Canyon	San Pablo Bay	2.5	*	--	--	--	--	--
Benicia	San Pablo Bay	4.5	*	--	--	--	--	--
Burlingame	South Bay	5.5	*	--	--	--	--	--
Central San	Suisun Bay	53.8	*	981	823	785	871	855
CMSA	Central Bay	10	*	--	--	--	--	--
Port Costa	San Pablo Bay	0.033	*	--	--	--	--	--
Delta Diablo	Suisun Bay	19.5	*	339	362	353	344	345
EBDA	South Bay	107.8	*	1,620	1,630	1,650	1,580	1,560
EBMUD	Central Bay	120	*	1,960	1,580	1,960	2,560	1,970
FSSD	Suisun Bay	23.7	*	369	373	403	392	350
Las Gallinas ^(c)	San Pablo Bay	2.92	*	--	--	--	--	--
Paradise Cove	Central Bay	0.04	*	--	--	--	--	--
Tiburon	Central Bay	0.98	*	--	--	--	--	--
Millbrae	South Bay	3	*	--	--	--	--	--
Mt. View	Suisun Bay	3.2	*	--	--	--	--	--
Napa ^(c)	San Pablo Bay	15.4	*	146	150	160	227	153
Novato	San Pablo Bay	7	*	--	--	--	--	--
Palo Alto	Lower South Bay	39	*	410	368	409	442	418
Petaluma ^(c)	San Pablo Bay	6.7	*	--	--	--	--	--
Pinole	San Pablo Bay	4.06	*	--	--	--	--	--
Rodeo	San Pablo Bay	1.14	*	--	--	--	--	--
SFO Airport	South Bay	2.2	*	--	--	--	--	--
SFPUC Southeast	South Bay	85.4	*	1,330	1,270	1,260	1,060	930
San Jose	Lower South Bay	167	*	2,940	2,650	2,490	2,090	2,580
San Mateo	South Bay	15.7	*	246	226	242	221	221
SMCSD	Central Bay	1.8	*	--	--	--	--	--
SASM	Central Bay	3.6	*	--	--	--	--	--
SVCW	South Bay	29	*	387	390	369	327	354
Sonoma Valley ^(c)	San Pablo Bay	3	*	--	--	--	--	--
South SF	South Bay	13	*	234	224	232	193	214
Sunnyvale	Lower South Bay	29.5	*	283	267	280	291	335
Treasure Island	Central Bay	2	*	--	--	--	--	--
Vallejo	San Pablo Bay	15.5	*	173	185	191	182	181
West County	Central Bay	28.5	*	347	357	340	434	338
Total ^(d)		827	* ^(e)	11,800	10,900	11,100	11,200	10,800

* Values for 2018/2019 are not shown as they are limited to July 2019 through September 2019.

- Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data not required as such dischargers have a permitted capacity of less than 10 mgd, whereas a "0" indicates a value of zero.
- No discharge during a portion or all of the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- Totals not provided due to an incomplete dataset.

Table 4-26. Influent: Dry Season Average Loads to each Plant, TP (kg P/d)*

Discharger	Subembayment	Permitted Capacity ^(a)	2019 ^{(a), (b),*}	2020 ^{(a), (b)}	2021 ^{(a), (b)}	2022 ^{(a), (b)}	2023 ^{(a), (b)}	2024 ^{(a), (b)}
American Canyon	San Pablo Bay	2.5	--	--	--	--	--	--
Benicia	San Pablo Bay	4.5	--	--	--	--	--	--
Burlingame	South Bay	5.5	--	--	--	--	--	--
Central San	Suisun Bay	53.8	1,030	875	783	793	813	842
CMSA	Central Bay	10	--	--	--	--	--	--
Port Costa	San Pablo Bay	0.033	--	--	--	--	--	--
Delta Diablo	Suisun Bay	19.5	361	367	367	380	341	328
EBDA	South Bay	107.8	^(e)	1,670	1,700	1,570	1,670	1,580
EBMUD	Central Bay	120	1,800	1,690	1,530	2,340	2,060	1,840
FSSD	Suisun Bay	23.7	372	371	381	402	382	336
Las Gallinas ^(c)	San Pablo Bay	2.92	--	--	--	--	--	--
Paradise Cove	Central Bay	0.04	--	--	--	--	--	--
Tiburon	Central Bay	0.98	--	--	--	--	--	--
Millbrae	South Bay	3	--	--	--	--	--	--
Mt. View	Suisun Bay	3.2	--	--	--	--	--	--
Napa ^(c)	San Pablo Bay	15.4	--	--	--	175	--	151
Novato	San Pablo Bay	7	--	--	--	--	--	--
Palo Alto	Lower South Bay	39	^(e)	352	377	422	437	407
Petaluma ^(c)	San Pablo Bay	6.7	--	--	--	--	--	--
Pinole	San Pablo Bay	4.06	--	--	--	--	--	--
Rodeo	San Pablo Bay	1.14	--	--	--	--	--	--
SFO Airport	South Bay	2.2	--	--	--	--	--	--
SFPUC Southeast	South Bay	85.4	1,300	1,550	960	947	790	978
San Jose	Lower South Bay	167	2,770	2,460	2,200	2,440	1,600	1,940
San Mateo	South Bay	15.7	223	218	207	212	213	213
SMCSD	Central Bay	1.8	--	--	--	--	--	--
SASM	Central Bay	3.6	--	--	--	--	--	--
SVCW	South Bay	29	329	367	370	346	268	345
Sonoma Valley ^(c)	San Pablo Bay	3	--	--	--	--	--	--
South SF	South Bay	13	209	228	226	255	188	209
Sunnyvale	Lower South Bay	29.5	322	245	269	302	289	353
Treasure Island	Central Bay	2	--	--	--	--	--	--
Vallejo	San Pablo Bay	15.5	175	167	191	193	232	187
West County	Central Bay	28.5	321	333	345	313	441	344
Total^(d)		827	9,210	10,900	9,910	11,100	9,720	10,100

* 2019 dataset limited to July through September compared against May through September for 2020 and beyond.

- Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data not required as such dischargers have a permitted capacity of less than 10 mgd, whereas a "0" indicates a value of zero.
- No discharge during a portion or all of the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- Permit required data not provided.

Table 4-27. Influent: Annual Average TP Loads by Subembayment (kg P/d)*,**

Subembayment	2018/2019 (a)	2019/2020 (a)	2020/2021 (a)	2021/2022 (a)	2022/2023 (a)	2023/2024 (a)
Suisun Bay	*	1,690	1,560	1,540	1,610	1,550
San Pablo Bay	*	319	334	350	409	333
Central Bay	*	2,310	1,940	2,300	2,990	2,310
South Bay	*	3,820	3,740	3,760	3,380	3,280
Lower South Bay	*	3,640	3,280	3,180	2,820	3,330
Total	*	11,800	10,900	11,100	11,200	10,800

* Values for 2018/2019 are not shown as they are limited to July 2019 through September 2019.

** Refer to Table 4-25 for a list of dischargers that did not sample for each timeframe.

- a. Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.

Table 4-28. Influent: Dry Season Average TP Loads by Subembayment (kg P/d)*,**

Subembayment	2019 (a),*	2020 (a)	2021 (a)	2022 (a)	2023 (a)	2024 (a)	Trend (b)
Suisun Bay	1,770	1,610	1,530	1,580	1,540	1,510	Down (-2.7%/yr)
San Pablo Bay	175	167	191	368	232	338	None
Central Bay	2,120	2,020	1,880	2,650	2,500	2,180	None
South Bay	2,060	4,040	3,470	3,330	3,130	3,330	None
Lower South Bay	3,090	3,060	2,840	3,170	2,320	2,700	None
Total	9,210	10,900	9,910	11,100	9,720	10,100	None

* 2019 dataset limited to July through September compared against May through September for 2020 and beyond.

** Refer to Table 4-26 for a list of dischargers that did not sample for each timeframe.

- a. Based on ADWF permitted capacity. Influent flow and load analysis required for plants with a permitted capacity greater than 10 mgd.
- b. Trend analysis is based on average monthly values. Discernible trends were identified based on the slope of a regression line determined using the method of least squares to fit the data (alpha = 0.05). Sample size is at a minimum 21. Where "None" is stated, the limited dataset does not indicate a statistically relevant trend. The percent change represents the change per year as a percentage of the average value over the entire dataset (2019-2024) (not considered if trend is "None").

5 Discharge Data Review Findings

This section presents a discussion of the data for the following discharge parameters:

1. Discharge Flow (reported as mgd)
2. Total Ammonia (reported as kg N/d)
3. Nitrate plus Nitrite (NO_x, reported as kg N/d)
4. Total Inorganic Nitrogen (reported as kg N/d)
5. Total Phosphorus (reported as kg P/d)

Data on flow (as mgd), load (as kg/d), and concentrations (mg/L) are summarized for each discharger (concentrations by Subembayment only), as well as for each of the five Subembayments. The data are also presented for both the annual average and dry season average. Data are presented based on the period of collection; for example, 2012/2013 represents the period between October 1, 2012 and September 30, 2013.

Following the subsections on each parameter, subsection 5.6 provides the relative contribution of flow and loads for each discharger by Subembayment. This was not included with the influent as the data does not include all the POTWs.

As previously described, the trend analysis presented in the following subsections is based on the Dry Season (a minimum of 60 samples for all major dischargers [>1 mgd permitted capacity ADWF]).

Since the first Group Annual Report submitted in 2015, there have been several data amendments within CIWQS and the Group Annual Reports as follows:

- ◆ Data from the City of Palo Alto, the City of San Mateo, and Napa Sanitation District submitted under the 2015 Group Annual Report Submittal were initially updated in the 2016 Report with updated data that are reflected in this report.
- ◆ Data from the Rodeo Sanitary District 2014-2016 datasets were updated with values that are reflected in this report.
- ◆ Ammonia data for June 2017 from Sausalito Marin City Sanitation District were updated with values that are reflected in this report.
- ◆ Flow data from Tiburon for the 2014/2015 and 2015/2016 were inaccurately reported in the 2017 Group Annual Report. This report reflects the accurate data from CIWQS.
- ◆ Flow data for Mt View Sanitary District for a portion of the 2018 dry season and the 2018/2019 dataset were inaccurately reported in the 2018 and 2019 Group Annual Reports. This report reflects the accurate data since updated in CIWQS.

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5.1 Flow

The historical average monthly discharge flows from October 2012 through September 2024 are presented in Figure 5-1. The annual average (i.e., twelve months from October 1 to September 30) and dry season average monthly (i.e., May 1 through September 30) discharge flows were calculated based on reported flows in Table 5-1 and Table 5-2, respectively. In addition, the annual average and dry season average monthly discharge flows for each Subembayment are provided in Table 5-3 and Table 5-4, respectively.

A summary of the discharge data review findings is as follows (**new findings for 2023/2024 in bold**):

- ◆ It is well documented that influent/discharge flows typically increase with precipitation (discussed in Section 7.1). During relatively wet years (e.g., 2016/2017 and 2022/2023), the average monthly discharge flows have been the highest since sampling began in 2012. During December 2022 and January and March 2023, precipitation was the highest recorded since sampling began in 2012.
- ◆ **Average Annual Flows: the average annual flow for 2023/2024 decreased by 23 mgd compared to 2022/2023 but is still 17 mgd above the 12-year average (refer to Table 5-3). Most Dischargers experienced reductions in flow. Notable changes in annual average flow include Central San (decrease of 6.5 mgd), EBDA (decrease of 5.3 mgd), and San Jose (increase of 8.3 mgd).**
- ◆ **Dry Season Flows: while annual average flows were lower, dry season flows increased by 7 mgd compared to the previous year (refer to Table 5-4). The dry season flows this past year were approximately 15 mgd more than the 12-year average (10/2012 through 09/2024). The largest increase occurred for San Jose (Lower South Bay Discharger) at approximately 8.7 mgd.**
- ◆ **Lower South Bay was the only Subembayment to experience an increase in average annual flow (6 mgd) compared to 2022/2023. Other Subembayments decreased in flow from 3.9 to 8.9 mgd.**
- ◆ **Dry Season Trending: the dry season trending analysis suggests that South Bay has a downward trend when evaluated for the entire 12-year dry season. The magnitudes of the downward trends is not as large as last year's Group Annual Report.** This trending is based on the least-squares correlation test selected as the basis for trends analysis over the entire dry season dataset since sampling began in 2012 (see Section 3.8).
- ◆ Dischargers to South Bay and Lower South Bay Subembayments account for over half of discharge flow to San Francisco Bay (refer to Figure 5-1 and/or Table 5-3).

A discussion of the results is provided in Section 7.5.

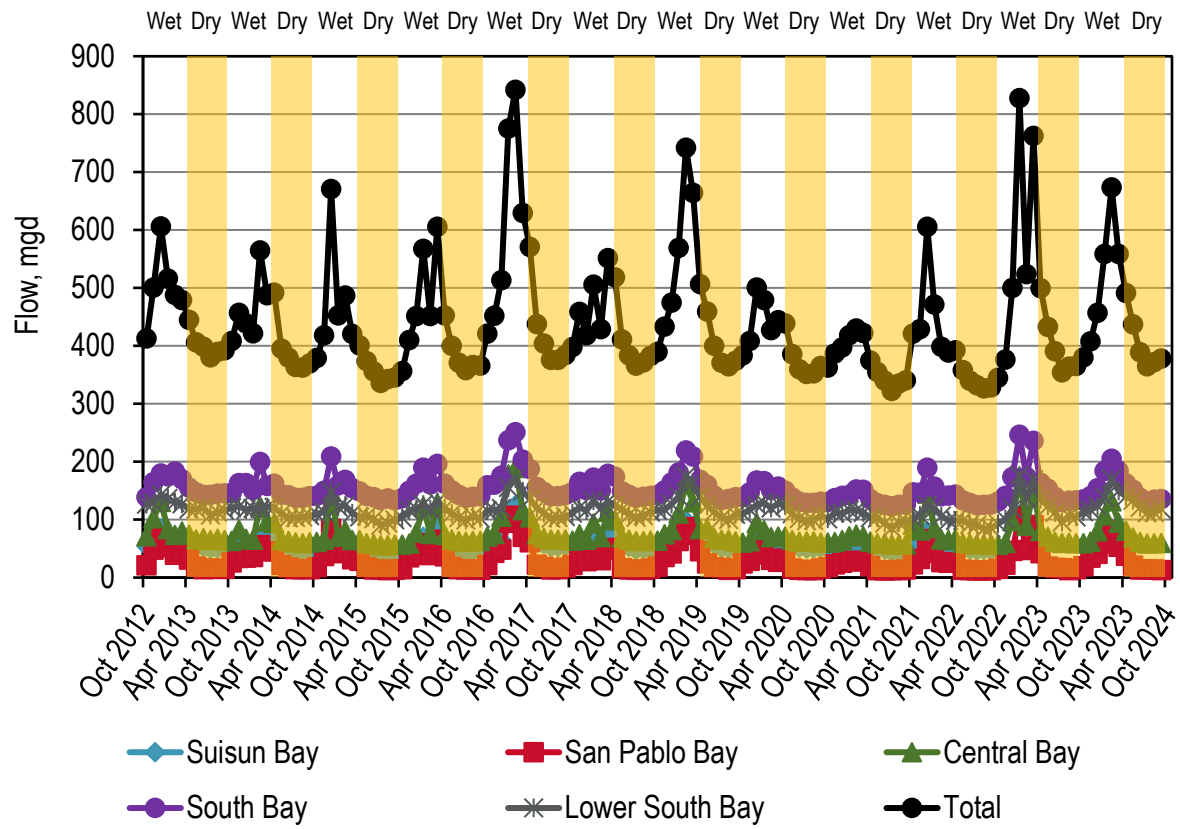


Figure 5-1. Discharge: Average Monthly Discharge Flows

Table 5-1. Discharge: Annual Average Flows by Discharger (mgd)

Discharger	Subembayment	Permitted Capacity ^(a)	2012/ 2013 ^(b,c)	2013/ 2014 ^(b,c)	2014/ 2015 ^(b,c)	2015/ 2016 ^(b,c)	2016/ 2017 ^(b,c)	2017/ 2018 ^(b,c)	2018/ 2019 ^(b,c)	2019/ 2020 ^(b,c)	2020/ 2021 ^(b,c)	2021/ 2022 ^(b,c)	2022/ 2023 ^(b,c)	2023/ 2024 ^(b,c)	12-Year Average
American Canyon	San Pablo Bay	2.5	1.47	1.36	1.45	1.44	1.77	1.39	1.58	1.22	1.13	1.27	1.62	1.45	1.43
Benicia	San Pablo Bay	4.5	2.18	2.04	1.98	2.00	2.46	1.99	2.23	1.80	1.67	1.79	2.28	1.99	2.03
Burlingame	South Bay	5.5	3.03	2.91	2.96	2.84	3.62	2.74	2.99	2.44	2.12	2.53	3.15	2.53	2.82
Central San	Suisun Bay	53.8	37.5	35.5	32.8	33.7	43.5	34.9	38.6	33.3	31.4	34.1	42.8	36.3	36.2
CMSA	Central Bay	10	7.66	5.84	6.97	8.05	13.4	9.16	12.0	9.01	7.42	9.53	11.42	10.4	9.24
Port Costa	San Pablo Bay	0.033	0.00682	0.00630	0.0102	0.0165	0.0308	0.0197	0.0240	0.0296	0.0145	0.0200	0.0409	0.0326	0.0210
Delta Diablo	Suisun Bay	19.5	6.83	6.12	7.38	7.21	9.88	9.04	8.74	8.17	7.41	7.84	9.01	8.45	8.01
EBDA	South Bay	107.8	62.2	58.5	59.1	61.0	68.1	60.5	65.0	62.1	60.2	62.0	71.5	66.2	63.0
EBMUD	Central Bay	120	58.3	56.2	51.5	53.4	66.1	52.0	58.0	48.1	45.3	51.5	60.0	53.6	54.5
FSSD	Suisun Bay	23.7	13.2	12.4	12.1	13.0	17.0	13.4	15.4	12.9	12.3	13.9	17.4	15.7	14.1
Las Gallinas ^(d)	San Pablo Bay	2.92	1.37	1.19	1.25	1.66	2.86	1.35	2.62	1.93	1.44	1.38	2.14	1.78	1.75
Paradise Cove	Central Bay	0.04	0.0144	0.0138	0.0135	0.0129	0.0148	0.0159	0.0166	0.0149	0.0144	0.0141	0.0145	0.0126	0.0144
Tiburon	Central Bay	0.98	0.587	0.592	0.665	0.551	0.791	0.641	0.670	0.573	0.526	0.592	0.714	0.629	0.628
Millbrae	South Bay	3	1.58	1.65	1.35	1.49	1.87	1.48	1.73	1.48	1.38	1.54	1.76	1.66	1.58
Mt. View	Suisun Bay	3.2	1.34	1.27	1.26	1.20	1.53	1.27	1.36	1.19	1.02	1.08	1.34	1.13	1.25
Napa ^(d)	San Pablo Bay	15.4	5.05	4.60	5.30	6.04	8.94	4.55	7.42	3.54	1.28	3.16	6.46	5.94	5.19
Novato ^(d)	San Pablo Bay	7	3.18	2.89	3.33	2.94	5.08	2.98	4.78	2.75	2.04	2.52	4.82	3.70	3.42
Palo Alto	Lower South Bay	39	21.5	19.2	18.9	22.4	23.2	19.1	21.9	19.5	17.1	17.0	21.8	20.0	20.1
Petaluma ^(d)	San Pablo Bay	6.7	3.67	4.32	3.18	2.83	4.63	3.18	4.02	2.89	1.61	2.25	3.59	4.02	3.35
Pinole	San Pablo Bay	4.06	2.57	2.60	2.39	2.40	2.98	2.50	2.78	2.27	2.20	2.73	3.11	2.89	2.62
Rodeo	San Pablo Bay	1.14	0.650	0.593	0.603	0.601	0.805	0.587	0.680	0.551	0.527	0.572	0.741	0.660	0.631
SFO Airport	South Bay	2.2	1.13	1.17	1.02	1.10	1.25	1.15	1.22	0.943	0.748	0.900	1.05	1.11	1.07
SFPUC Southeast	South Bay	85.4	56.9	58.9	55.3	56.6	63.0	56.5	55.5	46.8	42.2	44.3	48.3	48.2	52.7
San Jose	Lower South Bay	167	91.5	84.3	81.3	80.3	90.4	87.5	93.8	84.4	76.1	73.1	87.9	96.6	85.6
San Mateo	South Bay	15.7	10.8	9.73	10.2	10.3	12.3	10.4	11.6	9.92	9.19	9.99	12.1	11.2	10.6
SMCSD	Central Bay	1.8	1.52	1.25	1.19	1.27	1.52	1.14	1.30	1.03	1.09	1.09	1.21	1.20	1.23
SASM	Central Bay	3.6	2.19	2.69	2.35	2.49	3.09	2.26	2.67	2.14	2.08	2.43	2.86	2.65	2.49
SVCW	South Bay	29	12.9	12.2	12.8	14.1	16.0	13.9	15.6	13.7	12.5	13.1	16.1	14.8	14.0
Sonoma Valley ^(d)	San Pablo Bay	3	1.59	1.29	0.317	0.567	2.22	0	1.48	0	0	0.339	1.760	1.33	0.908
South SF	South Bay	13	8.99	8.68	8.43	8.25	8.98	7.60	8.55	7.34	6.72	7.66	8.90	8.99	8.26
Sunnyvale	Lower South Bay	29.5	10.8	10.8	10.2	10.2	11.9	10.5	11.6	10.1	10.7	10.6	12.9	12.5	11.1
Treasure Island	Central Bay	2	0.312	0.323	0.324	0.330	0.375	0.313	0.412	0.285	0.234	0.320	0.402	0.355	0.332
Vallejo	San Pablo Bay	15.5	10.4	9.14	10.0	9.70	12.6	9.06	10.1	8.51	7.80	9.55	10.84	9.67	9.77
West County	Central Bay	28.5	8.32	8.27	7.40	10.1	13.1	9.93	13.3	7.37	6.29	8.75	8.74	8.16	9.14
Total ^(e)		827	451	428	415	430	515	433	480	408	374	399	479	456	439

- a. Based on ADWF permitted capacity.
- b. Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.
- c. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2012/2013 represents the period between October 1, 2012 and September 30, 2013.
- d. No discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- e. The total values might vary from the sum of the listed values by plant due to rounding.

Table 5-2. Discharge: Dry Season Average Flows by Discharger (mgd)

Discharger	Subembayment	Permitted Capacity ^(a)	2013 ^(b,c)	2014 ^(b,c)	2015 ^(b,c)	2016 ^(b,c)	2017 ^(b,c)	2018 ^(b,c)	2019 ^(b,c)	2020 ^(b,c)	2021 ^(b,c)	2022 ^(b,c)	2023 ^(b,c)	2024 ^(b,c)	12-Year Average
American Canyon	San Pablo Bay	2.5	1.19	1.18	1.14	1.04	1.12	1.09	1.17	0.949	0.892	0.796	1.04	0.955	1.05
Benicia	San Pablo Bay	4.5	1.99	1.85	1.68	1.83	1.92	1.82	1.90	1.68	1.58	1.55	1.77	1.72	1.77
Burlingame	South Bay	5.5	2.82	2.55	2.57	2.54	2.84	2.49	2.49	2.20	1.91	2.03	2.13	2.14	2.39
Central San	Suisun Bay	53.8	34.1	32.6	28.1	30.1	33.9	31.2	32.8	31.5	28.7	29.5	33.7	32.4	31.5
CMSA	Central Bay	10	5.59	4.97	4.71	5.72	7.49	6.93	7.96	7.14	6.08	6.15	6.86	6.72	6.36
Port Costa	San Pablo Bay	0.033	0.00496	0.00400	0.00868	0.0157	0.0147	0.0208	0.0149	0.0149	0.0118	0.0188	0.0236	0.0167	0.0141
Delta Diablo	Suisun Bay	19.5	6.19	5.72	5.89	6.24	8.81	7.43	8.28	8.00	6.48	6.72	8.41	7.88	7.17
EBDA	South Bay	107.8	55.6	50.8	51.3	53.3	53.0	54.9	56.4	56.4	55.2	54.0	59.1	57.3	54.8
EBMUD	Central Bay	120	50.0	47.1	43.5	45.4	48.1	45.9	48.3	45.3	42.4	42.8	45.6	44.8	45.8
FSSD	Suisun Bay	23.7	10.3	10.2	9.12	10.2	12.2	11.7	12.8	11.3	10.8	11.4	13.6	12.8	11.4
Las Gallinas ^(d)	San Pablo Bay	2.92	0	0	0	0	0.407	0	0.750	0.405	0	0	0	0	0.130
Paradise Cove	Central Bay	0.04	0.0140	0.0130	0.0126	0.0129	0.0125	0.0183	0.0149	0.0154	0.0127	0.0132	0.0125	0.0112	0.0136
Tiburon	Central Bay	0.98	0.532	0.542	0.545	0.551	0.558	0.547	-	0.537	0.485	0.473	0.558	0.482	0.528
Millbrae	South Bay	3	1.53	1.25	1.19	1.40	1.42	1.30	1.48	1.37	1.32	1.33	1.44	1.46	1.37
Mt. View	Suisun Bay	3.2	1.14	1.21	1.12	1.22	1.25	1.19	1.20	1.11	0.979	1.00	1.05	1.07	1.13
Napa ^(d)	San Pablo Bay	15.4	0	1.20	0	0	0	0	0	0	0	0	0	0	0.100
Novato ^(d)	San Pablo Bay	7	0.806	0.743	0.736	0.763	2.28	0.779	2.30	0.503	0.264	0	2.22	0.707	1.01
Palo Alto	Lower South Bay	39	22.5	19.6	18.5	21.6	18.9	19.5	17.4	17.5	17.0	16.1	18.4	19.7	18.9
Petaluma ^(d)	San Pablo Bay	6.7	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinole	San Pablo Bay	4.06	2.50	2.33	2.09	2.20	2.36	2.27	2.50	2.22	2.11	2.44	2.46	2.54	2.33
Rodeo	San Pablo Bay	1.14	0.572	0.551	0.491	0.523	0.552	0.526	0.550	0.540	0.496	0.486	0.546	0.548	0.532
SFO Airport	South Bay	2.2	1.07	1.13	0.949	1.06	1.14	1.12	1.17	0.665	0.688	0.915	0.990	1.09	1.000
SFPUC Southeast	South Bay	85.4	53.3	56.0	52.8	54.6	57.1	52.9	49.6	42.0	40.4	42.2	44.4	45.4	49.2
San Jose	Lower South Bay	167	83.6	77.2	72.1	74.6	80.1	81.9	83.4	77.2	68.3	64.3	80.4	89.1	77.7
San Mateo	South Bay	15.7	10.0	9.18	8.52	9.18	9.63	9.68	9.97	9.52	8.52	8.66	9.53	9.61	9.34
SMCSD	Central Bay	1.8	1.22	1.06	1.03	1.11	1.13	1.02	1.06	0.943	1.08	0.885	0.96	0.964	1.04
SASM	Central Bay	3.6	1.95	1.87	1.74	1.77	1.94	1.79	1.70	1.98	1.80	1.80	1.94	1.85	1.85
SVCW	South Bay	29	11.8	11.0	11.9	12.5	13.1	12.5	13.3	12.6	11.3	11.4	12.7	12.7	12.2
Sonoma Valley ^(d)	San Pablo Bay	3	0	0	0	0	0.0549	0	0	0	0	0	0.0741	0	0.0108
South SF	South Bay	13	8.43	8.34	7.46	7.41	7.13	7.21	7.50	6.97	6.45	7.17	7.57	8.25	7.49
Sunnyvale	Lower South Bay	29.5	9.02	8.94	7.71	8.04	9.34	8.54	9.06	8.38	9.57	9.56	9.78	10.5	9.04
Treasure Island	Central Bay	2	0.281	0.296	0.275	0.273	0.277	0.306	0.307	0.253	0.238	0.272	0.323	0.296	0.283
Vallejo	San Pablo Bay	15.5	8.75	8.73	8.21	8.40	8.70	7.94	8.10	7.75	7.66	7.42	7.77	8.62	8.17
West County	Central Bay	28.5	6.55	6.09	5.61	8.74	8.65	8.67	10.2	6.16	5.76	5.53	6.11	6.54	7.05
Total ^(e)		827	393	374	351	372	396	383	394	363	339	337	381	388	373

- a. Based on ADWF permitted capacity.
- b. Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.
- c. Based on average values from May 1 through September 30.
- d. No discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- e. The total values might vary from the sum of the listed values by plant due to rounding.

Table 5-3. Discharge: Annual Average by Subembayment, Flow (mgd)

Subembayment	Permitted Capacity ^(a)	2012/2013 ^(b)	2013/2014 ^(b)	2014/2015 ^(b)	2015/2016 ^(b)	2016/2017 ^(b)	2017/2018 ^(b)	2018/2019 ^(b)	2019/2020 ^(b)	2020/2021 ^(b)	2021/2022 ^(b)	2022/2023 ^(b)	2023/2024 ^(b)	12-Year Average
Suisun Bay	100	58.9	55.3	53.5	55.1	71.9	58.6	64.1	55.6	52.1	56.9	70.5	61.6	59.5
San Pablo Bay ^(c)	62.8	32.1	30.0	29.8	30.2	44.4	27.6	37.7	25.5	19.7	25.6	37.4	33.5	31.1
Central Bay	167	78.9	75.2	70.3	75.9	98.3	75.3	88.4	68.5	62.9	74.2	85.4	77.0	77.6
South Bay	262	157	154	151	156	175	154	162	145	135	142	163	155	154
Lower South Bay	236	124	114	110	113	125	117	127	114	104	101	123	129	117
Total	827	451	428	415	430	515	433	480	408	374	399	479	456	439

- a. Based on ADWF permitted capacity.
- b. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2012/2013 represents the period between October 1, 2012 and September 30, 2013.
- c. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.

Table 5-4. Discharge: Dry Season by Subembayment, Flow (mgd)

Subembayment	Permitted Capacity ^(a)	2013 ^(b)	2014 ^(b)	2015 ^(b)	2016 ^(b)	2017 ^(b)	2018 ^(b)	2019 ^(b)	2020 ^(b)	2021 ^(b)	2022 ^(b)	2023 ^(b)	2024 ^(b)	12-Year Average	Trend ^(d,e)
Suisun Bay	100	51.7	49.8	44.2	47.8	56.1	51.6	55.1	51.9	47.0	48.7	56.7	54.1	51.2	None
San Pablo Bay ^(c)	62.8	15.8	16.6	14.4	14.8	17.4	14.5	17.3	14.1	13.1	12.7	15.9	15.1	15.1	None
Central Bay	167	66.1	61.9	57.3	63.5	68.2	64.9	69.5	62.4	57.9	58.0	62.4	61.7	62.9	None
South Bay	262	145	140	137	142	145	142	142	132	126	128	138	138	138	Down (-0.8%/yr)
Lower South Bay	236	115	106	98.3	104	108	110	110	103	94.9	90.0	109	119	106	None
Total	827	393	374	351	372	396	383	394	363	339	337	381	388	373	None

- a. Based on ADWF permitted capacity.
- b. Based on average values from May 1 through September 30.
- c. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- d. Trend analysis is based on average monthly values. Discernible trends were identified based on the slope of a regression line determined using the method of least squares to fit the data (alpha = 0.05). Sample size is 60. Where “None” is stated, the limited dataset does not indicate a statistically relevant trend.
- e. The percent change represents the change per year as a percentage of the average value over the entire dataset (2013-2024) (not considered if trend is “None”).

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5.2 Total Ammonia

The historical average monthly discharge loads from October 2012 through September 2024 are presented in Figure 5-2. The annual average (i.e., twelve months from October 1 to September 30) and dry season average monthly (i.e., May 1 through September 30) discharge loads were calculated based on reported loads in Table 5-5 and Table 5-6, respectively. In addition, the annual average and dry season average monthly discharge loads and concentrations for each Subembayment are provided in Table 5-7 through Table 5-10, respectively.

A summary of the discharge data review findings is as follows (**new findings for 2023/2024 in bold**):

- ◆ **Average Annual Loads:** the loads for this past year are the second lowest since sampling began in 2012 (refer to Table 5-5). The decrease compared to the previous year (2022/2023) is approximately 850 kg N/d. The largest contributors to the decrease are Central San (Suisun Bay Discharger, 320 kg N/d), EBDA (South Bay Discharger, 360 kg N/d), and SVCW (South Bay Discharger, 320 kg N/d) compared to last year. The significant load reduction at EBMUD first observed in 2022/2023 (Central Bay Discharger) has remained consistent and is attributed to two independent efforts: i) EBMUD stopped accepting trucked waste with relatively high nitrogenous compounds (e.g., animal blood waste) and ii) the treatment plant began treating up to 50 percent of the dry season plant flow via split treatment with biological nitrification/denitrification.
- ◆ **Dry Season Loads:** the total load for 2022/2023 and 2023/2024 are tied for the lowest since sampling began in 2012 (refer to Table 5-6). The overall load decreased approximately 30 kg N/d compared to last year. While Central San contributed to the reduction in average annual load, Central San's dry season load increased by approximately 100 kg N/d. The two largest contributors to the decrease are EBDA (South Bay Discharger, 490 kg N/d) and SVCW (South Bay Discharger, 490 kg N/d). The large reduction observed at EBMUD (Central Bay Discharger) first observed in 2022/2023 has remained consistent and is attributed to the reasons referenced in the average annual loads section.
- ◆ **Dry Season Trending:** the dry season trending analysis suggests that San Pablo Bay has an upward trend when evaluated over the entire 12-years of dry season data. In contrast, the South Bay has a dry season trend suggesting a downward trend. Baywide, the trending analysis suggests no emerging trend over the entire 12-years of dry season data. This trending is based on the least-squares correlation test selected as the basis for trends analysis over the entire dry season dataset since sampling began in 2012 (see Section 3.8).
- ◆ Dischargers to the South Bay Subembayment account for over half of the load discharged to the Bay, regardless of annual or dry season average (refer to Figure 5-2, Table 5-7, or Table 5-8).
- ◆ The nutrient concentrations are calculated based on flow-weighted values (refer to Table 5-9 and Table 5-10). The key findings on concentrations are as follows:
 - ▲ **The annual average discharge concentrations for 2023/2024 are higher for all Subembayments compared to 2022/2023 by approximately 0.2 to 2.6 mg N/L. The**

dry season discharge concentration for Suisun Bay Dischargers increased by 3.0 mg N/L for 2023/2024 compared to 2022/2023 and increased by 5.0 mg N/L for San Pablo Bay Dischargers. The 2022/2023 dataset has discharge concentrations that are at or near the lowest levels for all Subembayments since sampling began in 2012 (except San Pablo and Lower South Bays). The relatively low discharge concentrations for 2022/2023 is attributed to this past year's relatively wet year that has resulted in a higher dilution. Furthermore, all the Lower South Bay dischargers are required to fully nitrify (i.e., ammonia values less than 2 mg N/L on average) which is why the concentrations have been reliably less than 1.3 mg N/L since sampling began in 2012.

- ▲ Prior to 2022/2023, dischargers to Central Bay usually had the highest discharge concentrations of all the Subembayments. However, in 2022/2023, discharge concentrations were the highest for South Bay Dischargers (regardless of average period). This change is attributed to EBMUD's efforts in the Central Bay as previously noted in the average annual loads section. **For 2023/2024, South Bay Dischargers have a slightly higher discharge concentration than the Central Bay Dischargers; however, the difference is small (0.2 mg N/L).**

An overall discussion of the results is provided in Section 7.5.2.

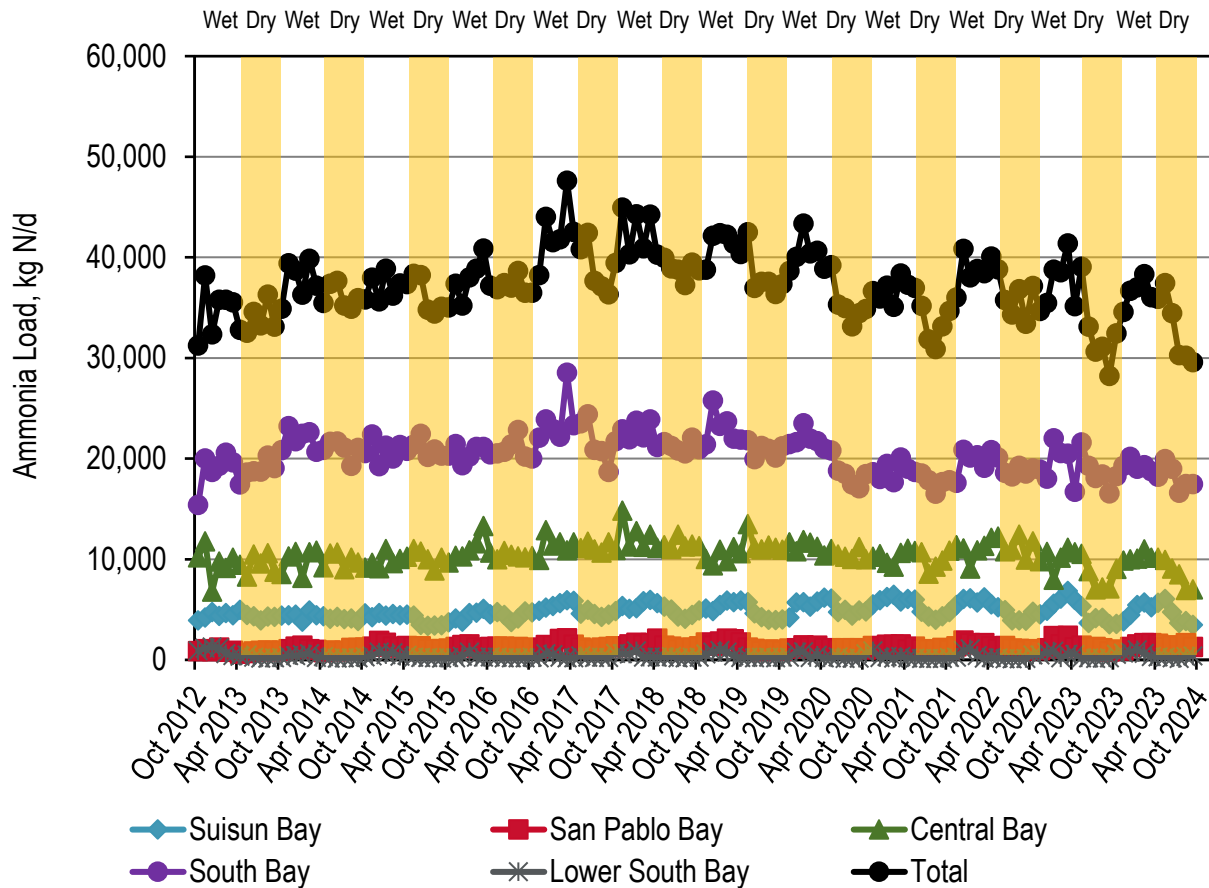


Figure 5-2. Discharge: Average Monthly Discharge Total Ammonia Loads

Table 5-5. Discharge: Annual Average by Discharger, Total Ammonia (kg N/d)

Discharger	Subembayment	2012/ 2013 ^(a,b)	2013/ 2014 ^(a,b)	2014/ 2015 ^(a,b)	2015/ 2016 ^(a,b)	2016/ 2017 ^(a,b)	2017/ 2018 ^(a,b)	2018/ 2019 ^(a,b)	2019/ 2020 ^(a,b)	2020/ 2021 ^(a,b)	2021/ 2022 ^(a,b)	2022/ 2023 ^(a,b)	2023/ 2024 ^(a,b)	12-Year Average
American Canyon	San Pablo Bay	1.77	5.43	3.25	1.54	2.31	4.83	4.12	1.33	0.390	0.650	1.82	2.51	2.50
Benicia	San Pablo Bay	190	159	186	194	175	216	187	174	200	165	193	187	186
Burlingame	South Bay	305	251	259	274	323	320	351	240	243	284	277	210	278
Central San	Suisun Bay	3,610	3,510	3,210	3,490	3,610	3,560	3,530	3,870	4,210	4,070	3,660	3,340	3,640
CMSA	Central Bay	720	779	603	753	1,010	861	1,060	1,070	987	993	971	1,045	905
Port Costa	San Pablo Bay	0.255	0.337	0.344	0.431	0.716	0.885	0.565	3.65	0.793	0.594	0.811	0.911	0.858
Delta Diablo	Suisun Bay	757	740	903	873	1,420	1,500	1,480	1,290	1,130	1,050	1,270	1,280	1,140
EBDA	South Bay	6,820	7,010	7,320	7,330	7,320	7,830	7,680	8,070	6,670	7,010	7,180	6,820	7,250
EBMUD	Central Bay	8,070	8,350	8,630	9,010	9,390	10,100	8,810	8,920	8,130	9,190	7,730	7,740	8,670
FSSD	Suisun Bay	1.45	1.68	1.56	1.91	2.67	7.66	9.09	5.17	3.85	15.0	18.02	10.27	6.53
Las Gallinas ^(c)	San Pablo Bay	10.7	14.8	11.6	23.4	34.7	34.6	54.1	31.8	43.9	17.4	19.8	4.9	25.2
Paradise Cove	Central Bay	0.443	0.249	0.0102	1.35	0.0386	0.0197	0.0452	0.0624	0.155	0.367	0.114	0.074	0.244
Tiburon	Central Bay	40.2	48.3	53.0	55.0	33.6	55.1	48.7	29.4	32.3	31.8	33.3	31.8	41.0
Millbrae	South Bay	237	233	237	265	292	260	284	281	269	232	250	291	261
Mt. View	Suisun Bay	3.09	0.824	2.08	3.80	2.61	2.53	4.25	3.60	3.90	1.25	1.99	1.23	2.60
Napa ^(c)	San Pablo Bay	44.1	17.0	6.35	16.5	103	38.1	158	25.0	8.52	34.4	85.2	87.3	52.0
Novato ^(c)	San Pablo Bay	7.25	10.0	17.5	6.92	40.6	16.5	57.1	23.1	22.1	23.3	70.8	29.4	27.0
Palo Alto	Lower South Bay	13.4	12.8	17.7	17.6	12.0	15.8	10.6	8.90	12.3	9.11	23.5	115.4	22.4
Petaluma ^(c)	San Pablo Bay	3.22	7.17	2.82	5.43	2.57	3.15	7.47	2.94	2.22	4.42	3.21	4.34	4.08
Pinole	San Pablo Bay	187	202	229	258	242	273	115	171	218	381	349	352	248
Rodeo	San Pablo Bay	3.47	5.05	3.76	6.96	9.30	3.84	4.78	18.5	11.9	32.7	31.2	21.6	12.7
SFO Airport	South Bay	227	242	132	141	212	115	82.4	3.75	50.5	68.1	157	45	123
SFPUC Southeast	South Bay	7,280	9,580	8,630	8,400	9,780	8,460	8,380	7,110	6,400	6,800	6,360	6,680	7,820
San Jose	Lower South Bay	280	204	197	232	183	206	215	197	139	131	159	138	190
San Mateo	South Bay	1,320	1,300	1,210	1,110	1,250	1,320	1,520	1,210	1,250	1,250	1,090	1,170	1,250
SMCSD	Central Bay	51.0	41.6	50.2	44.7	73.7	94.8	72.8	73.2	75.8	60.6	38.4	55.8	61.1
SASM	Central Bay	49.5	45.5	39.0	62.2	26.7	67.2	107	85.6	91.8	116	106.8	79.8	73.1
SVCW	South Bay	1,900	1,980	2,240	2,540	2,390	2,670	2,610	2,560	2,380	2,620	2,520	2,200	2,380
Sonoma Valley ^(c)	San Pablo Bay	1.53	2.45	0.178	0.130	0.788	0	0.411	0	0	0.130	0.839	0.466	0.577
South SF	South Bay	772	828	863	746	1,030	1,000	1,010	943	1,110	1,020	1,288	1,204	984
Sunnyvale	Lower South Bay	305	86.5	163	30.0	101	171	196	116	133	184	213	206	159
Treasure Island	Central Bay	0.883	2.61	8.36	8.51	5.09	4.76	4.44	3.64	3.22	3.50	4.18	1.96	4.26
Vallejo	San Pablo Bay	426	622	854	749	784	845	849	732	733	674	626	699	716
West County	Central Bay	650	651	620	812	720	705	877	769	714	694	516	347	673
Total ^(d)		34,300	37,000	36,700	37,500	40,600	40,800	39,800	38,000	35,300	37,200	35,300	34,400	37,200

- a. Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.
- b. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2012/2013 represents the period between October 1, 2012 and September 30, 2013.
- c. No discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- d. The total values might vary from the sum of the listed values by plant due to rounding.



Table 5-6. Discharge: Dry Season by Discharger, Total Ammonia (kg N/d)

Discharger	Subembayment	2013 ^(a,b)	2014 ^(a,b)	2015 ^(a,b)	2016 ^(a,b)	2017 ^(a,b)	2018 ^(a,b)	2019 ^(a,b)	2020 ^(a,b)	2021 ^(a,b)	2022 ^(a,b)	2023 ^(a,b)	2024 ^(a,b)	12-Year Average
American Canyon	San Pablo Bay	1.56	2.21	2.06	1.13	1.74	2.93	1.93	0.990	0.374	0.454	1.72	1.48	1.55
Benicia	San Pablo Bay	190	149	143	192	195	195	140	188	199	157	221	219	182
Burlingame	South Bay	311	209	241	246	220	366	224	219	214	216	234	196	241
Central San	Suisun Bay	3,540	3,390	2,960	3,510	3,240	3,250	3,170	3,740	3,830	3,520	2,980	3,080	3,350
CMSA	Central Bay	740	780	619	915	1,020	815	1,020	1,060	993	998	959	1,064	916
Port Costa	San Pablo Bay	0.319	0.0381	0.133	--	0.290	0.296	0.461	0.749	0.613	0.525	0.552	--	0.398
Delta Diablo	Suisun Bay	709	674	650	858	1,320	1,360	1,310	1,280	839	846	1,170	1,270	1,020
EBDA	South Bay	6,290	6,500	7,210	6,620	6,250	7,320	7,260	6,820	5,950	6,190	6,470	5,980	6,570
EBMUD	Central Bay	8,020	8,490	8,770	8,480	9,340	9,770	9,460	8,610	7,940	9,380	6,460	6,770	8,460
FSSD	Suisun Bay	0.938	1.27	1.02	1.26	1.84	6.83	7.41	3.18	3.47	12.1	13.09	7.82	5.02
Las Gallinas ^(c)	San Pablo Bay	0	0	0	0	2.32	0	11.2	0.722	0	0	0	0	1.18
Paradise Cove	Central Bay	0.0284	0.249	0.0119	1.35	0.0169	0.0197	0.0677	0.121	0.258	0.0541	0.016	0.032	0.185
Tiburon	Central Bay	32.2	48.3	46.2	55.0	29.4	57.2	-	27.5	43.3	33.2	21.3	36.8	39.1
Millbrae	South Bay	243	206	235	292	290	249	305	266	274	242	245	265	259
Mt. View	Suisun Bay	1.31	0.754	2.21	3.66	1.19	3.49	4.39	3.40	1.81	1.35	0.91	0.93	2.12
Napa ^(c)	San Pablo Bay	0	0.415	0	0	0	0	0	0	0	0	0	0	0.0346
Novato ^(c)	San Pablo Bay	0.305	2.39	1.20	0.902	18.0	2.40	20.5	5.15	1.44	0	12.00	1.28	5.49
Palo Alto	Lower South Bay	15.1	13.1	17.3	25.8	13.3	26.1	8.29	8.32	9.39	11.6	22.8	117.2	24.0
Petaluma ^(c)	San Pablo Bay	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinole	San Pablo Bay	210	203	220	332	191	266	60.9	174	209	332	325	282	234
Rodeo	San Pablo Bay	0.780	3.66	2.14	5.44	5.24	1.26	3.80	36.2	13.8	19.8	29.6	19.6	11.8
SFO Airport	South Bay	234	263	142	192	337	48.9	146	3.84	61.7	82.5	210	51	148
SFPUC Southeast	South Bay	7,910	9,580	8,930	9,300	10,100	8,670	7,980	6,730	6,770	7,300	6,880	7,290	8,120
San Jose	Lower South Bay	229	158	182	162	197	211	222	172	116	94.5	131	109	165
San Mateo	South Bay	1,530	1,480	1,200	1,290	1,190	1,420	1,550	1,240	1,030	1,260	1,190	1,310	1,310
SMCSD	Central Bay	49.3	50.2	45.8	59.3	105	132	126	66.3	69.1	52.5	35.0	42.0	69.4
SASM	Central Bay	54.4	32.7	25.1	49.8	22.1	100	132	94.6	73.0	164	71.0	78.2	74.7
SVCW	South Bay	1,760	1,900	2,310	2,470	2,390	2,300	2,480	2,320	2,470	2,410	2,510	2,010	2,280
Sonoma Valley ^(c)	San Pablo Bay	0	0	0	0	0.0182	0	0	0	0	0	0.03367	0	0.00433
South SF	South Bay	781	827	775	716	852	882	864	895	1,070	1,230	1,038	991	910
Sunnyvale	Lower South Bay	16.8	11.8	12.5	15.6	60.8	9.43	2.97	5.38	12.5	16.7	23.4	31.8	18.3
Treasure Island	Central Bay	1.23	4.55	10.5	4.16	4.05	6.65	3.41	3.81	3.73	3.01	4.02	1.55	4.23
Vallejo	San Pablo Bay	435	645	795	705	752	767	791	722	692	600	579	872	696
West County	Central Bay	653	639	665	815	725	678	871	712	714	645	576	292	665
Total ^(d)		34,000	36,300	36,200	37,300	38,900	38,900	38,200	35,400	33,600	35,800	32,400	32,400	35,800

- a. Data are presented in detail and summarized for each plant in the Appendix. A “--” indicates data were not available, whereas a “0” indicates a value of zero.
- b. Based on average values from May 1 through September 30.
- c. No discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- d. The total values might vary from the sum of the listed values by plant due to rounding.

Table 5-7. Discharge: Annual Average by Subembayment, Total Ammonia (kg N/d)

Subembayment	2012/ 2013 ^(a)	2013/ 2014 ^(a)	2014/ 2015 ^(a)	2015/ 2016 ^(a)	2016/ 2017 ^(a)	2017/ 2018 ^(a)	2018/ 2019 ^(a)	2019/ 2020 ^(a)	2020/ 2021 ^(a)	2021/ 2022 ^(a)	2022/ 2023 ^(a)	2023/ 2024 ^(a)	12-Year Average
Suisun Bay	4,380	4,250	4,120	4,370	5,030	5,080	5,020	5,170	5,340	5,140	4,950	4,640	4,790
San Pablo Bay ^(b)	874	1,040	1,320	1,260	1,390	1,440	1,440	1,180	1,240	1,330	1,380	1,390	1,270
Central Bay	9,570	9,870	9,960	10,700	11,200	11,900	11,000	11,000	10,000	11,100	9,400	9,300	10,400
South Bay	18,900	21,400	20,900	20,800	22,600	22,000	21,900	20,400	18,400	19,300	19,100	18,600	20,400
Lower South Bay	598	303	378	280	296	393	421	321	284	325	396	459	371
Total	34,300	37,000	36,700	37,500	40,600	40,800	39,800	38,000	35,300	37,200	35,300	34,400	37,200

- a. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2012/2013 represents the period between October 1, 2012 and September 30, 2013.
- b. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.

Table 5-8. Discharge: Dry Season by Subembayment, Total Ammonia (kg N/d)

Subembayment	2013 ^(a)	2014 ^(a)	2015 ^(a)	2016 ^(a)	2017 ^(a)	2018 ^(a)	2019 ^(a)	2020 ^(a)	2021 ^(a)	2022 ^(a)	2023 ^(a)	2024 ^(a)	12-Year Average	Trend ^(c,d)
Suisun Bay	4,250	4,070	3,610	4,380	4,570	4,620	4,500	5,020	4,680	4,380	4,160	4,350	4,380	None
San Pablo Bay ^(b)	835	1,000	1,160	1,240	1,160	1,230	1,030	1,130	1,120	1,110	1,170	1,400	1,130	Up (2.0%/yr)
Central Bay	9,540	10,000	10,200	10,300	11,200	11,600	11,600	10,600	9,840	11,300	8,120	8,300	10,200	None
South Bay	19,100	21,000	21,000	21,100	21,600	21,300	20,800	18,500	17,800	18,900	18,800	18,100	19,800	Down (-1.3%/yr)
Lower South Bay ^(e)	260	183	212	203	271	246	233	186	138	123	177	258	208	-- ^(e)
Total	34,000	36,300	36,200	37,300	38,900	38,900	38,200	35,400	33,600	35,800	32,400	32,400	35,800	Down (-0.8%/yr)

- a. Based on average values from May 1 through September 30.
- b. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- c. Trend analysis is based on average monthly values. Discernible trends were identified based on the slope of a regression line determined using the method of least squares to fit the data (alpha = 0.05). Sample size is 60. Where “None” is stated, the limited dataset does not indicate a statistically relevant trend.
- d. The percent change represents the change per year as a percentage of the average value over the entire dataset (2013-2024) (not considered if trend is “None”).
- e. Dischargers to the Lower South Bay are all required to fully nitrify. As such, no trending analysis was performed on the Lower South Bay.



Table 5-9. Discharge: Annual Average by Subembayment, Total Ammonia (mg N/L)

Subembayment	2012/ 2013 (a,b)	2013/ 2014 (a,b)	2014/ 2015 (a,b)	2015/ 2016 (a,b)	2016/ 2017 (a,b)	2017/ 2018 (a,b)	2018/ 2019 (a,b)	2019/ 2020 (a,b)	2020/ 2021 (a,b)	2021/ 2022 (a,b)	2022/ 2023 (a,b)	2023/ 2024 (a,b)	12-Year Average (b)
Suisun Bay	19.6	20.3	20.3	21.0	18.5	22.9	20.7	24.5	27.1	23.9	18.6	20.6	21.3
San Pablo Bay (c)	7.21	9.20	11.7	11.0	8.31	13.7	10.1	12.3	16.6	13.8	9.76	11.8	10.9
Central Bay	32.1	34.8	37.6	37.2	30.3	41.6	32.8	42.2	42.2	39.5	29.1	31.7	35.5
South Bay	31.6	36.8	36.5	35.3	34.1	37.6	35.7	37.3	36.0	35.8	31.0	31.9	34.9
Lower South Bay	1.28	0.701	0.905	0.654	0.624	0.886	0.875	0.745	0.723	0.852	0.852	1.04	0.849
Total	20.1	22.8	23.4	23.0	20.8	24.9	21.9	24.6	24.9	24.6	19.5	20.7	22.5

- a. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2012/2013 represents the period between October 1, 2012 and September 30, 2013.
- b. Calculation based on a flow-weighted average values.
- c. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.

Table 5-10. Discharge: Dry Season by Subembayment, Total Ammonia (mg N/L)

Subembayment	2013 (a,b)	2014 (a,b)	2015 (a,b)	2016 (a,b)	2017 (a,b)	2018 (a,b)	2019 (a,b)	2020 (a,b)	2021 (a,b)	2022 (a,b)	2023 (a,b)	2024 (a,b)	12-Year Average (b)
Suisun Bay	21.7	21.6	21.6	24.2	21.5	23.7	21.6	25.6	26.3	23.8	19.4	22.4	22.7
San Pablo Bay (d)	14.0	16.0	21.4	22.1	17.7	22.6	15.7	21.2	22.7	23.1	19.4	24.4	19.8
Central Bay	38.2	42.9	46.8	43.1	43.6	46.9	44.1	44.8	44.9	51.4	34.4	34.8	42.9
South Bay	34.9	39.5	40.7	39.3	39.3	39.5	38.8	37.1	37.5	39.1	36.0	34.7	38.0
Lower South Bay	0.598	0.458	0.569	0.516	0.662	0.592	0.560	0.476	0.383	0.360	0.431	0.646	0.526
Total	22.8	25.6	27.3	26.5	26.0	26.8	25.6	25.8	26.2	28.1	22.5	23.0	25.5

- a. Based on average values from May 1 through September 30.
- b. Calculation based on a flow-weighted average values.
- c. Dry season trending not applied to concentrations as the emphasis is on load. Focusing on concentration is limiting as it does not consider the impact of flow.
- d. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.

5.3 Nitrate + Nitrite (NO_x)

The historical average monthly discharge loads from October 2012 through September 2024 are presented in Figure 5-3. The annual average (i.e., twelve months from October 1 to September 30) and dry season average monthly (i.e., May 1 through September 30) discharge loads were calculated based on reported loads in Table 5-11 and Table 5-12, respectively. In addition, the annual average and dry season average monthly discharge loads and concentrations for each Subembayment are provided in Table 5-13 through Table 5-16, respectively.

A summary of the discharge data review findings is as follows (**new findings for 2023/2024 in bold**):

- ◆ **Both the annual average and dry season loads for 2023/2024 increased modestly from 2022/2023 compared to the increase from 2021/2022 to 2022/2023** (refer to Table 5-11 through Table 5-14).
- ◆ **Average Annual Loads:** the average annual load (refer to Table 5-11) increased approximately 400 kg N/d compared to last year and is 600 kg N/d lower than the 12-year average. The highest loads occurred during the first year of sampling and have subsequently decreased annually (except for 2016/2017, 2018/2019, and 2022/2023). **The largest contributor to this increase since last year was San Jose (Lower South Bay discharger) which had an increase of 900 kg N/d.**
- ◆ **Dry Season Loads:** the average annual load (refer to Table 5-12) increased approximately 550 kg N/d compared to last year and is 200 kg N/d higher than the 12-year average. The highest loads occurred during the first year of sampling and have subsequently decreased annually ever since (except in 2015 and 2023). **Similar to average annual, the largest contributor in this increase was from San Jose (Lower South Bay discharger) with an increase of approximately 870 kg N/d.**
- ◆ **Dry Season Trending:** the dry season trending analysis for all the Subembayments and Baywide suggests a downward trend when evaluated over the entire 12-years of dry season data (except Central Bay). The lack of trend for the Central Bay was anticipated as EBMUD (Central Bay Discharger) began producing more NO_x due to converting ammonia to NO_x via biological nitrification in 2023. This trending is based on the least-squares correlation test selected as the basis for trends analysis over the entire dry season dataset since sampling began in 2012 (see Section 3.8).
- ◆ The nutrient concentrations are calculated based on flow-weighted values (refer to Table 5-15 and Table 5-16). The key findings on concentrations are as follows:
 - ▲ **Compared to last year's average annual concentrations, which were the lowest since sampling began in 2012, concentrations increased in all Subembayments except for San Pablo Bay.** The relatively low discharge concentrations for 2022/2023 is attributed to a wet year that resulted in a higher dilution of loads coupled with EBMUD (Central Bay Discharger) not nitrifying during the wet season.
 - ▲ **Dischargers to Lower South Bay have the highest discharge concentrations compared to the dischargers to other Subembayments as all of them fully nitrify (i.e., biologically remove ammonia to values less than 2 mg N/L on average)**

- ▲ Compared to last year, Dischargers to Suisun Bay increased the average dry season NO_x concentration by 0.6 mg N/L, while Dischargers to San Pablo Bay reduced the average NO_x concentration by 2.6 mg N/L. Dischargers to both Suisun Bay and San Pablo Bay have some dischargers that fully nitrify and convert the ammonia to nitrite plus nitrate (e.g., Petaluma).
- ▲ Dischargers to Central Bay had the highest average NO_x concentration since sampling began in 2012. This is attributed to EBMUD (Central Bay Discharger) nitrifying during the dry season.
- ▲ As agencies implement nitrification technologies (e.g., Oro Loma/Castro Valley Sanitary District), the discharge NO_x concentrations (and loads) will increase as the ammonia is biologically converted to nitrite plus nitrate. In such instances, the TIN concentrations (and loads) are anticipated to decline.

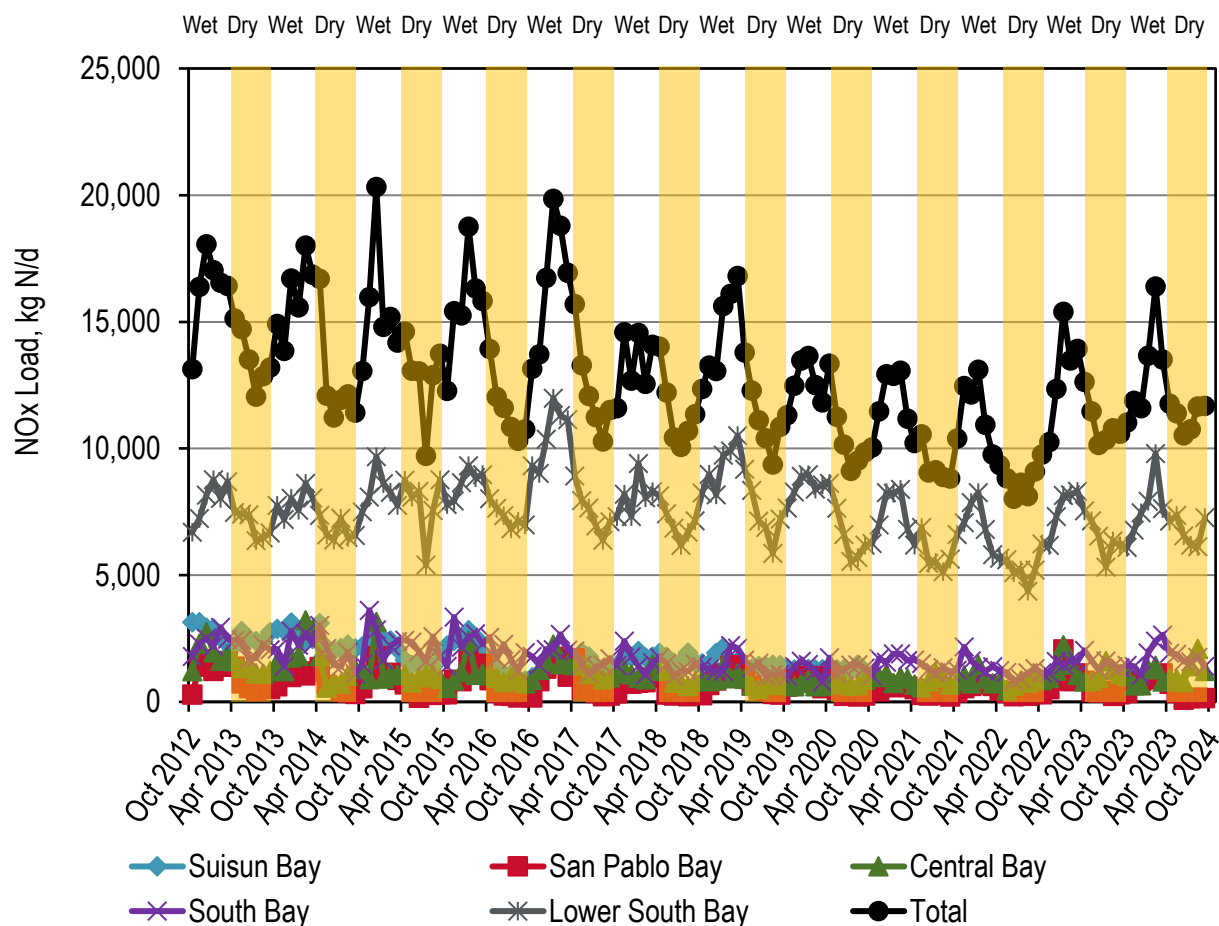


Figure 5-3. Discharge: Average Monthly Discharge NO_x Loads

Table 5-11. Discharge: Annual Average Values by Discharger, NOx (kg N/d)

Discharger	Subembayment	2012/ 2013 ^(a,b)	2013/ 2014 ^(a,b)	2014/ 2015 ^(a,b)	2015/ 2016 ^(a,b)	2016/ 2017 ^(a,b)	2017/ 2018 ^(a,b)	2018/ 2019 ^(a,b)	2019/ 2020 ^(a,b)	2020/ 2021 ^(a,b)	2021/ 2022 ^(a,b)	2022/ 2023 ^(a,b)	2023/ 2024 ^(a,b)	12-Year Average
American Canyon	San Pablo Bay	68.6	74.9	41.2	30.6	39.1	31.9	33.2	31.8	17.5	18.3	28.5	38.0	37.8
Benicia	San Pablo Bay	35.1	45.5	47.5	39.3	67.9	35.2	34.5	37.3	28.4	46.2	20.0	35.0	39.3
Burlingame	South Bay	92.9	182	33.2	18.0	43.0	39.2	115	220	145	51.8	36.1	61.3	86.5
Central San	Suisun Bay	270	293	461	309	392	284	255	108	55.8	94.9	263	371	263
CMSA	Central Bay	124	67.2	158	115	171	125	58.4	95.2	104	70.3	58.4	55	100
Port Costa	San Pablo Bay	0	0	0	1.30	1.13	0.700	0.143	0.573	0.776	0.744	0.935	0.477	0.565
Delta Diablo	Suisun Bay	936	774	382	450	31.4	34.1	48.2	46.1	68.6	55.0	39.5	43	242
EBDA	South Bay	1,050	822	994	1,070	1,000	852	818	748	1,050	885	943	1,139	948
EBMUD	Central Bay	1,120	1,090	763	521	517	573	517	391	556	584	845	676	680
FSSD	Suisun Bay	1,310	1,330	1,030	874	914	1,290	1,120	1,030	1,010	1,110	1,050	1,060	1,090
Las Gallinas ^(c)	San Pablo Bay	118	104	85.9	97.7	104	101	114	136	96.5	44.5	59.5	57.3	93.1
Paradise Cove	Central Bay	1.64	0	2.53	0.180	2.21	2.11	1.77	1.65	1.39	0.599	1.11	2.43	1.47
Tiburon	Central Bay	18.6	7.78	4.81	7.60	11.5	0.382	1.04	22.5	0.581	17.5	5.40	14.35	9.34
Millbrae	South Bay	3.37	1.30	2.14	2.14	2.28	0.766	2.10	6.85	9.95	12.8	13.7	1.73	4.93
Mt. View	Suisun Bay	118	128	117	119	139	122	111	116	95.7	69.3	82.7	73	108
Napa ^(c)	San Pablo Bay	129	158	165	154	156	123	149	127	36.5	84.6	135	114	128
Novato ^(c)	San Pablo Bay	137	126	150	132	157	114	124	85.3	64.8	63.4	122	92	114
Palo Alto	Lower South Bay	2,340	2,150	2,110	2,630	2,550	2,160	2,300	2,220	1,940	2,140	2,400	1,800	2,230
Petaluma ^(c)	San Pablo Bay	22.0	4.61	20.4	10.1	13.8	1.72	16.7	3.74	3.09	2.71	12.7	6.67	9.86
Pinole	San Pablo Bay	114	93.1	48.4	51.4	78.1	44.1	104	60.3	54.7	28.6	30.5	42.5	62.5
Rodeo	San Pablo Bay	32.9	25.6	29.5	23.4	35.1	28.7	33.5	20.1	19.6	18.3	22.8	29.6	26.6
SFO Airport	South Bay	23.6	15.4	22.0	20.6	13.6	23.8	24.6	21.5	4.63	4.75	2.39	7.6	15.4
SFPUC Southeast	South Bay	645	757	963	648	484	401	399	122	112	94.8	137	115	406
San Jose	Lower South Bay	4,520	4,570	5,390	4,760	5,610	4,720	5,290	4,680	3,940	3,320	3,620	4,520	4,580
San Mateo	South Bay	129	102	94.8	190	105	112	12.7	121	122	139	267	201	133
SMCSD	Central Bay	77.4	76.2	76.8	87.6	62.3	41.4	62.3	50.5	63.0	55.1	72.8	61.1	65.5
SASM	Central Bay	162	158	134	172	138	110	92.7	115	124	99.6	138	137	132
SVCW	South Bay	75.7	67.3	62.3	53.0	68.8	23.3	25.9	23.9	33.9	51.4	49.0	156.9	57.6
Sonoma Valley ^(c)	San Pablo Bay	27.9	6.76	23.1	10.5	81.2	0	29.5	0	0	0.790	71.3	16.0	22.3
South SF	South Bay	211	104	76.8	151	44.1	34.0	32.7	61.0	13.5	55.7	44.8	72.9	75.1
Sunnyvale	Lower South Bay	589	611	563	562	852	707	769	694	766	669	937	874	716
Treasure Island	Central Bay	9.96	11.2	10.6	8.91	11.2	7.22	8.73	17.3	15.8	13.4	21.0	21.8	13.1
Vallejo	San Pablo Bay	341	224	106	153	122	95.0	105	114	111	152	188	131	153
West County	Central Bay	114	150	56.0	144	434	169	121	40.6	27.1	27.8	67.9	150	125
Total ^(d)		14,900	14,300	14,200	13,600	14,500	12,400	12,900	11,600	10,700	10,100	11,800	12,200	12,800

- a. Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.
- b. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2012/2013 represents the period between October 1, 2012 and September 30, 2013.
- c. No discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- d. The total values might vary from the sum of the listed values by plant due to rounding.

Table 5-12. Discharge: Dry Season Discharges by Discharger, NOx (kg N/d)

Discharger	Subembayment	2013 ^(a,b)	2014 ^(a,b)	2015 ^(a,b)	2016 ^(a,b)	2017 ^(a,b)	2018 ^(a,b)	2019 ^(a,b)	2020 ^(a,b)	2021 ^(a,b)	2022 ^(a,b)	2023 ^(a,b)	2024 ^(a,b)	12-Year Average
American Canyon	San Pablo Bay	109	77.5	28.7	19.0	23.0	28.6	27.3	18.4	15.0	10.8	13.3	22.2	32.8
Benicia	San Pablo Bay	36.0	50.0	54.8	39.3	45.8	41.0	56.5	33.6	28.0	46.8	10.1	20.6	38.5
Burlingame	South Bay	125	78.2	31.6	27.9	50.6	22.7	227	243	48.5	81.5	43.7	48.2	85.7
Central San	Suisun Bay	181	243	417	196	368	302	247	154	64.4	175	450	342	262
CMSA	Central Bay	104	60.5	103	48.8	196	139	68.5	105	111	89.0	37.3	31.6	91.0
Port Costa	San Pablo Bay	--	--	--	--	--	--	0.203	0.769	--	--	0.591	--	0.391
Delta Diablo	Suisun Bay	925	807	219	69.0	27.0	47.2	51.0	47.4	107	99.9	26.9	54	207
EBDA	South Bay	880	696	656	821	685	712	616	821	926	696	856	1,025	783
EBMUD	Central Bay	888	581	614	478	418	472	421	368	481	505	813	841	573
FSSD	Suisun Bay	1,360	968	806	653	1,080	1,230	1,010	966	901	1,030	871	941	985
Las Gallinas ^(c)	San Pablo Bay	0	0	0	0	6.67	0	42.9	46.1	0	0	0	0	7.98
Paradise Cove	Central Bay	2.49	0.0374	2.60	0.180	2.60	2.11	2.09	0.848	0.545	0.783	2.20	2.41	1.57
Tiburon	Central Bay	14.5	7.78	6.99	7.60	15.6	0.339		26.3	0.0727	0.681	14.5	1.82	8.75
Millbrae	South Bay	4.31	1.20	1.58	0.672	0.887	0.923	2.32	9.60	1.64	2.53	8.58	2.40	3.05
Mt. View	Suisun Bay	99.6	112	101	118	115	107	101	123	88.5	40.3	55.6	48.3	92.5
Napa ^(c)	San Pablo Bay	0	49.7	0	0	0	0	0	0	0	0	0	0	4.14
Novato ^(c)	San Pablo Bay	39.6	39.9	36.3	37.3	80.1	40.7	62.0	17.9	6.77	0	106	37.6	42.0
Palo Alto	Lower South Bay	2,530	2,130	2,210	2,620	2,110	2,190	1,940	1,920	1,990	2,220	2,280	1,920	2,170
Petaluma ^(c)	San Pablo Bay	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinole	San Pablo Bay	133	103	47.2	9.16	44.2	55.8	109	68.4	71.9	37.3	24.8	69.1	64.4
Rodeo	San Pablo Bay	25.6	24.4	24.8	22.8	26.3	28.2	32.0	10.2	20.2	19.6	19.0	20.5	22.8
SFO Airport	South Bay	23.1	21.8	23.3	13.1	6.26	40.3	23.1	15.6	6.68	8.06	2.07	4.6	15.7
SFPUC Southeast	South Bay	738	688	1,100	581	455	381	267	49.2	66.9	102	151	90	389
San Jose	Lower South Bay	3,990	4,180	5,100	4,250	4,530	4,290	4,540	4,030	3,310	2,440	3,330	4,210	4,020
San Mateo	South Bay	6.26	5.81	77.9	78.9	94.1	61.4	4.83	76.8	195	83.0	255	102.8	86.8
SMCSD	Central Bay	83.8	72.5	88.9	81.6	42.4	15.2	32.5	56.0	75.2	59.8	76.0	70.1	62.8
SASM	Central Bay	136	130	126	140	132	79.0	43.7	140	146	56.9	154	154	120
SVCW	South Bay	121	40.6	74.1	45.3	55.2	18.4	26.6	30.1	31.8	54.0	57.4	261.5	68.0
Sonoma Valley ^(c)	San Pablo Bay	0	0	0	0	4.20	0	0	0	0	0	2.30	0	0.541
South SF	South Bay	135	79.3	104	198	66.4	49.2	43.4	79.9	22.0	45.5	75.0	135.5	86.1
Sunnyvale	Lower South Bay	344	359	312	325	569	382	614	385	433	443	696	580	454
Treasure Island	Central Bay	8.69	9.76	10.4	9.86	10.6	6.94	10.7	16.7	15.7	16.9	21.6	21.5	13.3
Vallejo	San Pablo Bay	317	206	104	131	118	86.5	110	98.3	122	169	175	15	138
West County	Central Bay	9.57	23.9	18.2	102	315	128	84.2	45.9	9.05	12.7	51.8	169.9	80.9
Total ^(d)		13,300	11,800	12,500	11,100	11,700	11,000	10,800	10,000	9,290	8,540	10,700	11,200	11,000

- a. Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.
- b. Based on average values from May 1 through September 30.
- c. No discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- d. The total values might vary from the sum of the listed values by plant due to rounding.

Table 5-13. Discharge: Annual Average by Subembayment, NOx (kg N/d)

Subembayment	2012/ 2013 ^(a)	2013/ 2014 ^(a)	2014/ 2015 ^(a)	2015/ 2016 ^(a)	2016/ 2017 ^(a)	2017/ 2018 ^(a)	2018/ 2019 ^(a)	2019/ 2020 ^(a)	2020/ 2021 ^(a)	2021/ 2022 ^(a)	2022/ 2023 ^(a)	2023/ 2024 ^(a)	12-Year Average
Suisun Bay	2,630	2,530	1,990	1,750	1,480	1,730	1,580	1,300	1,230	1,330	1,430	1,550	1,710
San Pablo Bay ^(b)	986	828	718	702	854	575	748	616	433	460	691	563	687
Central Bay	1,630	1,560	1,200	1,050	1,350	1,030	863	734	891	870	1,210	1,120	1,126
South Bay	2,230	2,050	2,250	2,150	1,770	1,490	1,430	1,320	1,490	1,300	1,490	1,760	1,730
Lower South Bay	7,450	7,330	8,070	7,960	9,010	7,590	8,350	7,590	6,650	6,130	6,950	7,200	7,520
Total	14,900	14,300	14,200	13,600	14,500	12,400	12,900	11,600	10,700	10,100	11,800	12,200	12,800

- a. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2012/2013 represents the period between October 1, 2012 and September 30, 2013.
- b. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.

Table 5-14. Discharge: Dry Season by Subembayment, NOx (kg N/d)

Subembayment	2013 ^(a)	2014 ^(a)	2015 ^(a)	2016 ^(a)	2017 ^(a)	2018 ^(a)	2019 ^(a)	2020 ^(a)	2021 ^(a)	2022 ^(a)	2023 ^(a)	2024 ^(a)	12-Year Average	Trend ^(c,d)
Suisun Bay	2,560	2,130	1,540	1,040	1,590	1,690	1,410	1,290	1,160	1,350	1,400	1,380	1,550	Down (-4.8%/yr)
San Pablo Bay ^(b)	572	479	296	259	348	281	440	294	264	284	352	185	351	Down (-7.1%/yr)
Central Bay	1,240	879	965	862	1,120	843	663	758	838	742	1,170	1,292	951	None
South Bay	2,030	1,610	2,070	1,770	1,410	1,290	1,210	1,330	1,300	1,070	1,450	1,670	1,520	Down (-3.5%/yr)
Lower South Bay	6,870	6,660	7,620	7,190	7,210	6,860	7,090	6,340	5,730	5,100	6,310	6,700	6,640	Down (-1.7%/yr)
Total	13,300	11,800	12,500	11,100	11,700	11,000	10,800	10,000	9,290	8,540	10,700	11,200	11,000	Down (-2.4%/yr)

- a. Based on average values from May 1 through September 30.
- b. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- c. Trend analysis is based on average monthly values. Discernible trends were identified based on the slope of a regression line determined using the method of least squares to fit the data (alpha = 0.05). Sample size is 60. Where “None” is stated, the limited dataset does not indicate a statistically relevant trend.
- d. The percent change represents the change per year as a percentage of the average value over the entire dataset (2013-2024) (not considered if trend is “None”).

Table 5-15. Discharge: Annual Average by Subembayment, NOx (mg N/L)

Subembayment	2012/ 2013 ^(a,b)	2013/ 2014 ^(a,b)	2014/ 2015 ^(a,b)	2015/ 2016 ^(a,b)	2016/ 2017 ^(a,b)	2017/ 2018 ^(a,b)	2018/ 2019 ^(a,b)	2019/ 2020 ^(a,b)	2020/ 2021 ^(a,b)	2021/ 2022 ^(a,b)	2022/ 2023 ^(a,b)	2023/ 2024 ^(a,b)	12-Year Average ^(b)
Suisun Bay	11.8	12.1	9.81	8.41	5.43	7.82	6.32	6.18	6.22	6.16	5.36	6.87	7.59
San Pablo Bay ^(c)	8.44	7.59	6.36	6.15	5.08	5.51	5.24	6.38	5.81	4.75	4.88	4.78	5.87
Central Bay	5.46	5.49	4.52	3.66	3.62	3.60	2.58	2.83	3.74	3.09	3.75	3.80	3.83
South Bay	3.75	3.53	3.93	3.65	2.66	2.55	2.33	2.42	2.92	2.41	2.42	3.01	2.96
Lower South Bay	15.9	17.0	19.3	18.6	19.0	17.1	17.3	17.6	16.9	16.1	15.0	16.3	17.2
Total	8.77	8.84	9.05	8.37	7.41	7.57	7.12	7.48	7.56	6.67	6.50	7.33	7.71

- a. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2012/2013 represents the period between October 1, 2012 and September 30, 2013.
- b. Calculation based on a flow-weighted average values.
- c. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.

Table 5-16. Discharge: Dry Season by Subembayment, NOx (mg N/L)

Subembayment	2013 ^(a,b)	2014 ^(a,b)	2015 ^(a,b)	2016 ^(a,b)	2017 ^(a,b)	2018 ^(a,b)	2019 ^(a,b)	2020 ^(a,b)	2021 ^(a,b)	2022 ^(a,b)	2023 ^(a,b)	2024 ^(a,b)	12-Year Average ^(b)
Suisun Bay	13.1	11.3	9.22	5.73	7.49	8.64	6.76	6.57	6.52	7.31	6.53	7.14	8.00
San Pablo Bay ^(d)	11.0	8.78	5.45	4.63	5.28	5.13	6.72	5.52	5.36	5.89	5.84	3.23	6.13
Central Bay	4.98	3.78	4.46	3.61	4.38	3.42	2.52	3.21	3.83	3.38	4.96	5.43	3.99
South Bay	3.72	3.04	3.99	3.28	2.57	2.39	2.25	2.66	2.73	2.22	2.78	3.20	2.91
Lower South Bay	15.8	16.7	20.5	18.2	17.6	16.5	17.0	16.2	16.0	15.0	15.3	16.8	16.8
Total	8.98	8.36	9.41	7.89	7.81	7.56	7.26	7.28	7.25	6.69	7.40	7.97	7.83

- a. Based on average values from May 1 through September 30.
- b. Calculation based on a flow-weighted average values.
- c. Dry season trending not applied to concentrations as the emphasis is on load. Focusing on concentration is limiting as it does not consider the impact of flow.
- d. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.

5.4 Total Inorganic Nitrogen (TIN)

The historical average monthly discharge loads from October 2012 through September 2024 are presented in Figure 5-4. The annual average (i.e., twelve months from October 1 to September 30) and dry season average monthly (i.e., May 1 through September 30) discharge loads were calculated based on reported loads in Table 5-17 and Table 5-18, respectively. In addition, the annual average and dry season average monthly discharge loads and concentrations for each Subembayment are provided in Table 5-19 through Table 5-22, respectively.

A summary of the discharge data review findings is as follows (**new findings for 2023/2024 in bold**):

- ◆ **The average annual loads decreased compared to last year (refer to Table 5-17), whereas the 2024 dry season loads were comparable to the 2023 dry season loads (refer to Table 5-18).** The total annual average and dry season TIN discharge increased from 2012/2013 to 2016/2017 season, remained relatively steady between 2016/2017 and 2018/2019, declined through 2020/2021, followed by an increase in 2021/2022, and the loads declined again in 2022/2023 **and 2023/2024.**
- ◆ **Average Annual Loads: the 2023/2024 average annual load was the second lowest since sampling began in 2012 (refer to Table 5-17).** The load decreased approximately 590 kg N/d compared to last year. This past year's dataset was 3,600 kg N/d lower than the 12-year average. The largest contributor to the load decrease was from Palo Alto (Lower South Bay Discharger) at approximately 490 kg N/d. However, SFPUC (South Bay Discharger) and San Jose (Lower South Bay Discharger) increased their annual average load by 300 and 880 kg N/d, respectively.
- ◆ **Dry Season Loads: the 2024 dry season load increased by 400 kg N/d compared to 2023 (refer to Table 5-18) and is 3,200 kg N/d lower than the 12-year average.** The largest contributor to the load increase is San Jose (Lower South Bay Discharger) with an increase of 850 kg N/d.
- ◆ **Dry Season Trending: consistent with last year's trends, the dry season trending analysis suggests South Bay, Lower South Bay, and Baywide have a downward trend over the entire 12-years of dry season data. The analysis performed for the 2021/2022 Group Annual Report suggested an upward trend for the Central Bay. Given the recent optimization efforts at EBMUD, the Central Bay has pivoted from an upward trend to no trend. Baywide, the trending analysis suggests a downward trend. This contrasts with last year's analysis which indicated no emerging trend over the entire 12-years of dry season data.** This trending is based on the least-squares correlation test selected as the basis for trends analysis over the entire dry season dataset since sampling began in 2012 (see Section 3.8).
- ◆ The South Bay Subembayment accounts for nearly half of the load discharged to San Francisco Bay (refer to Figure 5-4 and/or Table 5-20). It experienced a decrease of about 300 kg N/d for both average annual and 500 kg N/d for dry season values in 2023/2024 as compared to 2022/2023.
- ◆ The discharge nutrient concentrations are calculated based on flow-weighted values (refer to Table 5-21 and Table 5-22). The key findings on concentrations are as follows:

- ▲ **The most recent dataset has the second lowest average concentration since sampling began in 2012 (regardless of average annual or dry season).** The lowest concentrations occurred during 2022/2023, which is attributed to a wet year that resulted in a higher dilution of loads coupled with the optimization efforts at EBMUD (Central Bay Discharger).
- ▲ **Compared to last year, average annual and dry season average concentrations increased for all Subembayments, except for the South Bay during the dry season.**
- ▲ Central Bay Dischargers generally have the highest flow-weighted discharge concentrations of the Subembayments. Several dischargers in the Central Bay Subembayment, such as EBMUD, receive trucked waste (although less now than in the past) which can increase discharge concentrations/loads.

A discussion of the results is provided in Section 7.5.4.

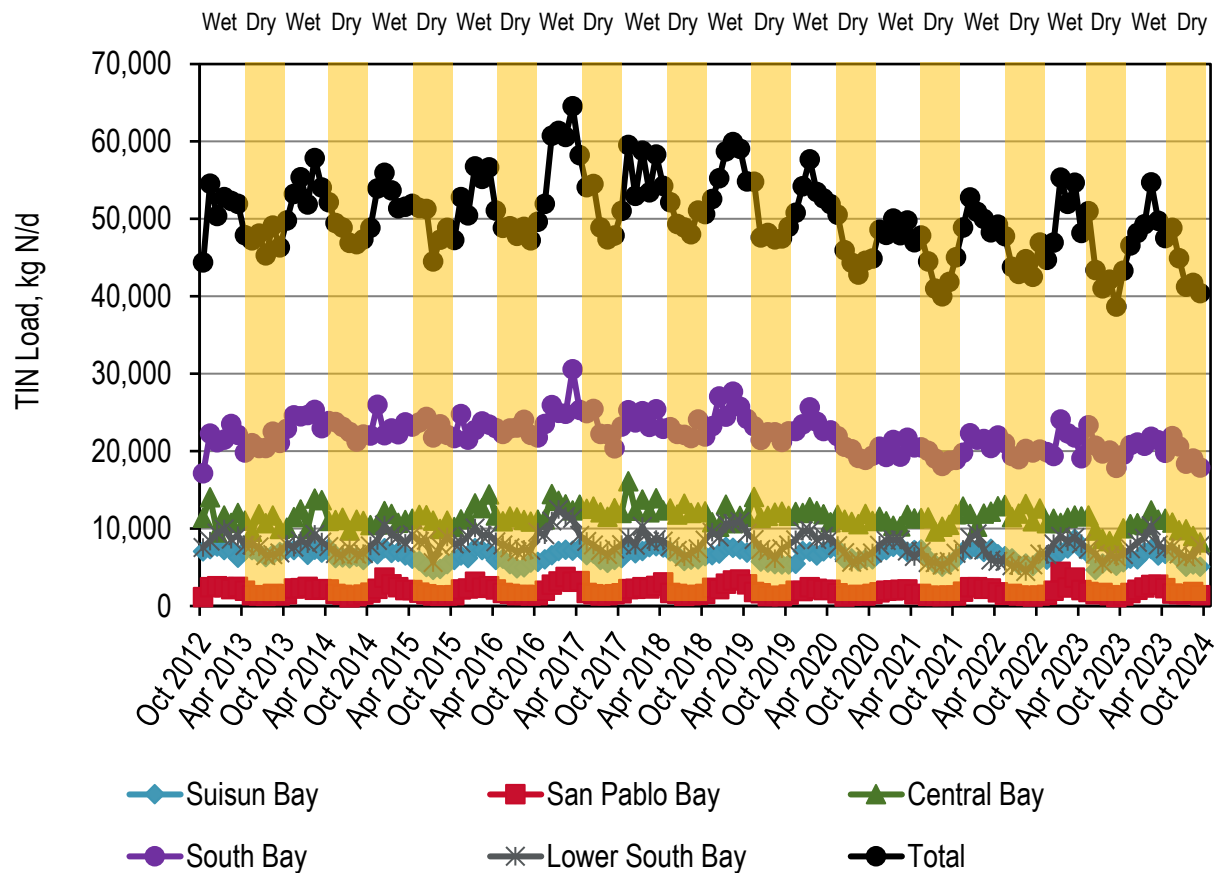


Figure 5-4. Discharge: Average Monthly Discharge TIN Loads

Table 5-17. Discharge: Annual Average by Discharger, TIN (kg N/d)

Discharger	Subembayment	2012/ 2013 ^(a,b)	2013/ 2014 ^(a,b)	2014/ 2015 ^(a,b)	2015/ 2016 ^(a,b)	2016/ 2017 ^(a,b)	2017/ 2018 ^(a,b)	2018/ 2019 ^(a,b)	2019/ 2020 ^(a,b)	2020/ 2021 ^(a,b)	2021/ 2022 ^(a,b)	2022/ 2023 ^(a,b)	2023/ 2024 ^(a,b)	12-Year Average
American Canyon	San Pablo Bay	70.4	80.3	44.4	32.2	41.4	36.8	37.3	33.1	17.8	18.9	30.3	40.5	40.3
Benicia	San Pablo Bay	225	205	234	233	243	251	222	211	228	211	212	222	225
Burlingame	South Bay	397	433	292	292	366	359	466	460	402	349	313	272	367
Central San	Suisun Bay	3,880	3,810	3,680	3,800	4,000	3,840	3,790	3,980	4,260	4,160	3,920	3,700	3,900
CMSA	Central Bay	844	846	761	869	1,180	986	1,120	1,170	1,090	1,030	1,020	1,100	1,000
Port Costa	San Pablo Bay	0	0	0	1.52	2.06	1.99	0.705	1.45	1.29	2.22	1.61	--	1.17
Delta Diablo	Suisun Bay	1,690	1,510	1,290	1,320	1,450	1,520	1,500	1,330	1,210	1,100	1,310	1,330	1,380
EBDA	South Bay	7,880	7,830	8,320	8,400	8,320	8,700	8,570	8,950	7,710	7,900	8,140	7,930	8,220
EBMUD	Central Bay	9,190	9,440	9,390	9,530	9,910	10,700	9,340	9,320	8,630	9,890	8,550	8,400	9,350
FSSD	Suisun Bay	1,310	1,330	1,030	876	916	1,320	1,130	1,040	1,010	1,120	1,060	1,070	1,100
Las Gallinas ^(c)	San Pablo Bay	129	118	97.5	121	138	135	153	160	128	53.1	64.0	62	113
Paradise Cove	Central Bay	2.08	0.287	2.54	1.53	2.25	2.11	1.80	1.89	1.62	0.856	1.14	2.45	1.71
Tiburon	Central Bay	58.8	56.1	57.8	62.6	45.1	55.5	49.7	33.7	41.2	56.8	48.2	36.3	50.2
Millbrae	South Bay	241	234	239	267	294	261	286	288	278	245	264	293	266
Mt. View	Suisun Bay	121	129	119	122	142	125	115	112	99.2	70.6	84.7	75	110
Napa ^(c)	San Pablo Bay	173	175	172	170	259	161	309	152	41.1	119	220	202	180
Novato ^(c)	San Pablo Bay	144	136	167	139	197	130	198	112	94.5	92.2	224	122	146
Palo Alto	Lower South Bay	2,360	2,160	2,130	2,650	2,560	2,180	2,310	2,220	1,950	2,150	2,420	1,930	2,250
Petaluma ^(c)	San Pablo Bay	25.3	11.8	24.8	15.6	16.3	4.87	24.2	6.68	5.31	7.14	15.9	11.0	14.1
Pinole	San Pablo Bay	301	289	278	309	320	317	227	232	273	410	380	395	311
Rodeo	San Pablo Bay	36.4	30.6	33.3	30.4	45.4	32.6	38.3	38.7	31.4	50.8	54.4	49.9	39.4
SFO Airport	South Bay	250	257	154	162	226	139	107	25.2	55.1	72.8	160	52	138
SFPUC Southeast	South Bay	7,920	10,300	9,590	9,050	10,300	8,860	8,850	7,210	6,500	6,880	6,500	6,800	8,230
San Jose	Lower South Bay	4,800	4,770	5,590	5,000	5,790	4,920	5,500	4,880	4,080	3,450	3,780	4,660	4,770
San Mateo	South Bay	1,450	1,400	1,310	1,300	1,350	1,430	1,530	1,330	1,380	1,390	1,360	1,370	1,380
SMCSD	Central Bay	128	118	127	132	136	137	134	124	141	116	116	117	127
SASM	Central Bay	212	204	173	234	164	187	211	219	227	227	251	224	211
SVCW	South Bay	1,970	2,050	2,300	2,590	2,460	2,690	2,640	2,590	2,410	2,670	2,570	2,360	2,440
Sonoma Valley ^(c)	San Pablo Bay	29.5	9.21	23.3	10.6	82.0	0	29.9	0	0	0.871	72.2	16.3	22.8
South SF	South Bay	983	933	940	897	1,070	1,060	1,310	1,160	1,160	1,030	1,400	1,300	1,100
Sunnyvale	Lower South Bay	894	697	726	592	952	878	964	810	900	846	1,150	1,057	872
Treasure Island	Central Bay	10.8	13.9	19.0	17.4	16.3	12.0	13.9	20.9	19.0	16.9	25.2	23.8	17.4
Vallejo	San Pablo Bay	768	846	961	901	906	931	928	851	849	826	813	829	868
West County	Central Bay	764	801	676	956	1,150	873	997	799	761	763	584	498	802
Total ^(d)		49,300	51,300	50,900	51,100	55,000	53,200	53,100	49,900	46,000	47,300	47,100	46,500	50,100

- a. Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.
- b. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2012/2013 represents the period between October 1, 2012 and September 30, 2013.
- c. No discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- d. The total values might vary from the sum of the listed values by plant due to rounding.

Table 5-18. Discharge: Dry Season by Discharger, TIN (kg N/d)

Discharger	Subembayment	2013 ^(a,b)	2014 ^(a,b)	2015 ^(a,b)	2016 ^(a,b)	2017 ^(a,b)	2018 ^(a,b)	2019 ^(a,b)	2020 ^(a,b)	2021 ^(a,b)	2022 ^(a,b)	2023 ^(a,b)	2024 ^(a,b)	12-Year Average
American Canyon	San Pablo Bay	111	79.7	30.7	20.1	24.7	31.8	29.2	19.4	15.4	11.3	15.0	23.7	34.3
Benicia	San Pablo Bay	226	199	198	231	240	236	197	221	227	204	230	240	221
Burlingame	South Bay	436	288	273	273	271	389	450	462	297	253	278	245	326
Central San	Suisun Bay	3,720	3,630	3,380	3,710	3,610	3,550	3,420	3,890	3,900	3,690	3,430	3,410	3,610
CMSA	Central Bay	844	841	721	964	1,220	954	1,090	1,170	1,100	1,090	997	1,100	1,010
Port Costa	San Pablo Bay	--	0.0381	--	--	--	--	0.552	2.15	--	--	--	--	0.913
Delta Diablo	Suisun Bay	1,630	1,480	869	927	1,350	1,370	1,310	1,320	979	944	1,200	1,320	1,220
EBDA	South Bay	7,170	7,190	7,870	7,440	6,940	8,080	7,880	7,700	6,870	6,890	7,320	7,030	7,370
EBMUD	Central Bay	8,910	9,070	9,390	8,960	9,760	10,200	9,900	8,960	8,410	9,960	7,330	7,610	9,040
FSSD	Suisun Bay	1,360	969	807	655	1,080	1,270	1,020	969	905	1,040	884	949	993
Las Gallinas ^(c)	San Pablo Bay	0	0	0	0	8.99	0	51.4	47.1	0	0	0	0	8.96
Paradise Cove	Central Bay	2.52	0.287	2.61	1.53	2.62	2.11	2.13	1.31	0.977	0.877	2.22	2.45	1.80
Tiburon	Central Bay	46.8	56.1	53.2	62.6	45.0	57.6		27.7	45.5	46.7	43.5	41.8	47.9
Millbrae	South Bay	247	207	236	293	291	250	307	276	276	245	254	268	262
Mt. View	Suisun Bay	101	112	103	122	116	110	106	108	90.4	41.6	56.5	49.3	93.1
Napa ^(c)	San Pablo Bay	0	50.1	0	0	0	0	0	0	0	0	0	0	4.18
Novato ^(c)	San Pablo Bay	39.9	42.3	37.5	38.2	98.2	43.1	100.0	23.1	8.21	0	118	38.9	49.0
Palo Alto	Lower South Bay	2,550	2,140	2,230	2,640	2,120	2,210	1,950	1,930	2,000	2,230	2,300	2,050	2,200
Petaluma ^(c)	San Pablo Bay	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinole	San Pablo Bay	342	287	267	341	235	322	170	243	281	369	350	351	296
Rodeo	San Pablo Bay	26.4	28.1	26.9	28.2	31.9	29.4	35.8	46.2	33.8	39.2	48.8	40.2	34.6
SFO Airport	South Bay	257	285	165	205	343	89.2	169	19.4	68.4	90.5	212	55	163
SFPUC Southeast	South Bay	8,650	10,300	10,000	9,880	10,600	9,050	8,260	6,780	6,840	7,400	7,040	7,380	8,510
San Jose	Lower South Bay	4,220	4,330	5,280	4,410	4,730	4,510	4,760	4,200	3,430	2,530	3,460	4,310	4,180
San Mateo	South Bay	1,540	1,490	1,280	1,370	1,280	1,480	1,560	1,320	1,230	1,340	1,450	1,410	1,400
SMCSD	Central Bay	133	123	135	141	148	148	155	123	149	110	114	118	133
SASM	Central Bay	191	162	151	190	154	203	187	253	221	246	235	233	202
SVCW	South Bay	1,880	1,940	2,380	2,510	2,440	2,320	2,500	2,350	2,500	2,460	2,560	2,280	2,350
Sonoma Valley ^(c)	San Pablo Bay	0	0	0	0	4.21	0	0	0	0	0	2.33	0	0.546
South SF	South Bay	916	906	879	915	919	995	1,020	1,250	1,220	1,220	1,230	1,150	1,050
Sunnyvale	Lower South Bay	360	371	324	341	630	392	617	391	446	460	720	621	473
Treasure Island	Central Bay	9.92	14.3	20.9	14.0	14.6	13.6	14.1	20.5	19.4	19.9	25.6	23.0	17.5
Vallejo	San Pablo Bay	751	851	899	837	870	831	900	821	814	769	755	887	832
West County	Central Bay	663	663	683	918	1,040	806	955	731	734	692	628	462	748
Total ^(d)		47,300	48,100	48,700	48,400	50,600	50,000	49,100	45,700	43,100	44,400	43,300	43,700	46,900

- a. Data are presented in detail and summarized for each plant in the Appendix. A “--” indicates data were not available, whereas a “0” indicates a value of zero.
- b. Based on average values from May 1 through September 30.
- c. No discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- d. The total values might vary from the sum of the listed values by plant due to rounding.

Table 5-19. Discharge: Annual Average by Subembayment, TIN (kg N/d)

Subembayment	2012/ 2013 ^(a)	2013/ 2014 ^(a)	2014/ 2015 ^(a)	2015/ 2016 ^(a)	2016/ 2017 ^(a)	2017/ 2018 ^(a)	2018/ 2019 ^(a)	2019/ 2020 ^(a)	2020/ 2021 ^(a)	2021/ 2022 ^(a)	2022/ 2023 ^(a)	2023/ 2024 ^(a)	12-Year Average
Suisun Bay	7,010	6,780	6,110	6,120	6,510	6,800	6,540	6,460	6,580	6,460	6,380	6,170	6,490
San Pablo Bay ^(b)	1,860	1,830	2,030	1,960	2,250	2,000	2,170	1,800	1,670	1,790	2,090	1,950	1,960
Central Bay	11,200	11,400	11,200	11,700	12,600	12,900	11,900	11,700	10,900	12,100	10,600	10,400	11,600
South Bay	21,100	23,500	23,100	23,000	24,400	23,500	23,800	22,000	19,900	20,500	20,700	20,400	22,200
Lower South Bay	8,050	7,630	8,440	8,240	9,310	7,980	8,770	7,910	6,930	6,450	7,350	7,640	7,890
Total	49,300	51,300	50,900	51,100	55,000	53,200	53,100	49,900	46,000	47,300	47,100	46,500	50,100

- a. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2012/2013 represents the period between October 1, 2012 and September 30, 2013.
- b. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.

Table 5-20. Discharge: Dry Season by Subembayment, TIN (kg N/d)

Subembayment	2013 ^(a)	2014 ^(a)	2015 ^(a)	2016 ^(a)	2017 ^(a)	2018 ^(a)	2019 ^(a)	2020 ^(a)	2021 ^(a)	2022 ^(a)	2023 ^(a)	2024 ^(a)	12-Year Average	Trend ^(c,d)
Suisun Bay	6,810	6,200	5,160	5,410	6,160	6,300	5,850	6,290	5,870	5,720	5,570	5,720	5,920	None
San Pablo Bay ^(b)	1,410	1,390	1,460	1,500	1,510	1,490	1,480	1,420	1,380	1,390	1,520	1,580	1,480	None
Central Bay	10,800	10,900	11,100	11,200	12,300	12,400	12,300	11,300	10,700	12,200	9,370	9,600	11,200	None
South Bay	21,100	22,600	23,100	22,900	23,100	22,700	22,200	20,200	19,300	19,900	20,300	19,800	21,400	Down (-1.4%/yr)
Lower South Bay	7,130	6,850	7,840	7,390	7,480	7,110	7,320	6,520	5,870	5,220	6,490	6,990	6,850	Down (-1.7%/yr)
Total	47,300	48,100	48,700	48,400	50,600	50,000	49,100	45,700	43,100	44,400	43,300	43,700	46,900	Down (-1.2%/year)

- a. Based on average values from May 1 through September 30.
- b. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- c. Trend analysis is based on average monthly values. Discernible trends were identified based on the slope of a regression line determined using the method of least squares to fit the data (alpha = 0.05). Sample size is 60. Where “None” is stated, the limited dataset does not indicate a statistically relevant trend.
- d. The percent change represents the change per year as a percentage of the average value over the entire dataset (2013-2024) (not considered if trend is “None”).

Table 5-21. Discharge: Annual Average by Subembayment, TIN (mg N/L)

Subembayment	2012/ 2013 ^(a,b)	2013/ 2014 ^(a,b)	2014/ 2015 ^(a,b)	2015/ 2016 ^(a,b)	2016/ 2017 ^(a,b)	2017/ 2018 ^(a,b)	2018/ 2019 ^(a,b)	2019/ 2020 ^(a,b)	2020/ 2021 ^(a,b)	2021/ 2022 ^(a,b)	2022/ 2023 ^(a,b)	2023/ 2024 ^(a,b)	12-Year Average ^(b)
Suisun Bay	31.4	32.4	30.2	29.4	23.9	30.7	26.9	30.7	33.4	30.0	23.9	27.4	28.9
San Pablo Bay ^(c)	15.6	16.7	18.0	17.2	13.4	19.2	15.2	18.6	22.4	18.5	14.8	16.6	16.7
Central Bay	37.6	40.3	42.1	40.9	33.9	45.2	35.5	45.0	45.8	43.1	32.8	35.4	39.4
South Bay	35.4	40.4	40.4	38.9	36.7	40.3	38.7	40.2	38.9	38.2	33.6	34.9	38.0
Lower South Bay	17.2	17.7	20.2	19.3	19.6	18.0	18.2	18.3	17.6	16.9	15.8	17.3	18.0
Total	28.8	31.6	32.4	31.4	28.2	32.5	29.3	32.3	32.5	31.3	26.0	28.0	30.2

- a. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2012/2013 represents the period between October 1, 2012 and September 30, 2013.
- b. Calculation based on a flow-weighted average values.
- c. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.

Table 5-22. Discharge: Dry Season by Subembayment, TIN (mg N/L)

Subembayment	2013 ^(a,b)	2014 ^(a,b)	2015 ^(a,b)	2016 ^(a,b)	2017 ^(a,b)	2018 ^(a,b)	2019 ^(a,b)	2020 ^(a,b)	2021 ^(a,b)	2022 ^(a,b)	2023 ^(a,b)	2024 ^(a,b)	12-Year Average ^(b)
Suisun Bay	34.8	32.9	30.8	29.9	29.0	32.3	28.0	32.0	33.0	31.1	25.9	29.5	30.7
San Pablo Bay ^(d)	25.0	24.5	26.9	26.8	23.0	27.3	22.7	26.7	28.0	28.9	25.2	27.6	25.9
Central Bay	43.2	46.6	51.3	46.8	48.0	50.3	46.7	47.8	48.8	55.5	39.7	40.3	47.0
South Bay	38.6	42.5	44.7	42.6	41.9	42.1	41.3	40.5	40.5	41.1	39.0	38.0	41.1
Lower South Bay	16.4	17.1	21.1	18.7	18.3	17.1	17.6	16.7	16.3	15.3	15.8	17.5	17.3
Total	31.8	34.0	36.7	34.4	33.8	34.4	33.0	33.2	33.6	34.8	30.0	31.0	33.3

- a. Based on average values from May 1 through September 30.
- b. Calculation based on a flow-weighted average values.
- c. Dry season trending not applied to concentrations as the emphasis is on load. Focusing on concentration is limiting as it does not consider the impact of flow.
- d. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.

5.5 Total Phosphorus (TP)

The historical average monthly discharge loads from October 2012 through September 2024 are presented in Figure 5-5. The annual average (i.e., twelve months from October 1 to September 30) and dry season average monthly (i.e., May 1 through September 30) discharge loads were calculated based on reported loads in Table 5-23 and Table 5-24, respectively. In addition, the annual average and dry season average monthly discharge loads and concentrations for each Subembayment are provided in Table 5-25 and Table 5-28, respectively.

A summary of the discharge data review findings is as follows (**new findings for 2023/2024 in bold**):

- ◆ Unlike the nitrogen species whose loads appear to be tied to precipitation, drought, etc., TP loads appear to be more random from year to year. Such variability is attributed to TP removal mechanisms. For example, at facilities that occasionally use chemicals for odor control (e.g., ferric chloride in the collection system), the chemical addition binds a portion of TP and subsequently reduces loads when chemicals are applied. Furthermore, facilities with anaerobic selectors in their activated sludge process to improve solids settleability also reduces TP loads. This biological feature can be “finicky” at plants and lead to variable TP load reduction.
- ◆ **Average Annual Loads:** the total load increased approximately 204 kg P/d compared to last year, with the total load 10 kg P/d higher than the 12-year average. The largest contributor to the increase was EBMUD (Central Bay Discharger) at 208 kg P/d more than 2021/2022. Such an increase is consistent with last year’s increase observed for EBMUD. Last year’s increase was anticipated as EBMUD’s anaerobic selector, which has historically removed TP, is now reducing TIN loads instead during the dry season. Note: South SF installed an anerobic selector in 2021 to improve solids settleability and their TP loads have since declined.
- ◆ **Dry Season Loads:** the total dry season load decreased approximately 103 kg P/d compared to last year, bringing the total to 20 kg P/d lower than the 12-year average. Unlike last year and in contrast to this year’s average annual load, EBMUD’s contribution decreased by 78 kg P/d compared to 2022/2023. As previously noted, South SF installed an anerobic selector in 2021 to improve solids settleability and their TP loads have since declined.
- ◆ **Dry Season Trending:** the dry season trending analysis is variable across Subembayments and Baywide. The trending analysis suggests that Suisun Bay, San Pablo Bay, South Bay, and Baywide has no trending over the entire 12-years of dry season data. The Lower South Bay data suggests downward trending over the entire 12-years of dry season data. In contrast, Central Bay suggests an upwards trend over the entire 12-years of dry season data. The upward trending in the Central Bay is likely attributed to EBMUD using the anaerobic selector for TIN load reduction over TP load reduction. This trending is based on the least-squares correlation test selected as the basis for trends analysis over the entire dry season dataset since sampling began in 2012 (see Section 3.8).
- ◆ The Central Bay and South Bay Subembayments account for over half of the TP loads discharged to the Bay (refer to Figure 5-5 or Table 5-26).

- ◆ The nutrient discharge concentrations are calculated based on flow-weighted values (refer to Table 5-27 and Table 5-28).
- ▲ Agencies across the Bay reduce phosphorus loads through a combination of chemical and biological processes.
- ▲ The most recent average annual data set shows increased in concentrations for all Subembayments except Suisun Bay.
- ▲ The dry season datasets shows a decline in concentrations for Suisun Bay, Central Bay, and South Bay, with increases for San Pablo Bay and Lower South Bay. Baywide, the change in concentration is negligible. Overall, the Baywide dry season value is nearly identical to the 12-year average.
- ▲ Dischargers to the Central Bay have the highest discharge concentrations across the Subembayments. Several dischargers in the Central Bay Subembayment, such as EBMUD, receive trucked waste (although less than in the past) which can increase discharge concentrations/loads.

A discussion of the results is provided in Section 7.5.5.

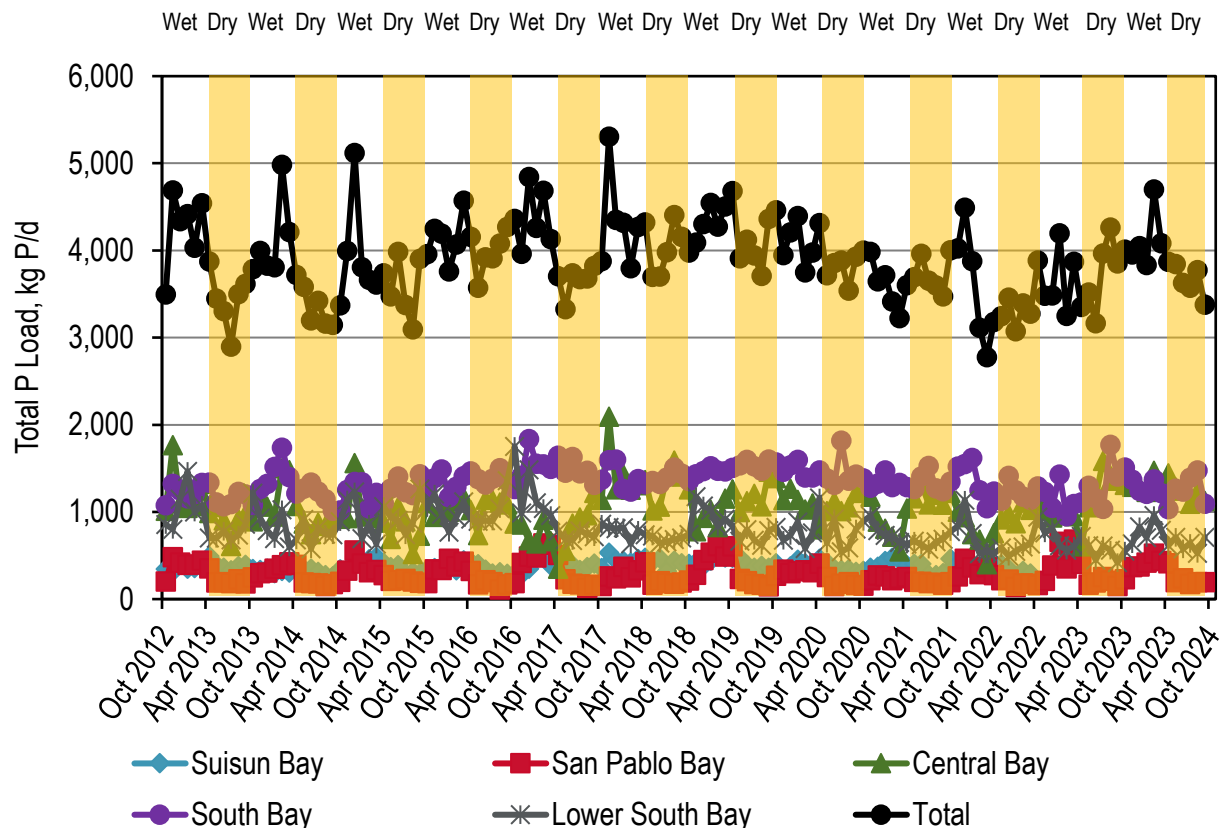


Figure 5-5. Discharge: Average Monthly Discharge TP Loads

Table 5-23. Discharge: Annual Average by Discharger, TP (kg P/d)

Discharger	Subembayment	2012/ 2013 (a,b)	2013/ 2014 (a,b)	2014/ 2015 (a,b)	2015/ 2016 (a,b)	2016/ 2017 (a,b)	2017/ 2018 (a,b)	2018/ 2019 (a,b)	2019/ 2020 (a,b)	2020/ 2021 (a,b)	2021/ 2022 (a,b)	2022/ 2023 (a,b)	2023/ 2024 (a,b)	12-Year Average
American Canyon	San Pablo Bay	29.0	17.9	28.7	27.6	24.0	26.0	23.4	24.7	15.5	18.5	22.4	28.2	23.8
Benicia	San Pablo Bay	25.2	25.7	26.2	15.1	16.5	15.7	19.2	15.9	15.4	21.4	17.4	19.3	19.4
Burlingame	South Bay	101	110	25.4	22.2	29.2	32.4	31.0	36.1	33.2	30.2	28.7	27.5	42.3
Central San	Suisun Bay	133	87.7	127	109	127	122	137	121	141	146	151	118	127
CMSA	Central Bay	92.4	81.7	94.2	84.5	106	100	108	123	127	128	116	123	107
Port Costa	San Pablo Bay	0	0	0	0.598	0.479	0.352	0.226	0.777	0.200	0.289	0.154	0.005	0.257
Delta Diablo	Suisun Bay	31.1	27.1	36.7	29.4	51.5	60.6	42.6	50.3	33.6	22.8	39.3	34.8	38.3
EBDA	South Bay	544	534	501	551	642	534	534	583	636	603	577	592	569
EBMUD	Central Bay	843	824	718	827	538	1,100	818	856	775	618	852	1,061	819
FSSD	Suisun Bay	194	190	198	200	197	235	235	201	186	192	196	168	199
Las Gallinas ^(c)	San Pablo Bay	19.7	17.2	14.6	22.6	21.5	16.5	23.8	27.8	19.6	16.2	13.6	15.2	19.0
Paradise Cove	Central Bay	0.270	--	0.358	0.223	0.495	0.490	0.246	0.301	0.270	0.187	0.248	0.306	0.283
Tiburon	Central Bay	8.36	7.88	8.44	9.20	8.56	7.84	6.21	5.60	6.45	9.08	3.18	5.36	7.18
Millbrae	South Bay	16.5	13.5	13.0	12.0	11.9	7.41	17.9	19.8	15.6	13.9	14.5	18.9	14.6
Mt. View	Suisun Bay	18.2	17.0	16.2	15.4	13.5	15.2	10.0	12.0	12.6	11.3	8.00	4.4	12.8
Napa ^(c)	San Pablo Bay	22.5	14.4	25.3	34.6	58.7	22.4	86.1	37.8	8.98	25.4	71.6	54.3	38.5
Novato ^(c)	San Pablo Bay	15.7	10.9	20.6	9.59	12.9	2.74	13.9	6.62	1.62	7.26	11.6	9.1	10.2
Palo Alto	Lower South Bay	346	352	352	445	397	362	372	343	306	322	337	308	354
Petaluma ^(c)	San Pablo Bay	27.5	31.0	24.6	19.1	24.7	16.1	21.3	11.5	4.12	12.3	28.0	23.5	20.3
Pinole	San Pablo Bay	29.6	17.3	15.2	16.4	24.6	29.2	33.4	29.6	28.8	38.0	32.0	39.2	27.8
Rodeo	San Pablo Bay	8.36	8.01	7.95	8.37	8.75	7.58	9.43	9.17	7.50	5.83	8.00	9.82	8.23
SFO Airport	South Bay	17.5	13.4	8.97	9.69	16.2	32.0	35.5	18.2	7.10	4.33	11.1	17.4	16.0
SFPUC Southeast	South Bay	67.2	164	205	271	332	287	389	279	146	231	222	256	237
San Jose	Lower South Bay	354	246	370	368	322	154	243	220	162	139	137	261	248
San Mateo	South Bay	128	127	122	142	125	133	114	130	130	139	131	126	129
SMCSD	Central Bay	23.4	18.5	17.0	17.2	16.5	19.3	14.8	13.4	15.4	19.6	19.6	18.8	17.8
SASM	Central Bay	45.2	45.6	40.5	51.6	38.1	40.5	37.5	37.9	44.3	40.7	38.5	37.2	41.5
SVCW	South Bay	174	172	189	213	218	234	242	244	217	225	210	214	213
Sonoma Valley ^(c)	San Pablo Bay	16.5	10.5	2.83	2.51	21.3	0	5.35	0	0	1.87	8.34	5.10	6.18
South SF	South Bay	149	160	171	150	133	138	134	168	156	60.5	41.0	36	125
Sunnyvale	Lower South Bay	200	214	213	193	257	225	231	198	247	201	166	119	205
Treasure Island	Central Bay	1.57	3.01	3.70	4.10	4.50	3.32	3.08	3.32	2.82	2.93	3.17	3.23	3.23
Vallejo	San Pablo Bay	126	129	123	121	139	110	107	107	111	117	107	110	117
West County	Central Bay	53.4	60.7	46.6	67.6	88.5	101	110	71.9	57.6	76.6	73.3	36.3	70.3
Total ^(d)		3,860	3,750	3,770	4,070	4,020	4,190	4,210	4,010	3,670	3,500	3,700	3,900	3,890

- a. Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.
- b. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2012/2013 represents the period between October 1, 2012 and September 30, 2013.
- c. No discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- d. The total values might vary from the sum of the listed values by plant due to rounding.

Table 5-24. Discharge: Dry Season by Discharger, TP (kg P/d)

Discharger	Subembayment	2013 ^(a,b)	2014 ^(a,b)	2015 ^(a,b)	2016 ^(a,b)	2017 ^(a,b)	2018 ^(a,b)	2019 ^(a,b)	2020 ^(a,b)	2021 ^(a,b)	2022 ^(a,b)	2023 ^(a,b)	2024 ^(a,b)	12-Year Average
American Canyon	San Pablo Bay	47.4	8.23	29.1	15.4	14.5	24.8	16.2	19.9	14.8	11.0	15.3	16.0	19.4
Benicia	San Pablo Bay	23.9	23.9	20.4	16.4	8.96	9.68	13.1	15.0	10.4	20.9	23.0	18.9	17.0
Burlingame	South Bay	125	32.4	31.5	13.9	18.1	26.4	27.5	31.4	19.1	31.3	25.4	13.6	33.0
Central San	Suisun Bay	125	90.3	112	108	107	116	111	93.6	117	116	145	109	113
CMSA	Central Bay	101	79.6	89.3	87.5	127	112	109	129	133	125	123	129	112
Port Costa	San Pablo Bay	--	--	--	--	--	--	0.138	0.587	--	--	0.00366	--	0.182
Delta Diablo	Suisun Bay	27.7	27.2	27.8	28.1	51.1	51.2	47.0	49.5	24.0	18.7	48.5	35.7	36.4
EBDA	South Bay	490	494	480	546	533	505	555	592	627	557	583	609	548
EBMUD	Central Bay	668	668	576	813	643	1,030	938	820	905	711	1,060	984	818
FSSD	Suisun Bay	201	174	172	175	211	233	227	196	179	181	168	168	190
Las Gallinas ^(c)	San Pablo Bay	0	0	0	0	0.844	0	10.8	8.69	0	0	0	0	1.69
Paradise Cove	Central Bay	0.334	0.0384	0.377	0.223	0.592	0.490	0.305	0.303	0.232	0.252	0.324	0.316	0.316
Tiburon	Central Bay	7.62	7.88	8.34	9.20	8.18	8.90	--	4.61	6.00	8.01	2.90	5.27	6.99
Millbrae	South Bay	19.2	13.0	14.2	11.8	15.1	7.83	22.4	20.0	16.6	10.2	13.3	19.7	15.3
Mt. View	Suisun Bay	17.8	17.6	18.2	16.8	11.3	14.7	9.47	13.0	12.7	10.4	6.57	3.6	12.7
Napa ^(c)	San Pablo Bay	0	3.77	0	0	0	0	0	0	0	0	0	0	0.314
Novato ^(c)	San Pablo Bay	1.06	1.62	0.800	1.24	2.46	0.305	1.71	0.229	0.130	0	16.8	6.89	2.77
Palo Alto	Lower South Bay	386	381	381	450	354	382	311	296	327	334	325	320	354
Petaluma ^(c)	San Pablo Bay	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinole	San Pablo Bay	30.6	18.7	17.6	16.3	21.1	34.2	33.4	30.7	37.7	42.2	26.6	41.8	29.2
Rodeo	San Pablo Bay	6.98	7.73	9.24	8.63	6.23	7.07	9.71	10.6	4.60	3.80	6.60	8.43	7.47
SFO Airport	South Bay	25.0	8.95	8.79	4.12	21.6	42.4	33.7	8.42	8.72	4.04	18.5	16.5	16.7
SFPUC Southeast	South Bay	24.0	184	263	322	395	321	433	287	149	260	297	257	266
San Jose	Lower South Bay	185	196	384	397	111	113	151	216	100	55.2	79.0	199	182
San Mateo	South Bay	128	136	129	137	129	139	127	122	128	126	144	131	131
SMCSD	Central Bay	24.8	20.0	18.5	18.9	19.0	19.3	17.2	13.9	17.3	19.6	21.1	20.3	19.2
SASM	Central Bay	50.3	43.3	40.5	43.0	40.2	40.9	32.9	43.0	43.4	35.3	38.1	38.0	40.7
SVCW	South Bay	185	161	217	191	211	237	226	225	210	214	226	216	210
Sonoma Valley ^(c)	San Pablo Bay	0	0	0	0	0.711	0	0	0	0	0	1.23	0	0.162
South SF	South Bay	145	170	163	161	140	127	124	176	184	20.2	27.6	38	123
Sunnyvale	Lower South Bay	180	183	177	172	256	189	248	189	215	182	127	113	186
Treasure Island	Central Bay	1.27	2.84	3.99	4.46	4.74	3.61	2.80	3.34	2.98	2.58	3.71	3.29	3.30
Vallejo	San Pablo Bay	125	123	133	116	120	110	101	104	120	111	105	108	115
West County	Central Bay	45.5	42.0	46.5	75.2	72.9	94.1	72.4	73.3	68.5	85.8	75.4	20.9	64.4
Total ^(d)		3,400	3,320	3,570	3,960	3,660	4,000	4,010	3,790	3,680	3,300	3,760	3,650	3,670

- a. Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.
- b. Based on average values from May 1 through September 30.
- c. No discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- d. The total values might vary from the sum of the listed values by plant due to rounding.

Table 5-25. Discharge: Annual Average by Subembayment, TP (kg P/d)

Subembayment	2012/ 2013 ^(a)	2013/ 2014 ^(a)	2014/ 2015 ^(a)	2015/ 2016 ^(a)	2016/ 2017 ^(a)	2017/ 2018 ^(a)	2018/ 2019 ^(a)	2019/ 2020 ^(a)	2020/ 2021 ^(a)	2021/ 2022 ^(a)	2022/ 2023 ^(a)	2023/ 2024 ^(a)	12-Year Average
Suisun Bay	377	322	378	354	389	434	426	385	373	372	394	325	377
San Pablo Bay ^(b)	307	275	289	277	352	247	343	270	213	264	320	314	291
Central Bay	1,070	1,030	923	1,050	793	1,370	1,100	1,110	1,030	900	1,110	1,290	1,066
South Bay	1,200	1,300	1,220	1,370	1,510	1,400	1,500	1,480	1,340	1,310	1,240	1,290	1,350
Lower South Bay	900	811	935	1,010	976	741	846	760	715	662	640	688	807
Total	3,860	3,750	3,770	4,070	4,020	4,190	4,210	4,010	3,670	3,500	3,700	3,900	3,890

- a. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2012/2013 represents the period between October 1, 2012 and September 30, 2013.
- b. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.

Table 5-26. Discharge: Dry Season Average by Subembayment, TP (kg P/d)

Subembayment	2013 ^(a)	2014 ^(a)	2015 ^(a)	2016 ^(a)	2017 ^(a)	2018 ^(a)	2019 ^(a)	2020 ^(a)	2021 ^(a)	2022 ^(a)	2023 ^(a)	2024 ^(a)	12-Year Average	Trend ^(c,d)
Suisun Bay	372	309	330	328	381	415	394	352	333	327	368	317	352	None
San Pablo Bay ^(b)	197	177	210	174	175	186	186	189	188	189	195	200	193	None
Central Bay	894	858	778	1,040	909	1,310	1,170	1,090	1,180	990	1,330	1,200	1,060	Up (3.3%/yr)
South Bay	1,140	1,200	1,260	1,390	1,460	1,410	1,550	1,460	1,340	1,220	1,330	1,300	1,340	None
Lower South Bay	750	760	943	1,020	721	684	710	701	642	572	531	633	722	Down (-3.8%/yr)
Total	3,400	3,320	3,570	3,960	3,660	4,000	4,010	3,790	3,680	3,300	3,760	3,650	3,670	None

- a. Based on average values from May 1 through September 30.
- b. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- c. Trend analysis is based on average monthly values. Discernible trends were identified based on the slope of a regression line determined using the method of least squares to fit the data (alpha = 0.05). Sample size is 60. Where “None” is stated, the limited dataset does not indicate a statistically relevant trend.
- d. The percent change represents the change per year as a percentage of the average value over the entire dataset (2013-2024) (not considered if trend is “None”).



Table 5-27. Discharge: Annual Average by Subembayment, TP (mg P/L)

Subembayment	2012/ 2013 ^(a,b)	2013/ 2014 ^(a,b)	2014/ 2015 ^(a,b)	2015/ 2016 ^(a,b)	2016/ 2017 ^(a,b)	2017/ 2018 ^(a,b)	2018/ 2019 ^(a,b)	2019/ 2020 ^(a,b)	2020/ 2021 ^(a,b)	2021/ 2022 ^(a,b)	2022/ 2023 ^(a,b)	2023/ 2024 ^(a,b)	12-Year Average ^(b)
Suisun Bay	1.69	1.54	1.87	1.70	1.43	1.96	1.75	1.83	1.89	1.73	1.48	1.44	1.68
San Pablo Bay ^(c)	2.63	2.48	2.56	2.43	2.10	2.36	2.41	2.80	2.86	2.73	2.26	2.67	2.49
Central Bay	3.58	3.66	3.49	3.68	2.15	4.79	3.28	4.29	4.32	3.19	3.42	4.38	3.63
South Bay	2.01	2.23	2.16	2.32	2.27	2.40	2.44	2.70	2.62	2.43	2.01	2.21	2.31
Lower South Bay	1.92	1.88	2.24	2.35	2.06	1.67	1.76	1.76	1.82	1.74	1.38	1.56	1.84
Total	2.26	2.31	2.40	2.50	2.06	2.56	2.32	2.59	2.60	2.32	2.04	2.35	2.35

- a. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2012/2013 represents the period between October 1, 2012 and September 30, 2013.
- b. Calculation based on a flow-weighted average values.
- c. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.

Table 5-28. Discharge: Dry Season by Subembayment, TP (mg P/L)

Subembayment	2013 ^(a,b)	2014 ^(a,b)	2015 ^(a,b)	2016 ^(a,b)	2017 ^(a,b)	2018 ^(a,b)	2019 ^(a,b)	2020 ^(a,b)	2021 ^(a,b)	2022 ^(a,b)	2023 ^(a,b)	2024 ^(a,b)	12-Year Average ^(b)
Suisun Bay	1.90	1.64	1.97	1.81	1.79	2.13	1.89	1.79	1.87	1.77	1.71	1.63	1.82
San Pablo Bay ^(d)	3.93	2.99	3.88	3.11	2.65	3.41	2.84	3.56	3.81	3.92	3.24	3.50	3.37
Central Bay	3.59	3.69	3.60	4.37	3.55	5.29	4.46	4.61	5.37	4.50	5.62	5.05	4.47
South Bay	2.08	2.26	2.52	2.58	2.66	2.61	2.88	2.93	2.82	2.52	2.56	2.50	2.57
Lower South Bay	1.72	1.90	2.53	2.58	1.76	1.64	1.71	1.80	1.79	1.68	1.29	1.58	1.82
Total	2.28	2.34	2.69	2.81	2.44	2.76	2.69	2.76	2.87	2.58	2.60	2.59	2.61

- a. Based on average values from May 1 through September 30.
- b. Calculation based on a flow-weighted average values.
- c. Dry season trending not applied to concentrations as the emphasis is on load. Focusing on concentration is limiting as it does not consider the impact of flow.
- d. Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.

5.6 Flows and Nutrient Loads Distribution by Subembayment

Flows and nutrient discharge loading for select nitrogen species and total phosphorus has been analyzed by Subembayment to demonstrate the relative contributions for each discharger. In this section, loading diagrams illustrate the discharge loads over time for the past thirteen years (Oct 2012 through Sept 2024).

The cumulative figures in the following subsections are organized by Subembayment and present the relative contribution of each discharger within its respective Subembayment for flow, ammonia, TIN, and TP.

5.6.1 Suisun Bay

The average monthly discharge to Suisun Bay by discharger for flow, ammonia, TIN, and TP is provided in Figure 5-6 through Figure 5-9. Flows to Suisun Bay are dominated by the Central San discharge and followed, in terms of magnitude, by FSSD and Delta Diablo. Central San also discharges the largest loads of ammonia and TIN. FSSD discharges the largest TP load to Suisun Bay, followed by Central San.

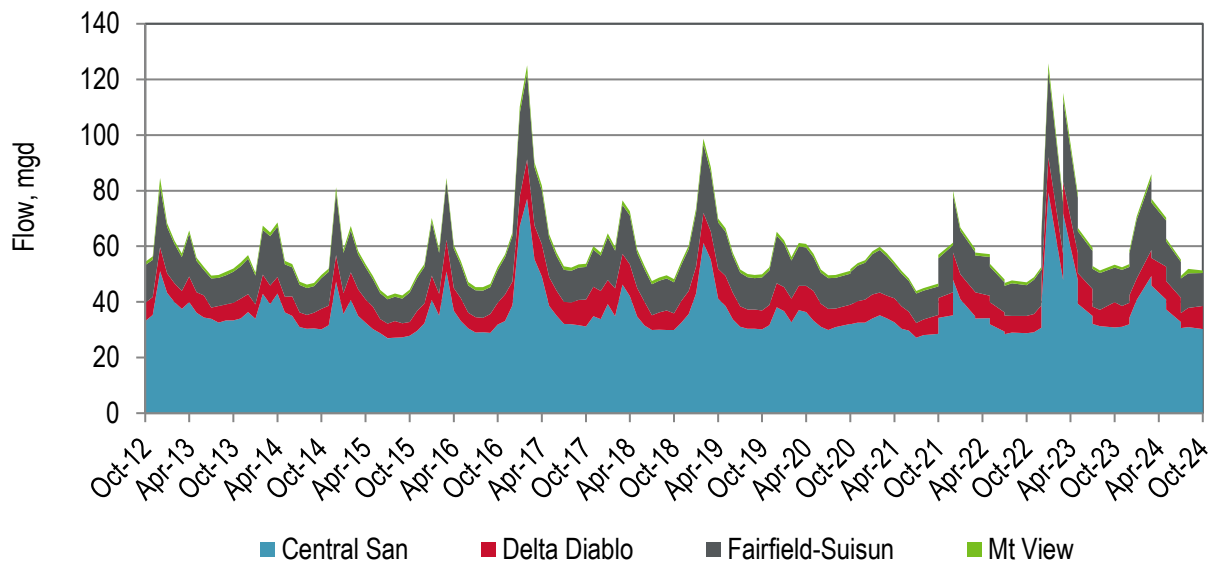


Figure 5-6. Flow Contribution by Discharger to Suisun Bay

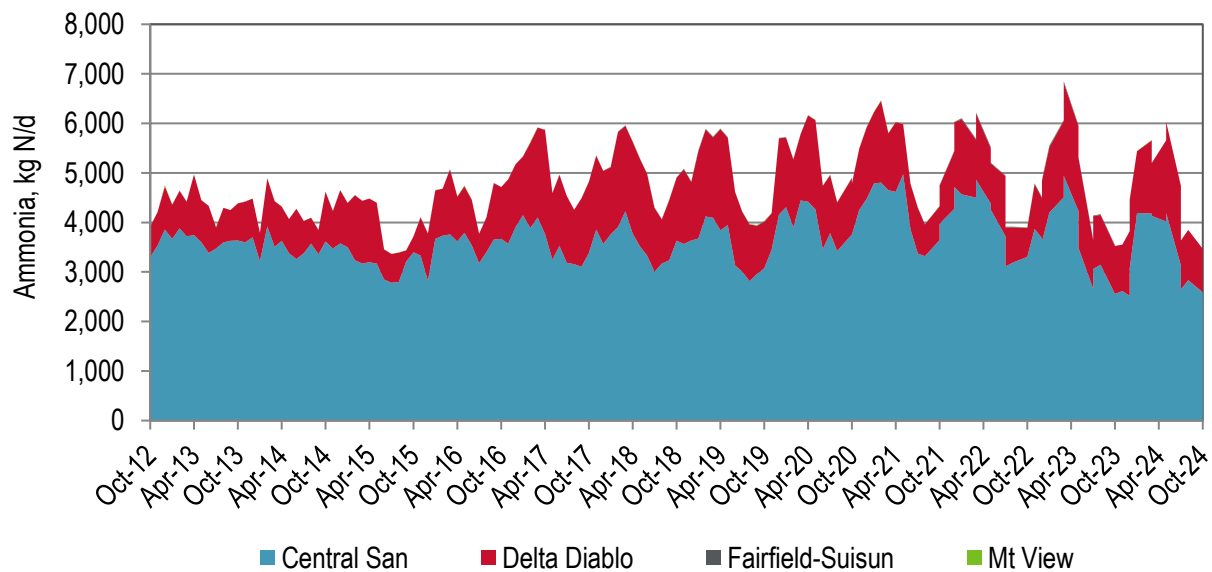


Figure 5-7. Ammonia Load Contribution by Discharger to Suisun Bay

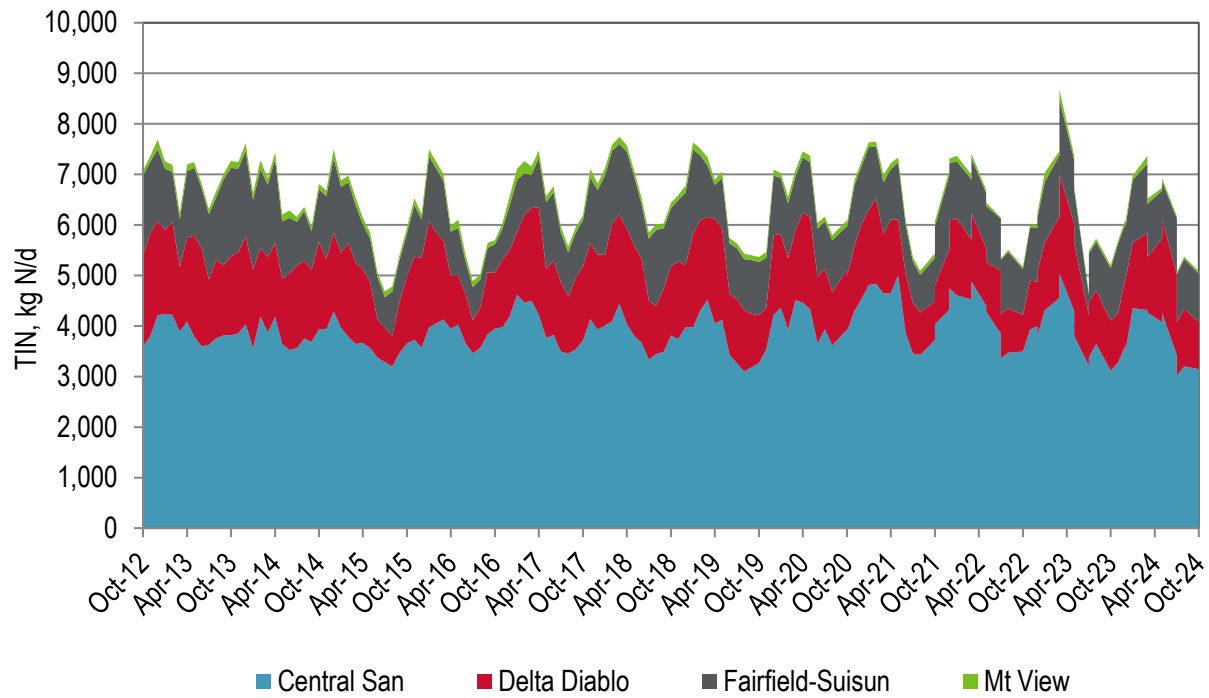


Figure 5-8. TIN Load Contribution by Discharger to Suisun Bay

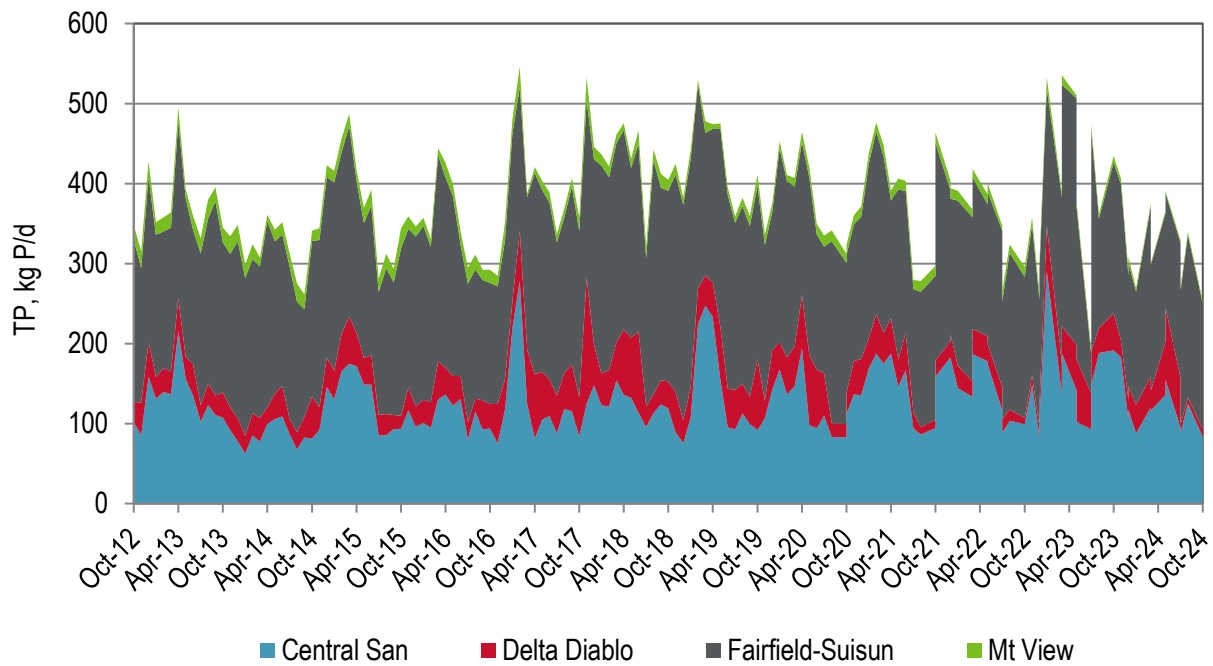


Figure 5-9. TP Load Contribution by Discharger to Suisun Bay

5.6.2 San Pablo Bay

The average monthly discharge to San Pablo Bay by discharger for discharge flows and loads are provided in Figure 5-10 through Figure 5-13. Figure 5-10 clearly demonstrates the seasonal discharges at Las Gallinas, Napa, Petaluma, and Sonoma Valley. Similar to flow, TIN and TP loads to San Pablo Bay appear to exhibit a significant seasonal pattern with higher wintertime loads.

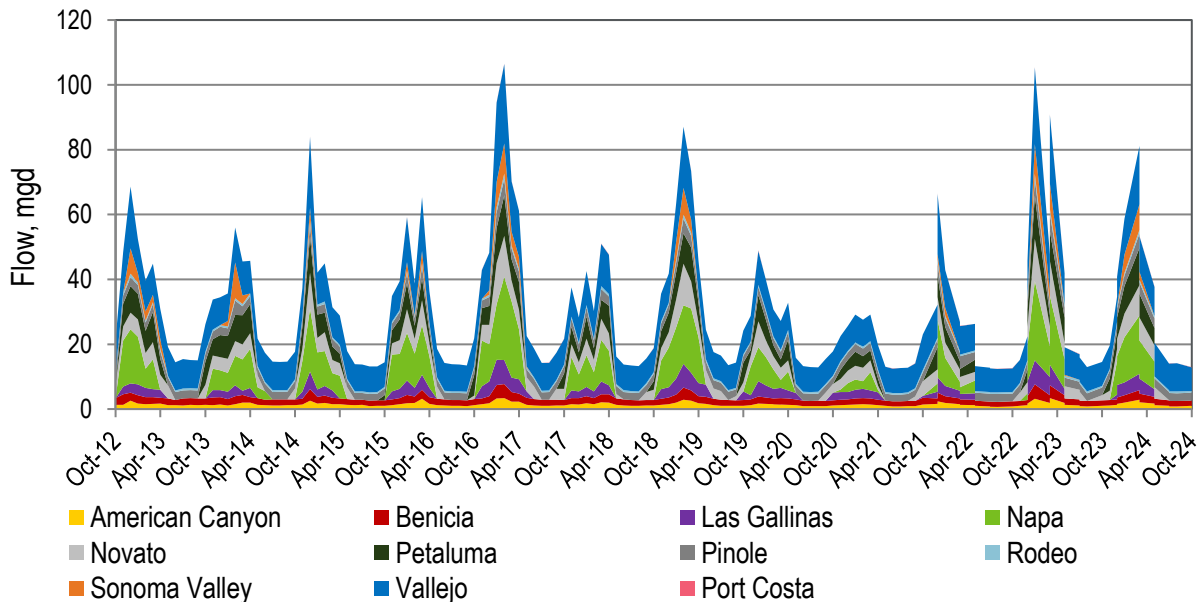


Figure 5-10. Flow Contribution by Discharger to San Pablo Bay

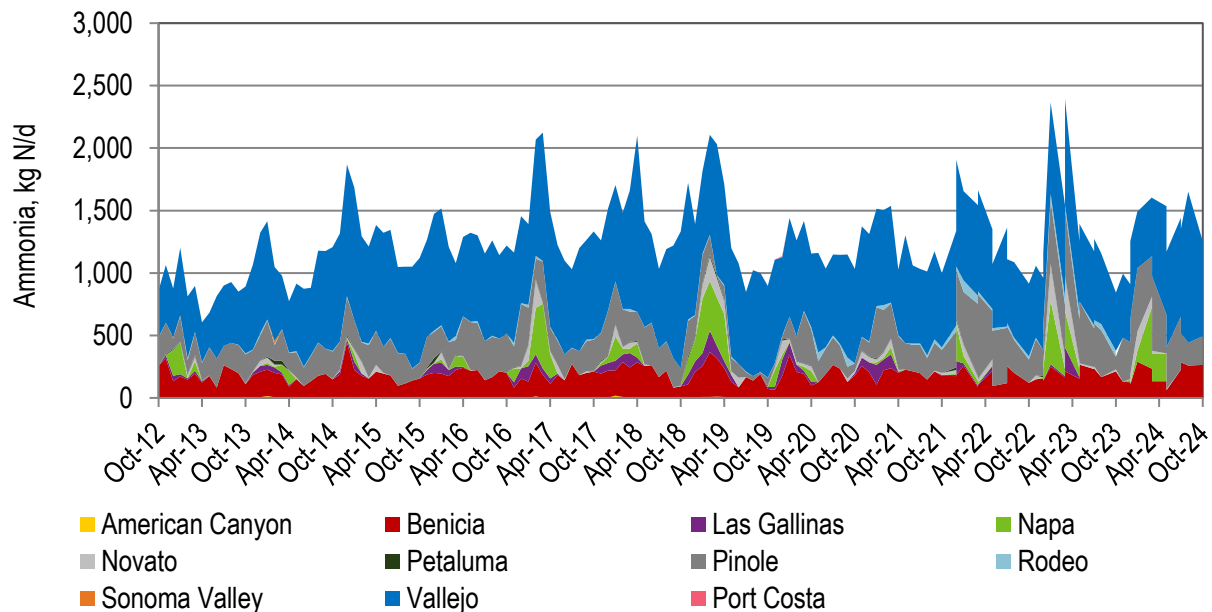


Figure 5-11. Ammonia Load Contribution by Discharger to San Pablo Bay

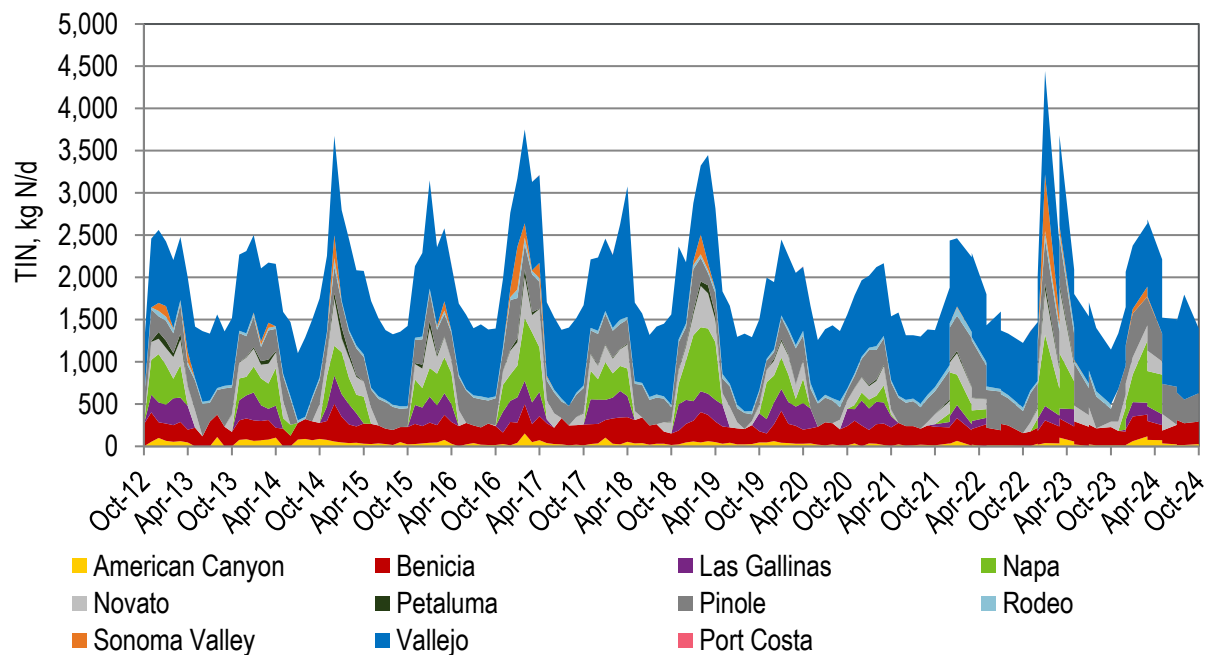


Figure 5-12. TIN Load Contribution by Discharger to San Pablo Bay

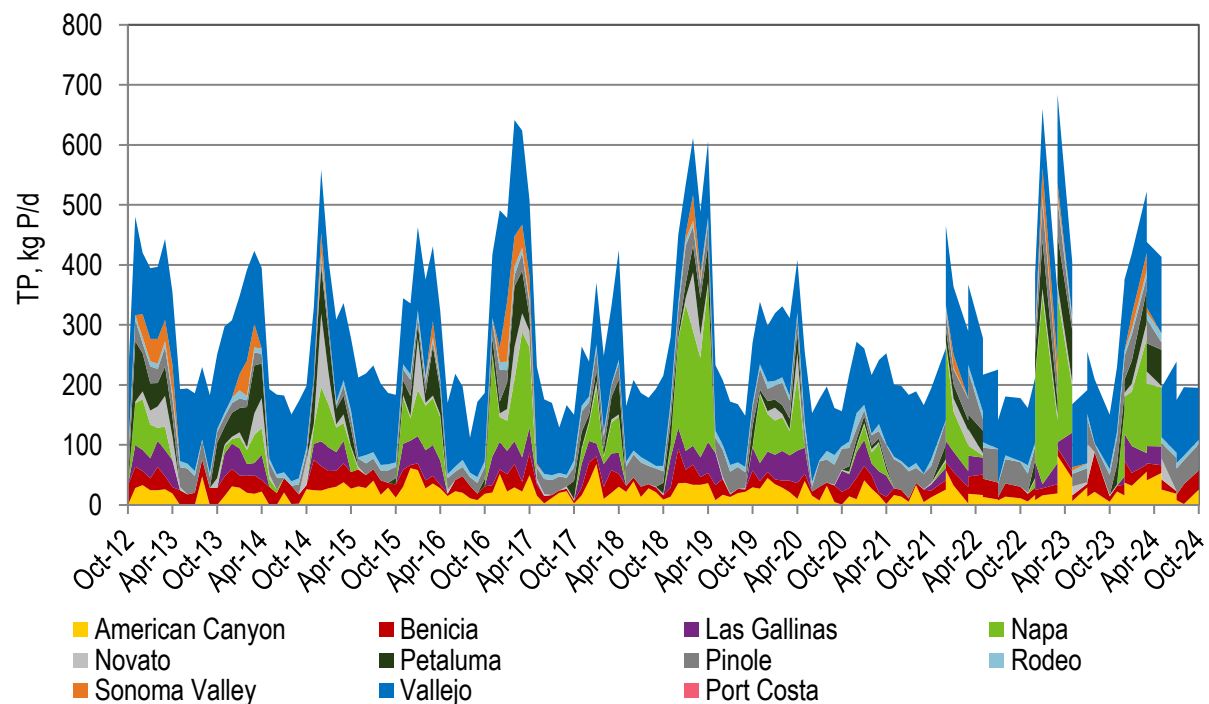


Figure 5-13. TP Load Contribution by Discharger to San Pablo Bay

5.6.3 Central Bay

The average monthly discharge to Central Bay by discharger for discharge flows and loads are provided in Figure 5-14 through Figure 5-17. Discharge flows and loads to Central Bay are dominated by EBMUD.

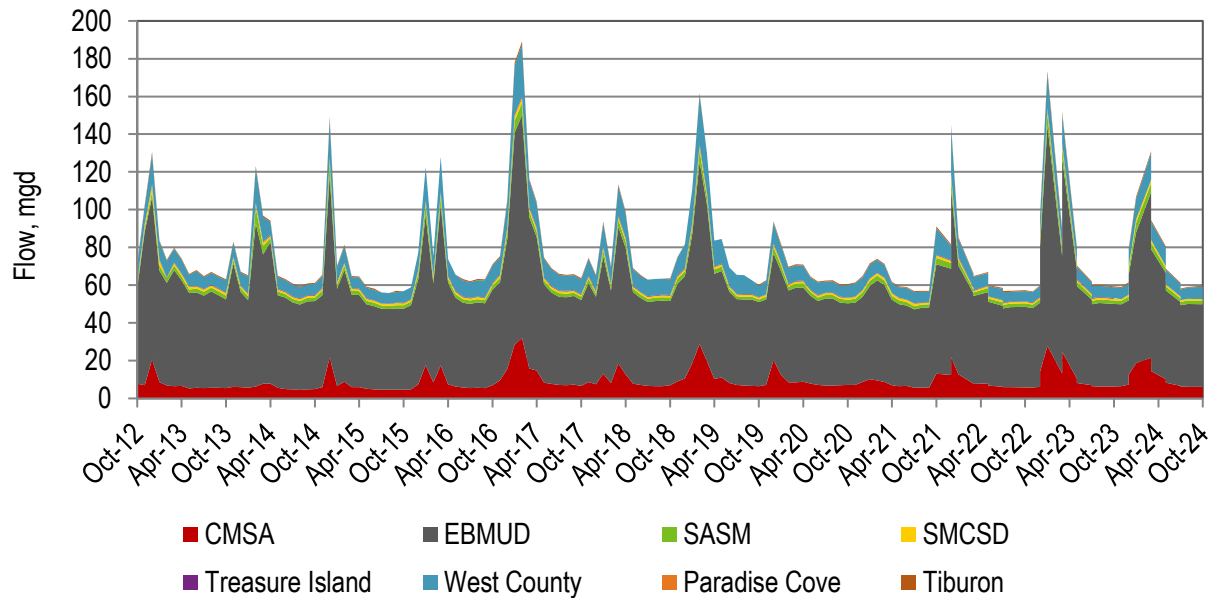


Figure 5-14. Flow Contribution by Discharger to Central Bay

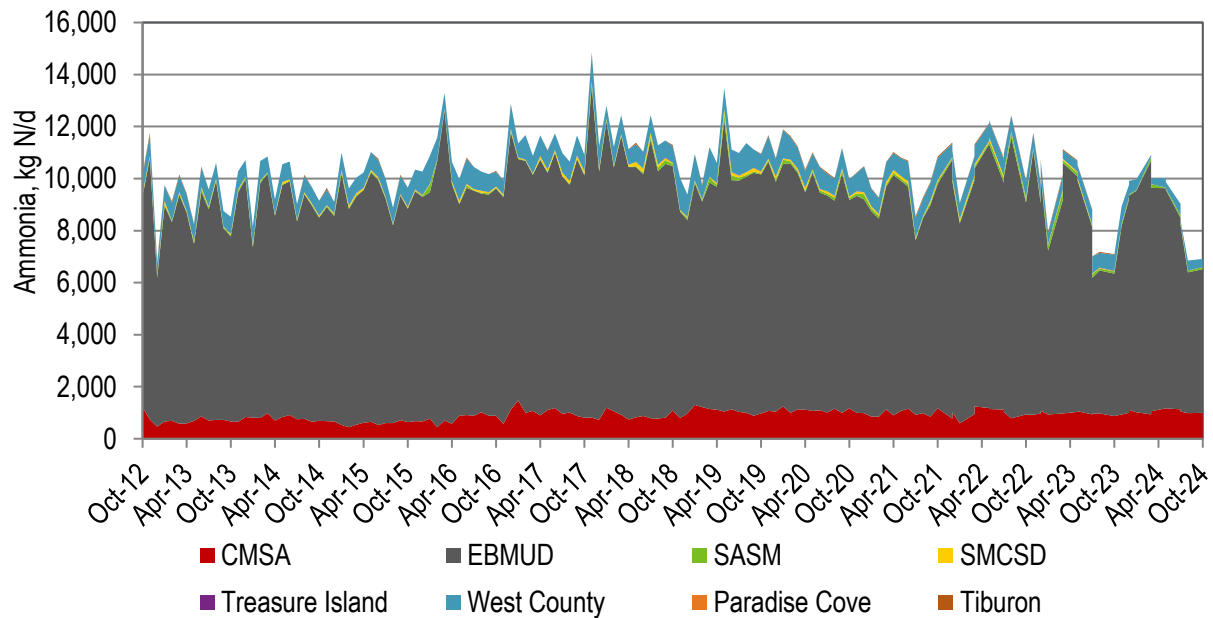


Figure 5-15. Ammonia Load Contribution by Discharger to Central Bay

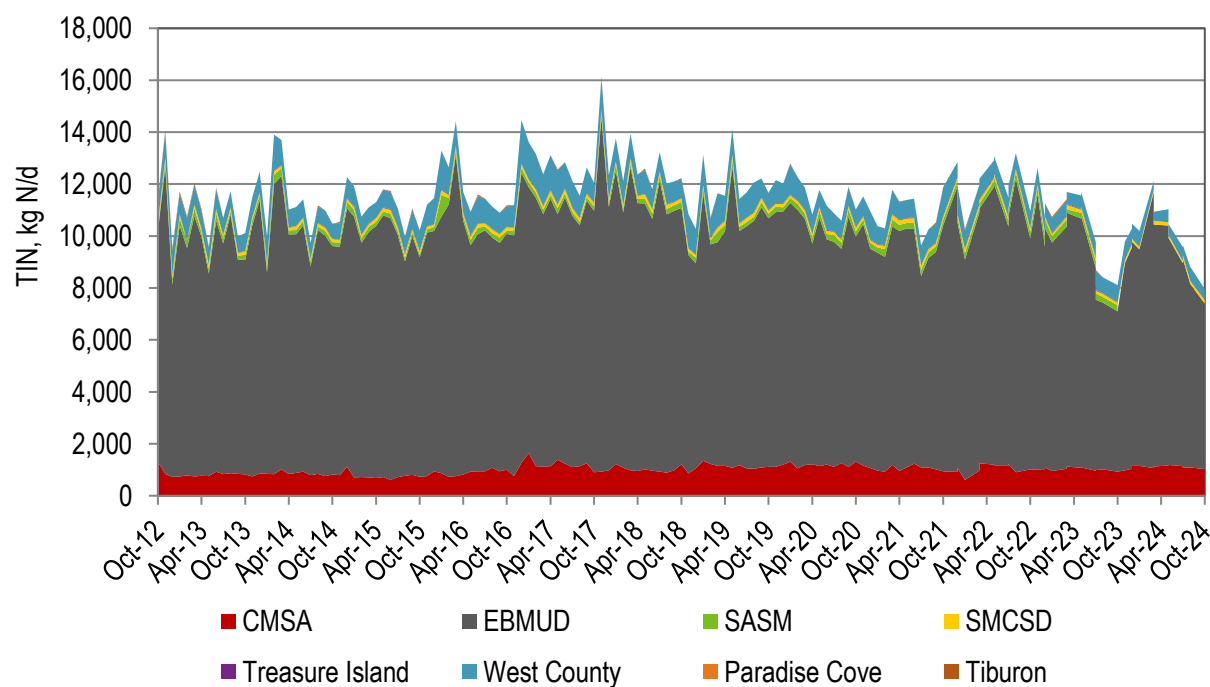


Figure 5-16. TIN Load Contribution by Discharger to Central Bay

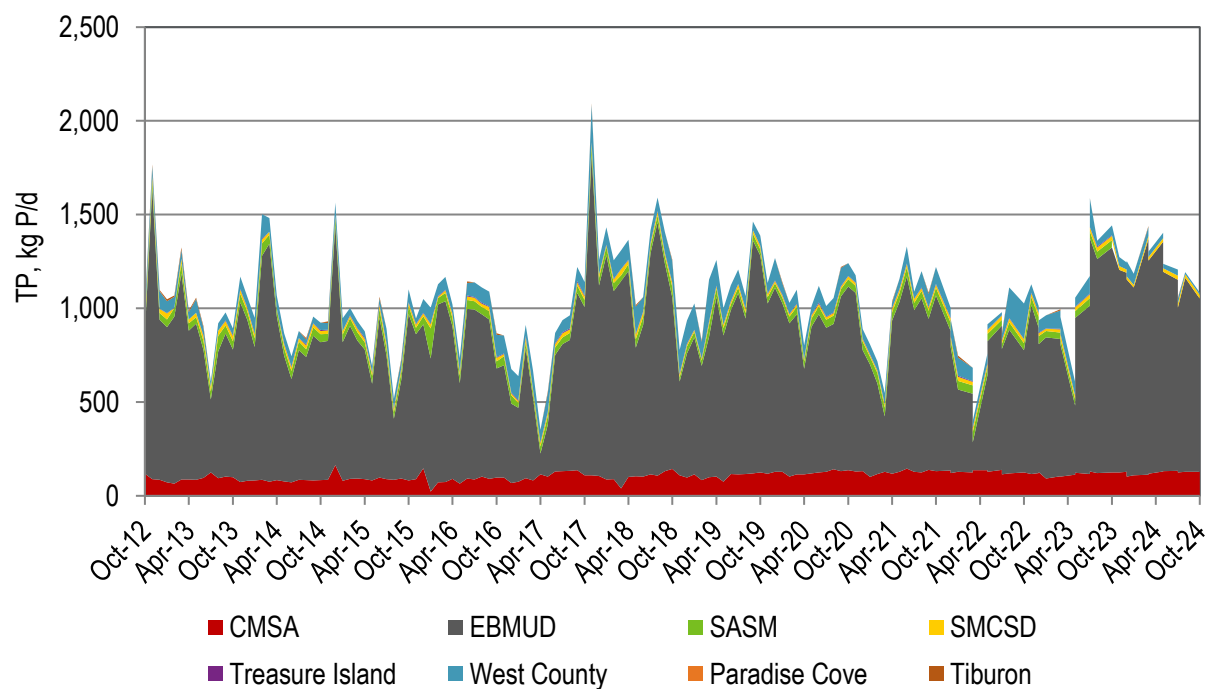


Figure 5-17. TP Load Contribution by Discharger to Central Bay

5.6.4 South Bay

The average monthly discharge to South Bay by discharger for discharge flows and loads are provided in Figure 5-18 through Figure 5-21. In the South Bay, the largest wastewater discharges are from the SFPUC Southeast Plant and EBDA. Ammonia and TIN loads to the South Bay are also largest from the SFPUC Southeast Plant and EBDA. The TP discharges to the South Bay have the largest contribution from EBDA, followed by relatively equal contributions between SFPUC Southeast Plant, San Mateo, SVCW, and South SF. SFPUC's TP loads are a lower proportion of the total compared to flow, ammonia, and TIN.

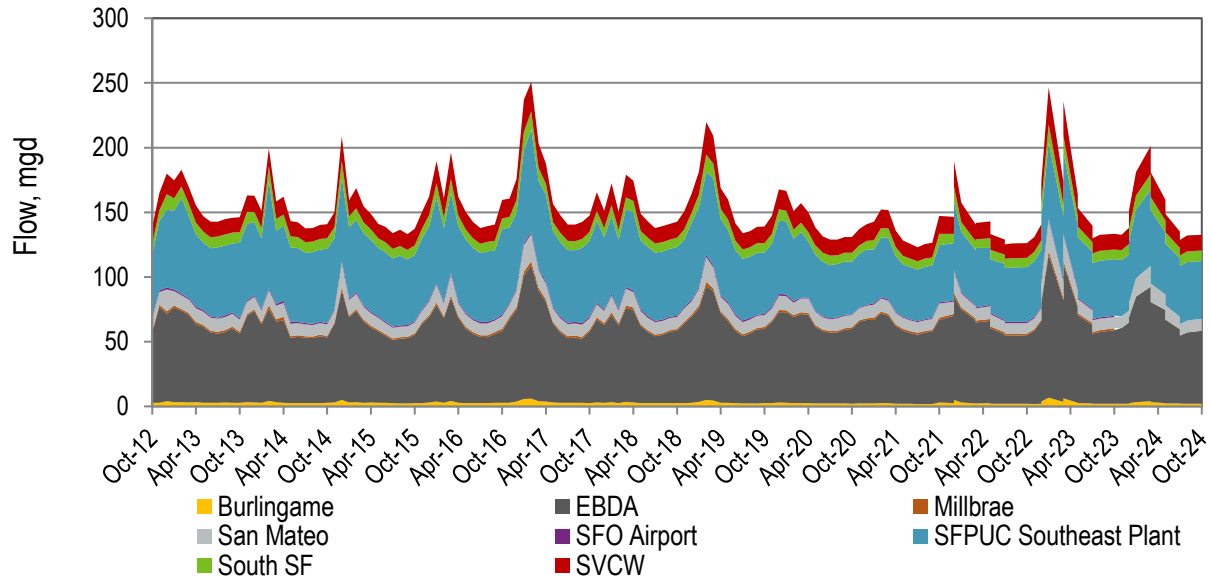


Figure 5-18. Flow Contribution by Discharger to South Bay

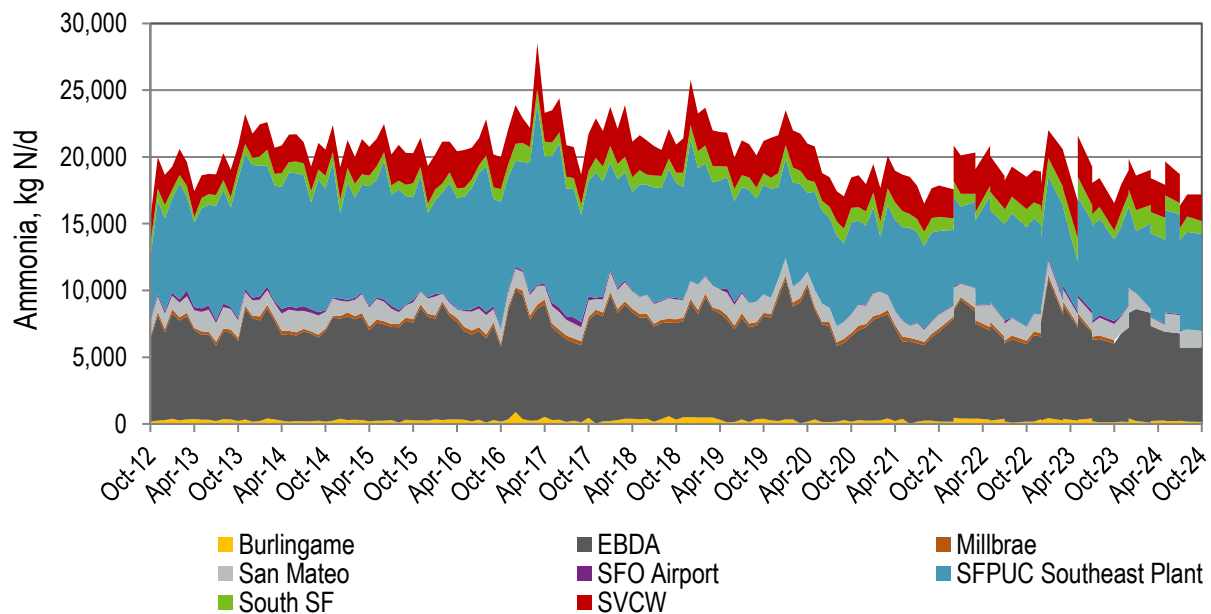


Figure 5-19. Ammonia Load Contribution by Discharger to South Bay

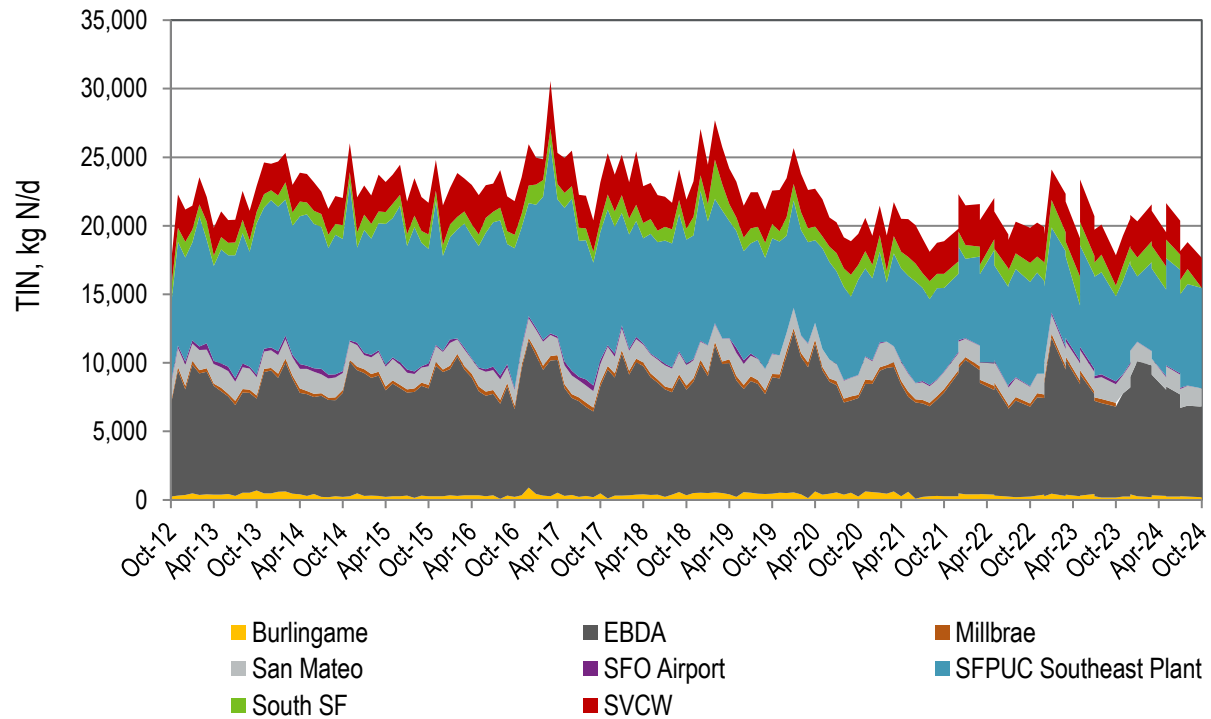


Figure 5-20. TIN Load Contribution by Discharger to South Bay

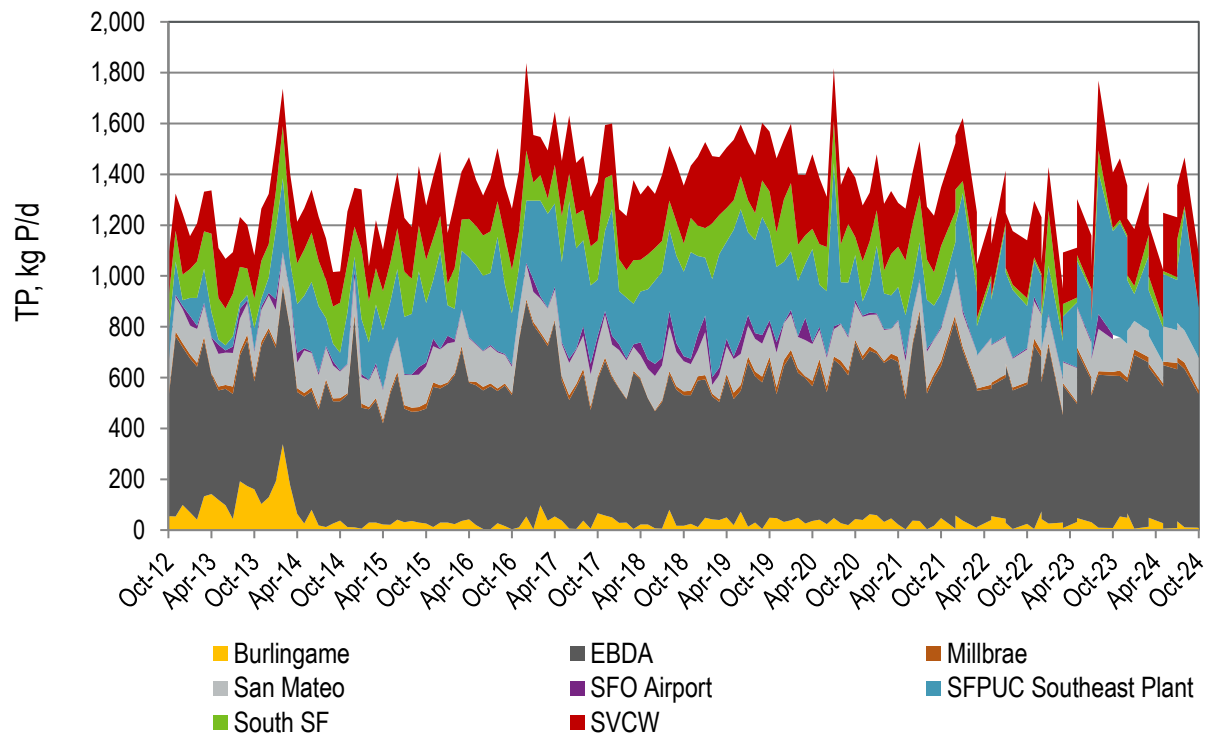


Figure 5-21. TP Load Contribution by Discharger to South Bay

5.6.5 Lower South Bay

The average monthly discharge to Lower South Bay by discharger for discharge flows and loads are provided in Figure 5-22 through Figure 5-25. Lower South Bay wastewater flows are dominated by San Jose. San Jose also discharges the largest TIN load. Sunnyvale and San Jose's ammonia loads exhibit a significant seasonal pattern. San Jose's TIN loads have been sporadic (e.g., July 2015), which is likely due to the biological nitrogen removal step feed process, but it has been more stable in recent years. Palo Alto is the largest discharger of TP to Lower South Bay, followed by San Jose and Sunnyvale.

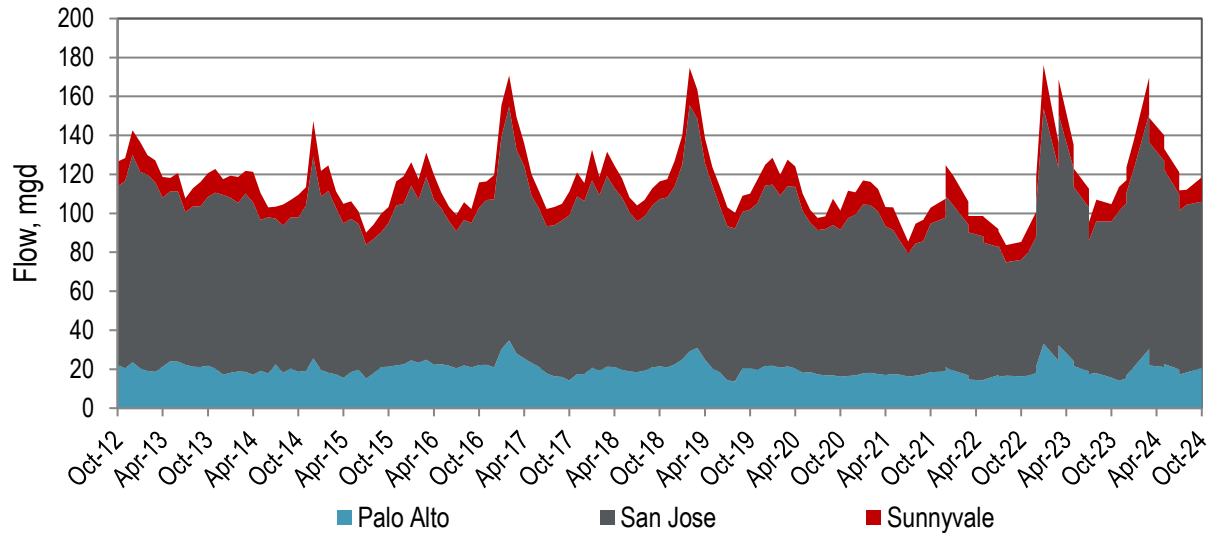


Figure 5-22. Flow Contribution by Discharger to Lower South Bay

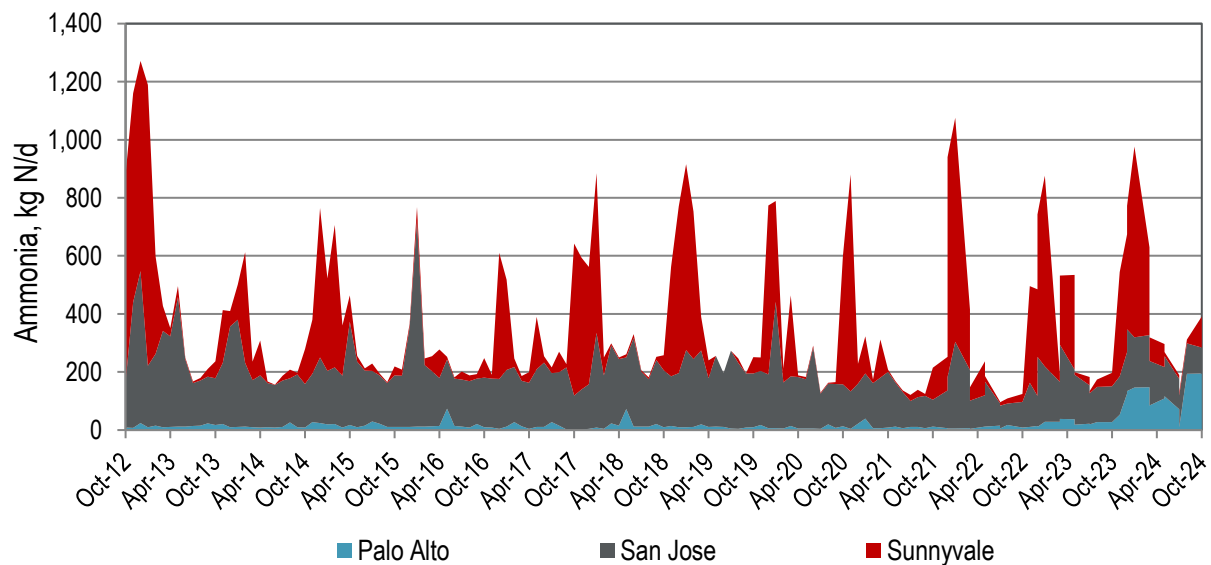


Figure 5-23. Ammonia Load Contribution by Discharger to Lower South Bay

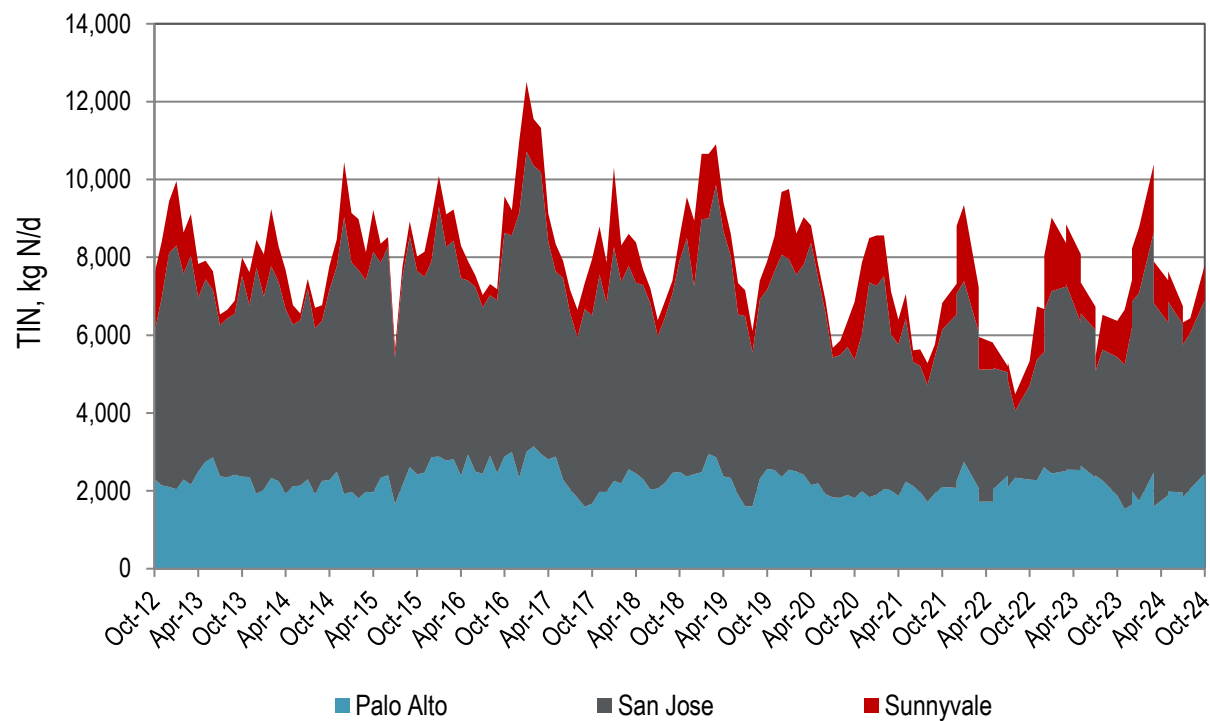


Figure 5-24. TIN Load Contribution by Discharger to Lower South Bay

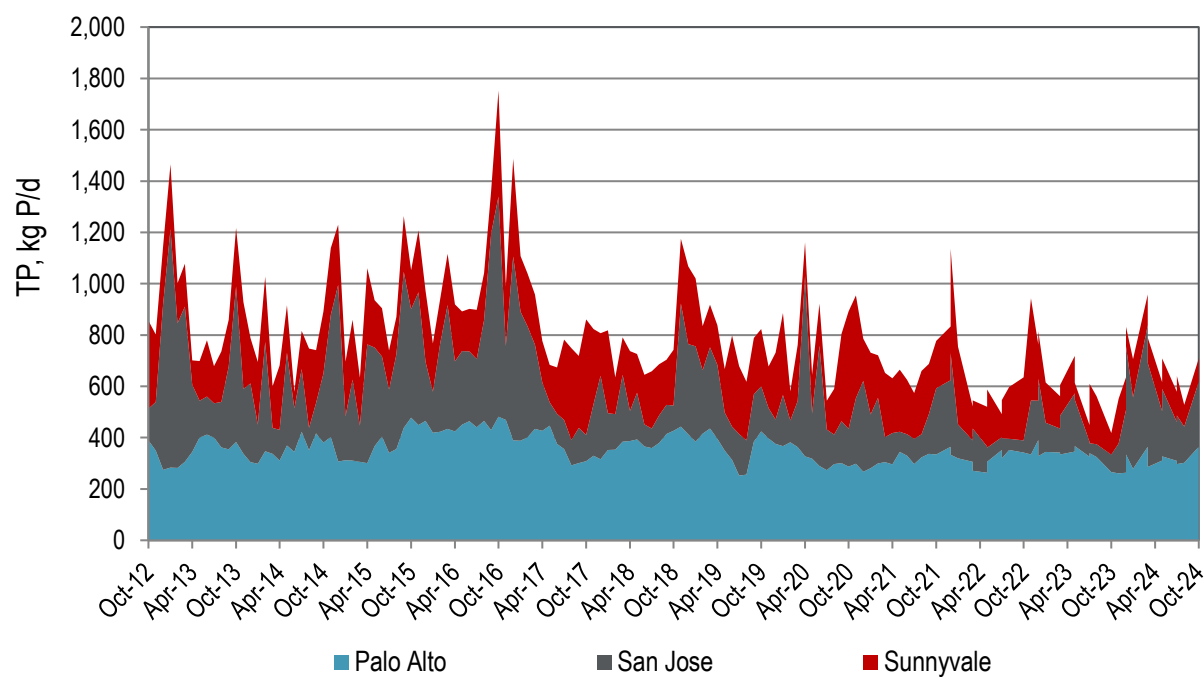


Figure 5-25. TP Load Contribution by Discharger to Lower South Bay

6 Recycled Water Data Review Findings

As previously noted in Section 3.7, this is the third Group Annual Report that includes data reported to the State Water Board⁶. It is important to note that the recycled water data lags one year behind the Group Annual Report. In addition to recycled water volumes, this Group Annual Report relies on the 2019/2020, 2020/2021, 2021/2022, and 2022/2023 datasets to quantify the corresponding load reductions to the Bay from recycled water. Similar to Sections 4 and 5, the average annual and dry season flows and loads are provided in the subsections that follow.

The approach used to compile and present recycled water data is as follows:

- ◆ The recycled water volumes are presented as flow (mgd) to stay consistent with the other sections of this report.
- ◆ There are instances when the nutrient loads associated with recycled water applications end up in the Bay. For example, there could be an industrial applications that use recycled water laden with nutrients for chillers. The chiller water that has nutrients is eventually exhausted and discharged to the Bay. This analysis attempts to exclude such recycled water nutrient loads that end up in the Bay. Assumptions made for flows and loads diverted from the Bay by each discharger are detailed in their respective Appendix.
- ◆ The dry season represents 153 days. The duration is critical when one calculates the average flow (mgd) during the dry season or year-round (for average annual).

Since including recycled water into the 2022 Group Annual Report, there are several data amendments within the Group Annual Reports as follows:

- ◆ Data from EBDA (South Bay Discharger) has been amended since the initial year with recycled water (year 2022) with plant specific effluent concentrations instead of EBDA effluent concentrations.
- ◆ Similar to EBDA, data from the West County Common Outfall (San Pablo Bay Discharger) has been amended since the 2022 Group Annual Report with West County Wastewater Treatment Plant specific effluent concentrations (instead of West County Common Outfall effluent concentrations, which also include Richmond). Furthermore, the recycled water users for the West County Wastewater Treatment Plant was expanded to include the North Richmond WRP.
- ◆ Nutrient loads associated recycled water for the various San Pablo Bay Dischargers that do not discharge during the dry season are included in this and future Group Annual Reports. Such nutrient loads associated with recycled water were inadvertently excluded in previous Group Annual Reports.

⁶ State Water Resources Control Board. (2020) [Volumetric Annual Report of Wastewater and Recycled Water - Annual Volumetric Report Effluent - California Open Data](#)

6.1 Flow

The annual average (i.e., twelve months from October 1 to September 30) and dry season average monthly (i.e., May 1 through September 30) recycled water flows are provided in Table 6-1 and Table 6-2, respectively. In addition, the annual average and dry season average monthly recycled water flows for each Subembayment are provided in Table 6-3 and Table 6-4, respectively. An additional set of tables is provided in Table 6-5 and Table 6-6 that offers the percent reduction of flow/load diverted from the Bay from recycled water.

A summary of the recycled water data review findings is as follows:

- ◆ The volume and percentage of water that is used by reuse customers is seasonally dependent. Example calculations for the percent of treated water that is diverted from the Bay and sent to reuse customers is as follows:
 - ▲ Average Annual (Example for 2020/2021 dataset): recycled water constitutes a diversion of approximately 11 percent of flow from the Bay (average annual flow = 374 mgd; recycled water = 47 mgd):

$$\frac{47 \text{ mgd}}{(47 \text{ mgd} + 374 \text{ mgd})} = 11\%$$
 - ▲ Dry Season (Example for 2021 dataset): recycled water constitutes a diversion of approximately 16 percent of flow from the Bay (dry season average flow = 339 mgd; recycled water dry season average flow = 64 mgd)

$$\frac{64 \text{ mgd}}{(64 \text{ mgd} + 339 \text{ mgd})} = 16\%$$
- ◆ The recycled water flows are seasonally dependent as evidenced by an increase of nearly 40 percent from average annual to dry season volumes. San Pablo and South Bays have the most pronounced seasonality impacts over the timeframe presented.
- ◆ West County (Central Bay Discharger): data has been amended since the 2022 Group Annual Report with recycled water volumes for both the Richmond Advanced Recycled Expansion (RARE) and the North Richmond Water Reclamation Plant. The previous reports were limited to recycled water volumes from RARE. As such, recycled water diversions have increased from previous reports.
- ◆ During the dry season when recycled water volumes are at their peak, the recycled water volumes by Subembayment are as follows (based on the 5-year average): Lower South Bay > South Bay > San Pablo Bay > Suisun Bay > Central Bay.
- ◆ The percentage of loads diverted from the Bay by reuse ranges from 7 to 16 percent Baywide (with higher percentages during the dry season averaging period; refer to Table 6-5 and Table 6-6).

Table 6-1. Recycled Water: Annual Average Flows Diverted from the Bay (mgd)

Discharger	Subembayment	Treatment Plant Permitted Capacity ^(a)	2019/2020 ^(b,c)	2020/2021 ^(b,c)	2021/2022 ^(b,c)	2022/2023 ^(b,c)	4-Year Average
American Canyon	San Pablo Bay	2.5	0.4	0.4	0.4	0.4	0.4
Benicia ^(f)	San Pablo Bay	4.5	--	--	--	--	--
Burlingame ^(f)	South Bay	5.5	--	--	--	--	--
Central San	Suisun Bay	53.8	1.6	1.7	1.7	1.6	1.7
CMSA	Central Bay	10	0.04	0.04	0.02	0.02	0.03
Port Costa ^(f)	San Pablo Bay	0.033	--	--	--	--	--
Delta Diablo ^(g)	Suisun Bay	19.5	4.1	4.9	4.9	4.3	4.5
EBDA	South Bay	107.8	8.5	9.3	8.6	8.3	8.7
EBMUD ^(g)	Central Bay	120	0.8	0.8	0.3	0.1	0.5
FSSD	Suisun Bay	23.7	0.9	0.9	0.6	0.2	0.7
Las Gallinas ^(d)	San Pablo Bay	2.92	0.4	0.7	1.0	1.0	0.8
Paradise Cove ^(f)	Central Bay	0.04	--	--	--	--	--
Tiburon ^(f)	Central Bay	0.98	--	--	--	--	--
Millbrae ^(f)	South Bay	3	--	--	--	--	--
Mt. View ^(f)	Suisun Bay	3.2	--	--	--	--	--
Napa ^(d)	San Pablo Bay	15.4	2.7	3.5	2.8	2.1	2.8
Novato	San Pablo Bay	7	1.7	1.8	2.1	1.1	1.7
Palo Alto	Lower South Bay	39	0.7	0.7	0.7	0.6	0.7
Petaluma ^(d)	San Pablo Bay	6.7	1.7	2.1	1.8	1.5	1.8
Pinole ^(f)	San Pablo Bay	4.06	--	--	--	--	--
Rodeo ^(f)	San Pablo Bay	1.14	--	--	--	--	--
SFO Airport	South Bay	2.2	--	<0.01	--	--	<0.01
SFPUC Southeast ^(f)	South Bay	85.4	--	--	--	--	--
San Jose	Lower South Bay	167	11	12	11	10	11
San Mateo ^(f)	South Bay	15.7	--	--	--	--	--
SMCSD ^(f)	Central Bay	1.8	--	--	--	--	--
SASM	Central Bay	3.6	0.03	0.02	0.03	0.03	0.03
SVCW	South Bay	29	0.8	0.7	0.6	0.5	0.6
Sonoma Valley ^(d)	San Pablo Bay	3	1.2	1.4	1.7	1.0	1.3
South SF ^(f)	South Bay	13	--	--	--	--	--
Sunnyvale	Lower South Bay	29.5	0.8	0.8	0.3	--	0.6
Treasure Island ^(f)	Central Bay	2	--	--	--	--	--
Vallejo ^(f)	San Pablo Bay	15.5	--	--	--	--	--
West County	Central Bay	28.5	5.3	5.2	4.8	4.3	4.9
Total ^(e)		827	42	47	44	37	43

a. Based on ADWF permitted capacity.

b. Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.

c. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.

d. No discharge during a portion or all the dry season months, except when necessary due to wet conditions.

e. The total values might vary from the sum of the listed values by plant due to rounding.

f. This discharger does not produce recycled water.

g. Assumes that a portion of flow from industrial application is not diverted from the Bay.

Table 6-2. Recycled Water: Dry Season Flows Diverted from the Bay (mgd)

Discharger	Subembayment	Treatment Plant Permitted Capacity ^(a)	2019 ^(b,c)	2020 ^(b,c)	2021 ^(b,c)	2022 ^(b,c)	2023 ^(b,c)	5-Year Average
American Canyon	San Pablo Bay	2.5	0.4	0.6	0.7	0.7	0.6	0.6
Benicia ^(f)	San Pablo Bay	4.5	--	--	--	--	--	--
Burlingame ^(f)	South Bay	5.5	--	--	--	--	--	--
Central San	Suisun Bay	53.8	2.2	2.1	2.3	2.3	2.2	2.2
CMSA	Central Bay	10	0.03	0.05	0.06	0.03	0.02	0.04
Port Costa ^(f)	San Pablo Bay	0.033	--	--	--	--	--	--
Delta Diablo ^(g)	Suisun Bay	19.5	3.7	4.3	5.7	5.5	4.0	4.6
EBDA	South Bay	107.8	13.0	13.0	13.0	13.0	13.0	13.0
EBMUD ^(g)	Central Bay	120	0.9	0.8	0.8	0.3	0.1	0.6
FSSD	Suisun Bay	23.7	1.2	1.8	1.7	1.1	0.4	1.2
Las Gallinas ^(d)	San Pablo Bay	2.92	0.8	0.7	1.5	1.7	1.8	1.3
Paradise Cove ^(f)	Central Bay	0.04	--	--	--	--	--	--
Tiburon ^(f)	Central Bay	0.98	--	--	--	--	--	--
Millbrae ^(f)	South Bay	3	--	--	--	--	--	--
Mt. View ^(f)	Suisun Bay	3.2	--	--	--	--	--	--
Napa ^(d)	San Pablo Bay	15.4	3.8	4.6	5.9	5.0	4.0	4.7
Novato	San Pablo Bay	7	1.6	3.1	2.9	3.4	1.5	2.5
Palo Alto	Lower South Bay	39	1.1	1.1	1.1	1.2	1.2	1.1
Petaluma ^(d)	San Pablo Bay	6.7	2.3	3.2	3.4	2.7	2.4	2.8
Pinole ^(f)	San Pablo Bay	4.06	--	--	--	--	--	--
Rodeo ^(f)	San Pablo Bay	1.14	--	--	--	--	--	--
SFO Airport	South Bay	2.2	--	--	<0.01	--	--	<0.01
SFPUC Southeast ^(f)	South Bay	85.4	--	--	--	--	--	--
San Jose	Lower South Bay	167	15	16	16	16	16	15
San Mateo ^(f)	South Bay	15.7	--	--	--	--	--	--
SMCSD ^(f)	Central Bay	1.8	--	--	--	--	--	--
SASM	Central Bay	3.6	0.05	0.03	0.03	0.03	0.03	0.03
SVCW	South Bay	29	1.1	0.9	1.1	1.0	0.9	1.0
Sonoma Valley ^(d)	San Pablo Bay	3	1.5	1.7	2.0	1.8	1.7	1.7
South SF ^(f)	South Bay	13	--	--	--	--	--	--
Sunnyvale	Lower South Bay	29.5	0.9	1.2	0.8	0.4	--	0.8
Treasure Island ^(f)	Central Bay	2	--	--	--	--	--	--
Vallejo ^(f)	San Pablo Bay	15.5	--	--	--	--	--	--
West County	Central Bay	28.5	5.0	5.3	5.0	4.5	4.4	5.0
Total ^(e)		827	55	60	64	61	54	59

- Based on ADWF permitted capacity.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.
- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- No discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- This discharger does not produce recycled water.
- Assumes that a portion of flow from industrial application is not diverted from the Bay.

Table 6-3. Recycled Water: Annual Average Flows by Subembayment, Flow (mgd)

Subembayment	Treatment Plant Permitted Capacity	2019/2020 ^(a)	2020/2021 ^(a)	2021/2022 ^(a)	2022/2023 ^(a)	4-Year Average
Suisun Bay	100	6.5	7.5	7.2	6.2	6.9
San Pablo Bay ^(b)	62.8	8.2	10	9.8	7.0	8.7
Central Bay	167	6.1	6.0	5.1	4.4	5.4
South Bay	262	9.2	10	9.3	8.8	9.3
Lower South Bay	236	12	13	12	11	12
Total ^(c)	827	42	47	44	37	42

- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.

Table 6-4. Recycled Water: Dry Season Average Flows by Subembayment, Flow (mgd)

Subembayment	Treatment Plant Permitted Capacity	2019 ^(a)	2020 ^(a)	2021 ^(a)	2022 ^(a)	2023 ^(a)	5-Year Average
Suisun Bay	100	7.2	8.1	9.7	9.0	6.7	8.1
San Pablo Bay ^(b)	62.8	10	14	16	15	12	14
Central Bay	167	6.0	6.2	5.8	4.7	4.6	5.5
South Bay	262	15	14	14	14	14	14
Lower South Bay	236	17	18	17	17	17	17
Total ^(c)	827	55	60	64	61	54	59

- Each reporting year represents the period between May 1 and September 30 of the indicated year.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.

Table 6-5. Recycled Water: Percent of Annual Average Flows Diverted from each Subembayment, Flow (%)

Subembayment	Treatment Plant Permitted Capacity	2019/2020 (a,c) %	2020/2021 (a,c) %	2021/2022 (a,c) %	2022/2023 (a,c) %	4-Year Average, %
Suisun Bay	100	11%	13%	11%	8%	10%
San Pablo Bay ^(b)	62.8	24%	34%	28%	16%	22%
Central Bay	167	8%	9%	6%	5%	7%
South Bay	262	6%	7%	6%	5%	6%
Lower South Bay	236	10%	11%	11%	8%	9%
Total	827	9%	11%	10%	7%	9%

- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The percent diverted is based on the recycled water value divided by the sum of recycled water value and discharge value.

Table 6-6. Recycled Water: Percent of Dry Season Average Flows Diverted from each Subembayment, Flow (%)

Subembayment	Treatment Plant Permitted Capacity	2019 ^(a,c) %	2020 ^(a,c) %	2021 ^(a,c) %	2022 ^(a,c) %	2023 ^(a,c) %	5-Year Average, %
Suisun Bay	100	12%	15%	17%	14%	11%	14%
San Pablo Bay ^(b)	62.8	42%	52%	56%	49%	44%	47%
Central Bay	167	9%	10%	9%	7%	7%	8%
South Bay	262	10%	10%	10%	9%	9%	9%
Lower South Bay	236	14%	16%	16%	14%	12%	14%
Total	827	13%	15%	16%	14%	12%	14%

- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The percent diverted is based on the recycled water value divided by the sum of recycled water value and discharge value.

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6.2 Total Ammonia

The annual average (i.e., twelve months from October 1 to September 30) and dry season average monthly (i.e., May 1 through September 30) recycled water ammonia loads are provided in Table 6-7 and Table 6-8, respectively. In addition, the annual average and dry season average monthly recycled water ammonia loads for each Subembayment are provided in Table 6-9 and Table 6-10, respectively. An additional set of tables is provided in Table 6-11 and Table 6-12 that offers the percent reduction of flow/load diverted from the Bay from recycled water.

A summary of the recycled water data review findings is as follows:

- ◆ The volume and percentage of water that is used by reuse customers is seasonally dependent. Example calculations for the percent of treated water that is diverted from the Bay and sent to reuse customers is as follows:
 - ▲ Average Annual (Example for 2020/2021 dataset): recycled water constitutes a diversion of approximately 5 percent of ammonia load from the Bay (average annual discharge load = 35,300 kg N/d; recycled water average annual load = 1,800 kg N/d):

$$\frac{1,800 \text{ kg N/d}}{(1,800 \text{ kg N/d} + 35,300 \text{ kg N/d})} = 5\%$$
 - ▲ Dry Season (Example for 2021 dataset): recycled water constitutes a diversion of approximately 7 percent of ammonia load from the Bay (dry season average discharge load = 33,600 kg N/d; recycled water dry season average load = 2,300 kg N/d):

$$\frac{2,300 \text{ kg N/d}}{(2,300 \text{ kg N/d} + 33,600 \text{ kg N/d})} = 7\%$$
- ◆ The recycled water flows are seasonally dependent as evidenced by an increase of nearly 40 percent from average annual to dry season loads. San Pablo and South Bays have the most pronounced seasonality impacts over the timeframe presented.
- ◆ EBDA (South Bay Discharger): data has been updated since the 2022 Group Annual Report with plant specific effluent concentrations (instead of EBDA effluent concentrations). As such, the recycled water diversions increased for EBDA as concentrations for the EBDA members with the largest recycled water production (e.g., Dublin San Ramon Services District) are typically higher than the EBDA discharge concentration.
- ◆ West County (Central Bay Discharger): data has been updated since the 2022 Group Annual Report with plant specific effluent concentrations (instead of West County Common Outfall). The recycled water loads have decreased as West County Wastewater Treatment Plant typically has lower effluent concentrations than common outfall.
- ◆ During the dry season when recycled water volumes are at their peak, the ammonia loads by Subembayment are as follows (based on the 5-year average): South Bay > Suisun Bay > Central Bay > San Pablo Bay > Lower South Bay. Note: Despite having the highest dry season recycled water volumes, the Lower South Bay has the second to lowest amount of ammonia loads diverted from the Bay as all Lower South Bay dischargers reliably nitrify.
- ◆ The percentage of loads diverted from the Bay by reuse ranges from 4 to 9 percent Baywide (with higher percentages during the dry season; refer to Table 6-11 and Table 6-12).

Table 6-7. Recycled Water: Annual Average Total Ammonia Loads Diverted from the Bay (kg N/day)

Discharger	Subembayment	2019/2020 (b,c)	2020/2021 (b,c)	2021/2022 (b,c)	2022/2023 (b,c)	4-Year Average
American Canyon	San Pablo Bay	0.3	0.2	0.2	0.5	0.3
Benicia ^(f)	San Pablo Bay	--	--	--	--	--
Burlingame ^(f)	South Bay	--	--	--	--	--
Central San	Suisun Bay	180	230	210	150	190
CMSA	Central Bay	5	6	3	3	4
Port Costa ^(f)	San Pablo Bay	--	--	--	--	--
Delta Diablo ^(g)	Suisun Bay	58	67	59	58	60
EBDA	South Bay	1,000	1,100	1,700	980	1,200
EBMUD	Central Bay	140	140	64	8	86
FSSD	Suisun Bay	0.3	0.3	0.7	0.2	0.4
Las Gallinas ^(d)	San Pablo Bay	5	19	12	6	10
Paradise Cove ^(f)	Central Bay	--	--	--	--	--
Tiburon ^(f)	Central Bay	--	--	--	--	--
Millbrae ^(f)	South Bay	--	--	--	--	--
Mt. View ^(f)	Suisun Bay	--	--	--	--	--
Napa ^(d)	San Pablo Bay	22	22	19	20	21
Novato	San Pablo Bay	17	14	17	9	14
Palo Alto	Lower South Bay	0.3	0.4	0.5	0.8	0.5
Petaluma ^(d)	San Pablo Bay	2	3	3	2	2
Pinole ^(f)	San Pablo Bay	--	--	--	--	--
Rodeo ^(f)	San Pablo Bay	--	--	--	--	--
SFO Airport	South Bay	--	<0.1	--	--	<0.1
SFPUC Southeast ^(f)	South Bay	--	--	--	--	--
San Jose	Lower South Bay	24	21	18	18	20
San Mateo ^(f)	South Bay	--	--	--	--	--
SMCSD ^(f)	Central Bay	--	--	--	--	--
SASM	Central Bay	1	1	2	1	1
SVCW	South Bay	140	140	130	91	120
Sonoma Valley ^(d)	San Pablo Bay	0.5	1	2	0.6	0.9
South SF ^(f)	South Bay	--	--	--	--	--
Sunnyvale	Lower South Bay	1	1	3	--	2
Treasure Island ^(f)	Central Bay	--	--	--	--	--
Vallejo ^(f)	San Pablo Bay	--	--	--	--	--
West County	Central Bay	10	10	9	9	10
Total ^(e)		1,600	1,800	2,300	1,400	1,800

a. Based on ADWF permitted capacity.

b. Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.

c. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.

d. No discharge during a portion or all the dry season months, except when necessary due to wet conditions.

e. The total values might vary from the sum of the listed values by plant due to rounding.

f. This discharger does not produce recycled water.

g. Assumes that a portion of load from industrial application is not diverted from the Bay.

Table 6-8. Recycled Water: Dry Season Total Ammonia Loads Diverted from the Bay (kg N/day)

Discharger	Subembayment	2019 ^(b)	2020 ^(b)	2021 ^(b)	2022 ^(b)	2023 ^(b)	5-Year Average
American Canyon	San Pablo Bay	0.6	0.5	0.3	0.4	1.0	0.5
Benicia ^(f)	San Pablo Bay	--	--	--	--	--	--
Burlingame ^(f)	South Bay	--	--	--	--	--	--
Central San	Suisun Bay	210	250	310	280	200	250
CMSA	Central Bay	4	7	9	5	3	6
Port Costa ^(f)	San Pablo Bay	--	--	--	--	--	--
Delta Diablo ^(g)	Suisun Bay	54	62	69	64	55	61
EBDA	South Bay	2,200	1,200	1,400	2,800	1,400	1,800
EBMUD	Central Bay	170	150	150	59	18	100
FSSD	Suisun Bay	0.7	0.5	0.5	1.2	0.4	0.7
Las Gallinas ^(d)	San Pablo Bay	15	11	40	21	10	19
Paradise Cove ^(f)	Central Bay	--	--	--	--	--	--
Tiburon ^(f)	Central Bay	--	--	--	--	--	--
Millbrae ^(f)	South Bay	--	--	--	--	--	--
Mt. View ^(f)	Suisun Bay	--	--	--	--	--	--
Napa ^(d)	San Pablo Bay	77	33	35	36	39	44
Novato	San Pablo Bay	6	31	21	26	11	19
Palo Alto	Lower South Bay	0.5	0.5	0.6	0.8	1.5	0.8
Petaluma ^(d)	San Pablo Bay	4	3	4	4	3	4
Pinole ^(f)	San Pablo Bay	--	--	--	--	--	--
Rodeo ^(f)	San Pablo Bay	--	--	--	--	--	--
SFO Airport	South Bay	--	--	<0.1	--	--	<0.1
SFPUC Southeast ^(f)	South Bay	--	--	--	--	--	--
San Jose	Lower South Bay	41	35	26	22	25	30
San Mateo ^(f)	South Bay	--	--	--	--	--	--
SMCSD ^(f)	Central Bay	--	--	--	--	--	--
SASM	Central Bay	4	2	1	3	1	2
SVCW	South Bay	210	160	240	200	170	200
Sonoma Valley ^(d)	San Pablo Bay	0.6	0.7	0.7	0.8	0.9	0.7
South SF ^(f)	South Bay	--	--	--	--	--	--
Sunnyvale	Lower South Bay	1	1	1	1	--	1
Treasure Island ^(f)	Central Bay	--	--	--	--	--	--
Vallejo ^(f)	San Pablo Bay	--	--	--	--	--	--
West County	Central Bay	10	10	9	9	8	9
Total ^(e)		3,000	1,900	2,300	3,500	1,900	2,500

- Based on ADWF permitted capacity.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.
- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- No discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- This discharger does not produce recycled water.
- Assumes that a portion of load from industrial application is not diverted from the Bay.

Table 6-9. Recycled Water: Annual Average Total Ammonia Loads by Subembayment, Flow (kg N/d)

Subembayment	Treatment Plant Permitted Capacity	2019/2020 (a)	2020/2021 (a)	2021/2022 (a)	2022/2023 (a)	4-Year Average
Suisun Bay	100	240	300	270	210	250
San Pablo Bay ^(b)	62.8	47	59	52	37	49
Central Bay	167	160	160	73	20	100
South Bay	262	1,200	1,300	1,900	1,100	1,300
Lower South Bay	236	26	23	21	19	22
Total ^(c)	827	1,600	1,800	2,300	1,400	1,800

- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.

Table 6-10. Recycled Water: Dry Season Average Total Ammonia Loads by Subembayment, Flow (kg N/d)

Subembayment	Treatment Plant Permitted Capacity	2019 ^(a)	2020 ^(a)	2021 ^(a)	2022 ^(a)	2023 ^(a)	5-Year Average
Suisun Bay	100	270	310	380	340	250	310
San Pablo Bay ^(b)	62.8	100	79	100	87	65	87
Central Bay	167	190	170	170	56	31	120
South Bay	262	2,400	1,400	1,700	3,000	1,600	2,000
Lower South Bay	236	42	36	28	24	26	31
Total ^(c)	827	3,000	1,900	2,300	3,500	1,900	2,500

- Each reporting year represents the period between May 1 and September 30 of the indicated year.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.

Table 6-11. Recycled Water: Percent of Annual Average Total Ammonia Loads Diverted from each Subembayment, Flow (%)

Subembayment	Treatment Plant Permitted Capacity	2019/2020 (a,c) %	2020/2021 (a,c) %	2021/2022 (a,c) %	2022/2023 (a,c) %	4-Year Average, %
Suisun Bay	100	4%	5%	5%	4%	5%
San Pablo Bay ^(b)	62.8	4%	5%	4%	3%	4%
Central Bay	167	1%	2%	1%	<1%	1%
South Bay	262	5%	6%	9%	5%	7%
Lower South Bay	236	7%	7%	6%	4%	6%
Total	827	4%	5%	6%	4%	5%

- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The percent diverted is based on the recycled water value divided by the sum of recycled water value and discharge value.

Table 6-12. Recycled Water: Percent of Dry Season Average Total Ammonia Loads Diverted from each Subembayment, Flow (%)

Subembayment	Treatment Plant Permitted Capacity	2019 ^(a,c) %	2020 ^(a,c) %	2021 ^(a,c) %	2022 ^(a,c) %	2023 ^(a,c) %	5-Year Average, %
Suisun Bay	100	6%	6%	7%	7%	6%	6%
San Pablo Bay ^(b)	62.8	9%	7%	8%	7%	5%	7%
Central Bay	167	2%	2%	2%	0%	0%	1%
South Bay	262	10%	7%	9%	14%	8%	10%
Lower South Bay	236	15%	16%	17%	16%	13%	17%
Total	827	7%	5%	7%	9%	6%	7%

- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The percent diverted is based on the recycled water value divided by the sum of recycled water value and discharge value.

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6.3 Nitrate + Nitrite (NO_x)

The annual average (i.e., twelve months from October 1 to September 30) and dry season average monthly (i.e., May 1 through September 30) recycled water NO_x loads are provided in Table 6-13 and Table 6-14, respectively. In addition, the annual average and dry season average monthly recycled water NO_x loads for each Subembayment are provided in Table 6-15 and Table 6-16, respectively. An additional set of tables is provided in Table 6-17 and Table 6-18 that offers the percent reduction of flow/load diverted from the Bay from recycled water.

A summary of the recycled water data review findings is as follows:

- ◆ The volume and percentage of water that is used by reuse customers is seasonally dependent. Example calculations for the percent of treated water that is diverted from the Bay and sent to reuse customers is as follows:
 - ▲ Average Annual (Example for 2020/2021 dataset): recycled water constitutes a diversion of approximately 12 percent of NO_x load from the Bay (average annual discharge load = 10,700 kg N/d; recycled water average annual load = 1,500 kg N/d):

$$\frac{1,500 \text{ kg N/d}}{(1,500 \text{ kg N/d} + 10,700 \text{ kg N/d})} = 12\%$$
 - ▲ Dry Season (Example for 2021 dataset): recycled water constitutes a diversion of approximately 17 percent of NO_x load from the Bay (dry season average discharge load = 9,290 kg N/d; recycled water dry season average load = 2,000 kg N/d):

$$\frac{2,000 \text{ kg N/d}}{(2,000 \text{ kg N/d} + 9,290 \text{ kg N/d})} = 17\%$$
- ◆ The recycled water flows are seasonally dependent as evidenced by an increase of approximately 38 percent from average annual to dry season loads. Suisun Bay has the most pronounced seasonality impact over the timeframe presented.
- ◆ EBDA (South Bay Discharger): data has been updated since the 2022 Group Annual Report with plant specific effluent concentrations (instead of EBDA effluent concentrations). Recycled water diversions decreased as concentrations for the EBDA members with the largest recycled water production are typically lower than the EBDA discharge concentration.
- ◆ West County (Central Bay Discharger): data has been updated since the 2022 Group Annual Report with plant specific effluent concentrations (instead of West County Common Outfall). As such, recycled diversions have increased as West County Wastewater Treatment Plant fully nitrifies and as such has higher NO_x levels than the West County common outfall.
- ◆ During the dry season when recycled water volumes are at their peak, the recycled water NO_x loads by Subembayment are as follows (based on the 5-year average): Lower South Bay > San Pablo Bay > Central Bay > South Bay > Suisun Bay. Unlike ammonia, the Lower South Bay has both the largest flow and NO_x loads diverted from the Bay by reuse as all Lower South Bay dischargers reliably convert ammonia to NO_x prior to reuse.
- ◆ The percentage of loads diverted from the Bay by reuse ranges from 8 to 18 percent Baywide (with higher percentages during the dry season; refer to Table 6-17 and Table 6-18).

Table 6-13. Recycled Water: Annual Average Nitrate + Nitrite Loads Diverted from the Bay (kg N/day)

Discharger	Subembayment	2019/2020 (b,c)	2020/2021 (b,c)	2021/2022 (b,c)	2022/2023 (b,c)	4-Year Average
American Canyon	San Pablo Bay	9	6	6	6	7
Benicia ^(f)	San Pablo Bay	--	--	--	--	--
Burlingame ^(f)	South Bay	--	--	--	--	--
Central San	Suisun Bay	6	4	7	15	8
CMSA	Central Bay	<1	1	<1	<1	<1
Port Costa ^(f)	San Pablo Bay	--	--	--	--	--
Delta Diablo ^(g)	Suisun Bay	2	5	4	2	4
EBDA	South Bay	83	83	83	87	79
EBMUD	Central Bay	6	10	4	1	5
FSSD	Suisun Bay	77	75	55	17	56
Las Gallinas ^(d)	San Pablo Bay	34	50	31	32	37
Paradise Cove ^(f)	Central Bay	--	--	--	--	--
Tiburon ^(f)	Central Bay	--	--	--	--	--
Millbrae ^(f)	South Bay	--	--	--	--	--
Mt. View ^(f)	Suisun Bay	--	--	--	--	--
Napa ^(d)	San Pablo Bay	87	120	100	57	92
Novato	San Pablo Bay	63	62	73	47	61
Palo Alto	Lower South Bay	72	77	94	76	80
Petaluma ^(d)	San Pablo Bay	2	4	2	5	3
Pinole ^(f)	San Pablo Bay	--	--	--	--	--
Rodeo ^(f)	San Pablo Bay	--	--	--	--	--
SFO Airport	South Bay	--	<1	--	--	<1
SFPUC Southeast ^(f)	South Bay	--	--	--	--	--
San Jose	Lower South Bay	590	580	470	430	520
San Mateo ^(f)	South Bay	--	--	--	--	--
SMCSD ^(f)	Central Bay	--	--	--	--	--
SASM	Central Bay	2	2	1	2	2
SVCW	South Bay	2	2	2	2	2
Sonoma Valley ^(d)	San Pablo Bay	49	65	53	46	53
South SF ^(f)	South Bay	--	--	--	--	--
Sunnyvale	Lower South Bay	37	33	20	--	30
Treasure Island ^(f)	Central Bay	--	--	--	--	--
Vallejo ^(f)	San Pablo Bay	--	--	--	--	--
West County	Central Bay	330	320	300	270	300
Total ^(e)		1,500	1,400	1,300	1,100	1,300

a. Based on ADWF permitted capacity.

b. Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.

c. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.

d. No discharge during a portion or all the dry season months, except when necessary due to wet conditions.

e. The total values might vary from the sum of the listed values by plant due to rounding.

f. This discharger does not produce recycled water.

g. Assumes that a portion of load from industrial application is not diverted from the Bay.

Table 6-14. Recycled Water: Dry Season Nitrate + Nitrite Loads Diverted from the Bay (kg N/day)

Discharger	Subembayment	2019 ^(b)	2020 ^(b)	2021 ^(b)	2022 ^(b)	2023 ^(b)	5-Year Average
American Canyon	San Pablo Bay	9	10	10	9	8	9
Benicia ^(f)	San Pablo Bay	--	--	--	--	--	--
Burlingame ^(f)	South Bay	--	--	--	--	--	--
Central San	Suisun Bay	17	11	5	14	30	16
CMSA	Central Bay	<1	1	1	<1	<1	1
Port Costa ^(f)	San Pablo Bay	--	--	--	--	--	--
Delta Diablo ^(g)	Suisun Bay	3	3	10	9	2	5
EBDA	South Bay	32	190	43	230	140	130
EBMUD	Central Bay	8	6	9	3	2	6
FSSD	Suisun Bay	100	150	140	100	31	100
Las Gallinas ^(d)	San Pablo Bay	41	59	100	54	51	62
Paradise Cove ^(f)	Central Bay	--	--	--	--	--	--
Tiburon ^(f)	Central Bay	--	--	--	--	--	--
Millbrae ^(f)	South Bay	--	--	--	--	--	--
Mt. View ^(f)	Suisun Bay	--	--	--	--	--	--
Napa ^(d)	San Pablo Bay	71	150	220	180	110	140
Novato	San Pablo Bay	53	110	100	120	68	90
Palo Alto	Lower South Bay	120	120	120	160	150	130
Petaluma ^(d)	San Pablo Bay	7	4	6	3	9	6
Pinole ^(f)	San Pablo Bay	--	--	--	--	--	--
Rodeo ^(f)	San Pablo Bay	--	--	--	--	--	--
SFO Airport	South Bay	--	--	<1	--	--	<1
SFPUC Southeast ^(f)	South Bay	--	--	--	--	--	--
San Jose	Lower South Bay	810	800	750	580	640	720
San Mateo ^(f)	South Bay	--	--	--	--	--	--
SMCSD ^(f)	Central Bay	--	--	--	--	--	--
SASM	Central Bay	2	2	2	1	2	2
SVCW	South Bay	2	2	3	5	4	3
Sonoma Valley ^(d)	San Pablo Bay	48	88	97	73	90	79
South SF ^(f)	South Bay	--	--	--	--	--	--
Sunnyvale	Lower South Bay	61	50	33	23	--	42
Treasure Island ^(f)	Central Bay	--	--	--	--	--	--
Vallejo ^(f)	San Pablo Bay	--	--	--	--	--	--
West County	Central Bay	310	330	310	280	280	300
Total ^(e)		1,700	2,100	2,000	1,800	1,600	1,800

- Based on ADWF permitted capacity.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.
- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- No discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- This discharger does not produce recycled water.
- Assumes that a portion of load from industrial application is not diverted from the Bay.

Table 6-15. Recycled Water: Annual Average Nitrate + Nitrite Loads by Subembayment, Flow (kg N/d)

Subembayment	Treatment Plant Permitted Capacity	2019/2020 (a)	2020/2021 (a)	2021/2022 (a)	2022/2023 (a)	4-Year Average
Suisun Bay	100	85	84	66	34	67
San Pablo Bay ^(b)	62.8	240	300	270	190	250
Central Bay	167	340	330	300	270	310
South Bay	262	85	85	86	89	81
Lower South Bay	236	700	690	580	500	620
Total (c)	827	1,500	1,400	1,300	1,100	1,300

- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.

Table 6-16. Recycled Water: Dry Season Average Nitrate + Nitrite Loads by Subembayment, Flow (kg N/d)

Subembayment	Treatment Plant Permitted Capacity	2019 ^(a)	2020 ^(a)	2021 ^(a)	2022 ^(a)	2023 ^(a)	5-Year Average
Suisun Bay	100	120	160	150	120	63	130
San Pablo Bay ^(b)	62.8	230	420	540	430	340	390
Central Bay	167	320	340	320	280	280	310
South Bay	262	34	190	46	230	140	130
Lower South Bay	236	990	970	910	760	790	880
Total (c)	827	1,700	2,100	2,000	1,800	1,600	1,800

- Each reporting year represents the period between May 1 and September 30 of the indicated year.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.

Table 6-17. Recycled Water: Percent of Annual Average Nitrate + Nitrite Loads Diverted from each Subembayment, Flow (%)

Subembayment	Treatment Plant Permitted Capacity	2019/2020 (a,c) %	2020/2021 (a,c) %	2021/2022 (a,c) %	2022/2023 (a,c) %	4-Year Average, %
Suisun Bay	100	6%	6%	5%	2%	5%
San Pablo Bay ^(b)	62.8	28%	41%	37%	22%	31%
Central Bay	167	32%	27%	26%	18%	25%
South Bay	262	6%	5%	6%	6%	5%
Lower South Bay	236	8%	9%	9%	7%	8%
Total	827	11%	12%	11%	8%	11%

- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The percent diverted is based on the recycled water value divided by the sum of recycled water value and discharge value.

Table 6-18. Recycled Water: Percent of Dry Season Average Nitrate + Nitrite Loads Diverted from each Subembayment, Flow (%)

Subembayment	Treatment Plant Permitted Capacity	2019 ^(a,c) %	2020 ^(a,c) %	2021 ^(a,c) %	2022 ^(a,c) %	2023 ^(a,c) %	5-Year Average, %
Suisun Bay	100	8%	11%	12%	8%	4%	9%
San Pablo Bay ^(b)	62.8	34%	59%	67%	61%	49%	57%
Central Bay	167	33%	31%	28%	28%	19%	26%
South Bay	262	3%	12%	3%	18%	9%	9%
Lower South Bay	236	12%	13%	14%	13%	11%	13%
Total	827	14%	17%	17%	18%	13%	16%

- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The percent diverted is based on the recycled water value divided by the sum of recycled water value and discharge value.

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6.4 Total Inorganic Nitrogen (TIN)

The annual average (i.e., twelve months from October 1 to September 30) and dry season average monthly (i.e., May 1 through September 30) recycled water TIN loads are provided in Table 6-19 and Table 6-20, respectively. In addition, the annual average and dry season average monthly recycled water TIN loads for each Subembayment are provided in Table 6-21 and Table 6-22, respectively. An additional set of tables is provided in Table 6-23 and Table 6-24 that offers the percent reduction of flow/load diverted from the Bay from recycled water.

A summary of the recycled water data review findings is as follows:

- ◆ The volume and percentage of water that is used by reuse customers is seasonally dependent. Example calculations for the percent of treated water that is diverted from the Bay and sent to reuse customers is as follows:
 - ▲ Average Annual (Example for 2020/2021 dataset): recycled water constitutes a diversion of approximately 7 percent of TIN load from the Bay (average annual discharge load = 46,000 kg N/d; recycled water average annual load = 3,200 kg N/d):

$$\frac{3,200 \text{ kg N/d}}{(3,200 \text{ kg N/d} + 46,000 \text{ kg N/d})} = 7\%$$
 - ▲ Dry Season (Example for 2021 dataset): recycled water constitutes a diversion of approximately 9 percent of TIN load from the Bay (dry season average discharge load = 43,100 kg N/d; recycled water dry season average load = 4,300 kg N/d):

$$\frac{4,300 \text{ kg N/d}}{(4,300 \text{ kg N/d} + 43,100 \text{ kg N/d})} = 9\%$$
- ◆ The recycled water flows are seasonally dependent as evidenced by an increase of approximately 40 percent from average annual to dry season loads. South Bay has the most pronounced seasonality impact over the timeframe presented.
- ◆ EBDA (South Bay Discharger): data has been updated since the 2022 Group Annual Report with plant specific effluent concentrations (instead of EBDA effluent concentrations). Recycled water diversions increased for EBDA (emphasis on dry season) as TIN concentrations were higher than in previous years.
- ◆ West County (Central Bay Discharger): data has been updated since the 2022 Group Annual Report with plant specific effluent concentrations (instead of West County Common Outfall). Despite an increase in recycled water volumes (refer to Section 6.1), recycled water diversions were comparable to the previous report as West County Wastewater Treatment Plant has lower effluent values than the common outfall.
- ◆ During the dry season when recycled water volumes are at their peak, the recycled water TIN loads by Subembayment are as follows (based on the 5-year average): South Bay > Lower South Bay > Central Bay > San Pablo Bay > Suisun Bay.
- ◆ The percentage of loads diverted from the Bay by reuse ranges from 6 to 11 percent Baywide (with higher percentages during the dry season; refer to Table 6-23 and Table 6-24). The percentages are more in alignment with ammonia values associated with recycled water.

Table 6-19. Recycled Water: Annual Average TIN Loads Diverted from the Bay (kg N/day)

Discharger	Subembayment	2019/2020 (b,c)	2020/2021 (b,c)	2021/2022 (b,c)	2022/2023 (b,c)	4-Year Average
American Canyon	San Pablo Bay	9	7	6	6	7
Benicia ^(f)	San Pablo Bay	--	--	--	--	--
Burlingame ^(f)	South Bay	--	--	--	--	--
Central San	Suisun Bay	190	230	220	160	200
CMSA	Central Bay	5	6	3	3	4
Port Costa ^(f)	San Pablo Bay	--	--	--	--	--
Delta Diablo ^(g)	Suisun Bay	60	73	63	60	64
EBDA	South Bay	1,100	1,200	1,800	1,100	1,300
EBMUD	Central Bay	150	150	69	9	91
FSSD	Suisun Bay	77	76	56	18	57
Las Gallinas ^(d)	San Pablo Bay	38	60	29	34	40
Paradise Cove ^(f)	Central Bay	--	--	--	--	--
Tiburon ^(f)	Central Bay	--	--	--	--	--
Millbrae ^(f)	South Bay	--	--	--	--	--
Mt. View ^(f)	Suisun Bay	--	--	--	--	--
Napa ^(d)	San Pablo Bay	110	140	120	77	110
Novato	San Pablo Bay	80	77	90	55	75
Palo Alto	Lower South Bay	73	77	95	77	80
Petaluma ^(d)	San Pablo Bay	4	7	5	7	5
Pinole ^(f)	San Pablo Bay	--	--	--	--	--
Rodeo ^(f)	San Pablo Bay	--	--	--	--	--
SFO Airport	South Bay	--	0.0	--	--	0.0
SFPUC Southeast ^(f)	South Bay	--	--	--	--	--
San Jose	Lower South Bay	610	600	480	440	540
San Mateo ^(f)	South Bay	--	--	--	--	--
SMCSD ^(f)	Central Bay	--	--	--	--	--
SASM	Central Bay	4	3	3	3	3
SVCW	South Bay	140	140	130	93	130
Sonoma Valley ^(d)	San Pablo Bay	49	68	57	47	55
South SF ^(f)	South Bay	--	--	--	--	--
Sunnyvale	Lower South Bay	38	35	23	--	32
Treasure Island ^(f)	Central Bay	--	--	--	--	--
Vallejo ^(f)	San Pablo Bay	--	--	--	--	--
West County	Central Bay	340	330	310	280	310
Total ^(e)		3,100	3,200	3,600	2,400	3,100

- Based on ADWF permitted capacity.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.
- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- No discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- This discharger does not produce recycled water.
- Assumes that a portion of load from industrial application is not diverted from the Bay.

Table 6-20. Recycled Water: Dry Season TIN Loads Diverted from the Bay (kg N/day)

Discharger	Subembayment	2019 ^(b)	2020 ^(b)	2021 ^(b)	2022 ^(b)	2023 ^(b)	5-Year Average
American Canyon	San Pablo Bay	9	11	11	10	9	10
Benicia ^(f)	San Pablo Bay	--	--	--	--	--	--
Burlingame ^(f)	South Bay	--	--	--	--	--	--
Central San	Suisun Bay	230	260	310	290	230	260
CMSA	Central Bay	4	8	11	5	4	6
Port Costa ^(f)	San Pablo Bay	--	--	--	--	--	--
Delta Diablo ^(g)	Suisun Bay	55	65	81	72	57	53
EBDA	South Bay	2,200	1,400	1,500	3,000	1,500	1,900
EBMUD	Central Bay	180	150	160	62	21	110
FSSD	Suisun Bay	100	150	140	100	32	110
Las Gallinas ^(d)	San Pablo Bay	54	66	130	42	54	69
Paradise Cove ^(f)	Central Bay	--	--	--	--	--	--
Tiburon ^(f)	Central Bay	--	--	--	--	--	--
Millbrae ^(f)	South Bay	--	--	--	--	--	--
Mt. View ^(f)	Suisun Bay	--	--	--	--	--	--
Napa ^(d)	San Pablo Bay	140	180	260	210	150	190
Novato	San Pablo Bay	63	140	120	150	80	110
Palo Alto	Lower South Bay	120	120	120	160	150	130
Petaluma ^(d)	San Pablo Bay	10	7	10	7	12	9
Pinole ^(f)	San Pablo Bay	--	--	--	--	--	--
Rodeo ^(f)	San Pablo Bay	--	--	--	--	--	--
SFO Airport	South Bay	--	--	0.0	--	--	0.0
SFPUC Southeast ^(f)	South Bay	--	--	--	--	--	--
San Jose	Lower South Bay	850	840	780	600	660	750
San Mateo ^(f)	South Bay	--	--	--	--	--	--
SMCSD ^(f)	Central Bay	--	--	--	--	--	--
SASM	Central Bay	6	4	4	4	3	4
SVCW	South Bay	210	160	250	200	170	200
Sonoma Valley ^(d)	San Pablo Bay	49	88	98	73	91	80
South SF ^(f)	South Bay	--	--	--	--	--	--
Sunnyvale	Lower South Bay	62	51	35	24	--	43
Treasure Island ^(f)	Central Bay	--	--	--	--	--	--
Vallejo ^(f)	San Pablo Bay	--	--	--	--	--	--
West County	Central Bay	320	340	320	290	290	310
Total ^(e)		4,700	4,000	4,300	5,300	3,500	4,300

- Based on ADWF permitted capacity.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.
- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- No discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- This discharger does not produce recycled water.
- Assumes that a portion of load from industrial application is not diverted from the Bay.

Table 6-21. Recycled Water: Annual Average TIN Loads by Subembayment, Flow (kg N/d)

Subembayment	Treatment Plant Permitted Capacity	2019/2020 (a)	2020/2021 (a)	2021/2022 (a)	2022/2023 (a)	4-Year Average
Suisun Bay	100	320	380	330	240	320
San Pablo Bay ^(b)	62.8	280	360	310	230	290
Central Bay	167	500	490	380	290	410
South Bay	262	1,300	1,300	2,000	1,200	1,400
Lower South Bay	236	720	720	600	520	640
Total ^(c)	827	3,100	3,200	3,600	2,400	3,100

- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.

Table 6-22. Recycled Water: Dry Season Average TIN Loads by Subembayment, Flow (kg N/d)

Subembayment	Treatment Plant Permitted Capacity	2019 ^(a)	2020 ^(a)	2021 ^(a)	2022 ^(a)	2023 ^(a)	5-Year Average
Suisun Bay	100	390	470	530	470	320	420
San Pablo Bay ^(b)	62.8	330	490	620	490	390	470
Central Bay	167	510	510	490	340	310	430
South Bay	262	2,400	1,500	1,700	3,200	1,700	2,100
Lower South Bay	236	1,000	1,000	940	790	810	910
Total ^(c)	827	4,700	4,000	4,300	5,300	3,500	4,300

- Each reporting year represents the period between May 1 and September 30 of the indicated year.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.

Table 6-23. Recycled Water: Percent of Annual Average TIN Loads Diverted from each Subembayment, Flow (%)

Subembayment	Treatment Plant Permitted Capacity	2019/2020 (a,c) %	2020/2021 (a,c) %	2021/2022 (a,c) %	2022/2023 (a,c) %	4-Year Average, %
Suisun Bay	100	5%	5%	5%	4%	5%
San Pablo Bay ^(b)	62.8	13%	18%	15%	10%	14%
Central Bay	167	4%	4%	3%	3%	4%
South Bay	262	5%	6%	9%	5%	6%
Lower South Bay	236	8%	9%	9%	7%	8%
Total	827	6%	7%	7%	5%	6%

- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The percent diverted is based on the recycled water value divided by the sum of recycled water value and discharge value.

Table 6-24. Recycled Water: Percent of Dry Season Average TIN Loads Diverted from each Subembayment, Flow (%)

Subembayment	Treatment Plant Permitted Capacity	2019 ^(a,c) %	2020 ^(a,c) %	2021 ^(a,c) %	2022 ^(a,c) %	2023 ^(a,c) %	5-Year Average, %
Suisun Bay	100	6%	7%	8%	8%	5%	7%
San Pablo Bay ^(b)	62.8	18%	26%	31%	26%	21%	25%
Central Bay	167	4%	4%	4%	3%	3%	4%
South Bay	262	10%	7%	8%	14%	8%	10%
Lower South Bay	236	12%	13%	14%	13%	11%	13%
Total	827	9%	8%	9%	11%	8%	9%

- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The percent diverted is based on the recycled water value divided by the sum of recycled water value and discharge value.

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6.5 Total Phosphorus

The annual average (i.e., twelve months from October 1 to September 30) and dry season average monthly (i.e., May 1 through September 30) recycled water TP loads are provided in Table 6-25 and Table 6-26, respectively. In addition, the annual average and dry season average monthly recycled water TP loads for each Subembayment are provided in Table 6-27 and Table 6-28, respectively. An additional set of tables is provided in Table 6-29 and Table 6-30 that offers the percent reduction of flow/load diverted from the Bay from recycled water.

A summary of the recycled water data review findings is as follows:

- ◆ The volume and percentage of water that is used by reuse customers is seasonally dependent. Example calculations for the percent of treated water that is diverted from the Bay and sent to reuse customers is as follows:
 - ▲ Average Annual (Example for 2020/2021 dataset): recycled water constitutes a diversion of approximately 6 percent of Total P load from the Bay (average annual discharge load = 3,670 kg P/d; recycled water average annual load = 250 kg P/d):

$$\frac{250 \text{ kg P/d}}{(250 \text{ kg P/d} + 3,670 \text{ kg P/d})} = 6\%$$
 - ▲ Dry Season (Example for 2021 dataset): recycled water constitutes a diversion of approximately 9 percent of Total P load from the Bay (dry season average discharge load = 3,680 kg P/d; recycled water dry season average load = 340 kg P/d):

$$\frac{340 \text{ kg P/d}}{(340 \text{ kg P/d} + 3,680 \text{ kg P/d})} = 9\%$$
- ◆ The recycled water flows are seasonally dependent as evidenced by an increase of approximately 40 percent from average annual to dry season loads. South and Suisun Bays have the most pronounced seasonality impacts over the timeframe presented.
- ◆ EBDA (South Bay Discharger): data has been updated since the 2022 Group Annual Report with plant specific effluent concentrations (instead of EBDA effluent concentrations). As such, the recycled water diversions decreased for EBDA as EBDA members with the largest recycled water production are typically lower than the EBDA discharge concentration.
- ◆ West County (Central Bay Discharger): data has been updated since the 2022 Group Annual Report with plant specific effluent concentrations (instead of West County Common Outfall). Despite an increase in recycled water volumes (refer to Section 6.1), recycled water diversions were comparable to the previous report as West County has lower effluent values than the common outfall.
- ◆ During the dry season when recycled water volumes are at their peak, the recycled water TP loads by Subembayment are as follows (based on the 5-year average): San Pablo Bay > South Bay > Lower South Bay > Central Bay > Suisun Bay.
- ◆ The percentage of loads diverted from the Bay by reuse ranges from 5 to 9 percent Baywide (with higher percentages during the dry season; refer to Table 6-29 and Table 6-30). The percentages align with ammonia/TIN load values associated with recycled water.

Table 6-25. Recycled Water: Annual Average Total P Loads Diverted from the Bay (kg P/day)

Discharger	Subembayment	2019/2020 (b,c)	2020/2021 (b,c)	2021/2022 (b,c)	2022/2023 (b,c)	4-Year Average
American Canyon	San Pablo Bay	7	6	6	6	6
Benicia ^(f)	San Pablo Bay	--	--	--	--	--
Burlingame ^(f)	South Bay	--	--	--	--	--
Central San	Suisun Bay	5	8	7	6	7
CMSA	Central Bay	1	1	<1	<1	1
Port Costa ^(f)	San Pablo Bay	--	--	--	--	--
Delta Diablo ^(g)	Suisun Bay	2	2	1	2	2
EBDA	South Bay	42	49	53	46	47
EBMUD	Central Bay	13	14	4	1	8
FSSD	Suisun Bay	15	14	10	3	11
Las Gallinas ^(d)	San Pablo Bay	7	10	12	8	9
Paradise Cove ^(f)	Central Bay	--	--	--	--	--
Tiburon ^(f)	Central Bay	--	--	--	--	--
Millbrae ^(f)	South Bay	--	--	--	--	--
Mt. View ^(f)	Suisun Bay	--	--	--	--	--
Napa ^(d)	San Pablo Bay	32	27	18	20	24
Novato	San Pablo Bay	1	1	2	8	3
Palo Alto	Lower South Bay	11	12	14	11	12
Petaluma ^(d)	San Pablo Bay	7	5	12	12	9
Pinole ^(f)	San Pablo Bay	--	--	--	--	--
Rodeo ^(f)	San Pablo Bay	--	--	--	--	--
SFO Airport	South Bay	--	0	--	--	0
SFPUC Southeast ^(f)	South Bay	--	--	--	--	--
San Jose	Lower South Bay	29	22	17	14	21
San Mateo ^(f)	South Bay	--	--	--	--	--
SMCSD ^(f)	Central Bay	--	--	--	--	--
SASM	Central Bay	1	1	1	1	1
SVCW	South Bay	13	12	11	8	11
Sonoma Valley ^(d)	San Pablo Bay	23	33	31	22	27
South SF ^(f)	South Bay	--	--	--	--	--
Sunnyvale	Lower South Bay	15	18	8	--	14
Treasure Island ^(f)	Central Bay	--	--	--	--	--
Vallejo ^(f)	San Pablo Bay	--	--	--	--	--
West County	Central Bay	20	20	18	16	19
Total^(e)		250	250	220	190	230

a. Based on ADWF permitted capacity.

b. Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.

c. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.

d. No discharge during a portion or all the dry season months, except when necessary due to wet conditions.

e. The total values might vary from the sum of the listed values by plant due to rounding.

f. This discharger does not produce recycled water.

g. Assumes that a portion of load from industrial application is not diverted from the Bay.

Table 6-26. Recycled Water: Dry Season Total P Loads Diverted from the Bay (kg P/day)

Discharger	Subembayment	2019 ^(b)	2020 ^(b)	2021 ^(b)	2022 ^(b)	2023 ^(b)	5-Year Average
American Canyon	San Pablo Bay	6	11	11	9	10	9
Benicia ^(f)	San Pablo Bay	--	--	--	--	--	--
Burlingame ^(f)	South Bay	--	--	--	--	--	--
Central San	Suisun Bay	7	6	10	9	10	8
CMSA	Central Bay	<1	1	1	1	<1	1
Port Costa ^(f)	San Pablo Bay	--	--	--	--	--	--
Delta Diablo ^(g)	Suisun Bay	2	2	2	1	2	2
EBDA	South Bay	74	50	50	77	61	63
EBMUD	Central Bay	17	14	17	5	3	13
FSSD	Suisun Bay	23	30	27	18	6	21
Las Gallinas ^(d)	San Pablo Bay	9	12	21	20	12	15
Paradise Cove ^(f)	Central Bay	--	--	--	--	--	--
Tiburon ^(f)	Central Bay	--	--	--	--	--	--
Millbrae ^(f)	South Bay	--	--	--	--	--	--
Mt. View ^(f)	Suisun Bay	--	--	--	--	--	--
Napa ^(d)	San Pablo Bay	36	49	44	33	40	40
Novato	San Pablo Bay	1	1	2	2	13	4
Palo Alto	Lower South Bay	19	18	20	25	21	20
Petaluma ^(d)	San Pablo Bay	10	13	8	18	21	14
Pinole ^(f)	San Pablo Bay	--	--	--	--	--	--
Rodeo ^(f)	San Pablo Bay	--	--	--	--	--	--
SFO Airport	South Bay	--	--	0	--	--	0
SFPUC Southeast ^(f)	South Bay	--	--	--	--	--	--
San Jose	Lower South Bay	28	44	23	13	13	24
San Mateo ^(f)	South Bay	--	--	--	--	--	--
SMCSD ^(f)	Central Bay	--	--	--	--	--	--
SASM	Central Bay	1	1	1	1	1	1
SVCW	South Bay	19	15	21	18	16	18
Sonoma Valley ^(d)	San Pablo Bay	9	35	49	35	39	33
South SF ^(f)	South Bay	--	--	--	--	--	--
Sunnyvale	Lower South Bay	26	24	18	10	--	19
Treasure Island ^(f)	Central Bay	--	--	--	--	--	--
Vallejo ^(f)	San Pablo Bay	--	--	--	--	--	--
West County	Central Bay	19	20	19	17	17	19
Total ^(e)		310	350	340	310	290	320

- Based on ADWF permitted capacity.
- Data are presented in detail and summarized for each plant in the Appendix. A "--" indicates data were not available, whereas a "0" indicates a value of zero.
- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- No discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.
- This discharger does not produce recycled water.
- Assumes that a portion of load from industrial application is not diverted from the Bay.

Table 6-27. Recycled Water: Annual Average Total P Loads by Subembayment, Flow (kg P/d)

Subembayment	Treatment Plant Permitted Capacity	2019/2020 (a)	2020/2021 (a)	2021/2022 (a)	2022/2023 (a)	4-Year Average
Suisun Bay	100	18	16	11	5	13
San Pablo Bay ^(b)	62.8	78	83	81	77	79
Central Bay	167	35	34	23	18	28
South Bay	262	60	69	72	61	65
Lower South Bay	236	55	53	38	25	43
Total (c)	827	250	250	220	190	230

- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.

Table 6-28. Recycled Water: Dry Season Average Total P Loads by Subembayment, Flow (kg P/d)

Subembayment	Treatment Plant Permitted Capacity	2019 ^(a)	2020 ^(a)	2021 ^(a)	2022 ^(a)	2023 ^(a)	5-Year Average
Suisun Bay	100	32	39	39	28	18	31
San Pablo Bay ^(b)	62.8	72	120	130	120	140	120
Central Bay	167	38	36	38	21	21	31
South Bay	262	93	66	71	95	77	80
Lower South Bay	236	73	85	62	48	34	60
Total (c)	827	310	350	340	310	290	320

- Each reporting year represents the period between May 1 and September 30 of the indicated year.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The total values might vary from the sum of the listed values by plant due to rounding.

Table 6-29. Recycled Water: Percent of Annual Average Total P Loads Diverted from each Subembayment, Flow (%)

Subembayment	Treatment Plant Permitted Capacity	2019/2020 (a,c) %	2020/2021 (a,c) %	2021/2022 (a,c) %	2022/2023 (a,c) %	4-Year Average %
Suisun Bay	100	4%	4%	3%	1%	3%
San Pablo Bay ^(b)	62.8	22%	28%	23%	19%	23%
Central Bay	167	3%	3%	2%	2%	3%
South Bay	262	4%	5%	5%	5%	5%
Lower South Bay	236	7%	7%	5%	4%	6%
Total	827	6%	6%	6%	5%	6%

- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The percent diverted is based on the recycled water value divided by the sum of recycled water value and discharge value.

Table 6-30. Recycled Water: Percent of Dry Season Average Total P Loads Diverted from each Subembayment, Flow (%)

Subembayment	Treatment Plant Permitted Capacity	2019 ^(a,c) %	2020 ^(a,c) %	2021 ^(a,c) %	2022 ^(a,c) %	2023 ^(a,c) %	5-Year Average, %
Suisun Bay	100	7%	10%	10%	8%	5%	8%
San Pablo Bay ^(b)	62.8	28%	39%	42%	38%	41%	38%
Central Bay	167	3%	3%	3%	2%	2%	3%
South Bay	262	6%	4%	5%	7%	5%	6%
Lower South Bay	236	9%	11%	9%	8%	6%	9%
Total	827	7%	8%	9%	9%	7%	8%

- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- Several of the plants that discharge to San Pablo Bay have no discharge during a portion or all the dry season months, except when necessary due to wet conditions.
- The percent diverted is based on the recycled water value divided by the sum of recycled water value and discharge value.

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7 Discussion

A plot of the historical monthly average of daily discharge flow, ammonia, NOx, TIN, and TP loads are presented in Figure 7-1. The 2023/2024 values are comparable to the 2022/2023 values, with flows being slightly lower due to less precipitation. The 2023/2024 flow values were relatively high due to significant precipitation over the 2023/2024 wet season. The relatively low loads compared to the 12-year average is attributed to a variety of factors, including i) several treatment plants implementing nutrient load reduction strategies (e.g., Oro Loma/Castro Valley Sanitary District), ii) optimization of treatment plants for nutrient management (e.g., San Jose, EBMUD, etc.), iii) piloting, and iv) recycled water.

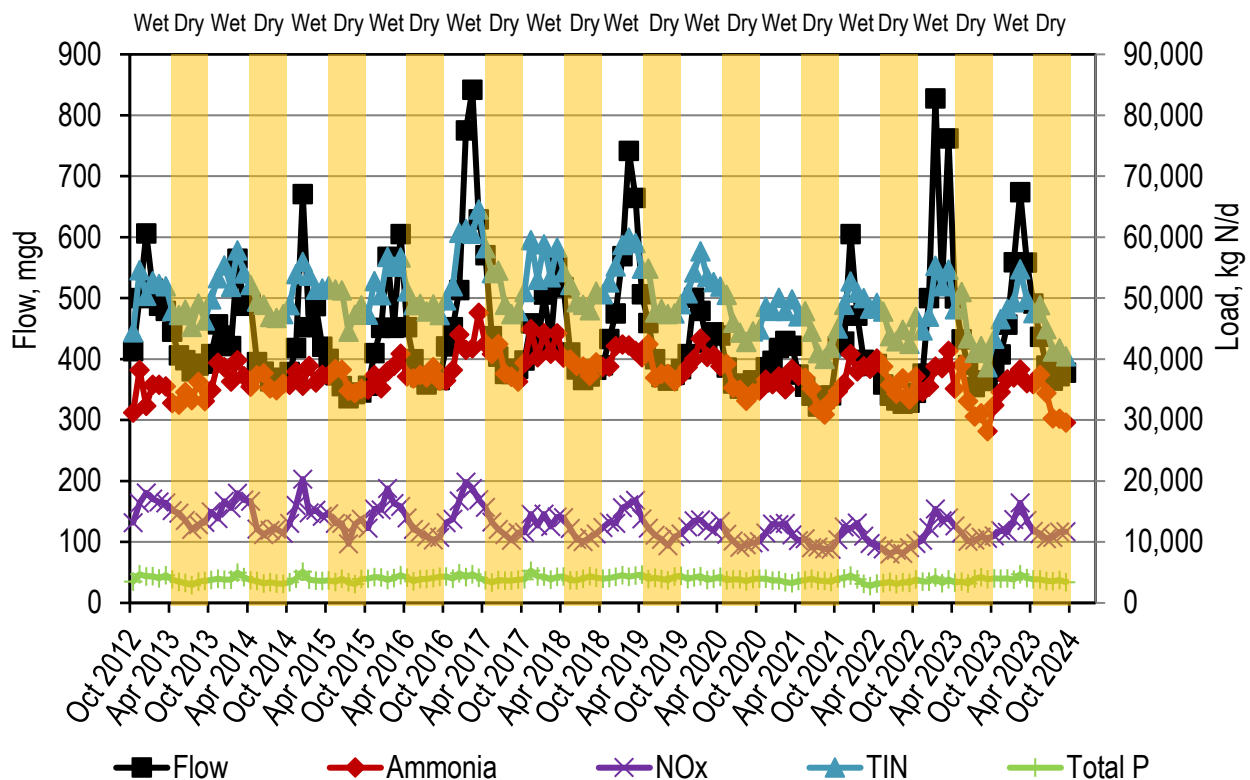


Figure 7-1. Historical Average Monthly Daily Discharge Flows and Loads

Historically, the ammonia, NOx, and TIN loads tend to track with the flows. For example, during peak wet weather events, both the flow and nitrogen loads typically increase. However, the limited dataset during wet weather events restricts confidence in the strength of this relationship. It is unknown whether the trend would be as evident with increased sampling frequency where the impacts from an initial scouring event in the collection system due to wet weather would be reduced and dilution increased (similar to the “first flush” in stormwater collection systems). Additional data would be needed to further understand the correlation between flow and loads during peak wet weather events.

The following subsections present observations of each parameter considered, including outliers, seasonality, and the role of the largest dischargers.

7.1 Annual Precipitation

A plot of the historical precipitation for the nutrient sampling period (October 2012 through September 2024) is provided in Figure 7-2. The precipitation this past year (Oct 1, 2023 through Sept 30, 2024) was lower than the previous year, but still the second highest of the last five years. As such, the dry season influent/discharge volumes remain elevated compared to the last five years. Note: the amount of rainfall seen across the Bay Area will vary and the data in Figure 7-2 are limited to a single precipitation monitoring location.

The impacts of relatively low precipitation are well-documented on wastewater treatment plants. The most notable impact is relatively low peak flows with respect to ADWF. While the influent data should capture such variability, the available dataset is limited so it is more prudent to review the discharge flow data. While several agencies do not discharge all of their influent, it remains a reasonable metric for comparing the impact of historical precipitation.

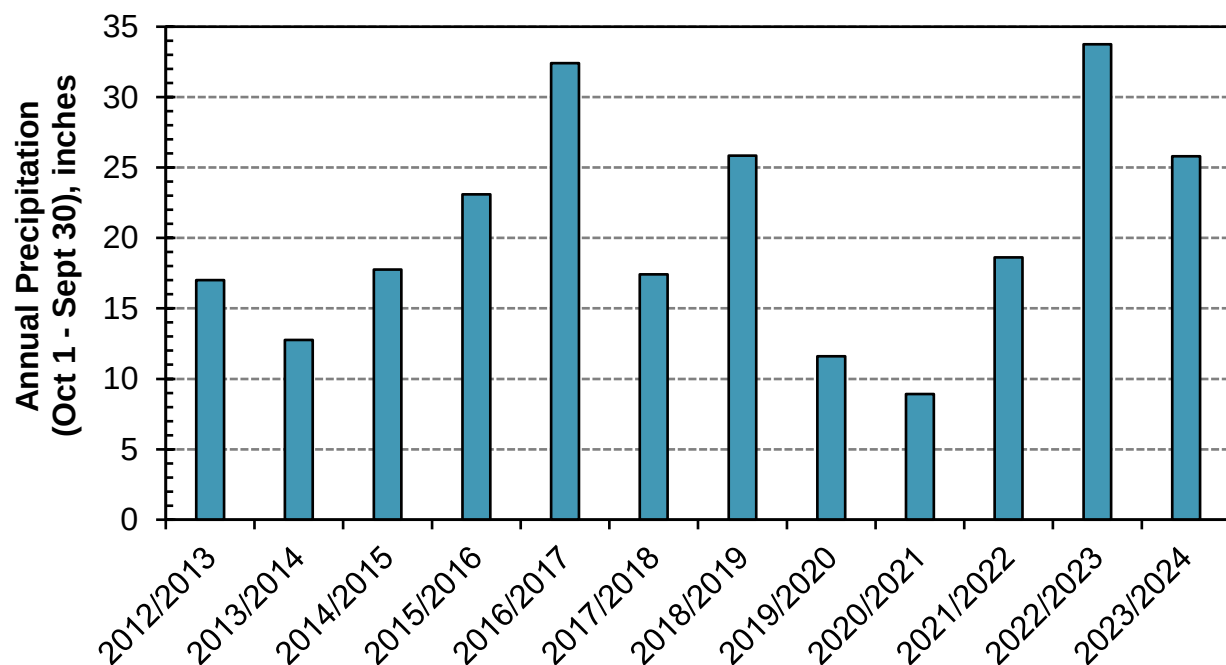


Figure 7-2. Historical Annual Precipitation in the Bay Area (Data from Golden Gate Weather Services)

7.2 Trending Statistics

The method of least squares trend analysis is intended to identify potential significant trends. Verifying the trends would require a more rigorous statistical approach than applied for this report. While effective as a first step for identifying potential significant trends, the method of least squares does not verify whether regression assumptions of normality and independence of errors have been satisfied. The recommended next steps if trend verification is required:

- 1) Evaluate whether the data need to be transformed (e.g., natural log) to provide context on whether data are conforming to the distributional assumptions of the modeling errors. A probability plot of errors will provide context on whether data are conforming to the errors.

- 2) Perform a more thorough statistical analysis to validate data and perform a more rigorous statistical analysis for a time series correlation.

Given that that data collected during the global pandemic (specifically during shelter-in-place) might include outliers, all identified trends will need to be carefully watched in the coming years to see how they evolve.

7.3 Agencies that have Implemented Nutrient Load Management Upgrades and/or Optimization

Multiple agencies have designed and implemented nutrient load management upgrades over the last several years as follows (listed alphabetically):

- ◆ **East Bay Municipal Utility District Water Pollution Control Plant:**
 - ▲ EBMUD stopped accepting trucked waste in recent years with relatively high nitrogenous compounds (e.g., animal blood waste)
 - ▲ The treatment plant began treating up to 50 percent of the dry season plant flow via split treatment with biological nitrification/denitrification in recent years. The vision is to further increase the percent of the dry season plant flow.
- ◆ **Oro Loma/Castro Valley Sanitary Districts Water Pollution Control Plant:**
 - ▲ Implemented an ammonia and TIN load reduction technology by modifying and expanding their existing activated sludge system in the Summer of 2020. The technology upgrade is known as the Modified Ludzack-Ettinger (MLE) system.
 - ▲ Implemented a sidestream full-scale demonstration using Microvi's MicroNiche Engineering™ (MNE) technology that reduces the ammonia load associated with their biosolids dewatering return stream in 2019 which is still operational.
- ◆ **Palo Alto Regional Water Quality Control Plant:** began construction in 2023 on a nearly \$200 Mil treatment plant upgrade. The upgrade includes replacement of various aged equipment and other capital improvements, including expansion of the activated sludge process to reduce TIN loads, construction of a new headworks facility, and relining of an aging joint intercepting sewer. While Palo Alto already reliably removes ammonia, these upgrades will reduce their TIN loads. The upgrades are anticipated to take approximately 5 years to implement.
- ◆ **Pinole-Hercules Water Pollution Control Plant:** implemented an ammonia and TIN load reduction technology by modifying and expanding their existing activated sludge system in Spring 2019 to an MLE system. This year's dataset suggests that this facility is not yet operating in nutrient removal mode. The plant is actively developing a plan to increase the solids residence time to foster ammonia/TIN load reduction.
- ◆ **San Jose-Santa Clara Regional Wastewater Facility:** began optimization in 2019 within the existing Biological Nutrient Removal (BNR) system which has been tested and subsequently improved upon from 2020 through 2022. For reference, the 2024 dry season loads were 500 kg N/d lower than the 12-Year average. Optimization of TIN load reduction has been achieved by the following:

- ▲ Reduction in DO set-points for the BNR aeration basins, implemented through reduced fine-bubble diffuser aeration. The reduced DO along with reconfiguring aeration basins with baffles to improve mixing under reduced aeration conditions has increased denitrification zones and fostered additional TIN reduction.
- ▲ Reduced aeration in the mixed liquor channels has also fostered additional TIN and TP load reductions.
- ▲ In addition, secondary blowers, meters, process controls, and clarifiers have been or are currently undergoing substantial rehabilitation or replacement as part of the Facility CIP, which has aided further reduction of nutrient loads by providing better process control.
- ◆ **San Mateo Wastewater Treatment Plant:** began construction in 2021 for a plant upgrade that will incorporate nutrient management technologies. Construction and commissioning are slated to be completed in 2025.
- ◆ **South San Francisco - San Bruno Water Quality Control Plant:** completed in 2022 the construction of an anaerobic selector within their activated sludge process. The anaerobic selector was added to improve solids settleability in their secondary clarifiers. The anaerobic selector also facilitates enhanced biological phosphorus removal as evidenced by a TP load reduction of greater than 85 percent since commissioning.
- ◆ **Sunnyvale – Water Pollution Control Plant:** the Sunnyvale Cleanwater Program is upgrading the City's Water Pollution Control Plant with various wastewater projects that includes an MLE upgrade, sidestream treatment, and others. These efforts will reduce ammonia and TIN loads, as well as increasing the water quality for reuse. The project is expected to be completed in year 2028.
- ◆ **Union Sanitary District:** began construction in 2022 for a BNR through the Enhanced Treatment and Site Upgrade (ETSU) program. Phase 1 of ETSU began construction in 2022; the anticipated completion date has been revised to 2031. Phase 1 of ETSU includes retrofits of existing aeration basins to operate with an anaerobic selector and BNR process, new clarifiers, and new chlorination and dechlorination facilities. The estimated capital cost has been revised total is \$542M. The estimated TIN reduction is 44-50%.
- ◆ **West County Wastewater Treatment Plant:** completed several plant expansion and upgrade projects in late 2017. The expansion and upgrades reduced nutrient load by enhancing the nitrification reliability and facilitated denitrification by a MLE process configuration.

This list is limited to agencies that are in construction and/or have optimized their nutrient load management strategies. There are several agencies that are in the process of designing nutrient load management upgrades (e.g., Central San is replacing their aeration system and repurposing tankage to foster step-feed treatment). and others that have already implemented nutrient removal (e.g., American Canyon). See Appendix B for additional details on planned nutrient removal efforts.

7.4 Influent Analysis

Overall, the inclusion of influent data has bolstered the evaluation and it offers a means to track load reduction across treatment plants. At this stage, the dataset has several limitations as follows:

- ◆ Limited to a minimum of 21 samples (quarterly sampling began in July 2019).

- ◆ The global pandemic impacts approximately one-third of the sampling quarters.
- ◆ Since dischargers sample during different months, developing historical load plots requires plotting quarterly averages (e.g., refer to Figure 4-2 for an example plot).
- ◆ There are a few instances during the first year of sampling where sampling for a particular nutrient did not occur (e.g., Palo Alto did not sample ammonia during the first quarter of sampling from July through September 2019). The extent of this issue has been minimized over time.
- ◆ Analytical measurement issues with the influent sampling matrix. Specifically, the effluent matrix is considerably cleaner compared to raw influent and as a result is less prone to analytical issues. There are a couple instances where ammonia values this past year were greater than TKN for the same sample. This is not possible as TKN is the sum of ammonia and organic nitrogen. Such analytical issues can skew the trending.

As such challenges are addressed and the dataset grows, the analysis will be more exhaustive, and it will provide valuable information to inform the nutrient management conversation.

Despite the data challenges, dry season trending analysis was performed. In all cases, no emerging Baywide trends were observed. Note, the trending analysis was performed over six successive dry seasons for flow, whereas the nutrient trending analysis excluded the 2019 dataset due to the missing nutrient samples. Furthermore, the dry season trending is limited to at least two samples per year, so it is limiting. As the dataset grows, this trending analysis will be more substantive.

7.5 Discharge Analysis

The discharge analysis includes subsections for each parameter monitored.

7.5.1 Flow

The total annual average discharge has ranged from 374 mgd to 515 mgd over the 12-year period (average of 439 mgd). The dry season discharge flows to the Bay declined from 2012/2013 to 2014/2015, increased in 2015/2016 and 2016/2017 due to the unusually high precipitation during these periods, stayed relatively steady until 2018/2019, declined to record low values until 2022/2021 due to the ongoing drought, increased during 2021/2022 and 2022/2023 and decreased during 2023/2024. The flows tend to correlate with the amount of precipitation.

The dry season discharge ranged from 337 mgd to 396 mgd for the 12-year period (average of 373 mgd). The total dry season discharge flows have steadily declined since peaking in 2017 until 2023. The 2023 dry season values reverted to 2018 levels due primarily to the large amount of precipitation the previous winter that resulted in relatively high groundwater levels through June. After June 2023, the Baywide average monthly flows were 361 mgd for the last three months of the dry season (compared to 381 mgd for the full 2023 dry season). For 2024, the dry season flows were even higher than observed during 2023 (388 mgd). This may be due to two consecutive years of high precipitation, although precipitation in 2024 was lower than in 2023.

The South Bay and Lower South Bay Subembayments received the highest flows, making up approximately 66 percent of the total flow discharged to the Bay. The largest discharger is San Jose, followed by EBDA, EBMUD, and SFPUC Southeast. San Pablo Bay has the largest portion of recycled water diversion during the dry season; several plants divert all flow and have zero dry

season discharge. For example, discharge flows to San Pablo Bay for the dry season are approximately 50 percent less than average annual discharge flows to San Pablo Bay.

The dry season flow trends suggest a downward trend for South Bay. The other Subembayments and Baywide suggest no significant trending for flow.

7.5.2 Total Ammonia

The total annual average ammonia discharge has ranged from approximately 34,300 kg N/d to 40,800 kg N/d over the 12-year period (average of 37,200 kg N/d). The dry season average ammonia discharge has ranged from approximately 32,400 kg N/d to 38,900 kg N/d over the eleven-year period (average of 35,800 kg N/d). The 2024 dry season ammonia load is tied with the 2023 load for the lowest since sampling began in 2012. The optimization efforts at EBMUD (Central Bay Discharger; refer to Section 7.3) are a significant contributor to the reductions observed in 2023 and 2024.

The Central Bay and South Bay Subembayments receive the highest ammonia load contributions across the Bay, making up 80 to 85 percent of the total ammonia discharged to the Bay. The largest overall ammonia discharge contributors are EBMUD (Central Bay Discharger) and SFPUC Southeast (South Bay) (each making up 20 to 25 percent of the total ammonia discharged to the Bay).

The dry season ammonia loads over the entire 12-year dry season dataset appear to be statistically trending upwards for San Pablo Bay. In contrast, the South Bay and Baywide statistical analyses suggests a downward trend.

There are several agencies that have brought online new systems (e.g., Pinole, Oro Loma/Castro Valley Sanitary District, etc.) and/or are in the design/construction phase (e.g., San Mateo, San Leandro, etc.) for ammonia and TIN load reduction. Furthermore, EBMUD (Central Bay Discharger) has been actively optimizing their facility during the dry season as previously noted. Such changes across the Bay should result in reductions in future ammonia and TIN loads, albeit with the potential to increase NO_x loads.

7.5.3 Nitrate + Nitrite (NO_x)

The total annual average NO_x discharge has ranged from approximately 10,100 kg N/d to 15,000 kg N/d over the 12-year period (average of 12,800 kg N/d). The total dry season average NO_x discharge has ranged from approximately 8,500 kg N/d to 13,400 kg N/d over the 12-year period (average of 11,000 kg N/d). Despite past annual reductions in NO_x loads, the 2023/2024 NO_x load increased compared to the 2022/2023 NO_x load (although the load is still below the 12-year average).

The Lower South Bay Subembayment receives the highest NO_x load contributions across the Bay, making up 50 to 65 percent of the total NO_x discharged to the Bay. The relatively large contribution compared to other Subembayments was anticipated as all three POTWs in the Lower South Bay are required to fully nitrify and remove ammonia. The ammonia load is converted to NO_x and subsequently removed for those plants that perform denitrification. The largest overall NO_x discharger is San Jose which makes up 30 to 35 percent of NO_x discharged to the Bay, followed by Palo Alto which contributes 15 to 20 percent of the NO_x discharged to the Bay.

The dry season NO_x loads over the entire 12-year dry season dataset appear to be statistically trending downwards for all the Subembayments (except for Central Bay), as well as Baywide.

There are several agencies that have brought online new systems (e.g., Pinole, Oro Loma/Castro Valley Sanitary District, etc.) and/or are in the design/construction phase (e.g., San Mateo, San Leandro, etc.) for ammonia and TIN load reduction. Furthermore, EBMUD (Central Bay Discharger) has been actively optimizing their facility during the dry season as previously noted. Such changes across the Bay should result in reductions in future ammonia and TIN loads, albeit with the potential to increase in NO_x loads.

7.5.4 Total Inorganic Nitrogen (TIN)

The total annual average TIN discharge ranged from 46,000 kg N/d to 55,000 kg N/d for the 12-year period (average of 50,100 kg N/d). The total dry season average TIN discharge ranged from 43,100 kg N/d to 50,600 kg N/d for the 12-year period (average of 46,900 kg N/d). The 2023 dry season ammonia loads were the second lowest since sampling began in 2012 (lowest was the 2021 dry season). A significant contribution to the 2023 reduction was the optimization effort at EBMUD (Central Bay Discharger; refer to Section 7.3).

The Central Bay and South Bay Subembayments receive the highest TIN loads, making up 65 to 75 of the TIN loads discharged to the Bay. Similar to ammonia, the largest overall TIN discharge contributors are EBMUD (Central Bay Discharger) and SFPUC Southeast (South Bay) (each making up 15 to 20 percent of the total ammonia discharged to the Bay, respectively).

There are instances where the TIN values do not necessarily reflect the sum of ammonia and NO_x (as discussed in Section 3.2). Such instances occur when agencies sample for only one of the nitrogen species that are used to calculate TIN (ammonia and NO_x). In most cases, the agencies sample more frequently for ammonia. The average monthly ammonia loads are based on the average for each sampling event during that particular month. In contrast, TIN loads are only calculated for sampling days when both ammonia and NO_x are sampled. Such a discrepancy in sampling frequency can result in average monthly values where TIN does not equal ammonia plus NO_x.

The seasonal difference in TIN discharges from the wet to the dry season (based on the percent difference) are most pronounced in San Pablo Bay and the Lower South Bay. San Pablo Bay has the most significant seasonal load reduction, as evidenced by an approximately 25 to 35 percent reduction from the wet to the dry season. Similar to ammonia, this is attributed to a combination of more effective nitrification/denitrification during the dry season and seasonal use of recycled water, which diverts loads for the Bay. A large proportion of POTWs that discharge to San Pablo Bay do not discharge during the dry season (e.g., Petaluma).

The dry season TIN loads over the entire 12-year dataset appear to be statistically decreasing for the South Bay, Lower South Bay, and Baywide. Central Bay, Suisun Bay, and San Pablo Bay showed no significant trending over the entire dry season 12-year dataset.

There are several agencies that have brought online new systems (e.g., Pinole, Oro Loma/Castro Valley Sanitary District, etc.) and/or are in the design/construction phase (e.g., San Mateo, San Leandro, etc.) for ammonia and TIN load reduction. Furthermore, EBMUD (Central Bay Discharger) has been actively optimizing their facility during the dry season as previously noted. Such changes across the Bay should result in reductions in future ammonia and TIN loads, albeit with the potential to increase in NO_x loads.

7.5.5 Total Phosphorus (TP)

The total annual average TP discharge ranged from approximately 3,500 kg P/d to 4,210 kg P/d for the 12-year period (average of 3,890 kg P/d). The total dry season average TP discharge ranged from approximately 3,300 kg P/d to 4,010 kg P/d over the 12-year period (average of 3,670 kg P/d).

As previously stated in Section 5.5, TP loads appear to be more random from year to year compared to nitrogen loads. This variability is attributed to TP removal mechanisms. For example, at facilities that occasionally use chemicals for odor control (e.g., ferric chloride in the collection system), the chemical addition binds a portion of TP and subsequently reduces loads when chemicals are applied. Furthermore, facilities with anaerobic selectors in their activated sludge process to improve solids settleability also reduces TP loads. This biological feature can be “finicky” at plants and lead to variable TP load reduction.

The Central Bay and South Bay Subembayments receive the highest TP load contributions across the Bay, making up 55 to 65 percent of the TP discharged to the Bay. The largest overall TP discharger is EBMUD (Central Bay Discharger) which makes up 15 to 25 percent of the TP discharged to the Bay, followed by EBDA which makes up 10 to 15 percent of the TP discharged to the Bay.

The dry season trending analysis is variable across Subembayments and Baywide. The trending analysis suggests that Suisun Bay, San Pablo Bay, South Bay and Baywide have no trending over the entire 12-years of dry season data. The Lower South Bay data suggests downward trending over the entire 12-years of dry season data. In contrast, Central Bay suggests an upwards trending over the entire 12-years of dry season data. The upward trending in the Central Bay is likely attributed to EBMUD using the anaerobic selector for TIN load reduction over TP load reduction.

During the first half of the 2022 calendar year, South San Francisco completed construction of an anaerobic selector within their activated sludge process. Since commissioning the anaerobic selector, South San Francisco has enhanced their TP load reduction as evidenced by removal rates of 85 percent or higher.

7.6 Recycled Water Analysis

The inclusion of recycled water flows and nutrient loads diverted from the Bay has been included in this Group Annual Report since the 2021 submittal (submitted February 1, 2022). The first year that recycled water was included was based on a request for information. For all subsequent Group Annual Reports, the recycled water analysis is based on recycled water volume data provided by the State Water Board.⁴

The distribution of recycled water volumes/flows by Subembayments are as follows (based on 5-year average annual values): Lower South Bay > South Bay > San Pablo Bay > Suisun Bay > Central Bay. Note: the order can adjust from year to year. The annual average percent flow and loads diverted from the Bay due to recycled water ranges from 4 to 12 percent (regardless of parameter: flow or nutrient load). Of the parameters, flow has the highest percentage diverted from the Bay due to reuse, followed by NOx loads. The percent of flow and loads diverted from the Bay from reuse increases during the dry season as evidenced by values that range from 6 to 18 percent (regardless of parameter: flow or nutrient load).

8 Compliance Schedule Milestones and Progress Reporting

A summary of the compliance schedule milestones progress report as required by Section 6.3.3 of the 2024 watershed permit is provided in Appendix B.

9 Summary

The 2024 Group Annual Report includes data from October 2012 through September 2024. Influent flows and loads are required as part of the 2024 Permit for plants with a permitted ADWF capacity of greater than 10 mgd. The influent dataset is limited because influent monitoring was not required until the 2019 Permit (R2-2019-0017) came into effect in July 2019. Sampling challenges are a blend of confidence in the results, as well as obtaining all the quarterly sampling data. Additionally, this is the fourth Group Annual Report that includes recycled water data. The recycled water component is included to assist with informing nutrient management across the Bay.

It is important to recognize that a portion of the 2019/2020 and all of the 2020/2021 dataset includes data influenced by the global pandemic (COVID-19) that started in March 2020. Given that, any emerging trends need to be carefully considered in the coming years to evaluate whether the 2019/2020 and 2020/2021 datasets were outliers. As a result, the future of influent/discharge flows and loads is unclear and the trends that have been tracked for the past several years may be impacted.

9.1 Influent

Table 9-1 and Table 9-2 present overall summaries of the annual average and dry season influent flows and nutrient loads, respectively, between July 2019 and September 2024. Similarly, Table 9-3 and Table 9-4 present summaries of the corresponding dry season and annual average constituent concentrations, respectively, for the same period. The concentrations were calculated by dividing the loads by the flows for the appropriate averaging period.

As previously noted, the influent data are limited both in timeframe for the initial dataset (July 2019 through September 2024), sampling frequency (required quarterly), and limited applicability (the sample set only includes POTWs that have a permitted ADWF capacity of greater than 10 mgd). During the initial year of sampling, several dischargers had missing data. Since this initial year, all the dischargers have addressed sampling requirements (except for Napa which is not required to collect influent samples when not discharging during the dry season).

Given that the influent dry season dataset is limited to a partial dry season (July 2019 through September 2019) and five complete dry seasons (2020 through 2024), the trending analysis is somewhat limited (refer to Section 7.4). Despite this limitation, trends were analyzed for the quarterly dry season data. The trending analysis resulted in having no emerging dry season trends.

As previously noted, this past year had relatively high levels of precipitation, although not as high as the previous year's. The two consecutive wet years may have contributed to the highest dry season influent flows observed since 2019, when influent data were first collected and analyzed.

Subsequently, the dry season nitrogen species discharge concentrations are below average (except for NO_x levels). It is unclear why the NO_x concentrations are higher than past years despite the elevated flows.

Table 9-1. Influent: Summary of Average Annual Flow and Loads *

Constituent	2018 / 2019 (a,b) *	2019 / 2020 (a,b)	2020 / 2021 (a,b)	2021 / 2022 (a,b)	2022 / 2023 (a,b)	2023 / 2024 (a,b)	5-Year Average (a,b)
Flow, mgd	*	427	398	415	487	470	432
Ammonia, kg N/d	*	61,000	58,200	55,700	56,000	59,500	57,700
NOx, kg N/d	*	1,990	943	1,270	1,920	1,810	1,530
TIN, kg N/d (c)	*	63,100	59,500	57,400	57,900	62,400	59,500
TKN, kg N/d	*	96,600	87,400	87,300	87,700	90,500	89,700
TN, kg N/d	*	98,700	88,400	88,500	89,600	92,200	91,300
TP, kg P/d	*	11,800	10,800	11,100	11,200	11,000	11,200

* Values for 2018/2019 are not shown as they are limited to July 2019 through September 2019.

- Limited to POTWs with a permitted capacity greater than 10 mgd.
- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- The TIN values do not necessarily equal ammonia plus NOx due to instances when ammonia was sampled more frequently than NOx.

Table 9-2. Influent: Summary of Dry Season Flow and Loads *

Constituent	2019 (a,b) *	2020 (a,b)	2021 (a,b)	2022 (a,b)	2023 (a,b)	2024 (a,b)	6-Year Average (a,b)	Trend (d)
Flow, mgd	419	402	374	372	411	422	400	None
Ammonia, kg N/d	58,200	55,800	56,400	54,500	53,900	55,800	55,800	None
NOx, kg N/d	2,830	1,760	989	950	1,250	1,850	1,610	None
TIN, kg N/d (c)	50,100	57,600	57,100	54,800	54,900	57,500	55,300	None
TKN, kg N/d	72,700	91,900	83,900	84,600	79,900	83,700	82,800	None
TN, kg N/d	73,900	93,600	85,000	84,000	81,100	85,300	83,800	None
TP, kg P/d	9,210	10,900	9,910	11,100	9,720	10,100	10,100	None

* 2019 dataset limited to July through September compared against May through September for 2019/2020.

- Limited to POTWs with a permitted capacity greater than 10 mgd.
- The dry season represents May 1 through September 30 for each calendar year.
- The TIN values do not necessarily equal ammonia plus NOx due to instances when ammonia was sampled more frequently than NOx.
- Trend analysis based on the approach discussed in Section 3.8. Note: the trending analysis is limited to dry season data for 2020 through 2024 as several data was missing for the 2019 dry season.

Table 9-3. Influent: Summary of Average Annual Flow and Concentrations *

Constituent	2018 / 2019 (a,b) *	2019 / 2020 (a,b,c)	2020 / 2021 (a,b,c)	2021 / 2022 (a,b,c)	2022 / 2023 (a,b,c)	2023 / 2024 (a,b,c)	5-Year Average (a,b,c)
Flow, mgd	*	427	398	415	487	470	439
Ammonia, mg N/L	*	37.7	38.7	35.5	30.4	33.4	34.9
NOx, mg N/L	*	1.23	0.627	0.812	1.04	1.01	0.954
TIN, mg N/L ^(d)	*	39.0	39.5	36.5	31.4	35.0	36.1
TKN, mg N/L	*	59.7	58.1	55.6	47.5	50.9	54.0
TN, mg N/L	*	61.0	58.8	56.4	48.6	51.8	55.0
TP, mg P/L	*	7.28	7.21	7.09	6.08	6.18	6.73

* Values for 2018/2019 are not shown as they are limited to July 2019 through September 2019.

- Limited to POTWs with a permitted capacity greater than 10 mgd.
- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- The concentrations calculation is based on a flow-weighted average (limited to agencies that provided load data for the averaging period).
- The TIN values do not necessarily equal ammonia plus NOx due to instances when ammonia was sampled more frequently than NOx.

Table 9-4. Influent: Summary of Dry Season Flow and Concentrations *

Constituent	2019 (a,b,c) **	2020 (a,b,c)	2021 (a,b,c)	2022 (a,b,c)	2023 (a,b,c)	2024 (a,b,c)	6-Year Average (a,b,c)
Flow, mgd	419	402	374	372	411	422	400
Ammonia, mg N/L	36.7	36.7	39.8	38.7	34.6	35.0	36.8
NOx, mg N/L	1.79	1.16	0.698	0.675	0.805	1.16	1.06
TIN, mg N/L ^(d)	31.6	37.9	40.3	39.0	35.2	36.0	36.6
TKN, mg N/L	45.9	60.4	59.2	60.1	51.3	52.5	54.7
TN, mg N/L	46.6	61.5	60.0	59.7	52.1	53.5	55.4
TP, mg P/L	5.81	7.16	6.99	7.88	6.24	6.30	6.70

* Dry season trending not applied to concentrations as the emphasis is on load. Focusing on concentration is limiting as it does not consider the impact of flow.

** 2019 dataset limited to July through September compared against May through September for 2019/2020

- Limited to POTWs with a permitted capacity greater than 10 mgd.
- The dry season represents May 1 through September 30 for each calendar year.
- The concentrations calculation is based on a flow-weighted average (limited to agencies that provided load data for the averaging period).
- The TIN values do not necessarily equal ammonia plus NOx due to instances when ammonia was sampled more frequently than NOx.

9.2 Discharge

Table 9-5 and Table 9-6 present overall summaries of the annual average and dry season flows and nutrient loads discharged to San Francisco Bay, respectively, between October 2012 and September 2024. Similarly, Table 9-7 and Table 9-8 present summaries of the corresponding dry season and annual average constituent concentrations, respectively, for the same period. The concentrations were calculated by dividing the loads by the flows for the appropriate averaging period.

The largest dischargers dominate the nutrient loading. Generally, three to four large dischargers contribute more than 70 percent of the nutrient loads. The ammonia and NO_x loading of are impacted by plants that nitrify. Those plants that nitrify have the lowest ammonia discharge concentrations (e.g., all the plants that discharge to the Lower South Bay) and conversely the highest NO_x concentrations (e.g., Palo Alto).

Seasonal variations are pronounced, albeit not as pronounced during relatively dry years. In general, dry season loads are lower than wet season loads. This is attributed to two factors: 1) the higher flows experienced during wet weather events impact the wet season flows, as well as the loads during such events due to scouring in the collection system and 2) during the dry season, water reuse diverts nutrient loads away from the Bay. In some instances, agencies have achieved zero discharge during the summer months (e.g., Petaluma). The recycled water sections capture the extent of such nutrient load diversions from the Bay (refer to Section 9.3).

As for overall trends, the flows and loads reached their highest levels for both dry season average and annual average during the 2016/2017 dataset. The 2016/2017 dataset represents one of the wettest years on record for Northern California (refer to Section 7.1). As such, it represents the highest annual average flow for the period, which also led to higher groundwater levels and in turn higher flows during the dry season. Since 2016/2017, the datasets remained stable or declined each year through 2020/2021. The 2021/2022 dataset showed the first increase compared to the previous year flow. With the exception of flow, the 2022/2023 dataset reverted to loads in line with the 2020/2021 dataset while the 2023/2024 dataset remained similar to 2022/2023, with some parameters increasing and others decreasing.

Table 9-5. Discharge: Summary of Average Annual Flow and Loads to the Bay

Constituent	2012 / 2013 ^(a)	2013 / 2014 ^(a)	2014 / 2015 ^(a)	2015 / 2016 ^(a)	2016 / 2017 ^(a)	2017 / 2018 ^(a)	2018 / 2019 ^(a)	2019 / 2020 ^(a)	2020 / 2021 ^(a)	2021 / 2022 ^(a)	2022 / 2023 ^(a)	2023 / 2024 ^(a)	12-Year Average
Flow, mgd	451	428	415	430	515	433	480	408	374	399	479	456	439
Ammonia, kg N/d	34,300	37,000	36,700	37,500	40,600	40,800	39,800	38,000	35,300	37,200	35,300	34,400	37,200
NOx, kg N/d	14,900	14,300	14,200	13,600	14,500	12,400	12,900	11,600	10,700	10,100	11,800	12,200	12,800
TIN, kg N/d ^(b)	49,300	51,300	50,900	51,100	55,000	53,200	53,100	49,900	46,000	47,300	47,100	46,500	50,100
TP, kg P/d	3,860	3,750	3,770	4,070	4,020	4,190	4,210	4,010	3,670	3,500	3,700	3,900	3,890

- a. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2012/2013 represents the period between October 1, 2012 and September 30, 2013.
- b. The TIN values do not necessarily equal ammonia plus NOx due to a combination of rounding and instances when ammonia was sampled more frequently than NOx.

Table 9-6. Discharge: Summary of Dry Season Flow and Loads to the Bay

Constituent	2013 ^(a)	2014 ^(a)	2015 ^(a)	2016 ^(a)	2017 ^(a)	2018 ^(a)	2019 ^(a)	2020 ^(a)	2021 ^(a)	2022 ^(a)	2023 ^(a)	2024 ^(a)	Trend ^(b, c)	12-Year Average
Flow, mgd	393	374	351	372	396	383	394	363	339	337	381	388	None	373
Ammonia, kg N/d	34,000	36,300	36,200	37,300	38,900	38,900	38,200	35,400	33,600	35,800	32,400	32,400	Down (-0.8%/yr)	35,800
NOx, kg N/d	13,300	11,800	12,500	11,100	11,700	11,000	10,800	10,000	9,290	8,540	10,700	11,200	Down (-2.4%/yr)	11,000
TIN, kg N/d ^(d)	47,300	48,100	48,700	48,400	50,600	50,000	49,200	45,700	43,100	44,400	43,300	43,700	Down (-1.2%/yr)	46,900
TP, kg P/d	3,400	3,320	3,570	3,960	3,660	4,000	4,010	3,790	3,680	3,300	3,760	3,650	None	3,670

- a. The dry season represents May 1 through September 30 for each calendar year.
- b. Trend analysis is based on average monthly values. Discernible trends were identified based on the slope of a regression line determined using the method of least squares to fit the data (alpha = 0.05). Sample size is 60. Where "None" is stated, the limited dataset does not indicate a statistically relevant trend.
- c. The percent change represents the change per year as a percentage of the average value over the entire dataset (2012-2024) (not considered if trend is "None").
- d. The TIN values do not necessarily equal ammonia plus NOx due to a combination of rounding and instances when ammonia was sampled more frequently than NOx.

Table 9-7. Discharge: Summary of Average Annual Flow and Concentrations to the Bay

Constituent	2012 / 2013 ^(a)	2013 / 2014 ^(a)	2014 / 2015 ^(a)	2015 / 2016 ^(a)	2016 / 2017 ^(a)	2017 / 2018 ^(a)	2018 / 2019 ^(a)	2019 / 2020 ^(a)	2020 / 2021 ^(a)	2021 / 2022 ^(a)	2022 / 2023 ^(a)	2023 / 2024 ^(a)	12-Year Average
Flow, mgd	451	428	415	430	515	433	480	408	374	399	479	456	439
Ammonia, mg N/L	20.1	22.8	23.4	23.0	20.8	24.9	21.9	24.6	24.9	24.6	19.5	19.9	22.8
NOx, mg N/L	8.77	8.84	9.05	8.37	7.41	7.57	7.12	7.48	7.56	6.67	6.50	7.06	7.83
TIN, mg N/L ^(b)	28.8	31.6	32.4	31.4	28.2	32.5	29.3	32.3	32.5	31.3	26.0	27.0	30.6
TP, mg P/L	2.26	2.31	2.40	2.50	2.06	2.56	2.32	2.59	2.60	2.32	2.04	2.26	2.36

- a. Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2012/13 represents the period between October 1, 2012 and September 30, 2013.
- b. The TIN values do not necessarily equal ammonia plus NOx due to instances when ammonia was sampled more frequently than NOx.

Table 9-8. Discharge: Summary of Dry Season Flow and Concentrations to the Bay*

Constituent	2013 ^(a)	2014 ^(a)	2015 ^(a)	2016 ^(a)	2017 ^(a)	2018 ^(a)	2019 ^(a)	2020 ^(a)	2021 ^(a)	2022 ^(a)	2023 ^(a)	2024 ^(a)	Trend ^(b, c)	12-Year Average
Flow, mgd	393	374	351	372	396	383	393	363	339	337	381	388	None	373
Ammonia, mg N/L	22.8	25.6	27.3	26.5	26.0	26.8	25.6	25.8	26.2	28.1	22.5	22.0	None	25.7
NOx, mg N/L	8.98	8.36	9.41	7.89	7.81	7.56	7.26	7.28	7.25	6.69	7.40	7.65	Down (-2.0%/yr)	7.81
TIN, mg N/L ^(b)	31.8	34.0	36.7	34.4	33.8	34.4	33.0	33.2	33.6	34.8	30.0	29.7	Down (-0.7%/yr)	33.6
TP, mg P/L	2.28	2.34	2.69	2.81	2.44	2.76	2.69	2.76	2.87	2.58	2.60	2.49	Up (0.8%/yr)	2.62

** Dry season trending not applied to concentrations as the emphasis is on load. Focusing on concentration is limiting as it does not consider the impact of flow.

- a. The dry season represents May 1 through September 30 for each calendar year.
- b. The TIN values do not necessarily equal ammonia plus NOx due to instances when ammonia was sampled more frequently than NOx.

9.3 Recycled Water

As previously stated in Section 7.6, this and future Group Annual Reports will rely on the readily available recycled water volumes from the State Water Board.⁴ This report couples those recycled water volumes with effluent nutrient concentrations from this effort to quantify the corresponding recycled water nutrient loads.

The distribution of recycled water volumes/flows by Subembayments are as follows (based on 4-year average annual values): Lower South Bay > South Bay > San Pablo Bay > Suisun Bay > Central Bay. Note: the order can adjust from year to year. Table 9-9 and Table 9-10 present overall summaries of the annual average and dry season recycled water flows and nutrient loads diverted from San Francisco Bay, respectively, between October 2019 and September 2023. For all parameters, the daily average flow and/or loads increase from average annual to dry season conditions. This was anticipated due to the seasonal nature of recycled water, whereby reuse demands are typically highest during the dry season.

To better understand the contribution that recycled water has on nutrient management, Table 9-11 and Table 9-12 provide the percent flow and loads diverted from San Francisco Bay due to recycled water. The annual average percent flow and loads diverted from the Bay due to recycled water ranges from 4 to 12 percent (regardless of parameter: flow or nutrient load). Of the average annual parameters, flow has the highest percentage diverted from the Bay from reuse, followed by NO_x loads. The percent flow and loads diverted from the Bay increases from average annual to dry season as recycled water demands increase seasonally. Similar to average annual, the dry season flow has the highest percentage diverted from the Bay due to reuse, followed by dry season NO_x loads.

Table 9-9. Recycled Water: Annual Average Flow and Loads Diverted from the Bay

Parameter	2019/2020 ^(a)	2020/2021 ^(a)	2021/2022 ^(a)	2022/2023 ^(a)	4-Year Average
Flow, mgd	42	47	44	37	42
Ammonia, kg N/d	1,600	1,800	2,300	1,400	1,800
NOx, kg N/d	1,500	1,400	1,300	1,100	1,300
TIN, kg N/d ^(b)	3,100	3,200	3,600	2,400	3,100
Total P, kg P/d	250	250	220	190	230

- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- The TIN values do not necessarily equal ammonia plus NOx due to a combination of rounding and instances when ammonia was sampled more frequently than NOx.

Table 9-10. Recycled Water: Dry Season Average Flow and Loads Diverted from the Bay

Parameter	2019 ^(a)	2020 ^(a)	2021 ^(a)	2022 ^(a)	2023 ^(a)	5-Year Average
Flow, mgd	55	60	64	61	54	59
Ammonia, kg N/d	3,000	1,900	2,300	3,500	1,900	2,500
NOx, kg N/d	1,700	2,100	2,000	1,800	1,600	1,800
TIN, kg N/d ^(b)	4,700	4,000	4,300	5,300	3,500	4,300
Total P, kg P/d	310	350	340	310	290	320

- The dry season represents May 1 through September 30 for each calendar year.
- The TIN values do not necessarily equal ammonia plus NOx due to a combination of rounding and instances when ammonia was sampled more frequently than NOx.

Table 9-11. Recycled Water: Percent of Annual Average Flow and Loads Diverted from the Bay (%)

Parameter	2019/2020 ^(a,c) %	2020/2021 ^(a,c) %	2021/2022 ^(a,c) %	2022/2023 ^(a,c) %	4-Year Average %
Flow	9%	11%	10%	7%	9%
Ammonia	4%	5%	6%	4%	5%
NOx	11%	12%	11%	8%	11%
TIN ^(b)	6%	7%	7%	5%	6%
Total P	6%	7%	6%	5%	6%

- Each reporting year represents the period between October 1 of the first year and September 30 of the second year. For example, 2019/2020 represents the period between October 1, 2019 and September 30, 2020.
- The TIN values do not necessarily equal ammonia plus NOx due to a combination of rounding and instances when ammonia was sampled more frequently than NOx.
- The percent diverted from the Bay due to recycled water is based on the recycled water value divided by the sum of recycled water value and discharge value.

Table 9-12. Recycled Water: Percent of Dry Season Average Flow and Loads Diverted from the Bay (%)

Parameter	2019 ^(a,c) %	2020 ^(a,c) %	2021 ^(ac) %	2022 ^(ac) %	2023 ^(ac) %	5-Year Average %
Flow	13%	15%	16%	14%	12%	14%
Ammonia	7%	5%	7%	9%	6%	7%
NOx	14%	17%	18%	18%	13%	16%
TIN ^(b)	9%	8%	9%	11%	8%	9%
Total P	7%	9%	9%	9%	7%	8%

- The dry season represents May 1 through September 30 for each calendar year.
- The TIN values do not necessarily equal ammonia plus NOx due to a combination of rounding and instances when ammonia was sampled more frequently than NOx.
- The percent diverted from the Bay due to recycled water is based on the recycled water value divided by the sum of recycled water value and discharge value.

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Appendix A. Evaluation for Individual Dischargers

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1 City of American Canyon

American Canyon discharges to San Pablo Bay and serves approximately 5,562 connections. The plant is rated for an ADWF capacity of 2.5 mgd and a peak permitted wet weather flow of 5.0 mgd. This past year's dry season had a flow of approximately 1.0 mgd. The plant is a nitrifying and denitrifying MBR plant.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Discharge:

- ▲ There are 8 missing monthly average nutrient load samples per nutrient up to June 2014, after which no monthly sampling requirements have been missed.
- ▲ The average annual and monthly dry season flow values declined since 2022/2023 as the wet season had relatively lower precipitation levels.
- ▲ NO_x is the majority of the nitrogen species discharged, regardless of season. This is expected since this plant fully nitrifies and converts ammonia to NO_x.
- ▲ Total phosphorus concentrations are wide ranging (less than 1 mg P/L to 11 mg P/L).
- ▲ Based on Table 1-1 statistics for the entire dry season dataset, the flow, nitrate plus nitrite, and TIN loads are trending downwards. The ammonia and Total P loads do not appear to have any emerging trends.

◆ Recycled Water:

- ▲ Based on Table 1-2, the plant averaged 0.41 mgd of recycled water over the 2023 calendar year. Recycled water uses included landscape irrigation, industrial application, agricultural irrigation, and other non-potable uses within the plant (e.g., plumbing).
- ▲ Based on Table 1-3 through Table 1-5, the plant diverted <1 kg ammonia-N/d, 8 kg TIN/d, and 6 kg P/d away from the San Francisco Bay in 2023.

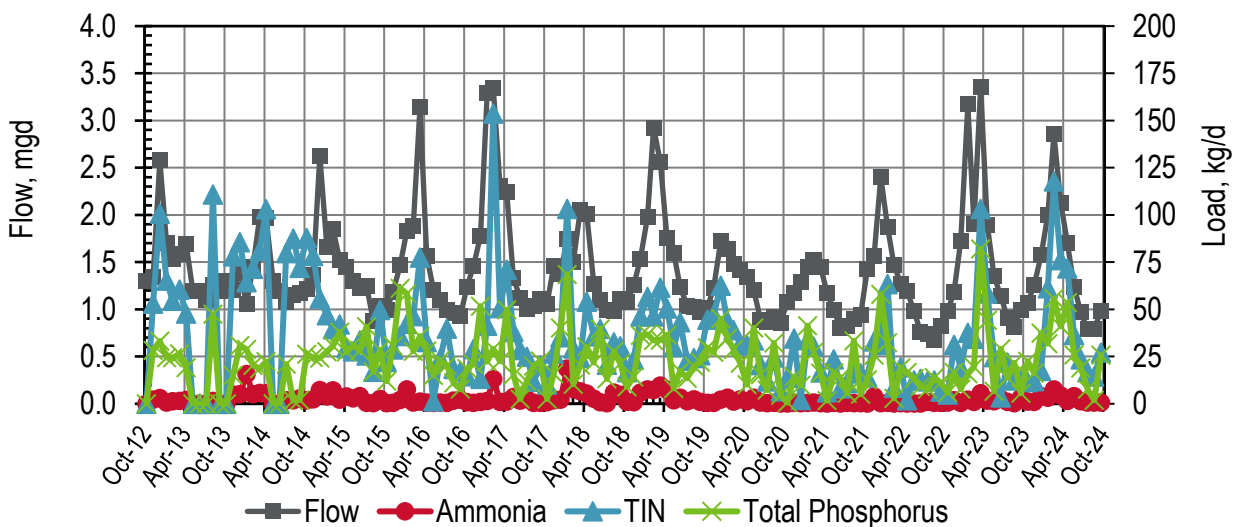


Figure 1-1. Discharge: American Canyon Monthly Flows and Loads

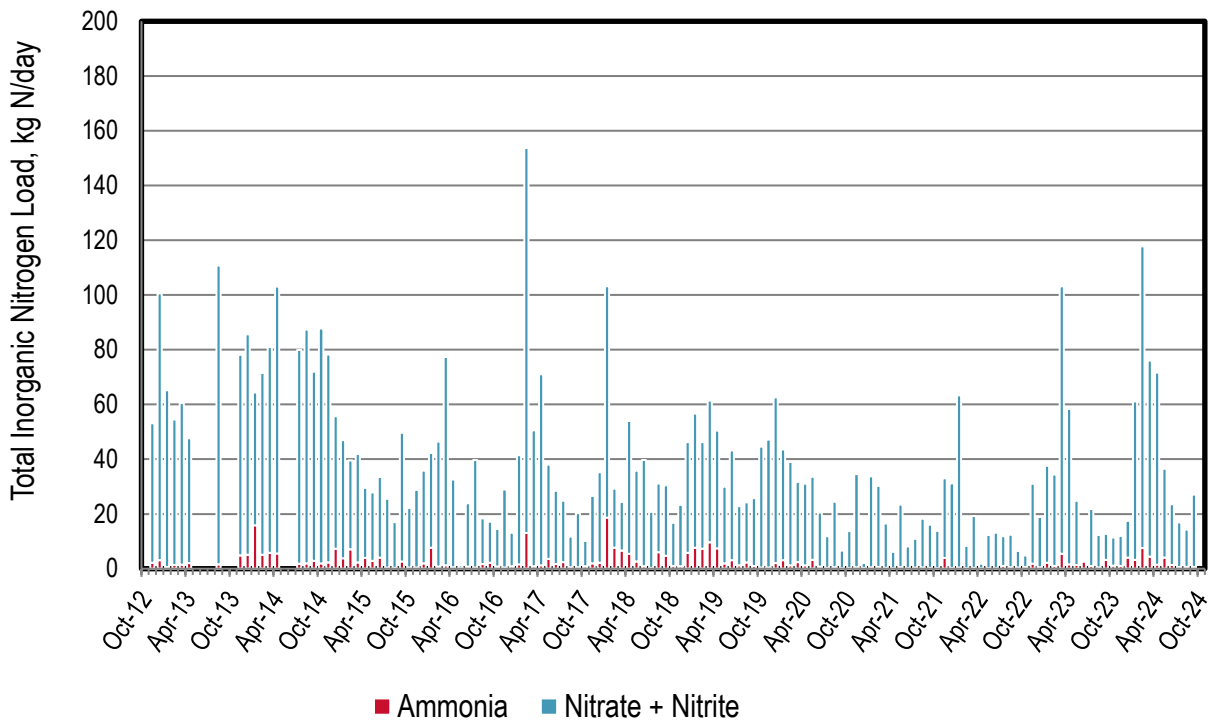


Figure 1-2. Discharge: American Canyon Monthly Nitrogen Loads

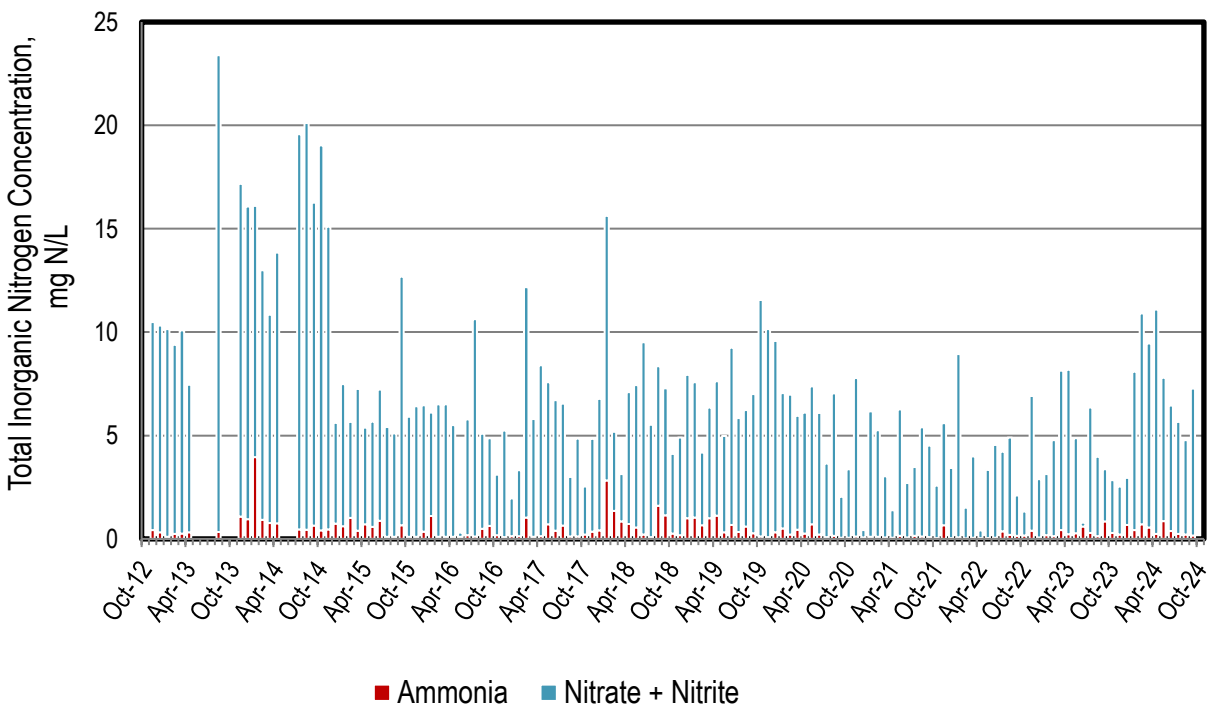


Figure 1-3. Discharge: American Canyon Monthly Nitrogen Concentrations

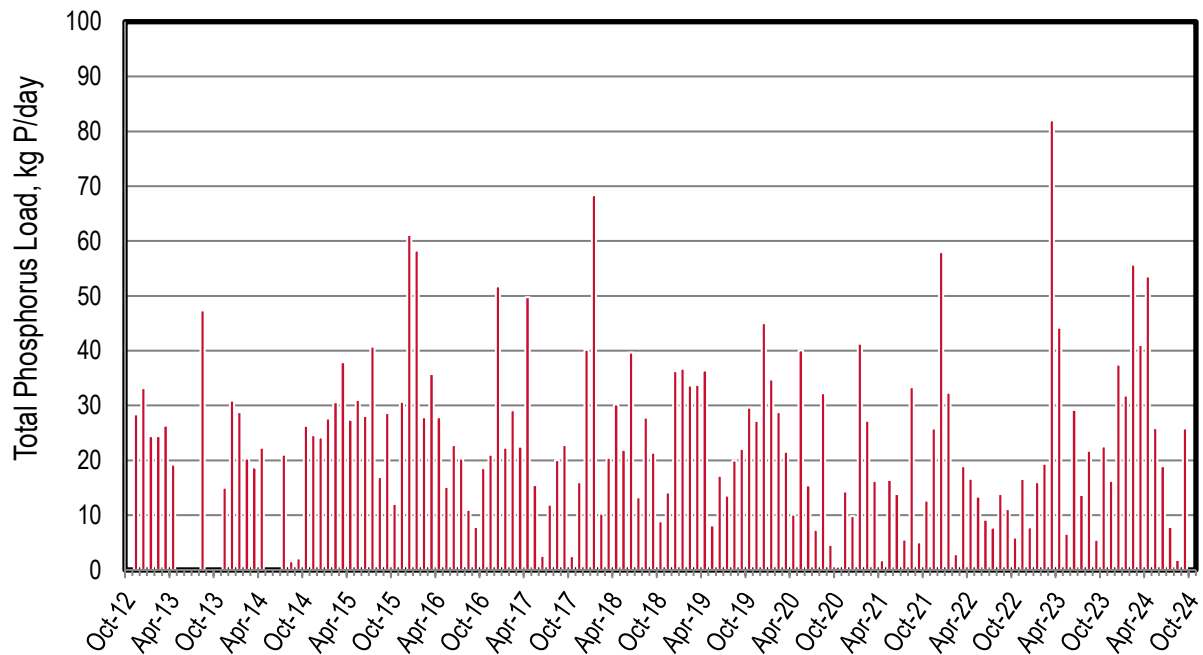


Figure 1-4. Discharge: American Canyon Monthly Phosphorus Loads

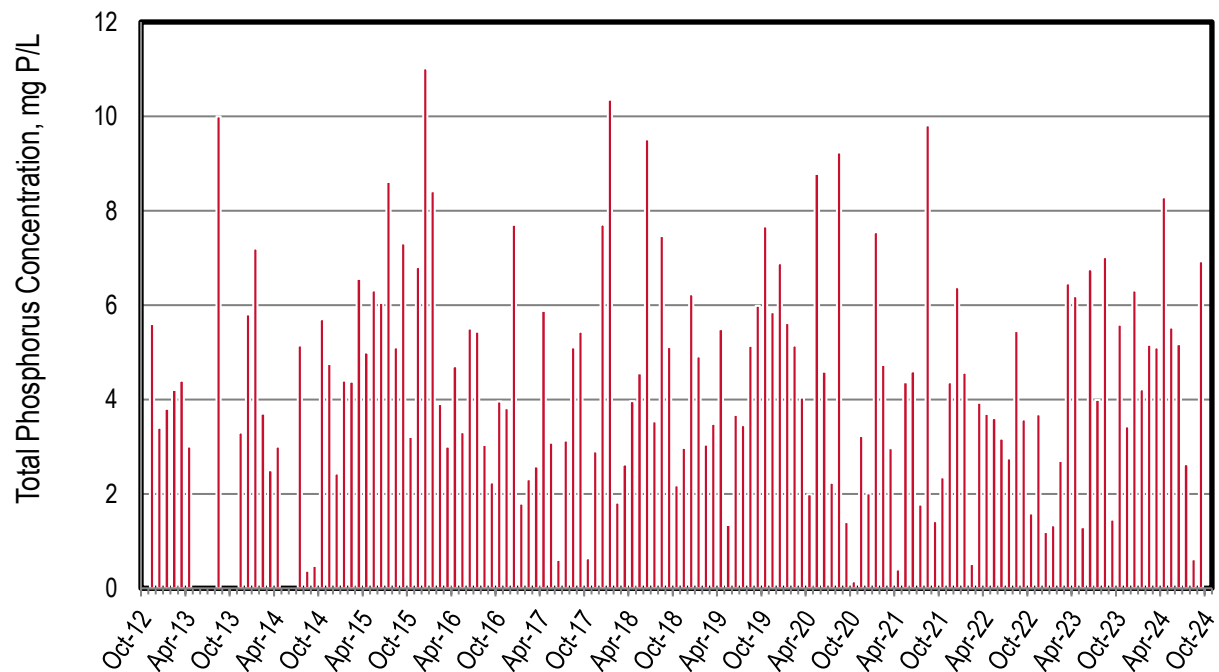


Figure 1-5. Discharge: American Canyon Monthly Phosphorus Concentration

Table 1-1. Discharge: American Canyon Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	1.30	--	--	--	--
Nov-12	1.34	2.13	51.0	53.1	28.4
Dec-12	2.58	3.12	97.5	101	33.2
Jan-13	1.70	0.643	64.6	65.2	24.4
Feb-13	1.54	1.40	53.2	54.6	24.4
Mar-13	1.59	1.50	59.0	60.5	26.4
Apr-13	1.69	2.05	45.7	47.7	19.2
May-13	1.20	--	--	--	--
Jun-13	1.20	--	--	--	--
Jul-13	1.10	--	--	--	--
Aug-13	1.25	1.56	109	111	47.4
Sep-13	1.20	--	--	--	--
Oct-13	1.30	--	--	--	--
Nov-13	1.20	4.91	73.2	78.1	15.0
Dec-13	1.41	5.12	80.5	85.6	30.9
Jan-14	1.06	15.8	48.6	64.4	28.8
Feb-14	1.46	5.06	66.4	71.5	20.3
Mar-14	1.98	5.75	75.3	81.0	18.7
Apr-14	1.97	5.58	97.5	103	22.3
May-14	1.30	--	--	--	--
Jun-14	1.20	--	--	--	--
Jul-14	1.08	1.88	78.0	79.9	21.0
Aug-14	1.15	1.91	85.5	87.4	1.60
Sep-14	1.17	2.83	69.1	71.9	2.10
Oct-14	1.22	1.89	85.9	87.8	26.3
Nov-14	1.37	2.33	75.9	78.2	24.6
Dec-14	2.63	7.36	48.4	55.8	24.2
Jan-15	1.66	3.83	43.1	46.9	27.6
Feb-15	1.85	7.13	32.4	39.5	30.6
Mar-15	1.53	2.26	39.7	42.0	37.9
Apr-15	1.45	3.89	25.6	29.5	27.4
May-15	1.30	2.85	25.0	27.9	31.0
Jun-15	1.23	4.04	29.5	33.5	28.1
Jul-15	1.25	0.474	25.1	25.6	40.8
Aug-15	0.879	0.333	16.6	17.0	17.0
Sep-15	1.04	2.59	47.0	49.6	28.6

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-15	0.993	0.376	21.8	22.2	12.0
Nov-15	1.19	0.451	28.4	28.9	30.7
Dec-15	1.47	1.94	33.9	35.8	61.1
Jan-16	1.83	7.63	34.7	42.3	58.3
Feb-16	1.89	0.714	45.7	46.4	27.9
Mar-16	3.15	1.19	76.2	77.4	35.7
Apr-16	1.57	0.593	32.0	32.6	27.9
May-16	1.21	0.458	0.916	1.37	15.1
Jun-16	1.10	0.746	23.2	24.0	22.8
Jul-16	0.989	0.462	39.3	39.7	20.3
Aug-16	0.958	1.74	16.7	18.4	11.0
Sep-16	0.927	2.22	14.9	17.1	7.85
Oct-16	1.24	0.825	13.7	14.6	18.6
Nov-16	1.46	0.438	28.5	28.9	21.0
Dec-16	1.78	0.941	12.2	13.2	51.7
Jan-17	3.29	1.59	39.8	41.4	22.3
Feb-17	3.34	13.1	141	154	29.1
Mar-17	2.31	0.938	49.7	50.6	22.5
Apr-17	2.24	1.18	69.9	71.1	49.7
May-17	1.33	3.57	34.5	38.1	15.5
Jun-17	1.12	1.70	26.8	28.5	2.56
Jul-17	1.01	2.45	22.4	24.9	11.9
Aug-17	1.04	0.488	11.2	11.7	20.0
Sep-17	1.11	0.484	19.9	20.3	22.8
Oct-17	1.06	0.846	9.31	10.2	2.54
Nov-17	1.46	1.94	24.7	26.6	16.0
Dec-17	1.38	2.17	33.1	35.3	40.2
Jan-18	1.75	18.6	84.5	103	68.4
Feb-18	1.50	7.71	21.6	29.3	10.3
Mar-18	2.06	6.59	17.8	24.4	20.4
Apr-18	2.01	5.49	48.5	54.0	30.2
May-18	1.27	2.68	33.1	35.8	21.9
Jun-18	1.10	0.881	38.8	39.7	39.7
Jul-18	0.993	0.324	20.4	20.7	13.3
Aug-18	0.986	5.98	25.2	32.5	27.8
Sep-18	1.11	4.76	25.8	30.5	21.4
Oct-18	1.08	1.02	15.8	16.8	8.90

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-18	1.26	0.832	22.5	23.3	14.1
Dec-18	1.54	5.85	40.3	46.2	36.3
Jan-19	1.98	7.66	49.0	56.7	36.8
Feb-19	2.93	7.35	38.9	46.2	33.6
Mar-19	2.56	9.65	51.9	61.5	33.8
Apr-19	1.75	7.42	43.0	50.4	36.4
May-19	1.59	1.91	28.1	30.0	8.10
Jun-19	1.24	3.13	40.1	43.3	17.2
Jul-19	1.04	1.29	21.6	22.9	13.6
Aug-19	1.03	2.31	21.9	24.2	20.0
Sep-19	0.975	1.02	24.8	25.8	22.1
Oct-19	1.02	0.442	44.2	44.6	29.6
Nov-19	1.23	0.425	46.8	47.2	27.2
Dec-19	1.73	2.11	60.5	62.6	45.0
Jan-20	1.64	3.16	40.4	43.6	34.7
Feb-20	1.48	1.20	37.8	39.0	28.8
Mar-20	1.41	2.40	29.4	31.8	21.6
Apr-20	1.35	1.27	29.8	31.0	10.1
May-20	1.21	3.22	30.4	33.6	40.1
Jun-20	0.890	0.718	19.8	20.5	15.4
Jul-20	0.865	0.305	11.6	11.9	7.32
Aug-20	0.923	0.511	24.0	24.5	32.2
Sep-20	0.858	0.190	6.46	6.65	4.56
Oct-20	1.08	0.199	13.6	13.8	0.598
Nov-20	1.17	0.494	34.1	34.5	14.3
Dec-20	1.29	0.351	1.76	2.11	9.83
Jan-21	1.45	0.582	33.2	33.7	41.3
Feb-21	1.52	0.605	29.7	30.3	27.2
Mar-21	1.45	0.361	16.2	16.6	16.2
Apr-21	1.18	0.220	5.93	6.15	1.76
May-21	0.994	0.547	23.0	23.5	16.4
Jun-21	0.798	0.190	7.98	8.17	13.9
Jul-21	0.827	0.463	10.4	10.9	5.56
Aug-21	0.898	0.374	18.0	18.3	33.3
Sep-21	0.941	0.298	15.8	16.1	5.06
Oct-21	1.42	0.176	13.7	13.9	12.7
Nov-21	1.56	3.93	29.2	33.1	25.8

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-21	2.40	0.308	30.8	31.1	58.0
Jan-22	1.87	0.462	62.8	63.3	32.3
Feb-22	1.47	0.159	8.27	8.43	2.86
Mar-22	1.27	0.296	18.9	19.2	18.9
Apr-22	1.19	0.203	1.62	1.83	16.6
May-22	0.982	0.146	12.2	12.4	13.4
Jun-22	0.764	0.148	13.0	13.1	9.15
Jul-22	0.743	1.03	10.8	11.9	7.73
Aug-22	0.671	0.503	11.9	12.4	13.8
Sep-22	0.820	0.444	6.07	6.51	11.1
Oct-22	0.983	0.600	4.30	4.90	5.90
Nov-22	1.19	1.80	29.3	31.1	16.6
Dec-22	1.73	0.500	18.4	18.9	7.80
Jan-23	3.17	2.20	35.4	37.6	16.0
Feb-23	1.91	1.00	33.4	34.4	19.4
Mar-23	3.36	5.50	97.7	103	82.0
Apr-23	1.89	1.60	56.8	58.4	44.2
May-23	1.35	1.40	23.4	24.8	6.60
Jun-23	1.14	2.60	0.800	3.40	29.2
Jul-23	0.908	1.00	20.8	21.8	13.7
Aug-23	0.818	0.400	11.9	12.3	21.7
Sep-23	1.00	3.20	9.50	12.7	5.50
Oct-23	1.07	1.15	10.3	11.5	22.6
Nov-23	1.25	0.975	11.1	12.0	16.3
Dec-23	1.57	4.00	13.5	17.5	37.5
Jan-24	2.00	3.18	57.9	61.1	31.8
Feb-24	2.86	7.60	110	118	55.7
Mar-24	2.13	4.37	71.7	76.0	41.1
Apr-24	1.71	1.51	70.2	71.7	53.6
May-24	1.24	4.05	32.4	36.5	25.8
Jun-24	0.968	1.37	22.2	23.6	18.9
Jul-24	0.788	0.712	16.1	16.8	7.83
Aug-24	0.794	0.614	13.7	14.3	1.84
Sep-24	0.985	0.629	26.4	27.0	25.8

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dry Season Average	1.05	1.49	25.0	26.5	17.4
Dry Season Trend	Down	None	Down	Down	None
Wet Season Average	1.70	3.07	42.7	45.8	27.7
Average Annual	1.43	2.46	35.8	38.3	23.8

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

Recycled Water

Table 1-2. Recycled Water: American Canyon Yearly Recycled Water Flows Diverted from the Bay

Year**	Flow Diverted*, Acre-Feet/yr (mgd)							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0 (0)	211 (0.19)	0 (0)	58 (0.05)	2 (≤ 0.01)	0 (0)	15 (≤ 0.01)	286 (0.25)
2020	0 (0)	251 (0.22)	0 (0)	123 (0.11)	16 (≤ 0.01)	0 (0)	9 (≤ 0.01)	399 (0.35)
2021	0 (0)	316 (0.28)	0 (0)	103 (0.09)	17 (≤ 0.01)	0 (0)	32 (0.03)	468 (0.41)
2022	0 (0)	279 (0.25)	0 (0)	97 (0.09)	15 (≤ 0.01)	0 (0)	45 (0.04)	436 (0.39)
2023	0 (0)	314 (0.28)	0 (0)	119 (0.11)	5 (≤ 0.01)	0 (0)	21 (0.02)	459 (0.41)
Average	0 (0)	264 (0.24)	0 (0)	95 (0.09)	12 (0.01)	0 (0)	25 (0.02)	397 (0.35)

* Assumes 100% of the recycled flow is diverted from the Bay

** Calendar year as opposed to California's water year (October 1 through September 30)

Table 1-3. Recycled Water: American Canyon Yearly Recycled Water Ammonia Load Diverted from the Bay

Year**	Ammonia Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	<1	0	<1	<1	0	<1	<1
2020	0	<1	0	<1	<1	0	<1	<1
2021	0	<1	0	<1	<1	0	<1	<1
2022	0	<1	0	<1	<1	0	<1	<1
2023	0	<1	0	<1	<1	0	<1	<1
Average	0	<1	0	<1	<1	0	<1	<1

* Assumes 100% of the recycled load is diverted from the Bay

** Calendar year as opposed to California's water year (October 1 through September 30)

Table 1-4. Recycled Water: American Canyon Yearly Recycled Water TIN Load Diverted from the Bay

Year**	TIN Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	5	0	1	<1	0	<1	7
2020	0	5	0	2	<1	0	<1	7
2021	0	4	0	1	<1	0	<1	6
2022	0	4	0	1	<1	0	<1	6
2023	0	6	0	2	<1	0	<1	8
Average	0	4	0	2	<1	0	<1	7

* Assumes 100% of the recycled load is diverted for all recycled water applications

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 1-5. Recycled Water: American Canyon Yearly Recycled Water Total Phosphorus Load Diverted from the Bay

Year**	Total Phosphorus Load Diverted*, kg P/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	--	3	--	1	<1	--	<1	4
2020	--	3	--	2	<1	--	<1	5
2021	--	5	--	2	<1	--	1	7
2022	--	3	--	1	<1	--	<1	4
2023	--	4	--	2	<1	--	<1	6
Average	--	4	--	1	<1	--	<1	5

* Assumes 100% of the recycled load is diverted for all recycled water applications

** **Calendar year as opposed to California's water year (October 1 through September 30)**

2 City of Benicia

Benicia discharges to San Pablo Bay and it serves approximately 9,306 service connections. The plant has a permitted ADWF capacity of 4.5 mgd and 11 mgd wet weather design flow capacity. It has a current dry season flow of approximately 1.7 mgd. The plant performs secondary treatment using a combination of activated sludge and rotating biological contractors.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Discharge

- ▲ The average monthly dry season flow values declined since 2022/2023 due to lower precipitation in 2023/2024.
- ▲ Wet season loads are greater and more variable year to year than the dry season loads.
- ▲ Ammonia is the majority of the nitrogen species discharged, regardless of season. This would be expected since this plant does not nitrify.
- ▲ Based on Table 2-1 statistics for the entire dry season dataset, dry season flow and nitrate plus nitrite are trending downwards. The dry season ammonia, TIN loads, and TP loads over the entire dataset do not appear to have any emerging trends.
- ▲ Ammonia concentrations vary in the range of 8 to 46 mg N/L throughout the year.
- ▲ Total phosphorus concentrations range from less than 1 mg P/L to over 10 mg P/L.

◆ Recycled Water: No recycled water was produced or distributed this past year.

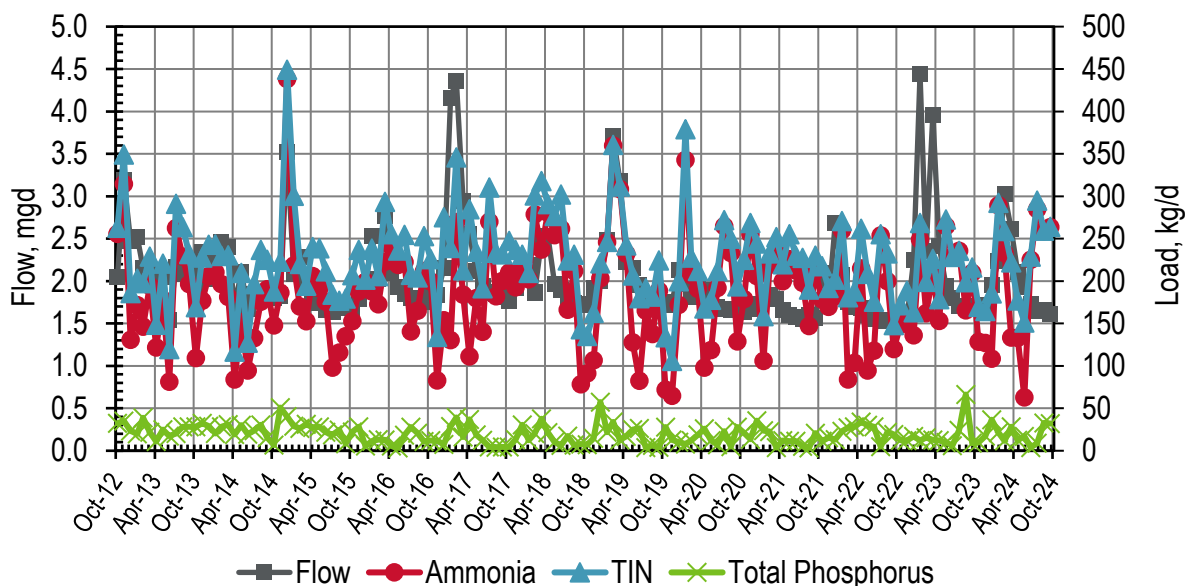


Figure 2-1. Discharge: Benicia Monthly Flows and Loads

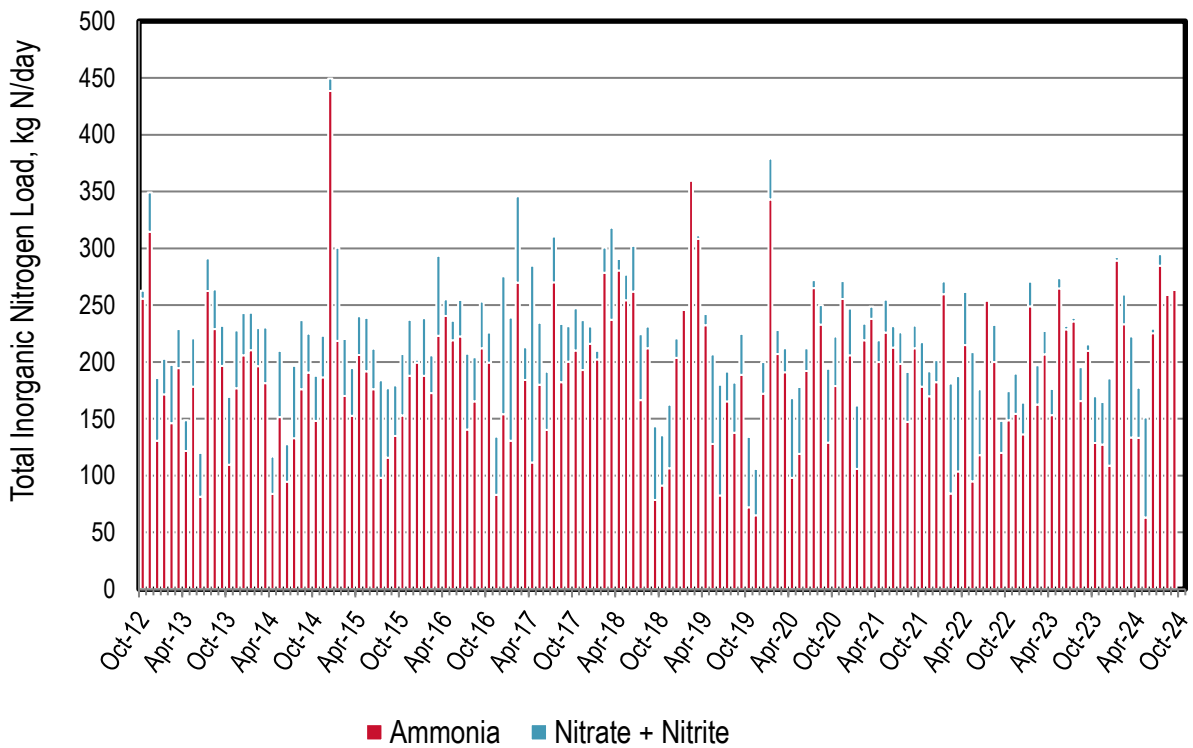


Figure 2-2. Discharge: Benicia Monthly Nitrogen Loads

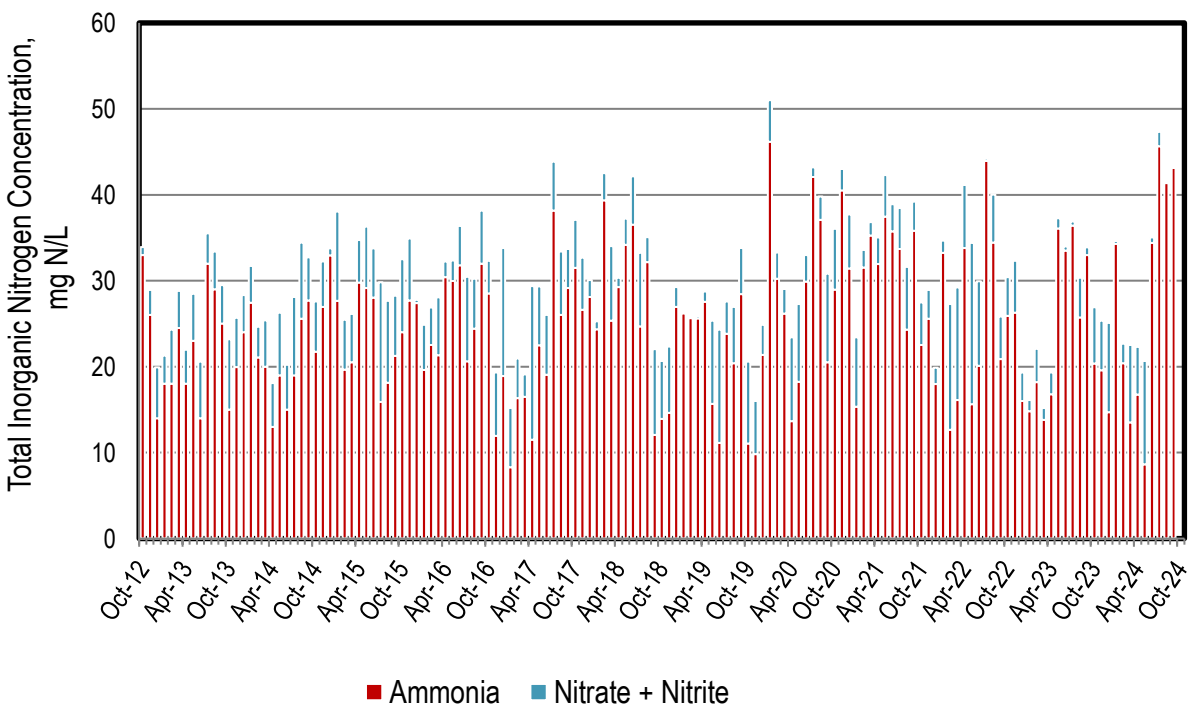


Figure 2-3. Discharge: Benicia Monthly Nitrogen Concentrations

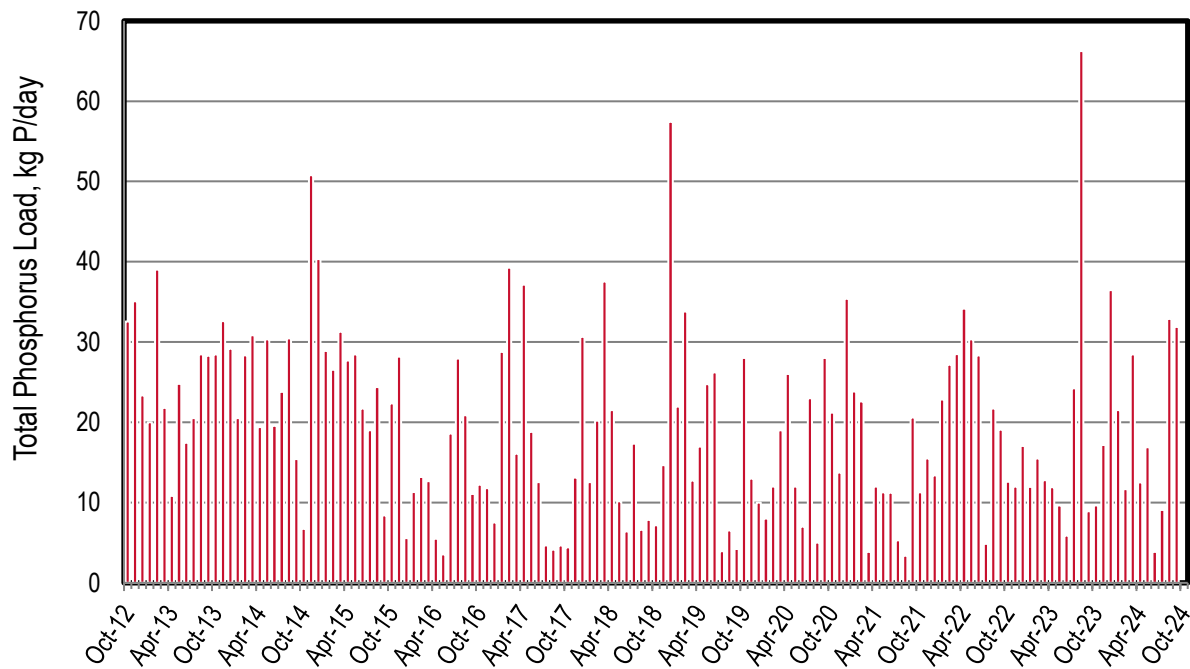


Figure 2-4. Discharge: Benicia Monthly Phosphorus Loads

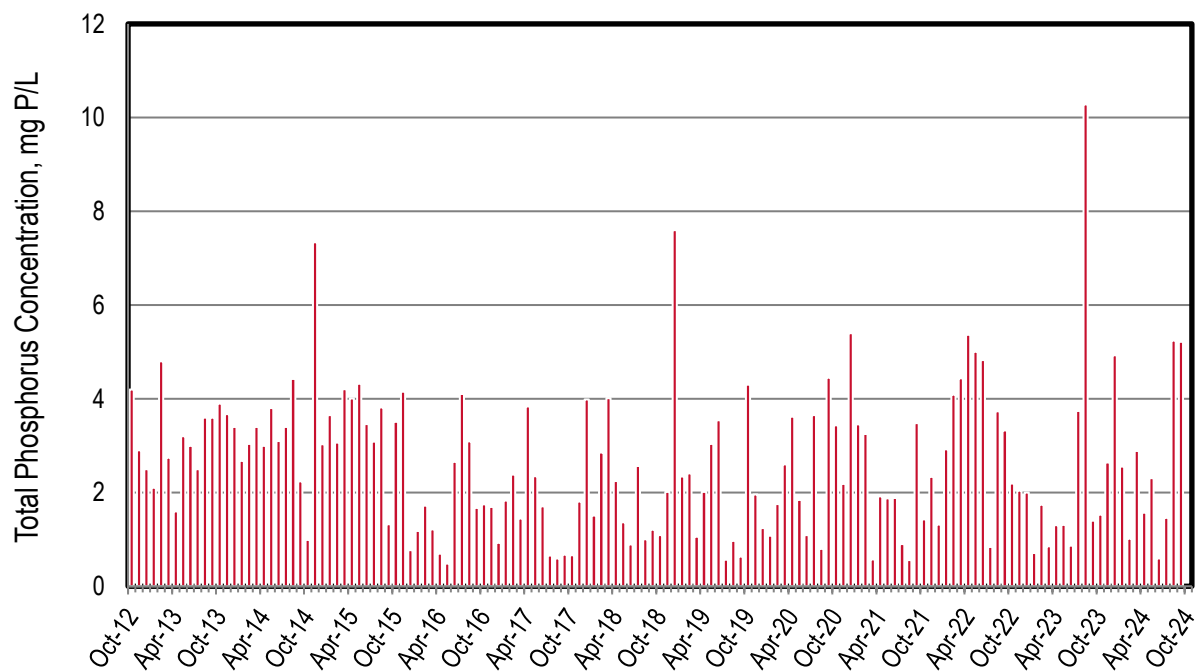


Figure 2-5. Discharge: Benicia Monthly Phosphorus Concentrations

Table 2-1. Discharge: Benicia Monthly Flows and Loads*

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	2.05	256	7.13	263	32.5
Nov-12	3.20	314	34.9	349	35.1
Dec-12	2.47	131	55.1	186	23.3
Jan-13	2.52	171	31.3	203	20.0
Feb-13	2.15	146	51.2	197	39.0
Mar-13	2.10	195	34.3	229	21.8
Apr-13	1.79	122	26.9	149	10.8
May-13	2.05	178	42.5	221	24.8
Jun-13	1.54	81.5	38.4	120	17.5
Jul-13	2.17	262	28.8	291	20.5
Aug-13	2.09	229	34.8	264	28.4
Sep-13	2.08	197	35.3	232	28.3
Oct-13	1.93	109	59.8	169	28.5
Nov-13	2.35	177	51.0	228	32.6
Dec-13	2.27	206	37.2	243	29.2
Jan-14	2.03	210	32.8	243	20.5
Feb-14	2.47	196	33.4	230	28.3
Mar-14	2.40	181	49.0	230	30.8
Apr-14	1.71	84.0	32.9	117	19.4
May-14	2.11	152	58.2	210	30.3
Jun-14	1.67	94.7	32.8	128	19.6
Jul-14	1.85	133	63.6	197	23.8
Aug-14	1.82	176	61.0	237	30.5
Sep-14	1.82	191	34.5	225	15.4
Oct-14	1.80	148	39.7	188	6.73
Nov-14	1.83	186	36.6	223	50.8
Dec-14	3.52	438	10.9	449	40.3
Jan-15	2.09	218	82.1	300	28.9
Feb-15	2.29	170	50.2	220	26.5
Mar-15	1.97	153	42.0	195	31.3
Apr-15	1.83	206	34.1	240	27.7
May-15	1.74	192	47.0	239	28.4
Jun-15	1.66	176	35.9	212	21.7
Jul-15	1.63	98.1	85.9	184	19.0
Aug-15	1.69	116	60.9	177	24.4
Sep-15	1.68	135	44.4	179	8.41

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-15	1.68	153	54.0	207	22.3
Nov-15	1.79	188	49.1	237	28.2
Dec-15	1.92	199	2.69	202	5.58
Jan-16	2.54	188	50.5	238	11.3
Feb-16	2.03	173	33.3	206	13.2
Mar-16	2.77	223	70.4	293	12.7
Apr-16	2.09	241	14.7	255	5.48
May-16	1.93	219	17.3	236	3.52
Jun-16	1.85	223	32.2	255	18.6
Jul-16	1.80	141	66.8	207	27.9
Aug-16	1.79	165	39.1	204	20.9
Sep-16	1.75	212	41.0	253	11.1
Oct-16	1.85	199	26.4	226	12.2
Nov-16	1.84	83.1	51.3	134	11.8
Dec-16	2.15	154	122	275	7.53
Jan-17	4.16	131	109	239	28.8
Feb-17	4.36	270	76.0	346	39.2
Mar-17	2.95	184	28.8	213	16.1
Apr-17	2.56	111	173	285	37.1
May-17	2.12	180	54.8	235	18.8
Jun-17	1.95	140	51.4	192	12.5
Jul-17	1.87	270	40.1	310	4.64
Aug-17	1.85	182	51.5	234	4.13
Sep-17	1.82	200	31.2	232	4.65
Oct-17	1.76	210	37.3	247	4.40
Nov-17	1.92	193	44.0	237	13.1
Dec-17	2.03	216	15.3	231	30.6
Jan-18	2.20	202	7.55	210	12.5
Feb-18	1.87	279	22.3	301	20.2
Mar-18	2.47	237	81.0	318	37.5
Apr-18	2.53	280	10.3	291	21.5
May-18	1.97	254	22.5	277	10.2
Jun-18	1.90	262	40.4	302	6.41
Jul-18	1.79	167	58.0	224	17.3
Aug-18	1.74	212	19.2	231	6.62
Sep-18	1.72	78.6	64.8	143	7.86
Oct-18	1.73	91.1	44.3	135	7.16

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-18	1.93	107	56.0	163	14.7
Dec-18	2.00	203	17.4	221	57.4
Jan-19	2.48	246	0.615	246	22.0
Feb-19	3.71	360	0.763	360	33.8
Mar-19	3.19	308	3.08	312	12.8
Apr-19	2.23	232	9.83	242	17.0
May-19	2.16	128	79.1	207	24.8
Jun-19	1.96	82.4	97.4	180	26.2
Jul-19	1.84	165	26.2	192	3.93
Aug-19	1.79	138	44.1	182	6.54
Sep-19	1.76	189	35.8	225	4.23
Oct-19	1.72	72.0	62.0	134	28.0
Nov-19	1.75	65.0	41.0	106	13.0
Dec-19	2.13	172	28.0	200	10.0
Jan-20	1.97	343	36.0	379	8.00
Feb-20	1.81	207	21.0	228	12.0
Mar-20	1.93	191	21.0	212	19.0
Apr-20	1.90	98.0	70.0	168	26.0
May-20	1.73	119	59.0	178	12.0
Jun-20	1.70	192	20.0	212	7.00
Jul-20	1.67	265	7.00	272	23.0
Aug-20	1.66	233	17.0	250	5.00
Sep-20	1.67	129	65.0	194	28.0
Oct-20	1.63	179	43.7	225	21.2
Nov-20	1.67	255	15.7	268	13.8
Dec-20	1.73	206	41.2	245	35.4
Jan-21	1.83	106	55.6	159	23.8
Feb-21	1.84	219	14.4	233	22.6
Mar-21	1.79	238	10.5	252	3.85
Apr-21	1.66	200	19.3	220	12.0
May-21	1.59	226	29.1	256	11.3
Jun-21	1.57	213	18.9	230	11.2
Jul-21	1.56	198	28.0	227	5.30
Aug-21	1.60	147	44.1	190	3.37
Sep-21	1.57	212	20.0	230	20.6
Oct-21	2.09	178	39.2	217	11.3
Nov-21	1.76	170	22.1	192	15.5

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-21	2.68	182	19.4	202	13.4
Jan-22	2.07	260	11.0	271	22.8
Feb-22	1.76	84.1	97.1	181	27.2
Mar-22	1.70	104	84.1	188	28.5
Apr-22	1.68	215	46.8	262	34.1
May-22	1.60	94.8	114	209	30.3
Jun-22	1.55	118	57.9	176	28.3
Jul-22	1.53	254	1.54	255	4.84
Aug-22	1.54	200	32.6	233	21.7
Sep-22	1.52	120	28.3	148	19.1
Oct-22	1.52	149	25.7	171	12.6
Nov-22	1.55	154	35.4	189	12.0
Dec-22	2.25	136	27.9	164	17.0
Jan-23	4.45	249	21.9	269	11.9
Feb-23	2.36	162	34.7	199	15.5
Mar-23	3.96	207	20.7	226	12.8
Apr-23	2.42	153	23.0	179	11.9
May-23	1.94	265	8.83	273	9.63
Jun-23	1.80	229	3.19	229	5.89
Jul-23	1.71	236	3.14	236	24.2
Aug-23	1.70	166	29.8	199	66.2
Sep-23	1.68	210	5.47	216	8.90
Oct-23	1.67	129	41.2	170	9.65
Nov-23	1.72	127	37.5	165	17.2
Dec-23	1.96	109	76.8	186	36.5
Jan-24	2.23	289	2.89	292	21.5
Feb-24	3.03	233	26.0	259	11.7
Mar-24	2.61	133	88.9	222	28.5
Apr-24	2.10	133	44.1	177	12.5
May-24	1.94	63.1	88.1	151	16.9
Jun-24	1.73	225	3.93	229	3.86
Jul-24	1.65	285	10.3	295	9.08
Aug-24	1.66	259	0.322	259	32.9
Sep-24	1.62	264	0.258	264	31.9

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dry Season Average	1.77	182	38.5	221	17.0
Dry Season Trend	Down	None	Down	None	None
Wet Season Average	2.22	188	39.9	228	21.1
Average Annual	2.03	186	39.3	225	19.4

* The City of Benicia has sampled more intensively since September 2015 than required under the Nutrient Watershed Permit. This data represents the average monthly loads during this intensive sampling period.

** The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

*** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

Recycled Water

No recycled water was produced or distributed this past year.

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3 City of Burlingame

Burlingame discharges to South Bay and it serves approximately 16,000 service connections. The plant has a permitted ADWF capacity of 5.5 mgd and a peak permitted wet weather flow of 16 mgd. It has a current dry season flow of approximately 2.1 mgd. The plant performs secondary treatment using activated sludge.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Discharge

- ▲ Both nitrogen and phosphorus loads increase with flow during wet weather events.
- ▲ Wet season loads are greater and more variable year to year than the dry season loads.
- ▲ Based on the table and figures with the average monthly values, there appears to be a dry season downward trend for flow and TP loads, with a stark TP load reduction beginning in spring 2014 (attributed to sampling methodology).
- ▲ Ammonia is typically the majority of the nitrogen species discharged, regardless of season. However, from about 8/2013 - 6/2014 and 6/2019 – 03/2020 the NO_x load and concentration were significantly higher than in other shown years, indicating the potential occurrence of nitrification during such periods.
- ▲ Total phosphorus concentrations were typically above 10 mg P/L in the first two reporting years and then dropped to reliably less than 10 mg P/L in the subsequent years. This decrease in concentration is largely attributed to the change in sampling methodology between the Section 13267 Letter data and the Nutrient Watershed Permit dataset.

◆ Recycled Water: No recycled water was produced or distributed this past year.

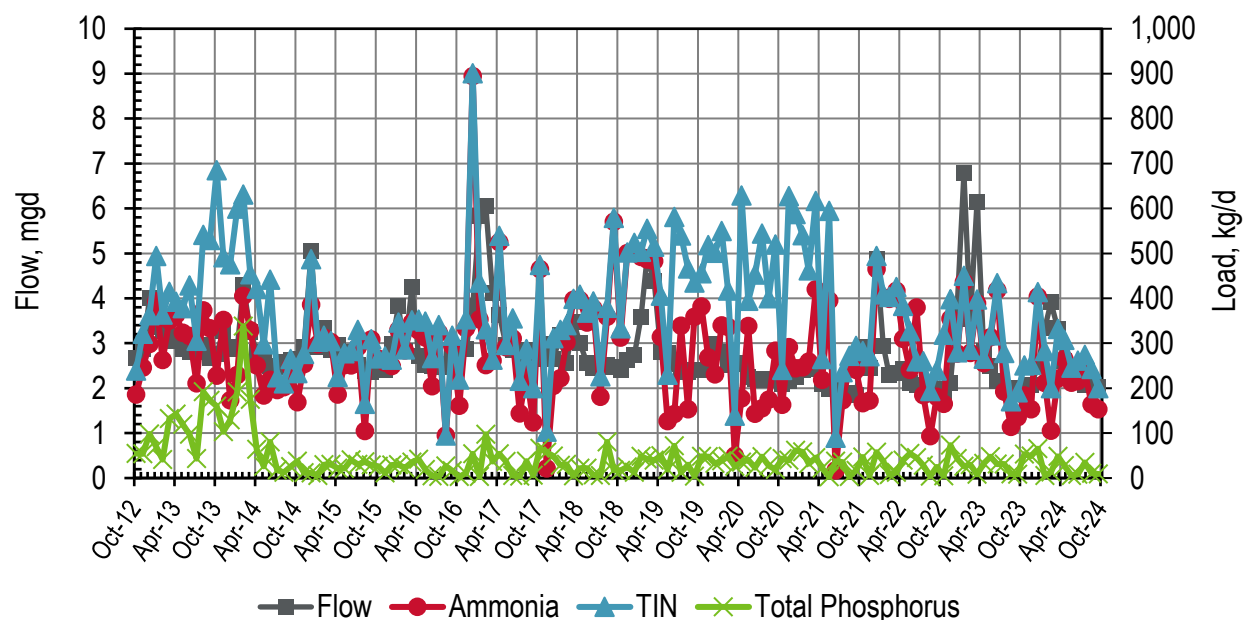


Figure 3-1. Discharge: Burlingame Monthly Flows and Loads

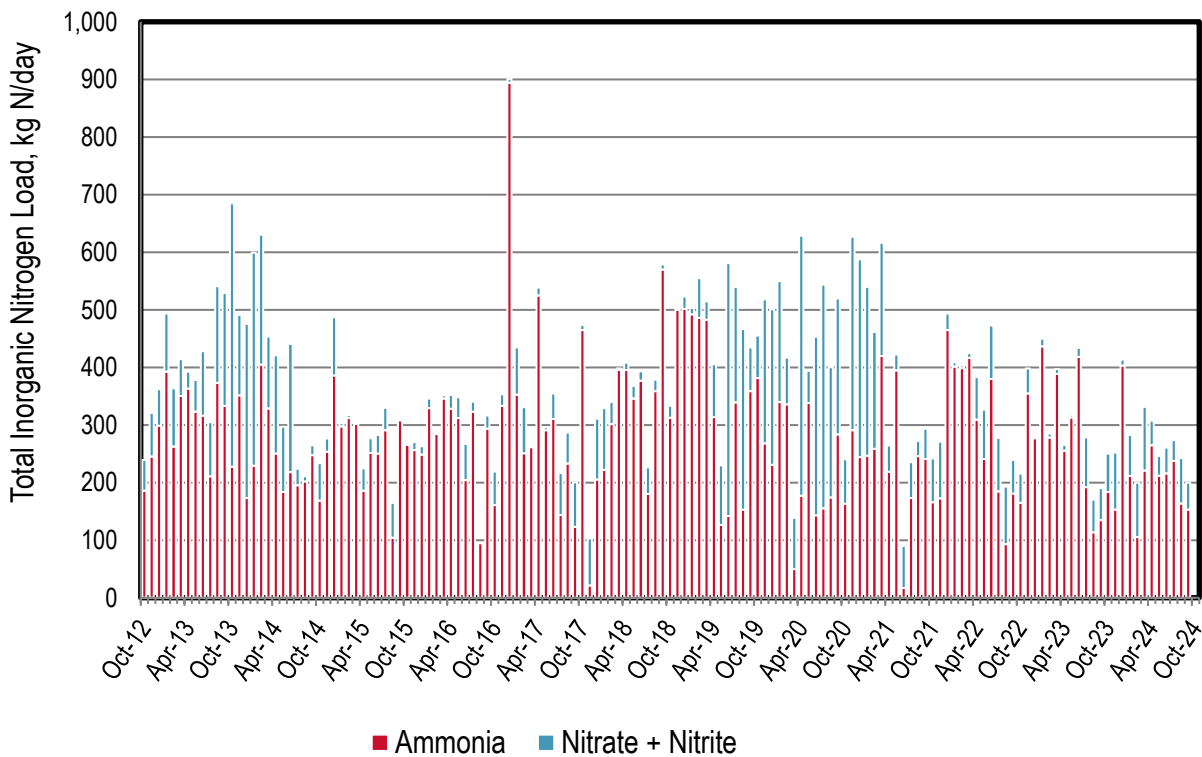


Figure 3-2. Discharge: Burlingame Monthly Nitrogen Loads

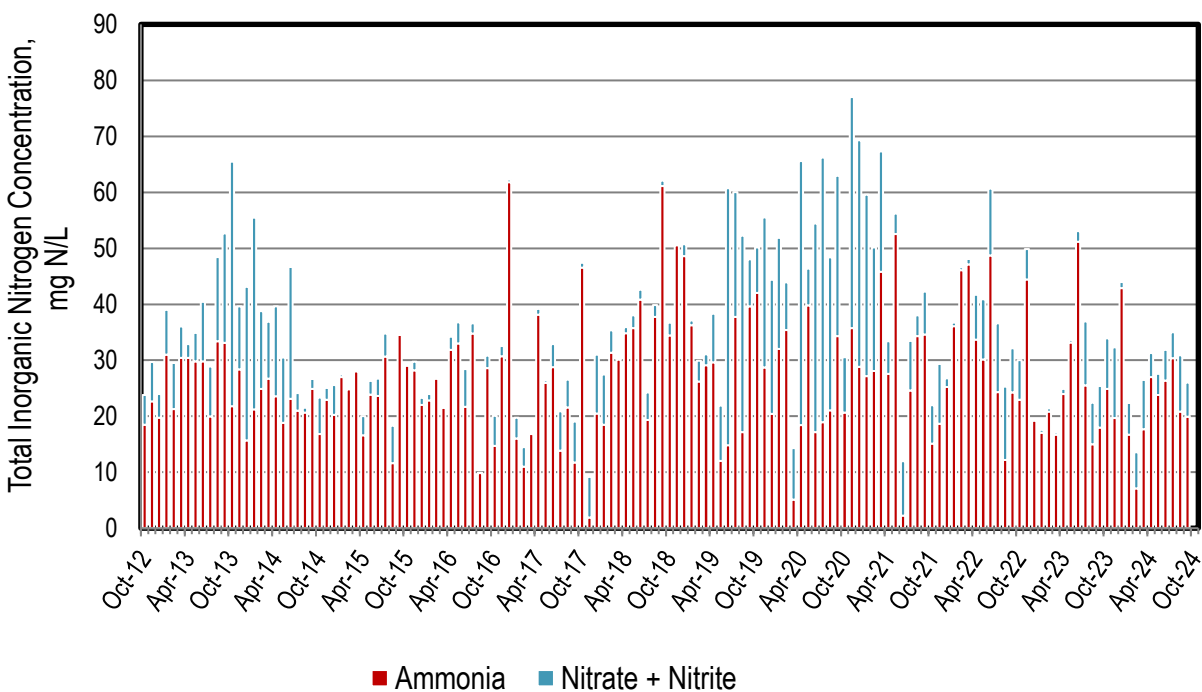


Figure 3-3. Discharge: Burlingame Monthly Nitrogen Concentrations

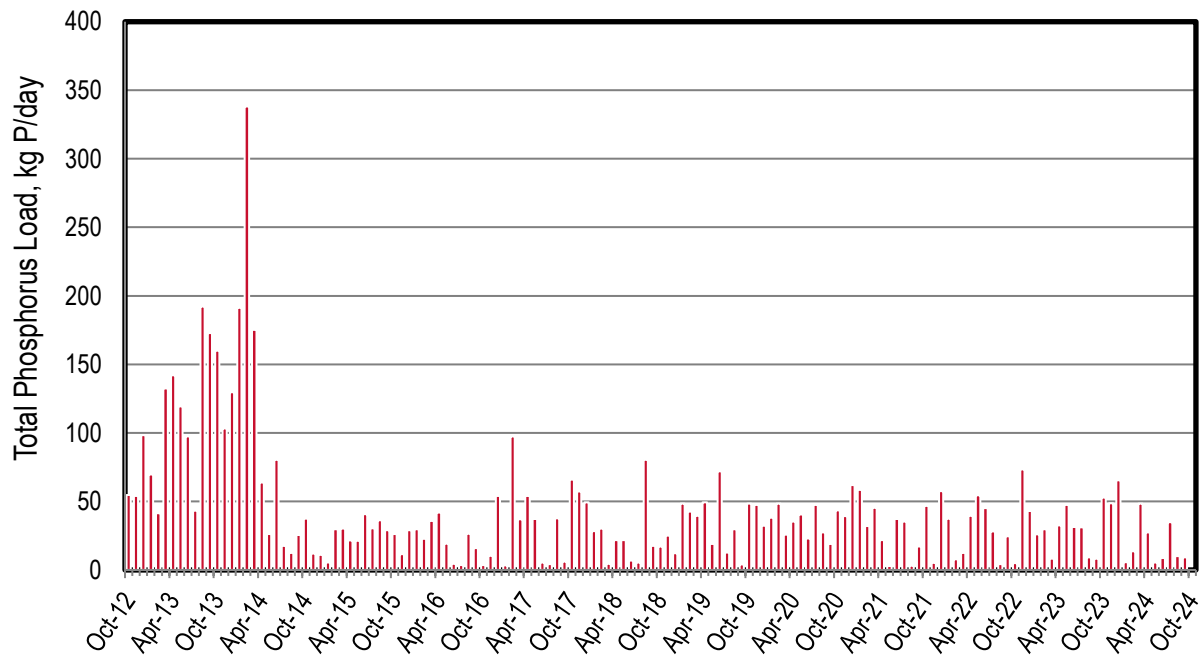


Figure 3-4. Discharge: Burlingame Monthly Phosphorus Loads

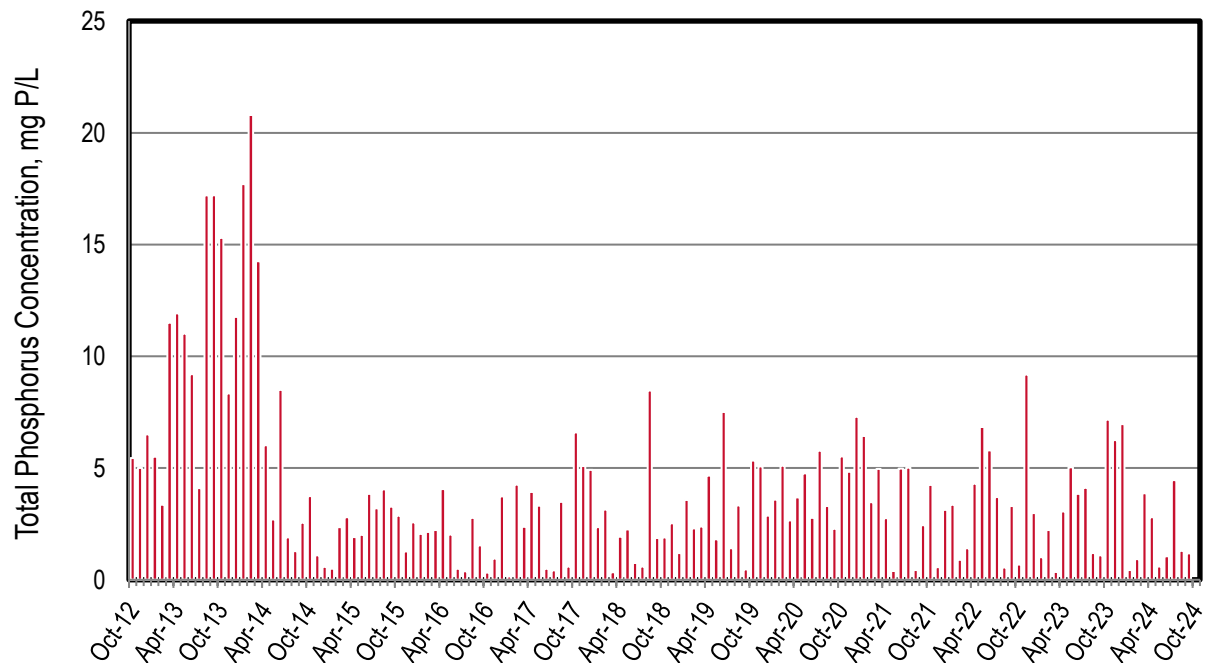


Figure 3-5. Discharge: Burlingame Monthly Phosphorus Concentrations

Table 3-1. Discharge: Burlingame Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	2.66	186	53.5	239	54.7
Nov-12	2.86	245	75.7	321	54.1
Dec-12	4.00	299	63.6	362	98.3
Jan-13	3.35	393	101	494	69.6
Feb-13	3.26	263	101	364	41.4
Mar-13	3.04	350	64.0	414	132
Apr-13	3.16	363	29.3	392	142
May-13	2.87	323	54.7	378	119
Jun-13	2.80	316	112	428	97.5
Jul-13	2.80	211	94.2	305	43.3
Aug-13	2.96	373	168	541	192
Sep-13	2.66	333	197	529	173
Oct-13	2.77	228	457	685	160
Nov-13	3.28	351	139	491	103
Dec-13	2.92	173	303	475	130
Jan-14	2.86	229	370	599	191
Feb-14	4.30	405	226	631	338
Mar-14	3.25	329	125	454	175
Apr-14	2.81	251	171	421	63.9
May-14	2.58	184	114	297	26.3
Jun-14	2.50	218	223	441	80.3
Jul-14	2.46	195	28.9	224	17.7
Aug-14	2.59	202	8.56	211	12.5
Sep-14	2.63	248	17.3	265	25.4
Oct-14	2.65	169	65.0	234	37.4
Nov-14	2.92	254	22.9	276	12.0
Dec-14	5.04	386	101	487	11.0
Jan-15	2.92	298	5.15	303	5.50
Feb-15	3.33	312	4.73	317	29.7
Mar-15	2.85	302	2.69	305	30.1
Apr-15	2.97	186	39.0	225	21.5
May-15	2.79	251	25.8	277	21.2
Jun-15	2.80	250	32.4	283	40.6
Jul-15	2.51	291	38.7	330	30.3
Aug-15	2.38	105	60.2	165	36.3
Sep-15	2.36	308	0.727	309	29.1

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-15	2.42	266	0.683	266	26.2
Nov-15	2.41	257	13.6	270	11.5
Dec-15	2.99	249	14.1	263	29.1
Jan-16	3.82	329	16.7	346	29.7
Feb-16	2.82	284	1.76	286	22.8
Mar-16	4.26	346	5.12	351	35.7
Apr-16	2.72	328	24.2	352	41.7
May-16	2.50	312	35.7	348	19.2
Jun-16	2.49	204	63.2	267	4.60
Jul-16	2.46	323	17.4	340	3.56
Aug-16	2.54	94.6	0.185	94.8	26.5
Sep-16	2.72	294	23.1	317	15.8
Oct-16	2.89	161	58.5	219	3.53
Nov-16	2.87	333	20.1	353	10.4
Dec-16	3.83	894	6.25	901	53.9
Jan-17	5.82	353	82.0	435	3.35
Feb-17	6.05	251	79.7	331	97.4
Mar-17	4.11	261	1.92	263	36.9
Apr-17	3.64	525	14.3	539	54.1
May-17	2.96	291	5.33	296	37.1
Jun-17	2.86	311	44.4	355	5.39
Jul-17	2.74	144	72.8	217	4.33
Aug-17	2.86	233	53.9	287	37.7
Sep-17	2.78	123	76.8	200	6.19
Oct-17	2.64	465	8.83	474	65.9
Nov-17	2.97	21.5	81.5	103	57.2
Dec-17	2.65	205	106	311	49.2
Jan-18	3.18	222	108	330	28.2
Feb-18	2.55	302	38.4	340	30.2
Mar-18	3.48	396	2.27	398	4.41
Apr-18	3.01	396	12.6	408	21.9
May-18	2.56	346	22.2	368	21.7
Jun-18	2.44	377	16.2	393	6.88
Jul-18	2.47	181	45.7	226	5.51
Aug-18	2.51	359	20.3	379	80.4
Sep-18	2.47	570	9.05	579	17.5
Oct-18	2.40	313	20.5	333	17.2

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-18	2.62	501	1.36	502	25.0
Dec-18	2.73	502	21.3	523	12.3
Jan-19	3.59	492	11.0	503	48.5
Feb-19	4.91	486	68.8	555	42.5
Mar-19	4.38	483	32.2	515	39.4
Apr-19	2.80	314	91.9	406	49.3
May-19	2.78	126	103	230	19.1
Jun-19	2.53	142	439	581	71.9
Jul-19	2.38	339	201	540	12.6
Aug-19	2.36	153	313	466	29.7
Sep-19	2.40	359	76.3	435	4.14
Oct-19	2.40	382	73.6	455	48.4
Nov-19	2.47	268	250	518	47.3
Dec-19	2.99	231	270	501	32.3
Jan-20	2.81	340	210	550	38.1
Feb-20	2.51	336	81.0	417	48.4
Mar-20	2.57	49.8	89.2	139	25.8
Apr-20	2.54	177	452	629	35.4
May-20	2.25	338	56.0	394	40.5
Jun-20	2.20	143	310	453	23.1
Jul-20	2.17	155	388	544	47.5
Aug-20	2.19	174	226	400	27.4
Sep-20	2.18	284	236	520	18.9
Oct-20	2.08	163	77.6	241	43.5
Nov-20	2.15	291	336	627	39.3
Dec-20	2.24	244	343	588	61.8
Jan-21	2.40	246	294	540	58.4
Feb-21	2.44	259	203	462	31.9
Mar-21	2.43	420	197	617	45.5
Apr-21	2.09	218	45.9	264	21.8
May-21	1.99	395	27.6	594	2.91
Jun-21	1.98	16.7	73.0	89.8	37.3
Jul-21	1.86	173	62.3	236	35.3
Aug-21	1.89	246	26.2	272	3.11
Sep-21	1.84	241	53.1	294	17.0
Oct-21	2.91	166	75.9***	282***	46.7
Nov-21	2.44	172	98.6	271	5.27

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-21	4.88	465	29.1	494	57.6
Jan-22	2.94	402	6.89	409	37.3
Feb-22	2.29	399	4.61	403	7.71
Mar-22	2.34	416	859	1,280	12.4
Apr-22	2.43	309	73.9	383	39.5
May-22	2.11	241	85.9	327	54.6
Jun-22	2.06	380	93.0***	260***	45.1
Jul-22	2.01	185	93.0***	260***	28.1
Aug-22	2.02	93.1	100	193	4.19
Sep-22	1.97	181	58.6	239	24.6
Oct-22	1.90	165	51.0	319	4.87
Nov-22	2.11	355	43.4	398	73.3
Dec-22	3.81	277	2.96	280	43.0
Jan-23	6.78	437	13.1	450	25.9
Feb-23	3.53	278	7.42	286	29.7
Mar-23	6.15	389	8.52	397	8.22
Apr-23	2.82	256	9.99	266	32.5
May-23	2.50	313	4.14	317	47.5
Jun-23	2.16	418	15.7	434	31.3
Jul-23	1.99	192	86.4	278	31.0
Aug-23	2.01	114	56.8	170	9.08
Sep-23	1.99	135	55.5	190	8.24
Oct-23	1.95	184	66.8	250	52.9
Nov-23	2.06	153	98.6	252	48.6
Dec-23	2.49	403	10.4	414	65.5
Jan-24	3.34	211	71.3	283	5.55
Feb-24	3.90	105	94.6	200	13.6
Mar-24	3.31	221	111	332	48.4
Apr-24	2.60	265	42.6	308	27.4
May-24	2.36	212	33.8	246	5.34
Jun-24	2.17	216	45.1	261	8.63
Jul-24	2.07	237	36.4	274	34.8
Aug-24	2.08	164	78.8	242	10.1
Sep-24	2.03	153	46.7	200	9.05

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dry Season Average	2.39	241	86.0	326	33.0
Dry Season Trend **	Down	None	None	None	Down
Wet Season Average	3.13	304	87.1	393	49.0
Average Annual	2.82	278	86.6	365	42.3

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

*** No nitrate plus nitrate and TIN samples taken during these months. In order to provide a complete dataset, the average of the months prior and post sampling for the missed months was used.

Recycled Water

No recycled water was produced or distributed this past year.

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4 Central Contra Costa Sanitary District (Central San)

Central San discharges to Suisun Bay, and it serves approximately 118,000 service connections. The plant has a permitted ADWF capacity of 53.8 mgd. It has a current dry season discharge flow of approximately 32.4 mgd (2024 average dry season flow). The plant performs secondary treatment using activated sludge.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Influent and Load Reduction Across the Plant:

- ▲ Note: influent flow and loads limited to data since July 2019; quarterly sampling is required but agency samples at a higher frequency for various parameters.
- ▲ Based on Table 1-1's statistical analysis for the entire dry season dataset, TP has a downward trend with no apparent trend for all other parameters.
- ▲ Influent flows were lower this past year when compared to 2022/2023. This was expected given how relatively wet this past wet season was.
- ▲ The average monthly flow reduction across the plant ranges from 0 to 19 percent. This reduction is attributed to recycled water, water bound with biosolids, evaporation, etc.
- ▲ The average monthly nitrogen load reduction values across the plant ranges from 12 to 60 percent. This load reduction is attributed primarily to biological assimilation in the activated sludge system, occasional nitrification (emphasis on the dry season), and load diversion with recycled water.
- ▲ The monthly average phosphorus load reduction across the plant ranges from 66 to 93 percent. This reduction is primarily attributed to biological phosphorus removal in the activated sludge system which has an anaerobic selector to improve settleability.

◆ Discharge:

- ▲ Ammonia and TIN loads typically increase with flow during wet weather events.
- ▲ Ammonia is the majority of the nitrogen species discharged, regardless of season. This would be expected since this plant is not designed to nitrify.
- ▲ Based on Table 1-2's statistics for the entire dry season dataset, none of the parameters appear to have any emerging trends.
- ▲ The 2024 dry season ammonia loads were the third lowest (average of 3,079 kg N/d) since sampling began in 2012, and it would have been the lowest if not for a high load in May 2024.
- ▲ The 2024 dry season TIN loads (average of 3,406 kg N/d) were comparable to pre-pandemic levels and the second lowest since sampling began in 2012.
- ▲ Total phosphorus concentrations are generally less than 1.6 mg P/L. This indicates the plant is reliably removing phosphorus.

◆ Recycled Water:

- ▲ Based on Table 1-3, the plant has averaged 1.7 mgd of recycled water from 2019 - 2023. Recycled water uses included golf course irrigation, landscape irrigation, industrial

applications, agricultural irrigation, and other non-potable uses such as a commercial residential truck fill program, sewer flushing, and a dust control/fill station.

- ▲ Based on Table 1-4 through Table 1-6, the plant has diverted from the Bay via recycled water 179 kg ammonia-N/d, 186 kg TIN-N/d, and 6 kg P/d on average from 2019 - 2023.

Influent

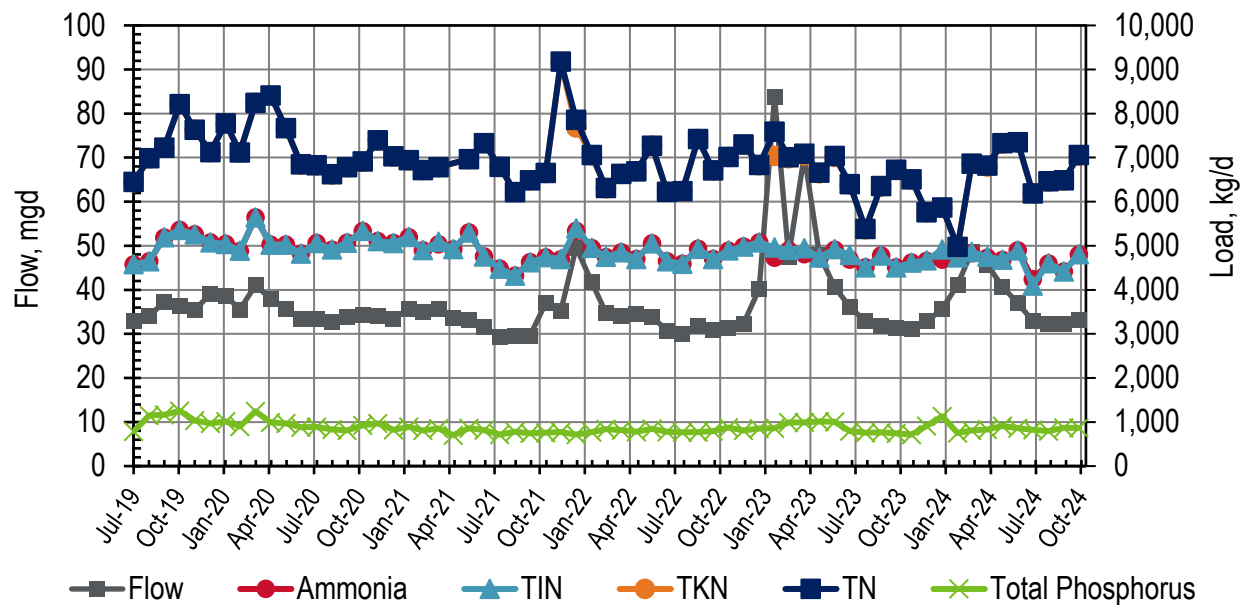


Figure 4-1. Influent: Central San Monthly Flows and Loads

Note: the ammonia/TIN loads and TKN/Total N loads are comparable. The ammonia and TKN values are located behind TIN and Total N loads and thus are challenging to see.

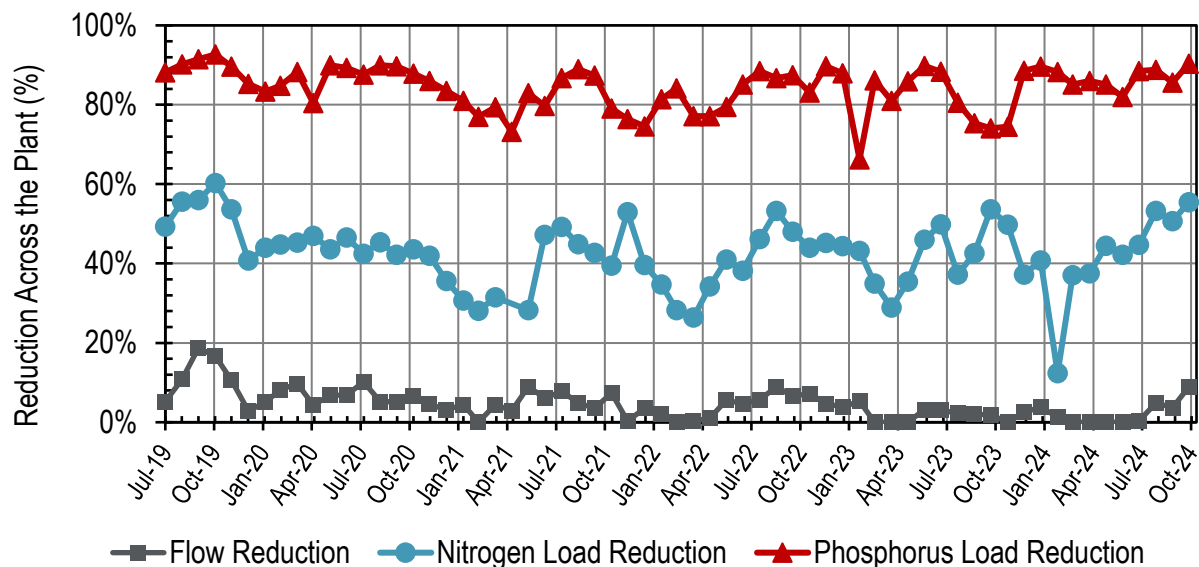


Figure 4-2. Influent: Central San Monthly Reductions Across the Plant

Note: Influent Total N was compared against Discharge TIN for calculating nitrogen load reduction.

Table 4-1. Influent: Central San Monthly Flows and Loads*

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-19	32.8	4,580	4.73	4,580	6,450	6,450	784
Aug-19	34.1	4,650	0.591	4,650	6,990	6,990	1,150
Sep-19	37.3	5,190	2.82	5,190	7,230	7,230	1,160
Oct-19	36.2	5,360	2.50	5,360	8,210	8,210	1,250
Nov-19	35.4	5,260	1.17	5,260	7,630	7,630	1,030
Dec-19	39.1	5,080	1.14	5,080	7,130	7,130	965
Jan-20	38.7	5,040	2.24	5,040	7,780	7,780	1,010
Feb-20	35.5	4,890	1.08	4,890	7,120	7,120	895
Mar-20	41.1	5,650	2.68	5,650	8,240	8,240	1,240
Apr-20	37.9	5,030	1.34	5,030	8,410	8,420	993
May-20	35.6	5,030	0.959	5,030	7,670	7,670	970
Jun-20	33.4	4,820	0.950	4,820	6,850	6,850	882
Jul-20	33.4	5,060	1.12	5,060	6,830	6,830	889
Aug-20	32.7	4,910	3.16	4,920	6,620	6,630	829
Sep-20	33.8	5,070	4.36	5,070	6,790	6,790	806
Oct-20	34.3	5,330	4.48	5,340	6,910	6,910	922
Nov-20	34.2	5,100	1.19	5,110	7,390	7,390	970
Dec-20	33.5	5,060	3.00	5,070	7,020	7,030	822
Jan-21	35.6	5,190	7.10	5,200	6,940	6,940	889
Feb-21	34.9	4,900	4.58	4,900	6,720	6,720	812
Mar-21	35.7	5,040	2.83	5,090	6,780	6,780	850
Apr-21	33.7	4,920	3.17	4,920	--	--	701
May-21	33.3	5,300	2.08	5,310	6,970	6,970	856
Jun-21	31.6	4,760	1.27	4,760	7,330	7,330	819
Jul-21	29.4	4,480	0.565	4,480	6,790	6,790	712
Aug-21	29.4	4,320	3.60	4,320	6,220	6,220	780
Sep-21	29.6	4,630	1.45	4,630	6,490	6,490	746
Oct-21	37.0	4,740	7.31	4,750	6,650	6,660	759
Nov-21	35.2	4,690	6.99	4,700	9,170	9,180	774
Dec-21	49.7	5,340	44.8	5,400	7,690	7,860	714
Jan-22	41.7	4,950	8.62	4,950	7,050	7,060	775
Feb-22	34.7	4,740	7.42	4,750	6,310	6,310	841
Mar-22	34.1	4,850	1.08	4,860	6,630	6,630	817

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Apr-22	34.6	4,700	3.19	4,700	6,690	6,690	778
May-22	33.9	5,060	2.09	5,060	7,270	7,270	849
Jun-22	30.7	4,650	1.43	4,650	6,230	6,230	780
Jul-22	30.1	4,590	2.96	4,590	6,240	6,240	767
Aug-22	31.8	4,930	2.44	4,940	7,420	7,420	776
Sep-22	30.8	4,700	2.67	4,700	6,710	6,710	794
Oct-22	31.4	4,890	2.34	4,900	7,020	7,020	875
Nov-22	32.3	4,980	3.36	4,990	7,290	7,300	812
Dec-22	40.2	5,080	3.33	5,080	6,830	6,830	852
Jan-23	83.8	4,730	233	4,960	7,040	7,590	863
Feb-23	47.5	4,900	16.8	4,910	6,990	7,010	989
Mar-23	70.5	4,810	137	4,950	7,050	7,090	990
Apr-23	47.9	4,720	17.5	4,740	6,650	6,660	1,010
May-23	40.6	4,910	10.8	4,930	7,020	7,040	1,000
Jun-23	36.1	4,690	106	4,790	6,390	6,400	797
Jul-23	32.8	4,510	2.56	4,520	5,380	5,380	760
Aug-23	31.9	4,780	3.72	4,780	6,350	6,360	764
Sep-23	31.4	4,510	4.29	4,510	6,720	6,730	741
Oct-23	31.0	4,620	3.87	4,620	6,510	6,510	717
Nov-23	32.8	4,660	9.33	4,670	5,760	5,770	912
Dec-23	35.6	4,680	8.93	4,920	5,860	5,870	1,130
Jan-24	41.2	4,730	7.55	4,740	4,970	4,980	747
Feb-24	48.6	4,830	26.8	4,860	6,860	6,870	808
Mar-24	45.7	4,730	18.1	4,750	6,800	6,820	829
Apr-24	40.7	4,680	4.89	4,690	7,330	7,330	912
May-24	37.0	4,900	5.38	4,900	7,350	7,350	860
Jun-24	32.9	4,250	1.26	4,100	6,190	6,190	826
Jul-24	32.2	4,600	3.92	4,600	6,460	6,470	791
Aug-24	32.2	4,420	0.968	4,420	6,480	6,480	868
Sep-24	33.1	4,800	4.89	4,810	7,050	7,060	867

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Dry Season Average	33.0	4,750	6.55	4,760	6,730	6,730	844
Dry Season Trend ***	None	None	None	None	None	None	Down
Wet Season Average	40.1	4,940	23.9	4,970	7,040	7,070	893
Average Annual	36.9	4,860	16.2	4,870	6,900	6,920	871

* Central San typically samples more than the required influent quarterly sampling. This dataset includes this additional sampling.

** The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values. The Total Nitrogen value is calculated by adding “TKN” and “Nitrate + Nitrite”.

*** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

Discharge

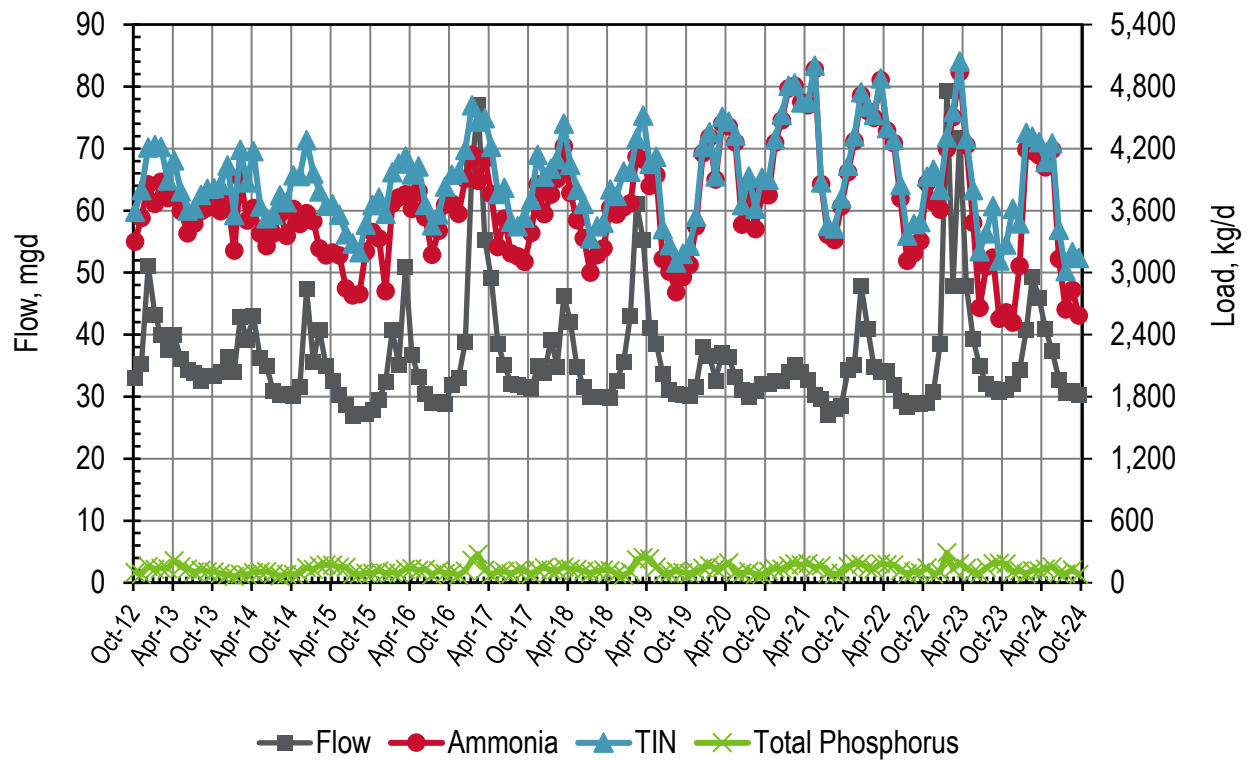


Figure 4-3. Discharge: Central San Monthly Flows and Loads

Table 4-2. Discharge: Central San Monthly Flows and Loads

Month, Year	Flow	Ammonia***	Nitrate + Nitrite	TIN*, ***	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	33.1	3,300	290	3,590	102
Nov-12	35.3	3,530	269	3,800	85.5
Dec-12	51.1	3,850	357	4,210	159
Jan-13	43.2	3,670	569	4,240	131
Feb-13	40.0	3,880	340	4,220	139
Mar-13	37.6	3,720	170	3,890	137
Apr-13	39.9	3,740	344	4,090	216
May-13	36.1	3,600	191	3,790	156
Jun-13	34.4	3,380	220	3,600	135
Jul-13	33.9	3,470	149	3,620	102
Aug-13	32.6	3,600	160	3,760	123
Sep-13	33.4	3,630	184	3,810	111
Oct-13	33.3	3,640	182	3,820	108

Month, Year	Flow	Ammonia***	Nitrate + Nitrite	TIN*, ***	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-13	34.0	3,600	255	3,850	92.0
Dec-13	36.3	3,700	336	4,040	77.5
Jan-14	34.0	3,220	342	3,560	62.5
Feb-14	42.9	3,920	270	4,190	85.0
Mar-14	39.2	3,500	370	3,870	77.5
Apr-14	43.0	3,630	550	4,180	99.5
May-14	36.3	3,380	264	3,640	106
Jun-14	35.0	3,260	268	3,530	109
Jul-14	30.9	3,380	182	3,560	86.5
Aug-14	30.4	3,570	178	3,750	67.6
Sep-14	30.5	3,360	325	3,680	82.7
Oct-14	30.2	3,620	323	3,940	81.1
Nov-14	31.7	3,470	465	3,940	92.1
Dec-14	47.3	3,580	705	4,280	146
Jan-15	35.7	3,500	463	3,960	130
Feb-15	40.7	3,240	550	3,790	165
Mar-15	35.0	3,170	479	3,650	175
Apr-15	32.6	3,200	467	3,660	172
May-15	30.3	3,170	395	3,560	149
Jun-15	28.7	2,850	524	3,370	149
Jul-15	27.0	2,780	501	3,280	85.2
Aug-15	27.2	2,790	406	3,200	85.5
Sep-15	27.2	3,210	260	3,470	92.9
Oct-15	27.8	3,400	260	3,660	93.6
Nov-15	29.6	3,330	393	3,720	116
Dec-15	32.4	2,820	747	3,570	95.7
Jan-16	40.7	3,670	302	3,970	101
Feb-16	35.1	3,730	327	4,060	94.7
Mar-16	50.9	3,760	365	4,120	130
Apr-16	36.8	3,620	333	3,950	136
May-16	33.1	3,790	239	4,030	122
Jun-16	30.5	3,540	120	3,660	130
Jul-16	29.0	3,180	283	3,460	80.0
Aug-16	29.1	3,410	159	3,560	115
Sep-16	28.9	3,660	178	3,830	92.7
Oct-16	31.8	3,670	277	3,950	93.9
Nov-16	33.1	3,570	402	3,970	75.1

Month, Year	Flow	Ammonia***	Nitrate + Nitrite	TIN*, ***	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-16	38.8	3,910	284	4,190	117
Jan-17	67.3	4,140	475	4,620	219
Feb-17	77.1	3,890	574	4,460	278
Mar-17	55.4	4,100	397	4,500	124
Apr-17	49.1	3,760	454	4,220	81.2
May-17	38.6	3,250	515	3,760	105
Jun-17	35.1	3,520	296	3,820	109
Jul-17	32.1	3,190	309	3,490	87.7
Aug-17	32.0	3,160	293	3,450	118
Sep-17	31.6	3,110	428	3,530	116
Oct-17	31.2	3,390	323	3,710	83.9
Nov-17	34.9	3,860	282	4,140	125
Dec-17	33.8	3,570	363	3,930	148
Jan-18	39.2	3,760	252	4,010	123
Feb-18	34.8	3,910	188	4,100	121
Mar-18	46.2	4,220	221	4,440	154
Apr-18	42.1	3,770	274	4,050	136
May-18	34.7	3,510	292	3,800	132
Jun-18	31.6	3,340	333	3,670	114
Jul-18	29.9	3,000	362	3,330	95.7
Aug-18	30.0	3,170	277	3,450	113
Sep-18	30.0	3,240	247	3,480	124
Oct-18	29.9	3,630	178	3,810	119
Nov-18	32.6	3,560	180	3,740	89.2
Dec-18	35.7	3,630	336	3,980	75.5
Jan-19	43.1	3,670	303	3,980	107
Feb-19	61.2	4,120	156	4,300	224
Mar-19	55.2	4,100	425	4,520	247
Apr-19	41.1	3,840	252	4,050	233
May-19	38.5	3,940	177	4,120	154
Jun-19	33.7	3,130	289	3,420	95.4
Jul-19	31.1	3,010	257	3,270	92.8
Aug-19	30.4	2,810	287	3,100	113
Sep-19	30.3	2,960	223	3,180	99.4
Oct-19	30.2	3,070	187	3,260	91.8
Nov-19	31.6	3,450	90.6	3,540	107
Dec-19	38.0	4,160	62.1	4,220	142

Month, Year	Flow	Ammonia***	Nitrate + Nitrite	TIN*, ***	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Jan-20	36.7	4,310	52.4	4,360	168
Feb-20	32.6	3,900	28.3	3,930	136
Mar-20	37.1	4,440	65.0	4,510	146
Apr-20	36.3	4,420	44.6	4,460	194
May-20	33.2	4,260	62.7	4,330	97.8
Jun-20	31.1	3,460	191	3,660	94.2
Jul-20	30.0	3,780	152	3,930	110
Aug-20	31.0	3,420	199	3,620	83.1
Sep-20	32.2	3,760	166	3,920	83.2
Oct-20	32.0	3,750	150	3,900	112
Nov-20	32.6	4,260	33.3	4,290	136
Dec-20	32.5	4,470	54.1	4,530	136
Jan-21	34.0	4,780	25.2	4,810	169
Feb-21	35.2	4,810	24.4	4,830	187
Mar-21	34.1	4,650	28.9	4,650	175
Apr-21	32.7	4,620	31.7	4,650	188
May-21	30.3	4,970	32.5	5,000	146
Jun-21	29.7	3,860	13.2	3,870	166
Jul-21	27.1	3,370	86.1	3,450	94.4
Aug-21	28.0	3,320	110	3,430	86.2
Sep-21	28.6	3,640	79.5	3,720	94.2
Oct-21	34.3	3,970	61.3	4,030	159
Nov-21	35.1	4,270	46.5	4,320	183
Dec-21	47.9	4,720	49.2	4,750	182
Jan-22	40.9	4,570	43.4	4,610	144
Feb-22	34.8	4,500	27.3	4,530	133
Mar-22	34.0	4,860	15.8	4,880	187
Apr-22	34.2	4,380	23.0	4,400	178
May-22	32.0	4,250	30.8	4,290	174
Jun-22	29.3	3,720	131	3,850	116
Jul-22	28.4	3,110	247	3,360	88.6
Aug-22	29.0	3,190	284	3,470	103
Sep-22	28.8	3,310	180	3,490	99.3
Oct-22	29.1	3,870	61.8	3,930	148
Nov-22	30.8	3,680	314	4,000	83.8
Dec-22	38.6	3,610	192	3,800	103
Jan-23	79.4	4,200	112	4,310	291

Month, Year	Flow	Ammonia***	Nitrate + Nitrite	TIN*, ***	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Feb-23	47.8	4,510	51.4	4,560	137
Mar-23	71.8	4,940	106	5,040	188
Apr-23	47.9	4,230	62.9	4,300	142
May-23	39.3	3,480	316	3,800	102
Jun-23	35.0	2,660	548	3,210	92.7
Jul-23	32.1	3,060	321	3,380	148
Aug-23	31.3	3,150	501	3,650	188
Sep-23	30.8	2,560	563	3,120	192
Oct-23	31.1	2,620	657	3,270	183
Nov-23	32.0	2,520	1,100	3,620	104
Dec-23	34.3	3,070	410	3,480	117
Jan-24	40.7	4,190	253	4,360	87.9
Feb-24	49.3	4,180	140	4,320	120
Mar-24	45.9	4,130	129	4,260	116
Apr-24	40.9	4,020	52.7	4,070	136
May-24	37.3	4,190	61.0	4,250	155
Jun-24	32.8	3,130	355	3,420	95.1
Jul-24	30.6	2,650	372	3,020	88.4
Aug-24	31.0	2,840	363	3,200	125
Sep-24	30.2	2,590	557	3,150	83.4
Dry Season Average	31.5	3,350	262	3,610	113
Dry Season Trend **	None	None	None	None	None
Wet Season Average	39.5	3,850	264	4,110	137
Average Annual	36.2	3,640	263	3,900	127

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

*** The statistical analysis does not capture the ammonia and TIN load increase associated with the 2020 dry season.

Note that the dry season average includes data from 2012 through 2024.

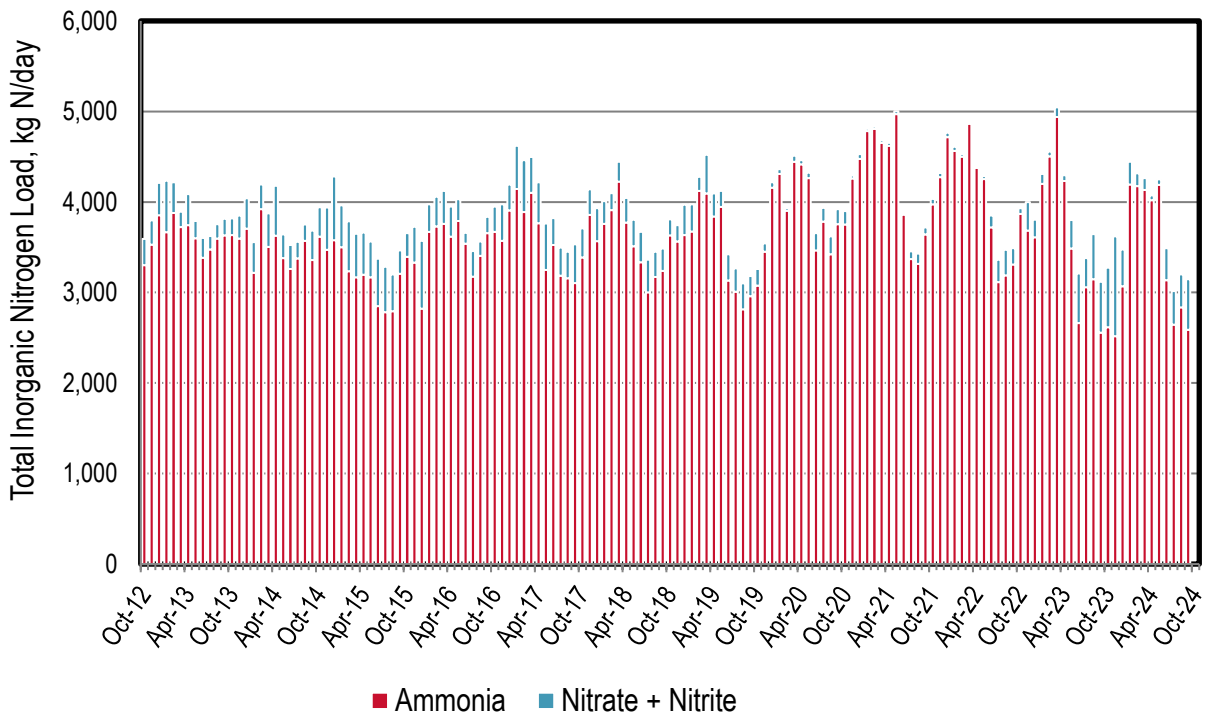


Figure 4-4. Discharge: Central San Monthly Nitrogen Loads

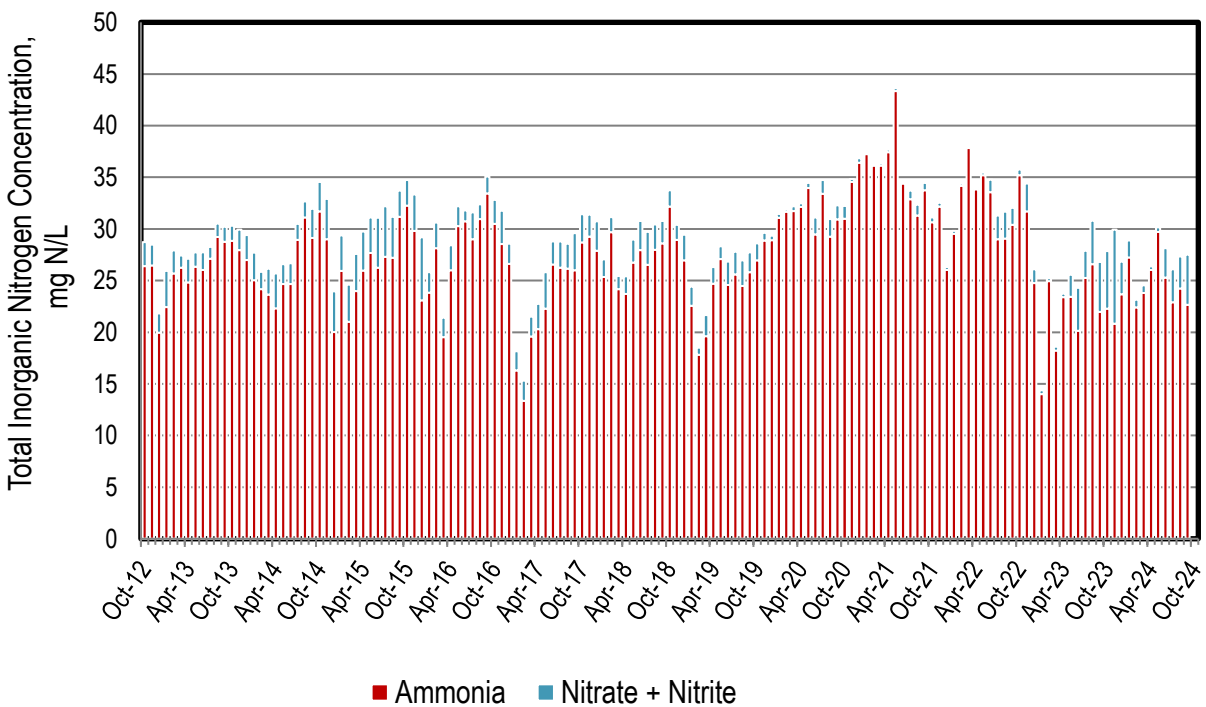


Figure 4-5. Discharge: Central San Monthly Nitrogen Concentrations

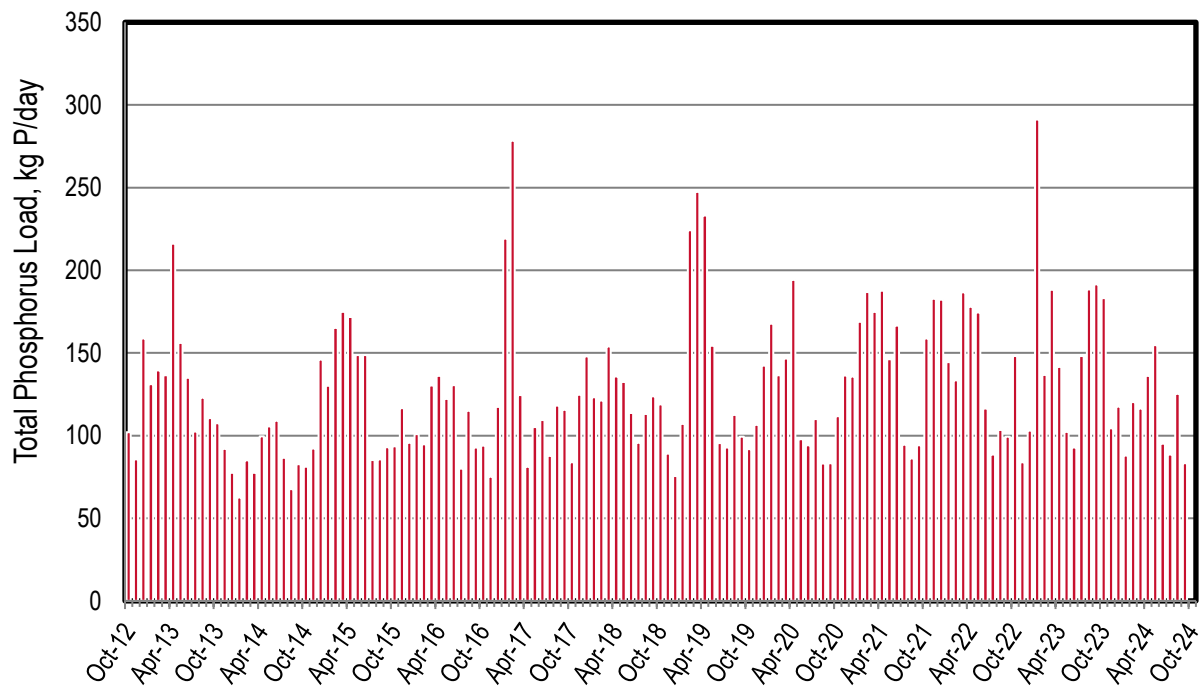


Figure 4-6. Discharge: Central San Monthly Phosphorus Loads

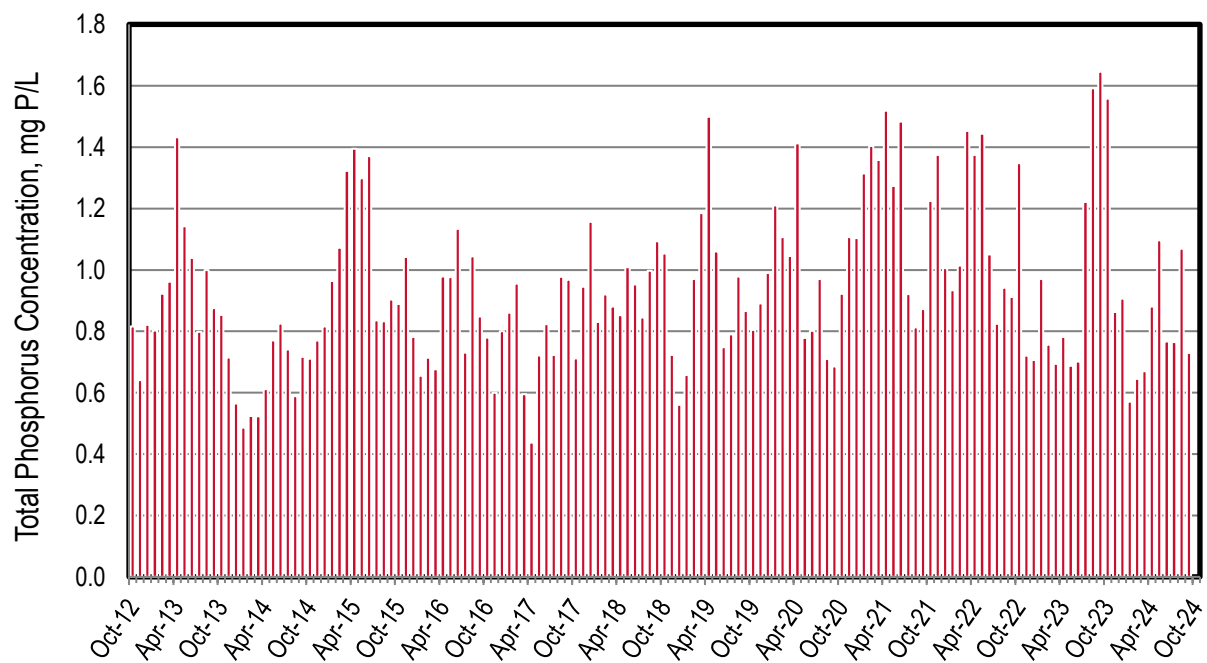


Figure 1-7. Discharge: Central San Monthly Phosphorus Concentrations

Recycled Water

Table 4-3. Recycled Water: Central San Yearly Recycled Water Flows Diverted from the Bay

Year**	Flow Diverted*, Acre-Feet/yr (mgd)							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	342 (0.31)	237 (0.21)	0 (0)	1,020 (0.91)	2 (≤ 0.01)	0 (0)	180 (0.16)	1,780 (1.59)
2020	373 (0.33)	242 (0.22)	0 (0)	924 (0.82)	3 (≤ 0.01)	0 (0)	262 (0.23)	1,800 (1.60)
2021	411 (0.37)	248 (0.22)	0 (0)	1,000 (0.89)	7 (0.01)	0 (0)	221 (0.20)	1,890 (1.69)
2022	355 (0.32)	264 (0.24)	0 (0)	1,070 (0.96)	9 (0.01)	0 (0)	265 (0.24)	1,960 (1.77)
2023	288 (0.26)	295 (0.26)	0 (0)	1,060 (0.95)	5 (≤ 0.01)	0 (0)	155 (0.14)	1,803 (1.61)
Average	354 (0.32)	257 (0.23)	0 (0)	1,015 (0.91)	5 (≤ 0.01)	0 (0)	217 (0.19)	1,848 (1.65)

* Assumes 100% of the recycled flow is diverted from the Bay

** Calendar year as opposed to California's water year (October 1 through September 30)

Table 4-4. Recycled Water: Central San Yearly Recycled Water Ammonia Load Diverted from the Bay

Year**	Average Ammonia Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	28	19	0	83	<1	0	15	145
2020	40	27	0	100	<1	0	28	194
2021	48	28	0	116	1	0	26	217
2022	39	29	0	116	1	0	29	214
2023	21	21	0	75	<1	0	11	127
Average	35	25	0	97	<1	0	22	179

* Assumes 100% of the recycled load is diverted from the Bay

** Calendar year as opposed to California's water year (October 1 through September 30)

Table 4-5. Recycled Water: Central San Yearly Recycled Water TIN Load Diverted from the Bay

Year**	Average Total Inorganic Nitrogen Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	30	20	0	88	<1	0	16	154
2020	41	27	0	102	<1	0	29	199
2021	48	29	0	115	1	0	26	219
2022	40	30	0	120	1	0	30	221
2023	22	22	0	81	<1	0	12	137
Average	36	26	0	101	1	0	22	186

* Assumes 100% of the recycled load is diverted for all recycled water applications

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 4-6. Recycled Water: Central San Yearly Recycled Water Total Phosphorus Load Diverted from the Bay

Year**	Average Total P Load Diverted*, kg P/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	1	1	0	3	<1	0	1	6
2020	1	1	0	3	<1	0	1	6
2021	2	1	0	4	<1	0	1	8
2022	1	1	0	4	<1	0	1	7
2023	1	1	0	3	<1	0	<1	6
Average	1	1	0	4	<1	0	1	6

* Assumes 100% of the recycled load is diverted for all recycled water applications

** **Calendar year as opposed to California's water year (October 1 through September 30)**

5 Central Marin Sanitation Agency (CMSA)

CMSA discharges to the Central Bay Subembayment and serves approximately 105,000 people via 52,200 service connections. The plant has a permitted ADWF capacity of 10.0 mgd. This past dry season average discharge flow was approximately 6.7 mgd. The plant performs secondary treatment using a trickling filter and activated sludge process.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Discharge

- ▲ Ammonia is the majority of the nitrogen species discharged, regardless of season. This would be expected since the plant was not designed to nitrify (some nitrification does occur in the secondary process, most likely in the biotowers).
- ▲ Ammonia/TIN concentrations increase during the dry weather season as flows decline. Total phosphorus concentrations range from less than 1 mg P/L to 6.4 mg P/L.
- ▲ Based on Table 5-1 statistics for the entire long term dry season dataset, all the monitored parameters are trending upwards, with the exception of nitrate plus nitrite.

◆ Recycled Water:

- ▲ Based on Table 1-2, the plant averages approximately 0.02 mgd annually of recycled water that is diverted from the Bay. Recycled water uses included landscape irrigation, industrial on-site application, and other off-site non-potable uses such as sewer flushing and dust control.
- ▲ Based on Table 5-3, Table 5-4, and Table 5-5 respectively, in the 2023 reporting period the plant diverted on average 2 kg ammonia-N/d, 2 kg TIN-N/d, and <1 kg P/d away from the Bay through recycled water.

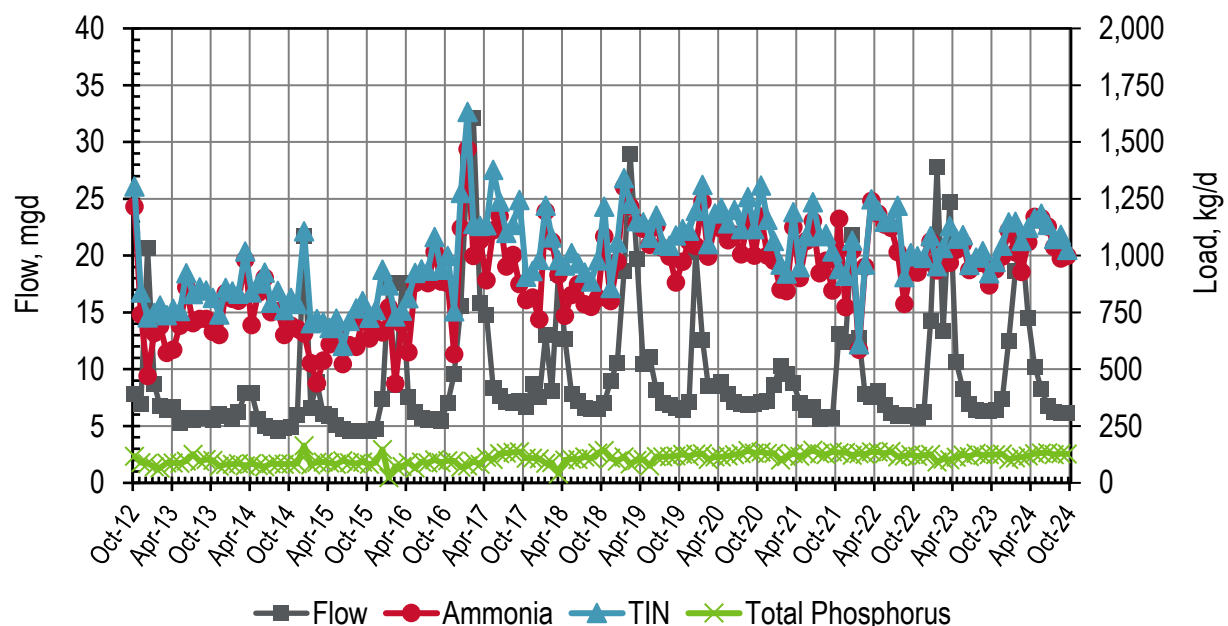


Figure 5-1. Discharge: CMSA Monthly Flows and Loads

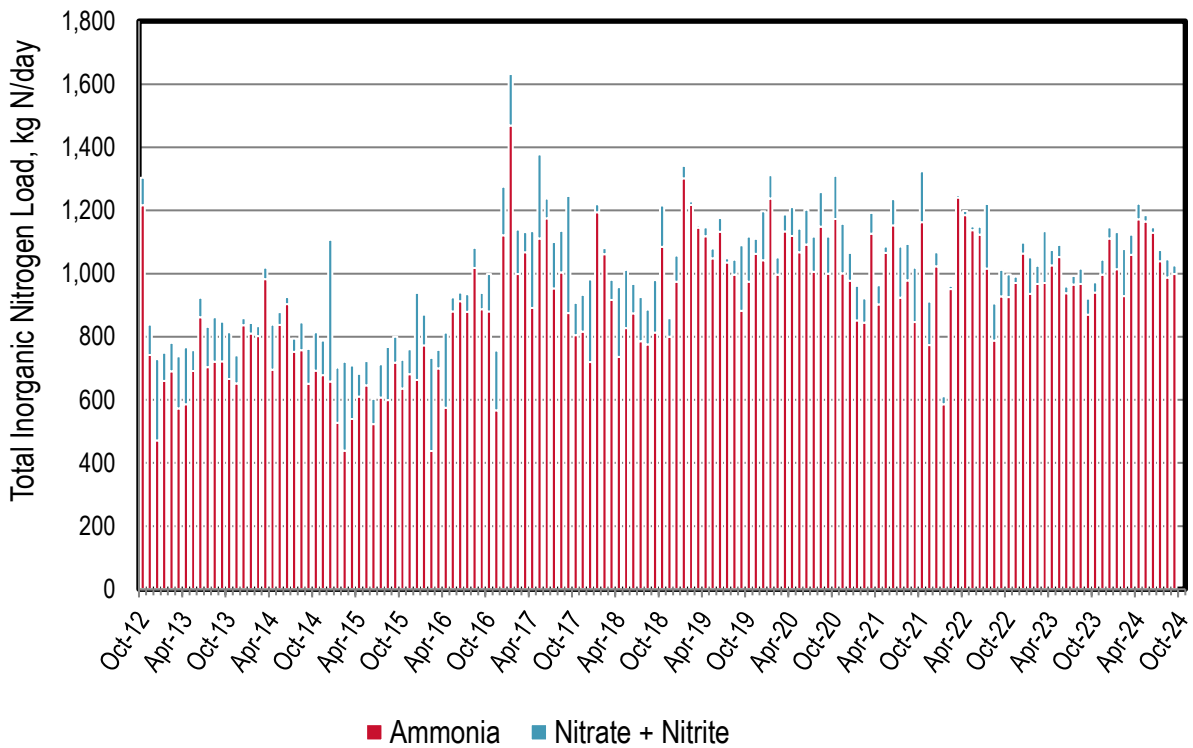


Figure 5-2. Discharge: CMSA Monthly Nitrogen Loads

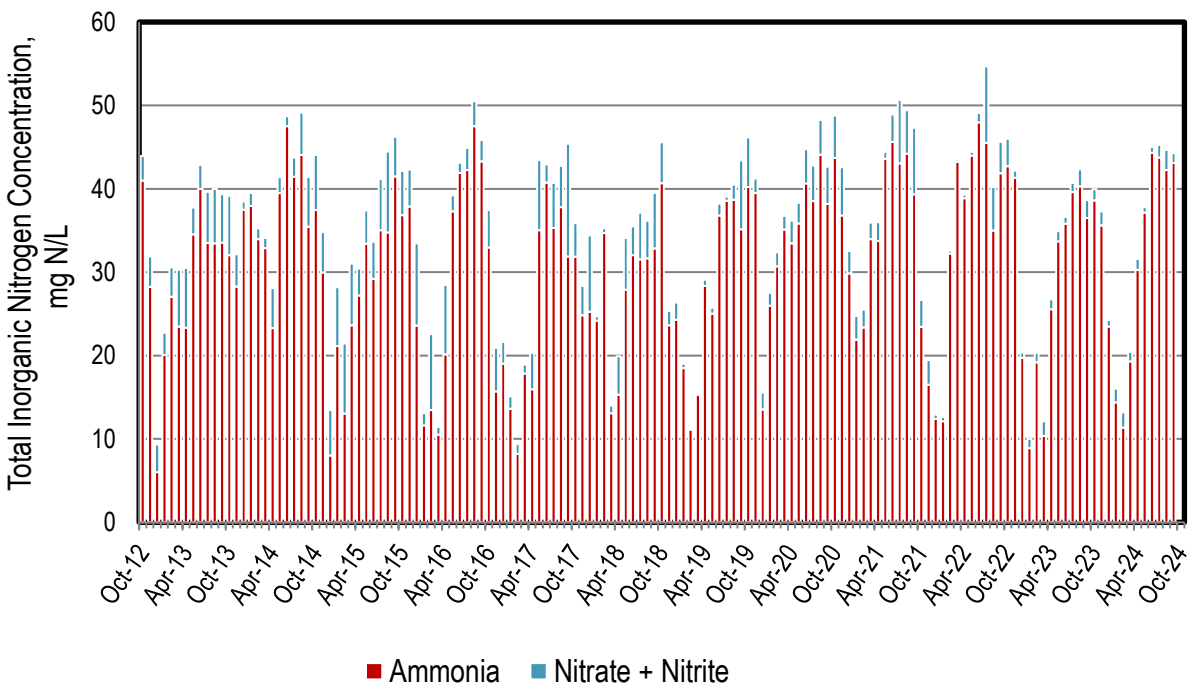


Figure 5-3. Discharge: CMSA Monthly Nitrogen Concentrations

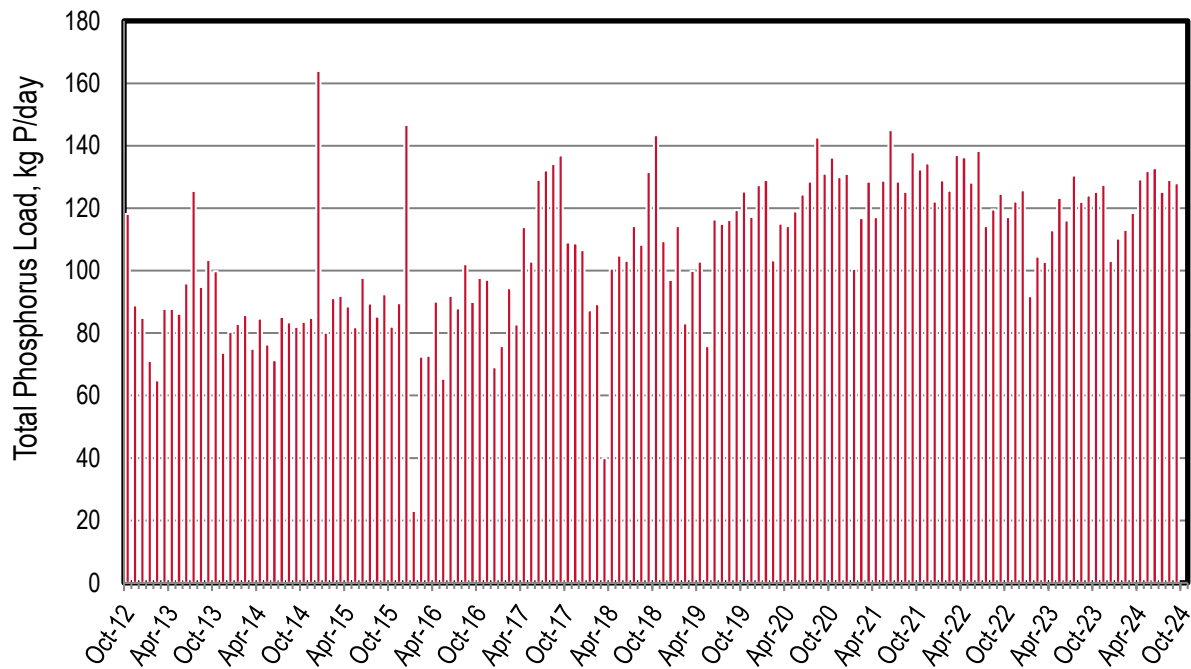


Figure 5-4. Discharge: CMSA Monthly Phosphorus Loads

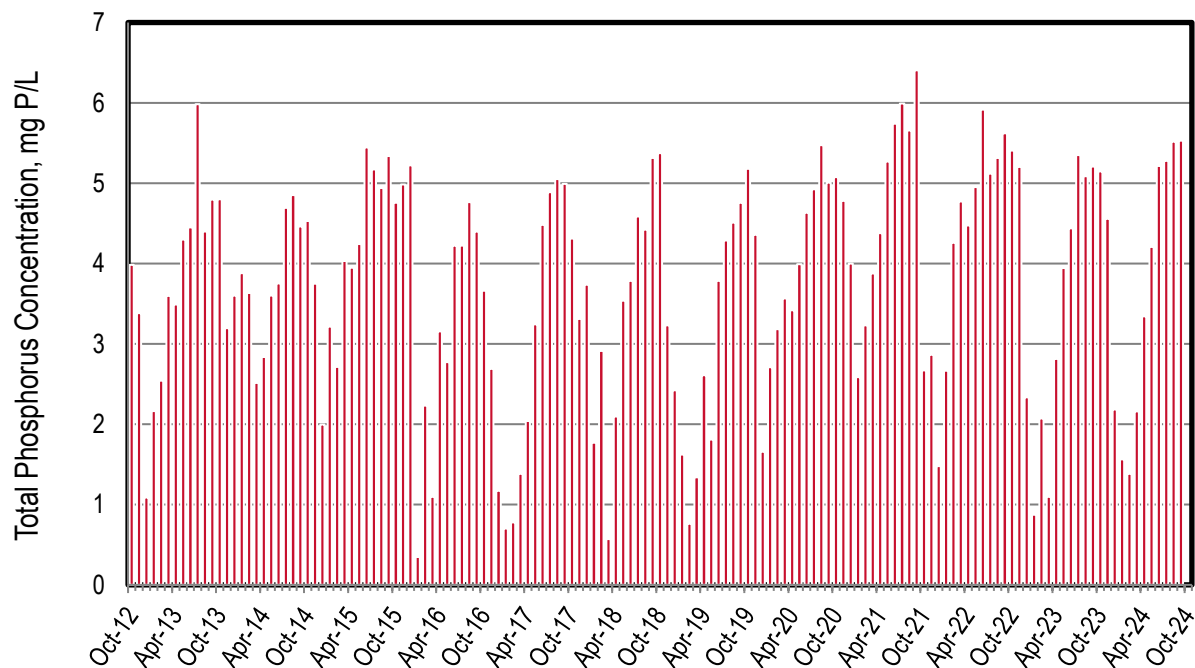


Figure 5-5. Discharge: CMSA Monthly Phosphorus Concentrations

Table 5-1. Discharge: CMSA Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	7.85	1,220	87.5	1,300	118
Nov-12	6.95	742	96.3	838	88.9
Dec-12	20.7	471	258	729	84.9
Jan-13	8.70	660	89.3	749	71.1
Feb-13	6.75	691	90.2	781	64.8
Mar-13	6.45	573	165	738	87.7
Apr-13	6.65	586	180	767	87.8
May-13	5.30	692	65.2	757	86.1
Jun-13	5.70	862	61.6	923	95.9
Jul-13	5.55	703	128	831	126
Aug-13	5.70	721	140	862	94.8
Sep-13	5.70	722	125	847	103
Oct-13	5.50	666	148	814	99.8
Nov-13	6.10	652	89.5	741	73.7
Dec-13	5.90	836	22.4	859	80.3
Jan-14	5.65	810	32.8	843	82.9
Feb-14	6.25	802	31.0	833	85.8
Mar-14	7.90	982	36.5	1,020	75.0
Apr-14	7.90	695	143	838	84.6
May-14	5.61	838	40.6	878	76.3
Jun-14	5.03	903	22.6	926	71.3
Jul-14	4.80	752	41.9	794	85.1
Aug-14	4.55	757	87.6	845	83.4
Sep-14	4.86	651	110	761	82.0
Oct-14	4.89	692	122	814	83.7
Nov-14	5.99	678	110	788	84.9
Dec-14	21.7	658	449	1,110	164
Jan-15	6.59	527	176	703	80.1
Feb-15	8.89	439	283	721	91.2
Mar-15	6.03	539	169	708	91.9
Apr-15	5.93	610	72.4	682	88.5
May-15	5.11	645	77.0	722	81.9
Jun-15	4.74	524	79.5	603	97.6
Jul-15	4.58	607	106	713	89.5
Aug-15	4.57	600	168	768	85.2
Sep-15	4.58	718	82.6	800	92.4

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-15	4.56	636	91.4	727	82.1
Nov-15	4.76	681	79.6	761	89.6
Dec-15	7.43	663	277	939	147
Jan-16	17.6	772	98.1	870	23.1
Feb-16	8.59	438	296	733	72.4
Mar-16	17.6	700	58.8	758	72.8
Apr-16	7.55	575	238	813	90.1
May-16	6.24	880	45.1	925	65.4
Jun-16	5.76	913	26.8	940	92.0
Jul-16	5.51	879	55.7	935	87.9
Aug-16	5.67	1,020	63.8	1,080	102
Sep-16	5.42	887	52.5	939	90.0
Oct-16	7.05	880	120	999	97.7
Nov-16	9.56	567	189	756	97.1
Dec-16	15.6	1,120	154	1,280	69.0
Jan-17	28.6	1,470	163	1,630	75.8
Feb-17	32.1	999	141	1,140	94.4
Mar-17	15.8	1,070	63.7	1,130	82.8
Apr-17	14.8	892	243	1,130	114
May-17	8.39	1,110	267	1,380	103
Jun-17	7.62	1,170	63.5	1,240	129
Jul-17	7.15	953	147	1,100	132
Aug-17	7.03	1,000	132	1,140	134
Sep-17	7.26	875	371	1,250	137
Oct-17	6.69	805	102	907	109
Nov-17	8.69	816	117	932	109
Dec-17	7.54	720	261	982	107
Jan-18	13.1	1,190	25.5	1,220	87.3
Feb-18	8.10	1,060	18.6	1,080	89.2
Mar-18	18.5	916	64.3	981	39.9
Apr-18	12.7	736	222	957	101
May-18	7.84	828	184	1,010	105
Jun-18	7.21	874	93.3	967	103
Jul-18	6.59	786	139	926	114
Aug-18	6.48	776	110	886	108
Sep-18	6.55	813	166	979	132
Oct-18	7.06	1,090	131	1,220	143

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-18	8.96	800	58.5	859	109
Dec-18	10.6	974	83.3	1,060	97.1
Jan-19	18.6	1,300	39.5	1,340	114
Feb-19	28.9	1,220	11.3	1,230	83.1
Mar-19	19.8	1,150	7.27	1,150	100.0
Apr-19	10.4	1,120	28.4	1,150	103
May-19	11.1	1,050	31.0	1,080	75.8
Jun-19	8.14	1,130	43.4	1,180	116
Jul-19	7.10	1,030	13.4	1,050	115
Aug-19	6.82	997	47.5	1,040	116
Sep-19	6.64	882	207	1,090	119
Oct-19	6.40	974	144	1,120	125
Nov-19	7.12	1,060	47.6	1,110	117
Dec-19	20.3	1,040	155	1,200	127
Jan-20	12.6	1,240	73.8	1,310	129
Feb-20	8.59	997	54.5	1,050	103
Mar-20	8.54	1,130	53.4	1,190	115
Apr-20	8.85	1,120	91.6	1,210	114
May-20	7.88	1,070	74.6	1,140	119
Jun-20	7.10	1,090	110	1,200	124
Jul-20	6.90	1,010	111	1,120	129
Aug-20	6.89	1,150	109	1,260	143
Sep-20	6.93	1,000	118	1,120	131
Oct-20	7.10	1,170	137	1,310	136
Nov-20	7.19	1,000	157	1,160	130
Dec-20	8.66	977	88.1	1,070	131
Jan-21	10.3	852	110	961	100
Feb-21	9.56	844	77.6	922	117
Mar-21	8.77	1,130	65.7	1,190	128
Apr-21	7.08	902	60.7	950	117
May-21	6.47	1,070	20.6	1,090	129
Jun-21	6.68	1,150	83.4	1,240	145
Jul-21	5.67	924	163	1,090	128
Aug-21	5.86	979	116	1,090	125
Sep-21	5.70	847	172	1,020	138
Oct-21	13.1	1,160	161	942	132
Nov-21	12.4	773	138	912	134

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-21	21.8	1,020	44.4	1,070	122
Jan-22	12.8	586	24.6	611	129
Feb-22	7.80	951	9.65	961	126
Mar-22	7.59	1,240	7.39	1,250	137
Apr-22	8.06	1,190	12.9	1,200	136
May-22	6.84	1,140	12.0	1,150	128
Jun-22	6.19	1,120	25.8	1,150	138
Jul-22	5.90	1,020	205	1,220	114
Aug-22	5.95	787	118	906	120
Sep-22	5.86	928	84.0	1,010	125
Oct-22	5.73	926	72.1	998	117
Nov-22	6.21	970	20.4	991	122
Dec-22	14.2	1,060	34.9	1,090	126
Jan-23	27.8	936	116	954	91.8
Feb-23	13.3	967	58.1	1,030	104
Mar-23	24.8	970	164	1,130	103
Apr-23	10.6	1,030	48.3	1,070	113
May-23	8.26	1,050	38.3	1,090	123
Jun-23	6.93	938	21.5	959	116
Jul-23	6.45	965	27.6	993	130
Aug-23	6.35	968	48.4	1,020	122
Sep-23	6.30	870	50.8	922	124
Oct-23	6.44	939	33.3	973	125
Nov-23	7.41	997	47.7	1,040	128
Dec-23	12.5	1,110	35.7	1,150	103
Jan-24	18.7	1,010	118	1,150	110
Feb-24	21.6	929	149	1,070	113
Mar-24	14.5	1,060	63.5	1,120	118
Apr-24	10.2	1,170	50.3	1,160	129
May-24	8.29	1,160	20.6	1,190	132
Jun-24	6.74	1,130	17.5	1,140	133
Jul-24	6.28	1,040	35.6	1,070	125
Aug-24	6.19	988	57.0	1,090	129
Sep-24	6.13	998	27.4	1,030	128

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dry Season Average	6.32	916	91.0	1,010	112
Dry Season Trend**	Up	Up	None	Up	Up
Wet Season Average	11.3	897	107	997	103
Average Annual	9.24	905	100	1,000	107

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

Recycled Water

Table 5-2. Recycled Water: CMSA Yearly Recycled Water Flows Diverted from the Bay

Year**	Flow Diverted*, Acre-Feet (mgd)							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0 (0)	26 (0.02)	0 (0)	--***	0 (0)	0 (0)	--***	26 (0.02)
2020	0 (0)	29 (0.03)	0 (0)	--***	0 (0)	0 (0)	--***	29 (0.03)
2021	0 (0)	25 (0.02)	0 (0)	--***	0 (0)	0 (0)	--***	25 (0.02)
2022	0 (0)	25 (0.02)	0 (0)	--***	0 (0)	0 (0)	--**	25 (0.02)
2023	0 (0)	22 (0.02)	0 (0)	--***	0 (0)	0 (0)	--**	22 (0.02)
Average	0 (0)	26 (0.02)	0 (0)	--***	0 (0)	0 (0)	--***	26 (0.02)

* Assumes 100% of the recycled flow is diverted from the Bay

** Calendar year as opposed to California's water year (October 1 through September 30)

*** CMSA has a recycled water Industrial Application user (averages approximately 1,180 AF per year (1.05 mgd)) and an Other Non-Potable Uses" user (averages approximately 2 AF per year (<0.01 mgd)). In both applications, the flows are not diverted from the Bay and thus not included as part of this effort.

Table 5-3. Recycled Water: CMSA Yearly Recycled Water Ammonia Load Diverted from the Bay

Year**	Average Ammonia Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	2	0	--***	0	0	--***	2
2020	0	4	0	--***	0	0	--***	4
2021	0	2	0	--***	0	0	--***	2
2022	0	3	0	--***	0	0	--***	3
2023	0	2	0	--***	0	0	--***	2
Average	0	2	0	--***	0	0	--***	2

* Assumes 100% of the recycled load is diverted from the Bay

** Calendar year as opposed to California's water year (October 1 through September 30)

*** CMSA has a recycled water Industrial Application user (averages approximately 127 kg N/d) and an Other Non-Potable Uses" user (averages approximately <1 kg N/d). In both applications, the loads are not diverted from the Bay and thus not included as part of this effort.

Table 5-4. Recycled Water: CMSA Yearly Recycled Water Total Inorganic Nitrogen Load Diverted from the Bay

Year**	Average Total Inorganic Nitrogen Load Diverted*, kg N/d							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	0	2	0	--***	0	0	--***	2
2020	0	4	0	--***	0	0	--***	4
2021	0	2	0	--***	0	0	--***	2
2022	0	3	0	--***	0	0	--***	3
2023	0	2	0	--***	0	0	--***	2
Average	0	3	0	--***	0	0	--***	3

* Assumes 100% of the recycled load is diverted for all recycled water applications

** Calendar year as opposed to California's water year (October 1 through September 30)

*** CMSA has a recycled water Industrial Application user (averages approximately 138 kg N/d) and an Other Non-Potable Uses" user (averages approximately <1 kg N/d). In both applications, the loads are not diverted from the Bay and thus not included as part of this effort.

Table 5-5. Recycled Water: CMSA Yearly Recycled Water Total P Load Diverted from the Bay

Year**	Average Total P Load Diverted*, kg P/d							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	0	<1	0	--***	0	0	--***	<1
2020	0	<1	0	--***	0	0	--***	<1
2021	0	<1	0	--***	0	0	--***	<1
2022	0	<1	0	--***	0	0	--***	<1
2023	0	<1	0	--***	0	0	--***	<1
Average	0	<1	0	--***	0	0	--***	<1

* Assumes 100% of the recycled load is diverted for all recycled water applications

** Calendar year as opposed to California's water year (October 1 through September 30)

*** CMSA has a recycled water Industrial Application user (averages approximately 15 kg P/d) and an Other Non-Potable Uses" user (averages approximately <1 kg P/d). In both applications, the loads are not diverted from the Bay and thus not included as part of this effort.

6 Crockett Community Services District - Port Costa

The Crockett Community Services District serves two distinct separate communities, the town of Crockett and the town of Port Costa, each with their own treatment plant facilities. The Crockett Sanitary Department is excluded from the requirements of the Nutrient NPDES Order No. R2-2014-0014 as it shares use of an industrial wastewater treatment plant with C&H Sugar which has submitted its own sampling plan. The town of Port Costa has its own municipal wastewater treatment plant which is covered under the Nutrient NPDES Order. This analysis focuses on Port Costa.

The Community of Port Costa uses the Port Costa Wastewater Treatment Plant to discharge to the Carquinez Straight, which is connected to San Pablo Bay. The service area population is approximately 250 people. The plant has a permitted ADWF capacity of 0.033 mgd. This past dry season average discharge flow was approximately 0.024 mgd. The plant performs secondary treatment using a septic tank for solids separation, followed by filtration and disinfection.

Port Costa was exempt from the Section 13267 Letter sampling requirements due to their permitted capacity flow (<1 mgd). The following observations are made based upon the available data presented in figures and table in the subsequent pages:

◆ Discharge

- ▲ The dataset is limited to flow, ammonia a few times per year, and most recently occasional nitrate + nitrite, TIN and TP samples.
- ▲ Ammonia loads typically increase with flow during wet weather events. There is insufficient TIN and TP data to comment on trends.
- ▲ Based on Table 6-1's statistics for the entire dry season dataset, dry season flows and ammonia loads over the entire dataset are trending upwards.

◆ Recycled Water: No recycled water was produced or distributed this past year.

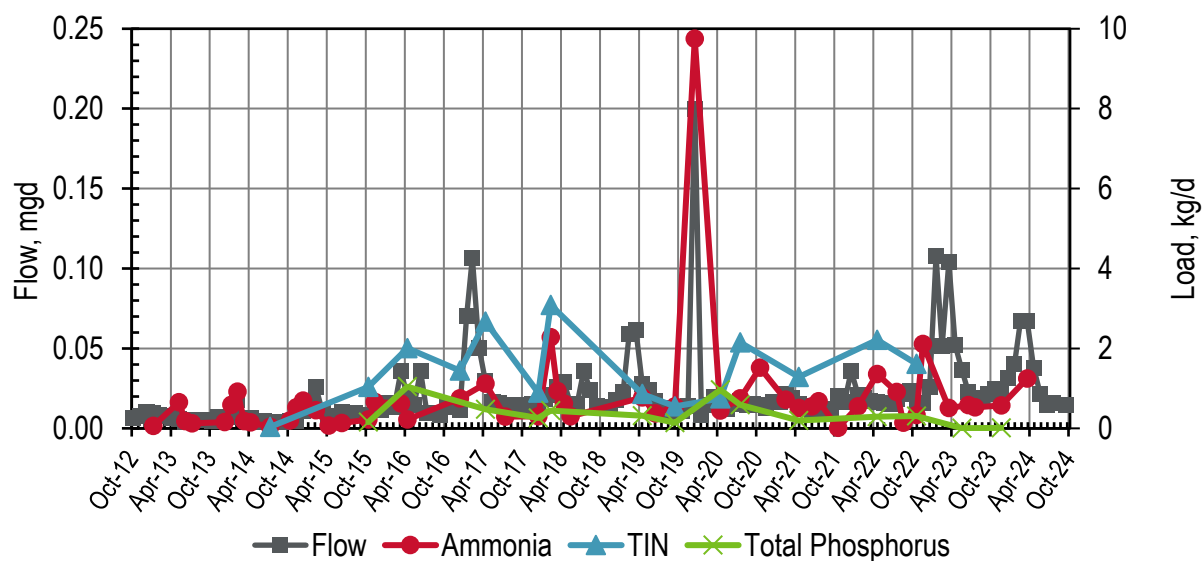


Figure 6-1. Discharge: Port Costa Monthly Flows and Loads

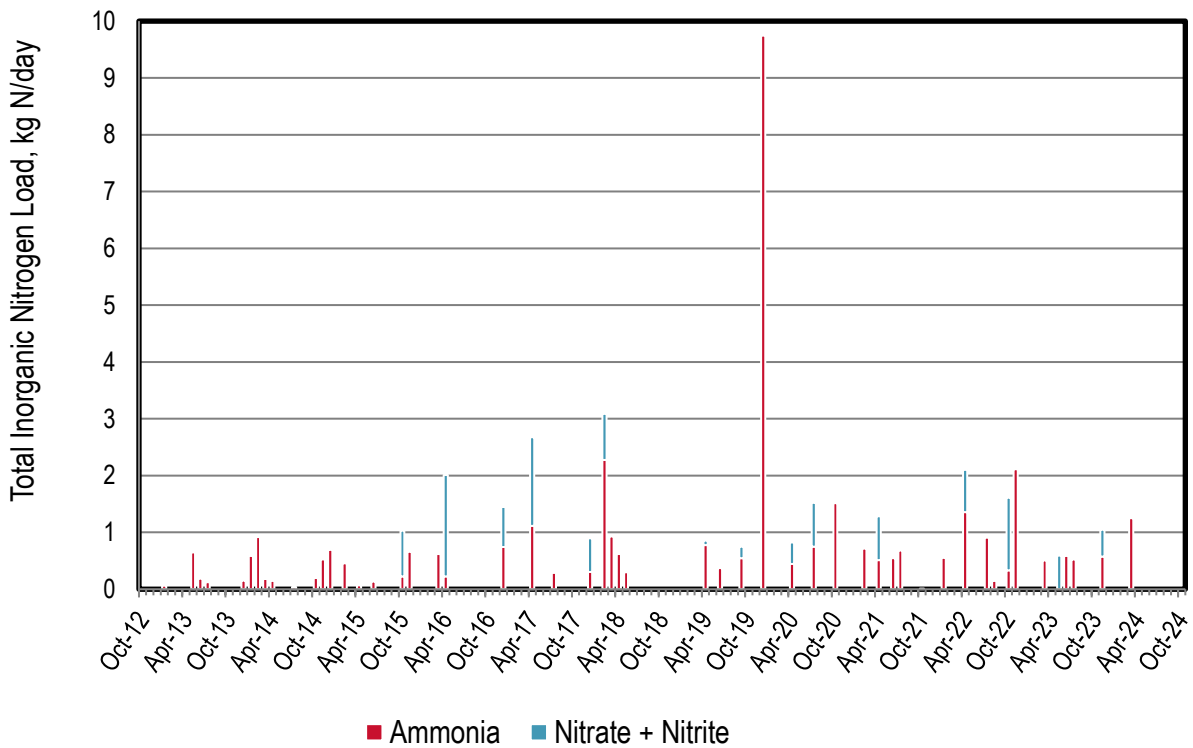


Figure 6-2. Discharge: Port Costa Monthly Ammonia Loads

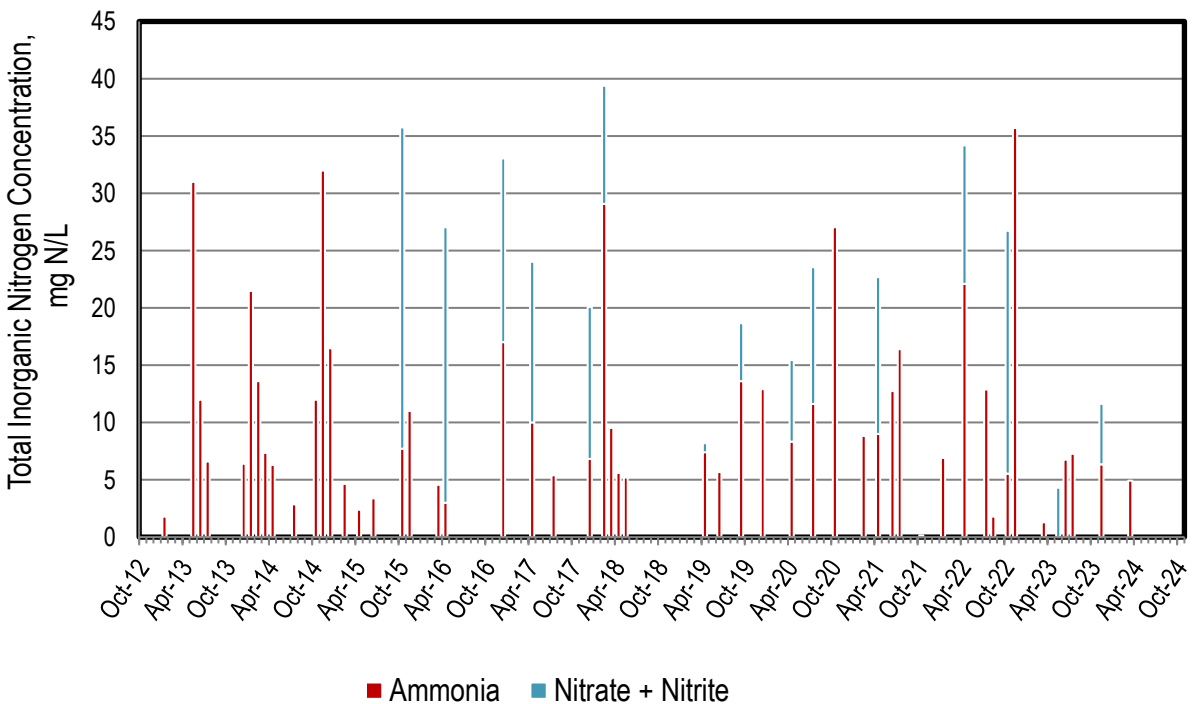


Figure 6-3. Discharge: Port Costa Monthly Ammonia Concentrations

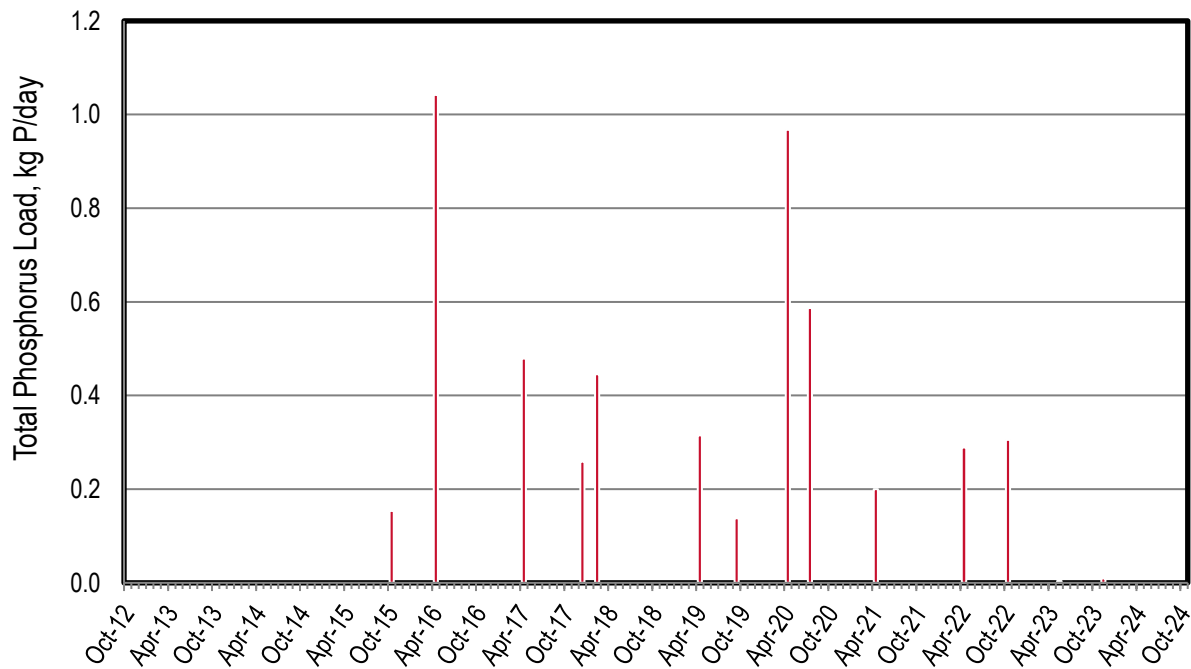


Figure 6-4. Discharge: Port Costa Monthly Phosphorus Loads

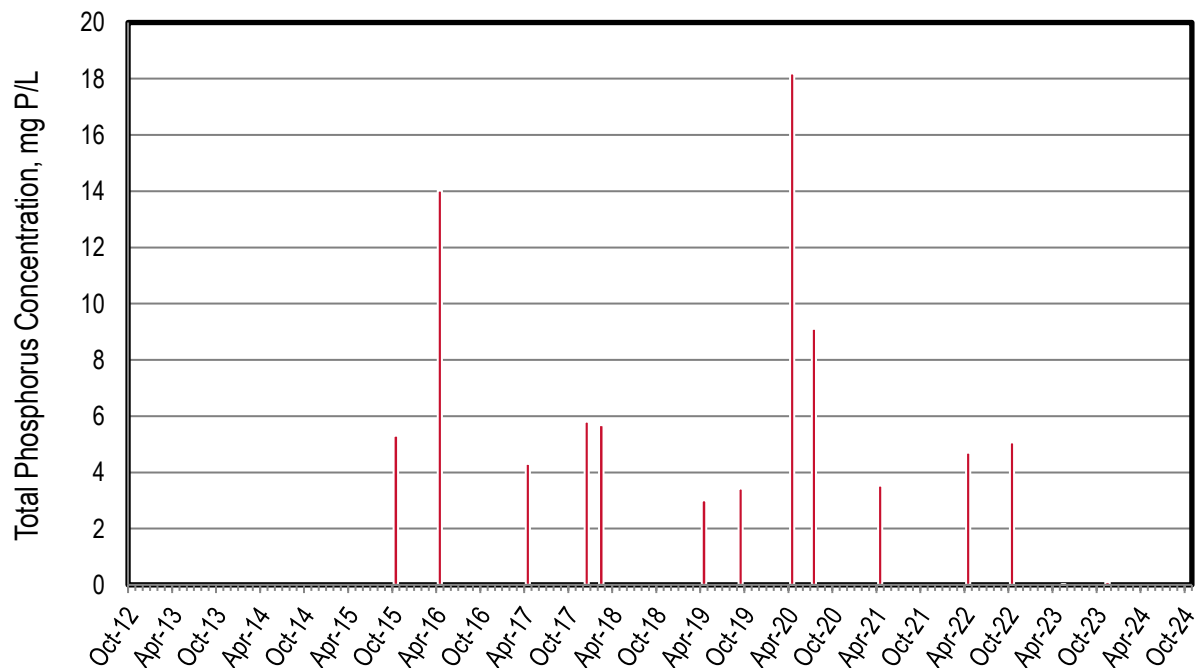


Figure 6-5. Discharge: Port Costa Monthly Phosphorus Concentrations

Table 6-1. Discharge: Port Costa Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	0.00640	--	--	--	--
Nov-12	0.00795	--	--	--	--
Dec-12	0.0103	--	--	--	--
Jan-13	0.00934	0.0636	--	--	--
Feb-13	0.00855	--	--	--	--
Mar-13	0.00780	--	--	--	--
Apr-13	0.00680	--	--	--	--
May-13	0.00555	0.650	--	--	--
Jun-13	0.00405	0.184	--	--	--
Jul-13	0.00497	0.124	--	--	--
Aug-13	0.00483	--	--	--	--
Sep-13	0.00538	--	--	--	--
Oct-13	0.00473	--	--	--	--
Nov-13	0.00688	--	--	--	--
Dec-13	0.00631	0.153	--	--	--
Jan-14	0.00720	0.585	--	--	--
Feb-14	0.0179	0.920	--	--	--
Mar-14	0.00644	0.179	--	--	--
Apr-14	0.00622	0.148	--	--	--
May-14	0.00409	--	--	--	--
Jun-14	0.00456	--	--	--	--
Jul-14	0.00354	0.0381	--	0.0381	--
Aug-14	0.00419	--	--	--	--
Sep-14	0.00361	--	--	--	--
Oct-14	0.00430	0.195	--	--	--
Nov-14	0.00433	0.524	--	--	--
Dec-14	0.0111	0.691	--	--	--
Jan-15	0.0153	--	--	--	--
Feb-15	0.0259	0.455	--	--	--
Mar-15	0.0108	--	--	--	--
Apr-15	0.00747	0.0678	--	--	--
May-15	0.00695	--	--	--	--
Jun-15	0.0103	0.133	--	--	--
Jul-15	0.00829	--	--	--	--
Aug-15	0.00941	--	--	--	--
Sep-15	0.00838	--	--	--	--

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-15	0.00765	0.223	0.810	1.03	0.153
Nov-15	0.0159	0.660	--	--	--
Dec-15	0.0118	--	--	--	--
Jan-16	0.0159	--	--	--	--
Feb-16	0.0133	--	--	--	--
Mar-16	0.0359	0.618	--	--	--
Apr-16	0.0197	0.223	1.79	2.01	1.04
May-16	0.0147	--	--	--	--
Jun-16	0.0359	--	--	--	--
Jul-16	0.00966	--	--	--	--
Aug-16	0.00964	--	--	--	--
Sep-16	0.00859	--	--	--	--
Oct-16	0.0132	--	--	--	--
Nov-16	0.0142	--	--	--	--
Dec-16	0.0116	0.746	0.702	1.45	
Jan-17	0.0702	--	--	--	--
Feb-17	0.107	--	--	--	--
Mar-17	0.0503	--	--	--	--
Apr-17	0.0294	1.11	1.56	2.67	0.479
May-17	0.0166	--	--	--	--
Jun-17	0.0156	--	--	--	--
Jul-17	0.0142	0.290	--	--	--
Aug-17	0.0127	--	--	--	--
Sep-17	0.0143	--	--	--	--
Oct-17	0.0117	--	--	--	--
Nov-17	0.0151	--	--	--	--
Dec-17	0.0118	0.304	0.591	0.896	0.259
Jan-18	0.0182	--	--	--	--
Feb-18	0.0207	2.28	0.808	3.09	0.445
Mar-18	0.0258	0.932	--	--	--
Apr-18	0.0292	0.618	--	--	--
May-18	0.0151	0.296	--	--	--
Jun-18	0.0150	--	--	--	--
Jul-18	0.0361	--	--	--	--
Aug-18	0.0242	--	--	--	--
Sep-18	0.0138	--	--	--	--
Oct-18	0.0131	--	--	--	--

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-18	0.0127	--	--	--	--
Dec-18	0.0176	--	--	--	--
Jan-19	0.0224	--	--	--	--
Feb-19	0.0587	--	--	--	--
Mar-19	0.0614	--	--	--	--
Apr-19	0.0277	0.775	0.0824	0.858	0.315
May-19	0.0237	--	--	--	--
Jun-19	0.0174	0.374	--	--	--
Jul-19	0.0128	--	--	--	--
Aug-19	0.0100	--	--	--	--
Sep-19	0.0106	0.547	0.203	0.552	0.138
Oct-19	0.0110	--	--	--	--
Nov-19	0.0141	--	--	--	--
Dec-19	0.200	9.75	--	--	--
Jan-20	0.00847	--	--	--	--
Feb-20	0.0144	--	--	--	--
Mar-20	0.0193	--	--	--	--
Apr-20	0.0141	0.444	0.378	0.746	0.968
May-20	0.0123	--	--	--	--
Jun-20	0.0152	--	--	--	--
Jul-20	0.0170	0.749	0.769	2.15	0.587
Aug-20	0.0144	--	--	--	--
Sep-20	0.0155	--	--	--	--
Oct-20	0.0148	1.51	--	--	--
Nov-20	0.0127	--	--	--	--
Dec-20	0.0165	--	--	--	--
Jan-21	0.0165	--	--	--	--
Feb-21	0.0214	0.715	--	--	--
Mar-21	0.0187	--	--	--	--
Apr-21	0.0150	0.511	0.776	1.29	0.200
May-21	0.0139	--	--	--	--
Jun-21	0.0113	0.546	--	--	--
Jul-21	0.0110	0.680	--	--	--
Aug-21	0.0106	--	--	--	--
Sep-21	0.0120	--	--	--	--
Oct-21	0.0204	0.0118			
Nov-21	0.0165				

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-21	0.0359				
Jan-22	0.0211	0.550			
Feb-22	0.0191				
Mar-22	0.0169				
Apr-22	0.0163	1.36	0.744	2.22	0.289
May-22	0.0161				
Jun-22	0.0149				
Jul-22	0.0186	0.905			
Aug-22	0.0213	0.144			
Sep-22	0.0231				
Oct-22	0.0160	0.334	1.28	1.61	0.305
Nov-22	0.0157	2.11			
Dec-22	0.0256				
Jan-23	0.108				
Feb-23	0.0514				
Mar-23	0.104	0.506			
Apr-23	0.0520				
May-23	0.0363		0.591		0.00366
Jun-23	0.0228	0.583			
Jul-23	0.0189	0.522			
Aug-23	0.0186				
Sep-23	0.0216				
Oct-23	0.0242				
Nov-23	0.0239	0.573	0.477		0.00958
Dec-23	0.0314				
Jan-24	0.0400				
Feb-24	0.0674				
Mar-24	0.0671	1.25			
Apr-24	0.0380				
May-24	0.0213				
Jun-24	0.0145				
Jul-24	0.0162				
Aug-24					
Sep-24	0.0148				

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dry Season Average	0.0141	0.338	0.313	0.457	0.146
Dry Season Trend **,***	Up	Up	None	None	None
Wet Season Average	0.0257	0.917	0.833	1.62	0.406
Average Annual	0.0209	0.762	0.770	1.47	0.371

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis. There is insufficient data for a trending analysis for nutrients other than Ammonia.

*** Insufficient sampling to perform trending analysis.

Recycled Water

No recycled water was produced or distributed this past year.

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7 Delta Diablo

Delta Diablo discharges to New York Slough (part of the Suisun Bay) and serves approximately 72,100 service connections throughout Antioch, Pittsburg, and Bay Point. The plant has a permitted ADWF capacity of 19.5 mgd. The average discharge flow this past dry season was approximately 7.9 mgd. The plant performs secondary treatment using trickling filters, followed by activated sludge. Secondary effluent (up to 12.8 mgd) is diverted upstream of the disinfection process and sent for tertiary treatment prior to distribution to recycled water users. Approximately 90-95% of the recycled water is sent to two power plants for use in their cooling towers. The blowdown from the cooling towers is returned to the secondary treatment plant, blended with secondary effluent, and disinfected prior to discharge.

The following observations on influent and discharge are made based upon the figures and tables in the subsequent pages:

◆ Influent:

- ▲ Note: limited to data since July 2019; quarterly required but more provided for various parameters. Based on this limited dataset, there is an emerging dry season upward trend for flow (refer to Table 7-1). None of the nutrient parameters have emerging trends.
- ▲ The overall reduction in effluent flow discharged to the Bay ranges from 16 to 60 percent (refer to Figure 7-2), depending on the cooling tower makeup water demand, cooling tower blowdown return flow, and other landscape irrigation recycled water demands.
- ▲ The observed nitrogen load reduction across the plant is approximately 45 to 80 percent. This is largely attributed to a combination of biological assimilation, cooling tower operations, and landscape irrigation recycled water demands.
- ▲ The observed total phosphorus load reduction across the plant are on the order of 75 to 95+ percent (with the exception of October 2019). This is largely attributed to chemical precipitation at the recycled water facility (RWF), biological assimilation, and landscape irrigation recycled water use.

◆ Discharge:

- ▲ The variability of nitrogen species in the effluent (refer to Figure 7-5) is primarily attributed to the power plant cooling tower operation. Power plant staff have indicated that the cooling tower operation partially nitrifies to control biological growth in the cooling towers; additional losses may also be attributed to other operational parameters (e.g., drift, breakpoint chlorination, etc). It should be noted that the power plants have indicated that when the District implements nitrogen removal, the cooling tower operation will be modified to no longer partially nitrify; thus, the District would likely not observe nitrogen reduction at the power plants after nitrogen removal is performed at the WWTP.
- ▲ Nutrient loads typically increase with flow during wet weather events.
- ▲ TIN concentrations are variable, ranging from 27 to 84 mg N/L, though concentrations have typically been <50 mg N/L in recent years. This is largely due to the variability associated with the ratio of blowdown to secondary effluent.
- ▲ TP concentrations are generally less than 2 mg P/L, which suggests that the plant is removing phosphorus as previously noted.

Based on Table 7-2 statistics for the entire dry season dataset, flows and ammonia loads discharged to the Bay are trending upwards, nitrite plus nitrate loads discharged to the Bay are trending downwards, and TIN and TP loads discharged to the Bay have no trends.

◆ Recycled Water:

- ▲ Based on Table 1-2, over the 2023 calendar year, approximately 4.7 mgd of recycled water was diverted offsite for use as golf course irrigation, landscape irrigation, and for use with commercial and industrial customers.
- ▲ Based on Table 5-3 through Table 5-5, the average annual load diverted from the Bay in 2023 was 52 kg ammonia-N/d, 53 kg TIN-N/d, and 2 kg P/d.

Influent

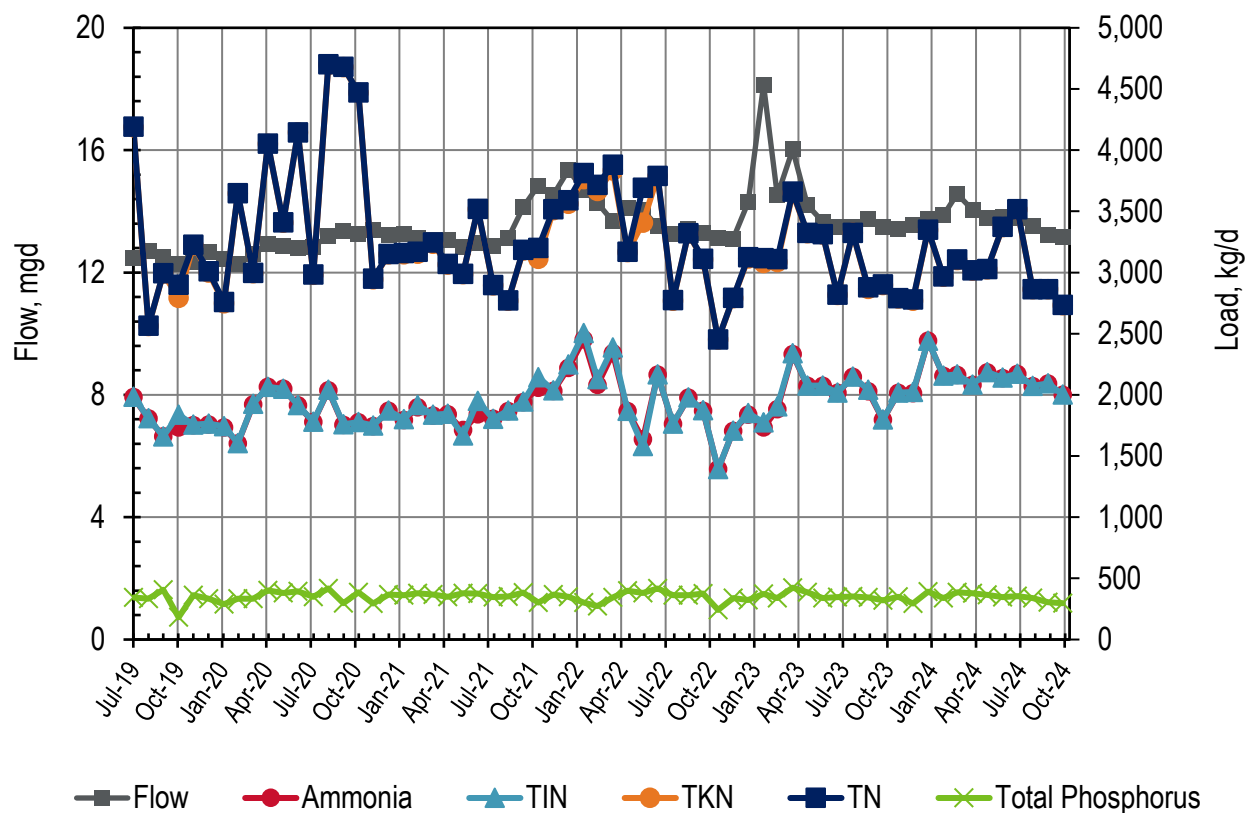


Figure 7-1. Influent: Delta Diablo Monthly Flows and Loads

Note: the ammonia/TIN loads and TKN/Total N loads are comparable. The ammonia and TKN values are located behind TIN and Total N loads and thus are not visible.

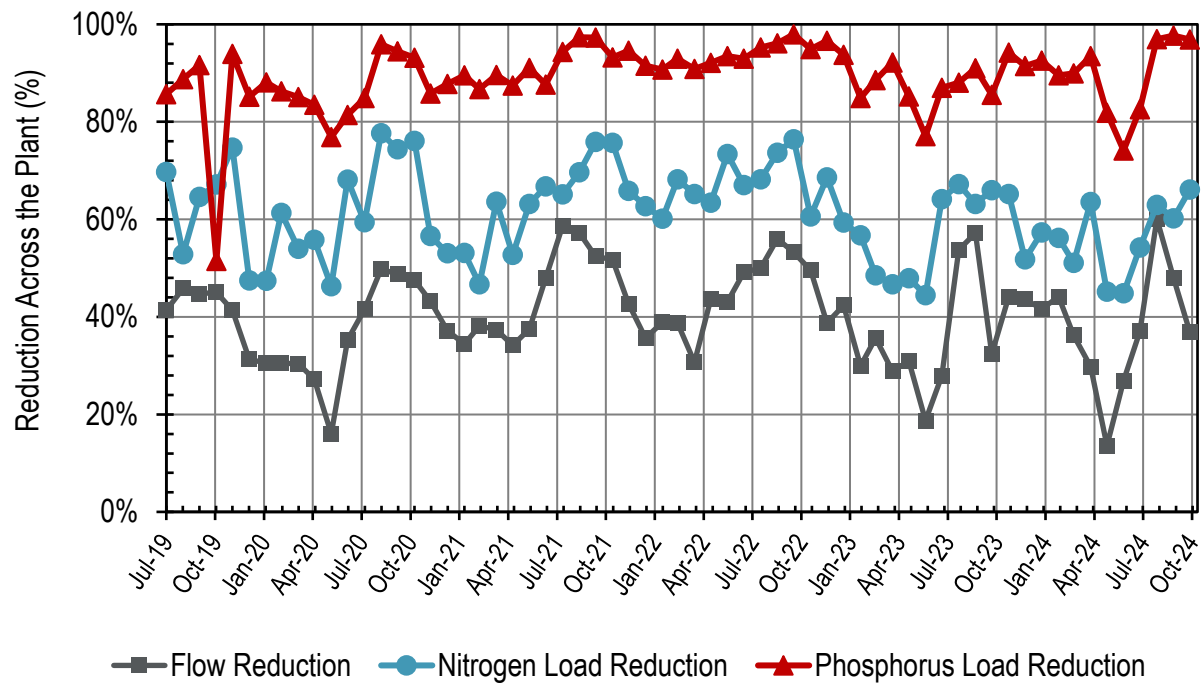


Figure 7-2. Influent: Delta Diablo Monthly Reductions Across the Plant

Note: Influent TN was compared against Discharge TIN for calculating nitrogen load reduction.

Table 7-1. Influent: Delta Diablo Monthly Flows and Loads

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-19	12.5	1,980	3.27	1,980	4,188	4,190	344
Aug-19	12.7	1,800	3.35	1,810	2,562	2,565	333
Sep-19	12.5	1,660	2.18	1,660	2,992	2,994	407
Oct-19	12.3	1,730	106.00	1,840	2,793	2,899	182
Nov-19	12.4	1,750	4.72	1,760	3,222	3,227	362
Dec-19	12.7	1,760	9.47	1,770	3,000	3,009	334
Jan-20	12.4	1,730	9.95	1,740	2,748	2,758	289
Feb-20	12.3	1,600	2.58	1,600	3,645	3,647	335
Mar-20	12.6	1,920	3.74	1,930	2,994	2,997	334
Apr-20	12.9	2,060	2.25	2,070	4,051	4,053	401
May-20	12.9	2,050	2.31	2,050	3,407	3,408	380
Jun-20	12.8	1,910	1.90	1,920	4,144	4,145	394
Jul-20	12.8	1,780	1.92	1,780	2,981	2,982	349
Aug-20	13.2	2,040	5.42	2,040	4,698	4,702.	418
Sep-20	13.4	1,750	4.03	1,760	4,677	4,681	296

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Oct-20	13.3	1,780	2.37	1,780	4,470	4,470	385
Nov-20	13.4	1,740	3.52	1,750	2,940	2,950	294
Dec-20	13.2	1,870	2.00	1,870	3,150	3,150	369
Jan-21	13.2	1,790	9.03	1,800	3,150	3,160	361
Feb-21	13.1	1,900	17.20	1,920	3,150	3,170	377
Mar-21	13.1	1,830	8.06	1,840	3,240	3,240	368
Apr-21	13.1	1,840	4.89	1,850	3,060	3,070	348
May-21	12.8	1,710	1.86	1,670	2,990	2,990	378
Jun-21	12.9	1,840	2.05	1,950	3,520	3,520	376
Jul-21	12.9	1,800	2.41	1,800	2,900	2,900	347
Aug-21	13.1	1,870	3.30	1,870	2,770	2,770	353
Sep-21	14.1	1,940	6.98	1,950	3,180	3,190	383
Oct-21	14.8	2,060	87.70	2,140	3,110	3,200	301
Nov-21	14.5	2,030	6.56	2,040	3,510	3,520	368
Dec-21	15.3	2,220	28.30	2,250	3,560	3,590	348
Jan-22	14.7	2,450	51.10	2,500	3,760	3,810	301
Feb-22	14.3	2,080	48.30	2,130	3,670	3,720	272
Mar-22	13.7	2,340	48.90	2,390	3,830	3,880	343
Apr-22	14.1	1,870	3.72	1,870	3,170	3,170	398
May-22	14.0	1,640	2.95	1,580	3,410	3,690	381
Jun-22	13.5	2,170	2.88	2,170	3,790	3,790	417
Jul-22	13.2	1,760	4.63	1,770	2,770	2,770	362
Aug-22	13.4	1,980	2.27	1,980	3,320	3,320	363
Sep-22	13.3	1,870	3.67	1,870	3,110	3,110	376
Oct-22	13.1	1,390	1.81	1,390	2,450	2,450	243
Nov-22	13.1	1,700	2.93	1,710	2,790	2,790	338
Dec-22	14.3	1,840	11.50	1,850	3,110	3,120	324
Jan-23	18.1	1,730	40.50	1,770	3,080	3,120	372
Feb-23	14.5	1,880	23.30	1,910	3,090	3,110	338
Mar-23	16.0	2,330	8.53	2,340	3,650	3,660	424
Apr-23	14.2	2,070	2.96	2,070	3,320	3,320	387
May-23	13.7	2,070	3.21	2,080	3,310	3,310	338
Jun-23	13.5	2,020	2.66	2,020	2,820	2,820	346
Jul-23	13.5	2,150	1.02	2,150	3,320	3,320	353
Aug-23	13.7	2,030	13.40	2,040	2,870	2,880	345
Sep-23	13.5	1,790	4.03	1,800	2,900	2,900	320
Oct-23	13.4	2,020	2.51	2,020	2,790	2,790	349

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Nov-23	13.5	2,010	10.1	2,020	2,770	2,780	295
Dec-23	13.8	2,440	2.06	2,440	3,350	3,350	391
Jan-24	13.9	2,150	2.95	2,160	2,970	2,970	340
Feb-24	14.6	2,160	5.78	2,170	3,100	3,110	385
Mar-24	14.0	2,080	2.62	2,080	3,020	3,020	379
Apr-24	13.8	2,180	3.56	2,190	3,020	3,030	366
May-24	13.8	2,140	3.50	2,140	3,370	3,370	347
Jun-24	13.8	2,170	3.64	2,170	3,510	3,520	354
Jul-24	13.5	2,070	1.84	2,070	2,860	2,860	340
Aug-24	13.2	2,090	2.19	2,090	2,860	2,860	304
Sep-24	13.2	2,000	2.68	2,000	2,730	2,740	296
Dry Season Average	13.3	1,930	3.41	1,930	3,280	3,300	357
Dry Season Trend ***	Up	None	None	None	None	None	None
Wet Season Average	13.8	1,950	16.6	1,970	3,220	3,240	343
Average Annual	13.5	1,940	10.7	1,950	3,250	3,260	349

* Delta Diablo typically samples more than the required influent quarterly sampling. This dataset includes this additional sampling.

** The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values. The Total Nitrogen value is calculated by adding "TKN" and "Nitrate + Nitrite".

*** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

Discharge

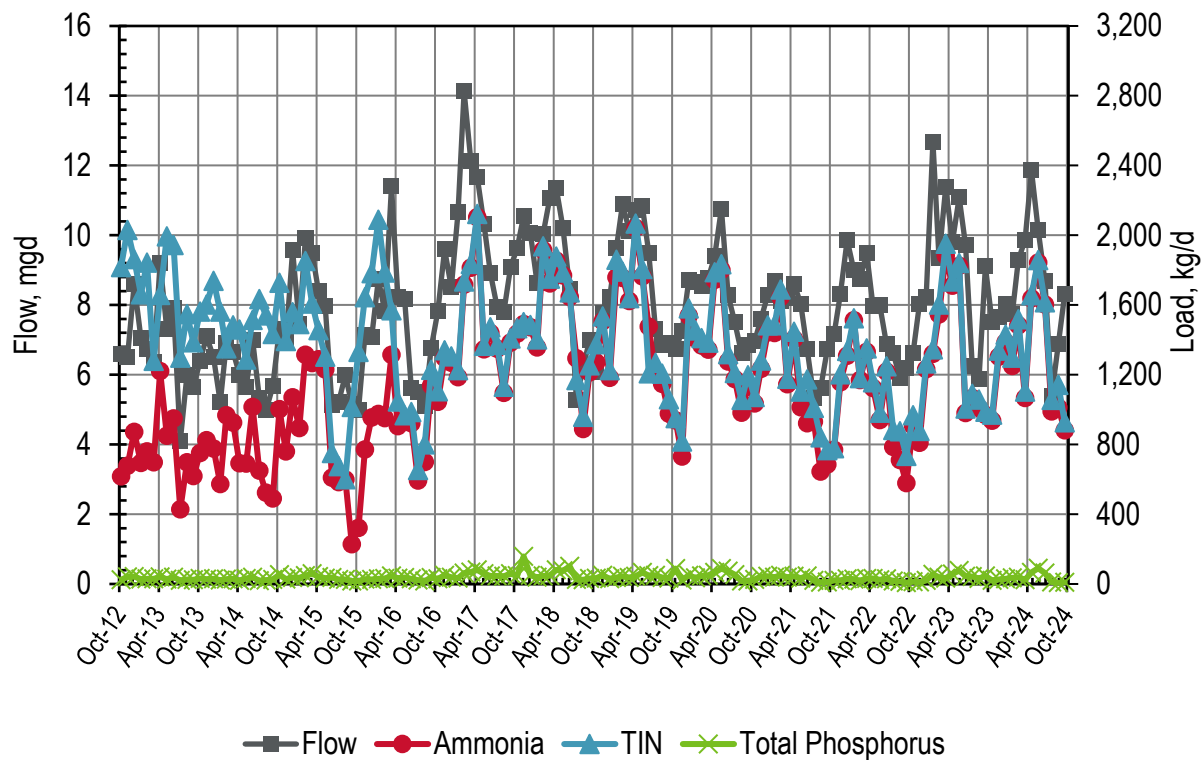


Figure 7-3. Discharge: Delta Diablo Monthly Flows and Loads

Table 7-2. Discharge: Delta Diablo Monthly Flows and Loads

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	6.60	618	1,200.0	1,820	24.9
Nov-12	6.50	677	1,350.0	2,030	40.9
Dec-12	8.60	872	991.0	1,860	43.2
Jan-13	7.05	694	967.0	1,660	27.2
Feb-13	6.73	760	1,080.0	1,840	29.7
Mar-13	6.35	697	582.0	1,280	28.7
Apr-13	9.20	1,220	437.0	1,660	40.2
May-13	7.30	850	1,140.0	1,990	27.6
Jun-13	7.90	948	995.0	1,940	39.4
Jul-13	4.10	429	868.0	1,300	20.1
Aug-13	6.00	697	850.0	1,550	26.7
Sep-13	5.65	619	767.0	1,390	24.7
Oct-13	6.40	750	812.0	1,560	31.5

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-13	7.10	824	778.0	1,600	28.3
Dec-13	6.50	776	963.0	1,740	28.9
Jan-14	5.20	573	990.0	1,560	22.5
Feb-14	6.90	966	385.0	1,350	27.8
Mar-14	6.67	925	559.0	1,480	29.6
Apr-14	6.00	693	767.0	1,460	20.8
May-14	5.65	690	596.0	1,290	31.8
Jun-14	7.00	1,020	498.0	1,510	38.0
Jul-14	5.34	651	982.0	1,630	19.0
Aug-14	4.97	524	1,020.0	1,540	21.5
Sep-14	5.66	490	942.0	1,430	25.7
Oct-14	7.32	1,000	725.0	1,730	52.7
Nov-14	6.94	761	633.0	1,390	28.4
Dec-14	9.56	1,070	488.0	1,560	36.8
Jan-15	7.44	894	595.0	1,490	35.9
Feb-15	9.91	1,310	538.0	1,850	47.3
Mar-15	9.50	1,270	341.0	1,610	58.8
Apr-15	8.40	1,290	167.0	1,450	41.9
May-15	7.97	1,230	73.8	1,300	33.0
Jun-15	5.13	609	142.0	751	36.8
Jul-15	5.22	583	92.7	676	25.4
Aug-15	6.00	599	1.4	601	26.2
Sep-15	5.15	228	787.0	1,010	17.6
Oct-15	4.99	322	1,010.0	1,330	16.2
Nov-15	7.13	771	875.0	1,650	28.6
Dec-15	7.07	954	828.0	1,780	25.7
Jan-16	8.73	975	1,110.0	2,090	29.0
Feb-16	7.83	951	834.0	1,780	31.8
Mar-16	11.40	1,310	256.0	1,570	47.0
Apr-16	8.23	905	141.0	1,050	33.6
May-16	8.18	940	28.2	968	37.2
Jun-16	5.62	921	64.4	985	29.1
Jul-16	5.51	593	59.9	653	21.6
Aug-16	5.11	699	102.0	801	16.2
Sep-16	6.76	1,140	89.9	1,230	36.4
Oct-16	7.83	1,040	60.0	1,100	30.2
Nov-16	9.59	1,300	43.5	1,340	49.5

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-16	8.50	1,270	36.7	1,310	37.9
Jan-17	10.70	1,190	41.1	1,230	33.5
Feb-17	14.10	1,720	18.9	1,730	62.4
Mar-17	12.10	1,810	22.5	1,840	68.4
Apr-17	11.70	2,100	19.5	2,120	80.2
May-17	10.30	1,350	19.5	1,370	59.6
Jun-17	8.92	1,440	34.7	1,470	45.8
Jul-17	7.95	1,350	22.1	1,370	47.0
Aug-17	7.79	1,100	34.7	1,130	44.8
Sep-17	9.07	1,380	23.8	1,410	58.1
Oct-17	9.63	1,440	32.0	1,470	48.5
Nov-17	10.60	1,490	11.1	1,500	158.0
Dec-17	10.10	1,470	12.8	1,480	50.6
Jan-18	8.64	1,360	45.8	1,400	39.6
Feb-18	10.00	1,910	21.7	1,940	45.3
Mar-18	11.10	1,720	26.3	1,750	47.6
Apr-18	11.40	1,850	23.6	1,880	81.8
May-18	10.20	1,770	17.6	1,790	75.1
Jun-18	8.47	1,650	25.6	1,670	101.0
Jul-18	5.27	1,290	82.6	1,170	25.4
Aug-18	6.24	888	69.2	957	23.6
Sep-18	6.98	1,210	40.8	1,250	30.6
Oct-18	6.08	1,270	104.0	1,370	33.8
Nov-18	7.76	1,510	26.2	1,530	50.3
Dec-18	8.23	1,180	43.2	1,230	28.7
Jan-19	9.64	1,760	71.9	1,860	37.7
Feb-19	10.90	1,750	36.2	1,790	44.6
Mar-19	10.10	1,620	16.6	1,640	37.5
Apr-19	10.70	2,040	25.3	2,070	43.6
May-19	10.80	1,760	27.8	1,810	66.3
Jun-19	9.49	1,480	25.0	1,210	48.0
Jul-19	7.31	1,210	61.8	1,270	49.3
Aug-19	6.87	1,150	58.2	1,210	37.4
Sep-19	6.91	977	82.2	1,060	34.0
Oct-19	6.74	938	13.6	952	88.1
Nov-19	7.24	730	86.9	817	22.0
Dec-19	8.71	1,540	42.7	1,580	49.6

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Jan-20	8.65	1,410	46.7	1,450	34.3
Feb-20	8.54	1,370	42.0	1,410	46.1
Mar-20	8.77	1,340	39.3	1,380	49.8
Apr-20	9.40	1,740	44.8	1,790	66.0
May-20	10.80	1,800	33.2	1,830	87.8
Jun-20	8.28	1,280	41.3	1,320	73.3
Jul-20	7.50	1,170	35.2	1,210	52.7
Aug-20	6.62	982	72.9	1,050	17.2
Sep-20	6.91	1,140	54.5	1,200	16.3
Oct-20	6.96	1,030	37.6	1,070	26.4
Nov-20	7.61	1,230	48.3	1,280	41.8
Dec-20	8.30	1,440	40.4	1,480	45.1
Jan-21	8.69	1,440	43.3	1,480	37.9
Feb-21	8.12	1,640	44.8	1,690	50.1
Mar-21	8.19	1,150	31.5	1,180	38.2
Apr-21	8.61	1,400	42.1	1,450	43.8
May-21	8.03	1,010	34.0	1,100	33.8
Jun-21	6.74	921	142.0	1,170	46.4
Jul-21	5.32	930	79.7	1,010	19.8
Aug-21	5.61	644	197.0	841	9.4
Sep-21	6.73	685	82.4	768	10.4
Oct-21	7.16	769	9.7	778	20.4
Nov-21	8.33	1,160	47.3	1,200	20.0
Dec-21	9.87	1,310	27.6	1,340	29.5
Jan-22	8.99	1,510	10.7	1,520	27.9
Feb-22	8.75	1,170	9.9	1,180	19.2
Mar-22	9.48	1,330	21.6	1,350	31.4
Apr-22	7.96	1,120	33.2	1,160	31.4
May-22	7.99	940	41.9	982	24.7
Jun-22	6.87	1,220	31.3	1,250	29.5
Jul-22	6.62	786	105.0	882	17.3
Aug-22	5.91	711	164.0	875	14.2
Sep-22	6.21	578	157.0	734	7.7
Oct-22	6.62	907	59.3	967	12.3
Nov-22	8.03	809	68.3	877	11.4
Dec-22	8.24	1,230	34.7	1,270	20.3
Jan-23	12.70	1,320	26.4	1,350	56.1

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Feb-23	9.34	1,540	57.6	1,600	38.8
Mar-23	11.40	1,880	68.2	1,950	33.3
Apr-23	9.81	1,710	24.7	1,730	57.1
May-23	11.10	1,820	16.5	1,840	77.6
Jun-23	9.72	980	25.8	1,010	45.0
Jul-23	6.24	1,070	24.1	1,090	42.3
Aug-23	5.88	1,010	48.3	1,060	31.2
Sep-23	9.11	969	19.8	988	46.3
Oct-23	7.50	937	34.1	971	20.2
Nov-23	7.64	1,300	35.9	1,340	25.1
Dec-23	8.03	1,390	42.6	1,430	29.1
Jan-24	7.75	1,250	48.8	1,300	35.6
Feb-24	9.30	1,480	35.4	1,520	38.8
Mar-24	9.86	1,070	37.3	1,100	24.8
Apr-24	11.9	1,640	18.1	1,660	66.3
May-24	10.1	1,840	14.9	1,860	89.9
Jun-24	8.69	1,600	11.1	1,610	61.7
Jul-24	5.39	990	66.0	1,060	10.3
Aug-24	6.88	1,010	130	1,140	7.11
Sep-24	8.31	881	47.2	928	9.23
Dry Season Average	7.17	1,020	207	1,220	36.4
Dry Season Trend ***	Up	Up	Down	None	None
Wet Season Average	8.60	1,220	268	1,490	39.7
Average Annual	8.01	1,140	242	1,380	38.3

* Delta Diablo typically samples each month more than the required frequency for ammonia. This dataset includes this additional sampling.

** The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values.

*** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

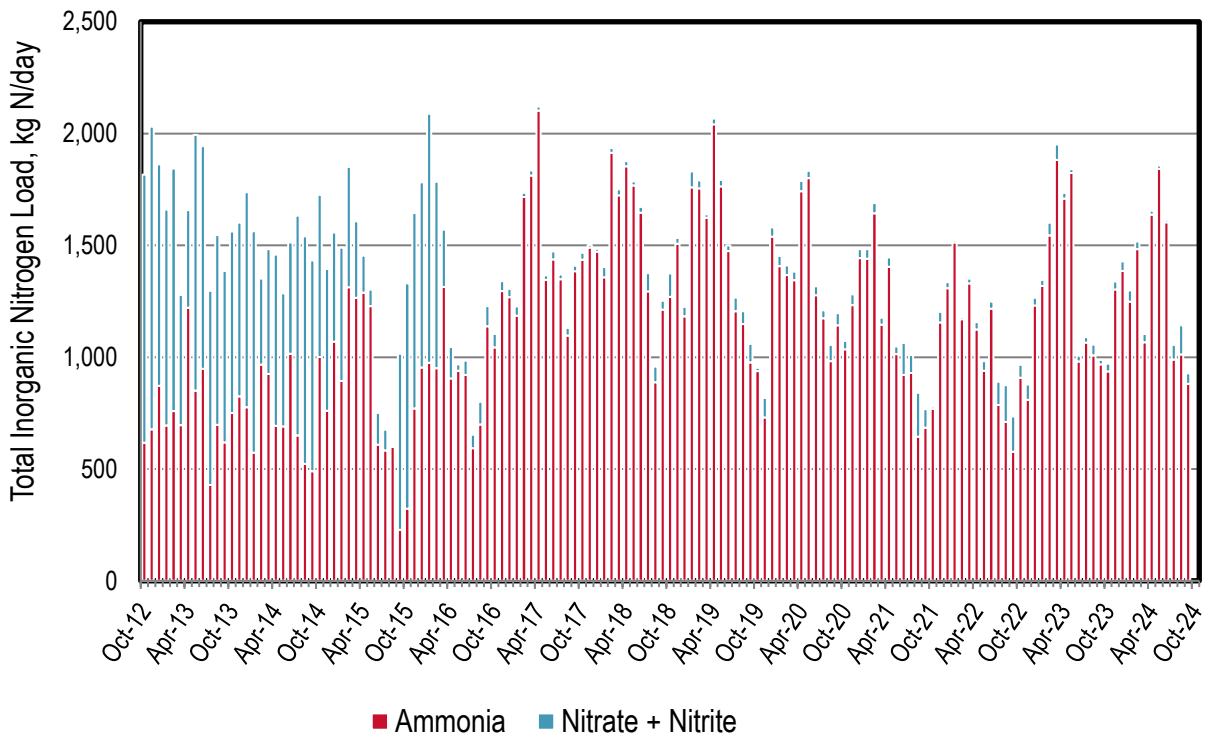


Figure 7-4. Discharge: Delta Diablo Monthly Nitrogen Loads

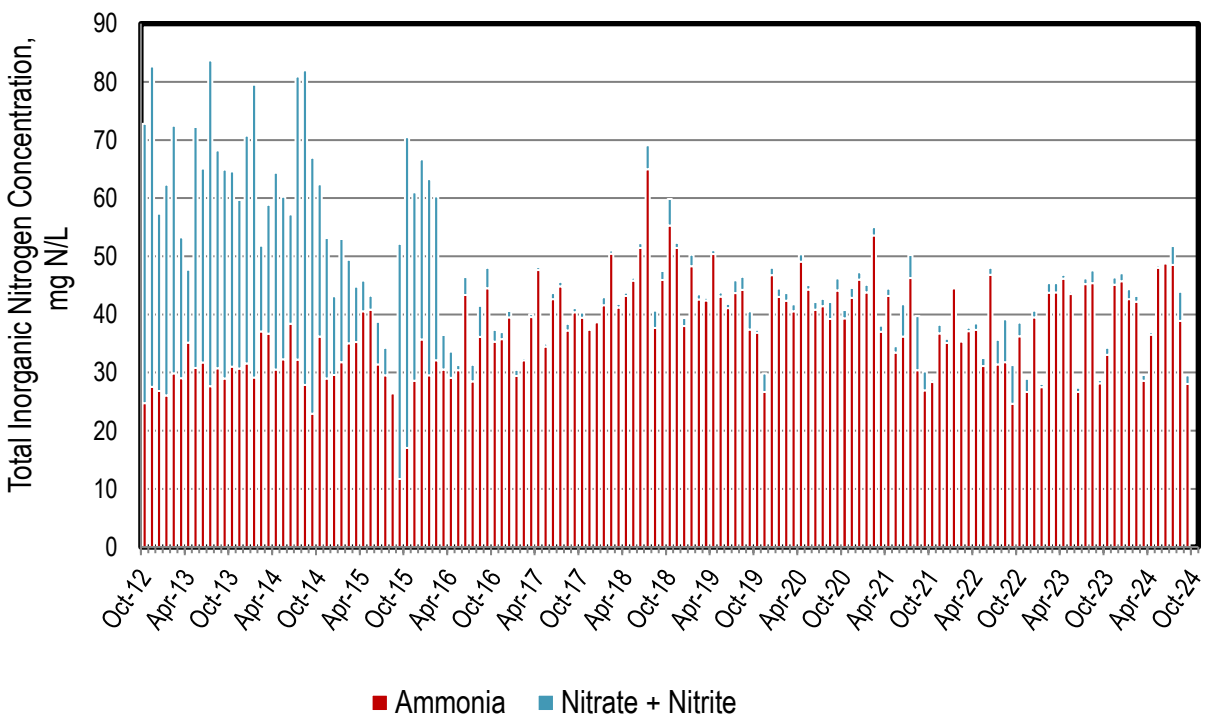


Figure 7-5. Discharge: Delta Diablo Monthly Nitrogen Concentrations

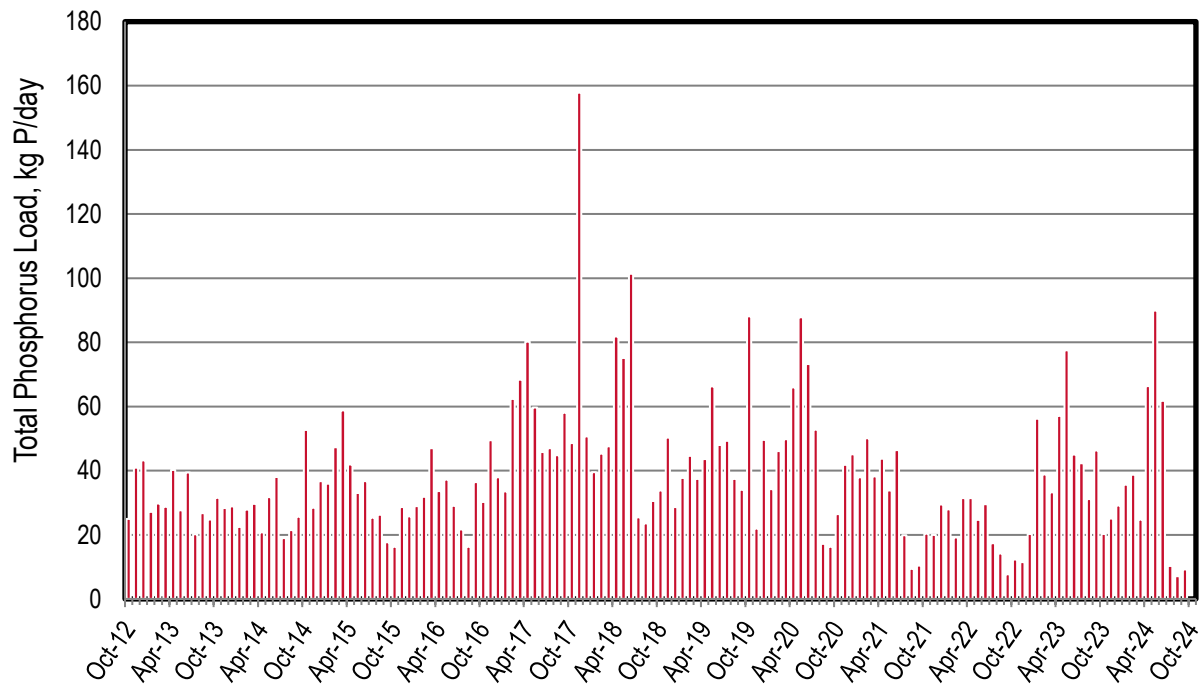


Figure 7-6. Discharge: Delta Diablo Monthly Phosphorus Loads

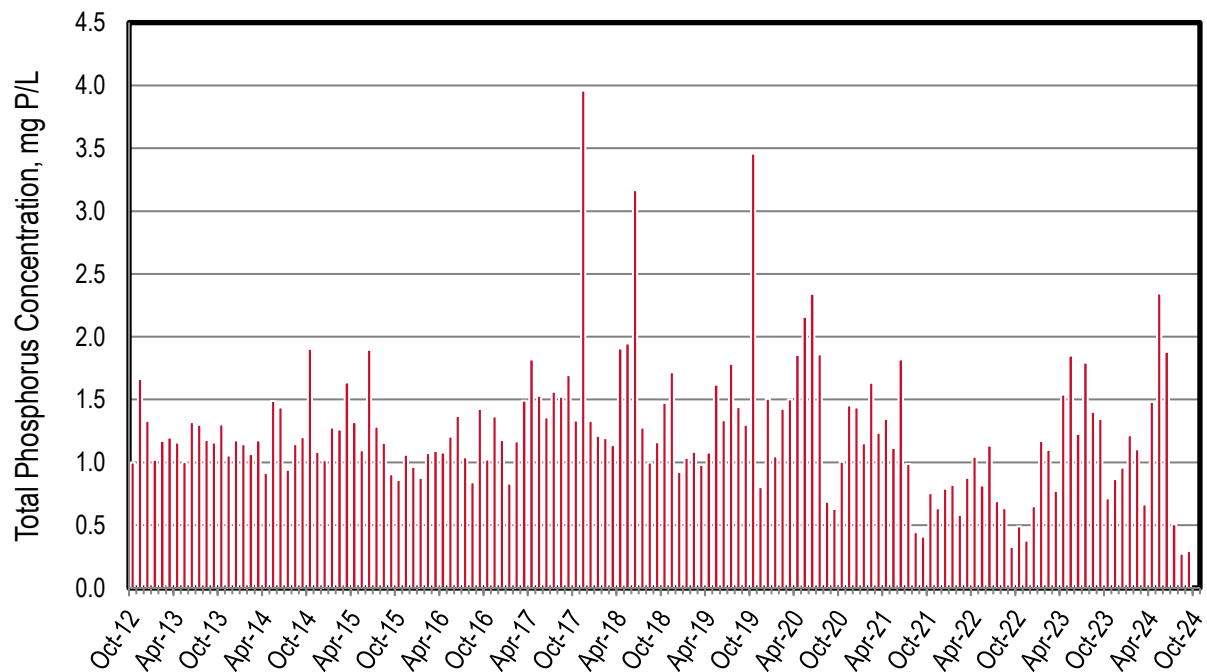


Figure 7-7. Discharge: Delta Diablo Monthly Phosphorus Concentrations

Recycled Water

Table 7-3. Recycled Water: Delta Diablo Yearly Recycled Water Flows Diverted from the Bay

Year**	Flow Diverted*, Acre-Feet (mgd)							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	54.8 (0.05)	228 (0.20)	0 (0)	3,840 (3.43)	0 (0)	0 (0)	119 (0.11)	4,240 (3.79)
2020	203 (0.18)	256 (0.23)	0 (0)	4,340 (3.88)	0 (0)	0 (0)	26.7 (0.02)	4,830 (4.31)
2021	246 (0.22)	273 (0.24)	0 (0)	5,220 (4.66)	0 (0)	0 (0)	2.6 (<0.01)	5,740 (5.12)
2022	215 (0.19)	259 (0.23)	0 (0)	5,160 (4.61)	0 (0)	0 (0)	2.6 (<0.01)	5,640 (5.03)
2023	152 (0.14)	245 (0.22)	0 (0)	4,830 (4.31)	0 (0)	0 (0)	2.6 (<0.01)	5,230 (4.67)
Average	174 (0.16)	252 (0.22)	0 (0)	4,964 (4.43)	0 (0)	0 (0)	30.7 (0.03)	5,421 (4.84)

* Assumes 100% of the recycled flow is diverted from the Bay for all but the Industrial Application. The analysis assumed 65% of the recycled flow sent to Industrial Application was diverted from the Bay.

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 7-4. Recycled Water: Delta Diablo Yearly Recycled Water Ammonia Load Diverted from the Bay

Year**	Average Ammonia Load Diverted*, kg N/d							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	8	32	0	0	0	0	18	58
2020	29	37	0	0	0	0	3	70
2021	31	34	0	0	0	0	0	66
2022	26	31	0	0	0	0	0	56
2023	20	32	0	0	0	0	0	52
Average	23	33	0	0	0	0	4	60

* Assumes 100% of the recycled nutrient load is diverted from the Bay for all but the Industrial Application. The analysis conservatively assumed 0% of the recycled nutrient load sent to Industrial Application was diverted from the Bay. Preliminary analysis suggests that the Industrial Application may be removing some nutrient load; however, additional studies are needed to quantify the nutrient load diverted from the Bay.

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 7-5. Recycled Water: Delta Diablo Yearly Recycled Water Total Inorganic Nitrogen Load Diverted from the Bay

Year**	Average Total Inorganic Nitrogen Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	8	33	0	0	0	0	18	59
2020	30	39	0	0	0	0	3	72
2021	34	37	0	0	0	0	0	71
2022	27	33	0	0	0	0	0	60
2023	21	33	0	0	0	0	0	53
Average	24	35	0	0	0	0	4	63

* Assumes 100% of the recycled nutrient load is diverted from the Bay for all but the Industrial Application. The analysis conservatively assumed 0% of the recycled nutrient load sent to Industrial Application was diverted from the Bay. Preliminary analysis suggests that the Industrial Application may be removing some nutrient load; however, additional studies are needed to quantify the nutrient load diverted from the Bay.

** Calendar year as opposed to California's water year (October 1 through September 30)

Table 7-6. Recycled Water: Delta Diablo Yearly Recycled Water Total P Load Diverted from the Bay

Year**	Average Total P Load Diverted*, kg P/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	1	0	0	0	0	1	2
2020	1	1	0	0	0	0	0	2
2021	1	1	0	0	0	0	0	2
2022	1	1	0	0	0	0	0	1
2023	1	1	0	0	0	0	0	2
Average	1	1	0	0	0	0	0	2

* Assumes 100% of the recycled nutrient load is diverted from the Bay for all but the Industrial Application. The analysis conservatively assumed 0% of the recycled nutrient load sent to Industrial Application was diverted from the Bay. Preliminary analysis suggests that the Industrial Application may be removing some nutrient load; however, additional studies are needed to quantify the nutrient load diverted from the Bay.

** Calendar year as opposed to California's water year (October 1 through September 30)

8 East Bay Dischargers Authority (EBDA)

EBDA discharges to the South Bay. EBDA has a permitted ADWF capacity of 107.8 mgd and a peak wet weather capacity of 189.1 mgd. The average dry season flow this past year was 57.3 mgd.

EBDA's discharge is a combined flow from six wastewater treatment plants: EBDA members City of Hayward, Oro Loma/Castro Valley Sanitary District, City of San Leandro, and Union Sanitary District, and Livermore-Amador Valley Water Management Agency members City of Livermore and Dublin-San Ramon Services District. The contributing plants have various types of secondary treatment.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Influent:

- ▲ Note: limited to quarterly data since July 2019. Based on the limited dataset in Table 1-1, none of the monitored parameters have any emerging trends.
- ▲ The flow reduction is seasonally influenced. The flows are reduced by up to 27 percent during the dry season, which is primarily attributed to recycled water.
- ▲ Nitrogen load reductions across the plants have also been historically seasonally dependent (range from 35 to 65 percent load reductions across the plants).
- ▲ Phosphorus load reductions across the plants have been relatively stable, with values ranging from approximately 60 to 75 percent. Several EBDA members perform phosphorus removal.

◆ Discharge:

- ▲ The average dry season monthly flows for 2023/2024 were the second highest, after 2022/2023, since nutrient sampling was initiated under the Section 13267 Letter Data in 2012.
- ▲ The wet season flows are 10 to 20 mgd higher than the dry season due to a combination of recycled water demand during the dry season and a lack of inflow and infiltration.
- ▲ Nitrogen loads typically increase with flow during wet weather events. This is attributed to a combination of scouring in the collection system and biological washout concerns for facilities performing nitrogen load reduction (e.g., Oro Loma/Castro Valley Sanitary District).
- ▲ Ammonia represents the majority of the nitrogen species discharged, regardless of season. This would be expected since the EBDA plants were not designed to nitrify (with the exception of the recent upgrades at Oro Loma/Castro Valley Sanitary District).
- ▲ Based on Table 1-2 statistics for the entire dry season dataset, there appears to be an upward trend for flows and TP loads. The upward trend in flows was driven by the extremely wet years in 2022/2023 and 2023/2024. The increase in TP loads was expected, as Oro Loma/Castro Valley Sanitary District replaced TP load reduction capabilities with ammonia/TIN load reduction capabilities as part of their recent upgrades. While the statistics for the entire dry season dataset currently show no significant trends for ammonia or TIN, the Oro Loma/Castro Valley Sanitary District upgrade has provided reliable year-round reduction.

◆ Recycled Water:

- ▲ Based on Table 1-3, EBDA and its member agencies have averaged 8.8 mgd of Recycled Water over the 2019-2023 calendar years. Users include Golf Course, Landscape Irrigation, Industrial, and Other. The EBDA contributors with the largest recycled water volumes/flows are the City of Livermore and Dublin San Ramon Services District.
- ▲ Based on Table 1-4 through Table 1-6, EBDA and its member agencies have averaged 1,278 kg ammonia-N/d, 1,325 kg TIN-N/d, and 104 kg P/d diverted from the Bay through recycled water over the 2019-2023 calendar years.

Influent

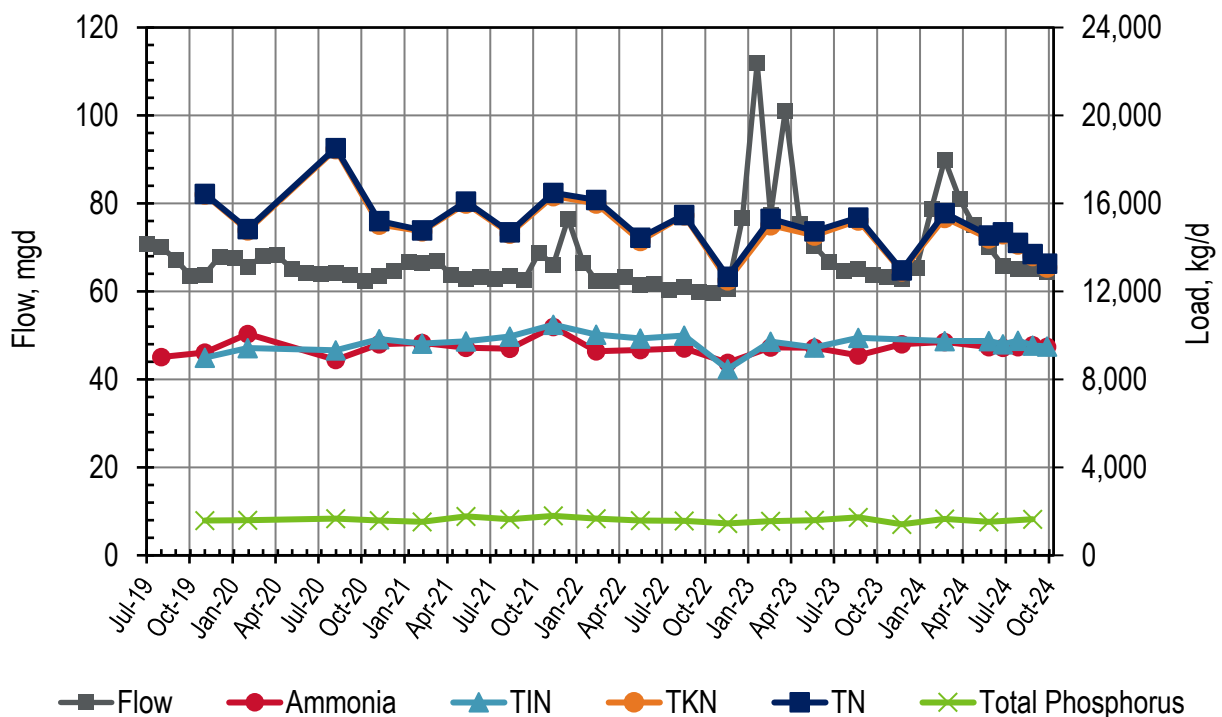


Figure 8-1. Influent: EBDA Monthly Flows and Loads

Note 1: Values are only provided for months when all six agencies sampled. Loads are summed for all agencies.

Note 2: The TKN/TN loads are comparable. The TKN values are located behind the TN load lines.

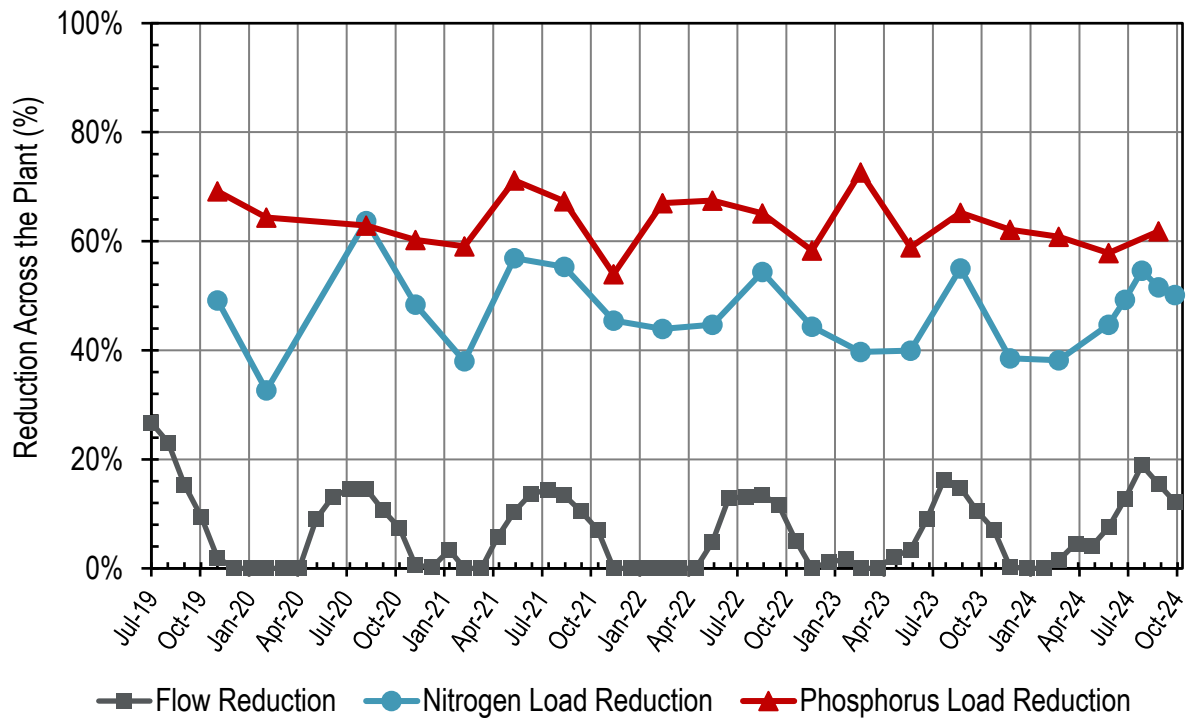


Figure 8-2. Influent: EBDA Monthly Reductions Across the Plants

Note: Influent Total N for the sum of all agencies was compared against EBDA Discharge TIN for calculating nitrogen load reduction.

Table 8-1. Influent: EBDA Members' Monthly Flows and Loads^{1,*}

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN **	TKN	Total N **	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-19	70.8	--	--	--	--	--	--
Aug-19	70.1	9,020	--	--	--	--	--
Sep-19	67.2	--	--	--	--	--	--
Oct-19	63.6	--	--	--	--	--	--
Nov-19	63.9	9,230	28.4	8,990	16,400	16,400	1,580
Dec-19	67.9	--	--	--	--	--	--
Jan-20	67.6	--	--	--	--	--	--
Feb-20	65.6	10,100	57.4	9,430	14,800	14,800	1,600
Mar-20	68.0	--	--	--	--	--	--
Apr-20	68.2	--	--	--	--	--	--
May-20	65.2	--	--	--	--	--	--
Jun-20	64.3	--	--	--	--	--	--
Jul-20	64.0	--	--	--	--	--	--
Aug-20	64.3	8,880	55.0	9,330	18,500	18,500	1,670

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN **	TKN	Total N **	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Sep-20	63.8	--	--	--	--	--	--
Oct-20	62.3	--	--	--	--	--	--
Nov-20	63.6	9,590	153	9,830	15,000	15,200	1,580
Dec-20	64.7	--	--	--	--	--	--
Jan-21	66.8	--	--	--	--	--	--
Feb-21	66.5	9,660	56.2	9,630	14,700	14,800	1,530
Mar-21	67.0	--	--	--	--	--	--
Apr-21	63.7	--	--	--	--	--	--
May-21	62.9	9,440	74.1	9,720	16,000	16,100	1,770
Jun-21	63.3	--	--	--	--	--	--
Jul-21	62.7	--	--	--	--	--	--
Aug-21	63.4	9,400	52.8	9,940	14,600	14,700	1,640
Sept-21	62.3	--	--	--	--	--	--
Oct-21	68.8	--	--	--	--	--	--
Nov-21	66.0	10,400	143	10,500	16,300	16,500	1,790
Dec-21	76.5	--	--	--	--	--	--
Jan-22	66.5	--	--	--	--	--	--
Feb-22	62.5	9,280	161	10,000	16,000	16,200	1,670
Mar-22	62.5	--	--	--	--	--	--
Apr-22	63.3	--	--	--	--	--	--
May-22	61.4	9,340	140	9,850	14,300	14,400	1,580
Jun-22	61.7	--	--	--	--	--	--
Jul-22	60.4	--	--	--	--	--	--
Aug-22	60.9	9,410	13.3	9,990	15,500	15,500	1,560
Sep-22	59.8	--	--	--	--	--	--
Oct-22	59.7	--	--	--	--	--	--
Nov-22	60.7	8,760	164	8,470	12,500	12,700	1,450
Dec-22	76.7	--	--	--	--	--	--
Jan-23	112	--	--	--	--	--	--
Feb-23	77.4	9,450	297	9,710	15,000	15,300	1,550
Mar-23	101	--	--	--	--	--	--
Apr-23	75.4	--	--	--	--	--	--
May-23	70.4	9,440	189	9,450	14,500	14,700	1,600
Jun-23	66.7	--	--	--	--	--	--
Jul-23	64.6	--	--	--	--	--	--
Aug-23	65.1	9,090	129	9,890	15,200	15,400	1,730
Sep-23	63.7	--	--	--	--	--	--
Oct-23	63.2	--	--	--	--	--	--

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN **	TKN	Total N **	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Nov-23	62.9	9,590	44.7	9,560	12,900	13,000	1,410
Dec-23	65.4	--	--	--	--	--	--
Jan-24	78.8	--	--	--	--	--	--
Feb-24	89.9	9,710	217	9,740	15,300	15,600	1,650
Mar-24	81.0	--	--	--	--	--	--
Apr-24	75.1	--	--	--	--	--	--
May-24	70.1	9,460	122	9,740	14,400	14,500	1,530
Jun-24	65.9	9,440	87.5	9,590	14,600	14,700	--
Jul-24	65.0	9,470	70.9	9,770	14,100	14,200	--
Aug-24	65.2	9,550	88.3	9,540	13,600	13,700	1,630
Sep-24	64.3	9,480	176	9,490	13,100	13,300	--
Dry Season Average	64.6	9,340	99.8	9,690	14,900	15,000	1,640
Dry Season Trend ***	None	None	None	None	None	None	None
Wet Season Average	70.4	9,570	132	9,590	14,900	15,000	1,580
Average Annual	67.8	9,440	114	9,650	14,900	15,000	1,610

1 After October 1, 2023, loads are calculated with 1/2 of the method detection limit if non-detect measurements are included. Prior to October 1, 2023, loads were calculated with the provided method detection limit if non-detect values were included.

* Agencies that Contribute to EBDA: City of Hayward, Oro Loma/Castro Valley Sanitary District, City of San Leandro, and Union Sanitary District, and Livermore-Amador Valley Water Management Agency members City of Livermore and Dublin-San Ramon Services District. Values are only provided for months where all agencies sampled.

** The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values. The Total Nitrogen value is calculated by adding "TKN" and "Nitrate + Nitrite".

*** Refer to the Section 3.8 in the main body for a description on the statistical analysis. Insufficient samples to perform statistical trending on nutrient loads.

Discharge

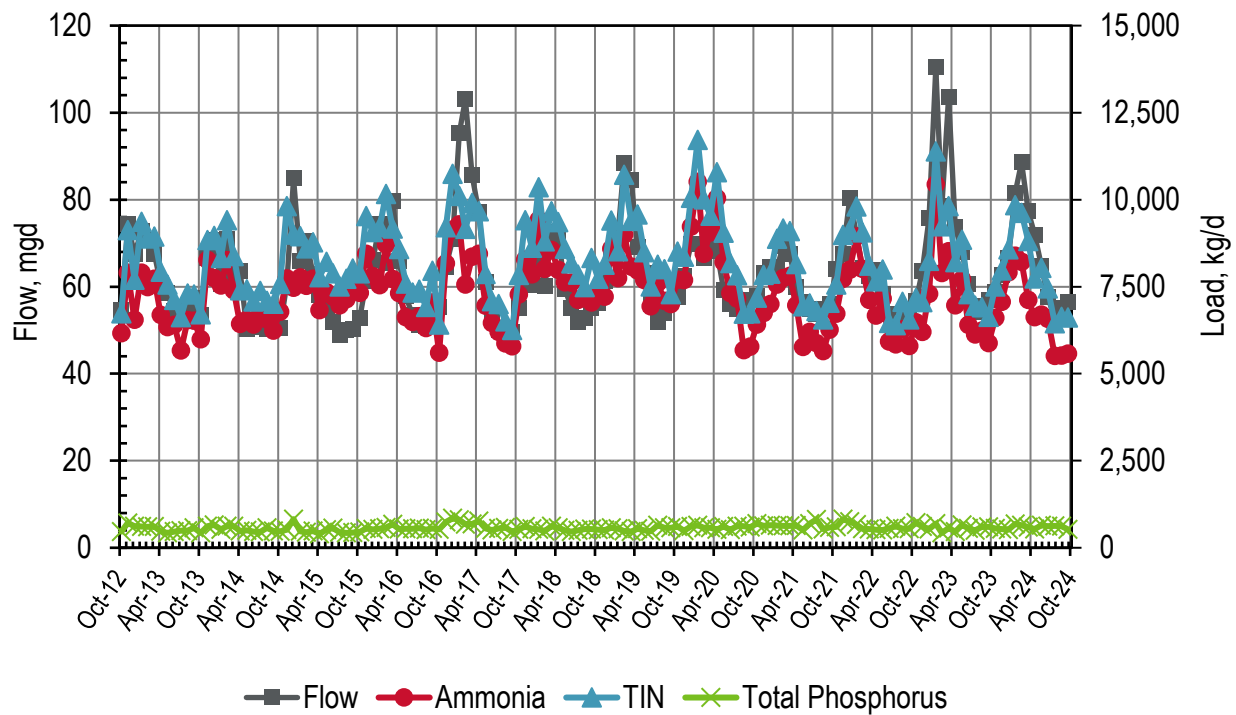


Figure 8-3. Discharge: EBDA Monthly Flows and Loads

Table 8-2. Discharge: EBDA Monthly Flows and Loads¹

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	54.5	6,160	568	6,730	462
Nov-12	74.3	7,900	1,230	9,130	710
Dec-12	67.5	6,550	1,150	7,700	621
Jan-13	72.9	7,900	1,460	9,360	606
Feb-13	70.7	7,490	1,390	8,880	601
Mar-13	67.6	7,730	1,210	8,940	613
Apr-13	60.6	6,690	1,240	7,930	469
May-13	58.5	6,340	1,220	7,560	431
Jun-13	54.5	6,400	719	7,120	459
Jul-13	53.3	5,670	953	6,620	493
Aug-13	54.5	6,540	763	7,300	494
Sep-13	57.5	6,520	750	7,270	575
Oct-13	53.4	5,990	715	6,700	425
Nov-13	66.5	8,270	567	8,840	621

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-13	70.7	7,740	1,220	8,960	654
Jan-14	60.6	7,530	789	8,320	526
Feb-14	70.9	8,260	1,150	9,410	616
Mar-14	62.3	7,400	986	8,380	616
Apr-14	63.5	6,430	966	7,390	480
May-14	50.3	6,550	873	7,420	499
Jun-14	51.2	6,410	660	7,070	465
Jul-14	50.7	6,730	649	7,380	456
Aug-14	50.2	6,560	534	7,090	570
Sep-14	51.5	6,240	765	7,000	481
Oct-14	50.6	6,780	795	7,570	470
Nov-14	60.7	7,740	2,070	9,810	520
Dec-14	84.9	7,470	1,520	8,990	821
Jan-15	65.9	7,770	1,180	8,950	476
Feb-15	70.4	7,520	1,080	8,600	446
Mar-15	62.8	7,720	1,050	8,770	479
Apr-15	58.0	6,820	948	7,770	399
May-15	55.2	7,340	874	8,210	517
Jun-15	51.9	7,220	667	7,880	569
Jul-15	48.8	6,970	540	7,510	448
Aug-15	50.0	7,130	594	7,730	429
Sep-15	50.3	7,410	609	8,020	439
Oct-15	52.8	7,320	564	7,880	452
Nov-15	61.2	8,440	1,080	9,530	552
Dec-15	66.1	7,790	1,270	9,070	529
Jan-16	74.4	7,550	1,660	9,200	543
Feb-16	65.4	8,710	1,450	10,200	586
Mar-16	79.6	7,710	1,450	9,170	676
Apr-16	65.8	7,310	1,260	8,580	539
May-16	57.7	6,620	972	7,590	550
Jun-16	53.5	6,480	845	7,330	545
Jul-16	51.2	6,650	763	7,410	562
Aug-16	51.0	6,310	608	6,920	520
Sep-16	53.3	7,040	916	7,960	552
Oct-16	55.3	5,600	802	6,410	527
Nov-16	64.5	8,170	1,040	9,200	736
Dec-16	70.9	9,140	1,600	10,700	845

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Jan-17	95.3	9,290	819	10,100	803
Feb-17	103	7,560	1,600	9,160	672
Mar-17	85.5	8,360	1,540	9,910	687
Apr-17	77.1	8,440	1,220	9,670	767
May-17	61.0	6,960	905	7,860	552
Jun-17	54.1	6,460	617	7,080	506
Jul-17	50.0	6,200	797	7,000	559
Aug-17	50.5	5,870	638	6,500	580
Sep-17	49.6	5,790	467	6,260	466
Oct-17	55.0	7,280	559	7,830	528
Nov-17	64.1	8,280	1,130	9,410	608
Dec-17	60.3	7,850	767	8,620	550
Jan-18	67.7	9,420	937	10,400	529
Feb-18	60.2	8,010	785	8,800	485
Mar-18	72.4	8,550	1,110	9,660	615
Apr-18	71.9	7,980	1,370	9,360	569
May-18	59.5	7,620	972	8,590	497
Jun-18	55.2	7,620	545	8,160	461
Jul-18	51.8	7,120	686	7,850	498
Aug-18	52.8	7,190	415	7,490	533
Sep-18	55.1	7,040	942	8,330	535
Oct-18	56.3	7,240	849	7,720	514
Nov-18	61.3	7,210	647	8,130	506
Dec-18	66.5	8,590	810	9,400	577
Jan-19	72.2	7,740	777	8,520	544
Feb-19	88.5	9,000	1,430	10,700	483
Mar-19	84.6	8,080	1,120	9,390	465
Apr-19	69.1	7,960	1,110	9,570	549
May-19	63.1	7,690	872	8,490	497
Jun-19	55.9	6,930	665	7,510	476
Jul-19	51.9	7,610	473	8,130	648
Aug-19	53.9	7,090	523	8,000	576
Sep-19	56.9	7,000	548	7,280	577
Oct-19	57.6	7,700	629	8,510	613
Nov-19	62.6	7,690	722	8,360	488
Dec-19	69.7	9,220	823	10,000	614
Jan-20	69.9	10,500	667	11,700	652

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Feb-20	66.5	8,440	804	10,000	571
Mar-20	68.6	9,050	483	9,540	572
Apr-20	68.2	10,000	745	10,800	531
May-20	59.3	8,200	843	9,050	607
Jun-20	55.9	7,310	602	8,180	519
Jul-20	54.7	7,160	663	7,820	623
Aug-20	54.9	5,680	1,040	6,720	621
Sep-20	56.9	5,780	956	6,730	590
Oct-20	57.7	6,410	779	7,190	694
Nov-20	63.2	6,740	1,100	7,840	630
Dec-20	64.5	7,000	868	7,870	644
Jan-21	64.5	7,560	1,310	8,880	636
Feb-21	69.2	7,750	1,430	9,170	626
Mar-21	67.5	7,810	1,280	9,090	630
Apr-21	60.0	6,960	1,180	8,140	640
May-21	56.4	5,770	1,200	6,930	511
Jun-21	54.7	6,200	826	7,020	692
Jul-21	53.7	5,880	919	6,800	815
Aug-21	54.9	5,650	913	6,560	534
Sep-21	56.0	6,260	775	7,040	583
Oct-21	63.9	6,720	840	7,560	599
Nov-21	67.5	7,720	1,270	8,990	826
Dec-21	80.4	7,980	1,150	9,130	749
Jan-22	72.0	8,940	866	9,800	670
Feb-22	64.4	8,010	1,050	9,060	551
Mar-22	62.5	7,120	990	8,110	536
Apr-22	63.7	6,670	979	7,650	517
May-22	58.4	7,150	838	7,990	514
Jun-22	53.7	5,920	541	6,460	555
Jul-22	52.5	5,840	548	6,390	623
Aug-22	52.7	6,270	791	7,060	546
Sep-22	52.9	5,790	765	6,560	548
Oct-22	56.6	6,480	701	7,180	722
Nov-22	63.6	6,200	851	7,050	606
Dec-22	75.8	7,300	948	8,240	539
Jan-23	110	10,400	947	11,400	697
Feb-23	78.4	7,890	1,050	9,230	423

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Mar-23	104	8,510	1,300	9,810	561
Apr-23	73.7	6,960	1,240	8,200	465
May-23	68.0	7,710	1,140	8,850	658
Jun-23	60.7	6,400	885	7,290	559
Jul-23	54.1	6,120	833	6,960	499
Aug-23	55.5	6,230	675	6,910	602
Sep-23	57.0	5,880	749	6,630	600
Oct-23	58.7	6,600	988	7,510	553
Nov-23	62.8	7,060	901	7,960	535
Dec-23	66.5	7,910	658	8,570	516
Jan-24	81.5	8,390	1,440	9,840	684
Feb-24	88.6	8,210	1,410	9,620	646
Mar-24	77.3	7,120	1,690	8,810	592
Apr-24	72.0	6,620	1,450	7,740	538
May-24	64.8	6,700	1,340	8,040	644
Jun-24	57.5	6,580	869	7,450	624
Jul-24	52.7	5,510	768	6,450	626
Aug-24	55.1	5,520	1,120	6,640	624
Sep-24	56.5	5,580	1,030	6,610	526
Dry Season Average	54.8	6,570	783	7,370	548
Dry Season Trend **	Up	None	None	None	Up
Wet Season Average	68.9	7,740	1,070	8,830	585
Average Annual	63.0	7,250	948	8,220	569

1 After October 1, 2023, loads are calculated with 1/2 of the method detection limit if non-detect measurements are included. Prior to October 1, 2023, loads were calculated with the provided method detection limit if non-detect values were included.

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

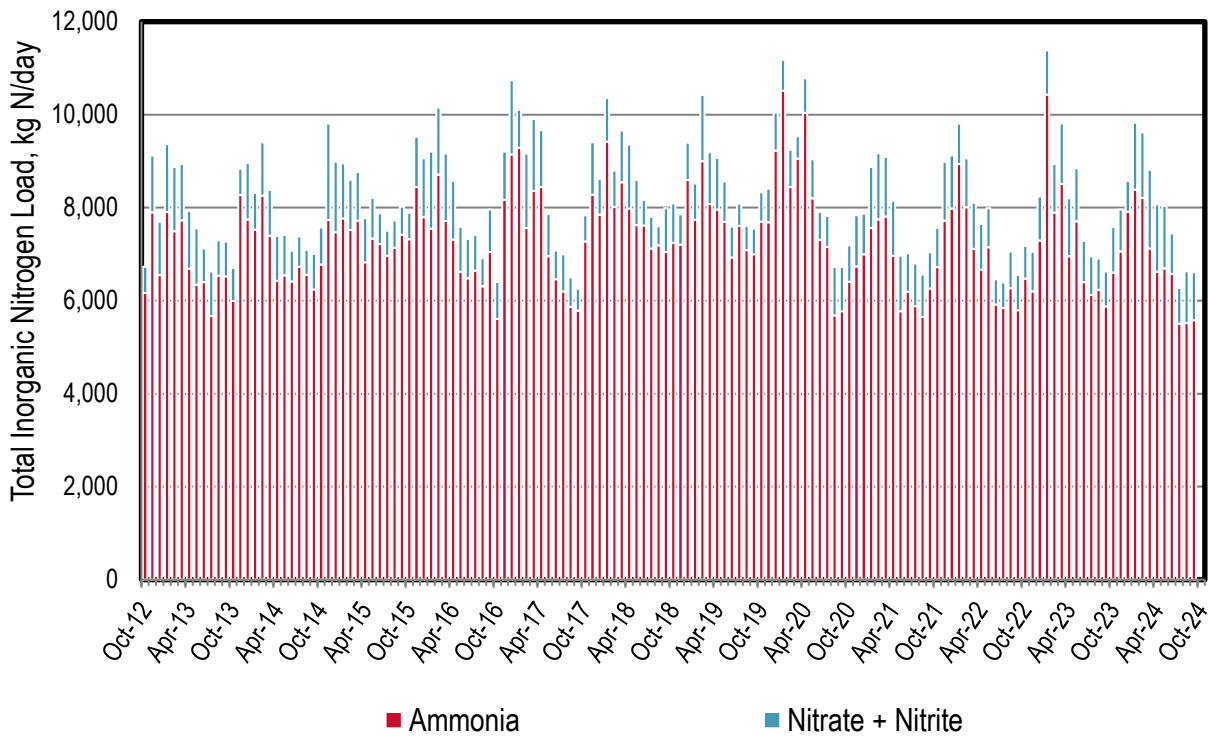


Figure 8-4. Discharge: EBDA Monthly Nitrogen Loads

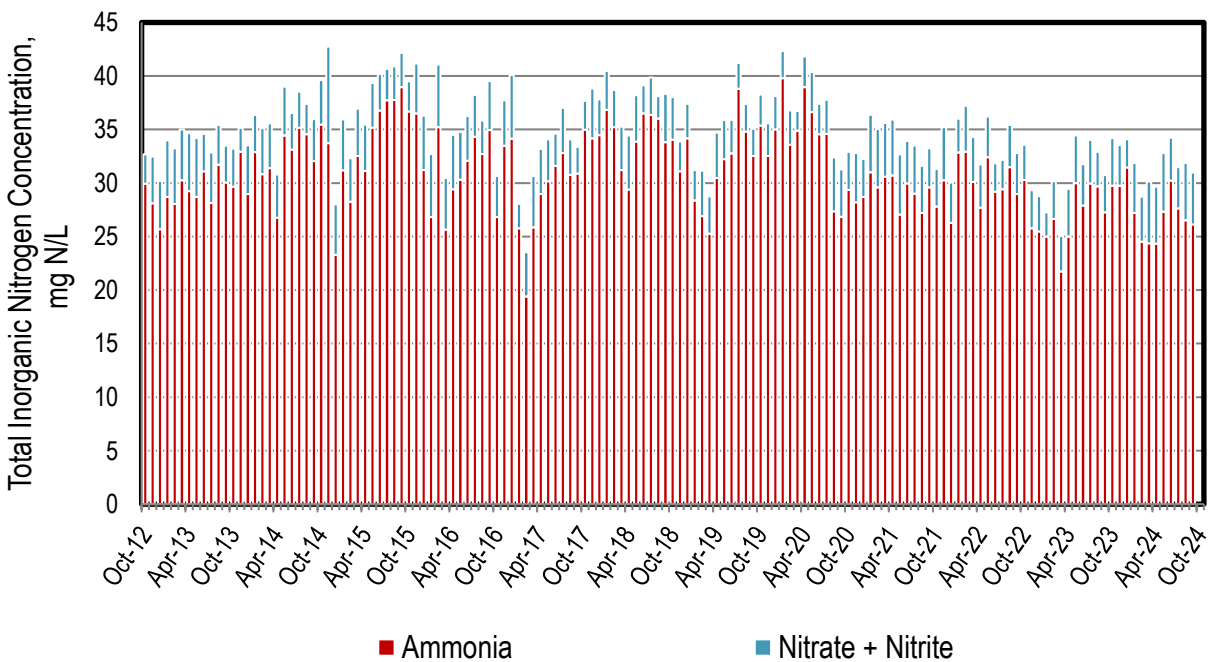


Figure 8-5. Discharge: EBDA Monthly Nitrogen Concentrations

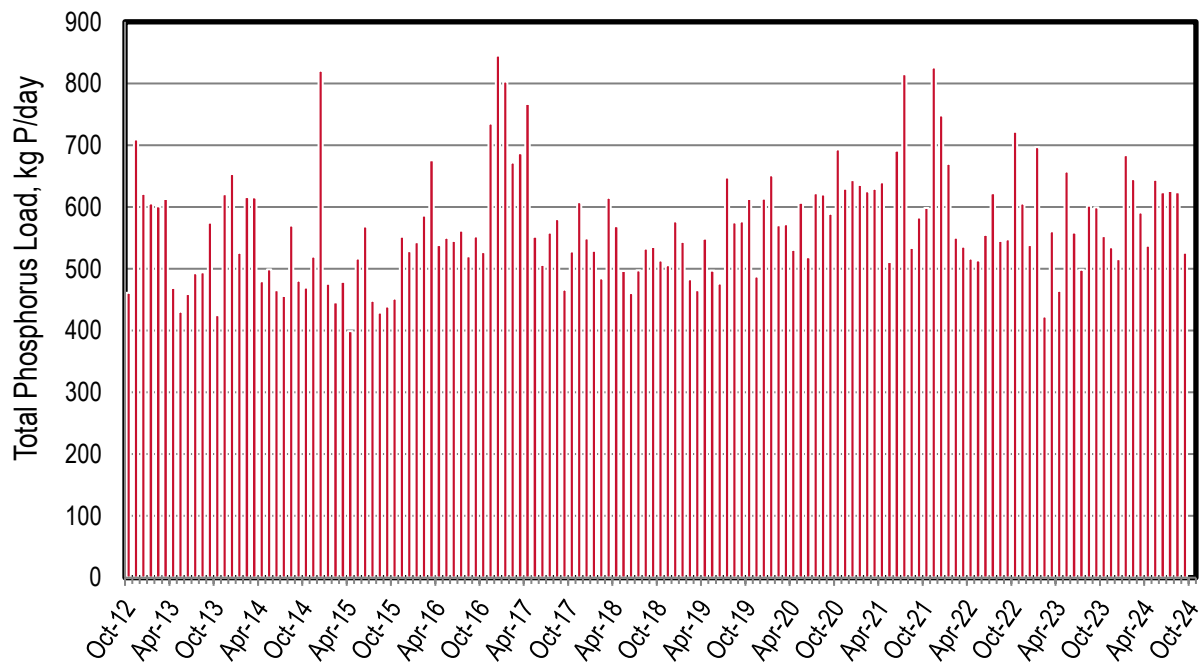


Figure 8-6. Discharge: EBDA Monthly Phosphorus Loads

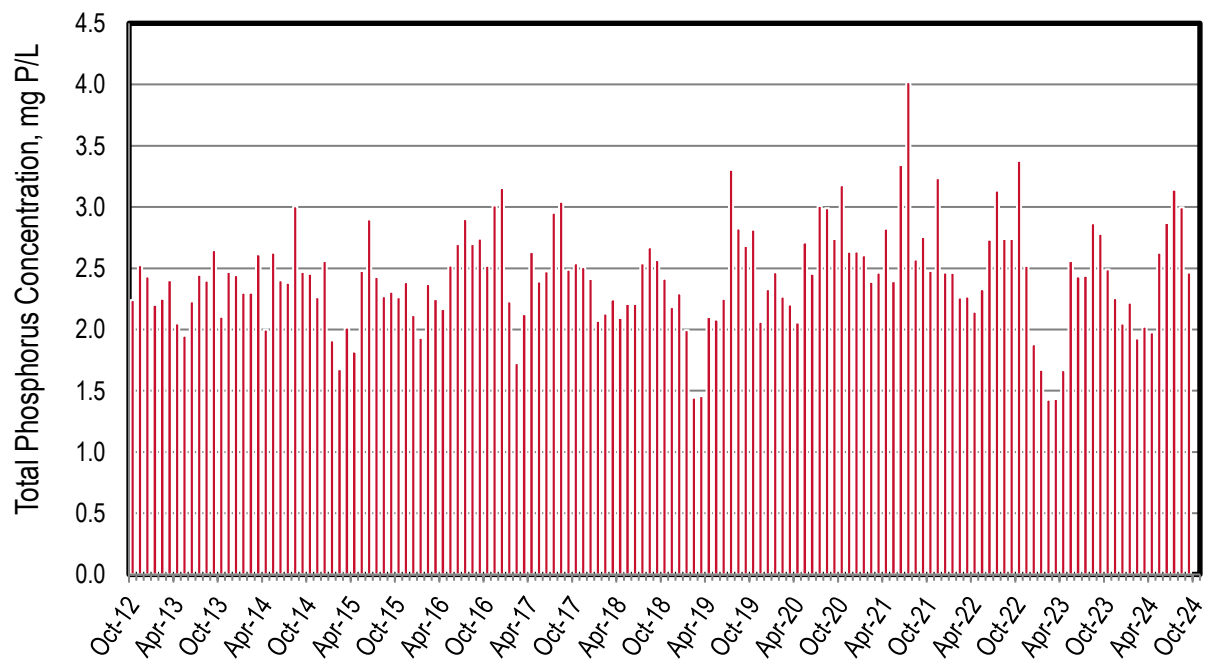


Figure 8-7. Discharge: EBDA Monthly Phosphorus Concentrations

Recycled Water

Table 8-3. Recycled Water: EBDA Yearly Recycled Water Flows Diverted from the Bay*

Year**	Flow Diverted***, Acre-Feet (mgd)							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	1,270 (1.1)	4,410 (3.9)	0 (0)	2,900 (2.6)	0 (0)	0 (0)	2,150 (1.9)	10,720 (9.6)
2020	1,200 (1.1)	4,250 (3.8)	0 (0)	3,220 (2.9)	668 (0.60)	0 (0)	166 (0.15)	9,500 (8.5)
2021	1,340 (1.2)	5,630 (5.0)	0 (0)	2,530 (2.3)	0 (0)	0 (0)	155 (0.14)	9,660 (8.6)
2022	1,260 (1.1)	5,180 (4.6)	0 (0)	3,140 (2.8)	0 (0)	0 (0)	537 (0.48)	10,120 (9.0)
2023	2,670 (2.4)	4,330 (3.9)	0 (0)	1,990 (1.8)	0 (0)	0 (0)	311 (0.28)	9,300 (8.3)
Average	1,549 (1.4)	4,760 (4.2)	0 (0)	2,755 (2.5)	134 (0.12)	0 (0)	663 (0.59)	9,860 (8.8)

* Agencies that Contribute to EBDA: City of Hayward, Oro Loma/Castro Valley Sanitary District, City of San Leandro, and Union Sanitary District, and Livermore-Amador Valley Water Management Agency members City of Livermore and Dublin-San Ramon Services District. The recycled water values represent the sum of EBDA's member agencies.

** Calendar year as opposed to California's water year (October 1 through September 30)

*** Assumes 100% of the recycled flow is diverted from the Bay

Table 8-4. Recycled Water: EBDA Yearly Recycled Water Ammonia Load Diverted from the Bay*

Year**	Average Ammonia Load Diverted***, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	150	456	0	359	0	0	294	1,260
2020	166	560	0	459	113	0	23	1,320
2021	184	828	0	346	0	0	23	1,381
2022	188	727	0	468	0	0	91	1,473
2023	236	428	0	258	0	0	35	957
Average	185	600	0	378	23	0	93	1,278

* Agencies that Contribute to EBDA: City of Hayward, Oro Loma/Castro Valley Sanitary District, City of San Leandro, and Union Sanitary District, and Livermore-Amador Valley Water Management Agency members City of Livermore and Dublin-San Ramon Services District. The recycled water values represent the sum of EBDA's member agencies.

** Calendar year as opposed to California's water year (October 1 through September 30)

*** Assumes 100% of the recycled flow is diverted from the Bay

Table 8-5. Recycled Water: EBDA Yearly Recycled Water Total Inorganic Nitrogen Load Diverted from the Bay*

Year**	Average Total Inorganic Nitrogen Load Diverted***, kg N/d							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	151	465	0	375	0	0	285	1,276
2020	168	569	0	479	116	0	23	1,355
2021	186	832	0	352	0	0	23	1,394
2022	193	766	0	481	0	0	93	1,533
2023	284	479	0	267	0	0	38	1,068
Average	196	622	0	391	23	0	92	1,325

* Agencies that Contribute to EBDA: City of Hayward, Oro Loma/Castro Valley Sanitary District, City of San Leandro, and Union Sanitary District, and Livermore-Amador Valley Water Management Agency members City of Livermore and Dublin-San Ramon Services District. The recycled water values represent the sum of EBDA's member agencies.

** Calendar year as opposed to California's water year (October 1 through September 30)

*** Assumes 100% of the recycled flow is diverted from the Bay

Table 8-6. Recycled Water: EBDA Yearly Recycled Water Total P Load Diverted from the Bay*

Year**	Average Total P Load Diverted***, kg P/d							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	6	8	0	21	0	0	19	54
2020	8	20	0	27	2	0	1	57
2021	9	25	0	21	0	0	1	55
2022	6	31	0	119	0	0	2	157
2023	157	11	0	29	0	0	1	197
Average	37	19	0	43	<1	0	5	104

* Agencies that Contribute to EBDA: City of Hayward, Oro Loma/Castro Valley Sanitary District, City of San Leandro, and Union Sanitary District, and Livermore-Amador Valley Water Management Agency members City of Livermore and Dublin-San Ramon Services District. The recycled water values represent the sum of EBDA's member agencies.

** Calendar year as opposed to California's water year (October 1 through September 30)

*** Assumes 100% of the recycled flow is diverted from the Bay

9 East Bay Municipal Utility District (EBMUD)

EBMUD discharges to the Central Bay. They have an ADWF permitted capacity of 120 mgd and a peak wet weather capacity of 320 mgd. It has a current dry season discharge flow of approximately 44.8 mgd. The plant performs secondary treatment using a high purity oxygen system. This plant accepts high-strength (organic) trucked wastes to its anaerobic digesters for renewable energy production. These wastes contribute to the plant discharge nutrient loads.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Influent

- ▲ Note: limited to sampling since July 2019; quarterly sampling required at a minimum.
- ▲ The influent flows and loads do not include the high-strength (organic) trucked wastes that are sent to EBMUD's anaerobic digesters for renewable energy production.
- ▲ Load Reduction Across the Plant: not performed for EBMUD as data on the high-strength (organic) trucked waste is not captured in the influent values. This calculation would not reflect actual load reduction across the plant.
- ▲ Based on Table 1-1 statistics, there are no dry season trends.

◆ Discharge

- ▲ Wet season loads are typically greater than the dry season loads.
- ▲ Nitrogen loads typically increase with flow during wet weather events.
- ▲ The ammonia and TIN loads were the second lowest this past dry season (after 2023) since sampling began in 2012. This reduction is attributed to two independent efforts: i) EBMUD stopped accepted trucked waste with relatively high nitrogenous compounds (e.g., animal blood waste) and ii) the treatment plant began treating up to 50 percent of the plant flow via split treatment during dry season with biological nitrification/denitrification. EBMUD performed initial piloting of the latter in 2020, 2021, and 2022. 2023 was the first dry season of using half of the secondary treatment system for nitrification/denitrification, and the results from 2024 confirm the benefits of this effort.
- ▲ Based on Table 1-2 statistics for the entire dry season dataset, flow, ammonia loads, and TIN loads appear to be trending downward, whereas TP appears to be trending upwards. The ammonia and TIN load trends were expected given the changes noted above. The increase in TP was expected as the unit process historically used for TP reduction is now being used for TIN load reduction.

◆ Recycled Water:

- ▲ Based on Table 1-3, the plant has averaged <1 mgd of Recycled Water from 2019-2023 calendar years that results in flow and/or load diversions from the Bay. Users include Landscape Irrigation and Industrial Applications.
- ▲ Based on Table 1-4 through Table 1-6, the plant has averaged the diversion of 89 kg ammonia-N/d, 95 kg TIN-N/d, and 8 kg P/d from the Bay over the 2019-2023 calendar years via recycled water.

Influent

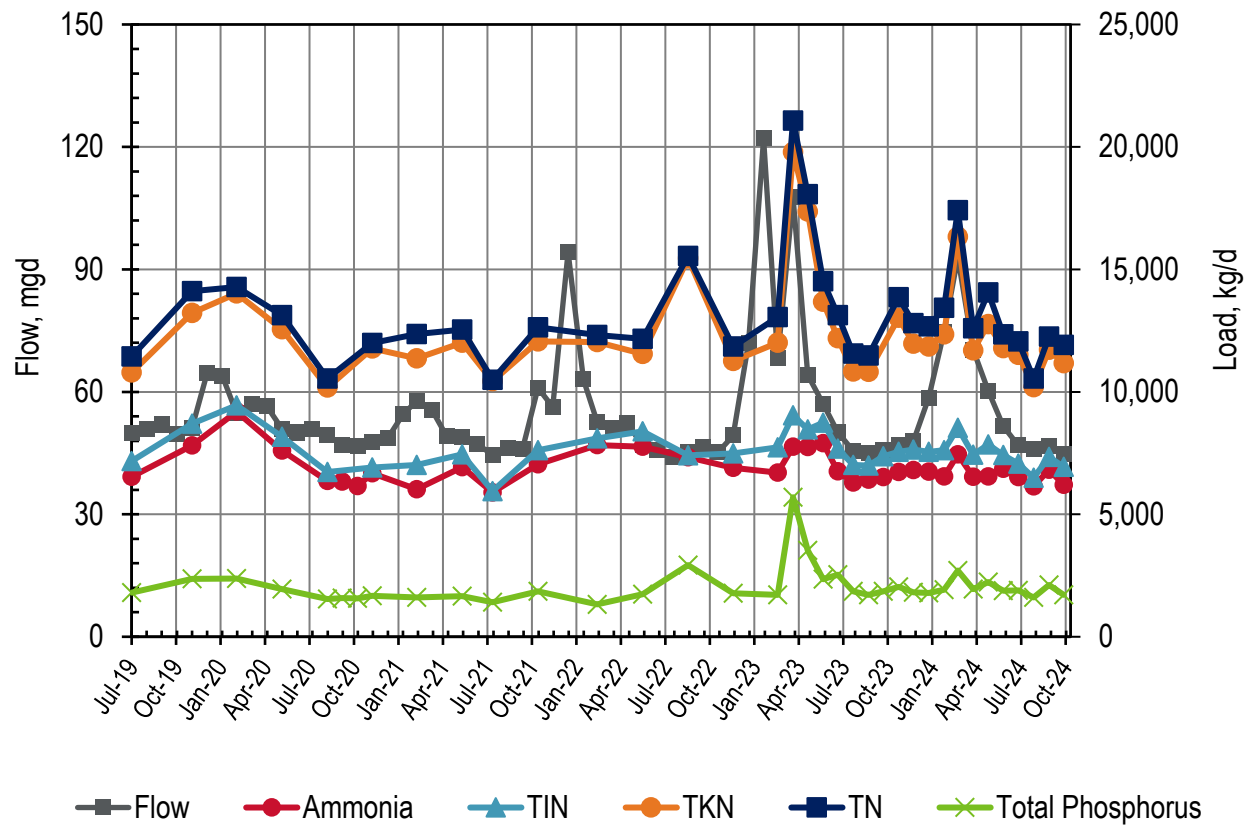


Figure 9-1. Influent: EBMUD Monthly Flows and Loads

Note: the quarterly nutrient data for July – September 2021 was provided in July 2021 samples.

Table 9-1. Influent: EBMUD Monthly Flows and Loads*

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-19	49.8	6,530	649	7,180	10,800	11,400	1,800
Aug-19	51.0	--	--	--	--	--	--
Sep-19	52.0	--	--	--	--	--	--
Oct-19	49.8	--	--	--	--	--	--
Nov-19	51.2	7,810	886	8,700	13,200	14,100	2,360
Dec-19	64.6	--	--	--	--	--	--
Jan-20	63.8	--	--	--	--	--	--
Feb-20	54.8	9,190	259	9,450	14,000	14,300	2,370
Mar-20	57.1	--	--	--	--	--	--
Apr-20	56.5	--	--	--	--	--	--
May-20	51.0	7,600	571	8,170	12,600	13,100	1,950
Jun-20	50.0	--	--	--	--	--	--
Jul-20	50.8	--	--	--	--	--	--
Aug-20	49.4	6,360	363	6,720	10,200	10,500	1,540
Sep-20	47.0	6,340	--	--	--	--	1,580
Oct-20	46.7	6,160	--	--	--	--	1,560
Nov-20	47.8	6,680	227	6,910	11,800	12,000	1,670
Dec-20	48.6	--	--	--	--	--	--
Jan-21	54.5	--	--	--	--	--	--
Feb-21	57.8	6,020	994	7,010	11,400	12,400	1,610
Mar-21	55.5	--	--	--	--	--	--
Apr-21	49.1	--	--	--	--	--	--
May-21	48.9	6,920	527	7,450	12,000	12,500	1,650
Jun-21	47.3	--	--	--	--	--	--
Jul-21	44.5	5,900	53.3	5,950	10,400	10,500	1,420
Aug-21	46.2	--	--	--	--	--	--
Sep-21	46.1	--	--	--	--	--	--
Oct-21	61.0	7,050	575	7,620	12,100	12,600	1,850
Nov-21	56.3	--	--	--	--	--	--
Dec-21	94.3	--	--	--	--	--	--
Jan-22	63.0	--	--	--	--	--	--
Feb-22	52.6	7,820	281	8,100	12,000	12,300	1,320
Mar-22	51.1	--	--	--	--	--	--
Apr-22	52.2	--	--	--	--	--	--
May-22	46.9	7,760	625	8,380	11,500	12,200	1,740
Jun-22	45.7	--	--	--	--	--	--

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-22	44.2	--	--	--	--	--	--
Aug-22	45.3	7,320	79.7	7,400	15,500	15,500	2,930
Sep-22	46.6	--	--	--	--	--	--
Oct-22	45.3	--	--	--	--	--	--
Nov-22	49.3	6,900	581	7,490	11,300	11,800	1,780
Dec-22	72.0	--	--	--	--	--	--
Jan-23	122	--	--	--	--	--	--
Feb-23	68.2	6,700	1,040	7,730	12,000	13,000	1,710
Mar-23	108	7,760	1,280	9,050	19,800	21,100	5,700
Apr-23	64.1	7,750	711	8,460	17,400	18,100	3,520
May-23	57.0	7,900	841	8,740	13,700	14,500	2,350
Jun-23	50.1	6,750	937	7,690	12,200	13,100	2,530
Jul-23	45.5	6,290	720	7,010	10,800	11,600	1,850
Aug-23	45.0	6,410	577	6,990	10,800	11,500	1,700
Sep-23	45.7	6,520	850	7,370	--	--	1,850
Oct-23	47.0	6,720	832	7,560	13,000	13,900	2,030
Nov-23	47.9	6,810	844	7,640	12,000	12,800	1,820
Dec-23	58.6	6,740	817	7,560	11,900	12,700	1,790
Jan-24	74.7	6,540	1,080	7,620	12,300	13,400	1,920
Feb-24	93.0	7,450	1,080	8,540	16,300	17,400	2,700
Mar-24	70.3	6,540	893	7,430	11,700	12,600	1,940
Apr-24	60.3	6,550	1,300	7,850	12,800	14,100	2,230
May-24	51.6	6,860	562	7,420	11,800	12,300	1,870
Jun-24	46.9	6,510	549	7,060	11,500	12,100	1,890
Jul-24	46.1	6,130	364	6,500	10,200	10,500	1,600
Aug-24	46.6	6,810	532	7,350	11,700	12,300	2,120
Sep-24	44.9	6,200	736	6,940	11,200	11,900	1,710
Dry Season Average	47.9	6,730	561	7,310	11,700	12,200	1,890
Dry Season Trend ***	None	None	None	None	None	None	None
Wet Season Average	62.0	7,070	805	7,920	13,200	14,000	2,220
Average Annual	55.7	6,900	683	7,620	12,500	13,200	2,060

* EBMUD occasionally samples more than the required influent quarterly sampling. This dataset includes this additional sampling.

** The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values. The Total Nitrogen value is calculated by adding "TKN" and "Nitrate + Nitrite".

*** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

Discharge

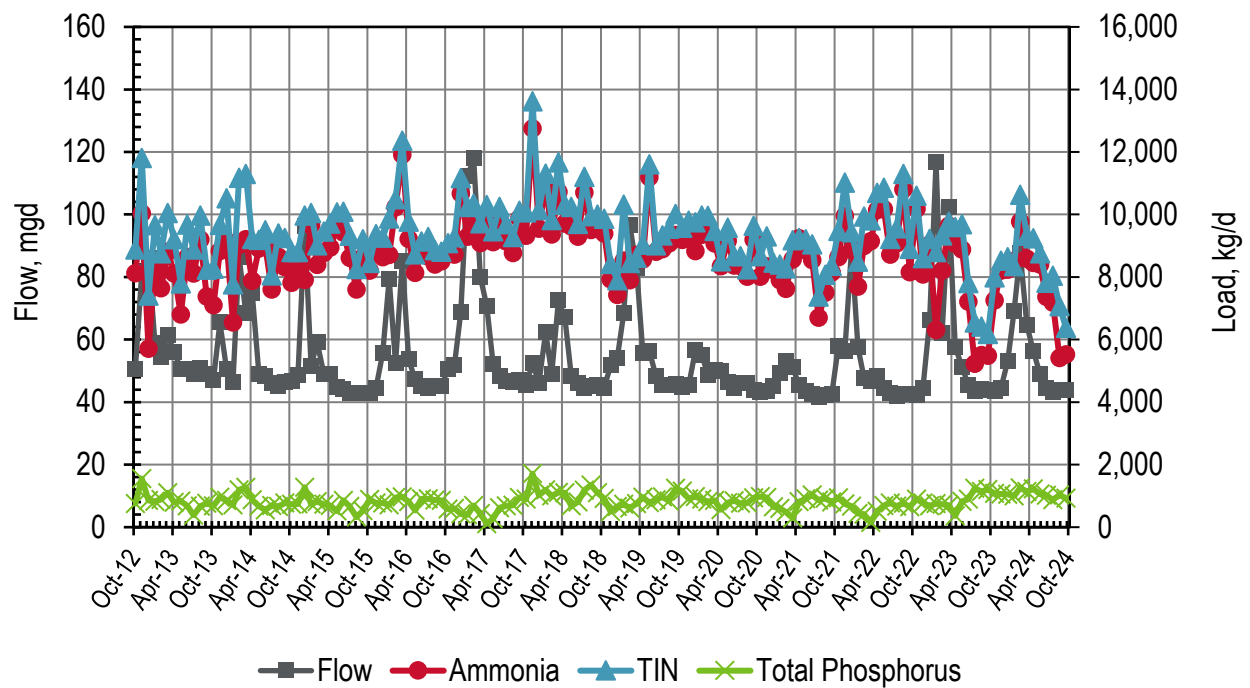


Figure 9-2. Discharge: EBMUD Monthly Flows and Loads

Table 9-2. Discharge: EBMUD Monthly Flows and Loads

Month, Year	Flow	Ammonia *	Nitrate + Nitrite *	TIN *,**	Total P *
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	50.5	8,120	756	8,880	752
Nov-12	81.5	10,000	1,770	11,800	1,550
Dec-12	86.0	5,710	1,690	7,400	854
Jan-13	59.0	8,290	1,370	9,660	829
Feb-13	54.5	7,640	1,120	8,760	891
Mar-13	61.5	8,800	1,240	10,000	1,100
Apr-13	56.0	8,110	1,090	9,210	794
May-13	50.5	6,800	996	7,800	832
Jun-13	50.5	8,640	1,050	9,680	683
Jul-13	49.0	8,120	767	8,880	389
Aug-13	51.0	9,200	771	9,970	675
Sep-13	49.0	7,380	858	8,230	762
Oct-13	47.0	7,100	1,170	8,270	681
Nov-13	65.5	8,820	847	9,670	958
Dec-13	50.5	9,150	1,380	10,500	859
Jan-14	46.5	6,550	1,220	7,770	711

Month, Year	Flow	Ammonia *	Nitrate + Nitrite *	TIN **	Total P *
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Feb-14	86.5	9,020	2,150	11,200	1,200
Mar-14	68.5	9,200	2,090	11,300	1,270
Apr-14	75.0	7,880	1,340	9,220	874
May-14	49.0	8,910	277	9,190	671
Jun-14	48.5	8,990	509	9,500	551
Jul-14	46.1	7,610	444	8,050	691
Aug-14	45.2	8,640	749	9,390	658
Sep-14	46.5	8,320	927	9,240	771
Oct-14	46.7	7,810	992	8,800	737
Nov-14	48.7	8,230	574	8,800	742
Dec-14	96.2	7,910	2,060	9,970	1,280
Jan-15	51.5	9,660	392	10,100	740
Feb-15	59.1	8,390	623	9,010	816
Mar-15	49.0	8,770	679	9,450	736
Apr-15	48.9	8,940	765	9,710	693
May-15	44.8	9,590	479	10,100	516
Jun-15	44.2	9,420	664	10,100	854
Jul-15	42.9	8,620	708	9,320	658
Aug-15	42.7	7,600	652	8,260	326
Sep-15	43.1	8,630	570	9,200	526
Oct-15	43.0	8,200	247	8,450	887
Nov-15	44.6	8,820	543	9,370	772
Dec-15	55.8	8,630	624	9,260	769
Jan-16	79.5	8,700	1,170	9,880	709
Feb-16	52.4	10,200	259	10,500	948
Mar-16	85.0	11,900	457	12,400	966
Apr-16	53.7	9,210	557	9,770	814
May-16	47.3	8,130	595	8,730	535
Jun-16	45.0	8,730	400	9,130	905
Jul-16	44.6	8,650	629	9,280	906
Aug-16	45.2	8,400	458	8,860	866
Sep-16	45.0	8,500	309	8,810	852
Oct-16	50.6	8,740	340	9,080	583
Nov-16	51.8	8,720	554	9,270	600
Dec-16	68.8	10,700	494	11,200	422
Jan-17	112	9,290	953	10,200	393
Feb-17	118	9,670	669	10,300	695

Month, Year	Flow	Ammonia *	Nitrate + Nitrite *	TIN **	Total P *
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Mar-17	80.0	9,080	640	9,720	438
Apr-17	70.7	9,840	463	10,300	112
May-17	52.1	9,110	357	9,470	277
Jun-17	48.4	9,820	423	10,200	622
Jul-17	46.6	9,140	555	9,690	677
Aug-17	46.5	8,770	511	9,280	698
Sep-17	47.0	9,870	243	10,100	945
Oct-17	45.4	9,320	742	10,100	898
Nov-17	52.5	12,800	867	13,600	1,710
Dec-17	46.2	9,550	593	10,100	1,020
Jan-18	62.3	11,000	303	11,300	1,200
Feb-18	49.0	9,360	458	9,820	1,000
Mar-18	72.5	10,700	945	11,700	1,110
Apr-18	67.1	9,700	606	10,300	1,100
May-18	48.5	9,620	622	10,200	686
Jun-18	46.0	9,290	409	9,700	809
Jul-18	44.5	10,700	499	11,200	1,180
Aug-18	45.2	9,510	394	9,950	1,350
Sep-18	45.3	9,750	435	9,990	1,110
Oct-18	44.5	9,400	467	9,860	915
Nov-18	51.7	7,930	484	8,420	500
Dec-18	54.2	7,430	468	7,900	663
Jan-19	68.4	8,520	1,030	10,300	731
Feb-19	96.6	7,890	552	8,450	610
Mar-19	82.9	8,710	614	8,610	749
Apr-19	55.5	8,560	477	9,030	959
May-19	56.4	11,200	406	11,600	780
Jun-19	48.3	8,810	380	9,010	874
Jul-19	45.5	8,890	440	9,330	965
Aug-19	45.5	9,070	467	9,540	830
Sep-19	45.9	9,340	413	10,000	1,240
Oct-19	44.7	9,190	387	9,570	1,160
Nov-19	45.3	9,580	357	9,810	908
Dec-19	56.6	8,830	409	9,740	982
Jan-20	55.2	9,350	568	9,970	898
Feb-20	48.7	9,580	373	9,950	816
Mar-20	50.1	9,080	394	9,470	852

Month, Year	Flow	Ammonia *	Nitrate + Nitrite *	TIN **	Total P *
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Apr-20	49.9	8,350	369	8,500	563
May-20	46.4	9,150	418	9,570	783
Jun-20	44.5	8,370	298	8,670	843
Jul-20	46.0	8,350	317	8,660	768
Aug-20	46.0	8,010	348	8,240	775
Sep-20	43.8	9,190	459	9,630	932
Oct-20	43.3	8,010	657	8,660	980
Nov-20	43.6	8,330	671	9,300	952
Dec-20	45.2	8,230	823	8,460	646
Jan-21	49.3	7,900	501	8,400	599
Feb-21	53.1	7,620	647	8,270	482
Mar-21	51.3	8,560	566	9,180	295
Apr-21	45.3	9,240	396	9,250	818
May-21	43.5	8,850	353	9,210	906
Jun-21	42.5	8,540	505	9,040	1,030
Jul-21	41.5	6,700	676	7,370	862
Aug-21	42.2	7,500	569	8,070	928
Sep-21	42.5	8,140	301	8,360	806
Oct-21	58.0	8,630	431	9,470	937
Nov-21	56.3	9,950	633	11,000	745
Dec-21	89.1	8,860	453	9,440	672
Jan-22	57.5	7,690	1,110	8,490	439
Feb-22	47.8	8,990	768	9,940	419
Mar-22	46.6	9,140	541	9,810	149
Apr-22	48.3	10,100	551	10,700	507
May-22	44.3	10,200	318	10,900	696
Jun-22	42.9	8,710	507	9,220	771
Jul-22	41.8	9,070	483	9,560	670
Aug-22	42.5	10,800	500	11,300	766
Sep-22	42.7	8,150	720	8,900	652
Oct-22	42.2	10,200	430	10,600	901
Nov-22	44.5	8,080	525	8,600	774
Dec-22	66.2	9,030	830	9,220	683
Jan-23	117	6,300	1,860	8,800	753
Feb-23	62.2	8,200	1,290	9,330	732
Mar-23	102	9,630	610	9,770	705
Apr-23	57.7	9,070	530	9,590	368

Month, Year	Flow	Ammonia *	Nitrate + Nitrite *	TIN **,**	Total P *
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
May-23	51.3	8,880	467	9,690	826
Jun-23	45.4	7,210	594	7,800	899
Jul-23	43.5	5,220	1,330	6,550	1,240
Aug-23	44.2	5,500	914	6,410	1,140
Sep-23	43.8	5,480	763	6,180	1,200
Oct-23	43.4	7,250	745	7,990	1,080
Nov-23	44.6	8,200	320	8,530	1,060
Dec-23	53.1	8,240	323	8,630	1,050
Jan-24	69.2	8,510	677	8,340	1,000
Feb-24	87.7	9,770	858	10,600	1,260
Mar-24	64.5	8,590	495	9,320	1,140
Apr-24	56.3	8,450	487	9,240	1,230
May-24	49.0	8,400	381	8,750	1,060
Jun-24	44.3	7,360	451	7,810	1,020
Jul-24	43.1	7,180	861	8,040	879
Aug-24	43.9	5,410	1,660	7,070	1,030
Sep-24	43.8	5,520	853	6,370	924
Dry Season Average	45.8	8,460	573	9,040	818
Dry Season Trend ***	Down	Down	None	Down	Up
Wet Season Average	60.7	8,830	756	9,580	820
Average Annual	54.55	8,670	680	9,350	819

* Numbers in this table are slightly different compared to those reported in the CIWQS, due to rounding of conversion factors used.

** The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

*** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

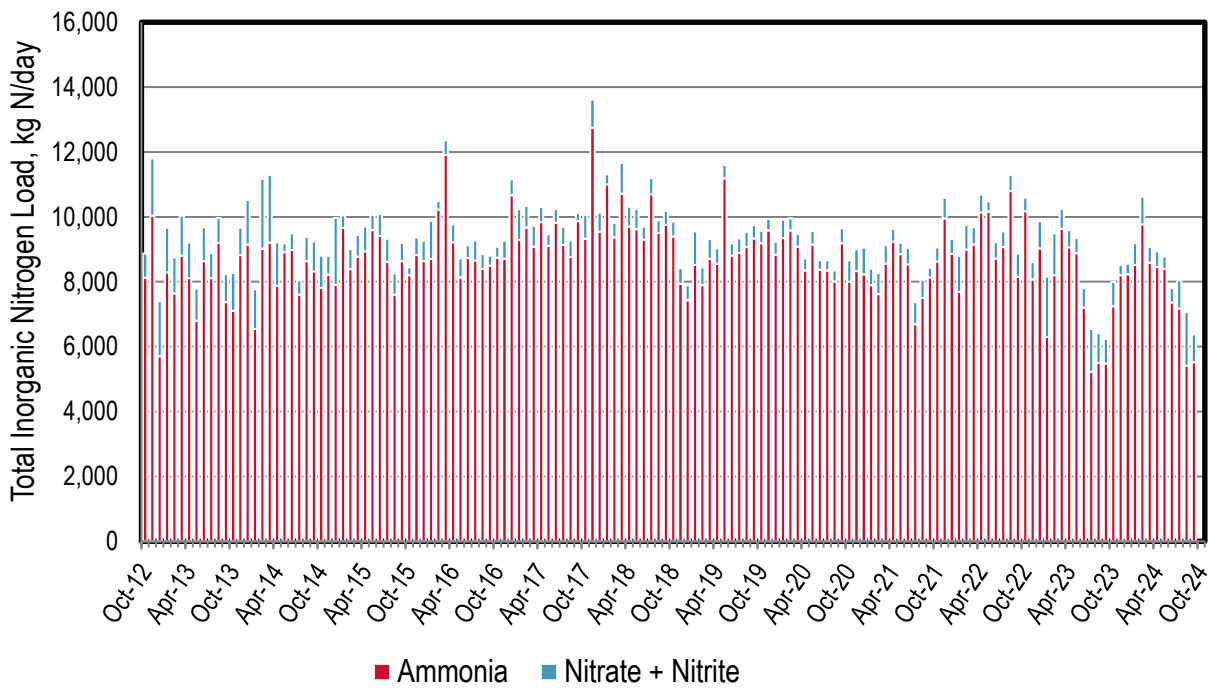


Figure 9-3. Discharge: EBMUD Monthly Nitrogen Loads

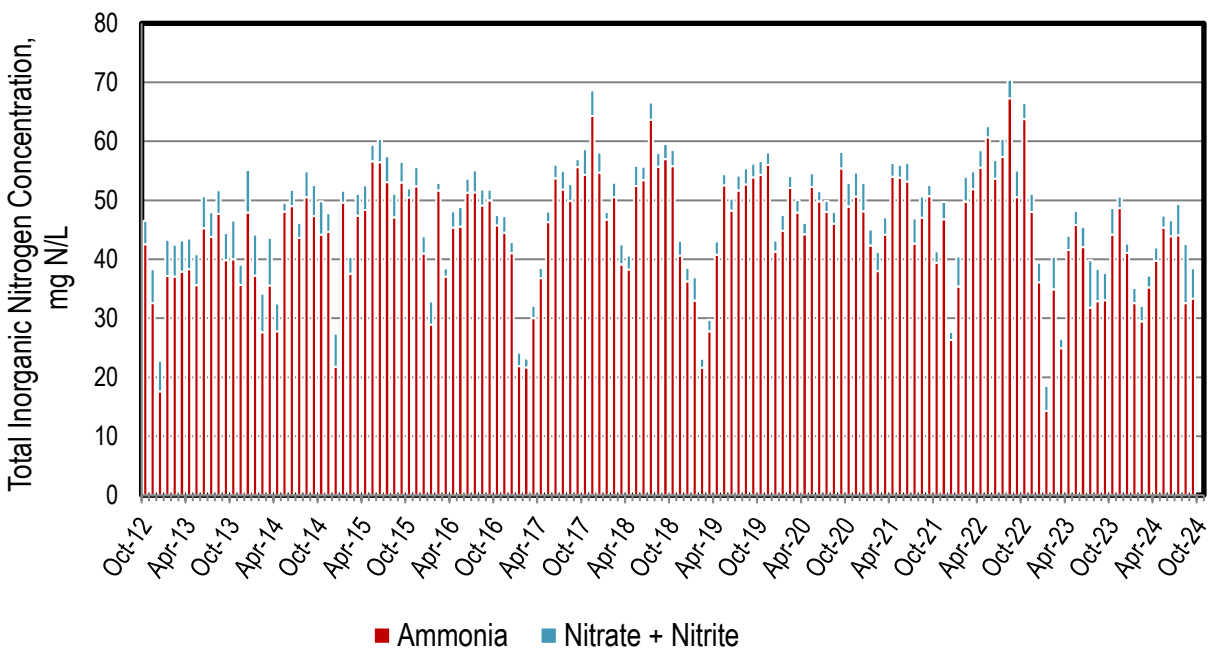


Figure 9-4. Discharge: EBMUD Monthly Nitrogen Concentrations

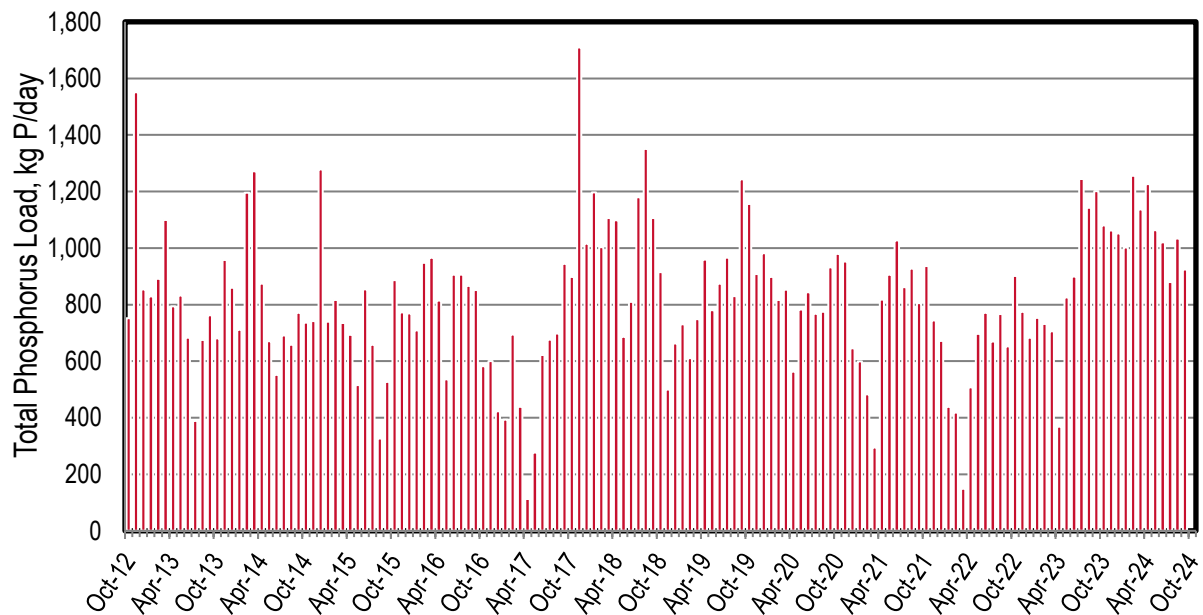


Figure 9-5. Discharge: EBMUD Monthly Phosphorus Loads

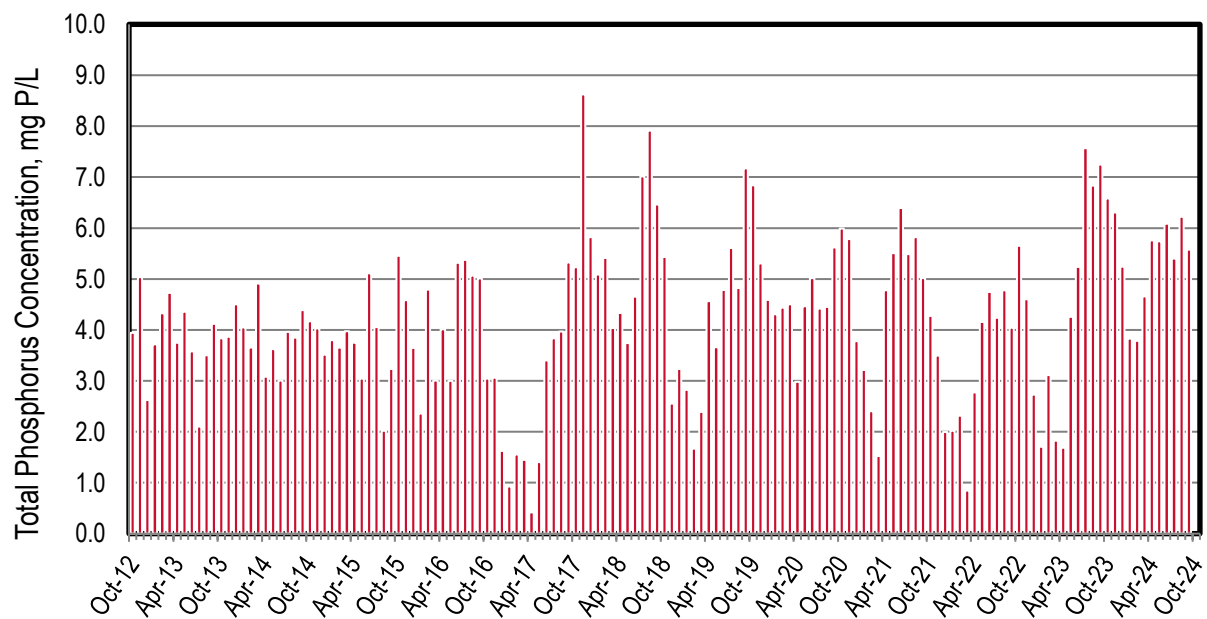


Figure 9-6. Discharge: EBMUD Monthly Phosphorus Concentrations

Recycled Water

Table 9-3. Recycled Water: EBMUD Yearly Recycled Water Flows Diverted from the Bay

Year**	Flow Diverted*, Acre-Feet (mgd)							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application ***	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	0 (0)	162 (0.14)	0 (0)	813 (0.73)	0 (0)	0 (0)	0 (0)	975 (0.87)
2020	0 (0)	185 (0.17)	0 (0)	648 (0.58)	0 (0)	0 (0)	0 (0)	833 (0.74)
2021	0 (0)	193 (0.17)	0 (0)	652 (0.58)	0 (0)	0 (0)	0 (0)	845 (0.75)
2022	0 (0)	198 (0.18)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	198 (0.18)
2023	0 (0)	150 (0.13)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	150 (0.13)
Average	0 (0)	178 (0.16)	0 (0)	423 (0.38)	0 (0)	0 (0)	0 (0)	601 (0.54)

* Assumes 100% of the recycled flow is diverted from the Bay

** Calendar year as opposed to California's water year (October 1 through September 30)

*** The listed EBMUD volume and/or load represents the portion of industrial application that is diverted from the Bay. Approximately 4 to 10 times more volume and/or load is used for industrial applications, but they are not diverted from the Bay and thus not included with this dataset.

Table 9-4. Recycled Water: EBMUD Yearly Recycled Water Ammonia Load Diverted from the Bay

Year**	Average Ammonia Load Diverted*, kg N/d							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application ***	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	0	22	0	115	0	0	0	137
2020	0	31	0	107	0	0	0	137
2021	0	28	0	95	0	0	0	123
2022	0	35	0	0	0	0	0	35
2023	0	15	0	0	0	0	0	15
Average	0	26	0	63	0	0	0	89

* Assumes 100% of the recycled load is diverted from the Bay

** Calendar year as opposed to California's water year (October 1 through September 30)

*** The listed EBMUD volume and/or load represents the portion of industrial application that is diverted from the Bay. Approximately 4 to 10 times more volume and/or load is used for industrial applications, but they are not diverted from the Bay and thus not included with this dataset.

Table 9-5. Recycled Water: EBMUD Yearly Recycled Water Total Inorganic Nitrogen Load Diverted from the Bay

Year**	Average Total Inorganic Nitrogen Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application ***	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	23	0	121	0	0	0	145
2020	0	33	0	112	0	0	0	143
2021	0	30	0	101	0	0	0	131
2022	0	37	0	0	0	0	0	37
2023	0	17	0	0	0	0	0	0
Average	0	28	0	67	0	0	0	95

* Assumes 100% of the recycled load is diverted for all recycled water applications

** Calendar year as opposed to California's water year (October 1 through September 30)

*** The listed EBMUD volume and/or load represents the portion of industrial application that is diverted from the Bay. Approximately 4 to 10 times more volume and/or load is used for industrial applications, but they are not diverted from the Bay and thus not included with this dataset.

Table 9-6. Recycled Water: EBMUD Yearly Recycled Water Total P Load Diverted from the Bay

Year**	Average Total P Load Diverted*, kg P/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application ***	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	2	0	11	0	0	0	14
2020	0	3	0	10	0	0	0	13
2021	0	3	0	9	0	0	0	11
2022	0	2	0	0	0	0	0	2
2023	0	2	0	0	0	0	0	2
Average	0	2	0	6	0	0	0	8

* Assumes 100% of the recycled load is diverted for all recycled water applications

** Calendar year as opposed to California's water year (October 1 through September 30)

*** The listed EBMUD volume and/or load represents the portion of industrial application that is diverted from the Bay. Approximately 4 to 10 times more volume and/or load is used for industrial applications, but they are not diverted from the Bay and thus not included with this dataset.

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10 Fairfield-Suisun Sewer District (FSSD)

FSSD discharges to waterways in the Suisun Marsh that flow more than 13 miles before reaching Suisun Bay. FSSD serves approximately 40,300 service connections. The plant has a permitted ADWF capacity of 23.7 mgd. This past dry season average discharge flow was approximately 12.8 mgd. The plant fully nitrifies and partially denitrifies using activated sludge.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Influent

- ▲ Note: limited to sampling since July 2019; quarterly sampling required at a minimum. Based on the limited dataset in Table 1-1, there is an upward dry season trend for flows and no emerging dry season trends for the nutrient parameters.
- ▲ The flow reduction across the plant is typically ≤ 10 percent. This reduction is attributed to a blend of water bound with biosolids, evaporation, and recycled water.
- ▲ Nitrogen load reduction values across the plant ranges from approximately 45 to 85 percent. This load reduction is attributed primarily to a combination of biological assimilation and nutrient load reduction in the activated sludge system.
- ▲ Phosphorus load reduction across the plant ranges from approximately 25 to 85 percent. This reduction is primarily attributed to a combination of chemical removal, biological assimilation, and biological phosphorus removal in the activated sludge system.

◆ Discharge

- ▲ Nitrogen loads typically increase with flow during wet weather events, whereas the phosphorus loads are relatively flat year-round.
- ▲ NO_x is the majority of the nitrogen species discharged, regardless of season. This would be expected since this plant reliably nitrifies year-round. The 2024 dry season load was approximately equal to the historical average.
- ▲ Total phosphorus concentrations are wide ranging from approximately 0.9 to 6.8 mg P/L.
- ▲ Based on Table 1-2 statistics for the entire dry season dataset, flow and ammonia loads appear to be trending upwards, whereas the other nutrient parameters have no emerging trends.

◆ Recycled Water

- ▲ Based on Table 1-3, the plant has averaged 0.66 mgd of recycled water over the 2019-2023 calendar years. Recycled water uses include commercial, industrial, and agricultural uses. Note: the listed volume/flows in Table 1-3 does not include in-plant/utility flow volumes. Furthermore, the listed average does not include water that is discharged to the duck clubs adjacent to the plant which provides marsh enhancement. Such duck club discharges are included in the plant's effluent flows.
- ▲ Based on Table 1-4 through Table 1-6 respectively, the plant has averaged the diversion of <1 kg ammonia-N/d, 51 kg TIN-N/d and 9 kg P/d away from the Bay through recycled water over the 2019-2023 calendar years.

Influent

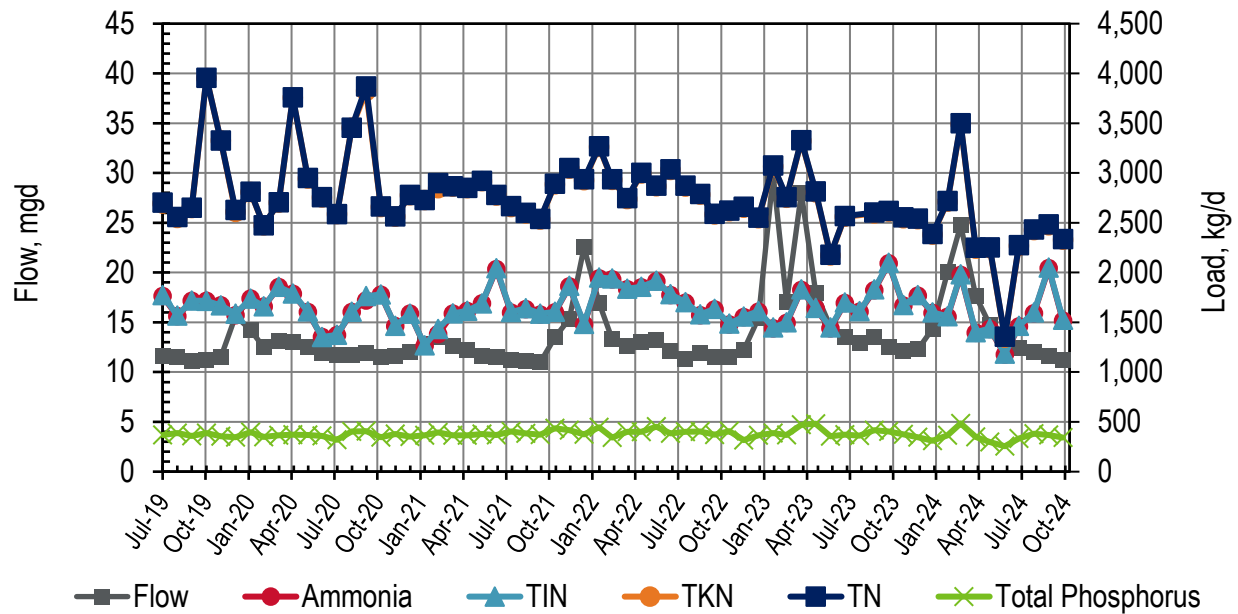


Figure 10-1. Influent: FSSD Monthly Flows and Loads

Note: the ammonia/TIN loads and TKN/Total N loads are comparable. The ammonia and TKN values are located behind TIN and Total N loads and thus are not visible.

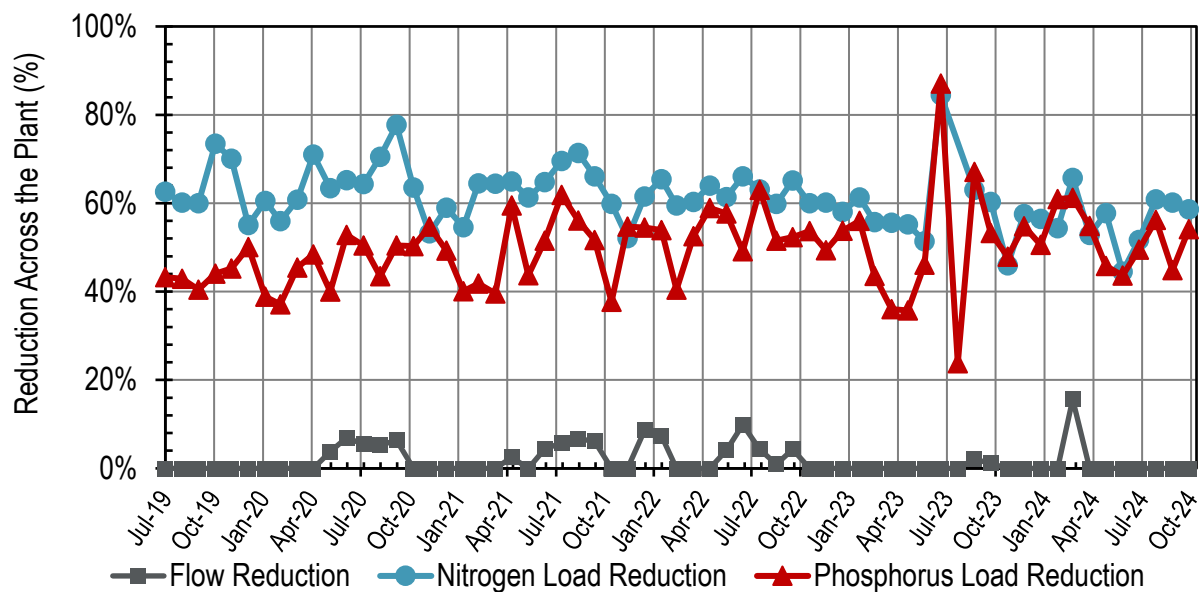


Figure 10-2. Influent: FSSD Monthly Reductions Across the Plant

Note: Influent TKN (instead of Total N) was compared against Discharge TIN for calculating nitrogen load reduction as insufficient Total N data was available. The difference is anticipated to be negligible as the historical TKN and Total N data are comparable (referred to Figure 1-1).

Table 10-1. Influent: FSSD Monthly Flows and Loads

Month, Year	Flow	Ammonia*	Nitrate + Nitrite ¹	TIN**	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-19	11.7	1,760	10.2	1,770	2,690	2,700	368
Aug-19	11.5	1,560	8.34	1,570	2,550	2,560	389
Sep-19	11.1	1,710	3.00	1,720	2,650	2,650	359
Oct-19	11.2	1,710	1.74	1,720	3,950	3,960	388
Nov-19	11.5	1,670	2.62	1,670	3,320	3,330	356
Dec-19	15.7	1,570	17.2	1,590	2,610	2,630	344
Jan-20	14.2	1,740	2.40	1,740	2,810	2,810	396
Feb-20	12.5	1,660	2.15	1,660	2,470	2,470	350
Mar-20	13.1	1,850	2.57	1,860	2,700	2,700	367
Apr-20	13.0	1,790	2.63	1,790	3,760	3,760	372
May-20	12.5	1,600	4.90	1,610	2,940	2,950	370
Jun-20	11.9	1,350	2.11	1,350	2,750	2,750	358
Jul-20	11.7	1,370	1.73	1,370	2,590	2,590	319
Aug-20	11.7	1,600	2.67	1,610	3,450	3,460	404
Sep-20	12.0	1,720	44.2	1,760	3,820	3,870	405
Oct-20	11.5	1,780	4.43	1,780	2,660	2,660	346
Nov-20	11.6	1,460	3.45	1,460	2,560	2,560	378
Dec-20	12.0	1,590	2.58	1,590	2,780	2,780	351
Jan-21	12.8	1,260	2.35	1,270	2,730	2,730	364
Feb-21	13.5	1,380	49.6	1,430	2,850	2,900	394
Mar-21	12.6	1,590	1.97	1,590	2,860	2,870	366
Apr-21	12.2	1,610	3.49	1,610	2,850	2,850	366
May-21	11.6	1,690	2.54	1,690	2,920	2,920	378
Jun-21	11.5	2,030	7.91	2,040	2,770	2,780	367
Jul-21	11.2	1,600	7.78	1,600	2,660	--	404
Aug-21	11.1	1,630	7.78	1,640	2,590	--	385
Sep-21	11.0	1,580	7.78	1,590	2,530	--	372
Oct-21	13.5	1,600	7.78	1,610	2,880	--	437
Nov-21	15.3	1,860	7.78	1,870	3,040	--	418
Dec-21	22.5	1,480	7.78	1,490	2,930	--	374
Jan-22	16.9	1,940	7.78	1,950	3,260	--	447
Feb-22	13.3	1,930	7.78	1,940	2,930	--	344
Mar-22	12.7	1,830	7.78	1,840	2,740	--	400
Apr-22	13.0	1,850	7.78	1,860	2,990	--	402
May-22	13.2	1,910	7.78	1,920	2,860	--	451
Jun-22	12.1	1,770	7.78	1,780	3,030	--	383

Month, Year	Flow	Ammonia*	Nitrate + Nitrite ¹	TIN**	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-22	11.3	1,690	7.78	1,700	2,860	--	400
Aug-22	11.9	1,570	7.78	1,580	2,780	--	405
Sep-22	11.5	1,630	7.78	1,630	2,580	--	371
Oct-22	11.5	1,480	7.78	1,490	2,610	2,620	406
Nov-22	12.2	1,550	7.78	1,560	2,650	2,660	316
Dec-22	15.4	1,610	7.78	1,610	2,540	2,550	365
Jan-23	29.8	1,440	7.78	1,450	3,070	3,070	389
Feb-23	17.0	1,490	7.78	1,500	2,750	2,760	369
Mar-23	28.0	1,820	7.78	1,830	3,320	3,330	472
Apr-23	18.0	1,640	7.78	1,650	2,810	2,810	479
May-23	14.6	1,440	7.78	1,450	2,170	2,180	356
Jun-23	13.6	1,690	7.78	1,700	2,560	2,570	371
Jul-23	12.9	1,610	7.78	1,610	--	--	362
Aug-23	13.5	1,820	7.78	1,830	2,590	2,600	416
Sep-23	12.5	2,090	7.78	2,100	2,610	2,620	404
Oct-23	12.1	1,670	7.78	1,670	2,550	2,550	374
Nov-23	12.3	1,770	7.78	1,770	2,530	2,540	345
Dec-23	14.4	1,590	7.78	1,600	2,380	2,390	312
Jan-24	20.0	1,550	7.78	1,560	2,710	2,720	364
Feb-24	24.8	1,980	7.78	1,980	3,490	3,500	485
Mar-24	17.7	1,390	7.78	1,400	2,240	2,250	348
Apr-24	14.7	1,430	7.78	1,440	2,240	2,250	297
May-24	13.3	1,180	7.78	1,180	1,350	1,350	255
Jun-24	12.4	1,460	7.78	1,460	2,270	2,280	333
Jul-24	12.0	1,590	7.78	1,600	2,430	2,430	382
Aug-24	11.7	2,040	7.78	2,050	2,470	2,480	368
Sep-24	11.2	1,520	7.78	1,530	2,330	2,340	342
Dry Season Average	12.1	1,650	8.13	1,660	2,660	2,670	374
Dry Season Trend ***	Up	None	None	None	None	None	None
Wet Season Average	15.2	1,640	7.50	1,650	2,850	2,850	379
Average Annual	13.8	1,650	7.78	1,650	2,760	2,770	377

- 1 After June 2021, Fairfield-Suisun Sewer District stopped sampling nitrate + nitrite as their values were reliably less than 1 mg N/L per the second watershed permit requirements (R2-2019-0017). Rather than placing values of zero, the historical average nitrate + nitrite value (7.78 kg N/d) has been applied from July 2021 to present.
- * Fairfield-Suisun Sewer District typically samples more than the required influent quarterly sampling. This dataset includes this additional sampling.
- ** The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values. The Total Nitrogen value is calculated by adding "TKN" and "Nitrate + Nitrite".
- *** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

Discharge

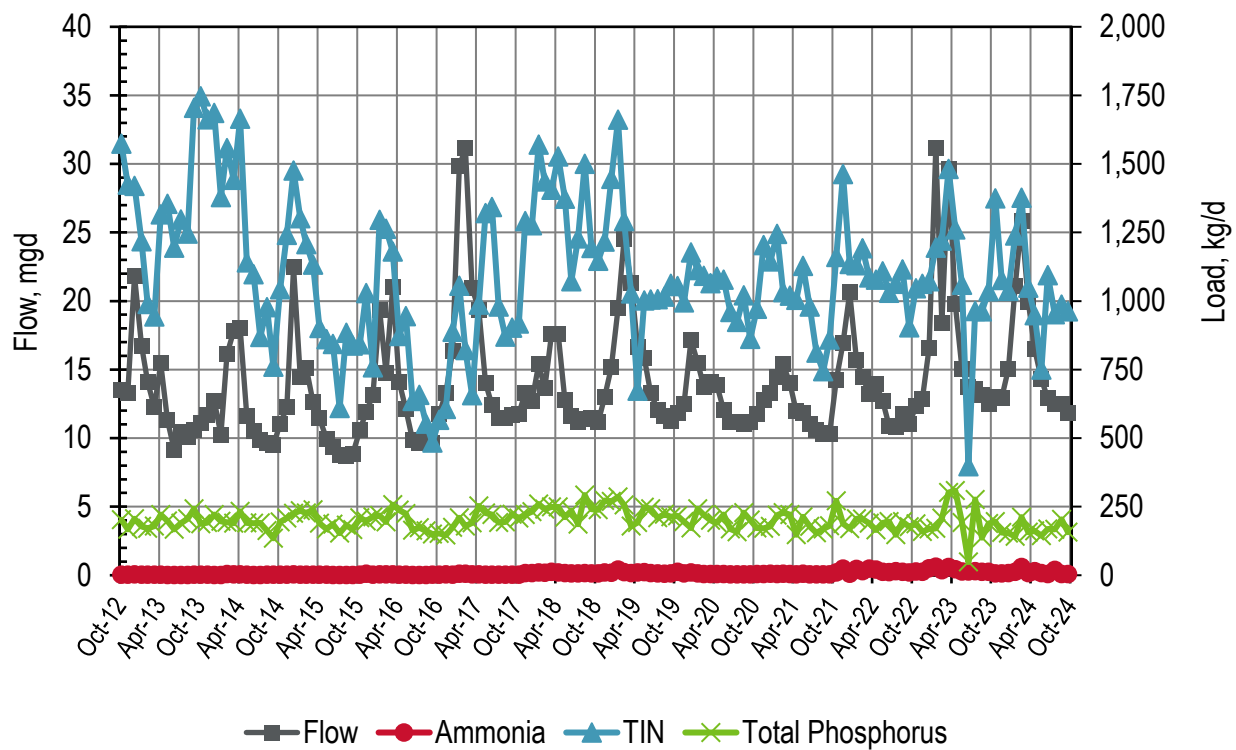


Figure 10-3. Discharge: FSSD Monthly Flows and Loads

Table 10-2. Discharge: FSSD Monthly Flows and Loads¹

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	13.5	1.26	1,570	1,570	203
Nov-12	13.3	1.81	1,420	1,420	168
Dec-12	21.8	2.74	1,420	1,420	206
Jan-13	16.7	1.90	1,220	1,220	177
Feb-13	14.1	1.60	987	989	171
Mar-13	12.2	1.95	941	943	179
Apr-13	15.4	1.46	1,310	1,320	221
May-13	11.3	0.855	1,350	1,350	198
Jun-13	9.15	0.691	1,190	1,190	168
Jul-13	10.4	0.787	1,300	1,300	190
Aug-13	10.1	0.940	1,240	1,250	206
Sep-13	10.6	1.42	1,700	1,700	243
Oct-13	11.1	1.25	1,740	1,750	187

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-13	11.7	1.50	1,660	1,660	192
Dec-13	12.7	0.962	1,680	1,690	221
Jan-14	10.3	0.775	1,380	1,380	197
Feb-14	16.1	3.57	1,550	1,560	193
Mar-14	17.8	2.89	1,440	1,440	189
Apr-14	18.1	2.82	1,660	1,670	232
May-14	11.6	1.75	1,140	1,140	191
Jun-14	10.5	0.982	1,100	1,100	189
Jul-14	9.88	1.12	868	869	190
Aug-14	9.67	1.18	977	978	163
Sep-14	9.50	1.32	759	761	135
Oct-14	11.0	1.83	1,040	1,040	195
Nov-14	12.2	2.00	1,240	1,240	209
Dec-14	22.4	3.12	1,470	1,480	225
Jan-15	14.5	2.18	1,300	1,300	235
Feb-15	15.1	1.78	1,210	1,210	227
Mar-15	12.6	1.45	1,130	1,130	238
Apr-15	11.5	1.34	901	902	190
May-15	9.95	1.18	860	861	169
Jun-15	9.35	1.07	842	843	187
Jul-15	8.75	0.924	608	609	154
Aug-15	8.70	1.03	883	884	183
Sep-15	8.85	0.896	836	837	166
Oct-15	10.6	1.17	840	842	209
Nov-15	11.9	4.73	1,020	1,030	198
Dec-15	13.2	1.36	756	757	213
Jan-16	19.3	2.38	1,290	1,300	217
Feb-16	14.8	2.69	1,260	1,260	194
Mar-16	21.0	2.77	1,180	1,180	258
Apr-16	14.1	1.58	871	873	238
May-16	12.1	1.99	942	944	225
Jun-16	9.86	1.01	634	635	164
Jul-16	9.65	1.04	657	658	173
Aug-16	9.88	0.910	552	553	161
Sep-16	9.60	1.33	482	483	150
Oct-16	11.7	1.76	565	566	152
Nov-16	13.3	2.52	604	607	147

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-16	16.4	2.15	885	887	174
Jan-17	29.8	4.77	1,050	1,060	210
Feb-17	31.1	5.60	815	821	179
Mar-17	20.9	3.24	653	656	190
Apr-17	19.4	2.83	984	987	252
May-17	14.0	1.96	1,320	1,320	227
Jun-17	12.4	2.10	1,340	1,340	221
Jul-17	11.5	1.58	979	980	192
Aug-17	11.4	1.73	868	870	195
Sep-17	11.7	1.84	900	902	223
Oct-17	11.8	1.94	916	918	208
Nov-17	13.3	7.91	1,280	1,290	221
Dec-17	12.7	7.81	1,270	1,280	232
Jan-18	15.4	9.74	1,560	1,570	260
Feb-18	13.6	8.61	1,430	1,440	241
Mar-18	17.6	12.0	1,390	1,410	249
Apr-18	17.6	9.75	1,520	1,530	249
May-18	12.8	7.29	1,370	1,370	212
Jun-18	11.6	5.97	1,070	1,070	235
Jul-18	11.2	6.74	1,040	1,230	186
Aug-18	11.4	7.57	1,490	1,500	293
Sep-18	11.4	6.56	1,190	1,190	240
Oct-18	11.2	6.63	1,140	1,150	238
Nov-18	13.0	9.32	1,210	1,220	272
Dec-18	15.2	8.32	1,440	1,450	269
Jan-19	19.4	19.9	1,640	1,660	286
Feb-19	24.5	10.6	1,280	1,290	256
Mar-19	21.3	7.67	1,020	1,030	179
Apr-19	16.7	9.60	663	672	191
May-19	15.9	11.4	991	1,000	248
Jun-19	13.3	6.98	998	1,010	242
Jul-19	12.1	6.36	1,000	1,010	209
Aug-19	11.6	5.73	1,010	1,020	222
Sep-19	11.3	6.57	1,060	1,060	214
Oct-19	11.8	12.0	1,040	1,050	217
Nov-19	12.5	6.04	989	995	195
Dec-19	17.2	9.73	1,170	1,180	172

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Jan-20	15.5	5.95	1,110	1,110	242
Feb-20	13.8	3.98	1,090	1,090	220
Mar-20	14.1	4.18	1,060	1,060	200
Apr-20	13.8	4.22	1,080	1,090	192
May-20	12.0	3.52	1,070	1,080	222
Jun-20	11.1	2.96	956	959	169
Jul-20	11.1	3.01	920	923	158
Aug-20	11.1	3.15	1,020	1,020	228
Sep-20	11.2	3.24	859	862	201
Oct-20	11.8	3.51	968	971	172
Nov-20	12.8	3.55	1,200	1,200	171
Dec-20	13.3	4.66	1,140	1,140	178
Jan-21	14.4	4.40	1,240	1,240	218
Feb-21	15.4	4.93	1,030	1,030	229
Mar-21	14.0	4.50	1,020	1,020	221
Apr-21	11.9	3.34	1,000	1,000	148
May-21	11.8	5.16	1,120	1,130	213
Jun-21	11.0	3.27	976	980	178
Jul-21	10.6	2.97	809	812	154
Aug-21	10.4	2.74	741	744	169
Sep-21	10.3	3.19	857	860	180
Oct-21	14.3	9.49	1,150	1,160	272
Nov-21	16.9	23.4	1,440	1,460	189
Dec-21	20.6	5.23	1,130	1,130	170
Jan-22	15.7	23.0	1,110	1,130	206
Feb-22	14.5	14.6	1,180	1,190	205
Mar-22	13.2	24.0	1,060	1,090	190
Apr-22	13.9	20.1	1,060	1,080	165
May-22	12.7	12.3	1,100	1,110	191
Jun-22	10.9	11.3	1,020	1,030	195
Jul-22	10.8	14.7	1,050	1,060	148
Aug-22	11.8	11.7	1,100	1,120	196
Sep-22	11.0	10.4	894	904	177
Oct-22	12.3	13.4	1,030	1,050	188
Nov-22	12.8	12.0	1,050	1,060	160
Dec-22	16.6	25.3	1,050	1,070	169
Jan-23	31.1	31.2	1,160	1,190	171

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Feb-23	18.4	17.8	1,200	1,220	208
Mar-23	29.6	29.3	1,450	1,480	302
Apr-23	19.7	21.8	1,240	1,260	308
May-23	15.0	13.5	1,050	1,060	192
Jun-23	13.7	13.6	384	398	48.0
Jul-22	13.6	14.7	949	963	276
Aug-23	13.2	11.8	951	962	137
Sep-23	12.4	11.7	1,020	1,040	189
Oct-23	13.0	6.82	1,370	1,370	195
Nov-23	12.9	6.25	1,070	1,080	156
Dec-23	15.1	8.01	1,030	1,040	154
Jan-24	21.1	12.3	1,230	1,240	142
Feb-24	25.8	29.8	1,350	1,380	212
Mar-24	19.9	7.08	1,040	1,050	157
Apr-24	16.5	14.0	934	948	161
May-24	14.3	7.55	742	749	144
Jun-24	12.9	4.58	1,090	1,090	168
Jul-24	12.5	19.0	933	952	167
Aug-24	12.4	4.01	982	986	203
Sep-24	11.8	3.95	958	962	157
Dry Season Average	11.4	5.02	985	993	190
Dry Season Trend **	Up	--***	None	None	None
Wet Season Average	16.0	7.61	1,170	1,180	206
Average Annual	14.1	6.53	1,090	1,100	199

1 For non-detects after October 1, 2023, 1/2 of the method detection limit was used to quantify values. Prior to October 1, 2023, non-detect values used the provided method detection limit.

* The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

*** Ammonia was not considered in the trending as the plant reliably fully nitrifies and the majority of samples are non-detects.

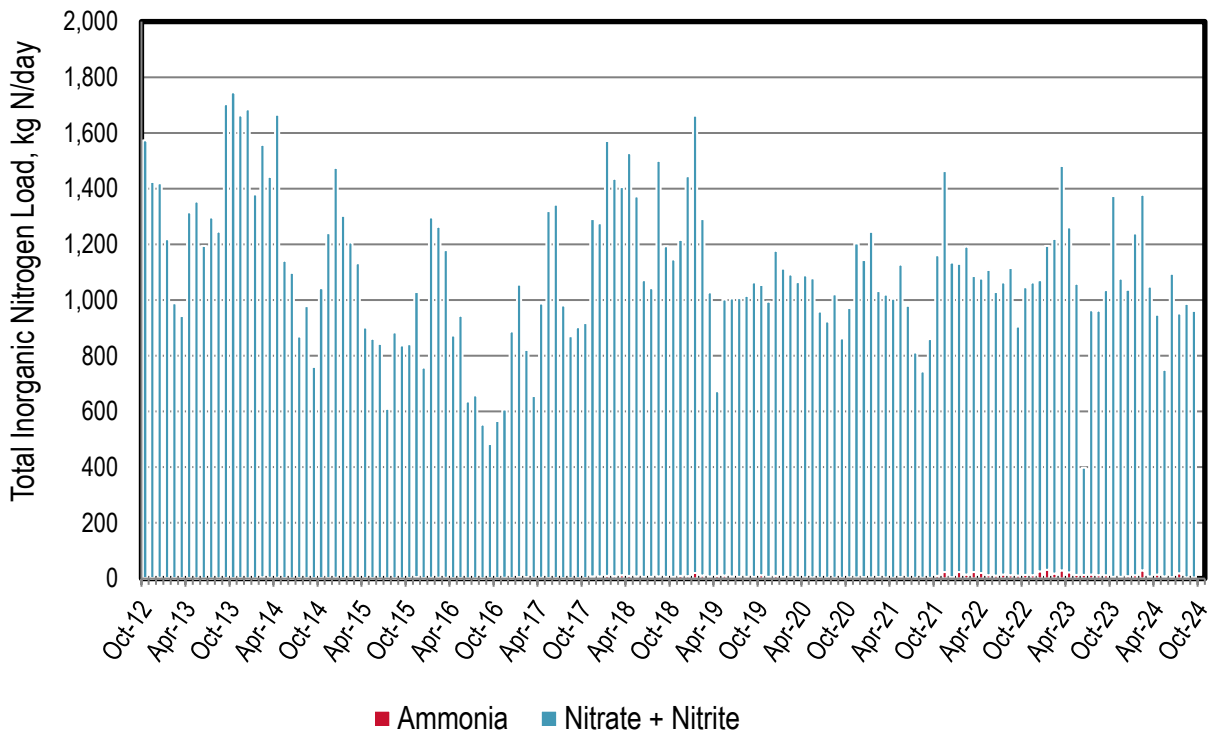


Figure 10-4. Discharge: FSSD Monthly Nitrogen Loads

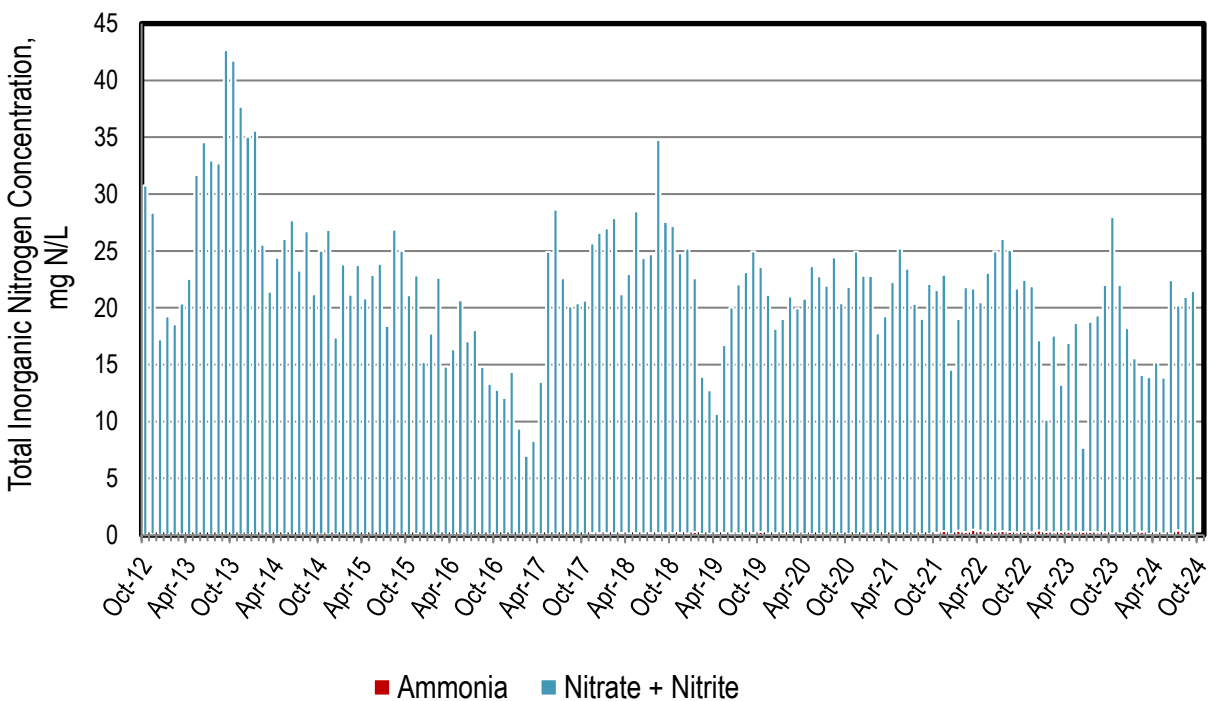


Figure 10-5. Discharge: FSSD Monthly Nitrogen Concentrations

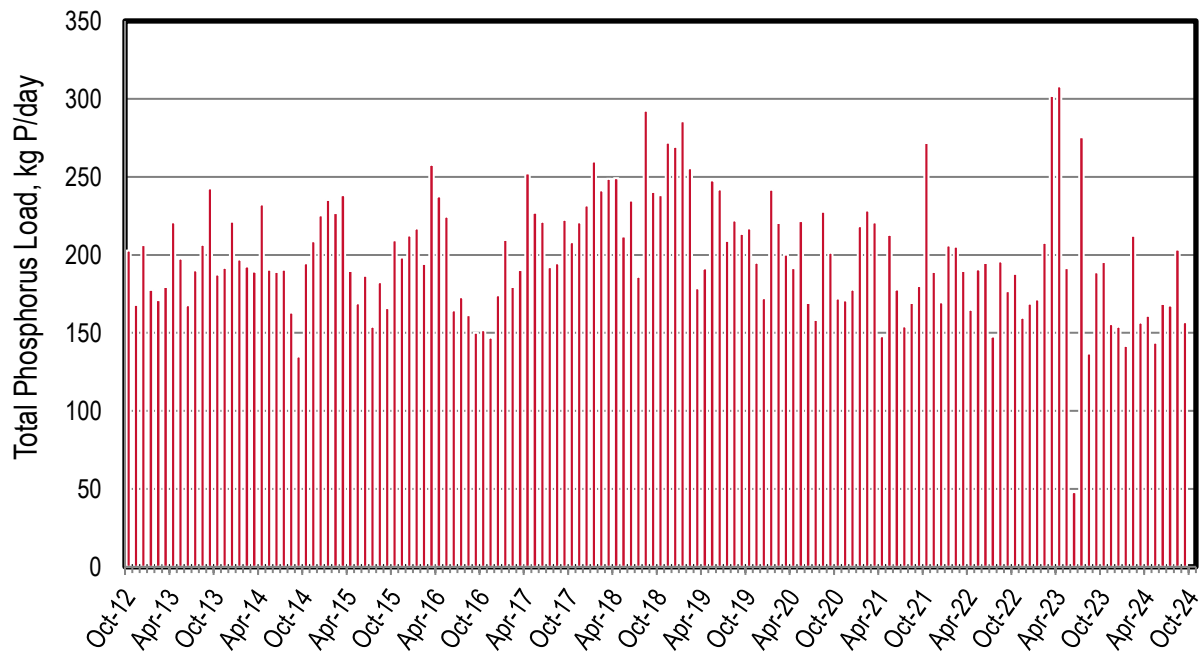


Figure 10-6. Discharge: FSSD Monthly Phosphorus Loads

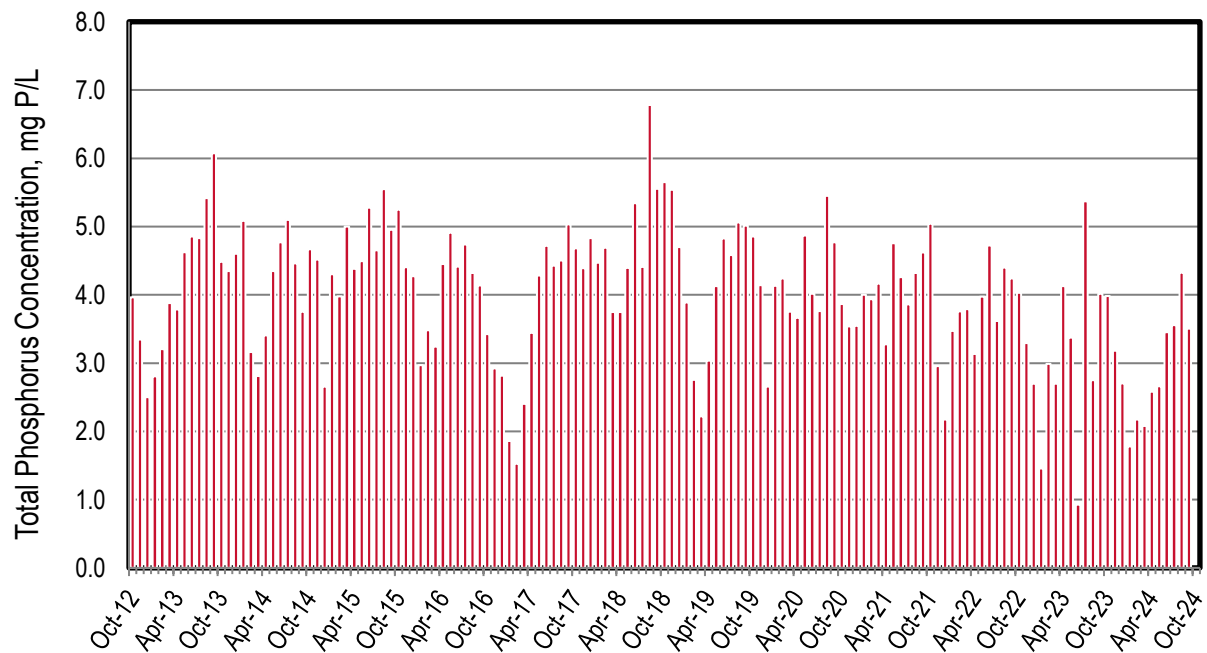


Figure 10-7. Discharge: FSSD Monthly Phosphorus Concentrations

Recycled Water

Table 10-3. Recycled Water: FSSD Yearly Recycled Water Flows Diverted from the Bay

Year**	Flow Diverted*, Acre-Feet (mgd)							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	0 (0)	0 (0)	0 (0)	19 (0.02)	730 (0.65)	0 (0)	0 (0)	749 (0.67)
2020	0 (0)	0 (0)	13 (0.01)	28 (0.02)	989 (0.88)	0 (0)	0 (0)	1,030 (0.92)
2021	0 (0)	0 (0)	38 (0.03)	32 (0.03)	925 (0.83)	0 (0)	0 (0)	995 (0.89)
2022	0 (0)	0 (0)	7 (0.01)	36 (0.03)	647 (0.58)	0 (0)	0 (0)	690 (0.62)
2023	0 (0)	0 (0)	0 (0)	46 (0.04)	234 (0.21)	0 (0)	0 (0)	280 (0.25)
Average	0 (0)	0 (0)	12 (0.01)	32 (0.03)	705 (0.63)	0 (0)	0 (0)	750 (0.67)

* Assumes 100% of the recycled flow is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 10-4. Recycled Water: FSSD Yearly Recycled Water Ammonia Load Diverted from the Bay

Year**	Average Ammonia Load Diverted*, kg N/d							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	0	0	0	<1	<1	0	0	<1
2020	0	0	<1	<1	<1	0	0	<1
2021	0	0	<1	<1	<1	0	0	<1
2022	0	0	<1	<1	1	0	0	1
2023	0	0	0	<1	<1	0	0	<1
Average	0	0	<1	<1	<1	0	0	<1

* Assumes 100% of the recycled load is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 10-5. Recycled Water: FSSD Yearly Recycled Water Total Inorganic Nitrogen Load Diverted from the Bay

Year**	Average Total Inorganic Nitrogen Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	0	0	1	45	0	0	46
2020	0	0	<1	2	73	0	0	76
2021	0	0	2	2	65	0	0	69
2022	0	0	<1	2	48	0	0	51
2023	0	0	0	2	12	0	0	14
Average	0	0	<1	2	49	0	0	51

* Assumes 100% of the recycled load is diverted for all recycled water applications

** Calendar year as opposed to California's water year (October 1 through September 30)

Table 10-6. Recycled Water: FSSD Yearly Recycled Water Total P Load Diverted from the Bay

Year**	Average Total P Load Diverted*, kg P/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	0	0	<1	9	0	0	9
2020	0	0	<1	<1	14	0	0	14
2021	0	0	<1	<1	12	0	0	13
2022	0	0	<1	<1	8	0	0	9
2023	0	0	0	<1	2	0	0	3
Average	0	0	<1	<1	9	0	0	9

* Assumes 100% of the recycled load is diverted for all recycled water applications

** Calendar year as opposed to California's water year (October 1 through September 30)

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11 Las Gallinas Valley Sanitary District

Las Gallinas discharges to Miller Creek that is connected to San Pablo Bay. The plant has approximately 15,800 service connections; it has a permitted capacity of 2.92 mgd ADWF and a peak wet weather secondary treatment capacity of up to 18 mgd. The average discharge flow this past dry season was 0 mgd as Las Gallinas did not discharge to San Pablo Bay during the dry season. The plant achieves secondary treatment using a hybrid fixed film activated sludge process, which also achieves nitrification and partial denitrification. Discharge to Miller Creek is prohibited June 1 through October 31, though the non-discharge period may be voluntarily extended if conditions allow.

The following observations are made based upon the figures and table in the subsequent pages:

◆ Discharge:

- ▲ TIN loads have decreased the last three years compared to historical averages. This is due to LGVSD extending the period of non-discharge and also a result of the new secondary treatment process, as noted above.
- ▲ Wet weather ammonia loads were the lowest in 2023/2024 since nutrient sampling began in 2012 under Section 13267 Letter Data, though this runs counter to the historical trend of increasing ammonia loads.
- ▲ NO_x is the majority of the nitrogen species discharged as would be expected since this plant nitrifies. A portion of ammonia bleeds through during the colder months.
- ▲ Total phosphorus concentrations range from 0.2 to 6.0 mg P/L. This suggests occasional P removal, as typical effluent TP concentrations are 4 to 6 mg P/L.
- ▲ Based on Table 11-1 statistics for the entire dry season dataset, there are no emerging dry season trends as Las Gallinas does not typically discharge during the dry season.

◆ Recycled Water:

- ▲ Based on Table 11-2, the plant averages 0.72 mgd of recycled water. Recycled water uses included landscape irrigation and agricultural irrigation.
- ▲ Based on Table 11-3 through Table 11-5, the plant diverted on average 13 kg ammonia-N/d, 32 kg TIN-N/d, and 7 kg P/d away from the Bay from 2019-2023 through reuse.

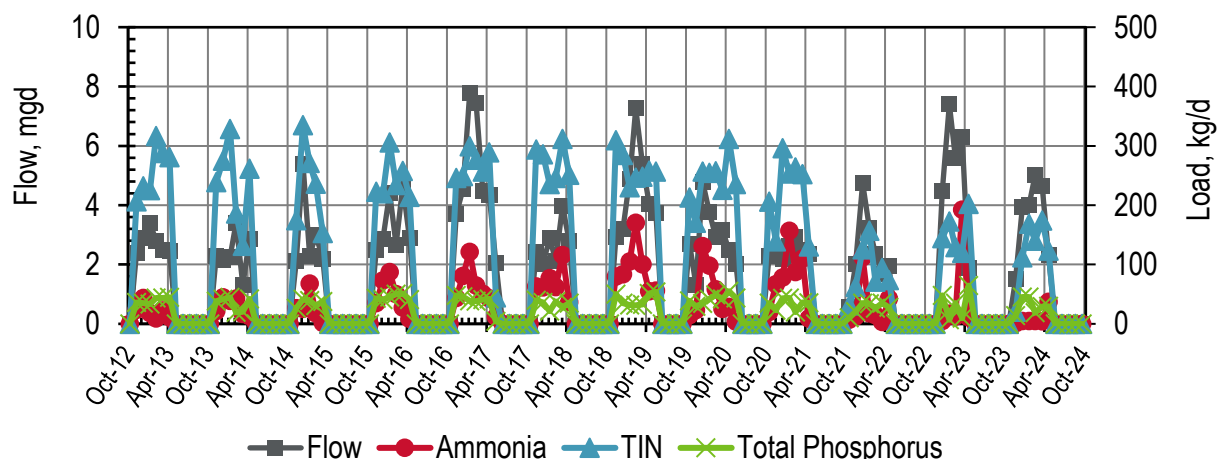


Figure 11-1. Discharge: Las Gallinas Monthly Flows and Loads

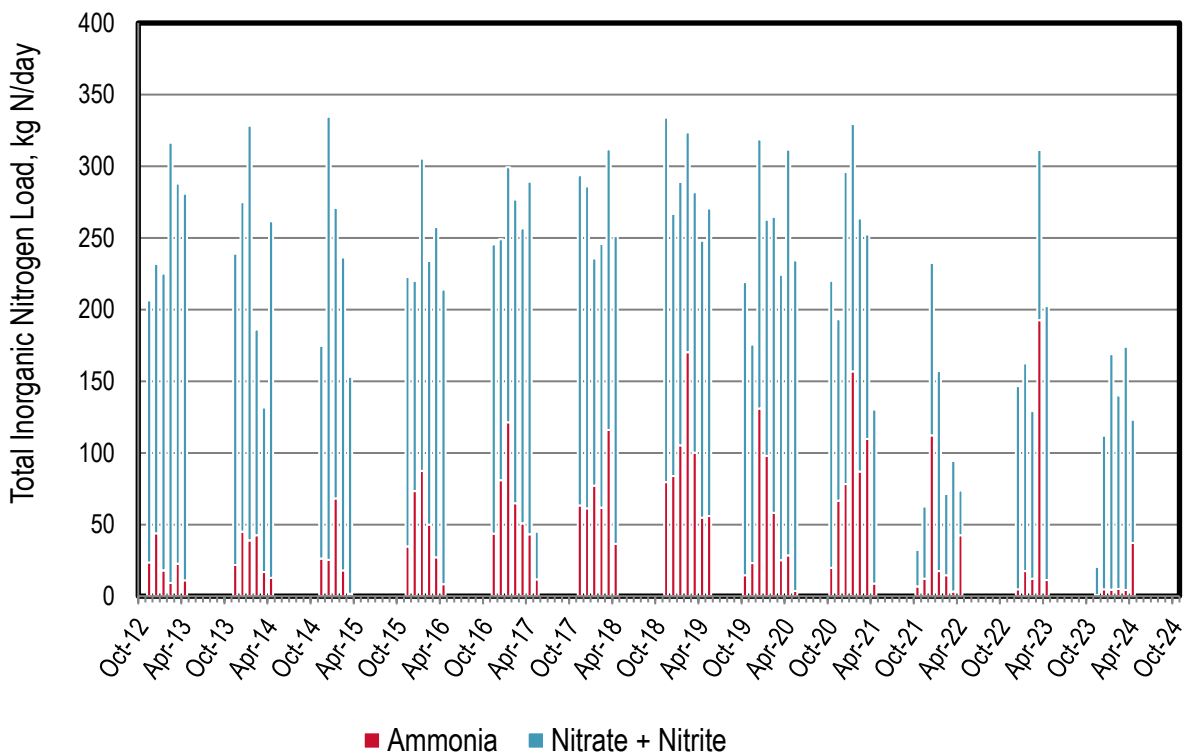


Figure 11-2. Discharge: Las Gallinas Monthly Nitrogen Loads

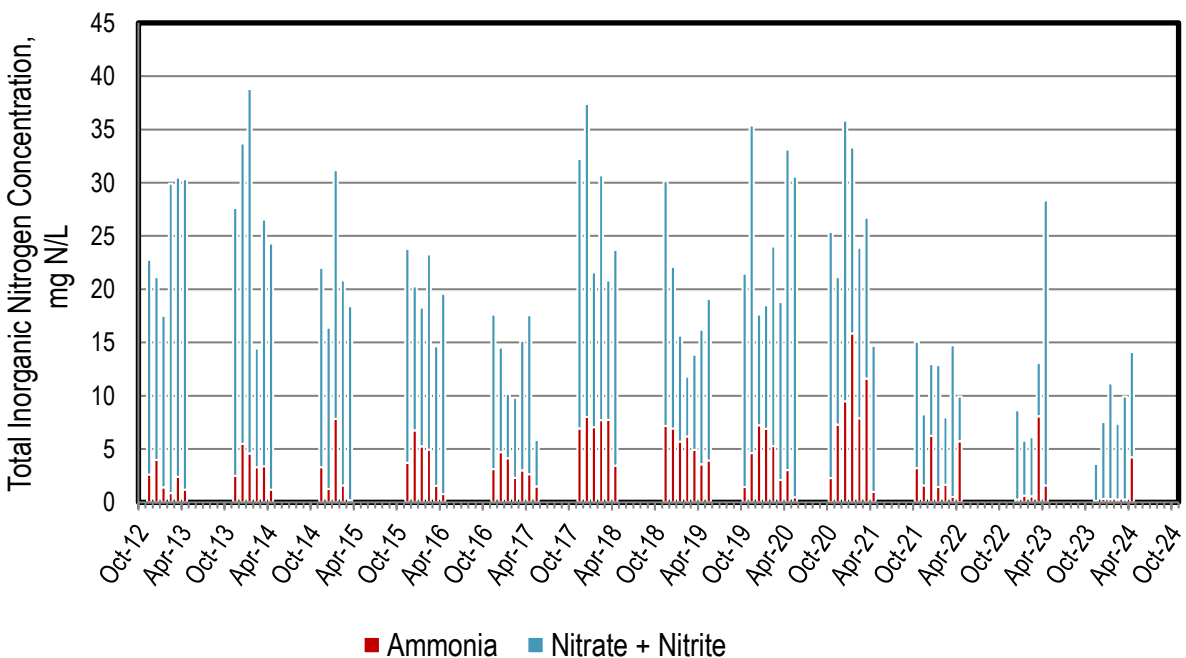


Figure 11-3. Discharge: Las Gallinas Monthly Nitrogen Concentrations

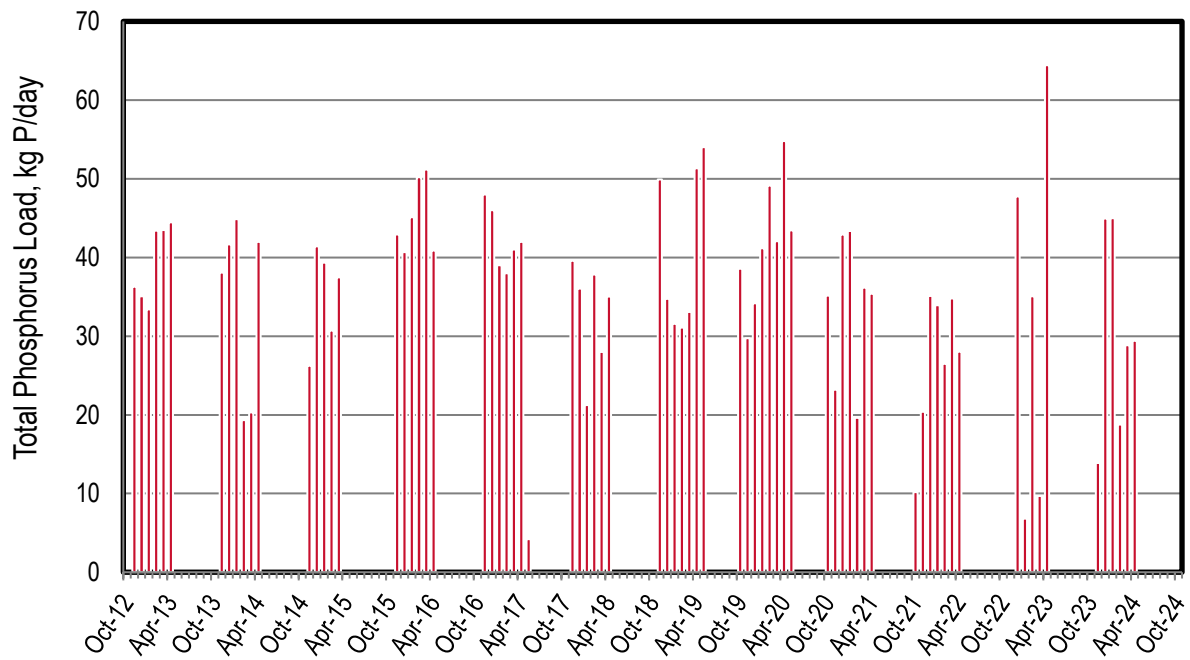


Figure 11-4. Discharge: Las Gallinas Monthly Phosphorus Loads

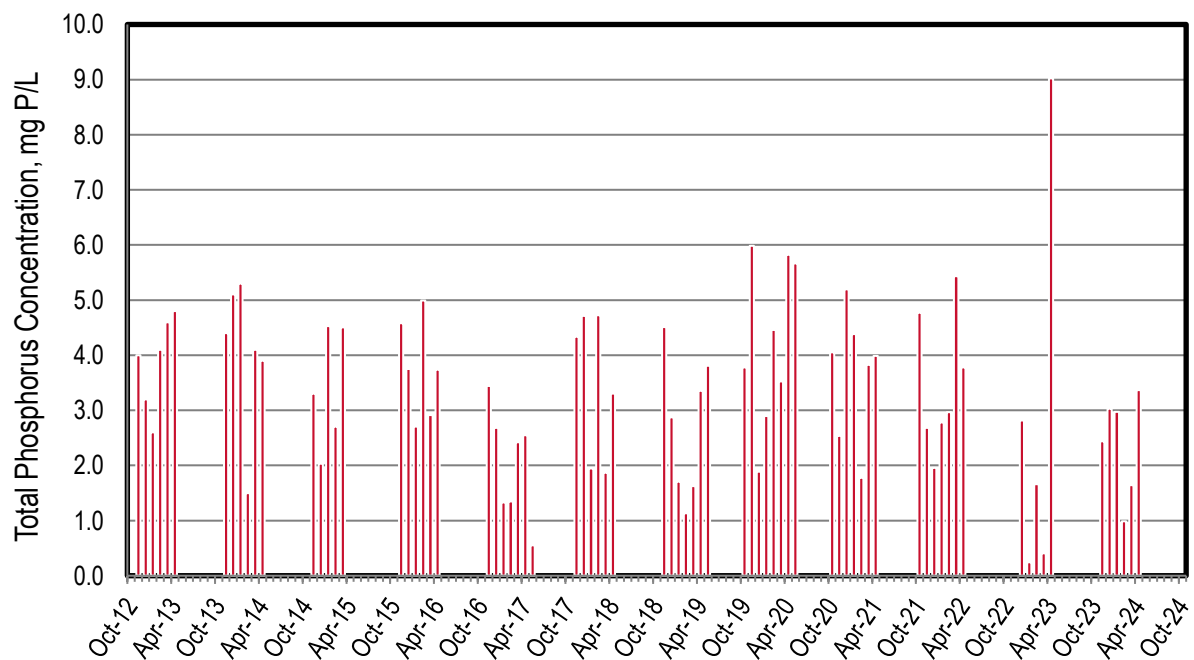


Figure 11-5. Discharge: Las Gallinas Monthly Phosphorus Concentrations

Table 11-1. Discharge: Las Gallinas Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	0	0	0	0	0
Nov-12	2.40	23.6	183	206	36.3
Dec-12	2.90	43.8	188	232	35.1
Jan-13	3.40	18.0	207	225	33.4
Feb-13	2.80	9.21	307	316	43.4
Mar-13	2.50	22.7	265	288	43.5
Apr-13	2.45	11.1	270	281	44.5
May-13	0	0	0	0	0
Jun-13	0	0	0	0	0
Jul-13	0	0	0	0	0
Aug-13	0	0	0	0	0
Sep-13	0	0	0	0	0
Oct-13	0	0	0	0	0
Nov-13	2.29	21.6	217	239	38.1
Dec-13	2.16	44.9	230	275	41.6
Jan-14	2.24	38.9	289	328	44.9
Feb-14	3.41	42.5	144	186	19.3
Mar-14	1.31	16.8	115	132	20.3
Apr-14	2.85	12.9	249	262	42.0
May-14	0	0	0	0	0
Jun-14	0	0	0	0	0
Jul-14	0	0	0	0	0
Aug-14	0	0	0	0	0
Sep-14	0	0	0	0	0
Oct-14	0	0	0	0	0
Nov-14	2.10	26.2	149	175	26.2
Dec-14	5.40	25.4	309	335	41.4
Jan-15	2.30	68.1	203	271	39.4
Feb-15	3.00	17.9	218	236	30.7
Mar-15	2.20	1.60	152	153	37.5
Apr-15	0	0	0	0	0
May-15	0	0	0	0	0
Jun-15	0	0	0	0	0
Jul-15	0	0	0	0	0
Aug-15	0	0	0	0	0
Sep-15	0	0	0	0	0

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-15	0	0	0	0	0
Nov-15	2.48	34.8	188	223	42.9
Dec-15	2.87	73.3	147	220	40.7
Jan-16	4.42	87.4	218	305	45.1
Feb-16	2.66	49.8	184	234	50.2
Mar-16	4.65	27.2	230	257	51.2
Apr-16	2.89	8.42	206	214	40.9
May-16	0	0	0	0	0
Jun-16	0	0	0	0	0
Jul-16	0	0	0	0	0
Aug-16	0	0	0	0	0
Sep-16	0	0	0	0	0
Oct-16	0	0	0	0	0
Nov-16	3.69	43.6	202	246	48.0
Dec-16	4.54	81.0	168	249	46.0
Jan-17	7.77	121	178	299	39.0
Feb-17	7.45	64.9	212	277	38.0
Mar-17	4.48	50.8	206	257	41.0
Apr-17	4.36	43.3	246	289	42.0
May-17	2.04	11.6	33.3	44.9	4.22
Jun-17	0	0	0	0	0
Jul-17	0	0	0	0	0
Aug-17	0	0	0	0	0
Sep-17	0	0	0	0	0
Oct-17	0	0	0	0	0
Nov-17	2.41	63.2	231	294	39.6
Dec-17	2.02	61.2	225	286	36.0
Jan-18	2.89	77.1	159	236	21.2
Feb-18	2.12	61.7	184	246	37.8
Mar-18	3.96	116	196	312	28.0
Apr-18	2.81	36.5	215	251	35.0
May-18	0	0	0	0	0
Jun-18	0	0	0	0	0
Jul-18	0	0	0	0	0
Aug-18	0	0	0	0	0
Sep-18	0	0	0	0	0
Oct-18	0	0	0	0	0

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-18	2.93	79.5	254	310	49.9
Dec-18	3.19	83.7	183	284	34.7
Jan-19	4.89	105	184	230	31.6
Feb-19	7.27	170	154	247	31.1
Mar-19	5.38	100	182	248	33.1
Apr-19	4.05	54.8	193	258	51.3
May-19	3.75	55.9	215	257	54.0
Jun-19	0	0	0	0	0
Jul-19	0	0	0	0	0
Aug-19	0	0	0	0	0
Sep-19	0	0	0	0	0
Oct-19	2.70	14.6	205	213	38.6
Nov-19	1.31	23.0	153	170	29.7
Dec-19	4.79	131	188	257	34.2
Jan-20	3.76	97.9	165	254	41.2
Feb-20	2.92	58.1	207	257	49.2
Mar-20	3.16	25.1	199	226	42.1
Apr-20	2.49	28.4	283	312	54.8
May-20	2.03	3.61	231	236	43.4
Jun-20	0	0	0	0	0
Jul-20	0	0	0	0	0
Aug-20	0	0	0	0	0
Sep-20	0	0	0	0	0
Oct-20	2.29	19.6	200	206	35.1
Nov-20	2.42	66.7	127	139	23.2
Dec-20	2.19	78.3	218	296	42.9
Jan-21	2.62	157	172	253	43.4
Feb-21	2.92	87.0	177	264	19.6
Mar-21	2.50	110	143	252	36.2
Apr-21	2.35	8.85	121	130	35.4
May-21	0	0	0	0	0
Jun-21	0	0	0	0	0
Jul-21	0	0	0	0	0
Aug-21	0	0	0	0	0
Sep-21	0	0	0	0	0
Oct-21	0.565	6.88	25.3	31.3	10.2
Nov-21	2.01	12.1	50.6	62.7	20.4

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-21	4.75	112	120	126	35.1
Jan-22	3.23	17.6	139	157	33.9
Feb-22	2.36	14.6	56.7	71.3	26.5
Mar-22	1.69	3.23	91.1	94.3	34.8
Apr-22	1.96	42.6	31.1	73.7	28.0
May-22	0	0	0	0	0
Jun-22	0	0	0	0	0
Jul-22	0	0	0	0	0
Aug-22	0	0	0	0	0
Sep-22	0	0	0	0	0
Oct-22	0	0	0	0	0
Nov-22	0	0	0	0	0
Dec-22	4.49	4.69	142	145	47.8
Jan-23	7.41	17.4	145	172	6.80
Feb-23	5.59	12.2	117	129	35.1
Mar-23	6.30	193	119	120	9.69
Apr-23	1.89	11.3	191	202	64.4
May-23	0	0	0	0	0
Jun-23	0	0	0	0	0
Jul-23	0	0	0	0	0
Aug-23	0	0	0	0	0
Sep-23	0	0	0	0	0
Oct-23	0	0	0	0	0
Nov-23	1.50	0.806	19.7	20.5	13.9
Dec-23	3.93	4.86	107	112	45.0
Jan-24	4.00	4.50	164	169	45.0
Feb-24	5.02	5.00	135	140	18.8
Mar-24	4.64	4.41	170	174	28.8
Apr-24	2.31	37.1	86.1	123	29.4
May-24	0	0	0	0	0
Jun-24	0	0	0	0	0
Jul-24	0	0	0	0	0
Aug-24	0	0	0	0	0
Sep-24	0	0	0	0	0

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dry Season Average	0.130	1.18	7.98	8.96	1.69
Dry Season Trend **	--***	--***	--***	--***	--***
Wet Season Average	2.90	42.3	154	188	31.3
Average Annual	1.75	25.1	92.9	113	19.0

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** The dry season average is significantly lower than the wet season due to only having one month with a dry season discharge (May 2017).

*** No dry season trending analysis was performed on Las Gallinas as discharge is prohibited from June through October.

Recycled Water

Table 11-2. Recycled Water: Las Gallinas Yearly Recycled Water Flows Diverted from the Bay

Year**	Flow Diverted*, Acre-Feet (mgd)							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	0 (0)	150 (0.13)	0 (0)	0 (0)	318 (0.28)	0 (0)	0 (0)	468 (0.41)
2020	0 (0)	101 (0.09)	0 (0)	0 (0)	275 (0.25)	0 (0)	0 (0)	376 (0.34)
2021	0 (0)	648 (0.58)	0 (0)	0 (0)	234 (0.21)	0 (0)	0 (0)	882 (0.79)
2022	0 (0)	882 (0.79)	0 (0)	0 (0)	245 (0.22)	0 (0)	0 (0)	1,127 (1.01)
2023	0 (0)	828 (0.74)	0 (0)	0 (0)	358 (0.32)	0 (0)	0 (0)	1,186 (1.06)
Average	0 (0)	522 (0.47)	0 (0)	0 (0)	286 (0.26)	0 (0)	0 (0)	808 (0.72)

* Assumes 100% of the recycled flow is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 11-3. Recycled Water: Las Gallinas Yearly Recycled Water Ammonia Load Diverted from the Bay

Year**	Average Ammonia Load Diverted*, kg N/d							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	0	2	0	0	5	0	0	8
2020	0	2	0	0	4	0	0	6
2021	0	16	0	0	6	0	0	22
2022	0	5	0	0	1	0	0	6
2023	0	15	0	0	6	0	0	21
Average	0	8	0	0	5	0	0	13

* Assumes 100% of the recycled load is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 11-4. Recycled Water: Las Gallinas Yearly Recycled Water Total Inorganic Nitrogen Load Diverted from the Bay

Year**	Average Total Inorganic Nitrogen Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	7	0	0	15	0	0	23
2020	0	8	0	0	23	0	0	31
2021	0	37	0	0	13	0	0	50
2022	0	31	0	0	9	0	0	39
2023	0	13	0	0	6	0	0	19
Average	0	19	0	0	13	0	0	32

* Assumes 100% of the recycled load is diverted for all recycled water applications

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 11-5. Recycled Water: Las Gallinas Yearly Recycled Water Total P Load Diverted from the Bay

Year**	Average Total P Load Diverted*, kg P/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	1	0	0	2	0	0	4
2020	0 --	1	--	--	4	--	--	5
2021	--	7	--	--	2	--	--	9
2022	--	10	--	--	3	--	--	12
Average	--	5	--	--	3	--	--	8

* Assumes 100% of the recycled load is diverted for all recycled water applications

** **Calendar year as opposed to California's water year (October 1 through September 30)**

12 City of Millbrae

Millbrae discharges to the South Bay. The plant has approximately 6,500 service connections and it has a permitted capacity of 3.0 mgd ADWF. The average dry season flow this past year was approximately 1.46 mgd. The plant performs secondary treatment using an activated sludge process.

The following observations are made based upon the figures and table in the subsequent pages:

◆ Discharge

- ▲ Nutrient loads typically increase with flow during wet weather events. However, the loads typically stay elevated after the flows decline back to typical values.
- ▲ Ammonia is the majority of the nitrogen species discharged, regardless of season. This would be expected since this plant does not nitrify.
- ▲ Total phosphorus concentrations range from 0.5 to 5.4 mg P/L. The plant has an anaerobic selector which is thought to be the removal mechanism for months with relatively low values.
- ▲ Based on Table 12-1 statistics for the entire dry season dataset, all the monitored parameters show no trending.

◆ Recycled Water: No recycled water was produced or distributed this past year.

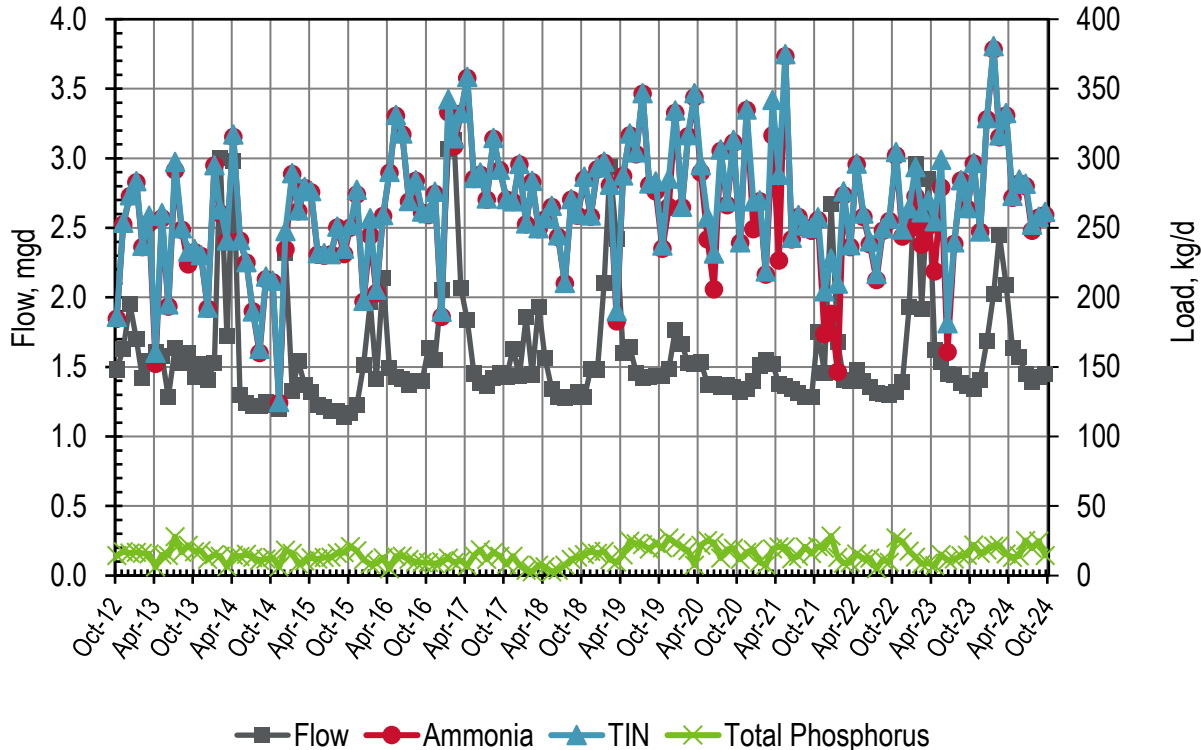


Figure 12-1. Discharge: Millbrae Monthly Flows and Loads

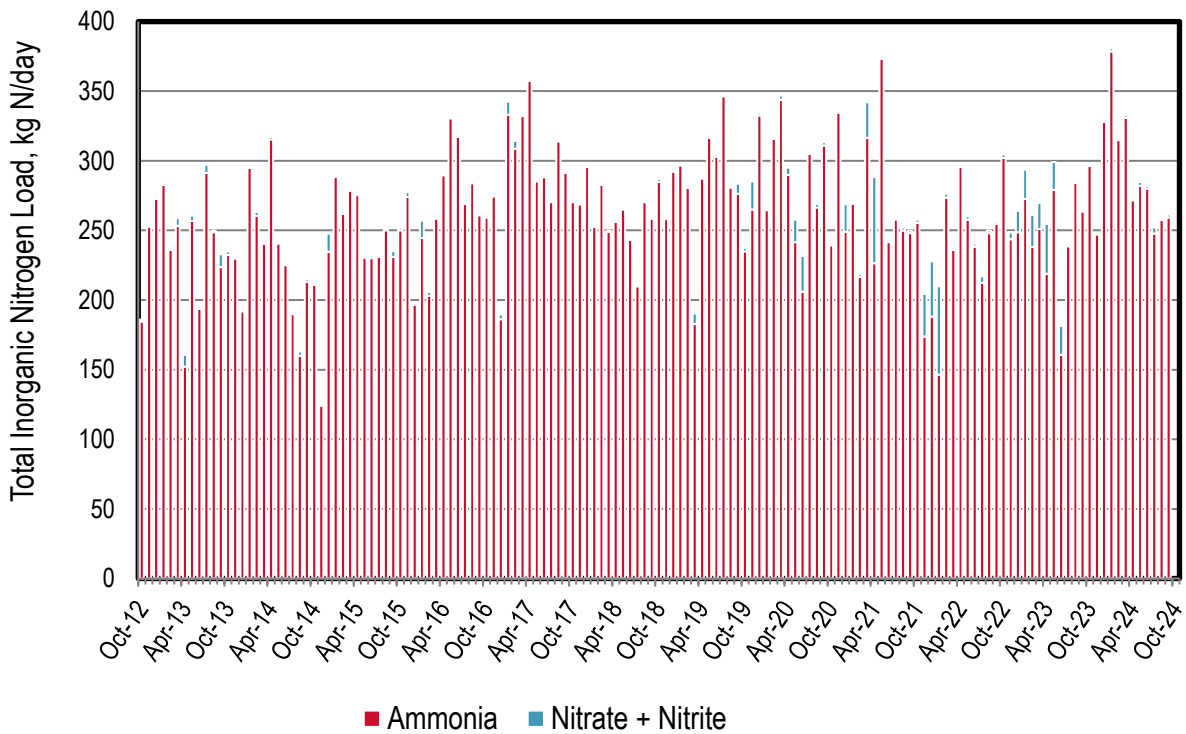


Figure 12-2. Discharge: Millbrae Monthly Nitrogen Loads

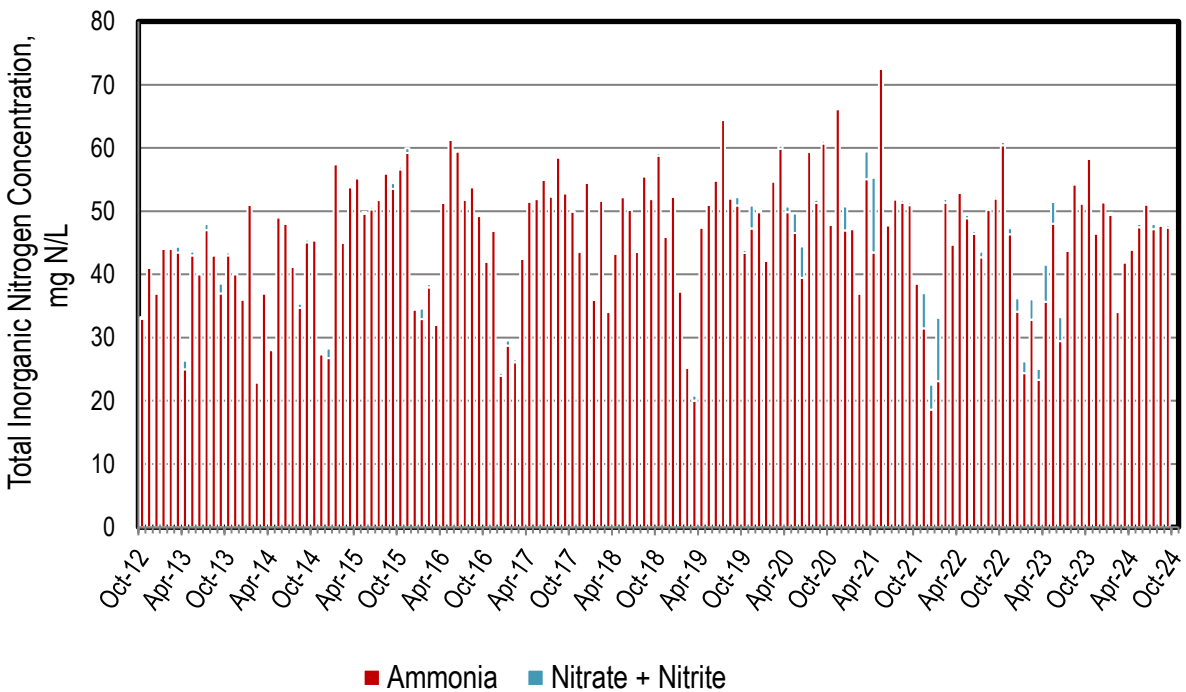


Figure 12-3. Discharge: Millbrae Monthly Nitrogen Concentration

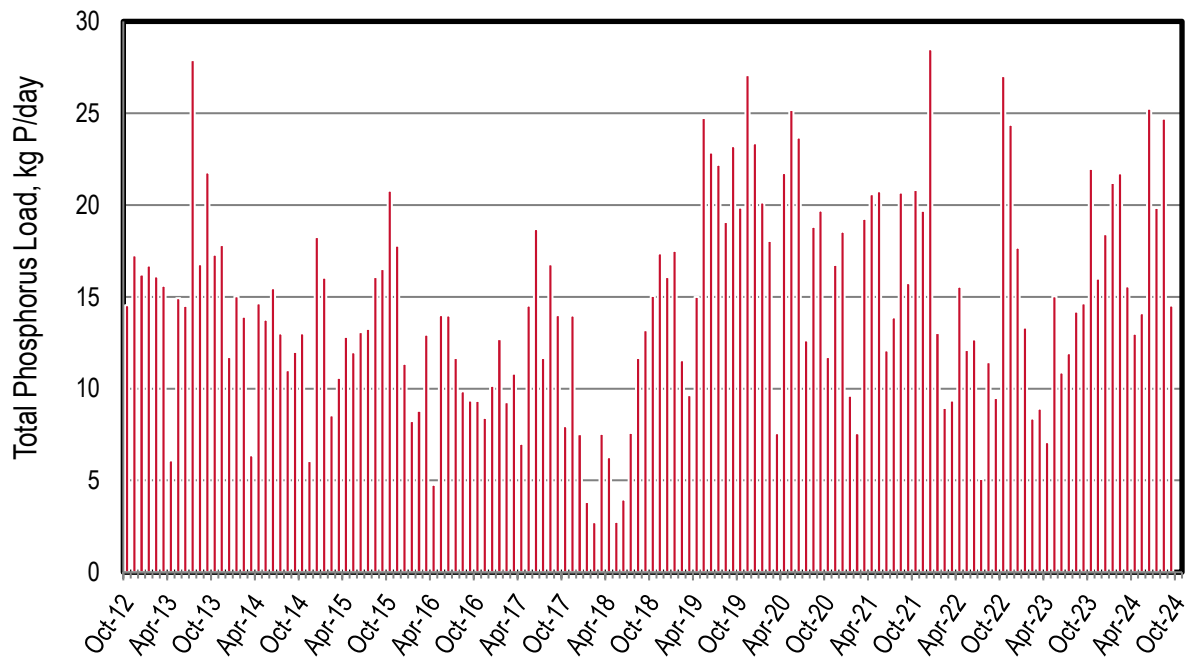


Figure 12-4. Discharge: Millbrae Monthly Phosphorus Loads

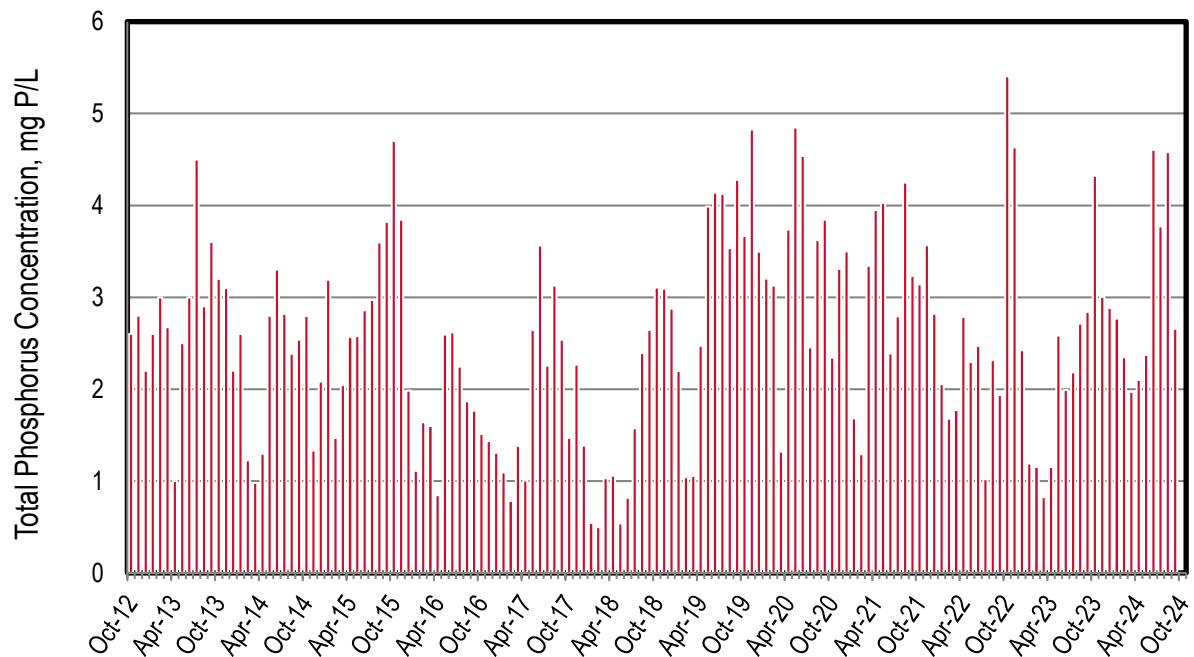


Figure 12-5. Discharge: Millbrae Monthly Phosphorus Concentrations

Table 12-1. Discharge: Millbrae Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	1.48	185	1.40	186	14.5
Nov-12	1.63	253	1.11	254	17.3
Dec-12	1.95	273	0.855	274	16.2
Jan-13	1.70	283	0.945	284	16.7
Feb-13	1.42	236	0.896	237	16.1
Mar-13	1.54	253	5.46	259	15.6
Apr-13	1.61	152	8.23	160	6.09
May-13	1.58	257	3.72	261	14.9
Jun-13	1.28	194	1.55	195	14.5
Jul-13	1.64	291	5.95	297	27.9
Aug-13	1.53	249	1.15	250	16.8
Sep-13	1.60	224	9.19	233	21.8
Oct-13	1.43	232	2.43	235	17.3
Nov-13	1.52	230	0.718	231	17.8
Dec-13	1.41	192	0.933	193	11.7
Jan-14	1.53	295	0.197	295	15.0
Feb-14	3.01	260	2.96	263	13.9
Mar-14	1.72	241	0.592	241	6.37
Apr-14	2.98	315	1.72	317	14.6
May-14	1.30	241	0.457	241	13.8
Jun-14	1.24	225	0.502	225	15.5
Jul-14	1.22	190	0.0650	190	13.0
Aug-14	1.22	160	3.00	163	11.0
Sep-14	1.25	213	2.00	215	12.0
Oct-14	1.23	211	1.00	212	13.0
Nov-14	1.20	124	0.670	125	6.05
Dec-14	2.32	235	13.0	248	18.3
Jan-15	1.33	289	0.750	289	16.0
Feb-15	1.54	262	0.690	263	8.55
Mar-15	1.37	279	0.780	279	10.6
Apr-15	1.32	276	0.900	276	12.8
May-15	1.23	231	1.33	232	12.0
Jun-15	1.21	230	1.76	232	13.1
Jul-15	1.18	231	0.0856	231	13.3
Aug-15	1.18	250	0.715	251	16.1
Sep-15	1.14	231	4.00	235	16.5

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-15	1.17	250	1.91	252	20.8
Nov-15	1.22	274	3.46	277	17.8
Dec-15	1.51	197	0.644	197	11.4
Jan-16	1.96	245	12.4	257	8.24
Feb-16	1.42	203	2.63	206	8.78
Mar-16	2.14	259	0.600	259	12.9
Apr-16	1.49	290	0.738	290	4.77
May-16	1.43	331	0.672	331	14.0
Jun-16	1.41	317	0.753	318	14.0
Jul-16	1.37	269	0.492	269	11.7
Aug-16	1.40	284	0.510	284	9.85
Sep-16	1.40	261	0.935	262	9.35
Oct-16	1.63	259	1.40	261	9.33
Nov-16	1.55	275	1.46	276	8.40
Dec-16	2.05	186	3.55	190	10.2
Jan-17	3.07	333	9.52	343	12.7
Feb-17	3.13	309	5.66	314	9.26
Mar-17	2.07	332	0.440	332	10.8
Apr-17	1.84	358	0.874	359	7.00
May-17	1.45	285	0.778	286	14.5
Jun-17	1.39	288	1.55	290	18.7
Jul-17	1.37	270	0.954	271	11.7
Aug-17	1.42	314	0.595	315	16.8
Sep-17	1.46	291	0.560	292	14.0
Oct-17	1.43	270	0.472	271	7.95
Nov-17	1.63	269	0.349	269	14.0
Dec-17	1.43	296	0.296	296	7.53
Jan-18	1.86	253	0.699	253	3.82
Feb-18	1.45	283	1.07	284	2.72
Mar-18	1.93	249	0.811	250	7.53
Apr-18	1.57	256	0.888	257	6.27
May-18	1.34	265	0.899	266	2.74
Jun-18	1.28	243	1.38	245	3.96
Jul-18	1.28	210	0.581	210	7.59
Aug-18	1.29	270	0.435	271	11.7
Sep-18	1.32	259	1.32	260	13.2
Oct-18	1.28	285	1.99	287	15.0

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-18	1.49	258	0.751	259	17.4
Dec-18	1.48	292	1.31	294	16.1
Jan-19	2.11	297	0.989	298	17.5
Feb-19	2.94	281	0.611	281	11.6
Mar-19	2.42	183	7.48	190	9.64
Apr-19	1.60	287	0.500	288	15.0
May-19	1.64	316	1.44	318	24.7
Jun-19	1.46	303	1.49	304	22.9
Jul-19	1.42	346	0.417	347	22.2
Aug-19	1.43	281	1.06	282	19.1
Sep-19	1.44	276	7.18	283	23.2
Oct-19	1.43	235	2.25	237	19.8
Nov-19	1.48	265	20.3	285	27.1
Dec-19	1.77	333	1.77	334	23.4
Jan-20	1.66	265	0.57	265	20.1
Feb-20	1.53	316	1.02	317	18.0
Mar-20	1.52	344	2.91	347	7.58
Apr-20	1.54	290	5.40	295	21.7
May-20	1.37	242	16.1	258	25.2
Jun-20	1.38	206	25.7	232	23.7
Jul-20	1.36	305	1.32	306	12.6
Apr-20	1.37	266	2.61	269	18.8
Sep-20	1.36	311	2.23	313	19.7
Oct-20	1.32	239	0.400	240	11.7
Nov-20	1.34	335	0.640	335	16.7
Dec-20	1.40	249	20.0	269	18.6
Jan-21	1.51	269	0.721	270	9.61
Feb-21	1.55	217	2.22	219	7.58
Mar-21	1.52	317	25.5	342	19.2
Apr-21	1.38	226	61.8	288	20.6
May-21	1.36	373	1.61	375	20.7
Jun-21	1.34	242	1.36	243	12.1
Jul-21	1.31	258	1.29	259	13.9
Aug-21	1.29	250	1.97	252	20.7
Sep-21	1.29	248	1.96	250	15.7
Oct-21	1.75	255	2.18	258	20.8
Nov-21	1.46	174	30.7	204	19.7

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-21	2.67	188	39.8	228	28.5
Jan-22	1.68	146	63.5	210	13.0
Feb-22	1.41	274	2.74	276	8.94
Mar-22	1.40	236	1.38	238	9.35
Apr-22	1.48	296	0.622	296	15.6
May-22	1.40	258	2.47	260	12.1
Jun-22	1.36	238	2.03	240	12.7
Jul-22	1.32	212	4.53	217	5.08
Aug-22	1.31	248	1.81	250	11.4
Sep-22	1.30	255	1.80	257	9.49
Oct-22	1.32	302	2.49	305	27.0
Nov-22	1.39	244	5.09	249	24.4
Dec-22	1.93	249	15.5	264	17.7
Jan-23	2.96	273	21.2	294	13.3
Feb-23	1.92	238	23.2	261	8.36
Mar-23	2.85	251	18.6	270	8.91
Apr-23	1.62	219	36.0	255	7.08
May-23	1.54	279	20.0	299	15.0
Jun-23	1.45	161	20.7	181	10.9
Jul-23	1.44	239	1.09	240	11.9
Aug-23	1.39	284	0.380	284	14.2
Sep-23	1.36	264	0.684	264	14.6
Oct-23	1.34	296	0.337	297	22.0
Nov-23	1.41	247	0.446	248	16.0
Dec-23	1.69	328	1.09	329	18.4
Jan-24	2.03	379	2.20	381	21.2
Feb-24	2.45	315	1.52	317	21.7
Mar-24	2.09	331	1.85	333	15.6
Apr-24	1.64	272	1.30	273	13.0
May-24	1.57	282	2.88	285	14.1
Jun-24	1.45	280	1.81	282	25.2
Jul-24	1.39	248	4.36	252	19.8
Aug-24	1.43	257	0.772	258	24.7
Sep-24	1.45	259	2.18	261	14.5

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dry Season Average	1.37	259	3.05	262	15.3
Dry Season Trend**	None	None	None	None	None
Wet Season Average	1.73	262	6.27	268	14.1
Average Annual	1.58	261	4.93	266	14.6

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

Recycled Water

No recycled water was produced or distributed this past year.

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13 Mt. View Sanitary District

Mt. View Sanitary District discharges to Suisun Bay. The plant has approximately 10,500 service connections; it has a permitted capacity of 3.2 mgd ADWF and a peak wet weather design flow of 10.9 mgd. This past dry season average discharge flow was approximately 1.1 mgd. The plant performs nitrification using a series of trickling filters.

The following observations are made based upon the figures and table in the subsequent pages:

◆ Discharge

- ▲ The average monthly concentrations for TIN have been lower than historical averages for the last three years due to a change in sampling location in 2021/2022. Sampling is now at the Moorhen Marsh effluent, whereby treatment occurs within the Marsh.
- ▲ Nutrient loads typically increase with flow during wet weather events.
- ▲ Wet season nitrogen loads are greater and more variable than the dry season loads.
- ▲ NO_x is the majority of the nitrogen species discharged as would be expected since this plant nitrifies. A portion of ammonia bleeds through during the colder months. This increases the ammonia contribution during such months.
- ▲ Total phosphorus concentrations range from 0.6 to 6.2 mg P/L, which suggests occasional P removal as typical effluent TP concentrations at treatment plants is typically 4 to 6 mg P/L.
- ▲ Based on Table 13-1 statistics for the entire dry season dataset, flow, and the nutrient parameters (except ammonia) are trending downwards. Ammonia does not appear to have any emerging trends as the plant already nitrifies. The change in sampling location at the Moorhen Marsh effluent seems to play a role as previously noted.

◆ Recycled Water: No recycled water was produced or distributed this past year.

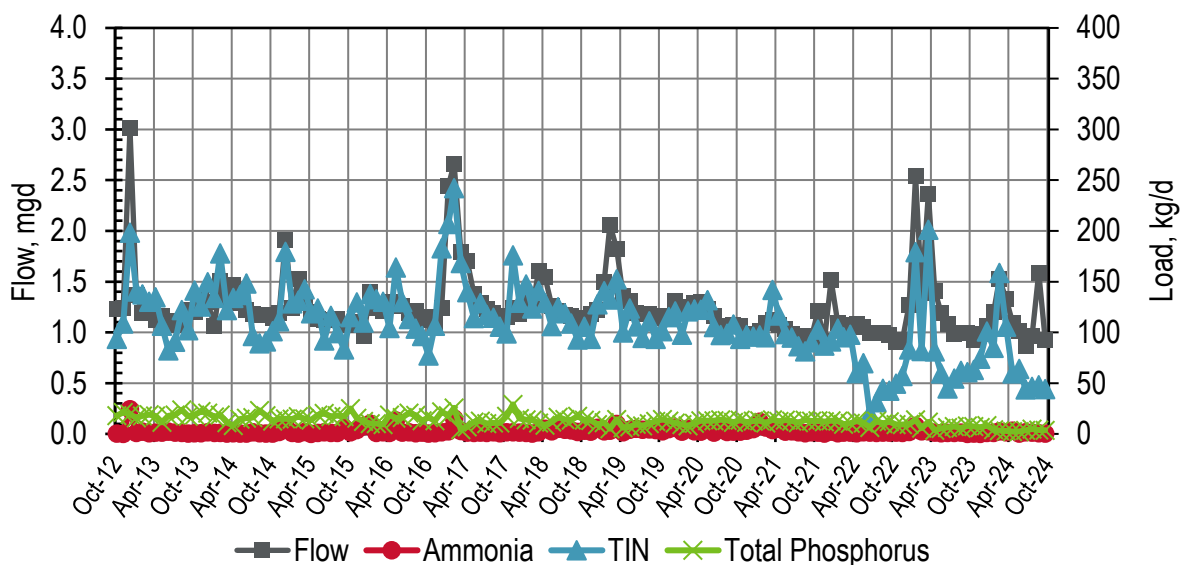


Figure 13-1. Discharge: Mt. View Sanitary District Monthly Flows and Loads

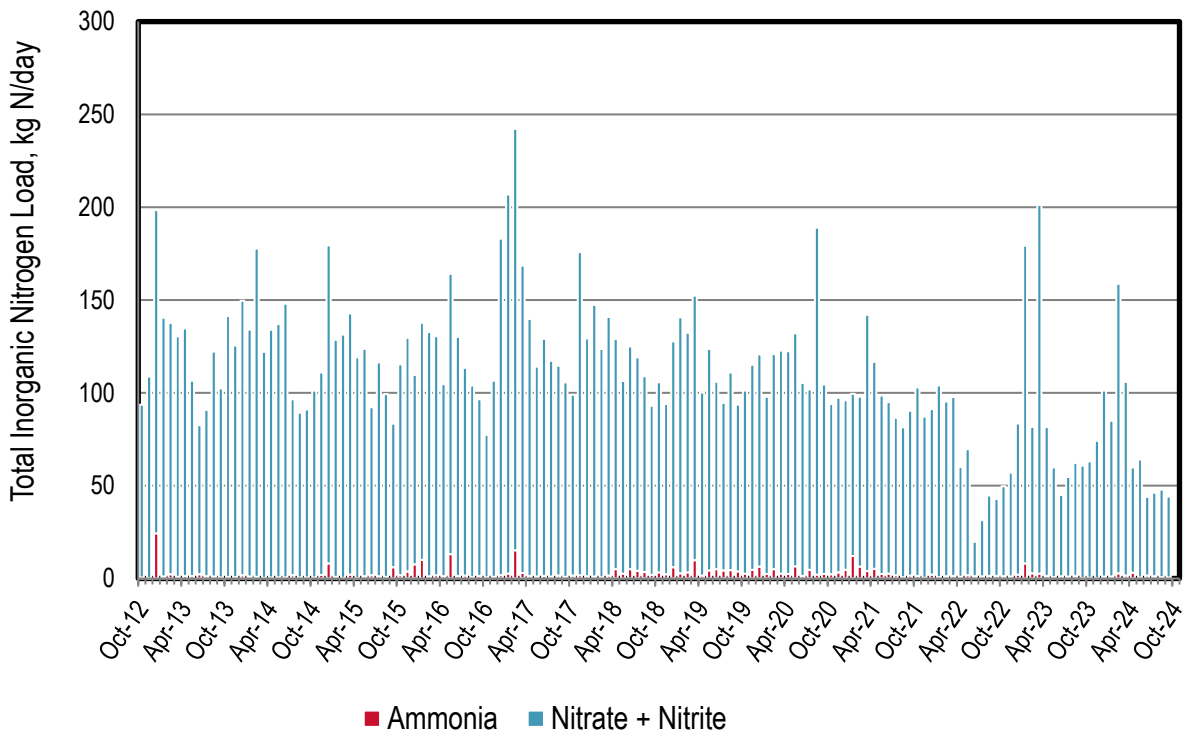


Figure 13-2. Discharge: Mt. View Sanitary District Monthly Nitrogen Loads

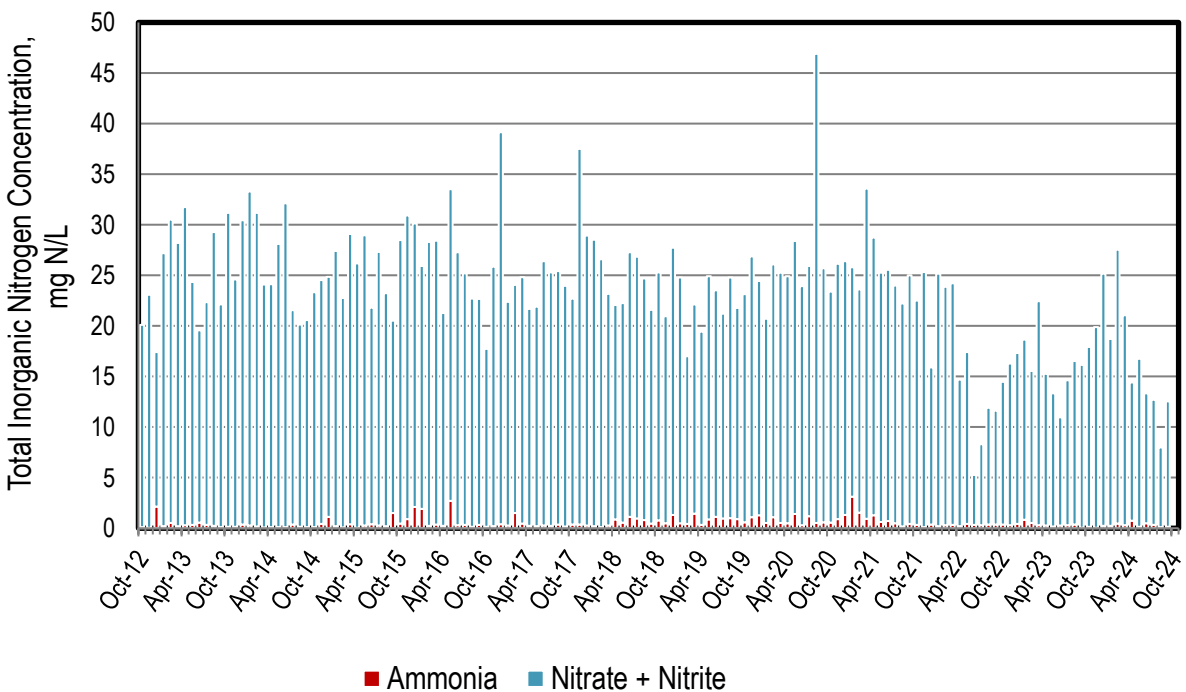


Figure 13-3. Discharge: Mt. View Sanitary District Monthly Nitrogen Concentrations

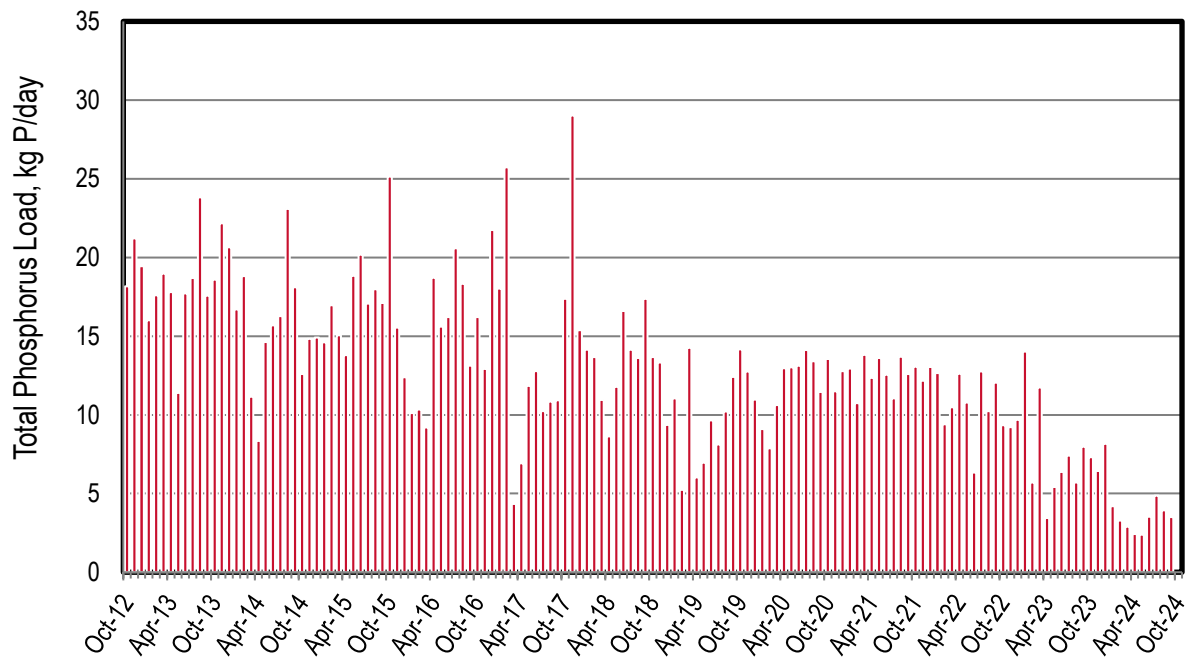


Figure 13-4: Discharge: Mt. View Sanitary District Monthly Phosphorus Loads

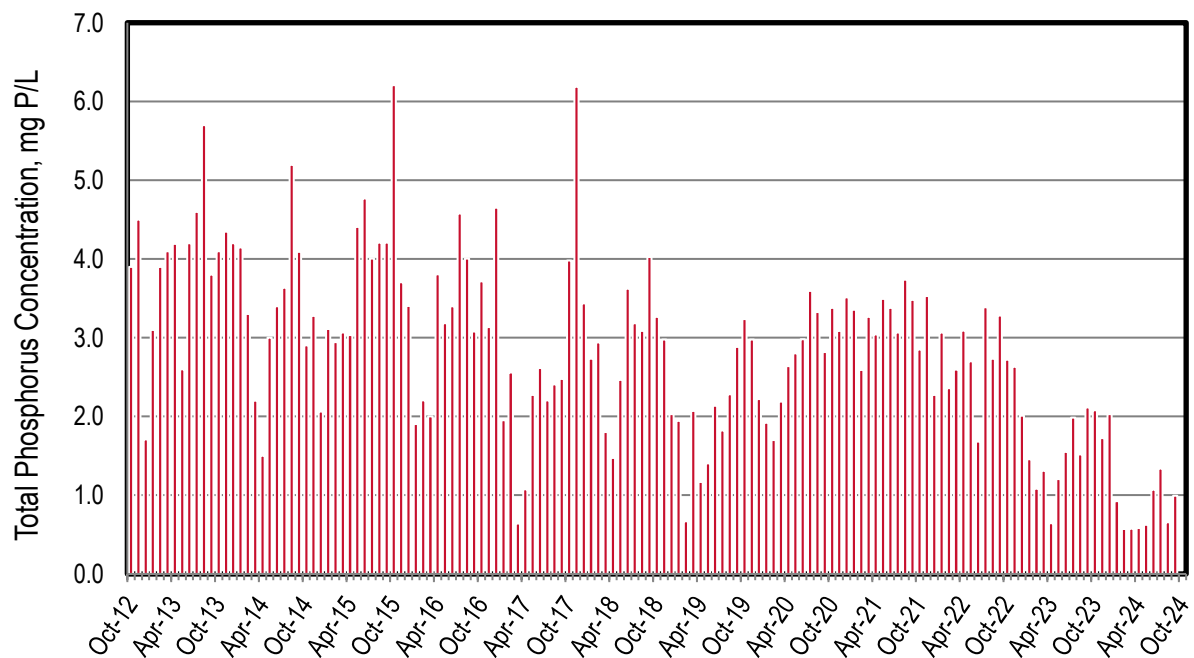


Figure 13-5. Discharge: Mt. View Sanitary District Monthly Phosphorus Concentrations

Table 13-1. Discharge: Mt. View Sanitary District Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	1.23	0.461	93.2	93.7	18.2
Nov-12	1.25	0.189	109	109	21.2
Dec-12	3.01	24.3	174	198	19.5
Jan-13	1.37	0.982	140	141	16.0
Feb-13	1.19	2.30	135	138	17.6
Mar-13	1.22	0.879	130	130	19.0
Apr-13	1.12	1.34	133	135	17.8
May-13	1.16	1.40	105	107	11.4
Jun-13	1.12	2.32	80.2	82.6	17.7
Jul-13	1.08	1.30	89.6	90.9	18.7
Aug-13	1.11	1.00	121	122	23.8
Sep-13	1.22	0.509	102	102	17.6
Oct-13	1.20	0.680	141	141	18.6
Nov-13	1.35	0.771	125	126	22.2
Dec-13	1.30	1.77	148	150	20.6
Jan-14	1.07	1.03	133	134	16.7
Feb-14	1.51	0.913	177	178	18.8
Mar-14	1.34	0.334	122	122	11.1
Apr-14	1.47	0.611	133	134	8.33
May-14	1.29	0.483	137	137	14.6
Jun-14	1.22	0.457	148	148	15.7
Jul-14	1.19	1.67	94.9	96.6	16.3
Aug-14	1.17	0.620	88.8	89.4	23.1
Sep-14	1.17	0.540	90.6	91.1	18.1
Oct-14	1.15	0.460	101	101	12.6
Nov-14	1.20	1.94	109	111	14.8
Dec-14	1.91	8.07	171	180	14.9
Jan-15	1.24	0.910	128	129	14.6
Feb-15	1.53	0.370	131	131	17.0
Mar-15	1.30	2.01	141	143	15.1
Apr-15	1.20	0.190	119	119	13.8
May-15	1.13	1.19	123	124	18.8
Jun-15	1.12	1.72	90.6	92.3	20.2
Jul-15	1.13	1.15	115	116	17.1
Aug-15	1.13	0.899	98.5	99.4	18.0
Sep-15	1.08	6.11	77.4	83.5	17.1

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-15	1.07	1.82	114	115	25.1
Nov-15	1.11	3.74	126	130	15.5
Dec-15	0.963	7.66	102	110	12.4
Jan-16	1.41	10.1	128	138	10.1
Feb-16	1.24	1.18	132	133	10.3
Mar-16	1.22	1.70	129	130	9.20
Apr-16	1.30	1.18	103	105	18.7
May-16	1.30	13.2	151	164	15.6
Jun-16	1.26	1.39	129	130	16.2
Jul-16	1.19	1.52	112	113	20.6
Aug-16	1.21	0.715	103	104	18.3
Sep-16	1.13	1.44	95.2	96.6	13.1
Oct-16	1.15	0.555	76.8	77.3	16.2
Nov-16	1.09	0.861	106	107	12.9
Dec-16	1.24	1.81	181	183	21.7
Jan-17	2.44	2.52	204	207	18.0
Feb-17	2.66	15.1	227	242	25.7
Mar-17	1.80	3.03	166	169	4.35
Apr-17	1.70	1.45	138	140	6.92
May-17	1.38	1.13	113	114	11.8
Jun-17	1.29	1.33	128	129	12.8
Jul-17	1.23	1.07	116	117	10.2
Aug-17	1.19	1.58	113	115	10.8
Sep-17	1.17	0.831	105	106	10.9
Oct-17	1.15	1.61	97.4	99.0	17.4
Nov-17	1.24	1.74	174	176	29.0
Dec-17	1.18	1.24	128	129	15.4
Jan-18	1.37	1.06	146	147	14.1
Feb-18	1.23	0.501	123	124	13.7
Mar-18	1.61	1.64	139	141	10.9
Apr-18	1.55	5.06	124	129	8.62
May-18	1.26	2.69	104	106	11.8
Jun-18	1.21	5.07	120	125	16.6
Jul-18	1.17	4.24	115	119	14.1
Aug-18	1.17	3.51	105	109	13.6
Sep-18	1.14	1.95	91.2	93.1	17.4
Oct-18	1.11	3.29	102	106	13.7

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-18	1.19	2.21	91.7	93.9	13.3
Dec-18	1.22	6.09	122	128	9.36
Jan-19	1.50	2.71	138	141	11.0
Feb-19	2.06	3.32	129	132	5.22
Mar-19	1.82	9.81	143	152	14.3
Apr-19	1.36	1.64	98.5	100	6.02
May-19	1.31	4.32	119	124	6.96
Jun-19	1.19	5.05	101	106	9.64
Jul-19	1.18	4.29	90.3	94.6	8.13
Aug-19	1.19	4.44	107	111	10.2
Sep-19	1.14	3.85	89.8	93.7	12.4
Oct-19	1.16	2.58	98.7	101	14.2
Nov-19	1.13	4.68	111	115	12.8
Dec-19	1.31	6.40	114	121	11.0
Jan-20	1.25	2.46	95.5	98.0	9.10
Feb-20	1.22	5.09	116	121	7.87
Mar-20	1.29	2.59	120	123	10.6
Apr-20	1.30	2.35	120	122	13.0
May-20	1.23	6.51	125	132	13.0
Jun-20	1.16	1.36	104	105	13.1
Jul-20	1.04	4.65	97.2	97.7	14.1
Aug-20	1.07	2.09	187	98.7	13.4
Sep-20	1.08	2.39	102	108	11.4
Oct-20	1.06	2.23	91.7	93.9	13.6
Nov-20	0.986	3.31	94.1	97.4	11.5
Dec-20	0.962	4.74	91.2	96.0	12.8
Jan-21	1.02	12.0	87.4	97.2	12.9
Feb-21	1.10	6.36	91.6	95.4	10.8
Mar-21	1.12	3.92	138	142	13.8
Apr-21	1.07	5.18	111	117	12.3
May-21	1.03	2.44	96.1	98.6	13.6
Jun-21	0.983	2.59	92.4	94.9	12.6
Jul-21	0.954	1.80	84.7	86.5	11.0
Aug-21	0.969	0.667	80.7	81.4	13.7
Sep-21	0.956	1.55	88.8	90.4	12.6
Oct-21	1.21	1.49	102	103	13.1
Nov-21	0.912	0.382	86.9	87.2	12.2

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-21	1.52	2.16	89.0	91.2	13.0
Jan-22	1.09	0.797	103	104	12.7
Feb-22	1.06	1.22	94.1	95.3	9.41
Mar-22	1.07	1.38	96.5	97.8	10.5
Apr-22	1.08	0.868	59.2	60.0	12.6
May-22	1.06	1.68	67.9	69.6	10.8
Jun-22	0.999	1.27	18.6	19.9	6.34
Jul-22	0.997	1.16	30.2	31.3	12.8
Aug-22	0.990	1.34	43.3	44.6	10.2
Sep-22	0.971	1.32	41.4	42.7	12.0
Oct-22	0.909	1.28	48.4	49.7	9.34
Nov-22	0.928	1.09	56.0	57.1	9.22
Dec-22	1.28	2.09	81.4	83.5	9.69
Jan-23	2.54	8.09	171	179	14.0
Feb-23	1.39	2.76	78.9	81.7	5.70
Mar-23	2.37	2.62	199	201	11.7
Apr-23	1.41	1.43	80.1	81.6	3.43
May-23	1.19	0.787	59.0	59.8	5.41
Jun-23	1.09	1.16	43.8	45.0	6.38
Jul-23	0.988	1.07	53.5	54.6	7.41
Aug-23	0.994	1.37	60.8	62.2	5.70
Sep-23	0.997	0.152	60.7	60.9	7.97
Oct-23	0.931	0.453	62.7	63.1	7.31
Nov-23	0.987	0.225	74.0	74.2	6.43
Dec-23	1.06	1.00	100	101	8.16
Jan-24	1.20	1.01	84.0	85.0	4.20
Feb-24	1.52	2.71	156	159	3.29
Mar-24	1.33	1.56	104	106	2.90
Apr-24	1.10	3.12	56.7	59.8	2.43
May-24	1.01	0.517	63.6	64.1	2.38
Jun-24	0.870	1.65	42.2	43.9	3.52
Jul-24	0.964	1.26	45.0	46.5	4.87
Aug-24	1.59	0.748	47.2	48.0	3.94
Sep-24	0.932	0.495	43.7	44.2	3.50

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dry Season Average	1.13	2.12	92.5	93.1	12.7
Dry Season Trend **	Down	None	Down	Down	Down
Wet Season Average	1.33	2.94	118	121	12.9
Average Annual	12.5	2.60	108	110	12.8

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

Recycled Water

No recycled water was produced or distributed this past year.

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14 Napa Sanitation District

Napa Sanitation District discharges to the Napa River that is connected to San Pablo Bay. The plant has a permitted capacity of 15.4 mgd ADWF. The plant performs nitrogen removal using a step-feed activated sludge process with anoxic zones coupled with oxidation ponds which also serves as equalization during peak flow. Discharge is prohibited July 1 through September 30. However, when conditions permit, the non-discharge period may be voluntarily extended beyond September 30, as was the case in 2023/2024.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Influent:

- ▲ Note: limited to data since July 2019; quarterly required but more provided for various parameters. Data is absent for a few nutrient species as Napa Sanitation District has not discharged for several quarters since sampling began.
- ▲ The flow reduction across the plant is heavily seasonal based as it ranges from 0 to 100 percent. Periods with 100 percent load reduction is attributed to no discharge as they recycle all their water during such periods.
- ▲ The nitrogen load reduction during discharge periods is greater than 65 percent (except for the relatively wet January 2022). The variability in reduction across the plant is attributed to discharge TIN concentrations that range from 6 to 22 mg N/L.
- ▲ The phosphorus load reduction during discharge periods is wide-ranging. This variability is attributed to occasional phosphorus load reduction across the plant as evidenced by discharge concentration occasionally less than 1 mg P/L. The mechanism for TP load reduction is likely from ferric chloride addition.

◆ Discharge:

- ▲ Nitrogen and phosphorus loads generally increase with flow during wet weather events.
- ▲ NO_x is the majority of the nitrogen discharged as the activated sludge system is operated to nitrify. During the wet season months partially nitrified pond effluent may be clarified then comingled with nitrified activated sludge effluent prior to discharge which may increase the ammonia levels during such months.
- ▲ Based on average monthly values, the plant discharge typically meets Level 2 TIN limits (i.e., 15 mg N/L) developed as part of the first Watershed Permit (R2-2014-0014).
- ▲ The average monthly phosphorus values range from 0.3 to 5.6 mg P/L. This suggests P is occasionally removed as previously noted from likely ferric chloride addition.
- ▲ Based on Table 14-2 statistics for the entire dry season dataset, there are no emerging trends as Napa rarely discharges during the dry season (i.e., May and June 2014).

◆ Recycled Water:

- ▲ Based on Table 14-3, the plant averaged 2.0 mgd in 2023. Users include Landscape Irrigation, Commercial, Agricultural, and Other Non-Potable Customers.
- ▲ Based on values from Table 5-3 through Table 5-5, the average nutrient loads diverted from the Bay in 2023 due to recycled water is 29 kg Ammonia-N/d, 67 kg TIN-N/d, and 22 kg P/d away.

Influent

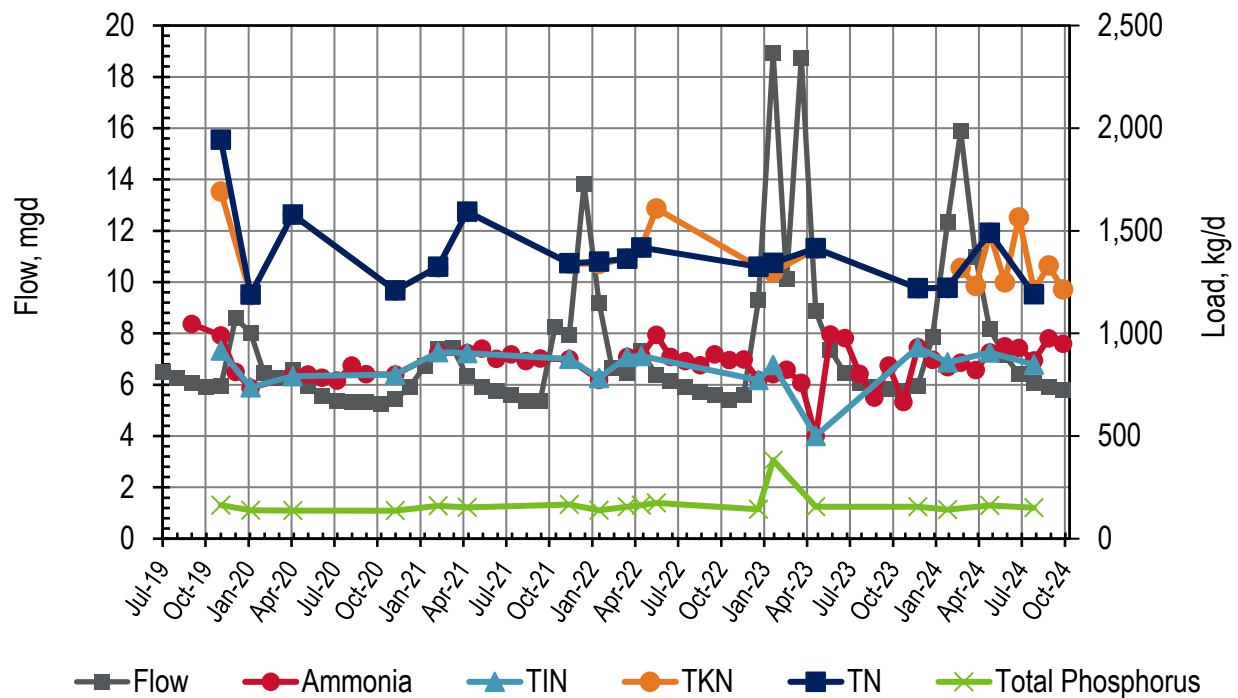


Figure 14-1. Influent: Napa Sanitation District Monthly Flows and Loads

Note: the ammonia/TIN loads and TKN/Total N loads are comparable. The ammonia and TKN values are located behind TIN and Total N loads and thus are not visible.

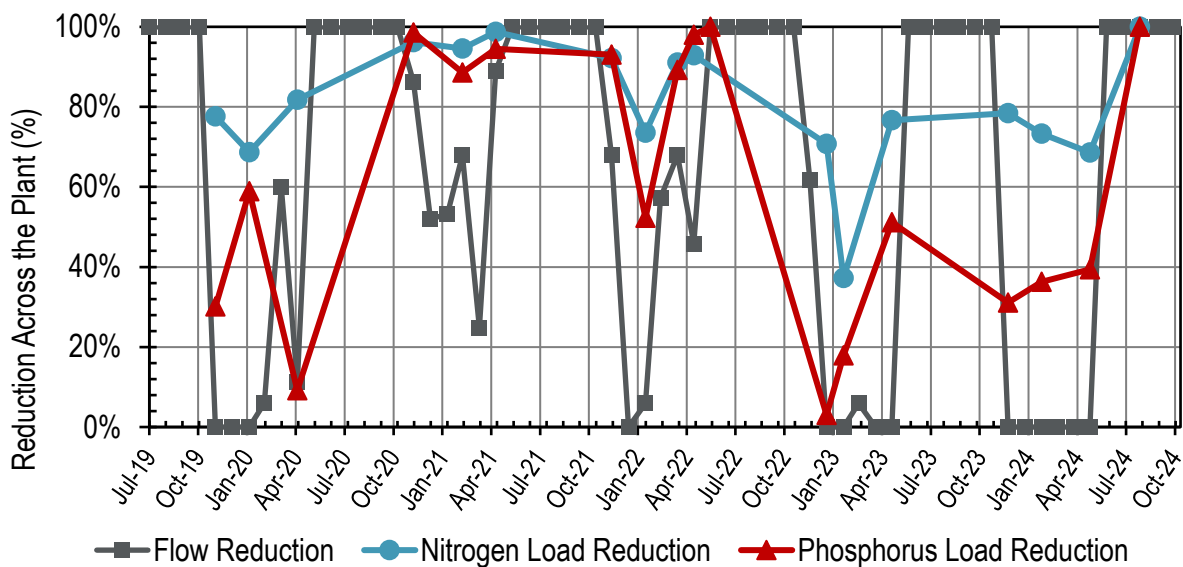


Figure 14-2. Influent: Napa Sanitation District Monthly Reductions Across the Plant

Note: Influent TN was compared against Discharge TIN for calculating nitrogen load reduction.

Table 14-1. Influent: Napa Sanitation District Monthly Flows and Loads*

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	TKN	Total N*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-19	6.50	--	--	--	--	--	--
Aug-19	6.27	--	--	--	--	--	--
Sep-19	6.07	1,050	--	--	--	--	--
Oct-19	5.90	--	--	--	--	--	--
Nov-19	5.94	990	2.93	917	1,690	1,940	163
Dec-19	8.59	813	--	--	--	--	--
Jan-20	8.02	735	2.78	737	1,190	1,190	139
Feb-20	6.47	--	--	--	--	--	--
Mar-20	6.27	--	--	--	--	--	--
Apr-20	6.55	791	1.18	792	1,580	1,580	137
May-20	5.94		--	--	--	--	--
Jun-20	5.56		--	--	--	--	--
Jul-20	5.38	770	--	--	--	--	--
Aug-20	5.31		--	--	--	--	--
Sep-20	5.32		--	--	--	--	--
Oct-20	5.23	--	--	--	--	--	--
Nov-20	5.42	799	0.975	800	1,210	1,210	136
Dec-20	5.92	--	--	--	--	--	--
Jan-21	6.74	--	--	--	--	--	--
Feb-21	7.40	906	3.15	909	1,320	1,320	160
Mar-21	7.43	--	--	--	--	--	--
Apr-21	6.33	904	0.490	904	1,590	1,590	152
May-21	5.91		--	--	--	--	--
Jun-21	5.74		--	--	--	--	--
Jul-21	5.59	897	--	--	--	--	--
Aug-21	5.38		--	--	--	--	--
Sep-21	5.37		--	--	--	--	--
Oct-21	8.22	--	--	--	--	--	--
Nov-21	7.93	874	1.98	876	1,340	1,340	166
Dec-21	13.8	--	--	--	--	--	--
Jan-22	9.19	773	10.2	783	1,340	1,350	139
Feb-22	6.63	--	--	--	--	--	--
Mar-22	6.46	885	0.526	886	1,360	1,360	155
Apr-22	7.30	889	0.649	890	1,420	1,420	163
May-22	6.37	994	--	--	1,610	--	175
Jun-22	6.13		--	--	--	--	--

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	TKN	Total N*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-22	5.89		--	--	--	--	--
Aug-22	5.70	845	--	--	--	--	--
Sep-22	5.59		--	--	--	--	--
Oct-22	5.40	869	--	--	--	--	--
Nov-22	5.61	872	--	--	--	--	--
Dec-22	9.29	772	1.65	773	1,320	1,320	143
Jan-23	18.9	801	44.7	846	1,300	1,340	382
Feb-23	10.1	822	--	--	--	--	--
Mar-23	18.7	759	--	--	--	--	--
Apr-23	8.88	498	2.60	501	1,410	1,420	156
May-23	7.36	995	--	--	--	--	--
Jun-23	6.44	978	--	--	--	--	--
Jul-23	6.09	803	--	--	--	--	--
Aug-23	5.93	687	--	--	--	--	--
Sep-23	5.84	844	--	--	--	--	--
Oct-23	5.76	665	--	--	--	--	--
Nov-23	5.96	932	0.670	932	1,220	1,220	155
Dec-23	7.87	871	--	--	--	--	--
Jan-24	12.3	835	1.75	859	1,220	1,220	142
Feb-24	15.9	857	--	--	1,320	--	--
Mar-24	11.0	821	--	--	1,230	--	--
Apr-24	8.16	907	0	907	1,490	1,490	162
May-24	7.15	937	--	--	1,250	--	--
Jun-24	6.41	929	--	--	1,560	--	--
Jul-24	6.05	869	0	847	1,210	1,190	151
Aug-24	5.90	976	--	--	1,330	--	--
Sep-24	5.80	949	--	--	1,210	--	--
Dry Season Average	5.96	882	***	***	***	***	***
Dry Season Trend **	None	None	***	***	***	***	***
Wet Season Average	8.45	826	4.77	832	1,360	1,400	166
Average Annual	7.34	854	4.49	833	1,360	1,380	165

* The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values. The Total Nitrogen value is calculated by adding "TKN" and "Nitrate + Nitrite".

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

*** Insufficient dry season sampling to perform analysis.

Discharge

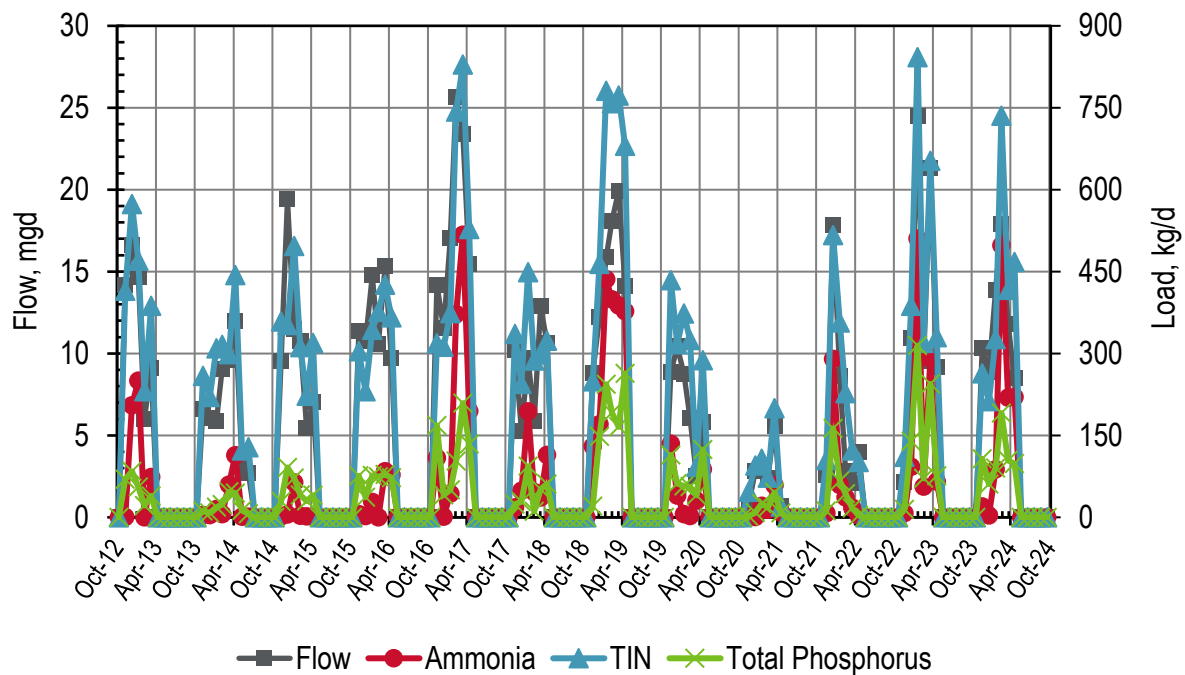


Figure 14-3. Discharge: Napa Sanitation District Monthly Flows and Loads

Table 14-2. Discharge: Napa Sanitation District Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	0	0	0	0	0
Nov-12	14.2	0.268	414	415	69.8
Dec-12	16.6	205	369	574	84.4
Jan-13	14.7	250	220	470	55.8
Feb-13	5.99	0.113	231	231	21.5
Mar-13	9.10	73.6	314	387	38.9
Apr-13	0	0	0	0	0
May-13	0	0	0	0	0
Jun-13	0	0	0	0	0
Jul-13	0	0	0	0	0
Aug-13	0	0	0	0	0
Sep-13	0	0	0	0	0
Oct-13	0	0	0	0	0
Nov-13	6.61	3.77	255	259	11.6
Dec-13	6.08	4.25	216	220	8.04

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Jan-14	5.85	15.4	294	309	18.7
Feb-14	9.09	5.49	310	315	23.5
Mar-14	9.60	59.3	239	299	47.0
Apr-14	12.0	113	330	443	44.5
May-14	3.30	0.988	122	122	12.8
Jun-14	2.70	1.09	127	128	6.06
Jul-14	0	0	0	0	0
Aug-14	0	0	0	0	0
Sep-14	0	0	0	0	0
Oct-14	0	0	0	0	0
Nov-14	9.53	1.91	356	358	29.3
Dec-14	19.4	5.30	347	352	91.0
Jan-15	11.5	63.8	433	497	71.8
Feb-15	10.8	2.73	309	312	41.1
Mar-15	5.42	1.51	221	223	29.8
Apr-15	7.00	0.900	319	319	40.4
May-15	0	0	0	0	0
Jun-15	0	0	0	0	0
Jul-15	0	0	0	0	0
Aug-15	0	0	0	0	0
Sep-15	0	0	0	0	0
Oct-15	0	0	0	0	0
Nov-15	11.4	5.66	298	304	76.1
Dec-15	10.7	2.26	228	231	37.0
Jan-16	14.8	27.7	315	343	76.5
Feb-16	10.6	0	376	376	74.3
Mar-16	15.3	84.3	342	426	78.3
Apr-16	9.74	78.1	288	366	72.6
May-16	0	0	0	0	0
Jun-16	0	0	0	0	0
Jul-16	0	0	0	0	0
Aug-16	0	0	0	0	0
Sep-16	0	0	0	0	0
Oct-16	0	0	0	0	0
Nov-16	14.2	109	210	319	168
Dec-16	11.5	0.778	311	312	41.1
Jan-17	17.1	43.5	330	374	50.3

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Feb-17	25.7	372	371	743	103
Mar-17	23.4	517	311	829	209
Apr-17	15.4	194	333	528	134
May-17	0	0	0	0	0
Jun-17	0	0	0	0	0
Jul-17	0	0	0	0	0
Aug-17	0	0	0	0	0
Sep-17	0	0	0	0	0
Oct-17	0	0	0	0	0
Nov-17	10.2	18.1	317	336	23.6
Dec-17	5.29	48.8	195	244	28.8
Jan-18	9.74	194	255	449	93.9
Feb-18	5.88	46.1	241	287	10.9
Mar-18	12.9	36.3	262	298	51.4
Apr-18	10.7	114	209	323	60.7
May-18	0	0	0	0	0
Jun-18	0	0	0	0	0
Jul-18	0	0	0	0	0
Aug-18	0	0	0	0	0
Sep-18	0	0	0	0	0
Oct-18	0	0	0	0	0
Nov-18	8.79	130	119	249	20.7
Dec-18	12.2	171	312	464	148
Jan-19	15.9	436	345	781	244
Feb-19	18.1	399	359	758	191
Mar-19	19.9	388	385	772	166
Apr-19	14.1	377	263	680	264
May-19	0	0	0	0	0
Jun-19	0	0	0	0	0
Jul-19	0	0	0	0	0
Aug-19	0	0	0	0	0
Sep-19	0	0	0	0	0
Oct-19	0	0	0	0	0
Nov-19	8.84	134	300	434	114
Dec-19	10.4	39.9	268	317	62.2
Jan-20	8.75	5.78	375	373	57.1
Feb-20	6.30	2.19	334	336	58.0

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Mar-20	5.57	66.6	138	205	89.6
Apr-20	7.59	114	261	375	162
May-20	0	0	0	0	0
Jun-20	0	0	0	0	0
Jul-20	0	0	0	0	0
Aug-20	0	0	0	0	0
Sep-20	0	0	0	0	0
Oct-20	0	0	0	0	0
Nov-20	0.745	0.192	46.4	46.6	2.00
Dec-20	2.84	0.712	93.8	94.6	8.57
Jan-21	3.16	20.9	86.3	107	25.0
Feb-21	2.37	13.9	58.3	72.3	18.3
Mar-21	5.59	58.2	142	200	45.6
Apr-21	0.696	8.47	11.3	19.8	8.34
May-21	0	0	0	0	0
Jun-21	0	0	0	0	0
Jul-21	0	0	0	0	0
Aug-21	0	0	0	0	0
Sep-21	0	0	0	0	0
Oct-21	0	0	0	0	0
Nov-21	2.55	7.40	97.4	105	11.6
Dec-21	17.8	290	226	517	163
Jan-22	8.65	59.2	298	357	66.4
Feb-22	2.84	36.4	191	227	43.4
Mar-22	2.07	17.4	105	122	16.8
Apr-22	3.96	2.50	98.8	101	3.30
May-22	0	0	0	0	0
Jun-22	0	0	0	0	0
Jul-22	0	0	0	0	0
Aug-22	0	0	0	0	0
Sep-22	0	0	0	0	0
Oct-22	0	0	0	0	0
Nov-22	2.15	7.67	103	111	14.3
Dec-22	10.9	92.2	295	387	139
Jan-23	24.5	511	332	843	314
Feb-23	9.53	55.9	263	319	71.5
Mar-23	21.3	290	362	653	244

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Apr-23	9.15	65.7	264	330	76.3
May-23	0	0	0	0	0
Jun-23	0	0	0	0	0
Jul-23	0	0	0	0	0
Aug-23	0	0	0	0	0
Sep-23	0	0	0	0	0
Oct-23	0	0	0	0	0
Nov-23	10.3	19.7	244	263	107
Dec-23	8.88	3.23	209	213	61.1
Jan-24	13.9	87.7	238	326	90.3
Feb-24	17.9	498	237	735	191
Mar-24	11.8	219	198	417	104
Apr-24	8.48	220	248	468	98.2
May-24	0	0	0	0	0
Jun-24	0	0	0	0	0
Jul-24	0	0	0	0	0
Aug-24	0	0	0	0	0
Sep-24	0	0	0	0	0
Dry Season Average	0.100	0.0346	4.14	4.18	0.314
Dry Season Trend	--**	--**	--**	--**	--**
Wet Season Average	8.83	89.1	216	305	65.8
Average Annual	5.19	52.0	128	180	38.5

* The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values.

** No dry season trending analysis was performed on Napa as there are only two months (May and June 2014) that Napa has discharged since sampling began in 2012.

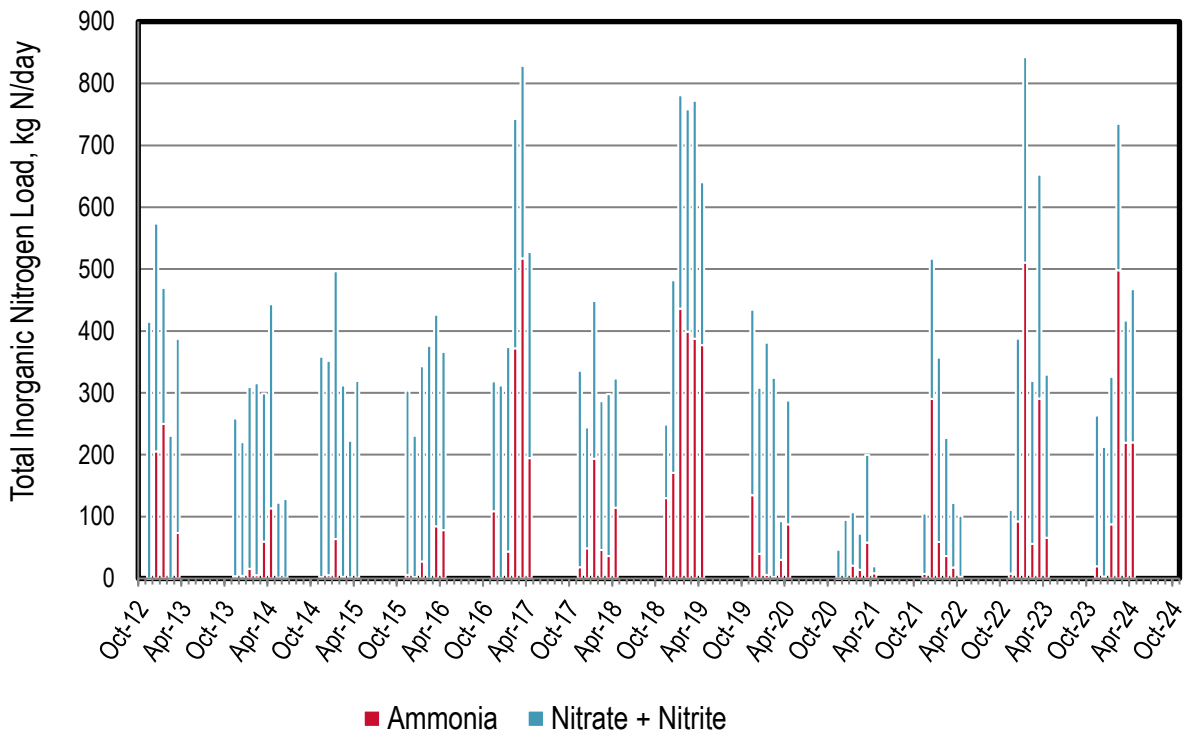


Figure 14-4. Discharge: Napa Sanitation District Monthly Nitrogen Loads

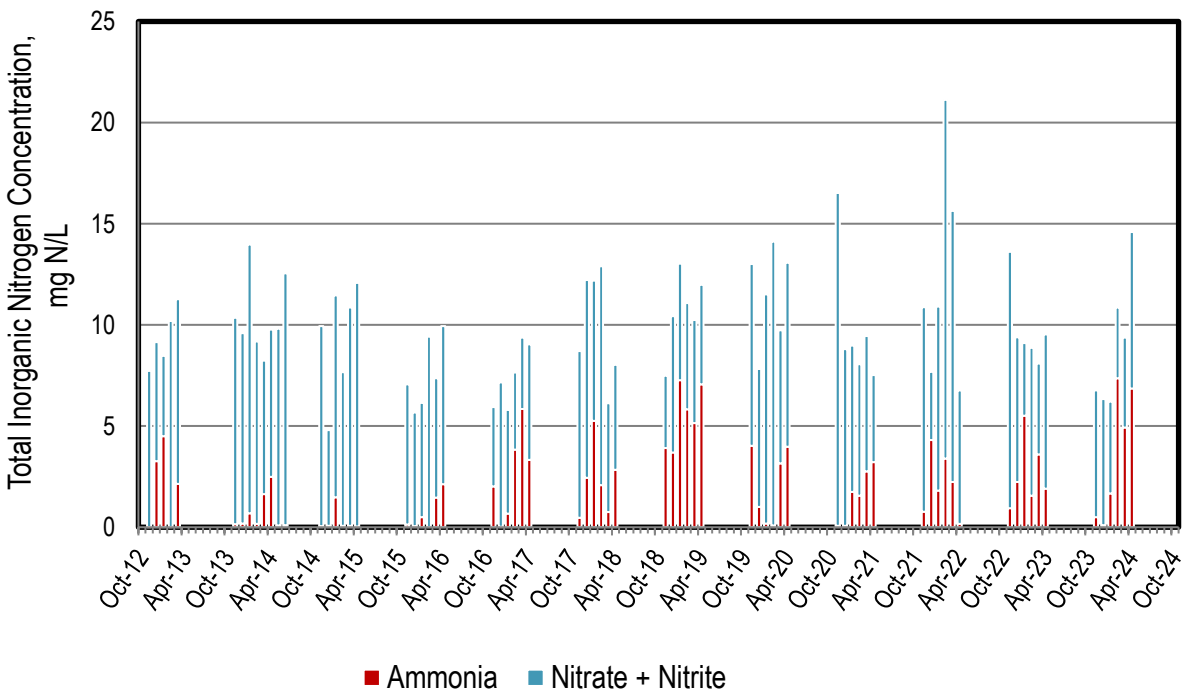


Figure 14-5. Discharge: Napa Sanitation District Monthly Nitrogen Concentrations

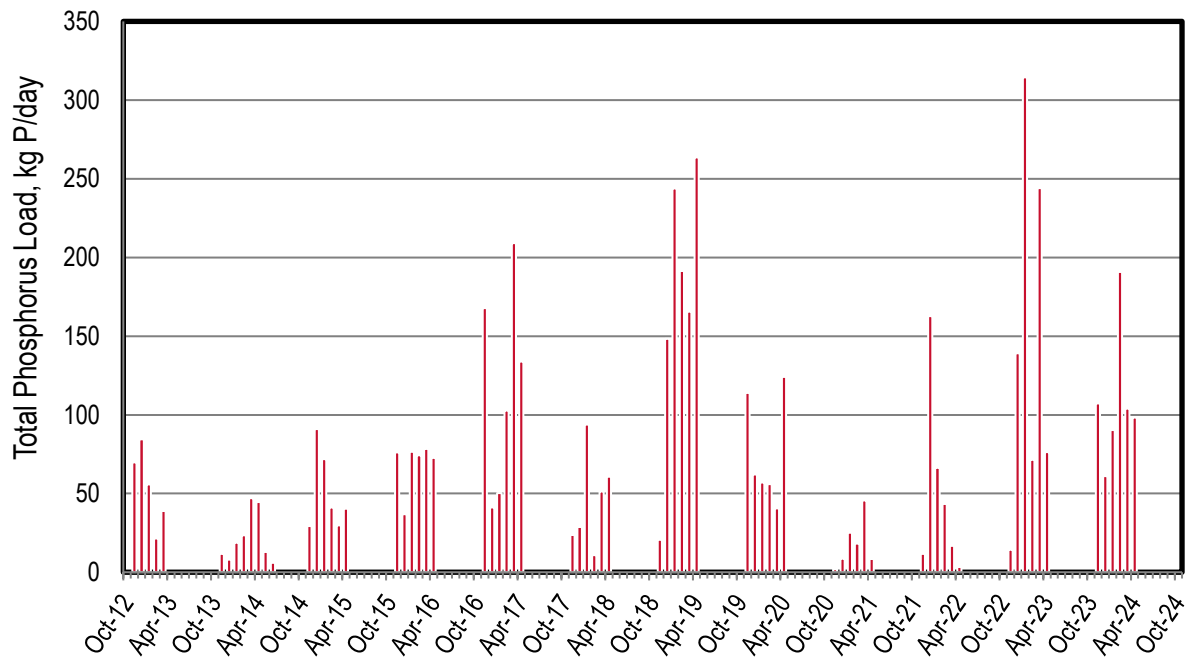


Figure 14-6. Discharge: Napa Sanitation District Monthly Phosphorus Loads

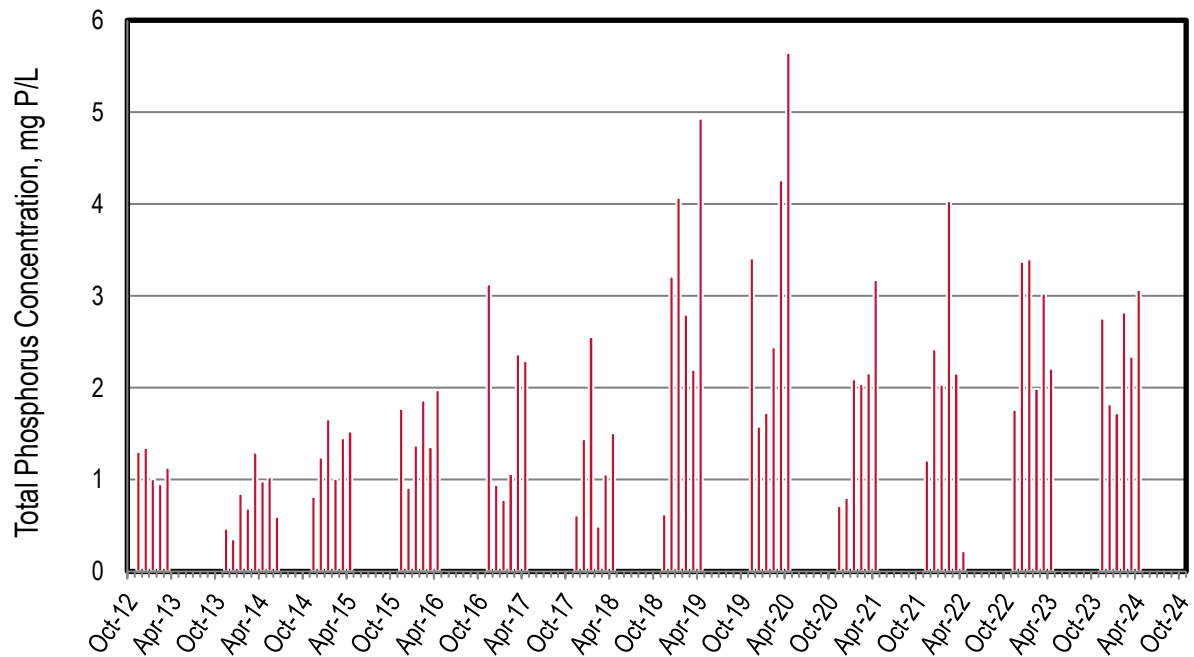


Figure 14-7. Discharge: Napa Sanitation District Monthly Phosphorus Concentrations

Recycled Water

Table 14-3. Recycled Water: Napa Sanitation District Yearly Recycled Water Flows Diverted from the Bay

Year**	Flow Diverted*, Acre-Feet (mgd)							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	1,040 (0.92)	509 (0.45)	0 (0)	0 (0)	767 (0.68)	0 (0)	26 (0.02)	2,340 (2.07)
2020	1,310 (1.17)	595 (0.53)	0 (0)	0 (0)	1,110 (0.99)	0 (0)	70 (0.06)	3,080 (2.75)
2021	1,280 (1.15)	530 (0.47)	0 (0)	0 (0)	1,760 (1.57)	0 (0)	130 (0.12)	3,700 (3.31)
2022	1,290 (1.15)	572 (0.51)	0 (0)	0 (0)	1,340 (1.19)	0 (0)	76 (0.07)	3,280 (2.92)
2023	973 (0.87)	462 (0.41)	0 (0)	0 (0)	798 (0.71)	0 (0)	28 (0.02)	2,261 (2.01)
Average	1,179 (1.05)	534 (0.47)	0 (0)	0 (0)	1,155 (1.03)	0 (0)	66 (0.06)	2,933 (2.61)

* Assumes 100% of the recycled flow is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 14-4. Recycled Water: Napa Sanitation District Yearly Recycled Water Ammonia Load Diverted from the Bay

Year**	Average Ammonia Load Diverted*, kg N/d							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	19	9	0	0	14	0	<1	42
2020	6	3	0	0	5	0	<1	13
2021	14	6	0	0	20	0	1	41
2022	8	4	0	0	8	0	<1	21
2023	12	6	0	0	10	0	<1	29
Average	12	5	0	0	11	0	1	29

* Assumes 100% of the recycled load is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 14-5. Recycled Water: Napa Sanitation District Yearly Recycled Water Total Inorganic Nitrogen Load Diverted from the Bay

Year**	Average Total Inorganic Nitrogen Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	39	19	0	0	29	0	1	89
2020	51	23	0	0	43	0	3	121
2021	37	15	0	0	50	0	4	105
2022	49	22	0	0	51	0	3	125
2023	29	14	0	0	24	0	1	67
Average	41	19	0	0	39	0	2	101

* Assumes 100% of the recycled load is diverted for all recycled water applications

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 14-6. Recycled Water: Napa Sanitation District Yearly Recycled Water Total P Load Diverted from the Bay

Year**	Average Total P Load Diverted*, kg P/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	11	5	0	0	8	0	<1	25
2020	13	6	0	0	11	0	1	30
2021	10	4	0	0	13	0	1	28
2022	11	5	0	0	11	0	1	27
2023	10	4	0	0	8	0	<1	22
Average	11	5	0	0	10	0	1	26

* Assumes 100% of the recycled load is diverted for all recycled water applications

** **Calendar year as opposed to California's water year (October 1 through September 30)**

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15 Novato Sanitary District

Novato discharges to San Pablo Bay. The plant has approximately 28,500 service connections; it has a permitted capacity of 7.0 mgd ADWF and a peak wet weather capacity of 47 mgd. The plant performs nitrogen removal using activated sludge. The District was issued a new NPDES permit (September 2020) that allows for year-round discharge to San Pablo Bay. The District will be transitioning to year-round discharge over the next several years as it winds down its ranching/irrigation spray field operation.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Discharge:

- ▲ Both nitrogen and phosphorus loads typically increase with wet weather flow events.
- ▲ NO_x is the majority of the nitrogen species discharged as would be expected since this plant nitrifies. A portion of ammonia bleeds through during the colder months. This increases the ammonia contribution during such months.
- ▲ The plant met Level 2 TIN concentration limits (i.e., 15 mg N/L) developed under the Scoping and Evaluation Plan during 2023/2024; historical values have been reliably less than 20 mg N/L.
- ▲ Total phosphorus concentrations range from 0.1 to 6.1 mg P/L. This suggests a portion of P is removed as typical effluent TP concentrations for similar treatment plants are 4 to 6 mg P/L. The removal mechanism might be attributed to a combination of ferric chloride addition to the digester influent and/or biological P removal.

◆ Recycled Water:

- ▲ Based on Table 1-2, the plant averages 1.2 mgd of recycled water. Recycled water uses included Golf Course, Landscape Irrigation, Agricultural, and Other Non-Potable.
- ▲ Based on Table 1-3 through Table 1-5, the plant diverts on average 13 kg ammonia-N/d, 51 kg TIN-N/d, and 3 kg P/d away from the Bay through recycled water.

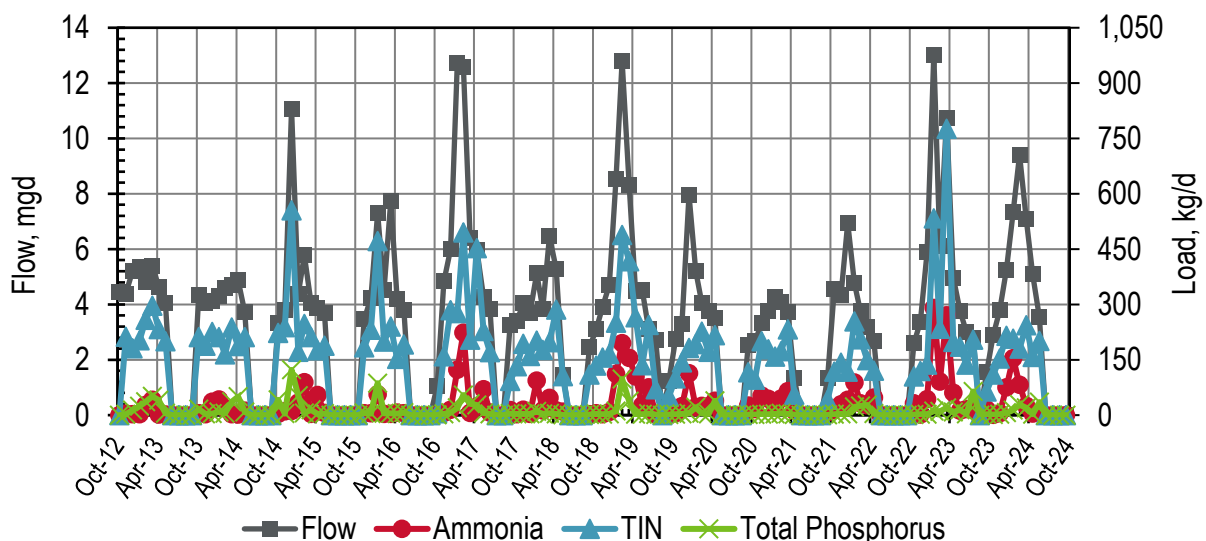


Figure 15-1. Discharge: Novato Monthly Flows and Loads

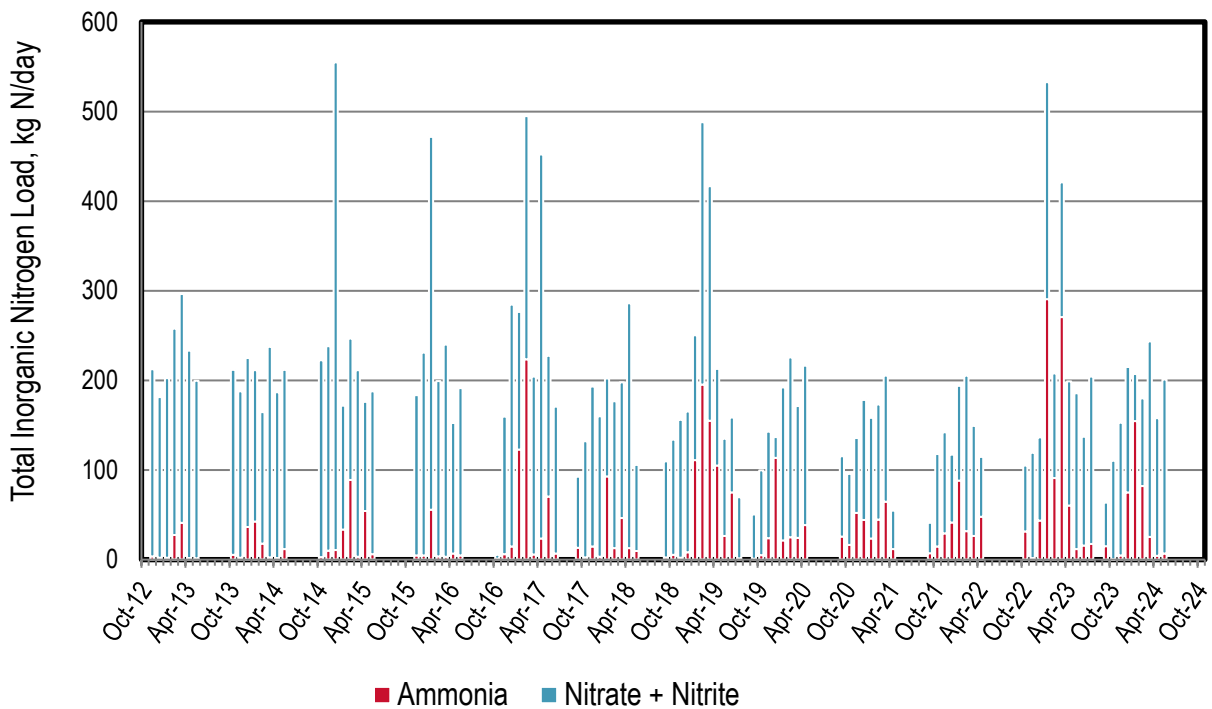


Figure 15-2. Discharge: Novato Monthly Nitrogen Loads

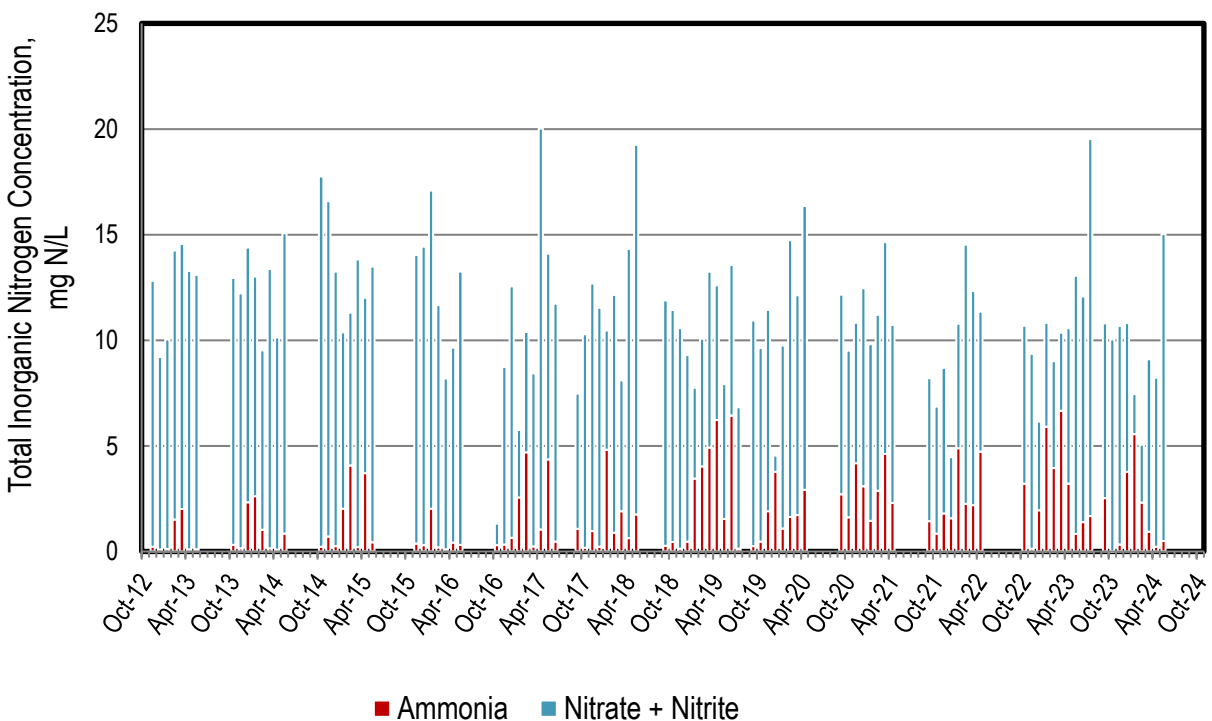


Figure 15-3. Discharge: Novato Monthly Nitrogen Concentrations

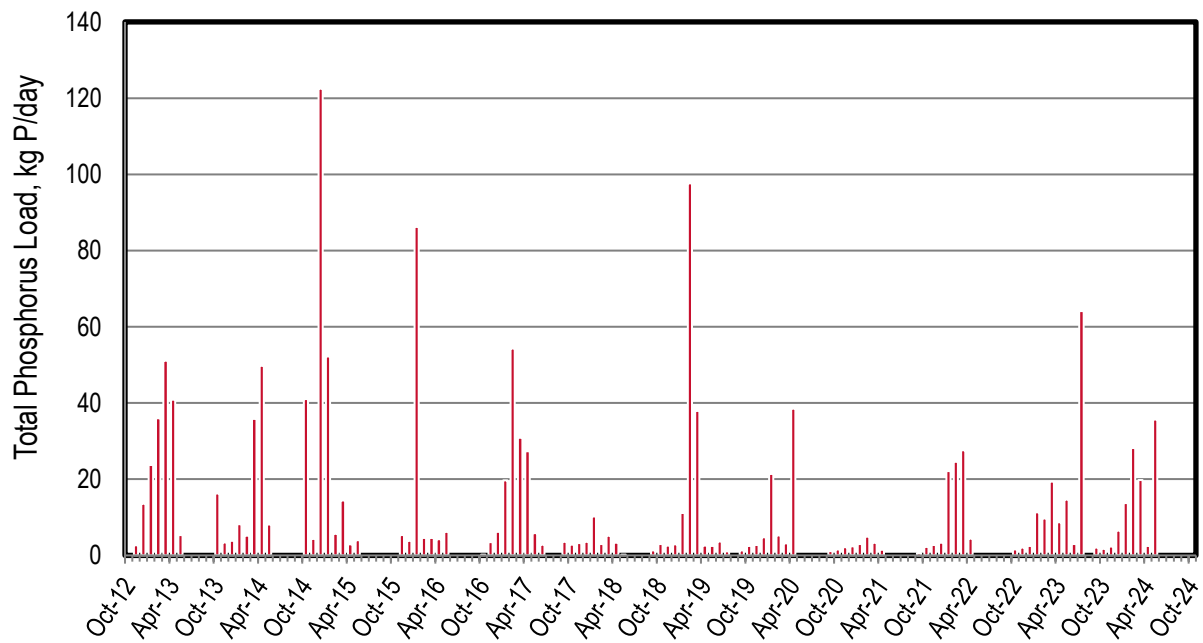


Figure 15-4. Discharge: Novato Monthly Phosphorus Loads

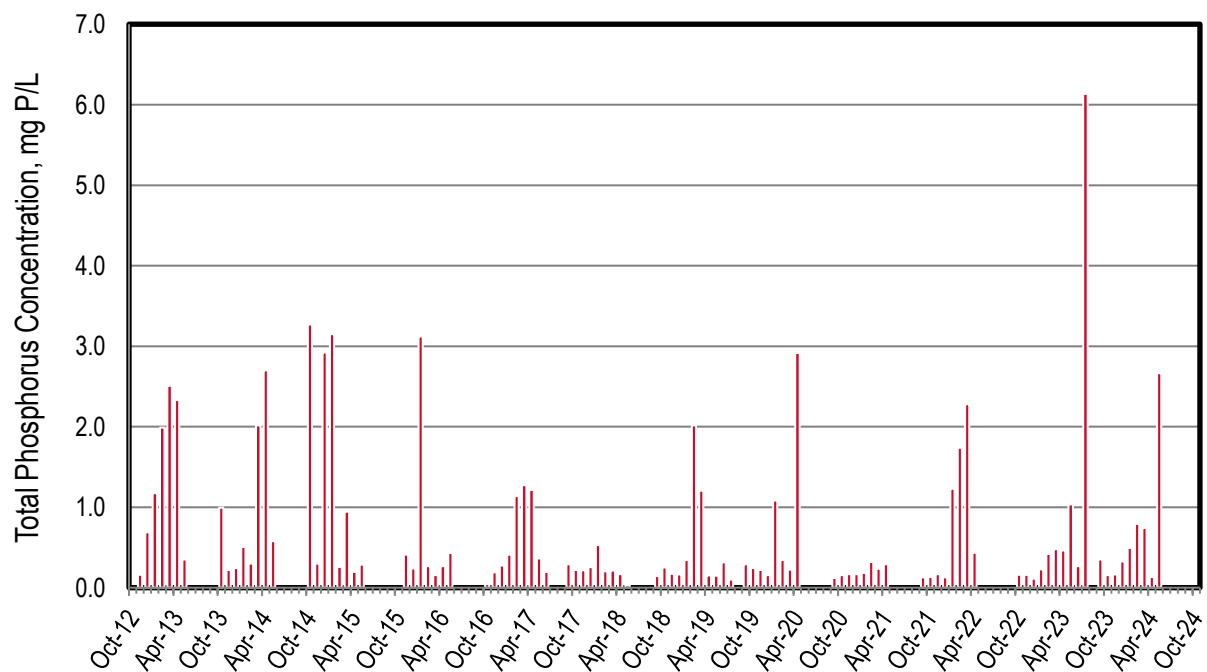


Figure 15-5. Discharge: Novato Monthly Phosphorus Concentrations

Table 15-1. Discharge: Novato Monthly Flows and Loads¹

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	4.44	--	--	--	--
Nov-12	4.39	3.63	209	213	2.65
Dec-12	5.21	2.16	179	181	13.6
Jan-13	5.34	2.30	200	203	23.7
Feb-13	4.79	27.3	231	258	36.0
Mar-13	5.39	41.0	255	296	51.1
Apr-13	4.64	1.85	231	233	40.9
May-13	4.03	1.52	198	200	5.32
Jun-13	0	0	0	0	0
Jul-13	0	0	0	0	0
Aug-13	0	0	0	0	0
Sep-13	0	0	0	0	0
Oct-13	4.33	5.24	207	212	16.3
Nov-13	4.07	2.16	186	188	3.39
Dec-13	4.14	36.4	189	225	3.82
Jan-14	4.30	42.6	169	211	8.23
Feb-14	4.57	17.8	147	165	5.18
Mar-14	4.70	2.52	235	238	35.8
Apr-14	4.88	1.66	185	187	49.8
May-14	3.71	11.9	200	212	8.09
Jun-14	0	0	0	0	0
Jul-14	0	0	0	0	0
Aug-14	0	0	0	0	0
Sep-14	0	0	0	0	0
Oct-14	3.32	2.88	220	222	41.0
Nov-14	3.80	10.1	228	238	4.30
Dec-14	11.1	10.6	544	555	123
Jan-15	4.38	33.6	138	172	52.2
Feb-15	5.78	89.0	158	247	5.70
Mar-15	4.05	3.10	208	212	14.4
Apr-15	3.88	54.3	122	176	2.90
May-15	3.68	6.00	182	188	4.00
Jun-15	0	0	0	0	0
Jul-15	0	0	0	0	0
Aug-15	0	0	0	0	0
Sep-15	0	0	0	0	0

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-15	0	0	0	0	0
Nov-15	3.46	4.81	179	183	5.36
Dec-15	4.24	4.67	227	231	3.82
Jan-16	7.30	55.8	416	472	86.2
Feb-16	4.52	3.43	196	199	4.57
Mar-16	7.75	3.16	237	240	4.58
Apr-16	4.18	6.68	146	152	4.25
May-16	3.82	4.51	187	191	6.22
Jun-16	0	0	0	0	0
Jul-16	0	0	0	0	0
Aug-16	0	0	0	0	0
Sep-16	0	0	0	0	0
Oct-16***	1.05	1.19	4.01	5.20	0.182
Nov-16	4.84	6.01	154	160	3.51
Dec-16	5.99	14.7	270	284	6.22
Jan-17	12.7	123	154	276	19.7
Feb-17	12.6	223	271	495	54.3
Mar-17	6.41	5.74	199	204	30.9
Apr-17	5.97	23.4	429	452	27.4
May-17	4.27	70.3	157	228	5.86
Jun-17	3.85	6.71	164	171	2.83
Jul-17	0	0	0	0	0
Aug-17	0	0	0	0	0
Sep-17	3.27	13.2	79.2	92.5	3.60
Oct-17	3.40	2.38	130	132	2.81
Nov-17	4.03	14.7	179	193	3.27
Dec-17	3.67	3.14	157	160	3.57
Jan-18	5.11	93.0	109	202	10.2
Feb-18	3.85	12.9	164	177	2.98
Mar-18	6.46	46.5	151	198	5.15
Apr-18	5.28	12.7	273	286	3.32
May-18***	1.45	9.61	96.1	106	0.186
Jun-18	0	0	0	0	0
Jul-18	0	0	0	0	0
Aug-18	0	0	0	0	0
Sep-18	2.44	2.41	107	110	1.34
Oct-18	3.10	5.28	129	134	2.96

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-18	3.91	2.06	154	156	2.57
Dec-18	4.71	8.23	157	165	2.93
Jan-19	8.54	111	139	250	11.1
Feb-19	12.8	195	293	488	97.6
Mar-19	8.32	155	262	417	37.9
Apr-19	4.47	105	108	265	2.58
May-19	4.51	26.3	109	135	2.51
Jun-19	3.09	75.1	83.5	245	3.66
Jul-19	2.70	1.35	68.4	69.7	1.03
Aug-19	0	0	0	0	0
Sep-19***	1.22	1.16	49.2	50.4	1.34
Oct-19	2.74	4.85	94.9	99.8	2.52
Nov-19	3.30	23.8	119	143	2.74
Dec-19	7.96	113	23.2	182	4.75
Jan-20	5.21	21.3	171	192	21.3
Feb-20	4.05	25.1	201	226	5.22
Mar-20	3.74	24.3	147	172	3.19
Apr-20	3.50	38.5	178	216	38.5
May-20	0	0	0	0	0
Jun-20	0	0	0	0	0
Jul-20	0	0	0	0	0
Aug-20	0	0	0	0	0
Sep-20	2.51	25.8	89.7	116	1.15
Oct-20	2.67	16.4	79.5	95.8	1.56
Nov-20	3.31	52.3	83.3	200	2.11
Dec-20	3.78	44.2	134	178	2.41
Jan-21	4.27	23.5	135	158	2.98
Feb-21	4.09	44.5	129	173	4.93
Mar-21	3.71	64.7	140	232	3.31
Apr-21***	1.35	11.8	43.0	54.8	1.48
May-21	0	0	0	0	0
Jun-21	0	0	0	0	0
Jul-21	0	0	0	0	0
Aug-21	0	0	0	0	0
Sep-21***	1.32	7.20	33.8	41.0	0.648
Oct-21	4.55	14.5	103	118	2.28
Nov-21	4.33	29.4	113	142	2.78

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-21	6.94	41.3	75.9	117	3.33
Jan-22	4.76	88.1	106	254	22.1
Feb-22	3.74	31.8	174	205	24.6
Mar-22	3.20	26.6	123	149	27.6
Apr-22***	2.67	47.7	67.0	120	4.39
May-22	0	0	0	0	0
Jun-22	0	0	0	0	0
Jul-22	0	0	0	0	0
Aug-22	0	0	0	0	0
Sep-22	0	0	0	0	0
Oct-22	2.59	31.5	73.4	105	1.57
Nov-22	3.37	1.62	118	119	2.03
Dec-22	5.88	43.5	93.1	137	2.48
Jan-23	13.0	291	242	533	11.3
Feb-23	6.10	91.2	117	233	9.67
Mar-23	10.8	271	150	776	19.4
Apr-23	4.97	60.3	138	199	8.71
May-23	3.76	11.8	174	186	14.7
Jun-23	3.00	15.8	121	137	3.03
Jul-23	2.77	17.5	187	204	64.1
Aug-23	0	0	0	0	0
Sep-23***	1.56	14.9	48.7	63.5	2.06
Oct-23	2.90	0.200	110	110	1.70
Nov-23	3.79	4.81	148	153	2.34
Dec-23	5.25	75.0	140	215	6.49
Jan-24	7.35	154	52.5	207	13.7
Feb-24	9.41	82.1	97.7	180	28.2
Mar-24	7.08	25.2	218	243	19.8
Apr-24	5.08	4.33	153	158	2.53
May-24	3.54	6.64	194	201	35.6
Jun-24	0	0	0	0	0
Jul-24	0	0	0	0	0
Aug-24	0	0	0	0	0
Sep-24	0	0	0	0	0

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dry Season Average	1.01	5.89	45.1	52.6	2.99
Dry Season Trend	--**	--**	--**	--**	--**
Wet Season Average	5.14	42.9	166	217	15.5
Average Annual	3.42	28.0	118	151	10.5

1 For non-detects after October 1, 2023, 1/2 of the method detection limit was used to quantify values. Prior to October 1, 2023, non-detect values used the provided method detection limit.

* The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values.

** No dry season trending analysis was performed on Novato as the facility typically does not discharge during most dry season months.

*** Lower than typical monthly averages due to discharge to the Bay only occurring during a portion of the month.

Recycled Water

Table 15-2. Recycled Water: Novato Yearly Recycled Water Flows Diverted from the Bay

Year**	Flow Diverted*, Acre-Feet (mgd)							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	215 (0.19)	200 (0.18)	0 (0)	0 (0)	401 (0.36)	0 (0)	57.3 (0.05)	873.3 (0.78)
2020	0 (0)	640 (0.57)	0 (0)	0 (0)	902 (0.8)	0 (0)	99.5 (0.09)	1,642 (1.46)
2021	385 (0.34)	196 (0.18)	0 (0)	8 (0.01)	1010 (0.9)	0 (0)	49.4 (0.04)	1,649 (1.47)
2022	350 (0.31)	202 (0.18)	0 (0)	10 (0.01)	1,200 (1.07)	0 (0)	45.6 (0.04)	1,807 (1.61)
2023	260 (0.23)	135 (0.12)	0 (0)	10 (0.01)	366 (0.33)	0 (0)	1.08 (0)	772 (0.69)
Average	242 (0.21)	275 (0.25)	0 (0)	6 (0.01)	776 (0.69)	0 (0)	51 (0.044)	1,348 (1.20)

* Assumes 100% of the recycled flow is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 15-3. Recycled Water: Novato Yearly Recycled Water Ammonia Load Diverted from the Bay

Year**	Average Ammonia Load Diverted*, kg N/d							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	3	2	0	0	5	0	1	11
2020	0	5	0	0	7	0	1	13
2021	3	1	0	<1	7	0	<1	11
2022	3	2	0	<1	11	0	<1	17
2023	4	2	0	<1	6	0	<1	12
Average	2	3	0	<1	7	0	<1	13

* Assumes 100% of the recycled load is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 15-4. Recycled Water: Novato Yearly Recycled Water Total Inorganic Nitrogen Load Diverted from the Bay

Year**	Average Total Inorganic Nitrogen Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	7	7	0	0	14	0	2	31
2020	0	28	0	0	39	0	4	71
2021	12	6	0	<1	31	0	1	50
2022	13	7	0	<1	45	0	2	67
2023	12	6	0	1	17	0	<1	35
Average	9	11	0	<1	29	0	2	51

* Assumes 100% of the recycled load is diverted for all recycled water applications

** Calendar year as opposed to California's water year (October 1 through September 30)

Table 15-5. Recycled Water: Novato Yearly Recycled Water Total P Load Diverted from the Bay

Year**	Average Total P Load Diverted*, kg P/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	1	1	0	0	1	0	<1	2
2020	0	2	0	0	2	0	<1	4
2021	<1	<1	0	<1	1	0	<1	1
2022	1	1	0	<1	3	0	<1	5
2023	1	<1	0	<1	1	0	<1	2
Average	<1	1	0	<1	2	0	<1	3

* Assumes 100% of the recycled load is diverted for all recycled water applications

** Calendar year as opposed to California's water year (October 1 through September 30)

16 City of Palo Alto

Palo Alto discharges to the Lower South Bay. The plant serves an estimated population of 217,000 and it has a permitted ADWF capacity of 39 mgd and a peak wet weather capacity of 80 mgd. This past dry season average discharge flow was approximately 19.7 mgd. The plant performs ammonia and limited nitrogen removal using a combination of trickling filters and activated sludge.

The following observations are made based upon the figures and table in the subsequent pages:

◆ Influent

- ▲ Note: limited to data since July 2019; quarterly required but more provided for various parameters.
- ▲ Based on the limited average monthly values in Table 1-1, there is an upward emerging dry season trend for ammonia, TIN, and TP (other parameters have no emerging trends).
- ▲ The flow reduction across the plant was up to 26 percent in 2019. Since September 2019, the flow reduction has been sporadic but it increased up to 20 percent in 2023. The primary flow reductions are from a blend of new recycled water demands and flow management during wet weather events.
- ▲ The nitrogen load reduction values across the plant typically ranges from approximately 25 to 60 percent. This load reduction is attributed primarily to a combination of biological assimilation and biological load reduction in the trickling filter/activated sludge system, as well as recycled water.
- ▲ The phosphorus load reduction across the plant is up to 27 percent. Such a reduction is attributed to biological assimilation within the plant, as well as recycled water.

◆ Discharge

- ▲ The average monthly dry season flow values in 2024 was consistent with 2023 and other relatively wet years. This was anticipated given how wet the 2023/2024 season was.
- ▲ Based on Table 1-2 statistics for the entire dry season dataset, all the monitored parameters are trending downwards (ammonia trend not included due to ammonia limit).
- ▲ NO_x is the majority of the nitrogen species discharged, regardless of season. This would be expected since this plant reliably nitrifies year-round. However, nitrification was not complete during 2023/2024, and ammonia effluent was consistently between 1.0 to 2.8 mg N/L. This is most likely due to construction occurring in one of the aeration basins in preparation for the future transition to a biological nitrogen removal process.
- ▲ TP discharge concentrations range from 2.7 to 5.9 mg P/L. Such values suggests occasional removal beyond biological assimilation.

◆ Recycled Water:

- ▲ Based on Table 1-3, the plant averages 0.66 mgd of Recycled Water. Recycled water uses include golf course irrigation, landscape irrigation, and other non-potable uses.
- ▲ Based on Table 1-4 through Table 1-6, the average load diverted from the Bay from recycled water is <1 kg ammonia-N/d, 75 kg TIN-N/d, and 11 kg P/d.

Influent

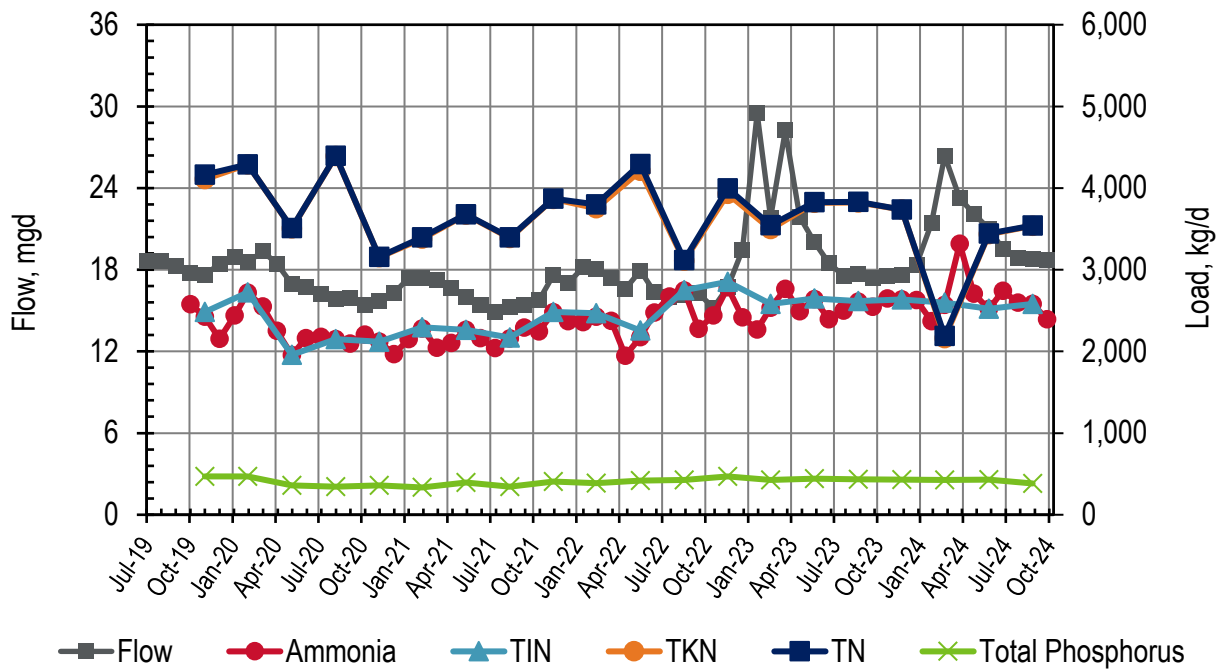


Figure 16-1. Influent: Palo Alto Monthly Flows and Loads

Note: the ammonia/TIN loads and TKN/Total N loads are comparable. The ammonia and TKN values are located behind TIN and Total N load lines, respectively.

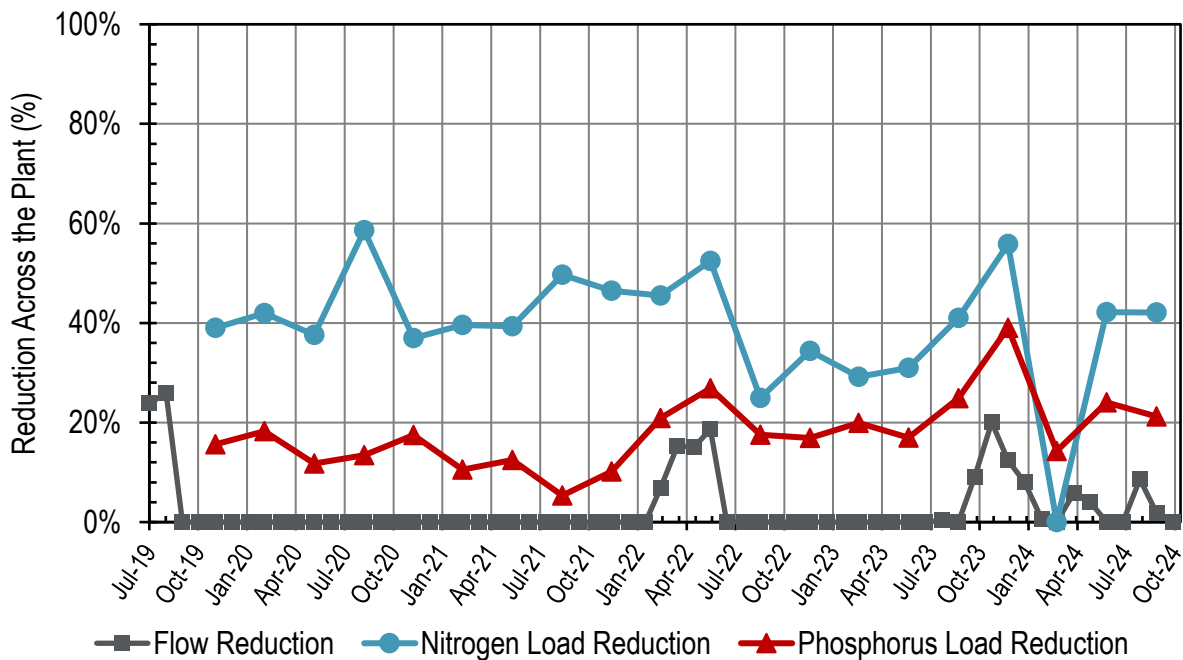


Figure 16-2. Influent: Palo Alto Monthly Reductions Across the Plant

Note: Influent TN was compared against Discharge TIN for calculating nitrogen load reduction.

Table 16-1. Influent: Palo Alto Monthly Flows and Loads*

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-19	18.7	--	--	--	--	--	--
Aug-19	18.6	--	--	--	--	--	--
Sep-19	18.2	--	--	--	--	--	--
Oct-19	17.8	2,580	--	--	--	--	--
Nov-19	17.6	2,420	57.2	2,480	4,110	4,160	469
Dec-19	18.5	2,160	--	--	--	--	--
Jan-20	18.9	2,440	--	--	--	--	--
Feb-20	18.6	2,720	2.81	2,720	4,290	4,290	467
Mar-20	19.3	2,550	--	--	--	--	--
Apr-20	18.4	2,250	--	--	--	--	--
May-20	16.9	1,960	2.60	1,960	3,510	3,510	360
Jun-20	16.7	2,160	--	--	--	--	--
Jul-20	16.2	2,180	--	--	--	--	--
Aug-20	15.8	2,150	2.77	2,150	4,390	4,400	343
Sep-20	15.9	2,090	--	--	--	--	--
Oct-20	15.4	2,210	--	--	--	--	--
Nov-20	15.7	2,120	2.38	2,120	3,150	3,160	361
Dec-20	16.3	1,970	--	--	--	--	--
Jan-21	17.4	2,150	--	--	--	--	--
Feb-21	17.4	2,280	12.6	2,290	3,380	3,390	334
Mar-21	17.3	2,040	--	--	--	--	--
Apr-21	16.6	2,100	--	--	--	--	--
May-21	16.0	2,260	2.53	2,260	3,670	3,680	394
Jun-21	15.4	2,160	--	--	--	--	--
Jul-21	14.9	2,040	--	--	--	--	--
Aug-21	15.2	2,160	10.7	2,170	3,390	3,400	342
Sep-21	15.4	2,290	--	--	--	--	--
Oct-21	15.7	2,250	--	--	--	--	--
Nov-21	17.6	2,480	2.67	2,480	3,870	3,870	405
Dec-21	17.0	2,370	--	--	--	--	--
Jan-22	18.2	2,360	--	--	--	--	--
Feb-22	18.0	2,420	45.7	2,470	3,750	3,800	387
Mar-22	17.4	2,370	--	--	--	--	--
Apr-22	16.6	1,950	--	--	--	--	--
May-22	17.9	2,170	81.5	2,250	4,210	4,290	418
Jun-22	16.4	2,480	--	--	--	--	--
Jul-22	16.0	2,670	--	--	--	--	--
Aug-22	16.1	2,740	6.71	2,750	3,110	3,120	426

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Sep-22	16.3	2,280	--	--	--	--	--
Oct-22	15.2	2,440	--	--	--	--	--
Nov-22	16.7	2,790	66.4	2,850	3,930	3,990	469
Dec-22	19.5	2,420	--	--	--	--	--
Jan-23	29.5	2,270	--	--	--	--	--
Feb-23	21.8	2,540	46.3	2,580	3,500	3,540	426
Mar-23	28.2	2,760	--	--	--	--	--
Apr-23	21.9	2,490	--	--	--	--	--
May-23	20.0	2,640	7.64	2,650	3,820	3,830	442
Jun-23	18.5	2,390	--	--	--	--	--
Jul-23	17.6	2,500	--	--	--	--	--
Aug-23	17.7	2,610	7.38	2,620	3,820	3,830	433
Sep-23	17.4	2,550	--	--	--	--	--
Oct-23	17.5	2,650	--	--	--	--	--
Nov-23	17.6	2,640	1.02	2,640	3,740	3,740	431
Dec-23	18.4	2,630	--	--	--	--	--
Jan-24	21.4	2,370	--	--	--	--	--
Feb-24	26.4	2,570	27.0	2,600	2,160	2,190	426
Mar-24	23.2	3,320	--	--	--	--	--
Apr-24	22.1	2,710	--	--	--	--	--
May-24	21.0	2,520	6.01	2,520	3,440	3,440	430
Jun-24	19.5	2,740	--	--	--	--	--
Jul-24	18.8	2,600	--	--	--	--	--
Aug-24	18.8	2,580	3.68	2,580	3,540	3,540	383
Sep-24	18.7	2,390	--	--	--	--	--
Dry Season Average	17.3	2,370	13.2	2,390	3,690	3,700	397
Dry Season Trend ***	None	Up	None	Up	None	None	Up
Wet Season Average	19.0	2,420	26.4	2,520	3,590	3,610	418
Average Annual	18.3	2,400	19.8	2,460	3,640	3,660	407

* Palo Alto typically samples more than the required influent ammonia quarterly sampling. This dataset includes this additional sampling.

** The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values. The Total Nitrogen value is calculated by adding "TKN" and "Nitrate + Nitrite".

*** Refer to the Section 3.8 in the main body for a description on the statistical analysis. Insufficient samples to perform statistical trending on nutrient loads (except for ammonia).

Discharge

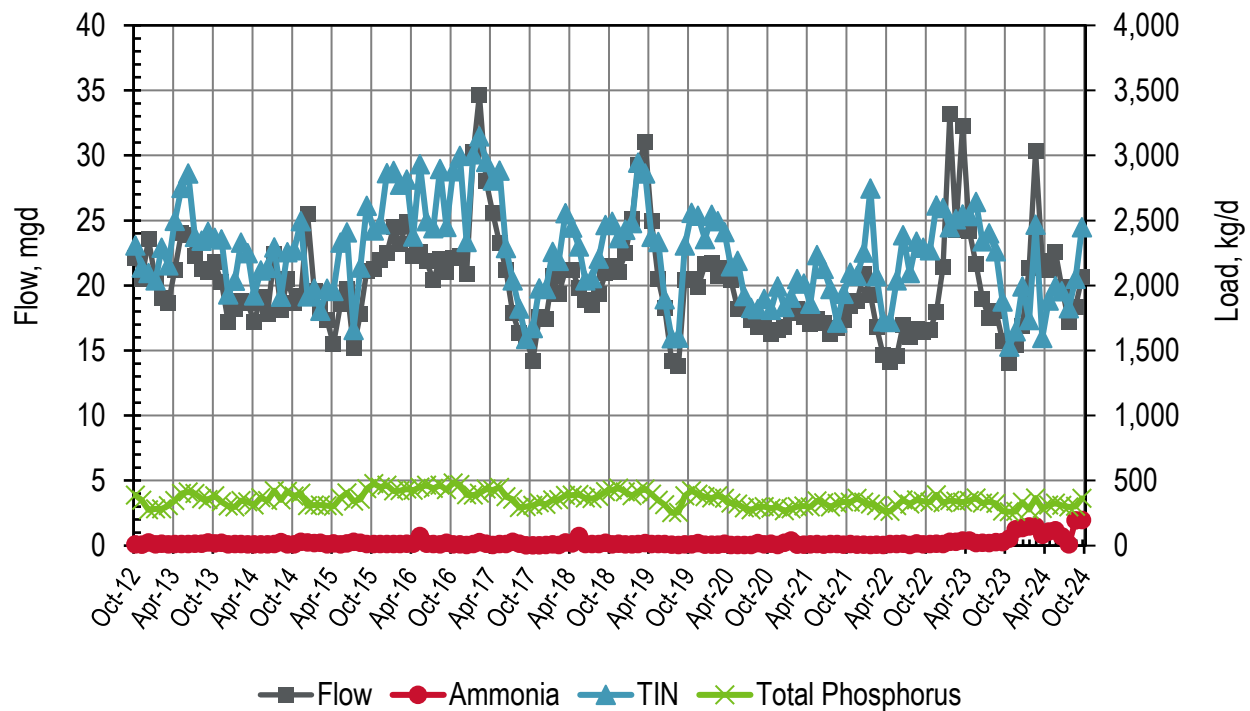


Figure 16-3. Discharge: Palo Alto Monthly Flows and Loads

Table 16-2. Discharge: Palo Alto Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	22.1	8.36	2,300	2,310	389
Nov-12	20.5	7.75	2,130	2,140	349
Dec-12	23.6	23.9	2,070	2,100	275
Jan-13	20.4	9.88	2,030	2,040	283
Feb-13	19.1	15.3	2,280	2,290	282
Mar-13	18.6	9.16	2,150	2,160	306
Apr-13	21.2	10.4	2,490	2,500	345
May-13	24.1	11.8	2,740	2,750	401
Jun-13	23.9	11.8	2,850	2,860	411
Jul-13	22.3	14.3	2,360	2,370	400
Aug-13	21.2	14.9	2,330	2,340	362
Sep-13	21.1	22.8	2,390	2,410	355
Oct-13	21.8	17.7	2,350	2,370	383
Nov-13	20.2	21.0	2,330	2,350	336

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-13	17.2	10.0	1,920	1,930	304
Jan-14	18.1	10.4	2,030	2,040	298
Feb-14	18.8	11.4	2,320	2,330	347
Mar-14	18.7	9.42	2,240	2,250	337
Apr-14	17.2	8.45	1,920	1,920	311
May-14	19.1	9.40	2,110	2,120	370
Jun-14	17.8	8.78	2,130	2,140	345
Jul-14	22.4	11.0	2,280	2,290	423
Aug-14	18.1	26.2	1,890	1,910	351
Sep-14	20.5	10.1	2,250	2,260	417
Oct-14	18.7	8.94	2,260	2,270	380
Nov-14	19.2	27.7	2,470	2,490	403
Dec-14	25.5	23.8	1,890	1,910	307
Jan-15	19.6	19.3	1,960	1,980	312
Feb-15	18.2	20.4	1,790	1,810	311
Mar-15	17.3	8.52	1,970	1,970	306
Apr-15	15.5	17.5	1,940	1,960	301
May-15	18.6	9.47	2,320	2,330	367
Jun-15	19.8	15.6	2,390	2,410	404
Jul-15	15.2	29.6	1,630	1,660	341
Aug-15	17.8	21.6	2,120	2,140	355
Sep-15	21.1	10.4	2,600	2,610	438
Oct-15	21.3	10.5	2,410	2,420	477
Nov-15	22.0	10.8	2,460	2,470	449
Dec-15	22.5	11.1	2,850	2,860	465
Jan-16	24.5	12.1	2,870	2,880	419
Feb-16	23.2	11.4	2,760	2,770	423
Mar-16	24.9	12.9	2,800	2,810	434
Apr-16	22.3	13.9	2,360	2,380	425
May-16	22.6	73.4	2,860	2,930	450
Jun-16	21.8	13.6	2,480	2,490	465
Jul-16	20.4	12.1	2,430	2,440	441
Aug-16	22.0	8.89	2,890	2,890	465
Sep-16	21.0	21.1	2,430	2,450	429
Oct-16	22.1	9.67	2,870	2,880	482
Nov-16	22.2	8.12	2,990	3,000	470
Dec-16	20.9	3.86	2,330	2,330	390

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Jan-17	30.2	11.5	3,000	3,010	388
Feb-17	34.7	27.0	3,120	3,150	402
Mar-17	28.0	13.6	2,930	2,950	435
Apr-17	25.6	4.20	2,800	2,810	427
May-17	23.2	11.0	2,870	2,880	447
Jun-17	21.2	10.6	2,280	2,290	376
Jul-17	17.9	27.7	2,010	2,040	356
Aug-17	16.3	14.9	1,810	1,820	292
Sep-17	15.9	2.14	1,590	1,590	300
Oct-17	14.2	2.02	1,670	1,670	309
Nov-17	17.5	2.13	1,980	1,980	329
Dec-17	17.4	4.22	1,970	1,970	316
Jan-18	20.8	8.38	2,250	2,260	352
Feb-18	19.3	3.91	2,190	2,190	353
Mar-18	21.2	22.8	2,530	2,560	384
Apr-18	21.2	15.6	2,430	2,440	387
May-18	19.8	72.7	2,230	2,300	393
Jun-18	18.9	12.4	2,030	2,040	366
Jul-18	18.5	12.4	2,040	2,060	360
Aug-18	19.3	12.1	2,200	2,210	379
Sep-18	20.9	21.0	2,440	2,460	414
Oct-18	21.5	10.3	2,480	2,490	427
Nov-18	21.0	14.0	2,350	2,360	443
Dec-18	22.4	10.1	2,420	2,430	414
Jan-19	25.1	10.2	2,470	2,480	384
Feb-19	29.2	10.4	2,930	2,940	416
Mar-19	31.0	19.7	2,840	2,860	435
Apr-19	24.9	10.8	2,360	2,370	395
May-19	20.5	11.6	2,320	2,330	349
Jun-19	18.3	11.4	1,880	1,890	313
Jul-19	14.2	5.75	1,590	1,590	252
Aug-19	13.8	4.40	1,590	1,600	256
Sep-19	20.4	8.35	2,300	2,310	384
Oct-20	20.5	9.73	2,550	2,560	424
Nov-19	19.8	17.8	2,520	2,540	396
Dec-19	21.6	6.03	2,350	2,360	375
Jan-20	21.7	5.88	2,540	2,540	367

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Feb-20	20.7	5.76	2,490	2,490	382
Mar-20	21.4	14.7	2,400	2,410	363
Apr-20	20.4	5.37	2,140	2,150	327
May-20	18.2	4.78	2,180	2,190	318
Jun-20	18.4	4.80	1,910	1,920	290
Jul-20	17.3	4.41	1,820	1,830	274
Aug-20	16.8	19.6	1,800	1,820	297
Sep-20	16.8	7.98	1,890	1,900	301
Oct-20	16.2	13.0	1,800	1,810	288
Nov-20	16.6	4.35	1,990	1,990	298
Dec-20	16.8	22.3	1,810	1,830	267
Jan-21	17.9	39.3	1,870	1,910	281
Feb-21	18.2	6.06	2,040	2,050	299
Mar-21	17.5	6.36	2,010	2,010	304
Apr-21	17.0	8.77	1,850	1,860	296
May-21	17.4	11.7	2,220	2,230	345
Jun-21	17.1	6.75	2,120	2,130	329
Jul-21	16.3	10.7	1,960	1,970	298
Aug-21	16.8	11.3	1,700	1,710	324
Sep-21	17.4	6.50	1,930	1,940	337
Oct-21	18.4	12.0	2,080	2,100	334
Nov-21	18.8	6.27	2,070	2,070	364
Dec-21	20.9	5.55	2,250	2,250	334
Jan-22	19.3	5.04	2,740	2,740	319
Feb-22	16.8	6.44	2,060	2,070	306
Mar-22	14.7	3.77	1,720	1,730	271
Apr-22	14.1	12.4	1,710	1,720	263
May-22	14.6	11.8	2,030	2,040	306
Jun-22	16.9	15.1	2,370	2,380	352
Jul-22	16.0	4.97	2,090	2,090	319
Aug-22	16.6	17.2	2,320	2,340	351
Sep-22	16.4	8.69	2,280	2,290	342
Oct-22	16.6	11.3	2,260	2,270	335
Nov-22	17.9	13.8	2,600	2,620	390
Dec-22	21.4	10.6	2,580	2,590	329
Jan-23	33.2	28.7	2,420	2,450	345
Feb-23	24.3	28.0	2,480	2,510	341

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Mar-23	32.3	37.9	2,510	2,550	335
Apr-23	24.2	37.8	2,500	2,530	346
May-23	21.7	19.0	2,620	2,640	367
Jun-23	19.0	22.0	2,320	2,340	326
Jul-23	17.5	19.3	2,380	2,400	339
Aug-23	18.0	27.0	2,240	2,260	325
Sep-23	15.8	26.9	1,850	1,880	266
Oct-23	14.0	52.9	1,480	1,530	261
Nov-23	15.4	125	1,470	1,650	263
Dec-23	16.9	134	1,860	1,990	335
Jan-24	21.3	146	1,590	1,730	278
Feb-24	30.3	147	2,350	2,470	365
Mar-24	21.9	84.1	1,510	1,600	286
Apr-24	21.2	109	1,780	1,880	311
May-24	22.6	116	1,880	1,990	327
Jun-24	19.9	71.4	1,880	1,960	309
Jul-24	17.2	10.2	1,810	1,820	298
Aug-24	18.4	193	1,860	2,050	302
Sep-24	20.6	195	2,160	2,450	364
Dry Season Average	18.9	24.0	2,170	2,200	354
Dry Season Trend **	Down	--***	Down	Down	Down
Wet Season Average	21.0	21.3	2,270	2,290	353
Average Annual	20.1	22.4	2,230	2,250	354

* The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

*** Ammonia not considered in the dry season trending as the plant has ammonia discharge limits and it reliably nitrifies.

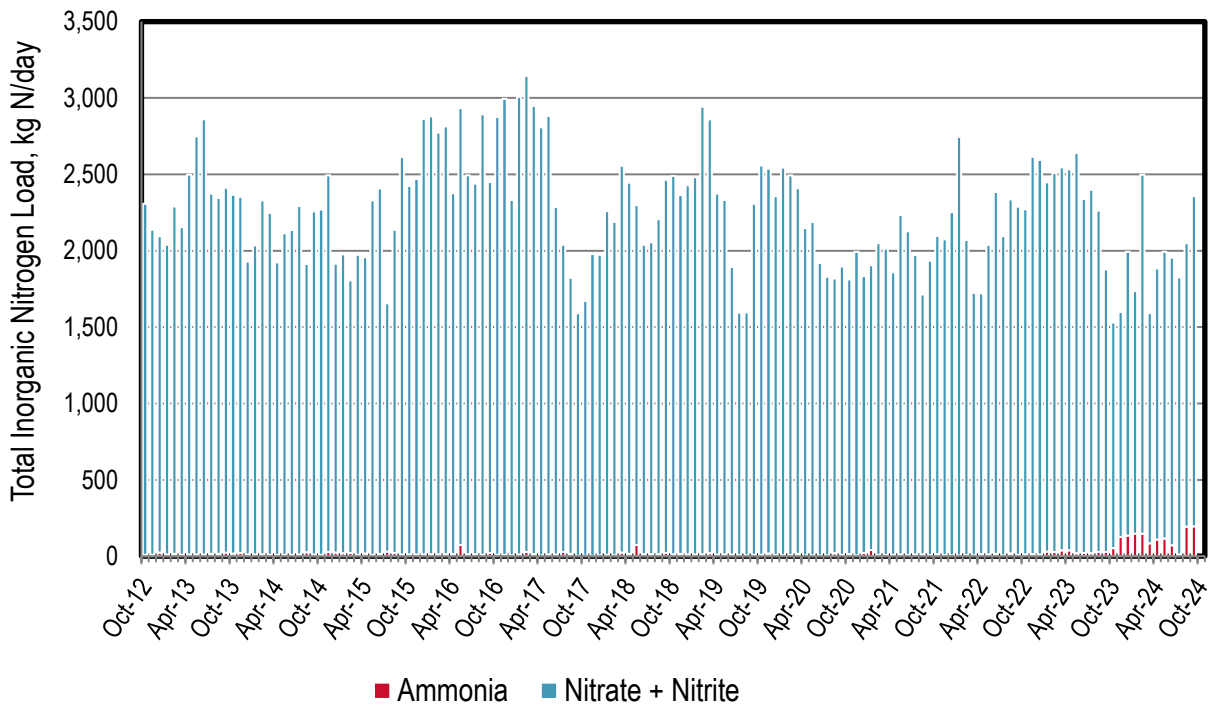


Figure 16-4. Discharge: Palo Alto Monthly Nitrogen Loads

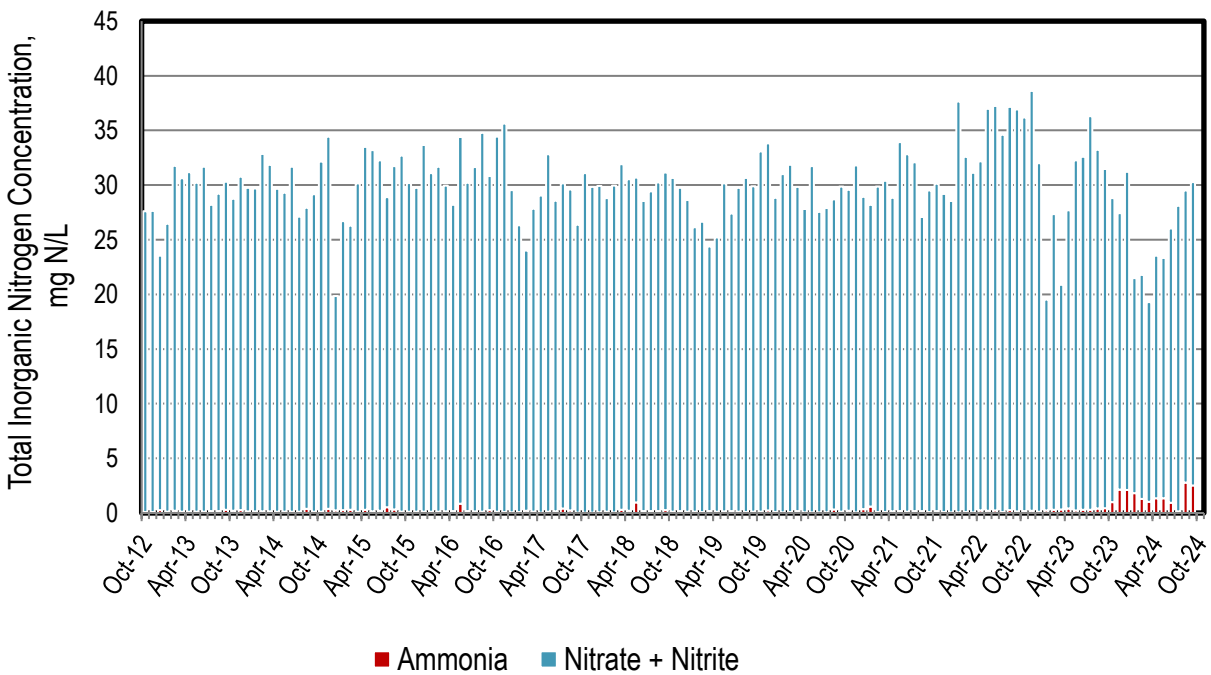


Figure 16-5. Discharge: Palo Alto Monthly Nitrogen Concentrations

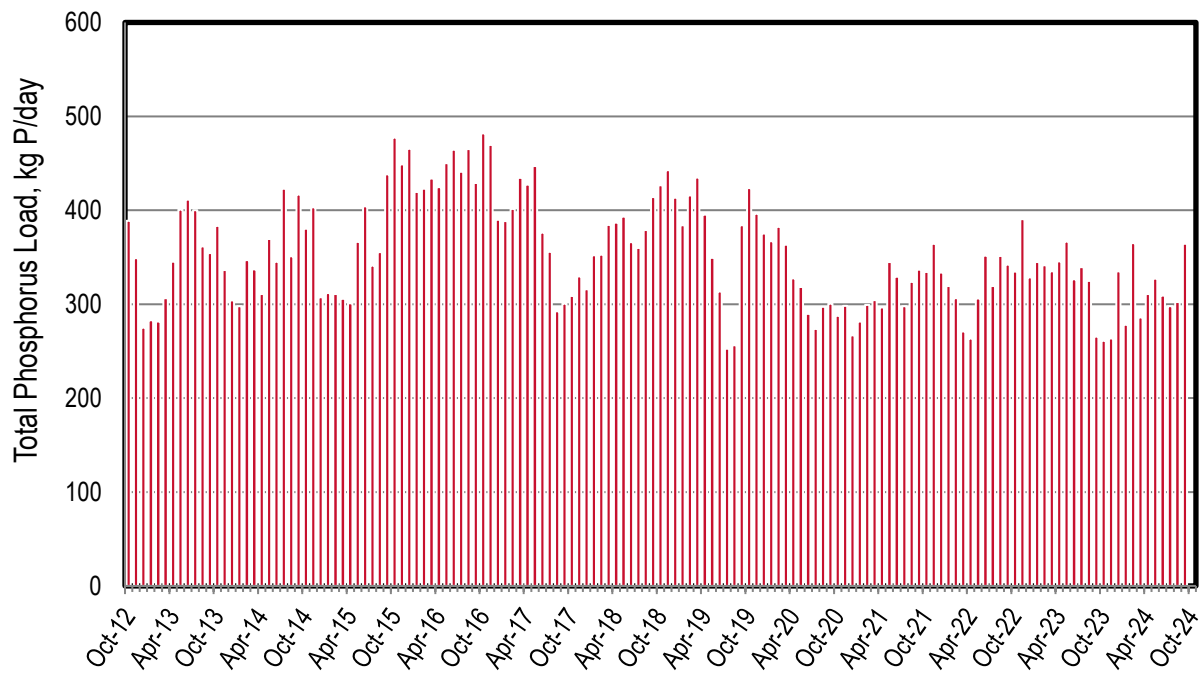


Figure 16-6. Discharge: Palo Alto Monthly Phosphorus Loads

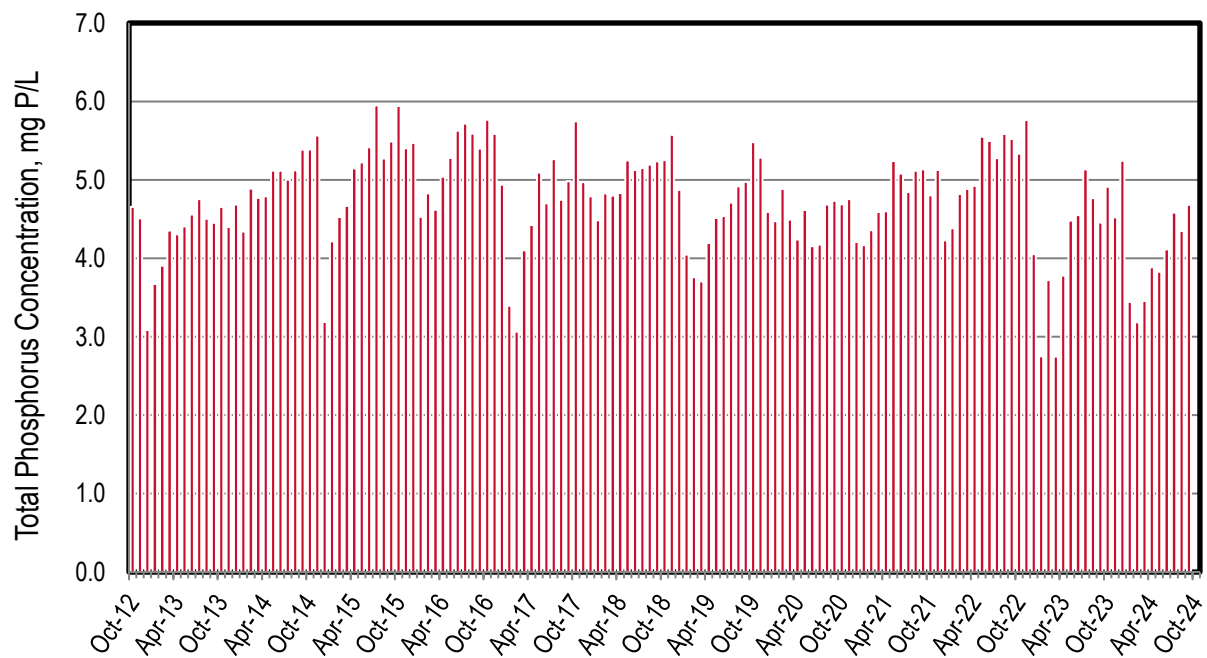


Figure 16-7. Discharge: Palo Alto Monthly Phosphorus Concentrations

Recycled Water

Table 16-3. Recycled Water: Palo Alto Yearly Recycled Water Flows Diverted from the Bay

Year**	Flow Diverted*, Acre-Feet (mgd)							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	332 (0.30)	307 (0.27)	0 (0)	0 (0)	0 (0)	0 (0)	62 (0.06)	701 (0.63)
2020	356 (0.32)	300 (0.27)	0 (0)	0 (0)	0 (0)	0 (0)	76 (0.07)	732 (0.66)
2021	313 (0.28)	369 (0.33)	0 (0)	0 (0)	0 (0)	0 (0)	13 (0.01)	695 (0.62)
2022	434 (0.39)	320 (0.29)	0 (0)	0 (0)	0 (0)	0 (0)	75 (0.07)	829 (0.75)
2023	351 (0.31)	277 (0.25)	0 (0)	0 (0)	0 (0)	0 (0)	64 (0.06)	692 (0.62)
Average	357 (0.32)	315 (0.28)	0 (0)	0 (0)	0 (0)	0 (0)	58 (0.05)	730 (0.66)

* Assumes 100% of the recycled flow is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 16-4. Recycled Water: Palo Alto Yearly Recycled Water Ammonia Load Diverted from the Bay

Year**	Average Ammonia Load Diverted*, kg N/d							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	<1	<1	0	0	0	0	<1	<1
2020	<1	<1	0	0	0	0	<1	<1
2021	<1	<1	0	0	0	0	<1	<1
2022	<1	<1	0	0	0	0	<1	<1
2023	<1	<1	0	0	0	0	<1	1
Average	<1	<1	0	0	0	0	<1	<1

* Assumes 100% of the recycled load is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 16-5. Recycled Water: Palo Alto Yearly Recycled Water Total Inorganic Nitrogen Load Diverted from the Bay

Year**	Average Total Inorganic Nitrogen Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	32	30	0	0	0	0	6	68
2020	36	30	0	0	0	0	8	74
2021	32	38	0	0	0	0	1	71
2022	51	38	0	0	0	0	9	98
2023	33	26	0	0	0	0	6	65
Average	37	32	0	0	0	0	6	75

* Assumes 100% of the recycled load is diverted for all recycled water applications

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 16-6. Recycled Water: Palo Alto Yearly Recycled Water Total P Load Diverted from the Bay

Year**	Average Total P Load Diverted*, kg P/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	5	5	0	0	0	0	1	11
2020	5	5	0	0	0	0	1	11
2021	5	6	0	0	0	0	<1	11
2022	7	5	0	0	0	0	1	14
2023	5	4	0	0	0	0	1	9
Average	5	5	0	0	0	0	1	11

* Assumes 100% of the recycled load is diverted for all recycled water applications

** **Calendar year as opposed to California's water year (October 1 through September 30)**

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17 Sanitary District No. 5 of Marin County - Paradise Cove Treatment Plant

The Paradise Cove Treatment Plant discharges to the Central Bay. The service area has approximately 65 service connections. The plant has a permitted ADWF capacity of 0.040 mgd and it has current dry season flows of approximately 0.011 mgd. The plant performs secondary treatment using an activated sludge treatment process.

The plant is classified as a minor discharger (<1 mgd permitted capacity) and thus not required to sample as frequently as the major dischargers (>1 mgd permitted capacity). The minor dischargers are required to sample twice per year under the Nutrient Watershed Permit. As a result, there are several months of nutrient data gaps.

The following observations are made based upon the figures and table in the subsequent pages:

◆ Discharge

- ▲ Flow values are provided over the entire study period. The remaining nutrient species only have monthly sampling for the first year of sampling, followed by occasional sampling thereafter.
- ▲ The plant occasionally nitrifies as evidenced by ammonia values of less than 0.2 mg N/L.
- ▲ During months of nitrification, NO_x is the majority of the nitrogen species discharged. During months of no nitrification, ammonia is the majority of discharged nitrogen species.
- ▲ Total phosphorus concentrations are wide ranging from approximately 2.2 to 16 mg P/L. Typical effluent TP concentrations range from 4 to 6 mg P/L.
- ▲ Based on Table 17-1 statistics for the entire dry season dataset, flow and ammonia do not appear to have any emerging trends.

◆ Recycled Water: No recycled water was produced or distributed this past year.

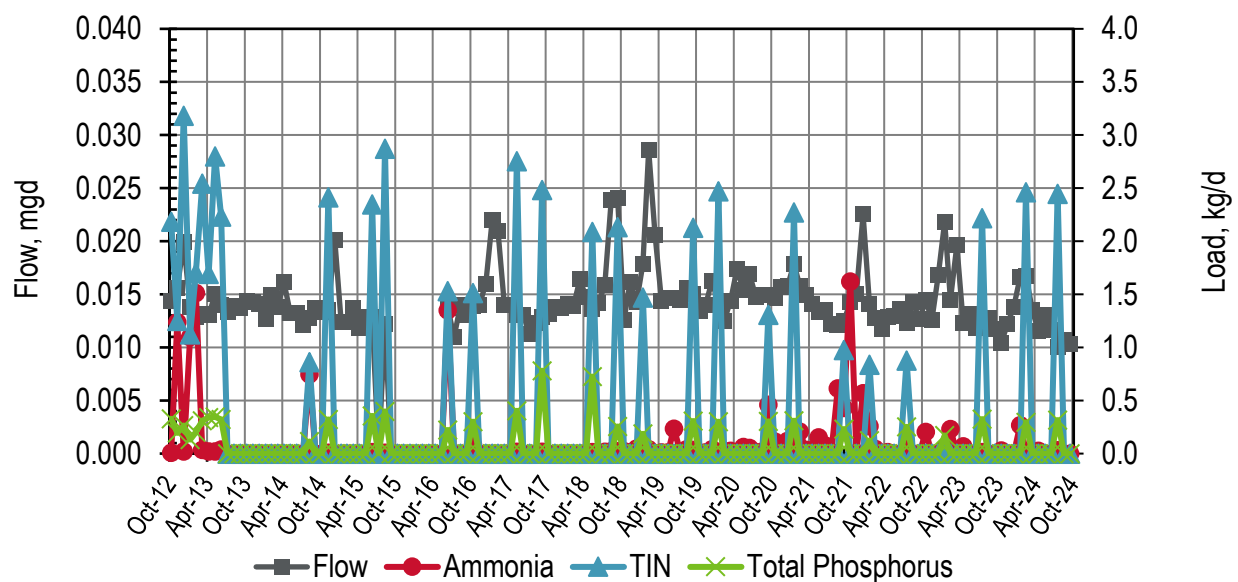


Figure 17-1. Discharge: Paradise Cove Monthly Flows and Loads

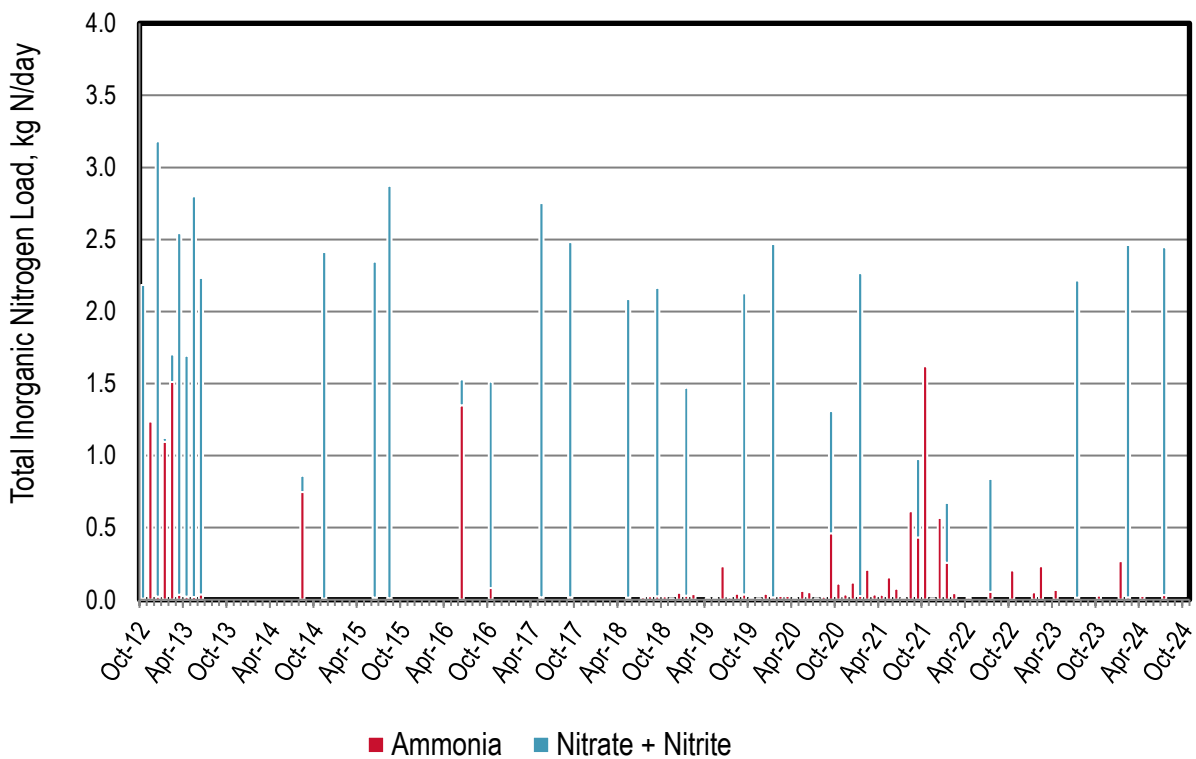


Figure 17-2. Discharge: Paradise Cove Monthly Nitrogen Loads

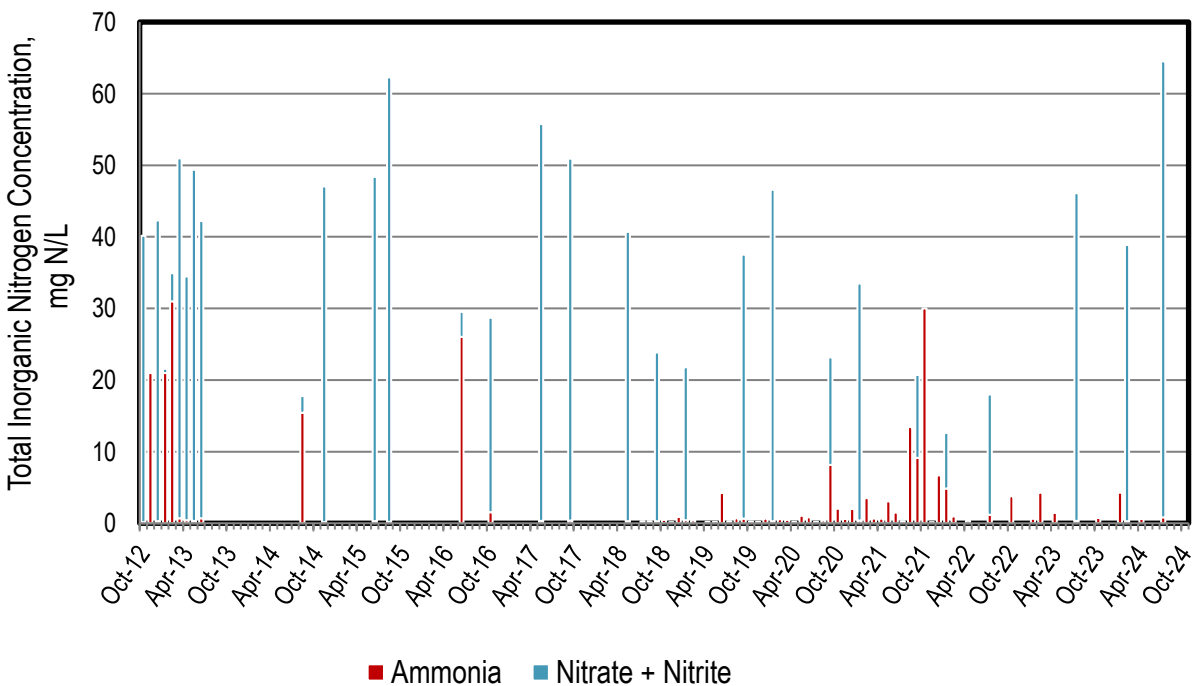


Figure 17-3. Discharge: Paradise Cove Monthly Nitrogen Concentrations

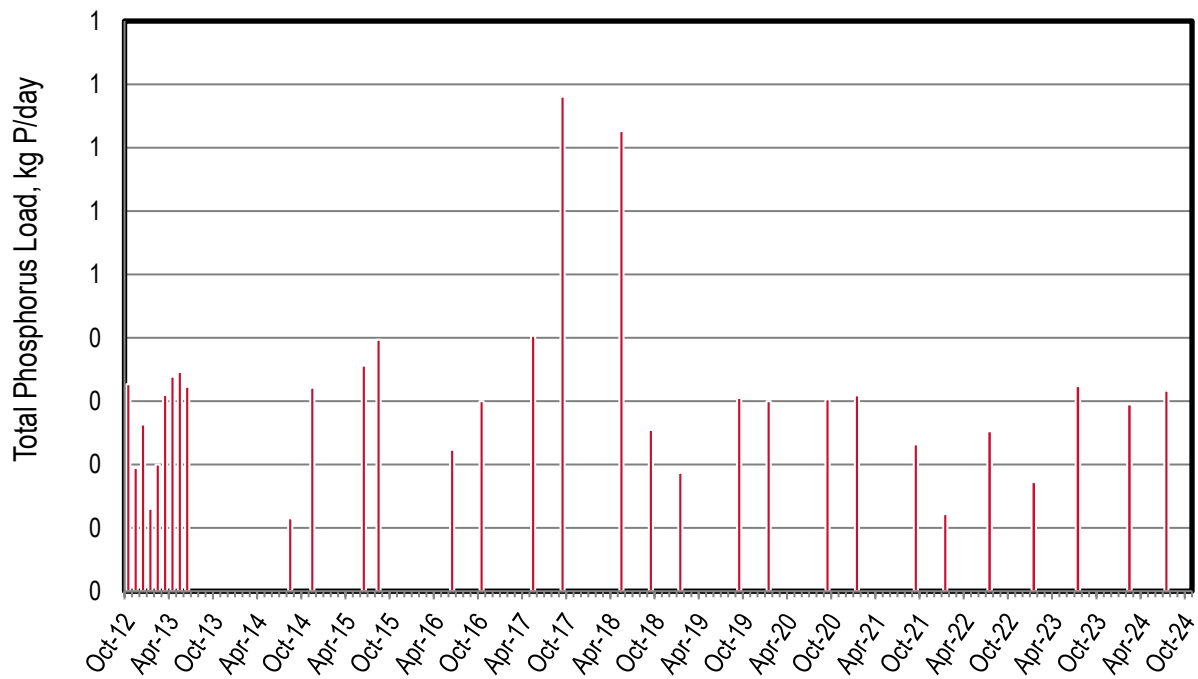


Figure 17-4. Discharge: Paradise Cove Monthly Phosphorus Loads

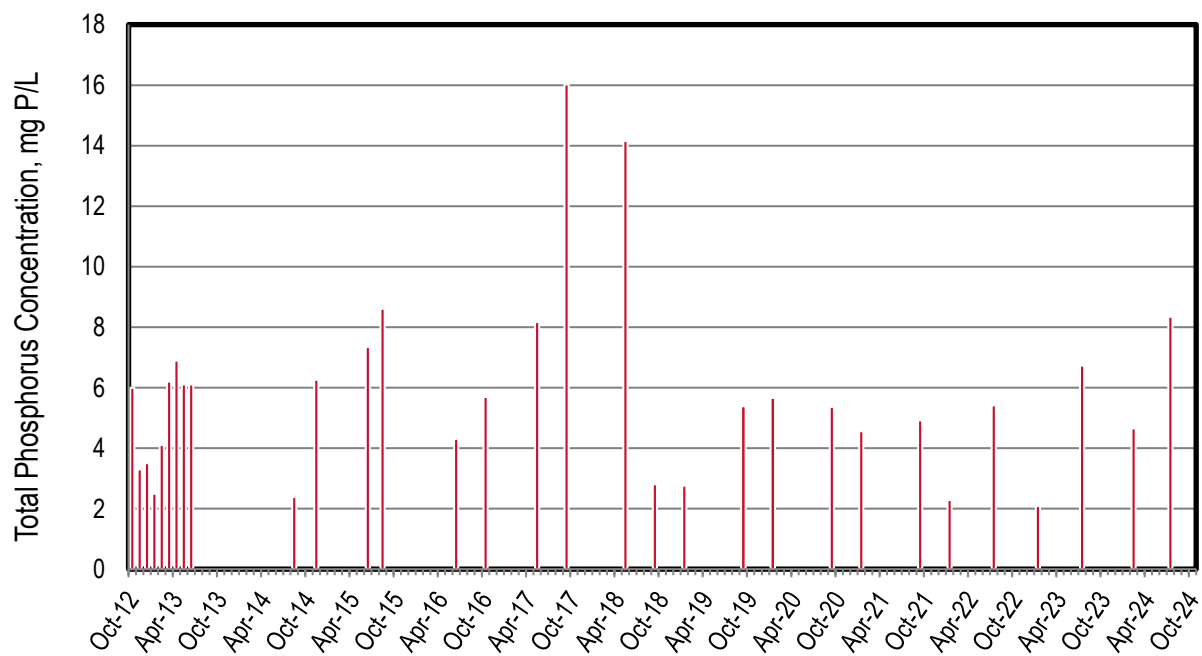


Figure 17-5. Discharge: Paradise Cove Monthly Phosphorus Concentrations

Table 17-1. Discharge: Paradise Cove Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	0.0144	0.00708	2.18	2.19	0.327
Nov-12	0.0156	1.24	0.0113	1.25	0.195
Dec-12	0.0199	0.0218	3.16	3.18	0.263
Jan-13	0.0138	1.10	0.0282	1.12	0.130
Feb-13	0.0129	1.51	0.191	1.70	0.200
Mar-13	0.0132	0.0349	2.51	2.54	0.309
Apr-13	0.0130	0.0216	1.67	1.69	0.339
May-13	0.0150	0.0198	2.78	2.80	0.346
Jun-13	0.0140	0.0370	2.20	2.23	0.323
Jul-13	0.0133	--	--	--	--
Aug-13	0.0139	--	--	--	--
Sep-13	0.0137	--	--	--	--
Oct-13	0.0144	--	--	--	--
Nov-13	0.0143	--	--	--	--
Dec-13	0.0141	--	--	--	--
Jan-14	0.0127	--	--	--	--
Feb-14	0.0149	--	--	--	--
Mar-14	0.0138	--	--	--	--
Apr-14	0.0162	--	--	--	--
May-14	0.0132	--	--	--	--
Jun-14	0.0132	--	--	--	--
Jul-14	0.0121	--	--	--	--
Aug-14	0.0128	0.748	0.112	0.860	0.115
Sep-14	0.0137	--	--	--	--
Oct-14	0.0133	--	--	--	--
Nov-14	0.0136	0.00689	2.41	2.41	0.321
Dec-14	0.0202	--	--	--	--
Jan-15	0.0124	--	--	--	--
Feb-15	0.0124	--	--	--	--
Mar-15	0.0137	--	--	--	--
Apr-15	0.0118	--	--	--	--
May-15	0.0128	--	--	--	--
Jun-15	0.0128	0.0146	2.33	2.35	0.356
Jul-15	--	--	--	--	--
Aug-15	0.0122	0.00924	2.86	2.87	0.397
Sep-15	--	--	--	--	--

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-15	--	--	--	--	--
Nov-15	--	--	--	--	--
Dec-15	--	--	--	--	--
Jan-16	--	--	--	--	--
Feb-16	--	--	--	--	--
Mar-16	--	--	--	--	--
Apr-16	--	--	--	--	--
May-16	--	--	--	--	--
Jun-16	0.0137	1.35	0.180	1.53	0.223
Jul-16	0.0110	--	--	--	--
Aug-16	0.0140	--	--	--	--
Sep-16	0.0130	--	--	--	--
Oct-16	0.0139	0.0818	1.43	1.51	0.300
Nov-16	0.0140	--	--	--	--
Dec-16	0.0160	--	--	--	--
Jan-17	0.0220	--	--	--	--
Feb-17	0.0210	--	--	--	--
Mar-17	0.0140	--	--	--	--
Apr-17	0.0140	--	--	--	--
May-17	0.0131	0.0165	2.74	2.75	0.403
Jun-17	0.0130	--	--	--	--
Jul-17	0.0113	--	--	--	--
Aug-17	0.0123	--	--	--	--
Sep-17	0.0129	0.0174	2.46	2.48	0.781
Oct-17	0.0131	--	--	--	--
Nov-17	0.0138	--	--	--	--
Dec-17	0.0137	--	--	--	--
Jan-18	0.0141	--	--	--	--
Feb-18	0.0139	--	--	--	--
Mar-18	0.0164	--	--	--	--
Apr-18	0.0147	--	--	--	--
May-18	0.0136	0.0149	2.07	2.09	0.726
Jun-18	0.0142	--	--	--	--
Jul-18	0.0159	0.0159	--	--	--
Aug-18	0.0239	0.0239	--	--	--
Sep-18	0.0240	0.0240	2.14	2.13	0.255
Oct-18	0.0126	0.0229	--	--	--

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-18	0.0162	0.0102	--	--	--
Dec-18	0.0142	0.0469	--	--	--
Jan-19	0.0179	0.0277	1.44	1.47	0.187
Feb-19	0.0286	0.0401	--	--	--
Mar-19	0.0206	--	--	--	--
Apr-19	0.0144	0.0114	--	--	--
May-19	0.0147	0.0113	--	--	--
Jun-19	0.0147	0.233	--	--	--
Jul-19	0.0144	0.0158	--	--	--
Aug-19	0.0156	0.0413	--	--	--
Sep-19	0.0150	0.0368	2.09	2.13	0.305
Oct-19	0.0135	0.0120	--	--	--
Nov-19	0.0140	0.0101	--	--	--
Dec-19	0.0163	0.0407	--	--	--
Jan-20	0.0140	0.0158	2.45	2.47	0.300
Feb-20	0.0125	0.0256	--	--	--
Mar-20	0.0144	0.0254	--	--	--
Apr-20	0.0174	0.0130	--	--	--
May-20	0.0154	0.0616	--	--	--
Jun-20	0.0169	0.0531	--	--	--
Jul-20	0.0147	0.0106	--	--	--
Aug-20	0.0149	0.0204	--	--	--
Sep-20	0.0151	0.460	0.848	1.31	0.303
Oct-20	0.0147	0.113	--	--	--
Nov-20	0.0157	0.0366	--	--	--
Dec-20	0.0157	0.119	--	--	--
Jan-21	0.0179	0.0263	2.24	2.27	0.309
Feb-21	0.0158	0.209	--	--	--
Mar-21	0.0149	0.0363	--	--	--
Apr-21	0.0141	0.0336	--	--	--
May-21	0.0133	0.154	--	--	--
Jun-21	0.0135	0.0763	--	--	--
Jul-21	0.0122	0.0132	--	--	--
Aug-21	0.0121	0.613	--	--	--
Sep-21	0.0125	0.431	0.545	0.977	0.232
Oct-21	0.0143	1.62	--	--	--
Nov-21	0.0150	0.00954	--	--	--

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-21	0.0225	0.568	--	--	--
Jan-22	0.0141	0.258	0.415	0.836	0.122
Feb-22	0.0128	0.0454	--	--	--
Mar-22	0.0118	--	--	--	--
Apr-22	0.0128	0.0151	--	--	--
May-22	0.0130	--	--	--	--
Jun-22	0.0136	--	--	--	--
Jul-22	0.0123	0.0541	0.783	0.877	0.252
Aug-22	0.0143	--	--	--	--
Sep-22	0.0127	--	--	--	--
Oct-22	0.0144	0.204	--	--	--
Nov-22	0.0126	--	--	--	--
Dec-22	0.0168	--	--	--	--
Jan-23	0.0218	0.0516	0.0143	0.0660	0.172
Feb-23	0.0145	0.233	--	--	--
Mar-23	0.0196	--	--	--	--
Apr-23	0.0123	0.0673	--	--	--
May-23	0.0131	--	--	--	--
Jun-23	0.0119	--	--	--	--
Jul-23	0.0127	0.0155	2.20	2.22	0.324
Aug-23	0.0128	--	--	--	--
Sep-23	0.0118	--	--	--	--
Oct-23	0.0104	0.0284			
Nov-23	0.0122				
Dec-23	0.0138				
Jan-24	0.0167	0.268			
Feb-24	0.0168	0.0173	2.45	2.46	0.295
Mar-24	0.0135				
Apr-24	0.0115	0.0254			
May-24	0.0131				
Jun-24	0.0117				
Jul-24	0.0100	0.0316	2.41	2.45	0.316
Aug-24	0.0107				
Sep-24	0.0103				

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dry Season Average	0.0136	0.144	1.92	2.14	0.377
Dry Season Trend **	None	None	***	***	***
Wet Season Average	0.0151	0.193	1.51	1.81	0.251
Average Annual	0.0145	0.177	1.66	1.91	0.304

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

*** No statistical dry season trending analysis was performed on nutrient species (except ammonia) due to the limited number of samples required for minor dischargers.

Recycled Water

No recycled water was produced or distributed this past year.

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18 City of Petaluma

Petaluma discharges to Petaluma River that is connected to San Pablo Bay. The plant has approximately 25,300 service connections and it has a permitted capacity of 6.7 mgd ADWF. The plant performs nitrogen and phosphorus removal using oxidation ditches coupled with treatment wetlands and oxidation ponds. The oxidation ponds also serve as equalization during peak wet weather flow. Effluent flow that is not discharged to the Petaluma River is diverted to recycled water whenever possible. Discharge to Petaluma River is prohibited May 1 through October 20, except when the Facility inflow exceeds the recycled water distribution and storage system capacity.

The following observations are made based upon the figures and table in the subsequent pages:

◆ Discharge:

- ▲ Nutrient loads typically increase with flow during wet weather events.
- ▲ NOx and organic nitrogen are the majority of the nitrogen species discharged as would be expected since this plant nitrifies. The plant also reduces their overall TIN and NOx loads due to enhanced denitrification.
- ▲ The plant meets Level 3 TIN concentration limits (i.e., 6 mg N/L) developed under the Bay Area Clean Water Agencies Scoping and Evaluation Plan for the whole dataset.
- ▲ Total phosphorus concentrations range from 0.5 to 3.8 mg P/L, which suggests P removal. Removal is attributed to biological P removal in the oxidation ditch.

◆ Recycled Water:

- ▲ Based on Table 1-2, the plant averaged 1.4 mgd of recycled water over the 2023 calendar year. Recycled water uses included golf course irrigation, landscape irrigation, agricultural irrigation, and other non-potable uses within the plant such as process water.
- ▲ Based on Table 1-3. Recycled Water: American Canyon Yearly Recycled Water Ammonia Load Diverted from the Bay through Table 1-5. Recycled Water: American Canyon Yearly Recycled Water Total Phosphorus Load Diverted from the Bay, the plant averaged the diversion of 1 kg Ammonia-N/d, 7 kg TIN-N/d, and 11 kg P/d away from the San Francisco Bay via recycled water in 2023.

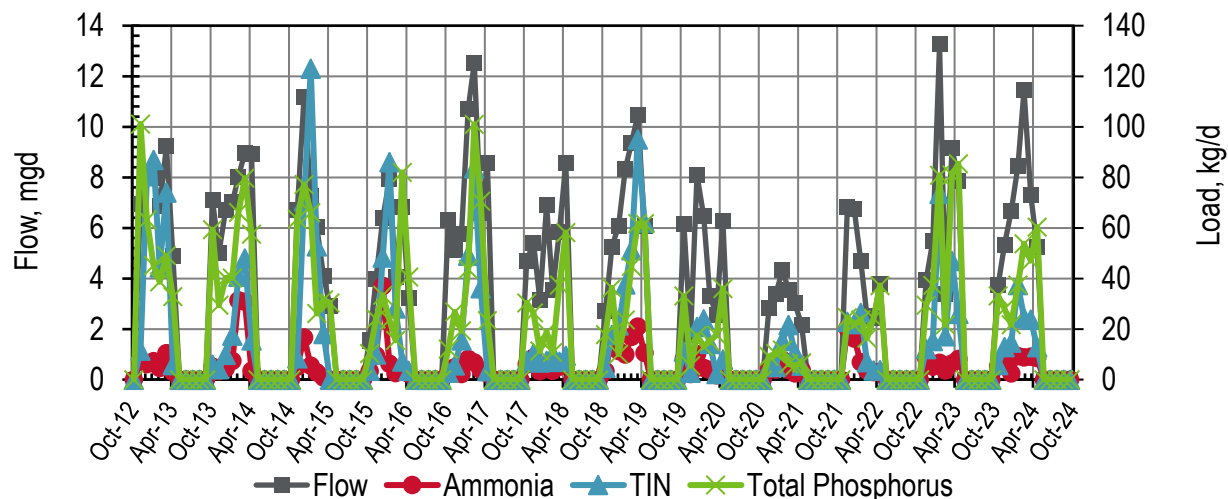


Figure 18-1. Discharge: Petaluma Monthly Flows and Loads

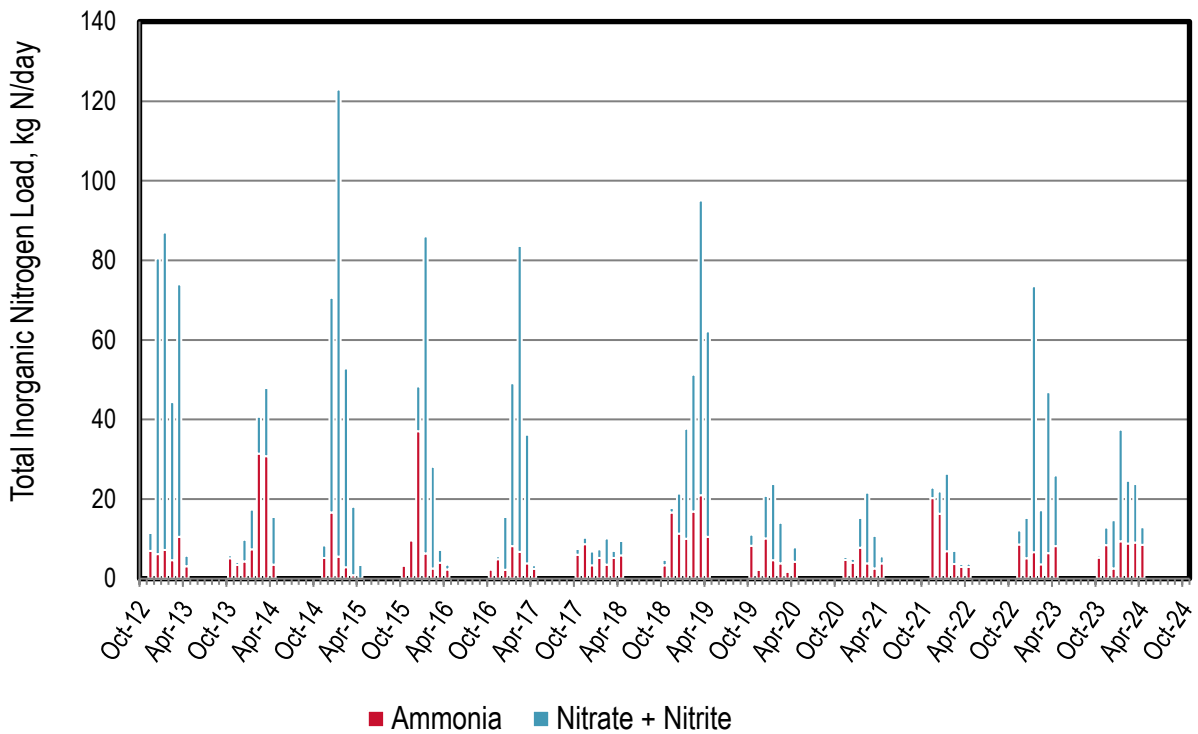


Figure 18-2. Discharge: Petaluma Monthly Nitrogen Loads

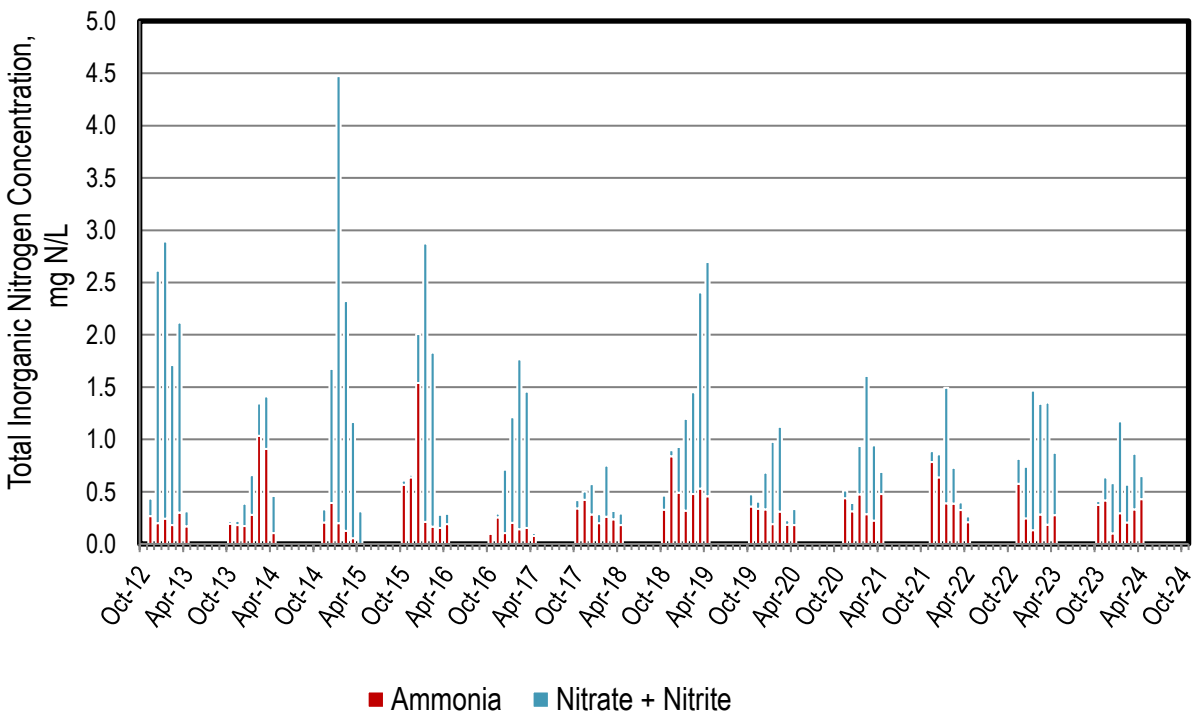


Figure 18-3. Discharge: Petaluma Monthly Nitrogen Concentrations

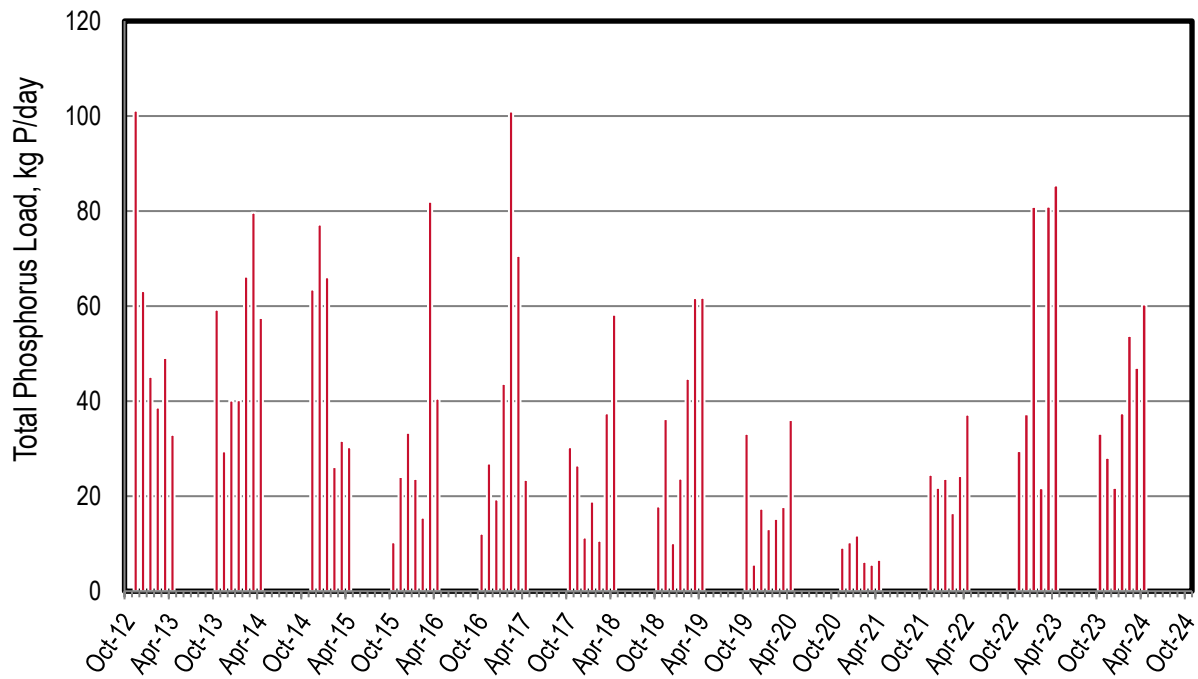


Figure 18-4. Discharge: Petaluma Monthly Phosphorus Loads

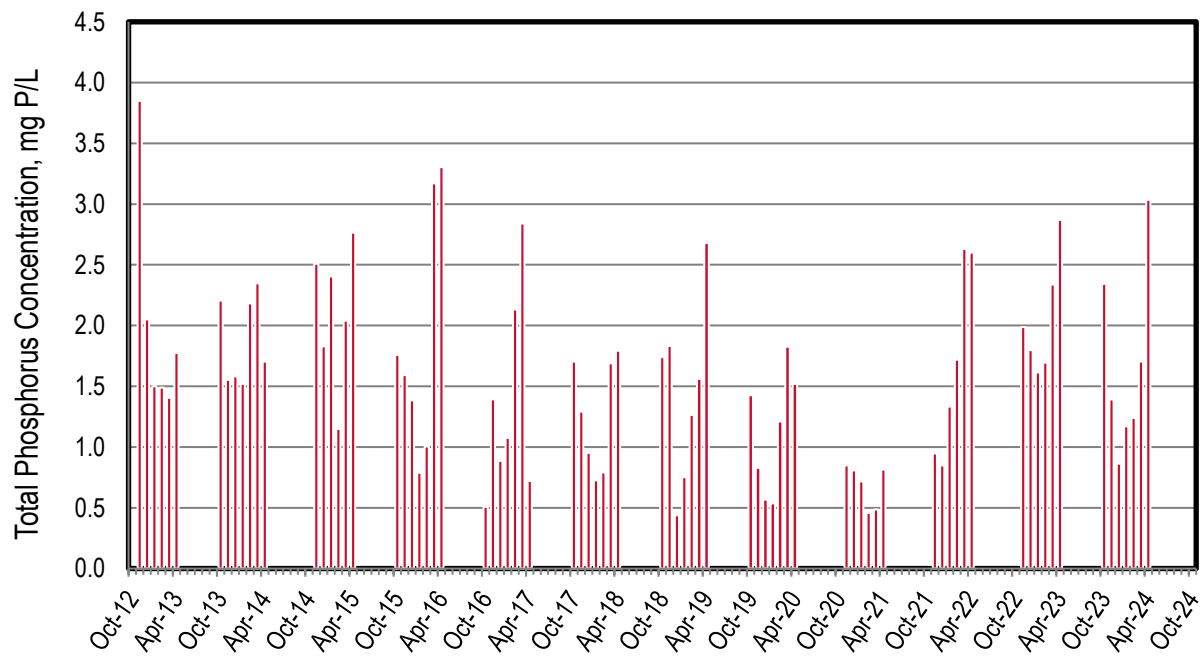


Figure 18-5. Discharge: Petaluma Monthly Phosphorus Concentrations

Table 18-1. Discharge: Petaluma Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	0	0	0	0	0
Nov-12	6.95	6.98	4.47	11.4	101
Dec-12	8.15	6.16	74.4	80.5	63.2
Jan-13	7.96	7.23	79.7	87.0	45.1
Feb-13	6.87	4.65	39.7	44.4	38.7
Mar-13	9.24	10.5	63.5	74.0	49.1
Apr-13	4.91	3.11	2.68	5.79	32.9
May-13	0	0	0	0	0
Jun-13	0	0	0	0	0
Jul-13	0	0	0	0	0
Aug-13	0	0	0	0	0
Sep-13	0	0	0	0	0
Oct-13	7.11	5.16	0.691	5.85	59.3
Nov-13	5.01	3.42	0.760	4.18	29.4
Dec-13	6.72	4.36	5.46	9.82	40.2
Jan-14	7.01	7.37	10.0	17.4	40.2
Feb-14	8.03	31.4	9.31	40.7	66.2
Mar-14	8.98	30.8	17.1	47.9	79.7
Apr-14	8.94	3.50	12.0	15.5	57.5
May-14	0	0	0	0	0
Jun-14	0	0	0	0	0
Jul-14	0	0	0	0	0
Aug-14	0	0	0	0	0
Sep-14	0	0	0	0	0
Oct-14	0	0	0	0	0
Nov-14	6.70	5.20	3.18	8.37	63.5
Dec-14	11.2	16.6	54.0	70.6	77.2
Jan-15	7.27	5.51	117	123	66.1
Feb-15	6.02	2.85	49.9	52.8	26.2
Mar-15	4.10	0.870	17.2	18.1	31.6
Apr-15	2.90		3.41		30.3
May-15	0	0	0	0	0
Jun-15	0	0	0	0	0
Jul-15	0	0	0	0	0
Aug-15	0	0	0	0	0
Sep-15	0	0	0	0	0

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-15	1.54	3.31	0.234	3.54	10.3
Nov-15	4.00	9.62	0.344	9.97	24.1
Dec-15	6.37	37.0	11.3	48.3	33.3
Jan-16	7.92	6.32	79.7	86.0	23.6
Feb-16	4.07	2.56	25.6	28.2	15.5
Mar-16	6.84	3.97	3.23	7.20	81.9
Apr-16	3.24	2.33	1.20	3.54	40.5
May-16	0	0	0	0	0
Jun-16	0	0	0	0	0
Jul-16	0	0	0	0	0
Aug-16	0	0	0	0	0
Sep-16	0	0	0	0	0
Oct-16	6.31	2.35	0.406	2.76	12.1
Nov-16	5.10	4.92	0.686	5.61	26.8
Dec-16	5.77	2.26	13.2	15.5	19.4
Jan-17	10.7	8.19	40.9	49.1	43.7
Feb-17	12.5	6.73	76.9	83.6	101
Mar-17	6.57	3.82	32.4	36.2	70.6
Apr-17	8.58	2.51	0.841	3.35	23.4
May-17	0	0	0	0	0
Jun-17	0	0	0	0	0
Jul-17	0	0	0	0	0
Aug-17	0	0	0	0	0
Sep-17	0	0	0	0	0
Oct-17	4.70	6.05	1.39	7.44	30.3
Nov-17	5.41	8.67	1.62	10.3	26.4
Dec-17	3.15	3.33	3.48	6.81	11.3
Jan-18	6.89	5.21	2.17	7.37	18.9
Feb-18	3.57	3.51	6.62	10.1	10.7
Mar-18	5.86	5.20	1.79	6.98	37.4
Apr-18	8.58	5.82	3.63	9.45	58.2
May-18	0	0	0	0	0
Jun-18	0	0	0	0	0
Jul-18	0	0	0	0	0
Aug-18	0	0	0	0	0
Sep-18	0	0	0	0	0
Oct-18	2.71	3.36	1.36	4.72	17.8

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-18	5.23	16.6	1.12	17.7	36.2
Dec-18	6.10	11.3	10.1	21.4	10.1
Jan-19	8.34	10.0	27.7	37.7	23.7
Feb-19	9.36	16.9	34.4	51.3	44.7
Mar-19	10.5	21.0	74.1	95.0	61.7
Apr-19	6.10	10.5	51.6	62.1	61.8
May-19	0	0	0	0	0
Jun-19	0	0	0	0	0
Jul-19	0	0	0	0	0
Aug-19	0	0	0	0	0
Sep-19	0	0	0	0	0
Oct-19	6.15	8.29	2.76	11.1	33.2
Nov-19	1.78	2.26	0.466	2.72	5.56
Dec-19	8.08	10.1	10.7	20.8	17.4
Jan-20	6.46	4.67	19.1	23.8	13.1
Feb-20	3.32	3.87	10.2	14.1	15.2
Mar-20	2.57	1.77	0.438	2.21	17.7
Apr-20	6.27	4.28	3.60	7.88	36.0
May-20	0	0	0	0	0
Jun-20	0	0	0	0	0
Jul-20	0	0	0	0	0
Aug-20	0	0	0	0	0
Sep-20	0	0	0	0	0
Oct-20	0	0	0	0	0
Nov-20	2.85	4.69	0.791	5.49	9.14
Dec-20	3.37	3.99	0.991	4.98	10.3
Jan-21	4.32	7.75	7.53	15.3	11.7
Feb-21	3.56	3.83	17.8	21.6	6.16
Mar-21	3.02	2.54	8.23	10.8	5.57
Apr-21	2.14	3.86	1.72	5.58	6.61
May-21	0	0	0	0	0
Jun-21	0	0	0	0	0
Jul-21	0	0	0	0	0
Aug-21	0	0	0	0	0
Sep-21	0	0	0	0	0
Oct-21	0	0	0	0	0
Nov-21	6.84	20.3	2.63	22.9	24.5

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-21	6.77	16.3	5.65	21.9	21.7
Jan-22	4.68	6.87	19.5	26.4	23.6
Feb-22	2.53	3.67	3.28	6.95	16.4
Mar-22	2.44	2.99	0.672	3.66	24.3
Apr-22	3.78	2.97	0.804	3.77	37.2
May-22	0	0	0	0	0
Jun-22	0	0	0	0	0
Jul-22	0	0	0	0	0
Aug-22	0	0	0	0	0
Sep-22	0	0	0	0	0
Oct-22	0	0	0	0	0
Nov-22	3.93	8.55	3.54	12.1	29.5
Dec-22	5.48	5.10	10.2	15.3	37.3
Jan-23	13.3	6.68	66.8	73.5	80.9
Feb-23	3.39	3.62	13.6	17.2	21.7
Mar-23	9.17	6.41	40.5	46.9	81.0
Apr-23	7.88	8.20	17.8	26.0	85.4
May-23	0	0	0	0	0
Jun-23	0	0	0	0	0
Jul-23	0	0	0	0	0
Aug-23	0	0	0	0	0
Sep-23	0	0	0	0	0
Oct-23	3.74	5.27	0.542	5.81	33.1
Nov-23	5.34	8.43	4.41	12.8	28.1
Dec-23	6.67	2.54	12.1	14.7	21.8
Jan-24	8.45	9.36	28.1	37.4	37.4
Feb-24	11.5	8.83	15.7	24.6	53.7
Mar-24	7.30	9.11	14.7	23.8	47.0
Apr-24	5.26	8.51	4.39	12.9	60.4
May-24	0	0	0	0	0
Jun-24	0	0	0	0	0
Jul-24	0	0	0	0	0
Aug-24	0	0	0	0	0
Sep-24	0	0	0	0	0

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dry Season Average	0	0	0	0	0
Dry Season Trend**	--**	--**	--**	--**	--**
Wet Season Average	5.74	7.04	16.9	24.1	34.8
Average Annual	3.35	4.09	9.88	14.0	20.3

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** No dry season trending analysis was performed on Petaluma as the facility does not discharge during dry season months.

Recycled Water

Table 18-2. Recycled Water: Petaluma Yearly Recycled Water Flows Diverted from the Bay

Year**	Flow Diverted*, Acre-Feet/yr (mgd)							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	510 (0.46)	195 (0.17)	0 (0)	0 (0)	512 (0.46)	0 (0)	14 (0.01)	1,230 (1.1)
2020	467 (0.42)	228 (0.20)	0 (0)	0 (0)	992 (0.89)	0 (0)	147 (0.13)	1,830 (1.6)
2021	580 (0.52)	215 (0.19)	0 (0)	0 (0)	1,150 (1.0)	0 (0)	466 (0.42)	2,410 (2.2)
2022	473 (0.42)	199 (0.18)	0 (0)	0 (0)	928 (0.83)	0 (0)	458 (0.41)	2,060 (1.84)
2023	360 (0.32)	190 (0.17)	0 (0)	0 (0)	620 (0.55)	0 (0)	377 (0.34)	1,547 (1.38)
Average	478 (0.43)	205 (0.18)	0 (0)	0 (0)	840 (0.75)	0 (0)	292 (0.26)	1,816 (1.62)

* Assumes 100% of the recycled flow is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 18-3. Recycled Water: Petaluma Yearly Recycled Water Ammonia Load Diverted from the Bay

Year**	Average Ammonia Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	1	<1	0	0	1	0	1	2
2020	1	<1	0	0	1	0	<1	1
2021	1	<1	0	0	2	0	1	4
2022	1	<1	0	0	1	0	1	2
2023	<1	<1	0	0	<1	0	<1	1
Average	1	<1	0	0	1	0	<1	2

* Assumes 100% of the recycled load is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 18-4. Recycled Water: Petaluma Yearly Recycled Water TIN Load Diverted from the Bay

Year**	Average Total Inorganic Nitrogen Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	3	1	0	0	3	0	<1	6
2020	1	<1	0	0	2	0	<1	4
2021	2	1	0	0	4	0	2	8
2022	1	1	0	0	2	0	1	5
2023	2	1	0	0	3	0	2	7
Average	2	1	0	0	3	0	1	6

* Assumes 100% of the recycled load is diverted for all recycled water applications

** Calendar year as opposed to California's water year (October 1 through September 30)

Table 18-5. Recycled Water: Petaluma Yearly Recycled Water Total Phosphorus Load Diverted from the Bay

Year**	Average TP Load Diverted*, kg P/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	2	1	0	0	2	0	<1	5
2020	2	1	0	0	4	0	1	7
2021	1	1	0	0	3	0	1	6
2022	3	1	0	0	6	0	3	14
2023	3	1	0	0	4	0	3	11
Average	2	1	0	0	4	0	2	9

* Assumes 100% of the recycled load is diverted for all recycled water applications

** Calendar year as opposed to California's water year (October 1 through September 30)

19 City of Pinole

The Pinole-Hercules Water Pollution Control Plant discharges to San Pablo Bay. The plant has approximately 11,215 service connections; it has a permitted capacity of 4.06 mgd ADWF and a peak wet weather capacity of 20.0 mgd. The average dry season discharge flow this past year was approximately 2.54 mgd.

The following observations are made based upon the figures and table in the subsequent pages:

◆ Discharge:

- ▲ The City of Pinole completed a \$45 Mil plant upgrade project that included the ability to remove ammonia and TIN loads during the dry season (commissioned in 2019 in conventional cBOD mode). While the system was upgraded to provide ammonia and TIN load reduction, the plant experiences multiple process upsets when the aeration basin is operated in biological nutrient removal mode. The plant is currently working with the design engineer on a plan on transitioning in and out biological nutrient removal mode and whether the plant can operate in this mode year-round or limited to the dry season. Additional upgrades maybe necessary to operate in biological nutrient removal mode.
- ▲ The average monthly ammonia and TIN loads for 2023/2024 are the second highest since nutrient sampling was initiated under Section 13267 Letter Data in 2012 (highest was in 2021/2022), while the average monthly TP loads were the highest recorded. As noted, the plant is still developing a plan for transitioning to ammonia/TIN load reduction mode during the dry season.
- ▲ As of the last few years, nitrogen and phosphorus loads track with the flow, though this has not been the case historically at this facility.
- ▲ Total phosphorus concentrations range from 0.5 to 6.0 mg P/L which suggests occasional removal.
- ▲ Based on Table 19-1 statistics for the entire dry season dataset, flow, ammonia, nitrate + nitrite and TIN loads do not appear to have any emerging trends. The dry season TP loads are trending upwards.

◆ Recycled Water: No recycled water was produced or distributed this past year.

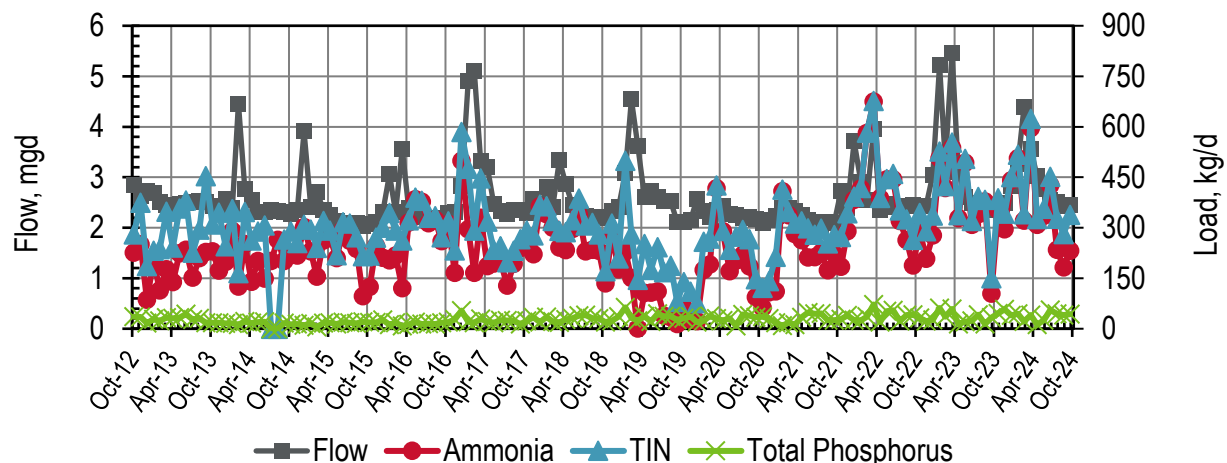


Figure 19-1. Discharge: Pinole Monthly Flows and Loads

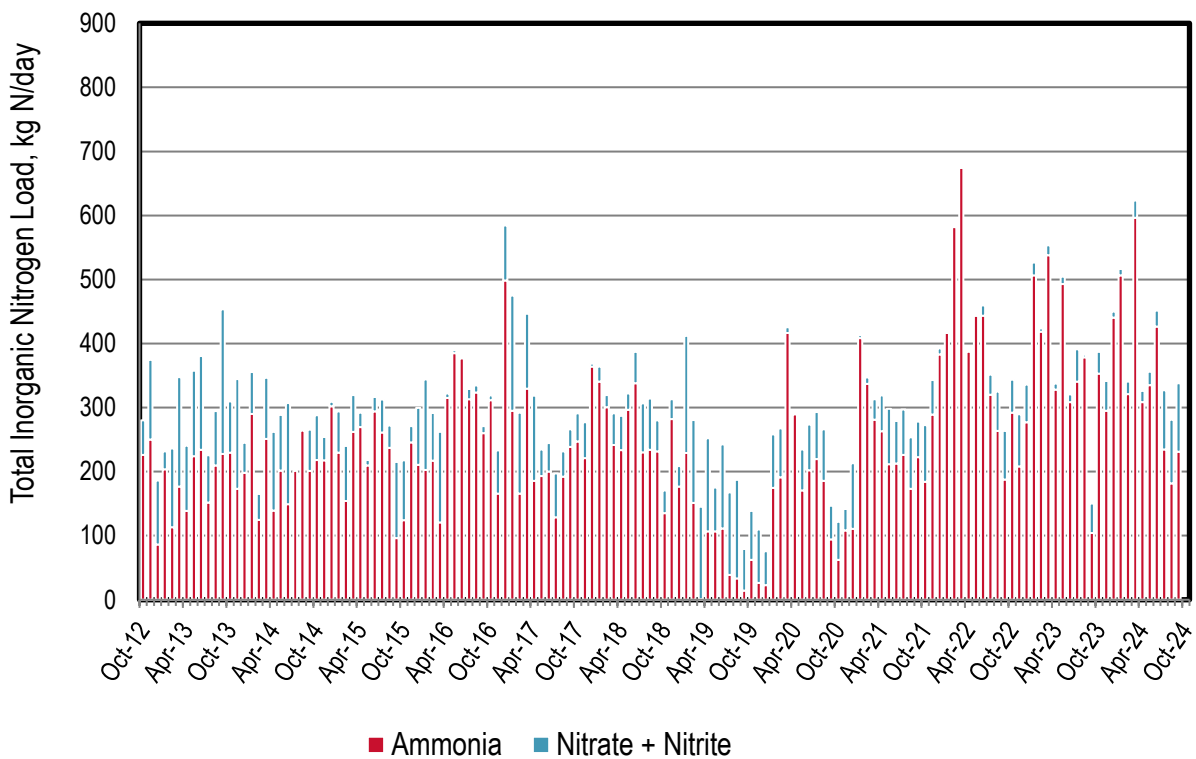


Figure 19-2. Discharge: Pinole Monthly Nitrogen Loads

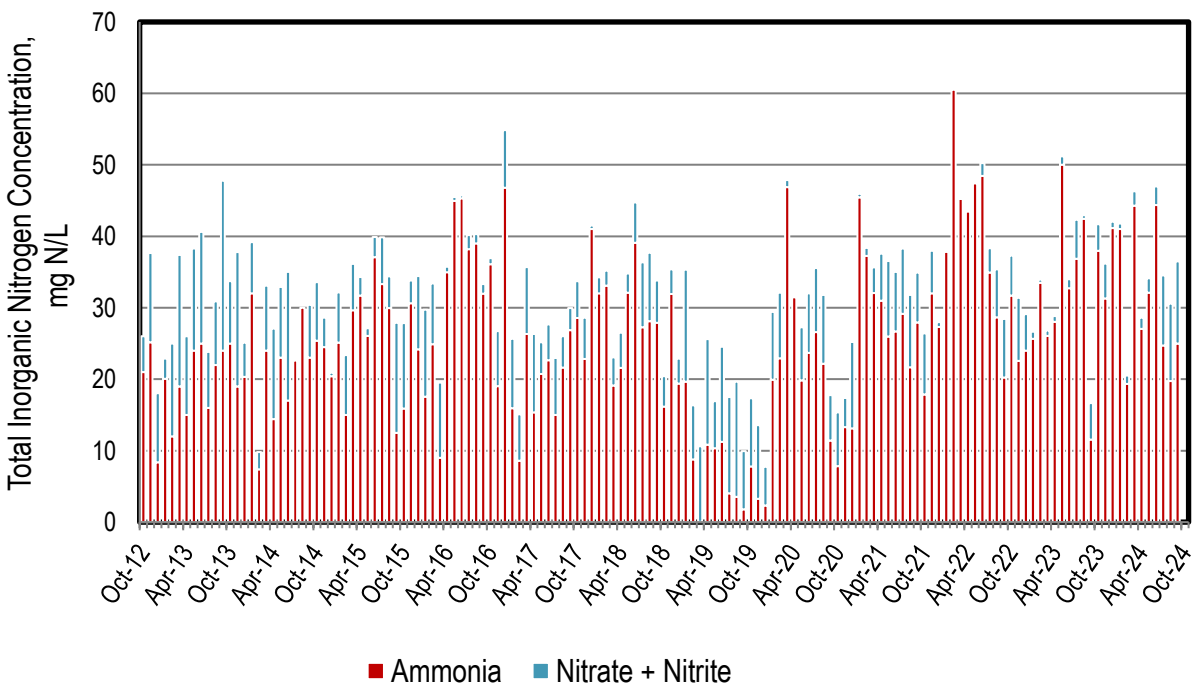


Figure 19-3. Discharge: Pinole Monthly Nitrogen Concentrations

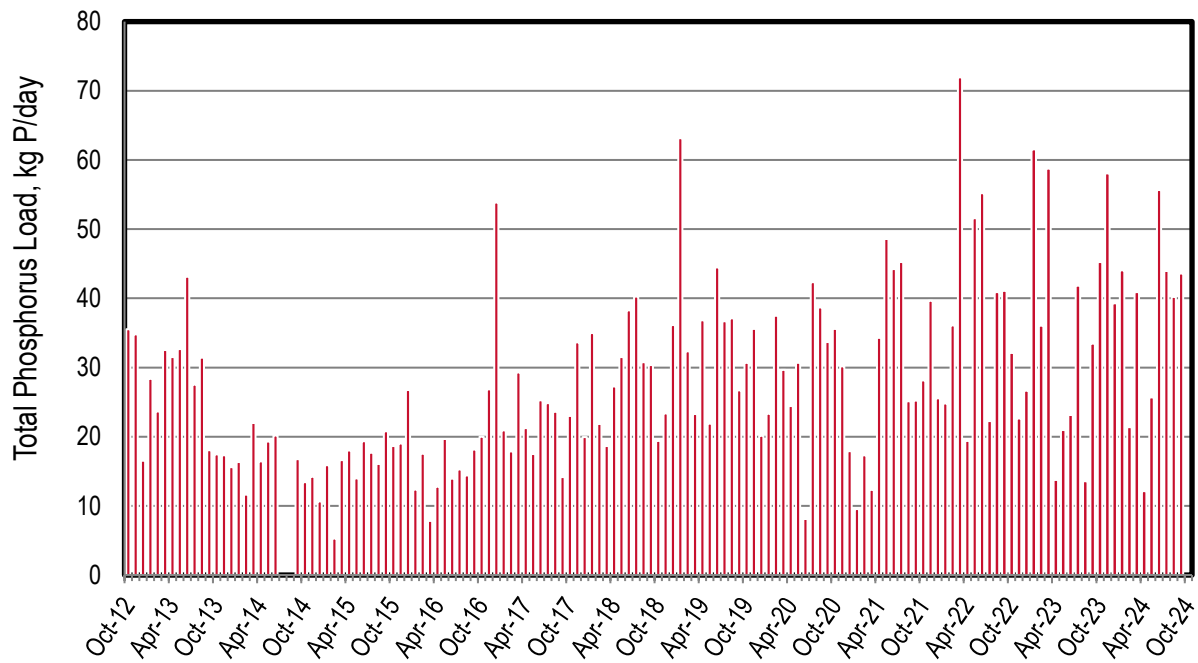


Figure 19-4. Discharge: Pinole Monthly Phosphorus Loads

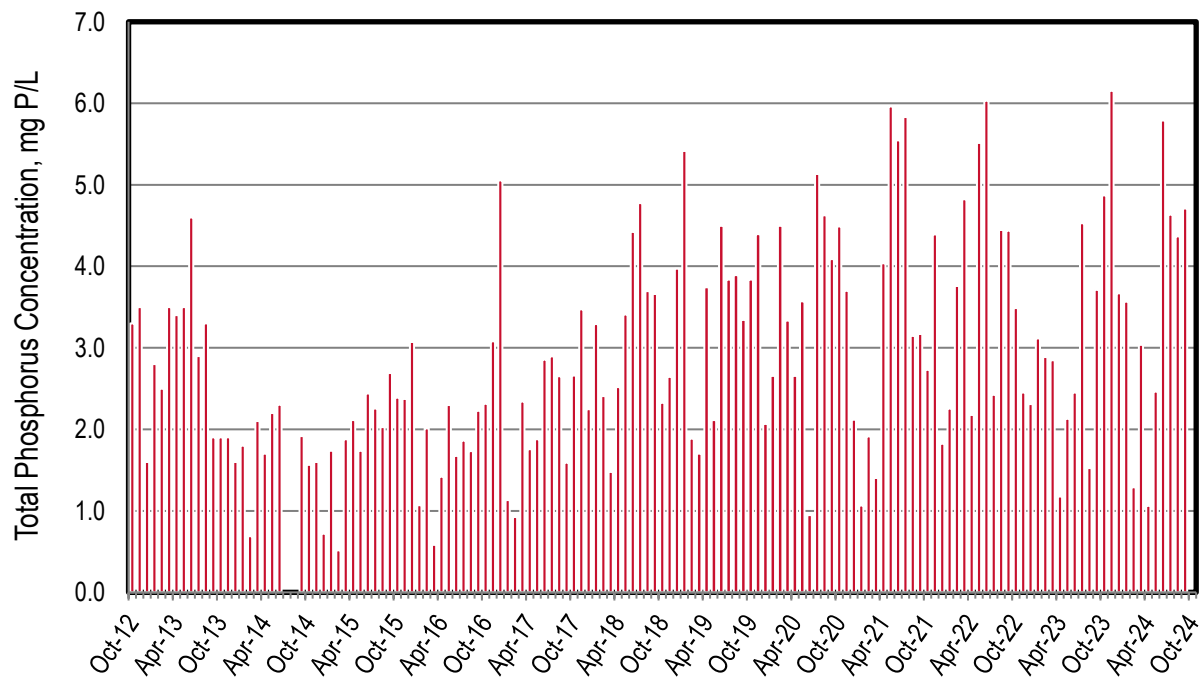


Figure 19-5. Discharge: Pinole Monthly Phosphorus Concentrations

Table 19-1. Discharge: Pinole Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	2.85	226	54.0	280	35.6
Nov-12	2.63	250	124	374	34.8
Dec-12	2.73	86.2	100	186	16.5
Jan-13	2.68	203	28.4	232	28.4
Feb-13	2.50	113	123	236	23.6
Mar-13	2.46	177	171	348	32.5
Apr-13	2.45	139	102	241	31.5
May-13	2.47	224	134	358	32.7
Jun-13	2.48	234	146	381	43.1
Jul-13	2.51	152	74.0	226	27.5
Aug-13	2.52	210	84.8	294	31.4
Sep-13	2.51	228	226	454	18.0
Oct-13	2.43	230	79.9	310	17.5
Nov-13	2.41	173	171	344	17.3
Dec-13	2.58	198	46.8	245	15.6
Jan-14	2.40	290	65.3	356	16.3
Feb-14	4.46	125	40.5	165	11.6
Mar-14	2.77	251	95.3	347	22.0
Apr-14	2.56	139	123	262	16.5
May-14	2.32	202	86.8	289	19.3
Jun-14	2.32	149	158	307	20.2
Jul-14	2.35	201	**	**	**
Aug-14	2.33	264	**	**	**
Sep-14	2.31	201	64.5	265	16.7
Oct-14	2.27	218	70.4	288	13.4
Nov-14	2.35	218	36.8	254	14.2
Dec-14	3.91	302	7.06	309	10.6
Jan-15	2.42	230	64.5	294	15.9
Feb-15	2.72	154	86.2	240	5.28
Mar-15	2.34	262	57.7	320	16.6
Apr-15	2.25	270	22.1	292	18.0
May-15	2.13	210	8.55	218	14.0
Jun-15	2.10	294	22.5	317	19.4
Jul-15	2.07	261	51.4	312	17.7
Aug-15	2.09	237	35.2	272	16.0
Sep-15	2.04	96.4	119	215	20.8

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-15	2.07	124	93.2	217	18.6
Nov-15	2.12	246	25.4	271	19.0
Dec-15	2.30	211	89.1	300	26.7
Jan-16	3.06	203	141	344	12.3
Feb-16	2.31	217	74.4	292	17.5
Mar-16	3.55	121	141	262	7.84
Apr-16	2.38	315	6.65	322	12.8
May-16	2.26	385	4.56	389	19.7
Jun-16	2.20	377	3.36	380	13.9
Jul-16	2.17	313	16.1	329	15.3
Aug-16	2.20	324	10.8	334	14.4
Sep-16	2.15	260	11.0	271	18.1
Oct-16	2.28	312	7.51	319	20.0
Nov-16	2.31	166	67.1	233	26.9
Dec-16	2.82	498	85.7	584	53.8
Jan-17	4.89	295	180	475	20.9
Feb-17	5.11	166	126	292	17.8
Mar-17	3.31	330	117	447	29.3
Apr-17	3.20	186	133	318	21.2
May-17	2.46	193	41.4	235	17.5
Jun-17	2.34	200	44.4	245	25.2
Jul-17	2.27	128	68.5	197	24.8
Aug-17	2.35	192	39.3	232	23.6
Sep-17	2.35	239	27.4	266	14.2
Oct-17	2.29	247	44.3	291	23.0
Nov-17	2.56	221	55.8	277	33.6
Dec-17	2.35	364	4.51	369	19.9
Jan-18	2.81	340	23.6	364	35.0
Feb-18	2.40	301	19.1	320	21.9
Mar-18	3.34	242	49.4	291	18.7
Apr-18	2.86	233	53.5	287	27.2
May-18	2.45	297	25.0	322	31.5
Jun-18	2.29	338	48.9	387	38.3
Jul-18	2.23	230	76.4	306	40.2
Aug-18	2.20	234	80.0	314	30.8
Sep-18	2.19	232	48.7	280	30.3
Oct-18	2.21	135	35.5	170	19.4

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-18	2.34	282	30.6	313	23.4
Dec-18	2.41	176	31.9	208	36.1
Jan-19	3.08	229	183	499	63.1
Feb-19	4.54	151	129	280	32.4
Mar-19	3.62	0.765	144	145	23.3
Apr-19	2.60	107	145	252	36.8
May-19	2.74	107	68.0	175	21.9
Jun-19	2.62	111	131	243	44.5
Jul-19	2.53	38.7	129	168	36.7
Aug-19	2.52	33.5	154	187	37.1
Sep-19	2.11	14.1	65.2	79.3	26.7
Oct-19	2.12	62.2	76.3	138	30.7
Nov-19	2.14	26.5	83.3	110	35.6
Dec-19	2.58	22.6	52.8	75.5	20.1
Jan-20	2.32	175	83.3	258	23.3
Feb-20	2.20	191	76.5	268	37.5
Mar-20	2.35	417	8.78	425	29.7
Apr-20	2.43	289	1.09	291	24.4
May-20	2.27	170	63.9	234	30.7
Jun-20	2.26	202	71.2	274	8.09
Jul-20	2.18	220	73.7	293	42.3
Aug-20	2.21	185	80.6	266	38.7
Sep-20	2.18	94.1	52.5	147	33.7
Oct-20	2.10	62.1	59.6	122	35.6
Nov-20	2.16	108	33.3	142	30.2
Dec-20	2.24	111	102	213	17.9
Jan-21	2.38	408	4.61	413	9.56
Feb-21	2.39	337	10.0	347	17.3
Mar-21	2.32	281	31.6	313	12.3
Apr-21	2.25	263	55.8	319	34.3
May-21	2.16	212	86.2	298	48.6
Jun-21	2.11	213	66.3	279	44.2
Jul-21	2.05	226	70.8	297	45.2
Aug-21	2.11	173	80.5	254	25.1
Sep-21	2.10	222	55.6	278	25.2
Oct-21	2.73	184	88.1	272	28.2
Nov-21	2.39	289	53.7	343	39.7

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-21	3.71	383	9.36	392	25.5
Jan-22	2.91	417	1.19	418	24.8
Feb-22	2.54	582	0.973	583	36.1
Mar-22	3.95	674	2.40	677	71.9
Apr-22	2.36	388	0.959	389	19.4
May-22	2.47	443	1.36	445	51.6
Jun-22	2.42	443	16.3	460	55.2
Jul-22	2.43	320	31.1	351	22.2
Aug-22	2.43	263	61.8	325	40.9
Sep-22	2.45	188	75.9	264	41.1
Oct-22	2.44	292	51.6	343	32.1
Nov-22	2.44	208	81.4	289	22.6
Dec-22	3.05	277	59.0	336	26.7
Jan-23	5.23	507	19.9	526	61.5
Feb-23	3.30	418	5.23	424	36.0
Mar-23	5.46	538	15.4	553	58.7
Apr-23	3.10	328	9.38	338	13.8
May-23	2.61	493	11.5	504	21.0
Jun-23	2.49	309	11.9	321	23.1
Jul-23	2.44	340	50.6	391	41.8
Aug-23	2.36	378	4.21	383	13.6
Sep-23	2.38	104	45.9	150	33.4
Oct-23	2.46	353	34.4	387	45.2
Nov-23	2.50	295	46.3	341	58.1
Dec-23	2.83	440	9.38	450	39.3
Jan-24	3.27	507	9.80	516	44.1
Feb-24	4.39	321	19.6	341	21.4
Mar-24	3.56	596	27.3	623	40.9
Apr-24	3.02	308	17.6	326	12.1
May-24	2.76	335	21.2	356	25.7
Jun-24	2.54	427	25.0	452	55.6
Jul-24	2.51	234	92.8	327	43.9
Aug-24	2.43	182	99.5	281	40.2
Sep-24	2.45	231	107	338	43.6

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dry Season Average	2.33	234	63.1	297	29.6
Dry Season Trend ***	None	None	None	None	Up
Wet Season Average	2.82	259	61.3	321	26.8
Average Annual	2.62	248	62.0	311	27.9

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** No samples taken this month.

*** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

Recycled Water

No recycled water was produced or distributed this past year.

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20 Rodeo Sanitary District

Rodeo discharges to San Pablo Bay. The plant services approximately 10,000 people and it has a permitted capacity of 1.14 mgd ADWF. This past dry season average discharge flow was approximately 0.55 mgd. The plant performs nitrification and phosphorus removal using an activated sludge process. The District collects and analyzes only one data point per month for effluent Nutrient monitoring.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Discharge:

- ▲ The annual average monthly ammonia and TIN loads and concentrations the last couple years are the highest since nutrient sampling was initiated under the Section 13267 Letter Data in 2012. This increase is attributed to a combination of struggles in maintaining the biology that performs ammonia removal during precipitation events coupled with maintaining an ammonia residual to form chloramines as a strategy to reduce chlorine demand.
- ▲ Total inorganic nitrogen loads generally increase with flow during wet weather events.
- ▲ Ammonia has been the majority of the nitrogen species discharged since the 2021/2022 period. This is attributed to biological washout and maintaining an ammonia residual.
- ▲ Total phosphorus concentrations are wide ranging from 0.3 to 12.7 mg P/L. This suggests occasional P removal for periods with values less than 1 mg P/L. The removal mechanism is thought to be the anaerobic selector in the activated sludge process.
- ▲ Based on Table 20-1 statistics for the entire dry season dataset, Ammonia and TIN loads appear to be trending upwards, while nitrate + nitrite loads have been trending downwards. All other monitored parameters do not have any emerging trends. Rodeo has seen an increase in influent flows/loads since the start of the pandemic.

◆ Recycled Water: No recycled water was produced or distributed this past year.

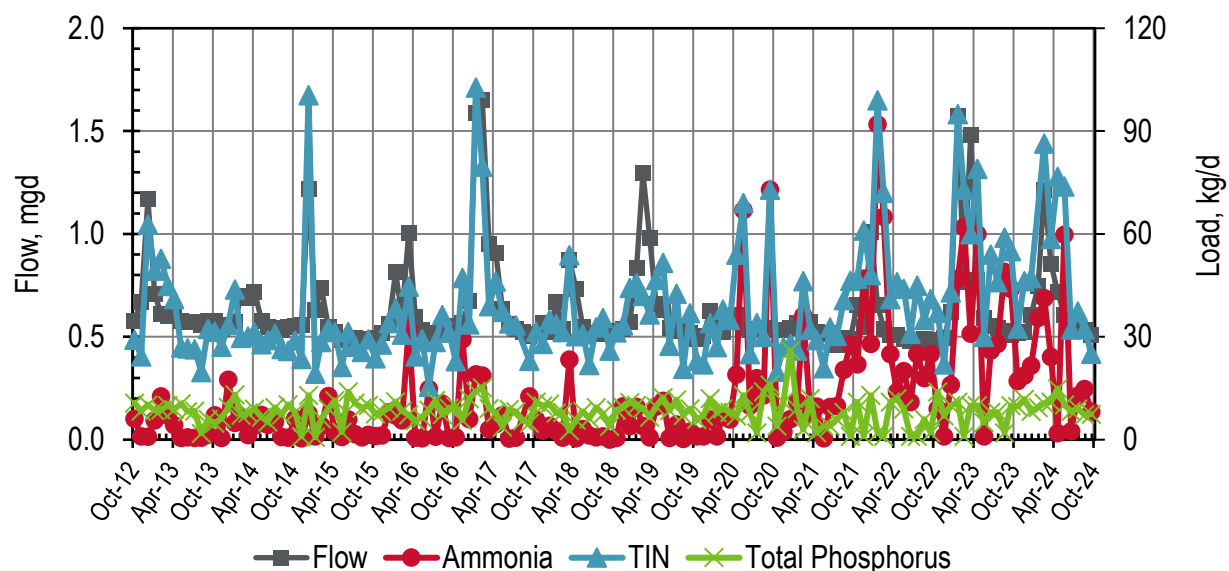


Figure 20-1. Discharge: Rodeo Monthly Flows and Loads

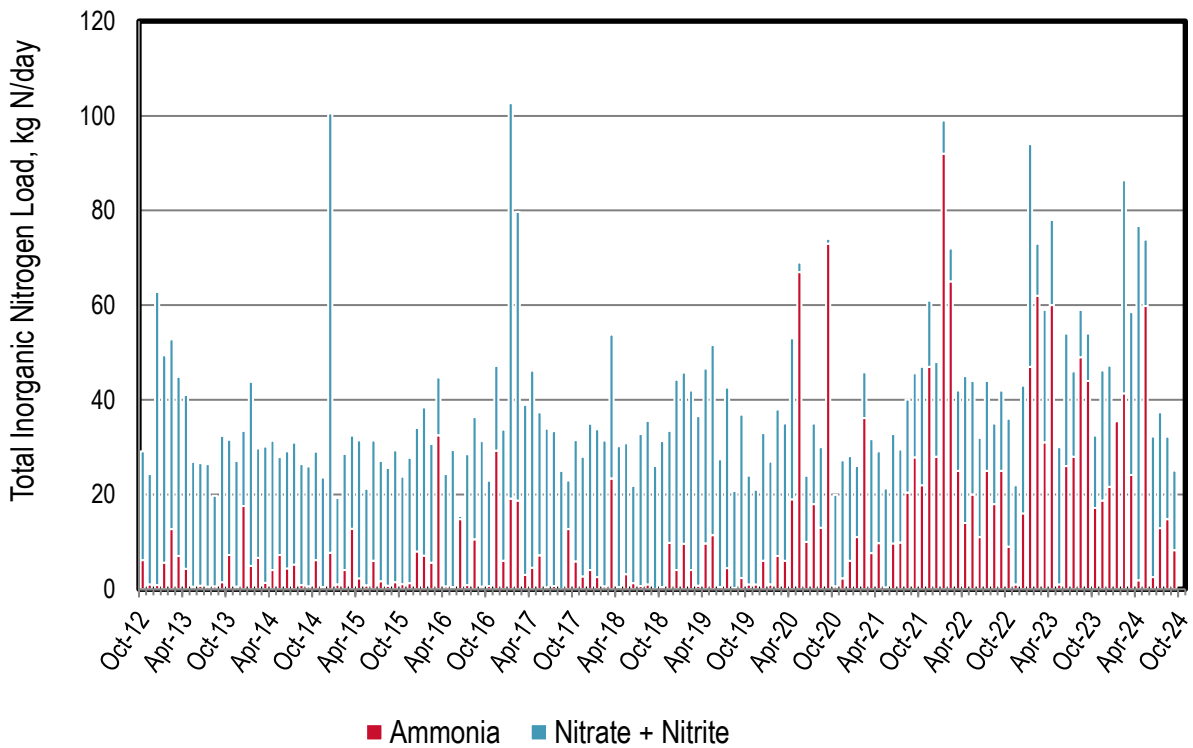


Figure 20-2. Discharge: Rodeo Monthly Nitrogen Loads

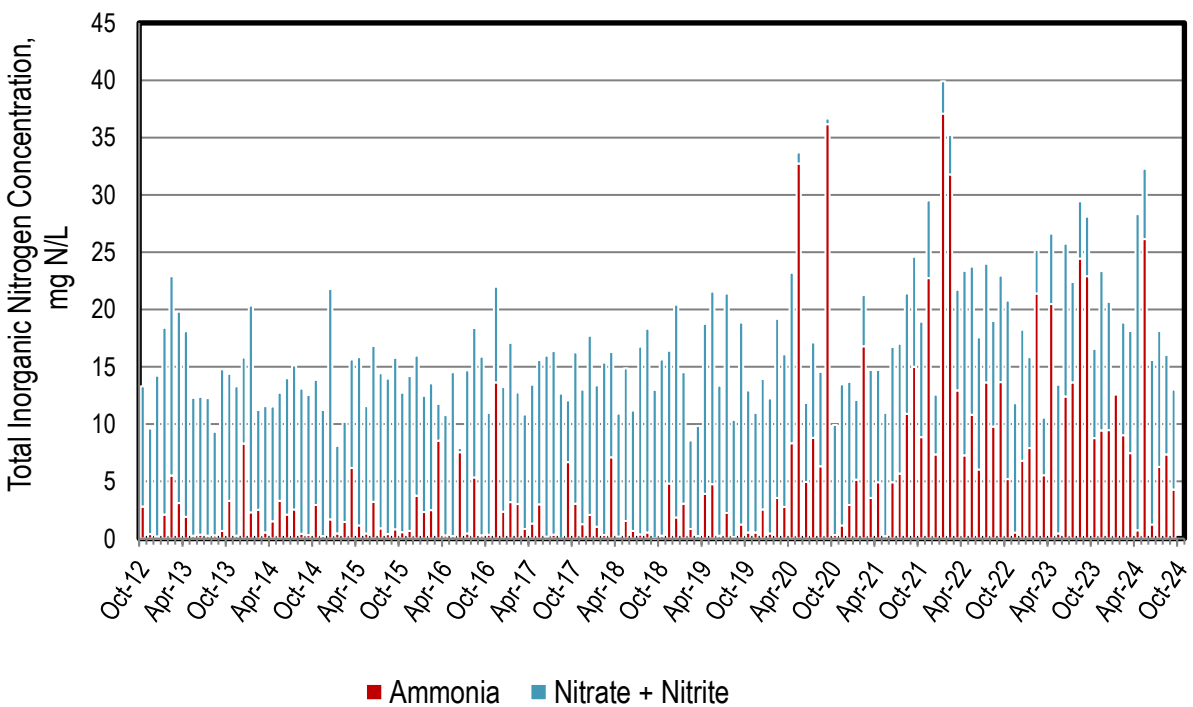


Figure 20-3. Discharge: Rodeo Monthly Nitrogen Concentrations

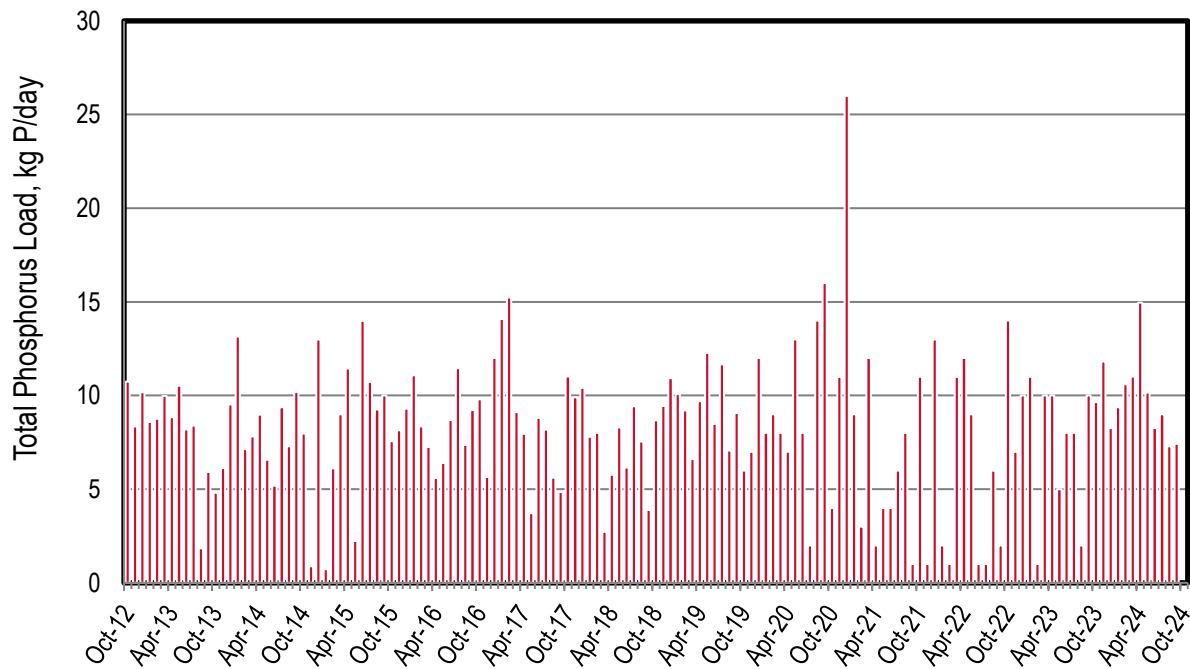


Figure 20-4. Discharge: Rodeo Monthly Phosphorus Loads

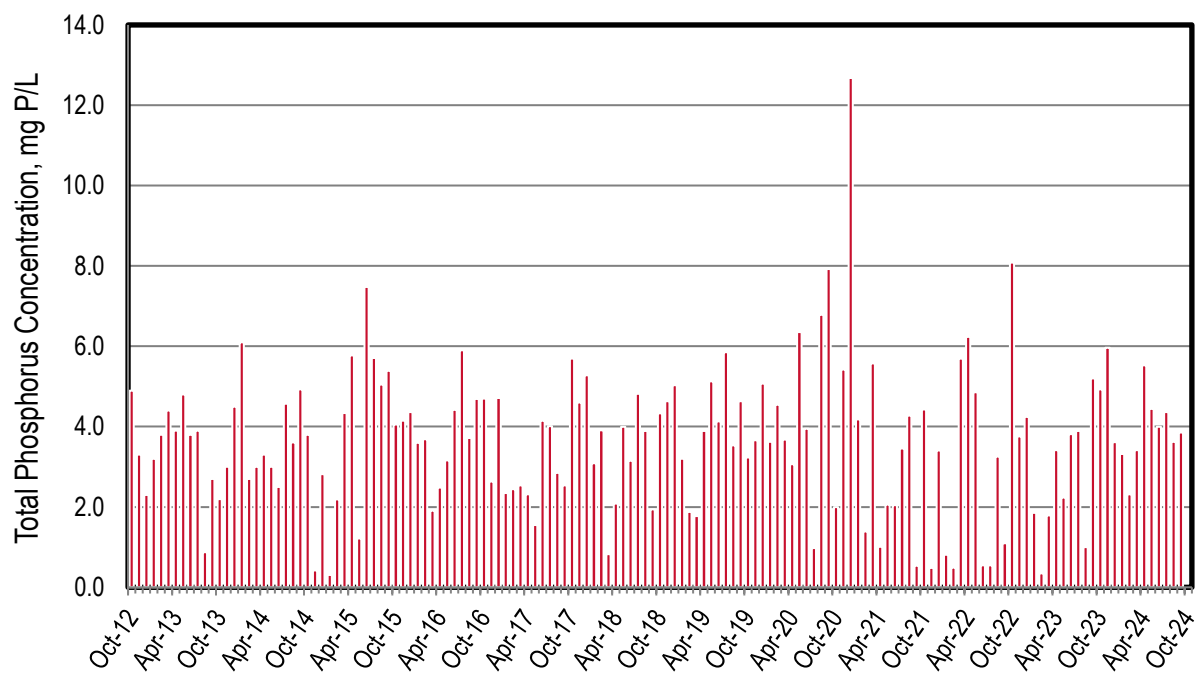


Figure 20-5. Discharge: Rodeo Monthly Phosphorus Concentrations

Table 20-1. Discharge: Rodeo Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	0.580	6.14	23.0	29.2	10.7
Nov-12	0.670	1.01	23.3	24.3	8.36
Dec-12	1.17	0.885	61.9	62.8	10.2
Jan-13	0.710	5.64	43.7	49.4	8.59
Feb-13	0.610	12.7	40.1	52.8	8.76
Mar-13	0.600	7.03	37.9	44.9	9.98
Apr-13	0.600	4.31	36.7	41.0	8.85
May-13	0.580	0.548	26.4	26.9	10.5
Jun-13	0.570	0.733	25.9	26.7	8.19
Jul-13	0.570	0.517	25.9	26.4	8.40
Aug-13	0.560	0.614	19.1	19.7	1.84
Sep-13	0.580	1.49	30.9	32.4	5.92
Oct-13	0.580	7.21	24.3	31.6	4.81
Nov-13	0.540	0.510	26.6	27.1	6.12
Dec-13	0.560	17.6	15.9	33.4	9.53
Jan-14	0.570	4.96	38.8	43.8	13.1
Feb-14	0.700	6.65	23.1	29.7	7.14
Mar-14	0.690	1.36	28.8	30.1	7.82
Apr-14	0.720	4.08	27.3	31.4	8.98
May-14	0.580	7.23	20.7	27.9	6.58
Jun-14	0.550	4.37	24.7	29.1	5.20
Jul-14	0.543	5.20	25.8	31.0	9.37
Aug-14	0.535	0.846	25.6	26.4	7.28
Sep-14	0.547	0.625	25.3	26.0	10.2
Oct-14	0.555	6.13	22.9	29.0	7.97
Nov-14	0.556	0.444	23.2	23.6	0.888
Dec-14	1.22	7.68	92.8	100	13.0
Jan-15	0.631	1.04	18.2	19.3	0.739
Feb-15	0.741	4.08	24.5	28.6	6.12
Mar-15	0.549	12.8	19.7	32.5	9.00
Apr-15	0.525	2.29	29.1	31.4	11.4
May-15	0.485	0.816	20.4	21.2	2.23
Jun-15	0.495	6.00	25.4	31.4	14.0
Jul-15	0.496	1.67	25.4	27.1	10.7
Aug-15	0.485	0.712	24.9	25.6	9.25
Sep-15	0.491	1.48	27.8	29.3	10.0

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-15	0.494	1.06	22.7	23.8	7.57
Nov-15	0.519	1.31	26.5	27.8	8.14
Dec-15	0.565	8.01	26.1	34.1	9.31
Jan-16	0.815	7.11	31.3	38.4	11.1
Feb-16	0.600	5.64	25.1	30.7	8.36
Mar-16	1.01	32.5	12.2	44.7	7.26
Apr-16	0.597	0.625	23.7	24.3	5.60
May-16	0.536	0.475	28.9	29.4	6.41
Jun-16	0.520	14.8	0.692	15.5	8.69
Jul-16	0.514	0.869	27.7	28.5	11.5
Aug-16	0.524	10.5	25.8	36.4	7.35
Sep-16	0.520	0.527	30.7	31.3	9.22
Oct-16	0.552	0.685	22.2	22.9	9.81
Nov-16	0.568	29.2	17.9	47.2	5.65
Dec-16	0.674	6.00	27.7	33.7	12.0
Jan-17	1.59	19.1	83.6	103	14.1
Feb-17	1.65	18.8	61.0	79.7	15.2
Mar-17	0.950	3.04	35.9	39.0	9.12
Apr-17	0.910	4.54	41.6	46.2	7.95
May-17	0.634	7.19	30.2	37.4	3.71
Jun-17	0.562	0.377	33.6	33.9	8.81
Jul-17	0.539	0.675	32.7	33.4	8.18
Aug-17	0.522	--***	25.0	--***	5.62
Sep-17	0.504	12.7	10.3	23.0	4.84
Oct-17	0.512	5.91	25.6	31.5	11.0
Nov-17	0.569	2.72	25.2	28.0	9.90
Dec-17	0.522	4.05	30.9	34.9	10.4
Jan-18	0.668	2.60	31.2	33.8	7.80
Feb-18	0.542	0.636	30.8	31.4	8.00
Mar-18	0.874	23.4	30.4	53.8	2.73
Apr-18	0.733	0.456	29.8	30.2	5.78
May-18	0.549	3.16	27.7	30.8	8.30
Jun-18	0.518	1.31	20.5	21.8	6.16
Jul-18	0.518	0.702	32.1	32.8	9.43
Aug-18	0.514	1.04	34.5	35.6	7.55
Sep-18	0.530	0.0742	26.0	26.0	3.89
Oct-18	0.530	0.501	30.8	31.3	8.67

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-18	0.539	9.81	23.6	33.4	9.45
Dec-18	0.574	4.03	40.3	44.3	10.9
Jan-19	0.833	9.57	36.2	45.8	10.1
Feb-19	1.30	4.03	38.0	42.0	9.21
Mar-19	0.983	0.770	35.8	36.5	6.60
Apr-19	0.659	9.70	36.9	46.6	9.70
May-19	0.633	11.4	40.2	51.6	12.3
Jun-19	0.544	0.497	26.9	27.4	8.49
Jul-19	0.527	4.45	38.2	42.6	11.7
Aug-19	0.529	0.297	20.4	20.7	7.06
Sep-19	0.517	2.37	34.5	36.9	9.06
Oct-19	0.492	1.00	23.0	23.0	6.00
Nov-19	0.506	1.00	20.0	22.0	7.00
Dec-19	0.626	6.00	27.0	34.0	12.0
Jan-20	0.585	1.00	26.0	27.0	8.00
Feb-20	0.524	7.00	31.0	38.0	9.00
Mar-20	0.575	6.00	29.0	35.0	8.00
Apr-20	0.604	19.0	34.0	54.0	7.00
May-20	0.541	67.0	2.00	69.0	13.0
Jun-20	0.536	10.0	14.0	25.0	8.00
Jul-20	0.541	18.0	17.0	34.0	2.00
Aug-20	0.546	13.0	17.0	30.0	14.0
Sep-20	0.534	73.0	1.00	73.0	16.0
Oct-20	0.531	0.630	19.3	19.9	4.00
Nov-20	0.537	2.29	25.0	27.1	11.0
Dec-20	0.543	6.02	22.1	28.1	26.0
Jan-21	0.569	11.0	15.0	26.0	9.00
Feb-21	0.570	36.2	9.65	46.2	3.00
Mar-21	0.570	7.62	24.1	32.1	12.0
Apr-21	0.523	9.70	19.4	29.1	2.00
May-21	0.514	0.417	20.9	20.9	4.00
Jun-21	0.518	9.63	23.1	32.8	4.00
Jul-21	0.460	9.84	19.7	30.3	6.00
Aug-21	0.495	20.4	19.7	40.8	8.00
Sep-21	0.491	27.8	17.8	46.4	1.00
Oct-21	0.657	22.0	25.0	47.0	11.0
Nov-21	0.547	47.0	14.0	61.0	1.00

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-21	1.01	28.0	20.0	48.0	13.0
Jan-22	0.656	92.0	7.00	99.0	2.00
Feb-22	0.541	65.0	7.00	72.0	1.00
Mar-22	0.511	25.0	17.0	41.0	11.0
Apr-22	0.509	14.0	31.0	46.0	12.0
May-22	0.490	20.0	24.0	44.0	9.00
Jun-22	0.482	11.0	21.0	31.0	1.00
Jul-22	0.486	25.0	19.0	45.0	1.00
Aug-22	0.488	18.0	17.0	35.0	6.00
Sep-22	0.484	25.0	17.0	41.0	2.00
Oct-22	0.458	9.00	27.0	37.0	14.0
Nov-22	0.493	1.00	21.0	22.0	7.00
Dec-22	0.624	16.0	27.0	43.0	10.0
Jan-23	1.57	47.0	47.0	95.0	11.0
Feb-23	0.767	62.0	11.0	73.0	1.00
Mar-23	1.48	31.0	28.0	60.0	10.0
Apr-23	0.775	60.0	18.0	79.0	10.0
May-23	0.591	1.00	29.0	30.0	5.00
Jun-23	0.555	26.0	28.0	54.0	8.00
Jul-23	0.543	28.0	18.0	46.0	8.00
Aug-23	0.530	49.0	10.0	59.0	2.00
Sep-23	0.509	44.0	10.0	55.0	10.0
Oct-23	0.518	17.2	15.2	32.4	9.65
Nov-23	0.524	18.7	27.6	46.3	11.8
Dec-23	0.605	21.7	25.6	47.2	8.27
Jan-24	0.747	35.5	--†	--†	9.38
Feb-24	1.21	41.3	45.0	86.4	10.6
Mar-24	0.855	24.1	34.4	58.6	11.0
Apr-24	0.716	1.92	74.8	76.7	15.0
May-24	0.605	59.8	14.1	73.9	10.2
Jun-24	0.547	2.54	29.7	32.2	8.27
Jul-24	0.546	12.9	24.5	37.4	8.99
Aug-24	0.532	14.8	17.5	32.3	7.29
Sep-24	0.510	8.22	16.9	25.1	7.42

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dry Season Average	0.532	11.9	22.8	34.7	7.47
Dry Season Trend **	None	Up	Down	Up	None
Wet Season Average	0.702	13.4	29.3	42.5	8.78
Average Annual	0.631	12.8	26.6	39.2	8.23

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

*** Missing data due to Caltest missing request for ammonia analysis. (See letter below).

† Missing data due to contract laboratory not analyzing the samples within the allowed hold time.

Recycled Water

No recycled water was produced or distributed this past year.

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21 San Jose-Santa Clara Regional Wastewater Facility

The San Jose-Santa Clara Regional Wastewater Facility discharges to the Lower South Bay. It serves an estimated population of 1.5 million with approximately 17,000 commercial and industrial connections. The plant has a permitted ADWF capacity of 167 mgd and a peak wet weather capacity of 261 mgd. This past year's dry season discharge flows were approximately 89 mgd. The process includes advanced treatment with a Biological Nutrient Removal system for N and P removal.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Influent

- ▲ Note: limited to data since July 2019.
- ▲ Influent flow increased approximately 10% this year compared to 2023/2023, while influent nutrient loading increased approximately 25%.
- ▲ The flow reduction across the plant is seasonal and it ranges from approximately 5 to 26 percent. This reduction is attributed to recycled water, water bound with biosolids, evaporation, etc.
- ▲ The nitrogen species and phosphorus load reductions across the plant ranges from approximately 70 to 98 percent. This load reduction is attributed primarily to nutrient load reduction in the activated sludge system and load diversion from recycled water.
- ▲ Based on the limited average monthly values in Table 1-1, there is no trend for influent flows. Trending was not performed on nutrients as the plant added a new autosampler in 2023 which has had plugging challenges. This issue has since been resolved.

◆ Discharge

- ▲ The average dry season flows increased 25 mgd when compared to 2022, the most recent dry year. This increase is attributed to the relatively wet winter this past year.
- ▲ The dry season nitrite plus nitrate and TIN loads increased approximately 900 kg N/d, potentially due to increased influent loads. Despite this increase, the average dry season TIN discharge concentration was 12.7 mg N/L. Maintaining such low TIN levels is attributed to optimization of the BNR system, which was piloted in 2019 and 2020 and implemented at full scale beginning in 2021.
- ▲ Wet season loads are greater and generally more variable than the dry season loads.
- ▲ Based on Table 1-2 statistics for the entire dry season dataset, nutrient parameters are all trending downwards, whereas dry season flow has no trend. Reduced nutrient levels is largely attributed to BNR system optimization.
- ▲ NO_x is the majority of the nitrogen species discharged, regardless of season. This would be expected since the plant fully nitrifies year-round and discharges very little ammonia.
- ▲ Since April 2017, the facility has enhanced the total phosphorus load reduction capabilities as evidenced by total phosphorus concentrations typically below 1 mg P/L.

◆ Recycled Water

- ▲ Based on Table 1-3, the plant has averaged 11 mgd of recycled water from 2019 through 2023. Recycled water uses included golf course irrigation, landscape irrigation, industrial application, agricultural irrigation, and other non-potable uses.
- ▲ Based on Table 1-4 through Table 1-6, the plant has diverted on average 22 kg ammonia-N/d, 554 kg TIN-N/d, and 22 kg P/d from the Bay through reuse from 2019 through 2023. Note: these values are for year-round values and not limited to the dry season when the facility has the highest non-potable recycled water demand.

Influent

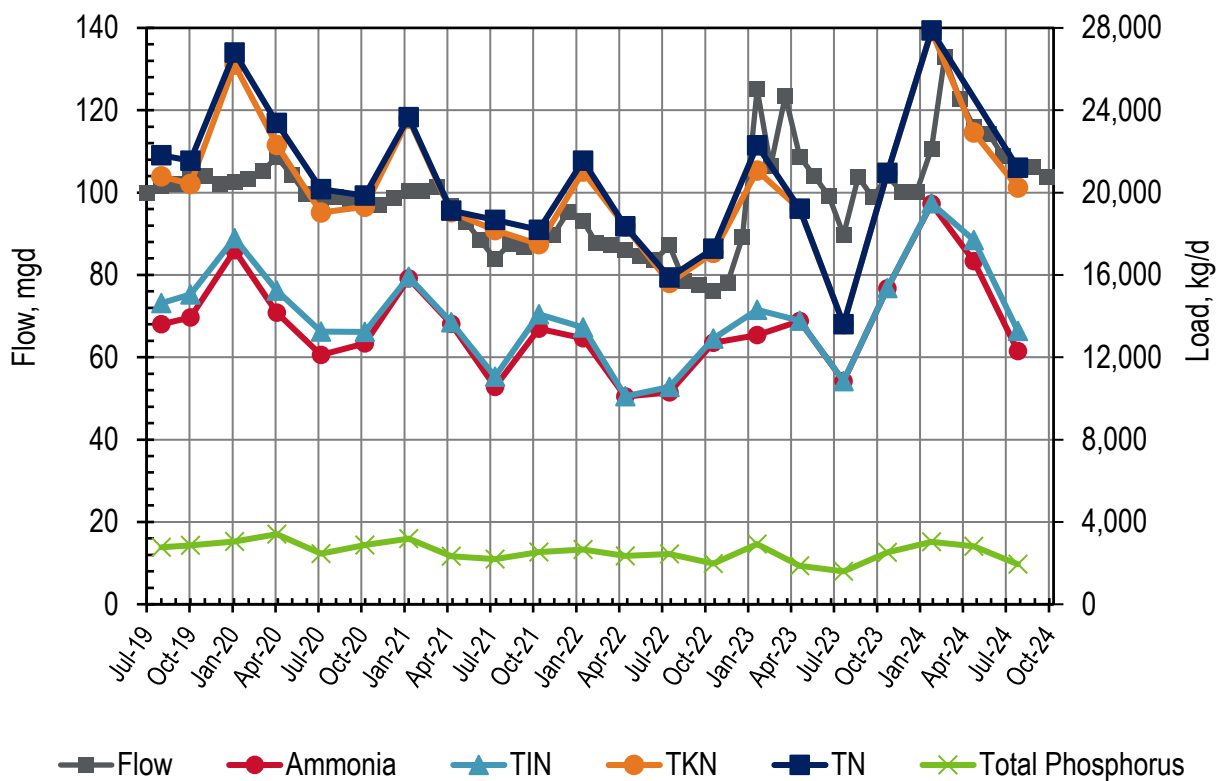


Figure 21-1. Influent: San Jose Monthly Flows and Loads

Note: the ammonia/TIN loads and TKN/Total N loads are comparable. The ammonia and TKN values are located behind TIN and Total N loads and thus are challenging to see.

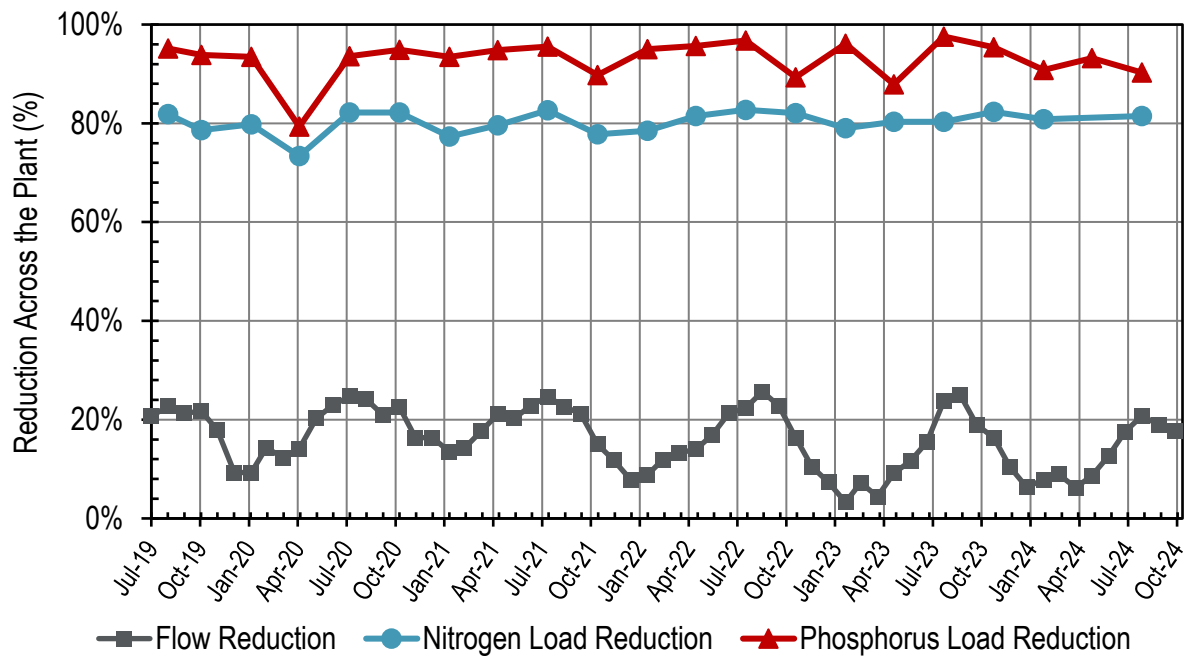


Figure 21-2. Influent: San Jose Monthly Reductions Across the Plant

Note: Influent TN was compared against Discharge TIN for calculating nitrogen load reduction.

Table 21-1. Influent: San Jose Monthly Flows and Loads*

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	TKN	Total N *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-19	99.9	--	--	--	--	--	--
Aug-19	102	13,600	1,020	14,600	20,800	21,800	2,770
Sep-19	102	--	--	--	--	--	--
Oct-19	104	13,900	1,130	15,100	20,400	21,500	2,870
Nov-19	104	--	--	--	--	--	--
Dec-19	102	--	--	--	--	--	--
Jan-20	103	17,200	594	17,800	26,200	26,800	3,040
Feb-20	103	--	--	--	--	--	--
Mar-20	105	--	--	--	--	--	--
Apr-20	109	14,200	1,070	15,200	22,300	23,400	3,410
May-20	104	--	--	--	--	--	--
Jun-20	99.6	--	--	--	--	--	--
Jul-20	98.4	12,100	1,130	13,200	19,000	20,200	2,460
Aug-20	99.0	--	--	--	--	--	--
Sep-20	97.8	--	--	--	--	--	--
Oct-20	97.3	12,700	546	13,200	19,300	19,900	2,870

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	TKN	Total N *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Nov-20	96.9	--	--	--	--	--	--
Dec-20	98.7	--	--	--	--	--	--
Jan-21	100	15,800	74.9	15,900	23,600	23,700	3,190
Feb-21	100	--	--	--	--	--	--
Mar-21	101	--	--	--	--	--	--
Apr-21	96.8	13,600	71.9	13,700	19,100	19,100	2,340
May-21	92.8	--	--	--	--	--	--
Jun-21	88.4	--	--	--	--	--	--
Jul-21	83.9	10,600	501	11,100	18,200	18,700	2,200
Aug-21	87.5	--	--	--	--	--	--
Sep-21	86.7	--	--	--	--	--	--
Oct-21	89.8	13,400	700	14,100	17,500	18,200	2,530
Nov-21	89.7	--	--	--	--	--	--
Dec-21	95.4	--	--	--	--	--	--
Jan-22	93.1	12,900	526	13,400	21,000	21,600	2,650
Feb-22	87.8	--	--	--	--	--	--
Mar-22	87.3	--	--	--	--	--	--
Apr-22	86.0	10,100	14.1	10,100	18,300	18,400	2,360
May-22	84.6	--	--	--	--	--	--
Jun-22	83.6	--	--	--	--	--	--
Jul-22	87.1	10,300	261	10,600	15,600	15,900	2,440
Aug-22	78.4	--	--	--	--	--	--
Sep-22	77.5	--	--	--	--	--	--
Oct-22	76.1	12,700	203	12,900	17,100	17,300	1,980
Nov-22	78.2	--	--	--	--	--	--
Dec-22	89.2	--	--	--	--	--	--
Jan-23	125	13,100	1,230	14,300	21,100	22,300	2,920
Feb-23	106	--	--	--	--	--	--
Mar-23	123	--	--	--	--	--	--
Apr-23	109	13,800	12.9 **	13,800	19,200	19,200	1,870
May-23	104	--	--	--	--	--	--
Jun-23	99.2	--	--	--	--	--	--
Jul-23	89.7	10,800	3.33 **	10,800	13,600	13,600	1,600
Aug-23	104	--	--	--	--	--	--
Sep-23	98.8	--	--	--	--	--	--
Oct-23	104	15,300	24.2	15,400	20,900	21,000	2,520
Nov-23	100	--	--	--	--	--	--

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	TKN	Total N *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Dec-23	100	--	--	--	--	--	--
Jan-24	111	19,400	28.2	19,500	27,800	27,900	3,030
Feb-24	133	--	--	--	--	--	--
Mar-24	123	--	--	--	--	--	--
Apr-24	116	16,700	1,020	17,700	22,900	--	2,820
May-24	114	--	--	--	--	--	--
Jun-24	109	--	--	--	--	--	--
Jul-24	106	12,300	971	13,300	20,200	21,200	1,940
Aug-24	106	--	--	--	--	--	--
Sep-24	104	--	--	--	--	--	--
Dry Season Average	96.0	11,600	648	12,300	17,900	18,600	2,230
Dry Season Trend ***	None	****	****	****	****	****	****
Wet Season Average	101	14,300	483	14,800	21,100	21,400	2,690
Average Annual	98.9	13,600	530	14,100	20,200	20,600	2,560

* The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values. The Total Nitrogen value is calculated by adding "TKN" and "Nitrate + Nitrite".

** "Nitrate + Nitrite" values that were non-detect. The listed values are equal to 50 percent of the method detection limit.

*** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

**** Statistical analyses not performed on the influent nutrient parameters due to a sampler plugging issue that occurred following construction of their new headworks.

Discharge

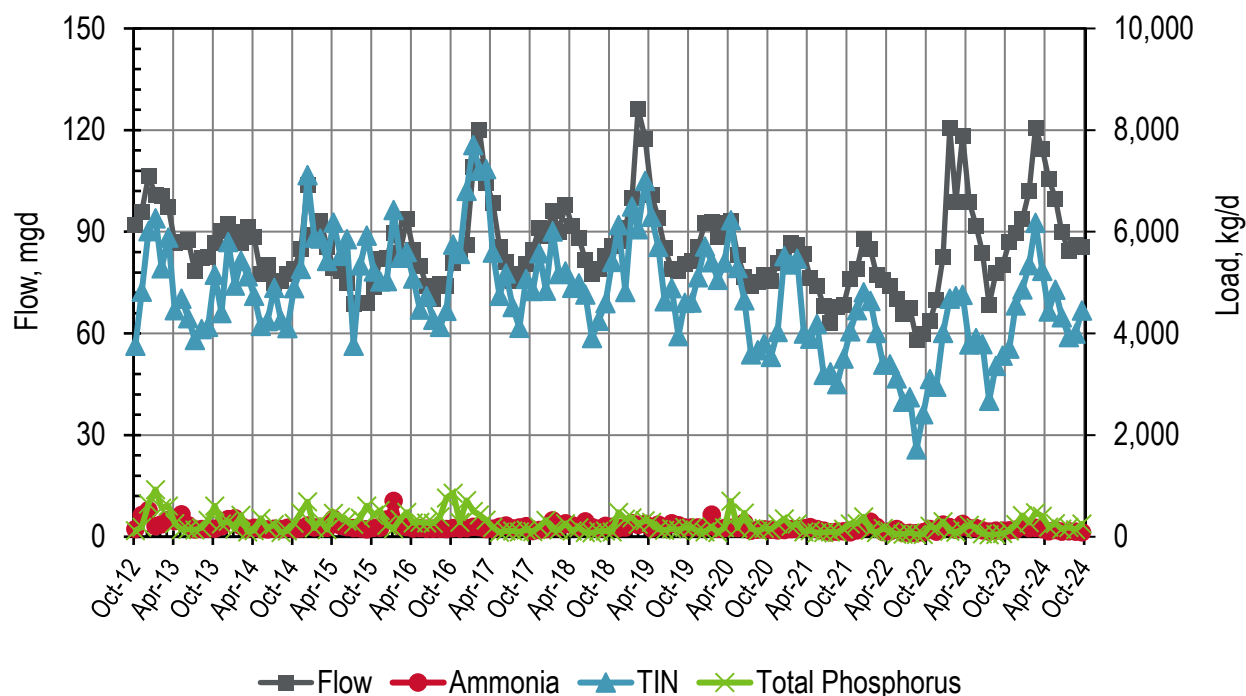


Figure 21-3. Discharge: San Jose Monthly Flows and Loads

Table 21-2. Discharge: San Jose Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	91.9	157	3,600	3,760	124
Nov-12	96.0	433	4,390	4,830	190
Dec-12	107	523	5,490	6,020	646
Jan-13	101	211	6,060	6,270	930
Feb-13	101	247	5,040	5,290	565
Mar-13	97.3	332	5,560	5,890	605
Apr-13	86.9	313	4,150	4,460	261
May-13	87.2	446	4,240	4,690	143
Jun-13	87.5	232	4,070	4,300	149
Jul-13	78.3	148	3,730	3,870	134
Aug-13	82.4	156	3,940	4,090	177
Sep-13	82.6	161	3,970	4,140	323
Oct-13	86.8	161	5,000	5,160	606
Nov-13	90.4	211	4,190	4,410	254
Dec-13	92.3	347	5,450	5,800	307

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Jan-14	89.9	370	4,580	4,950	152
Feb-14	86.7	220	5,220	5,440	426
Mar-14	91.5	162	4,960	5,120	101
Apr-14	88.4	180	4,560	4,740	120
May-14	77.6	153	4,000	4,150	361
Jun-14	80.2	146	4,100	4,240	169
Jul-14	74.9	160	4,740	4,900	244
Aug-14	75.6	152	4,110	4,270	86.8
Sep-14	77.5	181	3,930	4,110	118
Oct-14	79.1	149	4,750	4,900	270
Nov-14	84.9	166	5,110	5,270	475
Dec-14	104	226	6,890	7,120	688
Jan-15	89.0	184	5,710	5,890	171
Feb-15	93.3	195	5,680	5,870	315
Mar-15	85.5	178	5,250	5,430	141
Apr-15	79.4	356	5,830	6,190	463
May-15	78.7	227	5,310	5,530	385
Jun-15	74.9	190	5,670	5,860	312
Jul-15	68.6	175	3,580	3,760	246
Aug-15	69.0	167	5,170	5,340	370
Sep-15	69.2	151	5,770	5,920	608
Oct-15	73.8	178	5,050	5,220	423
Nov-15	82.1	177	4,850	5,030	518
Dec-15	82.4	343	4,690	5,030	231
Jan-16	89.8	710	5,720	6,430	160
Feb-16	83.8	212	5,280	5,490	346
Mar-16	93.8	190	5,420	5,610	483
Apr-16	84.7	166	4,910	5,080	273
May-16	80.1	170	4,300	4,470	287
Jun-16	74.1	163	4,570	4,740	272
Jul-16	70.3	161	4,110	4,270	265
Aug-16	74.7	159	3,970	4,130	394
Sep-16	74.1	156	4,290	4,450	766
Oct-16	80.7	171	5,580	5,750	857
Nov-16	84.6	169	5,400	5,570	287
Dec-16	86.2	172	6,640	6,810	716
Jan-17	109	196	7,510	7,710	502

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Feb-17	120	190	7,020	7,210	432
Mar-17	105	157	7,080	7,240	327
Apr-17	98.7	159	5,430	5,590	187
May-17	85.7	198	4,550	4,750	89.9
Jun-17	81.1	222	4,960	5,190	117
Jul-17	75.5	168	4,360	4,520	114
Aug-17	77.6	185	3,930	4,110	97.8
Sep-17	80.5	214	4,870	5,080	137
Oct-17	84.8	117	4,720	4,840	101
Nov-17	91.1	138	5,440	5,580	201
Dec-17	88.9	154	4,690	4,850	326
Jan-18	96.2	327	5,680	6,010	144
Feb-18	90.0	185	4,990	5,170	139
Mar-18	98.0	269	4,950	5,220	260
Apr-18	91.7	229	4,670	4,900	117
May-18	88.2	177	4,810	4,990	182
Jun-18	81.7	305	4,470	4,770	85.3
Jul-18	77.4	189	3,720	3,910	75.8
Aug-18	79.1	162	4,090	4,250	108
Sep-18	82.9	220	4,380	4,600	114
Oct-18	85.8	195	5,220	5,410	98.7
Nov-18	87.2	171	5,960	6,130	480
Dec-18	91.3	186	4,630	4,820	352
Jan-19	100.0	265	6,240	6,500	372
Feb-19	126	234	5,820	6,050	247
Mar-19	117	255	6,750	7,000	317
Apr-19	101	168	6,130	6,300	288
May-19	94.0	244	5,460	5,710	148
Jun-19	85.2	185	4,450	4,640	129
Jul-19	79.2	267	4,630	4,900	162
Aug-19	78.5	227	3,720	3,950	134
Sep-19	80.4	186	4,420	4,610	185
Oct-19	81.5	185	4,420	4,610	176
Nov-19	85.4	186	4,920	5,110	118
Dec-19	92.6	185	5,530	5,710	95.7
Jan-20	93.0	436	4,970	5,410	199
Feb-20	88.4	159	4,900	5,060	84.9

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Mar-20	92.5	171	5,230	5,400	179
Apr-20	93.2	178	6,050	6,230	704
May-20	83.1	171	5,120	5,290	176
Jun-20	76.8	279	4,380	4,660	469
Jul-20	74.1	121	3,470	3,590	158
Aug-20	75.1	140	3,530	3,670	115
Sep-20	77.2	150	3,650	3,800	164
Oct-20	75.4	145	3,400	3,540	146
Nov-20	81.0	129	3,900	4,030	256
Dec-20	82.5	137	5,390	5,520	355
Jan-21	86.7	155	5,200	5,360	209
Feb-21	86.1	156	5,320	5,470	256
Mar-21	83.5	174	3,830	4,000	97.8
Apr-21	76.4	192	3,710	3,900	121
May-21	74.0	152	4,040	4,190	78.1
Jun-21	68.2	124	3,060	3,190	83.2
Jul-21	63.2	89.4	3,150	3,240	97.8
Aug-21	67.7	101	2,900	3,000	88.6
Sep-21	68.3	112	3,400	3,510	155
Oct-21	76.3	92.8	3,950	4,040	258
Nov-21	79.1	131	4,330	4,460	260
Dec-21	87.9	177	4,640	4,820	396
Jan-22	84.9	299	4,340	4,640	132
Feb-22	77.4	201	3,810	4,010	82.9
Mar-22	75.7	97.0	3,290	3,390	164
Apr-22	74.0	107	3,290	3,400	102
May-22	70.3	154	2,970	3,120	54.8
Jun-22	65.8	77.2	2,580	2,660	50.5
Jul-22	67.6	79.0	2,670	2,740	79.3
Aug-22	58.3	73.5	1,650	1,720	44.2
Sep-22	59.8	88.5	2,330	2,410	47.0
Oct-22	63.6	152	2,950	3,100	211
Nov-22	70.0	103	2,850	2,960	154
Dec-22	82.7	242	3,770	4,020	301
Jan-23	121	191	4,490	4,680	113
Feb-23	98.8	139	4,600	4,740	93.4
Mar-23	118	257	4,510	4,760	150

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Apr-23	98.8	170	3,610	3,780	227
May-23	91.9	172	3,740	3,910	181
Jun-23	83.9	132	3,660	3,790	58.0
Jul-23	68.4	107	2,570	2,680	38.7
Aug-23	77.9	121	3,240	3,370	49.2
Sep-23	80.1	124	3,440	3,560	68.3
Oct-23	87.0	132	3,570	3,700	116
Nov-23	89.8	144	4,410	4,550	245
Dec-23	93.8	213	4,660	4,870	421
Jan-24	102	173	5,180	5,350	279
Feb-24	121	180	6,000	6,180	474
Mar-24	115	153	5,080	5,240	405
Apr-24	106	108	4,330	4,440	192
May-24	99.8	138	4,730	4,860	263
Jun-24	89.8	105	4,220	4,320	151
Jul-24	84.2	108	3,820	3,930	189
Aug-24	86.0	106	3,900	4,000	141
Sep-24	85.4	89.6	4,370	4,460	253
Dry Season Average	77.7	165	4,020	4,180	182
Dry Season Trend **	None	Down	Down	Down	Down
Wet Season Average	91.2	208	4,980	5,190	295
Average Annual	85.6	190	4,580	4,770	248

* The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

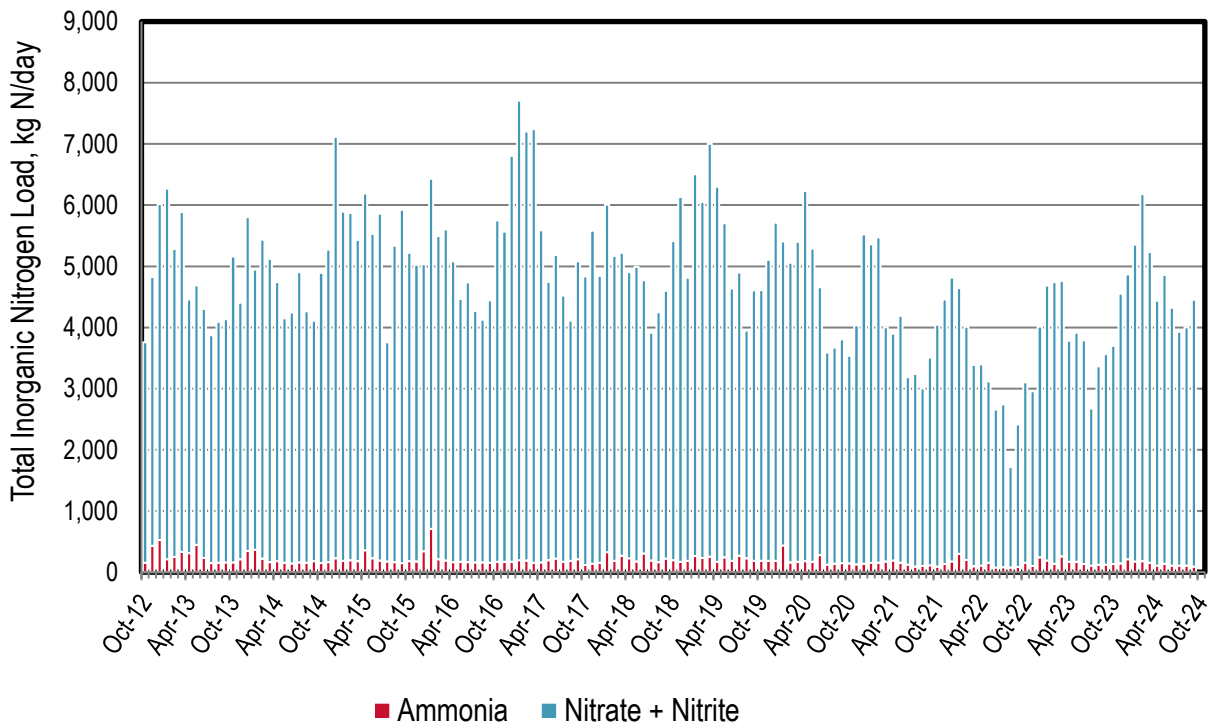


Figure 21-4. Discharge: San Jose Monthly Nitrogen Loads

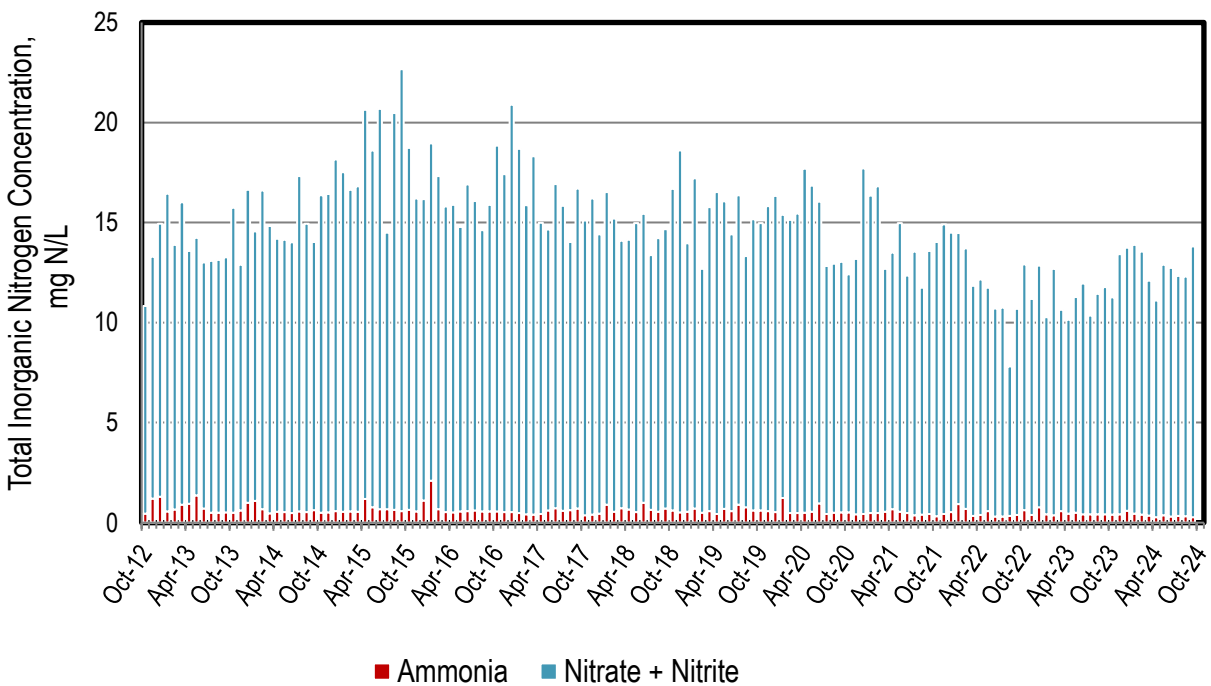


Figure 21-5. Discharge: San Jose Monthly Nitrogen Concentrations

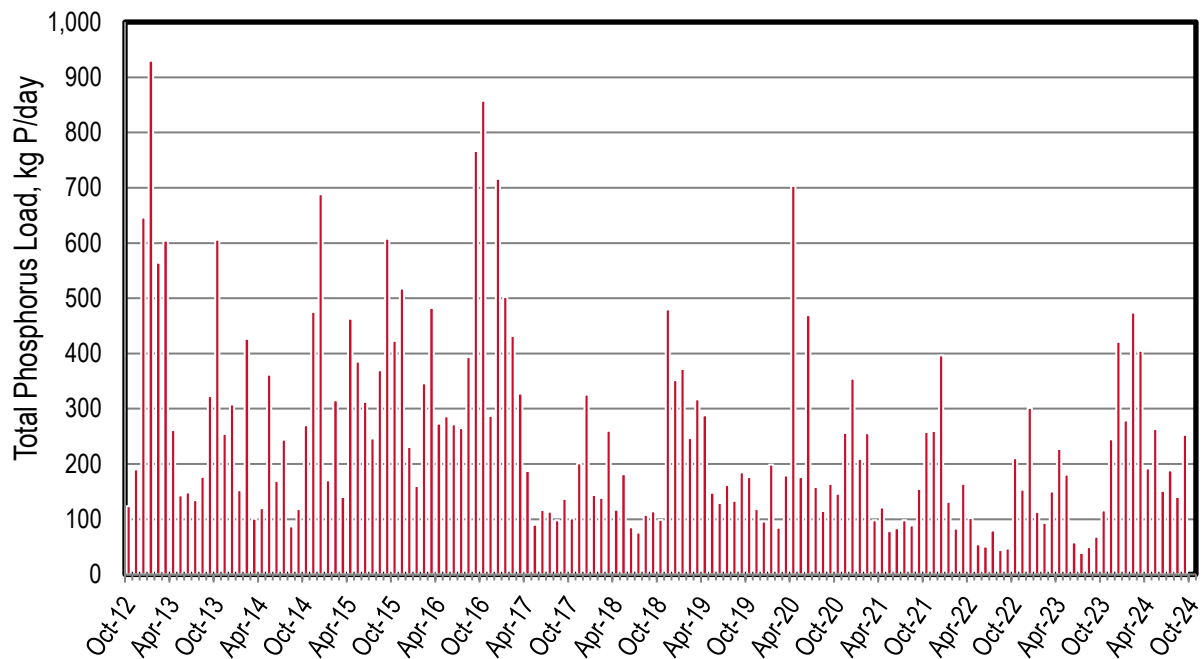


Figure 21-6. Discharge: San Jose Monthly Phosphorus Loads

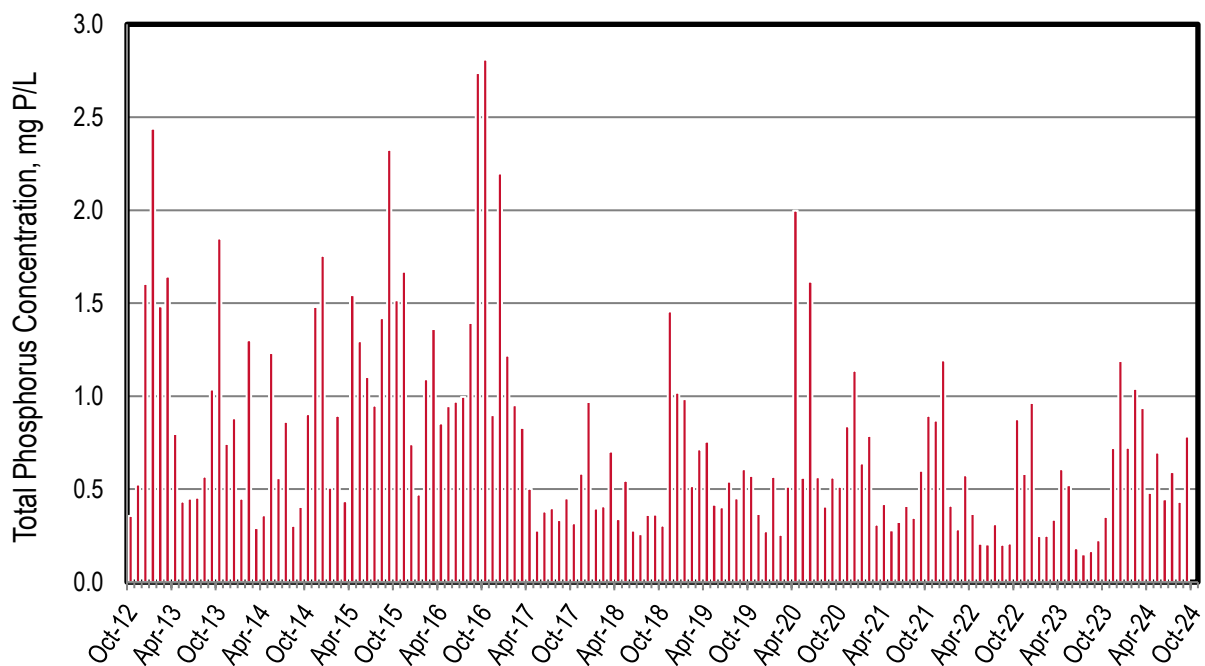


Figure 21-7. Discharge: San Jose Monthly Phosphorus Concentrations

Recycled Water

Table 21-3. Recycled Water: San Jose-Santa Clara Yearly Recycled Water Flows Diverted from the Bay

Year**	Flow Diverted*, Acre-Feet (mgd)							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	1,100 (0.98)	6,320 (5.64)	0 (0)	4,220 (3.77)	1 (<0.01)	0 (0)	39 (0.03)	11,680 (10.4)
2020	938 (0.84)	7,130 (6.37)	0 (0)	4,270 (3.82)	2 (<0.01)	0 (0)	59 (0.05)	12,400 (11.1)
2021	823 (0.73)	6,990 (6.24)	0 (0)	4,320 (3.86)	2 (<0.01)	0 (0)	38 (0.03)	12,170 (10.9)
2022	936 (0.84)	6,830 (6.10)	0 (0)	4,500 (4.01)	2 (<0.01)	0 (0)	8 (0.01)	12,280 (11.0)
2023	934 (0.83)	6,120 (5.46)	0 (0)	5,210 (4.65)	2 (<0.01)	0 (0)	7 (0.01)	12,270 (11.0)
Average	946 (0.84)	6,678 (5.96)	0 (0)	4,504 (4.02)	2 (<0.01)	0 (0)	30 (0.03)	12,160 (10.9)

* Assumes 100% of the recycled flow is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 21-4. Recycled Water: San Jose-Santa Clara Yearly Recycled Water Ammonia Load Diverted from the Bay

Year**	Average Ammonia Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	2	13	0	9	<1	0	<1	24
2020	2	14	0	8	<1	0	<1	25
2021	1	11	0	7	<1	0	<1	20
2022	2	12	0	8	<1	0	<1	22
2023	1	9	0	8	<1	0	<1	18
Average	2	12	0	8	<1	0	<1	22

* Assumes 100% of the recycled load is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 21-5. Recycled Water: San Jose-Santa Clara Yearly Recycled Water Total Inorganic Nitrogen Load Diverted from the Bay

Year**	Average Total Inorganic Nitrogen Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	57	327	0	219	<1	0	2	605
2020	48	361	0	216	<1	0	3	627
2021	39	334	0	207	<1	0	2	582
2022	38	274	0	180	<1	0	<1	492
2023	35	230	0	196	<1	0	<1	461
Average	43	305	0	204	<1	0	2	554

* Assumes 100% of the recycled load is diverted for all recycled water applications

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 21-6. Recycled Water: San Jose-Santa Clara Yearly Recycled Water Total P Load Diverted from the Bay

Year**	Average Total P Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	2	12	0	8	<1	0	<1	22
2020	3	19	0	12	<1	0	<1	34
2021	2	14	0	9	<1	0	<1	25
2022	1	10	0	7	<1	0	<1	18
2023	1	6	0	5	<1	0	<1	13
Average	2	12	0	8	<1	0	<1	22

* Assumes 100% of the recycled load is diverted for all recycled water applications

** **Calendar year as opposed to California's water year (October 1 through September 30)**

22 City of San Mateo

San Mateo discharges to the South Bay and it has approximately 41,434 service connections. The plant has a permitted ADWF capacity of 15.7 mgd and a peak wet weather capacity of 60 mgd. This past dry season average discharge flow was approximately 9.6 mgd. The plant performs secondary treatment using activated sludge. Note: the plant has on-going construction for upgrades that will result in nutrient reduction (emphasis on ammonia and TIN load reduction)

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Influent and Reduction Across the Plant

- ▲ Note: limited to data since July 2019; quarterly data is required but more provided for various parameters.
- ▲ Based on Table 22-1's statistical analysis for the entire dry season dataset, there are no apparent trends for all of the parameters.
- ▲ The flow reduction across the plant can be upwards of 17 percent. The reduction is attributed to biosolids, evaporation associated with the process, and/or flow management during wet weather events.
- ▲ The nitrogen load reduction across the plant is upwards of approximately 54 percent. This load reduction is attributed to a combination of biological assimilation, biosolids management, and/or biological load reduction in the activated sludge system.
- ▲ The phosphorus load reduction across the plant is upwards of approximately 63 percent. This load reduction is attributed to a combination of biological assimilation, biosolids management, and/or chemical precipitation associated with chemical addition in the collection system, headworks, and/or during solids thickening.

◆ Discharge

- ▲ Ammonia is the majority of the nitrogen species discharged, regardless of season. This would be expected since this plant does not fully nitrify. Note: the plant does occasionally nitrify as evidenced by nitrite plus nitrate discharge concentrations greater than influent concentrations. A portion of this produced nitrite plus nitrate is removed.
- ▲ Nitrogen species concentrations are typically highest during the dry season.
- ▲ Total phosphorus concentrations range from 0.5 to 5.0 mg P/L across the entire dataset (1.7 to 4.5 mg P/L for the 2023/2024 dataset). A portion of P is removed as influent concentrations are typically 4.6 mg P/L or greater for all sampling events. The removal mechanism is most likely from ferric addition at solids thickening.
- ▲ Based on Table 22-2 statistics for the entire dry season dataset, nitrite plus nitrate loads over the entire dataset is trending upwards, whereas the dry season ammonia is trending downwards. Such trending would be expected as the plant does occasionally nitrify as previously noted. The flow, TIN, and TP loads over the entire dataset do not appear to have any emerging trends.

- ◆ Recycled Water: No recycled water was produced or distributed this past year.

Influent

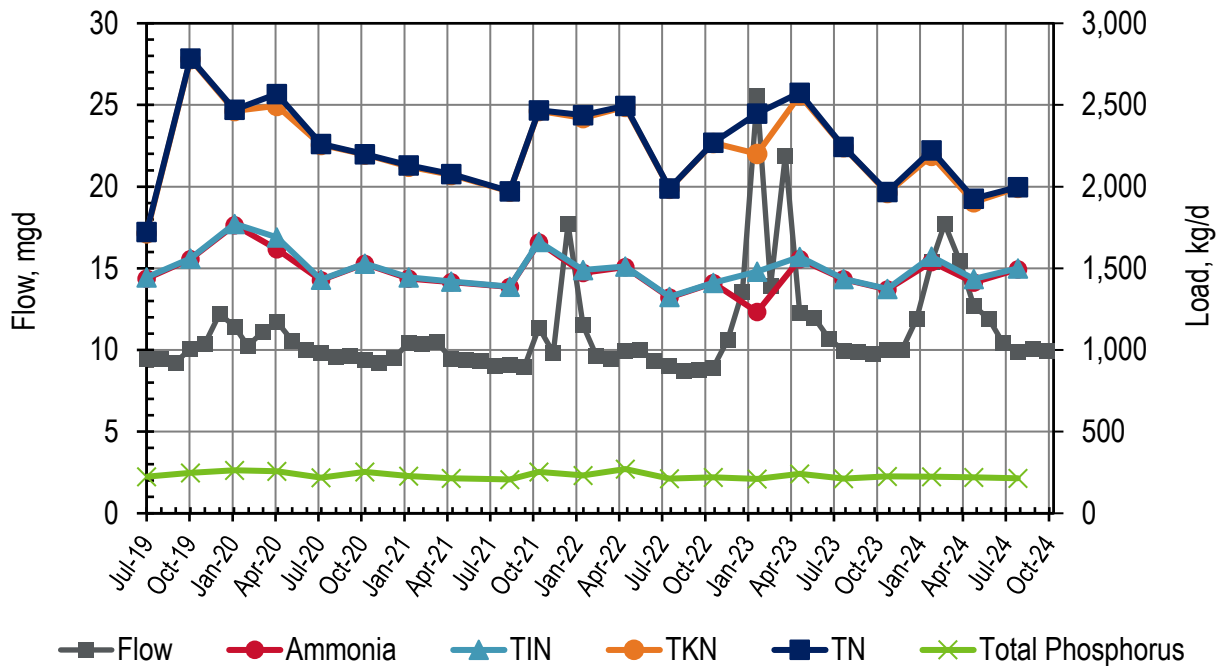


Figure 22-1. Influent: San Mateo Monthly Flows and Loads

Note: the ammonia/TIN loads and TKN/Total N loads are comparable. The ammonia and TKN values are located behind TIN and Total N load lines, respectively.

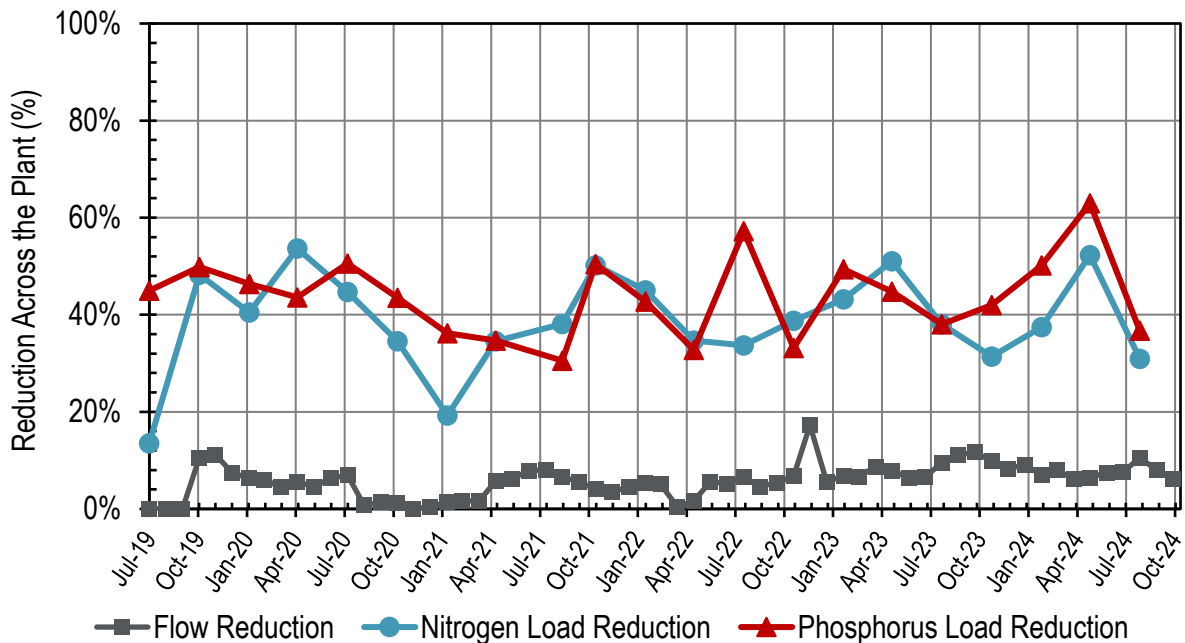


Figure 22-2. Influent: San Mateo Monthly Reductions Across the Plant

Note: Influent TN was compared against Discharge TIN for calculating nitrogen load reduction.

Table 22-1. Influent: San Mateo Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-19	9.44	1,440	7.98	1,440	1,720	1,720	223
Aug-19	9.47	--	--	--	--	--	--
Sep-19	9.24	--	--	--	--	--	--
Oct-19	10.1	1,560	3.86	1,560	2,780	2,790	247
Nov-19	10.4	--	--	--	--	--	--
Dec-19	12.2	--	--	--	--	--	--
Jan-20	11.4	1,760	7.80	1,770	2,460	2,470	263
Feb-20	10.2	--	--	--	--	--	--
Mar-20	11.1	--	--	--	--	--	--
Apr-20	11.7	1,620	72.6	1,690	2,490	2,570	257
May-20	10.6	--	--	--	--	--	--
Jun-20	10.0	--	--	--	--	--	--
Jul-20	9.84	1,430	5.10	1,430	2,260	2,260	218
Aug-20	9.56	--	--	--	--	--	--
Sep-20	9.65	--	--	--	--	--	--
Oct-20	9.39	1,530	3.72	1,530	2,200	2,200	253
Nov-20	9.22	--	--	--	--	--	--
Dec-20	9.49	--	--	--	--	--	--
Jan-21	10.5	1,440	8.34	1,440	2,120	2,130	227
Feb-21	10.4	--	--	--	--	--	--
Mar-21	10.5	--	--	--	--	--	--
Apr-21	9.48	1,410	4.64	1,420	2,070	2,080	214
May-21	9.41	--	--	--	--	--	--
Jun-21	9.32	--	--	--	--	--	--
Jul-21	8.99	--	--	--	--	--	--
Aug-21	9.10	1,390	1.73	1,390	1,970	1,970	207
Sep-21	8.94	--	--	--	--	--	--
Oct-21	11.4	1,660	3.91	1,660	2,460	2,470	254
Nov-21	9.83	--	--	--	--	--	--
Dec-21	17.7	--	--	--	--	--	--
Jan-22	11.5	1,470	17.8	1,490	2,420	2,440	232
Feb-22	9.66	--	--	--	--	--	--
Mar-22	9.48	--	--	--	--	--	--
Apr-22	9.97	1,510	5.24	1,510	2,490	2,490	271
May-22	9.99	--	--	--	--	--	--
Jun-22	9.33	--	--	--	--	--	--

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-22	9.02	1,320	3.43	1,330	1,990	1,990	212
Aug-22	8.73	--	--	--	--	--	--
Sep-22	8.76	--	--	--	--	--	--
Oct-22	8.93	1,410	1.72	1,410	2,270	2,270	220
Nov-22	10.6	--	--	--	--	--	--
Dec-22	13.6	--	--	--	--	--	--
Jan-23	25.5	1,230	247	1,480	2,200	2,450	211
Feb-23	13.9	--	--	--	--	--	--
Mar-23	21.9	--	--	--	--	--	--
Apr-23	12.3	1,560	14.6	1,570	2,560	2,570	241
May-23	12.0	--	--	--	--	--	--
Jun-23	10.7	--	--	--	--	--	--
Jul-23	9.96	1,430	1.84	1,440	2,240	2,240	213
Aug-23	9.90	--	--	--	--	--	--
Sep-23	9.78	--	--	--	--	--	--
Oct-23	10.0	1,370	5.18	1,370	1,960	1,970	226
Nov-23	9.97	--	--	--	--	--	--
Dec-23	11.9	--	--	--	--	--	--
Jan-24	15.4	1,540	33.7	1,570	2,190	2,220	225
Feb-24	17.7	--	--	--	--	--	--
Mar-24	15.4	--	--	--	--	--	--
Apr-24	12.7	1,410	21.5	1,430	1,900	1,930	221
May-24	11.9	--	--	--	--	--	--
Jun-24	10.4	--	--	--	--	--	--
Jul-24	9.88	1,490	4.63	1,500	1,990	2,000	213
Aug-24	10.1	--	--	--	--	--	--
Sep-24	9.94	--	--	--	--	--	--
Dry Season Average	9.78	1,420	4.12	1,420	2,030	2,030	215
Dry Season Trend **	None	None	None	None	None	None	None
Wet Season Average	12.2	1,500	30.1	1,530	2,310	2,340	238
Average Annual	11.1	1,470	22.7	1,500	2,230	2,250	231

* The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values. The Total Nitrogen value is calculated by adding "TKN" and "Nitrate + Nitrite".

** Refer to the Section 3.8 in the main body for a description on the statistical analysis. Insufficient samples to perform statistical trending on nutrient loads.

Discharge

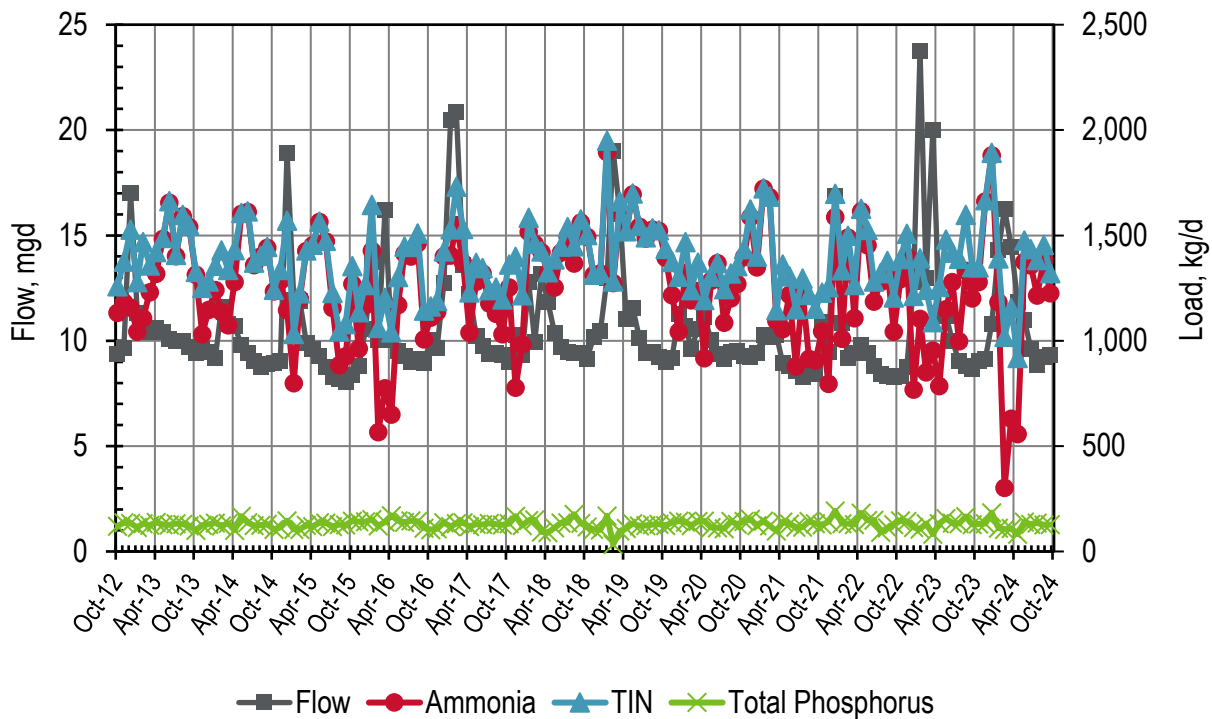


Figure 22-3. Discharge: San Mateo Monthly Flows and Loads

Table 22-2. Discharge: San Mateo Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	9.37	1,130	126	1,260	121
Nov-12	9.65	1,180	192	1,380	137
Dec-12	17.0	1,160	371	1,530	134
Jan-13	11.3	1,040	235	1,280	114
Feb-13	10.5	1,110	362	1,470	132
Mar-13	10.4	1,230	127	1,360	125
Apr-13	10.6	1,320	104	1,420	138
May-13	10.4	1,480	4.45	1,490	128
Jun-13	10.1	1,660	6.85	1,660	127
Jul-13	10.0	1,400	6.42	1,410	132
Aug-13	10.0	1,590	5.84	1,600	129
Sep-13	9.70	1,540	7.72	1,550	122
Oct-13	9.40	1,310	14.1	1,330	100
Nov-13	9.60	1,030	221	1,250	125

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-13	9.50	1,150	135	1,280	129
Jan-14	9.20	1,240	115	1,360	135
Feb-14	11.6	1,140	294	1,430	122
Mar-14	10.8	1,070	263	1,340	134
Apr-14	10.7	1,280	151	1,430	100
May-14	9.80	1,600	5.87	1,610	168
Jun-14	9.40	1,610	3.53	1,620	137
Jul-14	9.05	1,360	12.1	1,370	124
Aug-14	8.76	1,400	2.57	1,400	125
Sep-14	8.89	1,440	4.97	1,450	130
Oct-14	8.95	1,230	7.47	1,240	105
Nov-14	9.07	1,290	50.8	1,340	115
Dec-14	18.9	1,150	425	1,570	146
Jan-15	12.0	800	233	1,030	105
Feb-15	11.9	1,200	26.7	1,230	105
Mar-15	9.93	1,430	3.91	1,430	125
Apr-15	9.62	1,450	1.75	1,460	119
May-15	9.30	1,560	1.95	1,570	137
Jun-15	8.75	1,470	2.84	1,470	135
Jul-15	8.28	1,160	71.4	1,230	119
Aug-15	8.21	885	161	1,050	128
Sep-15	8.07	927	153	1,080	126
Oct-15	8.38	1,270	84.2	1,350	145
Nov-15	8.80	963	173	1,140	142
Dec-15	10.5	1,170	95.8	1,270	142
Jan-16	13.7	1,430	217	1,650	153
Feb-16	10.1	567	495	1,060	123
Mar-16	16.2	775	430	1,200	140
Apr-16	10.0	651	389	1,040	170
May-16	9.51	1,170	134	1,300	146
Jun-16	9.27	1,410	33.1	1,450	139
Jul-16	9.01	1,400	44.4	1,450	146
Aug-16	9.16	1,460	46.7	1,510	143
Sep-16	8.96	1,010	136	1,140	111
Oct-16	10.1	1,110	53.9	1,160	103
Nov-16	9.67	1,140	51.6	1,190	108
Dec-16	12.7	1,400	24.5	1,430	137

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Jan-17	20.5	1,410	124	1,530	118
Feb-17	20.9	1,550	182	1,730	133
Mar-17	13.6	1,370	162	1,530	137
Apr-17	12.2	1,040	190	1,230	118
May-17	10.2	1,280	90.0	1,370	129
Jun-17	9.76	1,320	27.1	1,350	128
Jul-17	9.38	1,180	63.4	1,240	134
Aug-17	9.45	1,130	124	1,250	130
Sep-17	9.34	1,030	166	1,200	126
Oct-17	9.02	1,250	109	1,360	132
Nov-17	10.3	778	621	1,400	168
Dec-17	9.34	983	233	1,220	123
Jan-18	12.8	1,520	67.5	1,580	147
Feb-18	9.93	1,460	2.59	1,460	151
Mar-18	13.2	1,420	3.92	1,420	93.4
Apr-18	11.8	1,320	5.13	1,330	90.0
May-18	10.4	1,250	132	1,390	113
Jun-18	9.73	1,420	29.2	1,450	135
Jul-18	9.46	1,490	47.2	1,540	137
Aug-18	9.46	1,370	82.6	1,450	177
Sep-18	9.40	1,560	15.5	1,580	134
Oct-18	9.16	1,490	9.07	1,500	118
Nov-18	10.2	1,310	2.58	1,310	105
Dec-18	10.4	1,320	2.88	1,320	103
Jan-19	13.0	1,900	54.5	1,950	170
Feb-19	19.0	1,280	6.80	1,280	34.0
Mar-19	16.0	1,610	49.0	1,660	97.3
Apr-19	11.0	1,520	2.96	1,520	110
May-19	11.6	1,700	3.84	1,700	132
Jun-19	10.1	1,540	4.55	1,550	122
Jul-19	9.44	1,490	6.55	1,490	123
Aug-19	9.47	1,530	5.47	1,530	128
Sep-19	9.24	1,520	3.76	1,530	129
Oct-19	9.01	1,400	42.5	1,440	124
Nov-19	9.20	1,220	158	1,370	137
Dec-19	11.3	1,040	261	1,310	145
Jan-20	10.7	1,320	147	1,470	141

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Feb-20	9.63	1,190	48.4	1,240	123
Mar-20	10.6	1,240	135	1,370	143
Apr-20	11.1	917	277	1,190	145
May-20	10.1	1,290	19.2	1,300	114
Jun-20	9.38	1,370	1.43	1,370	113
Jul-20	9.16	1,090	160	1,250	108
Aug-20	9.49	1,200	118	1,320	143
Sep-20	9.53	1,270	85.6	1,360	129
Oct-20	9.27	1,400	38.2	1,440	143
Nov-20	9.23	1,590	36.9	1,620	154
Dec-20	9.45	1,350	52.0	1,400	123
Jan-21	10.3	1,720	1.49	1,720	145
Feb-21	10.2	1,680	1.78	1,680	122
Mar-21	10.3	1,100	50.2	1,150	97.1
Apr-21	8.93	1,060	306	1,360	140
May-21	8.82	1,220	87.9	1,310	131
Jun-21	8.59	878	273	1,150	116
Jul-21	8.26	1,230	63.8	1,300	115
Aug-21	8.50	914	304	1,220	144
Sep-21	8.44	906	247	1,150	133
Oct-21	10.9	1,040	184	1,230	126
Nov-21	9.49	797	458	1,250	141
Dec-21	16.9	1,590	112	1,700	193
Jan-22	10.9	1,010	325	1,340	133
Feb-22	9.17	1,490	9.14	1,500	132
Mar-22	9.44	1,110	157	1,260	127
Apr-22	9.80	1,610	12.7	1,630	182
May-22	9.43	1,450	74.3	1,530	147
Jun-22	8.84	1,190	95.2	1,280	149
Jul-22	8.42	1,280	42.4	1,320	90.9
Aug-22	8.33	1,340	39.9	1,380	113
Sep-22	8.29	1,040	163	1,210	128
Oct-22	8.33	1,290	94.2	1,390	147
Nov-22	8.79	1,400	109	1,510	143
Dec-22	12.8	769	445	1,210	114
Jan-23	23.8	1,110	286	1,390	107
Feb-23	13.0	851	392	1,240	132

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Mar-23	20.0	953	135	1,090	82.2
Apr-23	11.3	786	469	1,260	133
May-23	11.2	1,150	331	1,480	156
Jun-23	10.00	1,280	139	1,420	136
Jul-23	9.02	999	391	1,390	132
Aug-23	8.80	1,330	264	1,600	166
Sep-23	8.64	1,200	149	1,350	129
Oct-23	9.03	1,280	69.6	1,350	131
Nov-23	9.15	1,660	5.95	1,670	132
Dec-23	10.8	1,880	11.9	1,890	185
Jan-24	14.3	1,180	208	1,390	112
Feb-24	16.3	302	718	1,020	105
Mar-24	14.5	631	526	1,160	110
Apr-24	11.9	557	362	919	81.9
May-24	11.0	1,370	102	1,480	139
Jun-24	9.64	1,360	77.0	1,440	129
Jul-24	8.84	1,210	170	1,380	135
Aug-24	9.25	1,380	69.8	1,450	126
Sep-24	9.32	1,230	95.9	1,320	128
Dry Season Average	9.34	1,310	86.8	1,400	131
Dry Season Trend **	None	Down	Up	None	None
Wet Season Average	11.6	1,210	166	1,370	127
Average Annual	10.6	1,250	133	1,380	129

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

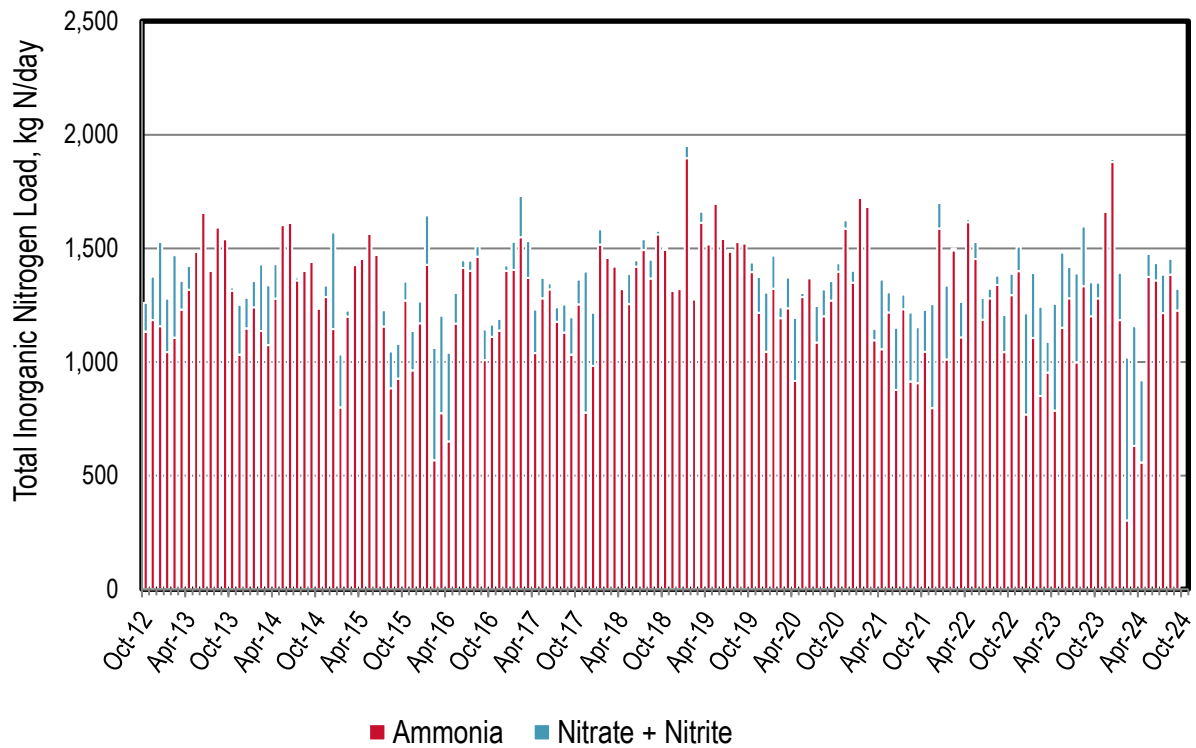


Figure 22-4. Discharge: San Mateo Monthly Nitrogen Loads

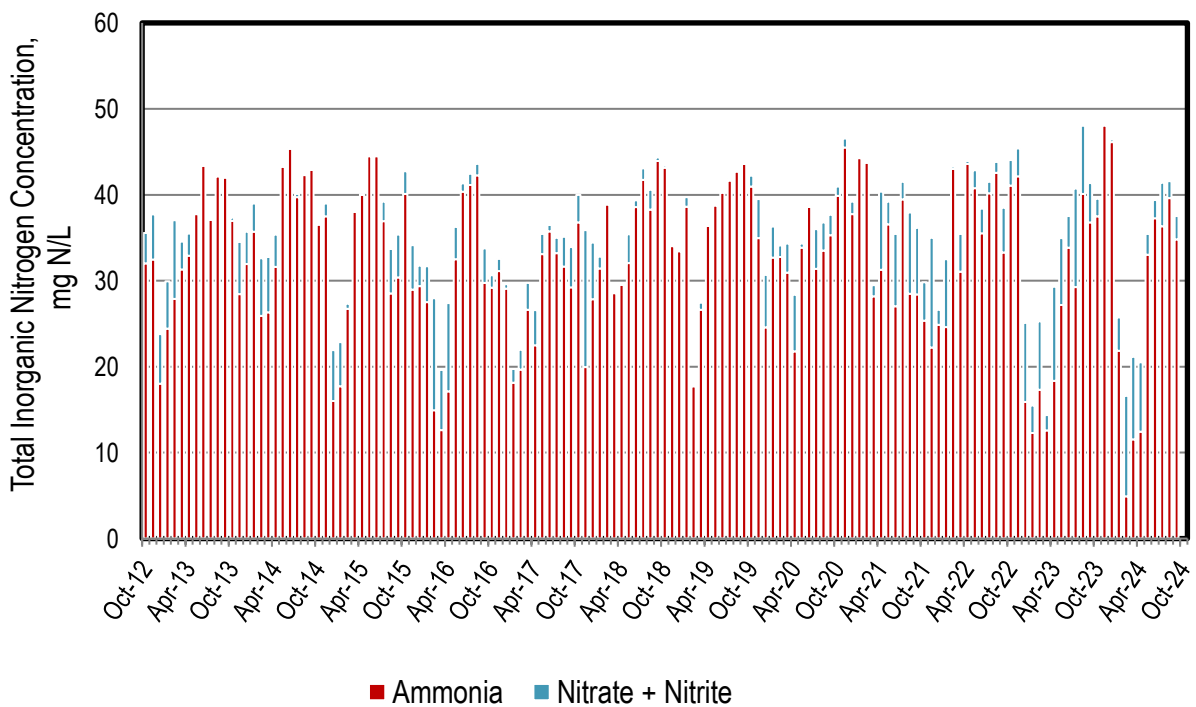


Figure 22-5. Discharge: San Mateo Monthly Nitrogen Concentrations

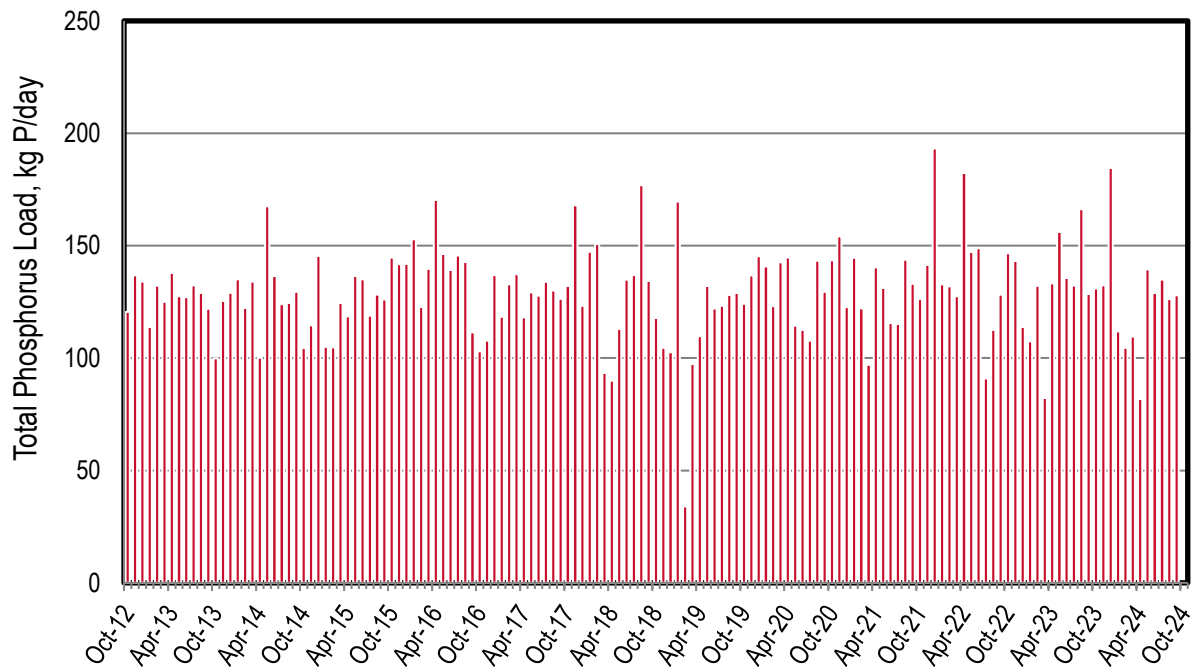


Figure 22-6-Discharge: San Mateo Monthly Phosphorus Loads

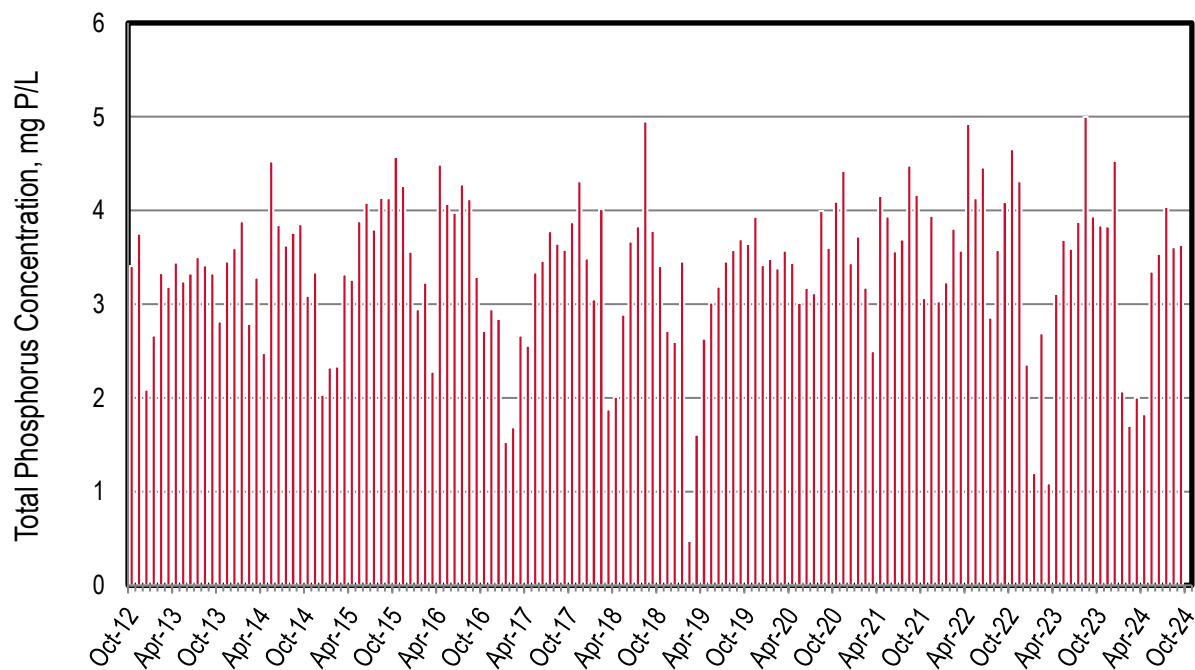


Figure 22-7. Discharge: San Mateo Monthly Phosphorus Concentrations

Recycled Water

No recycled water was produced or distributed this past year.

23 Sewerage Agency of Southern Marin (SASM)

SASM discharges to the Central Bay. The plant has approximately 14,800 service connections and it has a permitted capacity of 3.6 mgd ADWF. This past dry season average discharge flow was approximately 1.85 mgd. The existing plant performs nitrification using trickling filters.

The following observations are made based upon the figures and table in the subsequent pages:

◆ Discharge

- ▲ Total ammonia concentrations range from less than 1 to 20 mg N/L in 2023/2024. Up until year 2018, the values were reliably less than 15 mg N/L. Significant plant improvements in 2018/2019 that included new vertical flow trickling filter media to provide ammonia load reduction resulted in ammonia bleed through which in 2022 the trickling filter media was replaced again with cross-flow media. Therefore, 2023/2024 data showed the lowest average monthly ammonia load since the improvements were implemented in 2018/2019.
- ▲ TIN concentrations range from 7 to 37 mg N/L in 2023/2024. NOx represented the majority of nitrogen species until the ammonia bleed through that began in 2018/2019 as previously stated. Similar to ammonia, the 2023/2024 TIN data showed improvements since the trickling filter media was replaced again in 2022.
- ▲ Total phosphorus concentrations range from 1.1 to 11 mg P/L (<7 mg P/L since November 2018).
- ▲ Based on Table 21-1 statistics for the entire dry season dataset, dry season Ammonia and TIN loads over the entire dataset were trending upwards, while TP loads are trending downwards. The upward trends are attributed to the 2018/2019 plant upgrades as previously noted. The additional capital improvements in 2022 resulted in reversal of the upward trend for Ammonia.

◆ Recycled Water

- ▲ Based on Table 8-3, the plant averaged 0.01 mgd of recycled water over the 2023 calendar year. The primary recycled water use is landscape irrigation.
- ▲ Based on Table 8-4 through Table 8-6, in 2023 the plant averaged the diversion of <1 kg ammonia-N/d, 1 kg TIN-N/d, and <1 kg P/d from the Bay through recycled water.

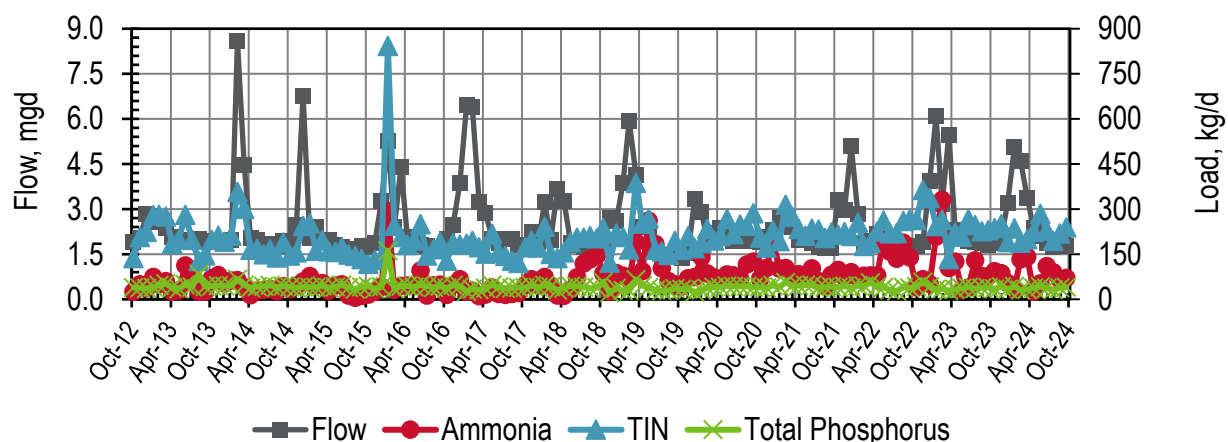


Figure 23-1. Discharge: SASM Monthly Flows and Loads

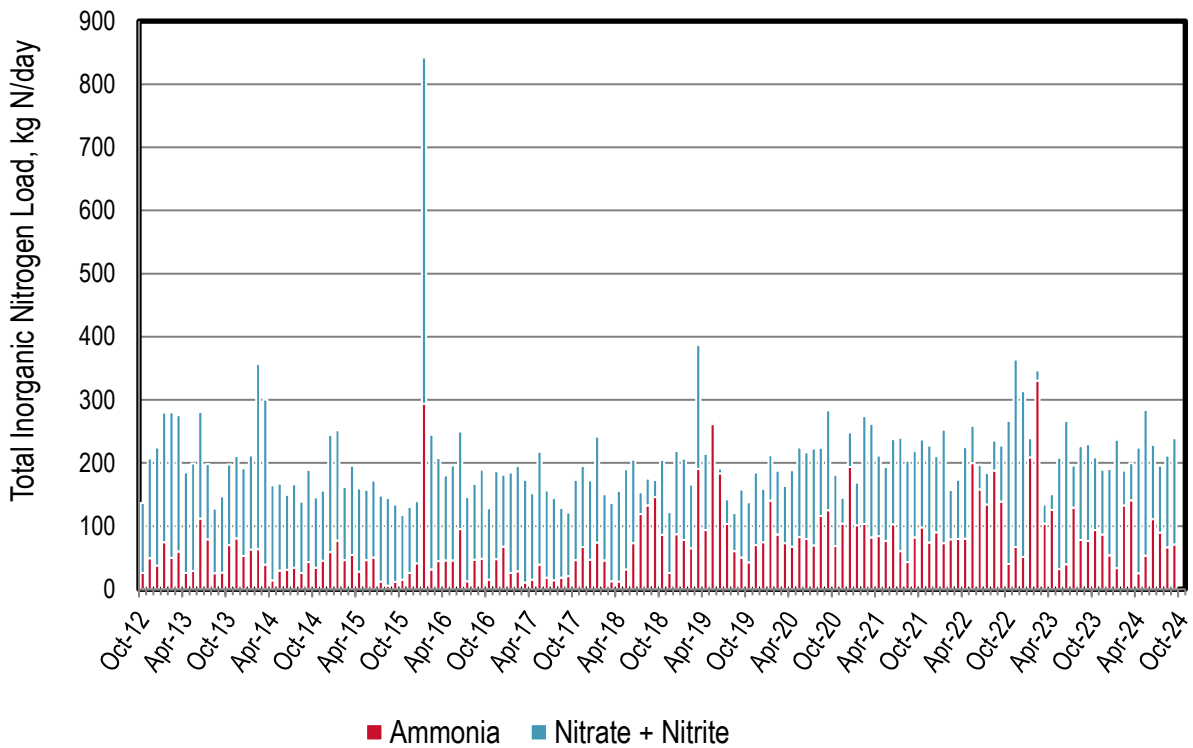


Figure 23-2. Discharge: SASM Monthly Nitrogen Loads

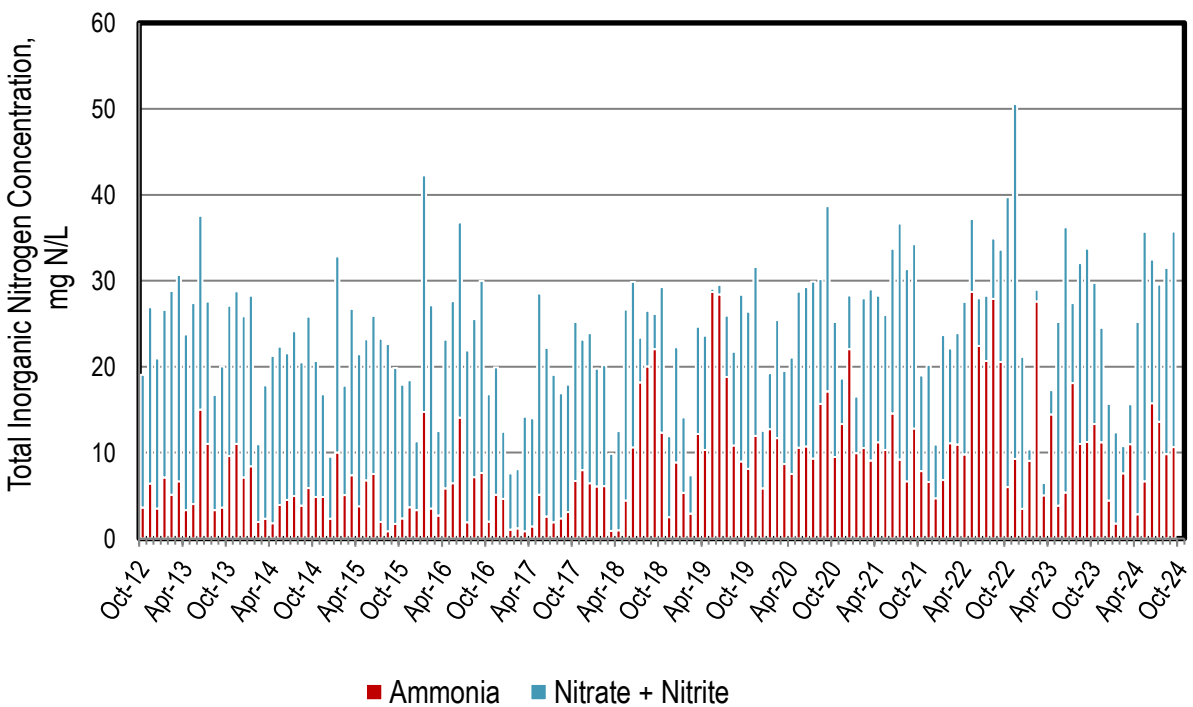


Figure 23-3. Discharge: SASM Monthly Nitrogen Concentrations

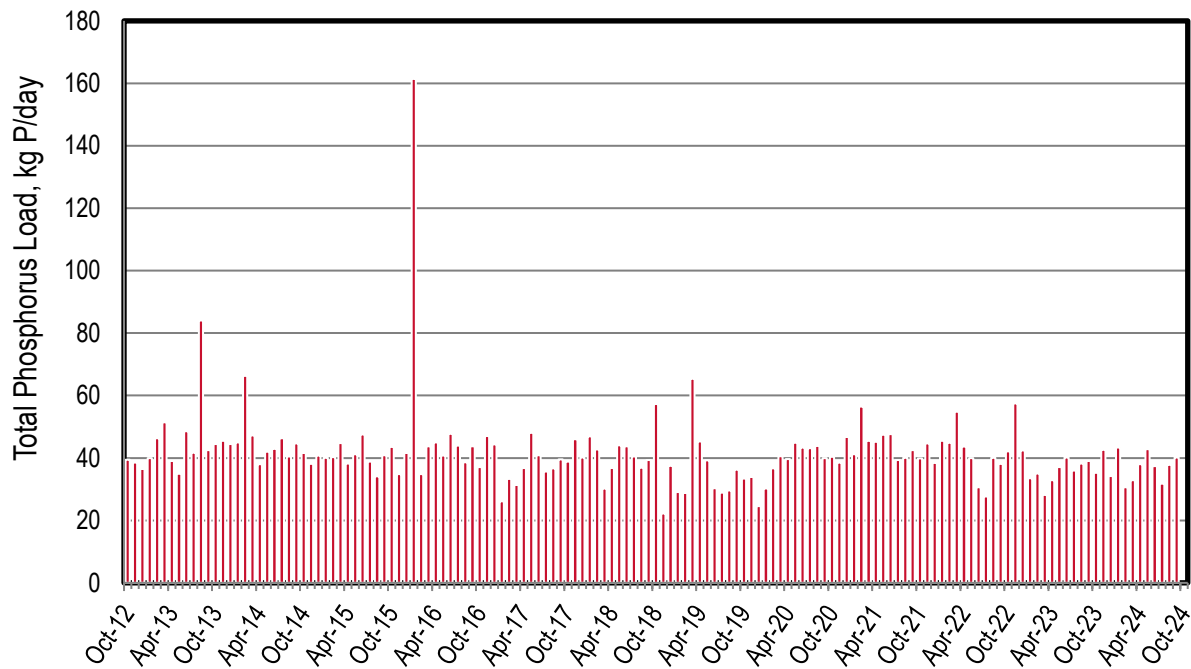


Figure 23-4. Discharge: SASM Monthly Phosphorus Loads

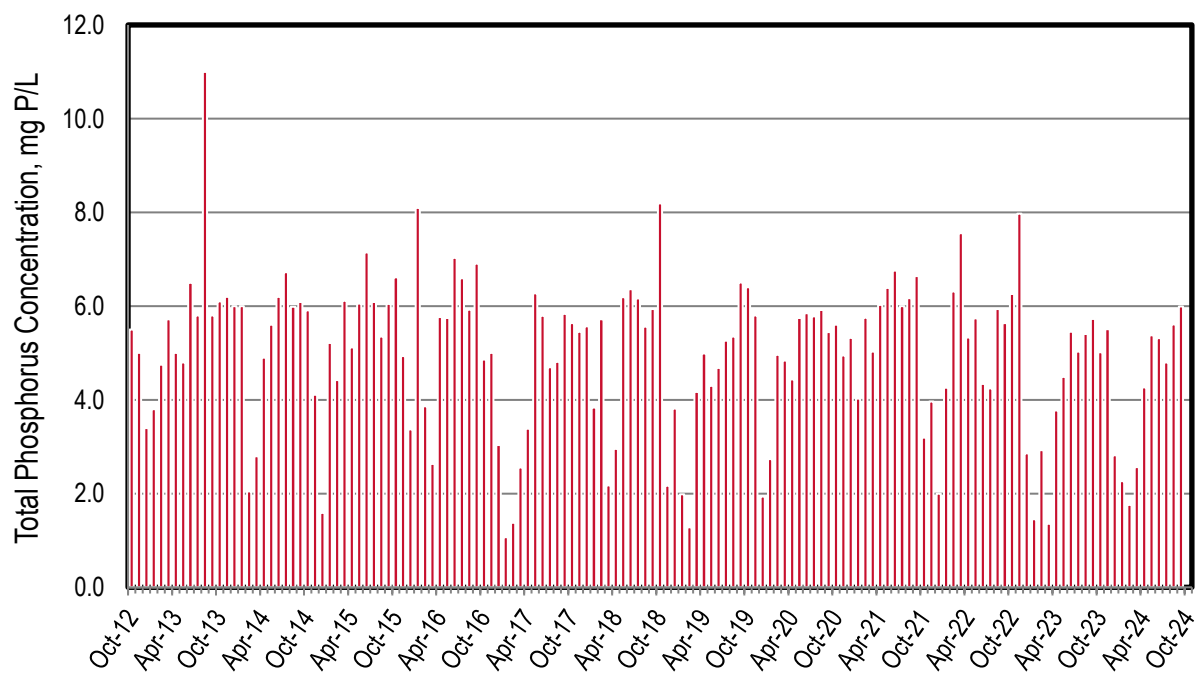


Figure 23-5. Discharge: SASM Monthly Phosphorus Concentrations

Table 23-1. Discharge: SASM Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	1.90	25.8	111	137	39.4
Nov-12	2.04	49.3	158	208	38.5
Dec-12	2.83	37.5	187	224	36.4
Jan-13	2.78	74.6	205	280	39.9
Feb-13	2.58	49.5	231	280	46.3
Mar-13	2.38	60.0	216	276	51.4
Apr-13	2.06	25.7	159	185	39.0
May-13	1.93	29.1	170	199	34.9
Jun-13	1.98	112	169	281	48.6
Jul-13	1.90	79.0	119	198	41.7
Aug-13	2.02	25.2	102	128	84.0
Sep-13	1.94	26.4	120	147	42.5
Oct-13	1.93	70.0	128	198	44.5
Nov-13	1.94	80.7	130	211	45.5
Dec-13	1.96	52.6	139	192	44.5
Jan-14	1.99	63.0	149	212	45.0
Feb-14	8.59	63.1	294	357	66.3
Mar-14	4.46	38.8	262	301	47.2
Apr-14	2.05	13.9	151	165	38.0
May-14	1.98	29.2	138	167	42.0
Jun-14	1.83	31.1	118	149	42.9
Jul-14	1.82	34.0	132	166	46.3
Aug-14	1.79	26.0	113	139	40.5
Sep-14	1.94	43.0	146	189	44.6
Oct-14	1.86	34.0	111	145	41.6
Nov-14	2.46	45.0	111	156	38.1
Dec-14	6.78	59.0	185	244	40.8
Jan-15	2.03	77.0	175	252	40.0
Feb-15	2.41	46.0	116	162	40.2
Mar-15	1.94	54.0	142	196	44.8
Apr-15	1.97	28.0	132	160	38.2
May-15	1.80	46.0	112	158	41.2
Jun-15	1.76	50.0	122	172	47.5
Jul-15	1.69	12.3	136	149	38.8
Aug-15	1.69	5.50	139	145	34.1
Sep-15	1.79	11.6	123	134	40.9

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-15	1.74	15.4	102	118	43.5
Nov-15	1.87	25.8	104	130	34.8
Dec-15	3.26	40.8	98.6	139	41.5
Jan-16	5.28	294	549	843	161
Feb-16	2.39	31.5	214	245	34.9
Mar-16	4.40	44.5	163	208	43.8
Apr-16	2.06	45.7	135	181	45.0
May-16	1.88	45.8	150	196	40.8
Jun-16	1.80	95.5	154	250	47.7
Jul-16	1.76	12.7	133	146	44.0
Aug-16	1.73	46.6	120	167	38.6
Sep-16	1.68	48.3	142	190	43.8
Oct-16	2.02	15.1	113	128	37.1
Nov-16	2.49	47.7	140	187	47.0
Dec-16	3.86	67.3	114	182	44.4
Jan-17	6.46	25.7	159	185	26.1
Feb-17	6.38	28.5	166	195	33.3
Mar-17	3.24	10.7	163	174	31.3
Apr-17	2.88	15.4	137	152	36.8
May-17	2.02	39.1	179	218	48.0
Jun-17	1.87	18.0	139	157	40.9
Jul-17	2.01	14.4	130	145	35.6
Aug-17	2.02	18.0	111	129	36.7
Sep-17	1.79	20.9	101	122	39.6
Oct-17	1.82	46.2	127	174	38.9
Nov-17	2.23	67.0	128	195	46.0
Dec-17	1.91	46.5	126	172	40.2
Jan-18	3.23	74.0	168	242	46.9
Feb-18	1.98	45.7	105	151	42.7
Mar-18	3.68	12.5	125	137	30.2
Apr-18	3.29	12.0	144	156	36.7
May-18	1.88	31.5	158	190	44.1
Jun-18	1.82	72.9	132	205	43.7
Jul-18	1.74	119	34.3	206	40.4
Aug-18	1.75	133	42.9	210	36.8
Sep-18	1.75	146	27.1	203	39.3
Oct-18	1.85	86.3	119	237	57.3

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-18	2.71	25.6	96.6	122	22.3
Dec-18	2.60	87.2	132	219	37.5
Jan-19	3.88	78.2	129	207	29.1
Feb-19	5.95	64.9	101	166	28.8
Mar-19	4.15	191	196	387	65.4
Apr-19	2.40	93.6	121	252	45.3
May-19	2.41	262	3.29	269	39.2
Jun-19	1.71	184	7.27	165	30.3
Jul-19	1.45	103	39.2	159	28.9
Aug-19	1.46	60.1	60.4	148	29.6
Sep-19	1.47	49.9	108	195	36.3
Oct-19	1.38	42.4	95.4	164	33.4
Nov-19	1.55	70.0	115	209	34.0
Dec-19	3.35	74.3	84.8	170	24.6
Jan-20	2.92	140	71.9	187	30.2
Feb-20	1.96	86.5	101	234	36.6
Mar-20	2.22	72.9	91.0	196	40.6
Apr-20	2.37	67.2	121	211	39.7
May-20	2.07	82.7	142	268	44.9
Jun-20	1.96	79.5	137	217	43.4
Jul-20	1.97	69.4	153	248	43.1
Aug-20	1.96	116	108	245	43.9
Sep-20	1.94	125	158	286	39.9
Oct-20	1.91	68.4	113	205	40.3
Nov-20	2.06	104	41.4	172	38.5
Dec-20	2.32	193	54.8	230	46.8
Jan-21	2.71	102	67.4	193	41.2
Feb-21	2.60	104	171	315	56.5
Mar-21	2.39	81.9	180	274	45.4
Apr-21	1.98	84.0	128	233	45.2
May-21	1.97	76.6	117	212	47.5
Jun-21	1.87	103	135	235	47.7
Jul-21	1.73	60.3	180	232	39.3
Aug-21	1.72	43.2	160	204	40.1
Sep-21	1.70	82.1	138	223	42.6
Oct-21	3.30	98.0	139	215	39.8
Nov-21	2.98	74.0	154	223	44.7

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-21	5.09	90.4	121	211	38.4
Jan-22	2.83	72.8	180	255	45.5
Feb-22	1.88	78.8	78.3	178	44.8
Mar-22	1.92	79.5	94.0	188	54.8
Apr-22	2.16	79.9	145	225	43.6
May-22	1.84	200	59.2	262	40.0
Jun-22	1.87	158	39.1	221	30.6
Jul-22	1.72	135	49.6	220	27.6
Aug-22	1.79	188	47.7	261	40.1
Sep-22	1.79	139	88.6	266	38.2
Oct-22	1.78	40.3	227	263	42.1
Nov-22	1.91	66.7	297	364	57.4
Dec-22	3.93	51.2	263	338	42.4
Jan-23	6.10	209	30.4	243	33.5
Feb-23	3.17	330	16.3	264	35.1
Mar-23	5.48	104	30.3	134	28.1
Apr-23	2.30	126	24.6	222	32.9
May-23	2.18	31.7	176	208	37.0
Jun-23	1.95	39.4	227	266	40.1
Jul-23	1.89	129	66.7	247	36.0
Aug-23	1.87	77.9	149	226	38.2
Sep-23	1.80	76.6	153	230	39.0
Oct-23	1.86	93.7	115	237	35.2
Nov-23	2.05	86.7	103	250	42.6
Dec-23	3.22	53.9	137	191	34.2
Jan-24	5.07	33.3	203	236	43.3
Feb-24	4.62	133	55.2	188	30.7
Mar-24	3.39	141	59.1	200	32.9
Apr-24	2.36	25.3	199	224	38.0
May-24	2.10	53.0	231	284	42.8
Jun-24	1.86	111	118	229	37.4
Jul-24	1.75	89.8	106	195	31.7
Aug-24	1.78	66.2	146	219	37.8
Sep-24	1.77	71.2	168	239	40.1

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dry Season Average	1.85	74.7	120	202	40.7
Dry Season Trend **	None	Up	None	Up	Down
Wet Season Average	2.95	71.9	140	217	42.0
Average Annual	2.49	73.1	132	211	41.5

* The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

Recycled Water

Table 23-2. Recycled Water: SASM Yearly Recycled Water Flows Diverted from the Bay

Year**	Flow Diverted*, Acre-Feet (mgd)							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0 (0)	28 (0.02)	0 (0)	0 (0)	0 (0)	0 (0)	1 (<0.01)	29 (0.02)
2020	0 (0)	17 (0.02)	0 (0)	0 (0)	0 (0)	0 (0)	1 (<0.01)	18 (0.02)
2021	0 (0)	14 (0.01)	0 (0)	0 (0)	0 (0)	0 (0)	1 (<0.01)	15 (0.01)
2022	0 (0)	21 (0.02)	0 (0)	0 (0)	0 (0)	0 (0)	1 (<0.01)	23 (0.01)
2023	0 (0)	14 (0.01)	0 (0)	0 (0)	0 (0)	0 (0)	1 (<0.01)	15 (0.01)
Average	0 (0)	19 (0.02)	0 (0)	0 (0)	0 (0)	0 (0)	1 (<0.01)	20 (0.02)

* Assumes 100% of the recycled flow is diverted from the Bay

** Calendar year as opposed to California's water year (October 1 through September 30)

Table 23-3. Recycled Water: SASM Yearly Recycled Water Ammonia Load Diverted from the Bay

Year**	Average Ammonia Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	1	0	0	0	0	<1	1
2020	0	1	0	0	0	0	<1	1
2021	0	<1	0	0	0	0	<1	<1
2022	0	1	0	0	0	0	<1	1
2023	0	<1	0	0	0	0	<1	<1
Average	0	1	0	0	0	0	<1	1

* Assumes 100% of the recycled load is diverted from the Bay

** Calendar year as opposed to California's water year (October 1 through September 30)

Table 23-4. Recycled Water: SASM Yearly Recycled Water Total Inorganic Nitrogen Load Diverted from the Bay

Year**	Average Total Inorganic Nitrogen Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	2	0	0	0	0	<1	2
2020	0	2	0	0	0	0	<1	2
2021	0	1	0	0	0	0	<1	1
2022	0	2	0	0	0	0	<1	2
2023	0	1	0	0	0	0	<1	1
Average	0	2	0	0	0	0	<1	2

* Assumes 100% of the recycled load is diverted for all recycled water applications

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 23-5. Recycled Water: SASM Yearly Recycled Water Total P Load Diverted from the Bay

Year**	Average Total P Load Diverted*, kg P/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	<1	0	0	0	0	<1	<1
2020	0	<1	0	0	0	0	<1	<1
2021	0	<1	0	0	0	0	<1	<1
2022	0	<1	0	0	0	0	<1	<1
2023	0	<1	0	0	0	0	<1	<1
Average	0	<1	0	0	0	0	<1	<1

* Assumes 100% of the recycled load is diverted for all recycled water applications

** **Calendar year as opposed to California's water year (October 1 through September 30)**

24 San Francisco International Airport – MLTP (SFO)

SFO discharges to the South Bay. The plant has a permitted capacity of 3.4 mgd ADWF. The average dry season flow this past year was approximately 1.09 mgd. The process includes two separate treatment processes. Domestic water from the airport facilities is collected through the sanitary sewer collection system and treated with a sequential batch reactor (SBR). Industrial wastewater and storm run-off is treated in the industrial plant, which includes a trickling filter.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Discharge

- ▲ The facility made numerous process changes over the last few years (completed in 2018) to accomplish total inorganic nitrogen load reductions (emphasis on the dry season). After additional construction in 2024, the dry season ammonia concentrations are the lowest since 2020.
- ▲ Historically, phosphorus loads have increased with flow during wet weather events, though in the last several years load distribution has been similar between wet and dry seasons.
- ▲ Total phosphorus concentrations range from <1 to 26.9 mg P/L. This wide range is attributed to a combination of highly variable industrial waste and recent construction.
- ▲ Based on Table 1-1 statistics for the entire dry season dataset, flow, ammonia, nitrite plus nitrate, and TIN loads are trending downwards.

◆ Recycled Water

- ▲ Based on Table 1-2, no water was recycled in the 2024 calendar year. Historically, recycled water has been used for landscape irrigation.

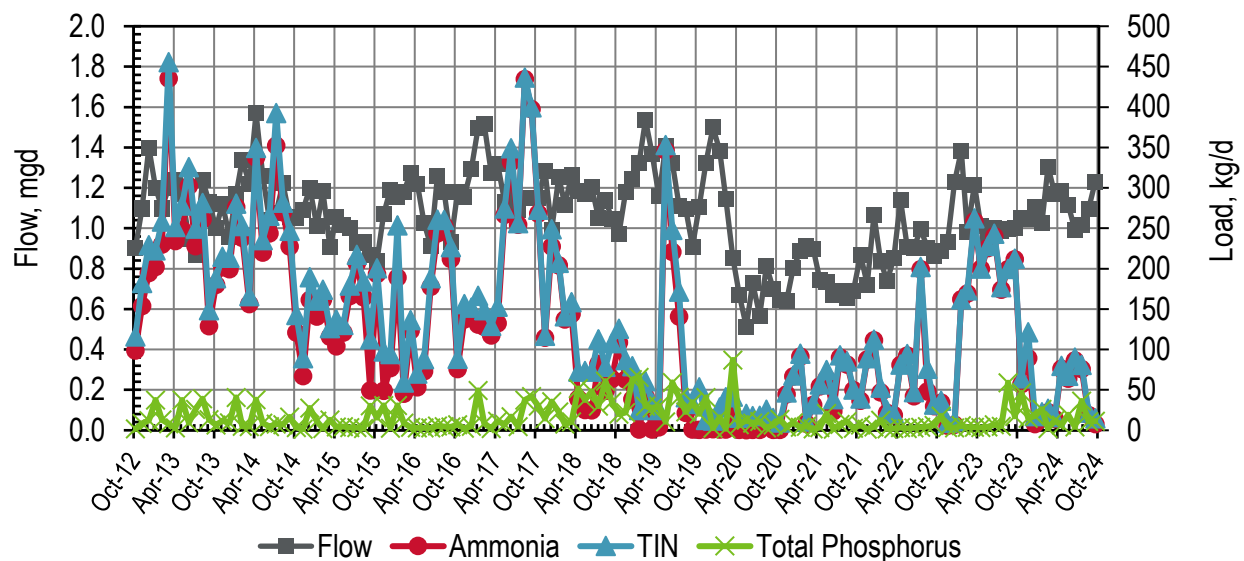


Figure 24-1. Discharge: SFO Airport Monthly Flows and Loads

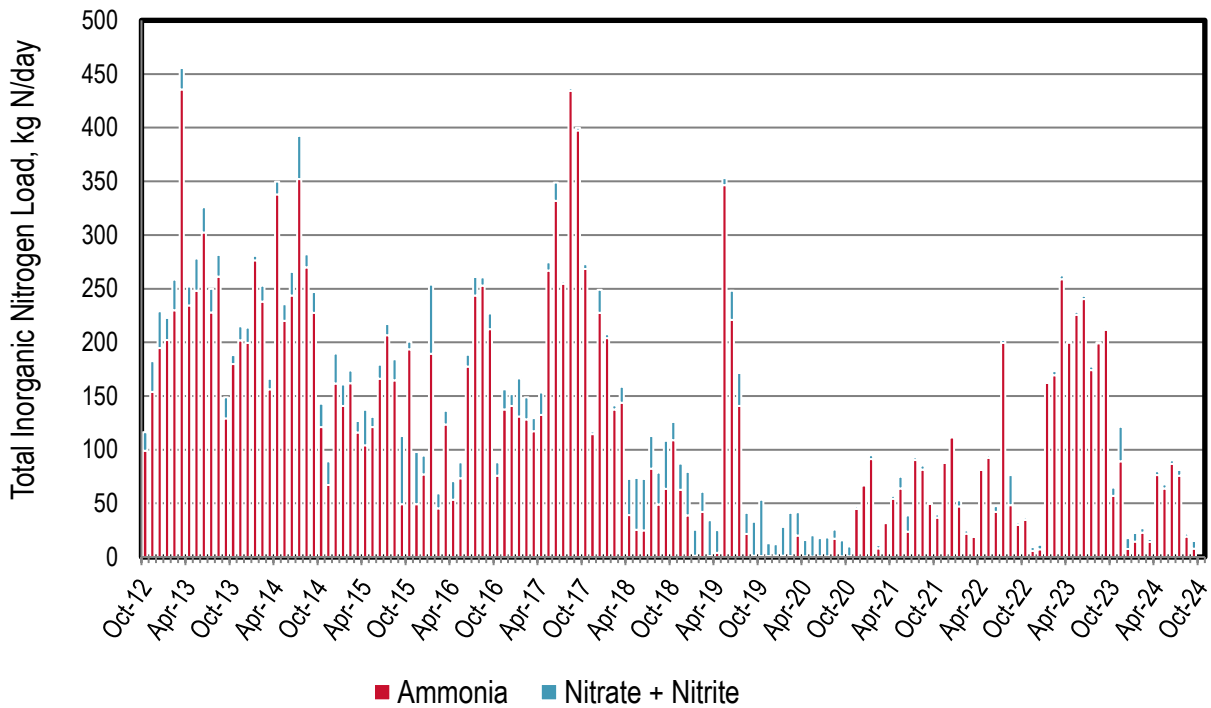


Figure 24-2. Discharge: SFO Airport Monthly Nitrogen Loads

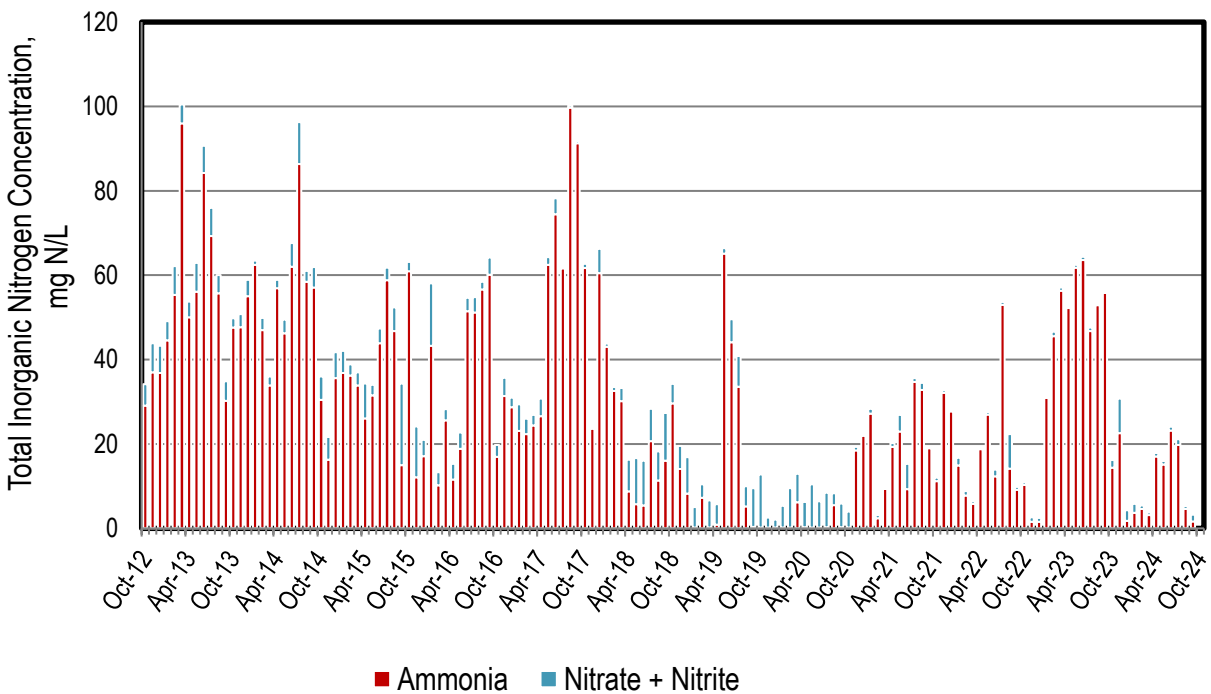


Figure 24-3. Discharge: SFO Airport Monthly Nitrogen Concentrations

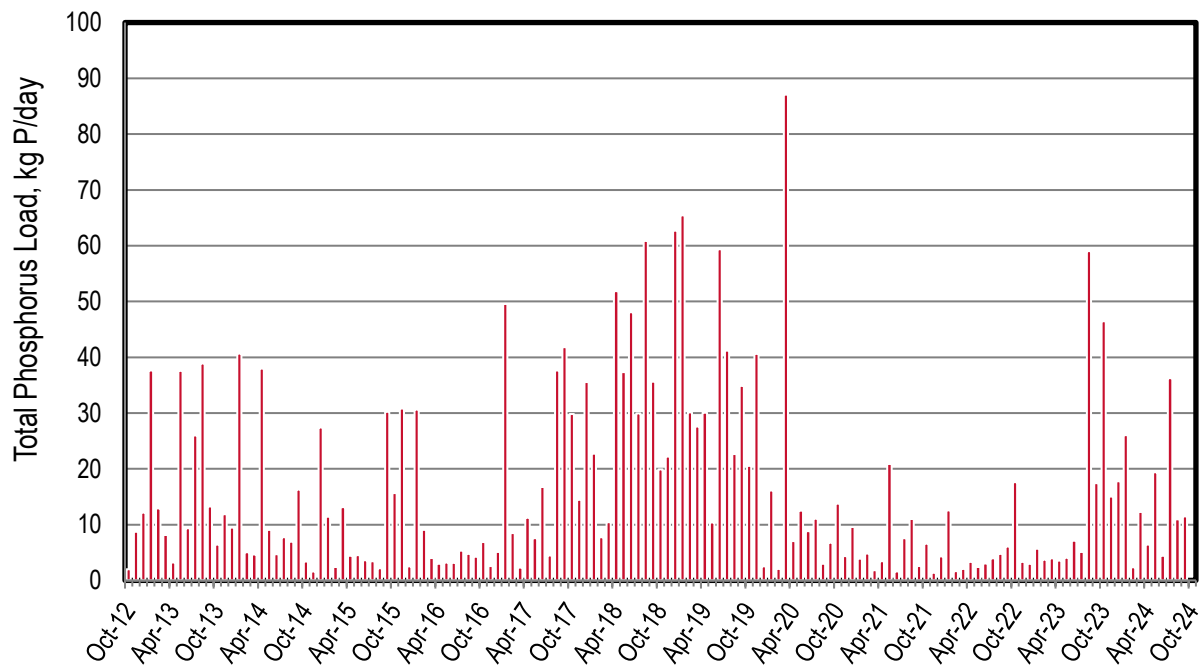


Figure 24-4. Discharge: SFO Airport Monthly Phosphorus Loads

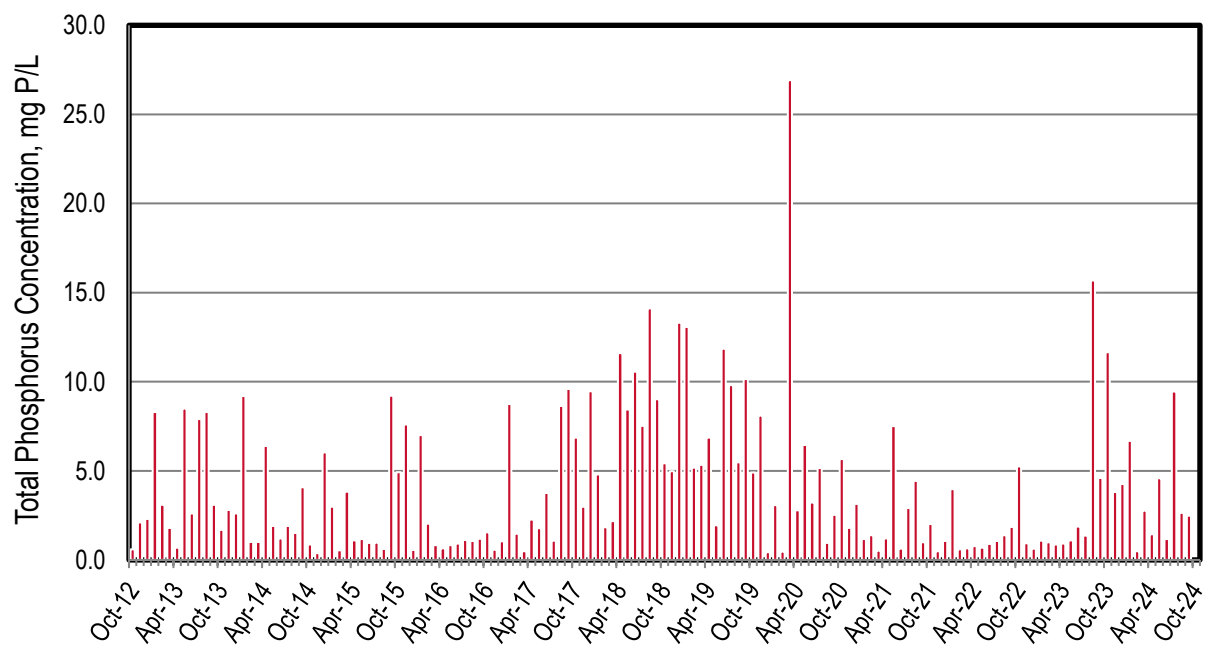


Figure 24-5. Discharge: SFO Airport Monthly Phosphorus Concentrations

Table 24-1. Discharge: SFO Airport Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	0.900	99.0	17.3	116	2.01
Nov-12	1.10	154	28.7	183	8.73
Dec-12	1.40	195	34.3	229	12.2
Jan-13	1.20	202	20.4	223	37.6
Feb-13	1.10	230	28.6	259	12.9
Mar-13	1.20	435	20.2	456	8.16
Apr-13	1.24	234	17.5	252	3.19
May-13	1.17	248	30.1	278	37.6
Jun-13	0.950	302	23.4	326	9.34
Jul-13	0.870	228	22.0	250	26.0
Aug-13	1.24	261	20.2	281	38.9
Sep-13	1.13	129	19.9	149	13.2
Oct-13	1.00	180	8.32	188	6.43
Nov-13	1.12	202	12.9	215	11.9
Dec-13	0.960	200	14.3	214	9.43
Jan-14	1.17	276	4.16	281	40.7
Feb-14	1.34	238	14.7	253	5.07
Mar-14	1.22	156	9.78	166	4.61
Apr-14	1.57	338	11.9	350	38.0
May-14	1.26	220	15.5	236	9.05
Jun-14	1.04	244	22.0	266	4.72
Jul-14	1.08	352	40.3	393	7.74
Aug-14	1.22	270	12.1	282	6.96
Sep-14	1.06	228	19.3	247	16.3
Oct-14	1.05	121	21.9	143	3.40
Nov-14	1.09	67.0	22.3	89.3	1.60
Dec-14	1.20	162	28.0	190	27.4
Jan-15	1.01	141	20.1	161	11.4
Feb-15	1.18	162	12.0	174	2.40
Mar-15	0.906	116	10.8	127	13.1
Apr-15	1.06	104	33.2	137	4.40
May-15	1.01	121	9.52	131	4.50
Jun-15	1.00	166	13.2	179	3.60
Jul-15	0.930	207	10.5	217	3.45
Aug-15	0.930	165	19.6	184	2.17
Sep-15	0.868	49.3	63.4	113	30.2

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-15	0.841	194	7.19	201	15.7
Nov-15	1.07	49.1	48.7	97.9	30.8
Dec-15	1.19	77.0	17.5	94.5	2.51
Jan-16	1.16	189	64.7	254	30.6
Feb-16	1.18	45.4	14.0	59.4	9.08
Mar-16	1.28	124	12.8	136	4.00
Apr-16	1.22	53.4	17.1	70.5	2.96
May-16	1.03	73.2	15.0	88.2	3.19
Jun-16	0.913	178	11.0	189	3.14
Jul-16	1.26	244	17.2	261	5.34
Aug-16	1.18	253	7.79	261	4.72
Sep-16	0.934	212	14.5	227	4.22
Oct-16	1.18	75.7	12.7	88.4	6.88
Nov-16	1.16	137	18.7	156	2.57
Dec-16	1.30	141	11.1	152	5.09
Jan-17	1.50	131	35.5	166	49.6
Feb-17	1.51	128	20.7	149	8.49
Mar-17	1.27	117	12.1	129	2.31
Apr-17	1.32	132	20.8	153	11.2
May-17	1.13	267	7.76	275	7.57
Jun-17	1.18	332	17.0	349	16.8
Jul-17	1.09	255	1.99	257	4.47
Aug-17	1.15	434	2.30	437	37.6
Sep-17	1.15	397	2.26	400	41.8
Oct-17	1.15	268	4.41	273	29.8
Nov-17	1.28	115	2.37	117	14.4
Dec-17	0.995	227	21.6	249	35.6
Jan-18	1.25	204	3.47	208	22.7
Feb-18	1.12	137	3.82	141	7.72
Mar-18	1.26	144	14.9	159	10.4
Apr-18	1.18	39.2	33.7	72.9	51.9
May-18	1.17	25.2	48.3	73.6	37.3
Jun-18	1.20	24.8	48.1	72.9	48.1
Jul-18	1.05	82.2	30.4	113	29.9
Aug-18	1.14	48.8	29.9	78.8	60.9
Sep-18	1.05	63.6	44.5	108	35.6
Oct-18	0.972	109	17.0	126	19.9

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-18	1.18	62.7	24.4	87.1	22.2
Dec-18	1.25	38.7	40.7	79.4	62.7
Jan-19	1.32	1.13	24.1	25.2	65.4
Feb-19	1.54	42.0	18.7	60.7	30.1
Mar-19	1.37	0.866	33.6	34.4	27.6
Apr-19	1.16	3.83	21.3	25.1	30.0
May-19	1.41	346	6.74	353	10.4
Jun-19	1.32	221	27.1	248	59.3
Jul-19	1.11	141	30.7	172	41.2
Aug-19	1.09	21.6	19.6	41.2	22.6
Sep-19	0.910	1.18	31.5	32.7	34.9
Oct-19	1.11	0.842	52.6	53.5	20.5
Nov-19	1.33	0.878	12.1	13.0	40.6
Dec-19	1.50	1.28	10.7	12.0	2.50
Jan-20	1.38	1.15	27.0	28.2	16.1
Feb-20	1.15	0.946	40.2	41.2	2.03
Mar-20	0.855	20.0	21.8	41.8	87.1
Apr-20	0.672	0.674	15.2	15.8	7.07
May-20	0.514	0.431	19.8	20.3	12.5
Jun-20	0.728	0.553	17.1	17.7	8.84
Jul-20	0.568	0.568	17.6	18.2	11.1
Aug-20	0.813	17.0	8.61	25.6	2.95
Sep-20	0.701	0.674	14.8	15.5	6.74
Oct-20	0.645	0.530	9.27	9.80	13.8
Nov-20	0.641	44.8	2.08	46.8	4.37
Dec-20	0.806	66.9	0.956	67.9	9.56
Jan-21	0.887	91.1	3.73	94.9	3.90
Feb-21	0.915	8.22	2.81	11.0	4.81
Mar-21	0.899	31.7	0.625	32.4	1.80
Apr-21	0.745	54.3	2.64	57.0	3.41
May-21	0.736	63.9	10.9	74.8	20.9
Jun-21	0.671	23.5	15.2	38.8	1.60
Jul-21	0.688	90.2	2.51	92.7	7.57
Aug-21	0.655	81.4	3.97	85.4	11.0
Sep-21	0.692	49.6	0.785	50.4	2.58
Oct-21	0.870	36.8	2.86	39.6	6.60
Nov-21	0.722	87.7	1.68	89.3	1.34

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-21	1.07	112	0.894	112	4.29
Jan-22	0.838	47.1	5.81	52.9	12.6
Feb-22	0.737	21.7	3.01	24.7	1.65
Mar-22	0.852	18.7	1.93	20.7	2.07
Apr-22	1.14	81.1	0.483	81.6	3.32
May-22	0.906	92.4	2.12	94.6	2.37
Jun-22	0.904	42.1	5.49	47.6	3.05
Jul-22	0.996	199	2.63	202	3.97
Aug-22	0.905	48.3	28.0	76.3	4.72
Sep-22	0.864	29.9	2.08	32.0	6.06
Oct-22	0.887	34.5	2.10	36.6	17.6
Nov-22	0.933	5.62	3.67	9.29	3.30
Dec-22	1.23	7.15	4.24	11.4	2.96
Jan-23	1.38	162	0.118	162	5.68
Feb-23	0.984	169	3.80	173	3.71
Mar-23	1.22	259	3.67	262	3.97
Apr-23	1.01	200	0.648	200	3.53
May-23	0.966	226	2.59	228	4.05
Jun-23	1.00	240	2.98	243	7.10
Jul-23	0.986	174	3.28	177	5.11
Aug-23	0.996	199	0.689	200	59.0
Sep-23	1.00	212	0.824	213	17.4
Oct-23	1.05	57.1	7.47	64.6	46.4
Nov-23	1.04	89.2	32.1	121	15.0
Dec-23	1.10	7.61	10.1	17.8	17.8
Jan-24	1.03	14.4	8.04	22.5	26.0
Feb-24	1.30	22.5	4.32	26.9	2.37
Mar-24	1.17	13.9	2.71	16.7	12.3
Apr-24	1.18	76.3	3.68	80.0	6.40
May-24	1.12	64.0	3.68	67.6	19.4
Jun-24	0.990	86.7	3.50	90.2	4.39
Jul-24	1.02	75.7	5.38	81.1	36.2
Aug-24	1.10	19.0	2.93	21.9	11.0
Sep-24	1.23	7.73	7.31	15.0	11.5

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dry Season Average	1.000	148	15.7	163	16.7
Dry Season Trend **	Down	Down	Down	Down	None
Wet Season Average	1.11	105	15.2	120	15.4
Average Annual	1.07	123	15.4	138	15.9

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

Recycled Water

Table 24-2. Recycled Water: SFO Airport Yearly Recycled Water Volume Diverted from the Bay

Year**	Flow Diverted*, Acre-Feet (mgd)							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	0 (0)	<1 (<0.01)	0 (0)	0 (0)	0 (0)	0 (0)	<1 (<0.01)	<1 (<0.01)
2020	0 (0)	<1 (<0.01)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	<1 (<0.01)
2021	0 (0)	<1 (<0.01)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	<1 (<0.01)
2022	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2023	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Average	0 (0)	<1 (<0.01)	0 (0)	0 (0)	0 (0)	0 (0)	<1 (<0.01)	<1 (<0.01)

* Assumes 100% of the recycled flow is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 24-3. Recycled Water: SFO Airport Yearly Recycled Water Ammonia Load Diverted from the Bay

Year**	Average Ammonia Load Diverted*, kg N/d							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	0	<1	0	0	0	0	<1	<1
2020	0	<1	0	0	0	0	0	<1
2021	0	<1	0	0	0	0	0	<1
2022	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0
Average	0	<1	0	0	0	0	<1	<1

* Assumes 100% of the recycled load is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 24-4. Recycled Water: SFO Airport Yearly Recycled Water TIN Load Diverted from the Bay

Year**	Average Total Inorganic Nitrogen Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	<1	0	0	0	0	<1	<1
2020	0	<1	0	0	0	0	0	<1
2021	0	<1	0	0	0	0	0	<1
2022	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0
Average	0	<1	0	0	0	0	<1	<1

* Assumes 100% of the recycled load is diverted for all recycled water applications

** Calendar year as opposed to California's water year (October 1 through September 30)

Table 24-5. Recycled Water: SFO Airport Yearly Recycled Water Total P Load Diverted from the Bay

Year**	Average Total P Load Diverted*, kg P/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	<1	0	0	0	0	<1	<1
2020	0	<1	0	0	0	0	0	<1
2021	0	<1	0	0	0	0	0	<1
2022	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0
Average	0	<1	0	0	0	0	<1	<1

* Assumes 100% of the recycled load is diverted for all recycled water applications

** Calendar year as opposed to California's water year (October 1 through September 30)

25 SFPUC Southeast Plant

SFPUC has a combined collection system, discharges to the South Bay, and serves approximately 450,000 service connections. The plant has a permitted ADWF capacity of 85.4 mgd and a peak wet weather capacity of 250 mgd (150 mgd secondary, 100 mgd primary). The average dry season flow this past year was approximately 45.4 mgd. The plant performs secondary treatment using a high purity oxygen system.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Influent

- ▲ Note: observations are limited to data since July 2019 (quarterly sampling required).
- ▲ Average monthly influent flows peaked in January of 2023 due to several wet weather events that month.
- ▲ Influent average monthly nitrogen loads were greatest in July 2021. The values during this month are in question as i) ammonia values are greater than the reported TKN which should not be the case as TKN = ammonia plus organic nitrogen and ii) the corresponding ammonia concentration for this month is nearly double the average value. A correction to this was made by assuming TKN = ammonia only for July 2021.
- ▲ No significant flow and load reductions across the plant are expected because the facility does not recycle water. Note: calculating flow and load reductions across the plant cannot be easily quantified because the permit has separate permit-designated monitoring locations for dry and wet weather effluent, and a single monitoring location for influent.
- ▲ Based on a statistical analysis performed for the entire dry season dataset since 2019 (see Table 1-1), there are no apparent trends for any of the evaluated parameters.

◆ Discharge

- ▲ Ammonia and TIN loads do not always increase with elevated flows typically associated with rain events during the wet season.
- ▲ Ammonia is the majority of the nitrogen species discharged, regardless of season. This is expected because this plant does not nitrify.
- ▲ Based on the average dry season monthly loads since 2012 in Table 1-2, there appears to be a dry season downward trend for all parameters monitored aside from total phosphorus which has no trend.

◆ Recycled Water: No recycled water was produced or distributed this year.

Influent

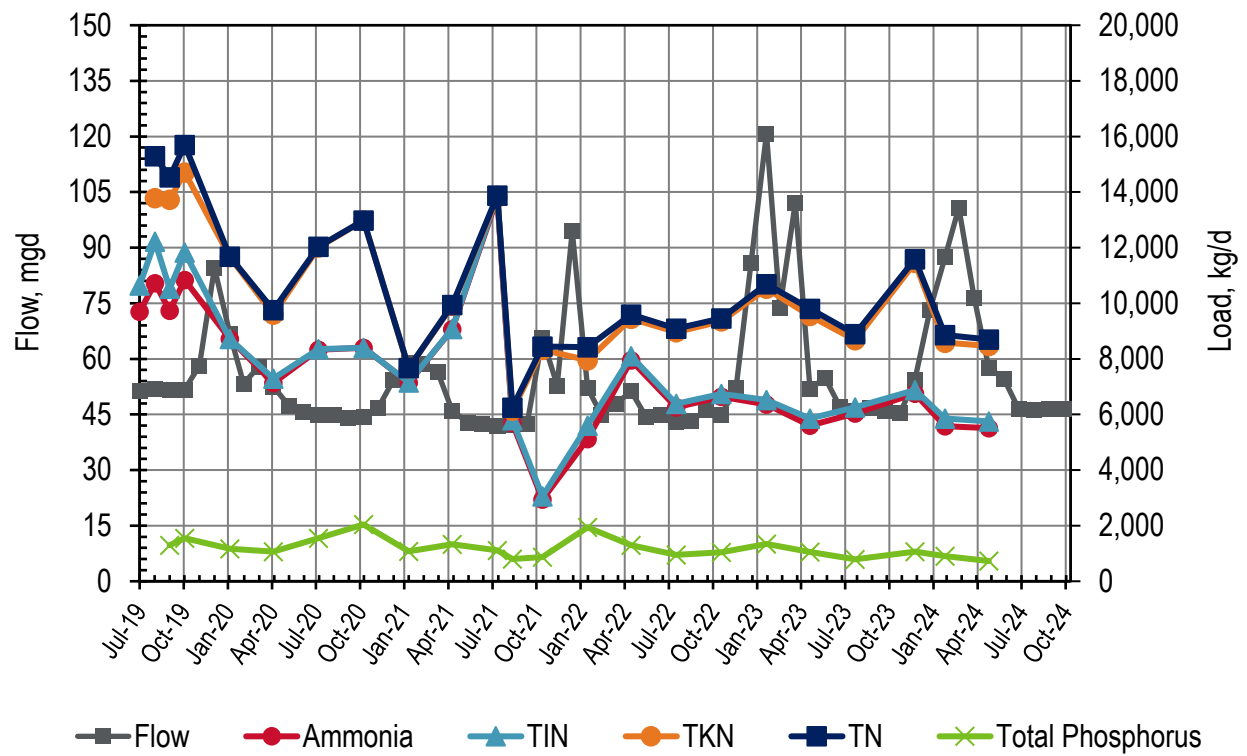


Figure 25-1. Influent: SFPUC Southeast Monthly Flows and Loads

Table 25-1. Influent: SFPUC Southeast Monthly Flows and Loads^{1,*}

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	TKN	Total N *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-19	51.3	9,700	940	10,600	--	--	--
Aug-19	51.9	10,700	1,500	12,200	13,800	15,300	--
Sep-19	51.6	9,730	797	10,500	13,700	14,500	1,300
Oct-19	51.8	10,800	986	11,800	14,700	15,700	1,550
Nov-19	58.1	--	--	--	--	--	--
Dec-19	84.5	--	--	--	--	--	--
Jan-20	66.8	8,720	8.74	8,730	11,700	11,700	1,170
Feb-20	53.3	--	--	--	--	--	--
Mar-20	57.9	--	--	--	--	--	--
Apr-20	52.6	7,130	158	7,290	9,600	9,750	1,060
May-20	47.5	--	--	--	--	--	--
Jun-20	45.6	--	--	--	--	--	--
Jul-20	44.8	8,330	28.0	8,350	12,000	12,000	1,550
Aug-20	44.8	--	--	--	--	--	--
Sep-20	44.0	--	--	--	--	--	--
Oct-20	44.2	8,400	7.66	8,400	13,000	13,000	2,040
Nov-20	46.8	--	--	--	--	--	--
Dec-20	54.3	--	--	--	--	--	--
Jan-21	58.8	7,140	8.10	7,150	7,670	7,670	1,080
Feb-21	58.8	--	--	--	--	--	--
Mar-21	56.6	--	--	--	--	--	--
Apr-21	46.0	9,060	15.7	9,080	9,920	9,940	1,330
May-21	42.9	--	--	--	--	--	--
Jun-21	42.4	--	--	--	--	--	--
Jul-21	41.8	13,800	75.8	13,900	13,800**	13,900**	1,120
Aug-21	42.3	5,700	101	5,800	6,150	6,250	804
Sep-21	42.6	--	--	--	--	--	--
Oct-21	65.7	2,940	114	3,060	8,330	8,450	874
Nov-21	52.8	--	--	--	--	--	--
Dec-21	94.5	--	--	--	--	--	--
Jan-22	52.1	5,120	477	5,600	7,950	8,430	1,940
Feb-22	45.0	--	--	--	--	--	--
Mar-22	48.0	--	--	--	--	--	--
Apr-22	51.3	7,950	146	8,100	9,450	9,590	1,290
May-22	44.4	--	--	--	--	--	--
Jun-22	45.1	--	--	--	--	--	--
Jul-22	43.1	6,250	134	6,390	8,960	9,090	947

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN *	TKN	Total N *	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Aug-22	43.3	--	--	--	--	--	--
Sep-22	46.2	--	--	--	--	--	--
Oct-22	45.0	6,630	107	6,740	9,350	9,460	1,040
Nov-22	52.2	--	--	--	--	--	--
Dec-22	86.0	--	--	--	--	--	--
Jan-23	121	6,360	154	6,520	10,500	10,700	1,340
Feb-23	73.8	--	--	--	--	--	--
Mar-23	102	--	--	--	--	--	--
Apr-23	51.9	5,610	249	5,860	9,550	9,800	1,060
May-23	54.9	--	--	--	--	--	--
Jun-23	47.2	--	--	--	--	--	--
Jul-23	46.0	6,040	217	6,260	8,680	8,890	790
Aug-23	46.7	--	--	--	--	--	--
Sep-23	46.0	--	--	--	--	--	--
Oct-23	45.4	--	--	--	--	--	--
Nov-23	54.4	6,750	131	6,880	11,500	11,600	1,060
Dec-23	73.2	--	--	--	--	--	--
Jan-24	87.4	5,580	279	5,860	8,580	8,860	901
Feb-24	101	--	--	--	--	--	--
Mar-24	76.5	--	--	--	--	--	--
Apr-24	57.5	5,510	236	5,750	8,460	8,700	728
May-24	54.6	--	--	--	--	--	--
Jun-24	46.5	--	--	--	--	--	--
Jul-24	46.1	--	--	--	--	--	--
Aug-24	46.5	--	--	--	--	--	--
Sep-24	46.4	--	--	--	--	--	--
Dry Season Average	46.3	8,780	474	9,260	11,000	11,400	1,080
Dry Season Trend ***	None	None	None	None	None	None	None
Wet Season Average	63.6	6,920	205	7,120	10,000	10,200	1,230
Average Annual	55.9	7,570	299	7,860	10,300	10,600	1,190

1 For non-detects after October 1, 2023, 1/2 of the method detection limit was used to quantify values. Prior to October 1, 2023, non-detect values used the provided method detection limit.

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values. The Total Nitrogen value is calculated by adding “TKN” and “Nitrate + Nitrite”.

** The Total Kjeldahl Nitrogen value for July 2021 has been assumed equal to the “Ammonia” value as the reported Total Kjeldahl Nitrogen value for July 2021 was less than the “Ammonia” value.

*** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

Discharge

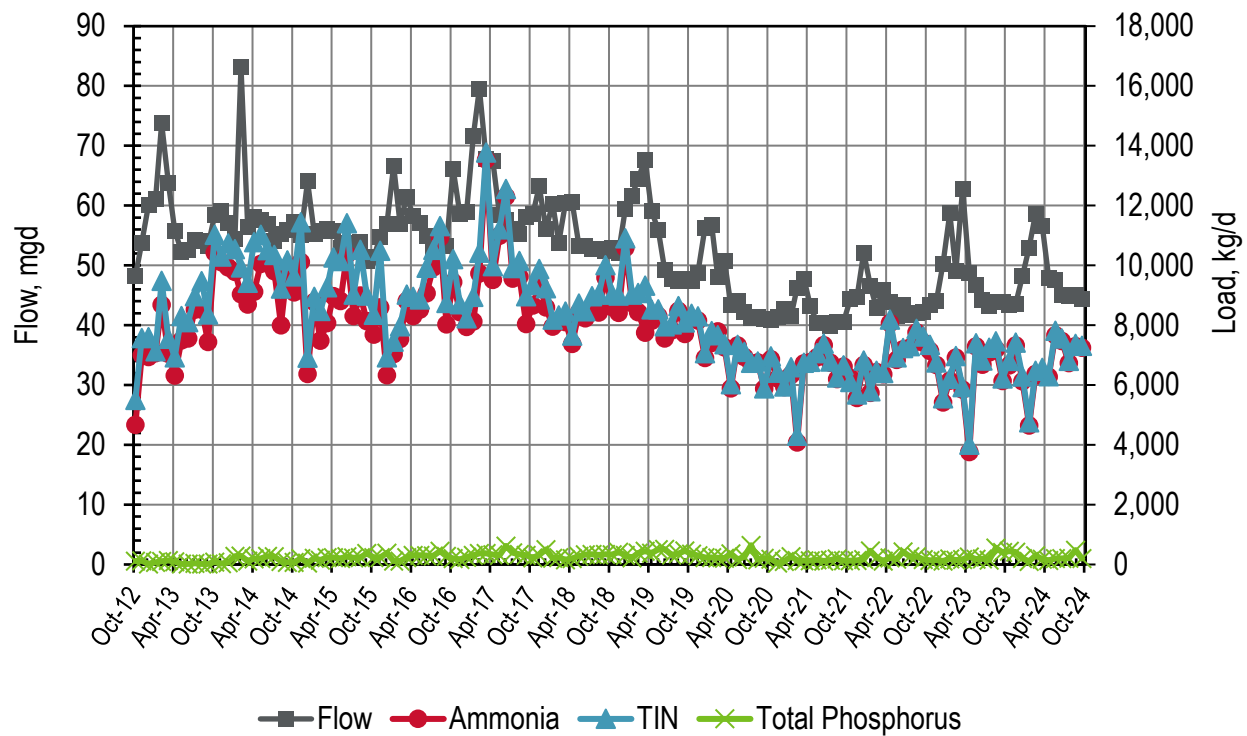


Figure 25-2. Discharge: SFPUC Southeast Monthly Flows and Loads

Table 25-2. Discharge: SFPUC Southeast Monthly Flows and Loads¹

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	48.2	4,670	832	5,510	118
Nov-12	53.8	7,010	570	7,580	131
Dec-12	60.2	6,940	663	7,600	22.7
Jan-13	61.1	7,070	65.0	7,130	69.9
Feb-13	73.8	8,680	810	9,490	110
Mar-13	63.8	7,050	506	7,560	134
Apr-13	55.9	6,330	600	6,930	100
May-13	52.3	7,500	813	8,310	19.8
Jun-13	52.6	7,560	550	8,110	19.9
Jul-13	54.3	8,530	451	8,980	39.9
Aug-13	54.0	8,530	956	9,480	20.4
Sep-13	53.4	7,450	920	8,370	20.2
Oct-13	58.4	10,400	600	11,000	84.9
Nov-13	59.1	10,100	194	10,300	32.2

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-13	57.1	9,930	804	10,700	61.1
Jan-14	54.5	9,780	769	10,600	272
Feb-14	83.2	9,040	895	9,940	289
Mar-14	56.4	8,700	726	9,420	119
Apr-14	58.2	9,130	1,650	10,800	192
May-14	57.7	10,100	973	11,000	207
Jun-14	56.9	10,100	452	10,500	274
Jul-14	54.2	9,810	549	10,400	263
Aug-14	55.2	8,010	1,230	9,240	109
Sep-14	55.9	9,940	235	10,200	69.0
Oct-14	57.3	9,110	528	9,640	70.0
Nov-14	55.1	10,100	1,330	11,400	203
Dec-14	64.1	6,370	544	6,920	53.0
Jan-15	55.3	8,780	168	8,950	217
Feb-15	55.8	7,490	997	8,490	148
Mar-15	56.1	8,070	1,210	9,280	230
Apr-15	55.8	8,980	1,300	10,300	231
May-15	52.9	8,810	1,340	10,200	206
Jun-15	53.7	10,400	1,050	11,400	266
Jul-15	52.6	8,310	714	9,030	226
Aug-15	53.9	9,000	1,520	10,500	239
Sep-15	50.8	8,140	856	8,990	377
Oct-15	51.4	7,690	668	8,360	234
Nov-15	54.8	8,600	1,900	10,500	230
Dec-15	56.9	6,340	591	6,930	384
Jan-16	66.7	7,040	425	7,460	120
Feb-16	57.0	7,540	427	7,970	122
Mar-16	61.5	8,810	217	9,030	232
Apr-16	58.3	8,310	643	8,950	315
May-16	57.1	8,530	344	8,870	309
Jun-16	55.0	9,070	856	9,930	295
Jul-16	53.1	9,930	591	10,500	284
Aug-16	54.6	10,900	388	11,300	450
Sep-16	53.3	8,030	723	8,750	273
Oct-16	66.1	9,440	777	10,200	204
Nov-16	58.6	8,440	263	8,710	169
Dec-16	58.9	7,950	287	8,240	246

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Jan-17	71.6	8,130	828	8,960	310
Feb-17	79.6	9,740	686	10,400	377
Mar-17	67.9	13,500	236	13,800	370
Apr-17	67.5	9,520	458	9,980	328
May-17	58.4	11,000	213	11,200	314
Jun-17	57.7	12,300	253	12,600	619
Jul-17	56.1	9,570	349	9,920	396
Aug-17	55.3	9,630	524	10,200	338
Sep-17	58.2	8,040	938	8,980	308
Oct-17	58.6	8,670	680	9,350	221
Nov-17	63.3	9,390	495	9,890	317
Dec-17	56.1	8,600	641	9,240	498
Jan-18	60.4	7,960	239	8,200	209
Feb-18	53.8	8,120	211	8,330	239
Mar-18	60.4	8,110	359	8,470	160
Apr-18	60.6	7,380	284	7,660	200
May-18	53.3	8,430	291	8,730	276
Jun-18	53.3	8,240	235	8,470	327
Jul-18	52.7	8,630	346	8,980	338
Aug-18	52.7	8,440	607	9,040	321
Sep-18	52.4	9,590	423	10,000	344
Oct-18	53.0	8,610	419	9,030	333
Nov-18	52.1	8,420	579	9,000	419
Dec-18	59.5	10,600	317	10,900	308
Jan-19	61.7	8,740	290	9,030	228
Feb-19	64.5	8,440	636	9,080	386
Mar-19	67.7	7,760	825	9,320	448
Apr-19	59.1	8,150	388	8,540	382
May-19	55.9	8,310	222	8,530	498
Jun-19	49.3	7,560	357	7,970	510
Jul-19	47.8	7,830	207	8,030	324
Aug-19	47.3	8,480	167	8,650	366
Sep-19	47.8	7,720	384	8,100	464
Oct-19	47.5	8,230	160	8,390	348
Nov-19	48.8	8,160	140	8,300	297
Dec-19	56.3	6,910	159	7,070	239
Jan-20	56.7	7,410	393	7,800	230

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Feb-20	48.0	7,800	211	7,670	219
Mar-20	50.7	7,270	12.9	7,380	214
Apr-20	43.3	5,890	138	6,030	367
May-20	44.1	7,330	20.6	7,350	166
Jun-20	42.3	6,950	171	7,120	253
Jul-20	41.2	6,730	19.1	6,750	643
Aug-20	41.3	6,760	28.9	6,790	163
Sep-20	41.0	5,890	6.83	5,900	209
Oct-20	40.9	6,870	100	6,970	177
Nov-20	41.4	6,230	197	6,420	55.4
Dec-20	42.8	5,940	201	5,960	111
Jan-21	41.6	6,350	252	6,600	267
Feb-21	46.3	4,090	223	4,310	139
Mar-21	47.8	6,730	21.7	6,750	130
Apr-21	43.3	6,770	10.3	6,780	130
May-21	40.4	6,930	137	7,070	159
Jun-21	40.5	7,340	49.2	7,390	117
Jul-21	39.8	6,750	44.7	6,790	146
Aug-21	40.6	6,200	58.0	6,260	193
Sep-21	40.6	6,620	45.8	6,670	132
Oct-21	44.3	6,240	97.6	6,110	132
Nov-21	44.6	5,570	116	5,690	140
Dec-21	52.1	6,670	149	6,820	169
Jan-22	46.5	5,740	51.0	5,790	461
Feb-22	42.8	6,440	47.4	6,480	236
Mar-22	45.9	6,360	48.0	6,410	115
Apr-22	44.0	8,080	117	8,190	226
May-22	41.6	6,840	90.1	6,930	177
Jun-22	43.4	7,200	49.0	7,250	428
Jul-22	41.7	7,250	57.5	7,310	263
Aug-22	42.1	7,770	117	7,890	266
Sep-22	42.3	7,430	198	7,620	165
Oct-22	43.3	7,140	209	7,350	142
Nov-22	44.0	6,680	81.5	6,760	148
Dec-22	50.4	5,420	140	5,560	117
Jan-23	58.8	6,150	57.8	6,210	192
Feb-23	49.1	6,920	55.9	6,970	147

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Mar-23	62.9	5,860	84.8	5,940	176
Apr-23	48.8	3,760	252	4,020	255
May-23	46.8	7,300	104	7,400	180
Jun-23	44.2	6,690	140	6,830	193
Jul-23	43.2	7,100	155	7,250	144
Aug-23	43.9	7,200	268	7,460	560
Sep-23	43.9	6,140	90.7	6,230	408
Oct-23	43.4	6,660	155	6,820	449
Nov-23	43.6	7,320	99.2	7,420	418
Dec-23	48.2	6,130	159	6,290	200
Jan-24	53.0	4,650	111	4,770	106
Feb-24	58.7	6,370	107	6,480	294
Mar-24	56.6	6,300	273	6,580	179
Apr-24	48.0	6,280	26.4	6,300	137
May-24	47.7	7,670	148	7,820	205
Jun-24	45.0	7,470	86.9	7,560	198
Jul-24	45.0	6,740	76.8	6,820	208
Aug-24	45.2	7,310	73.8	7,390	477
Sep-24	44.4	7,250	65.9	7,320	198
Dry Season Average	49.2	8,120	389	8,510	266
Dry Season Trend **	Down	Down	Down	Down	None
Wet Season Average	55.2	7,610	419	8,030	217
Average Annual	52.7	7,820	406	8,230	237

1 For non-detects after October 1, 2023, 1/2 of the method detection limit was used to quantify values. Prior to October 1, 2023, non-detect values used the provided method detection limit.

* The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

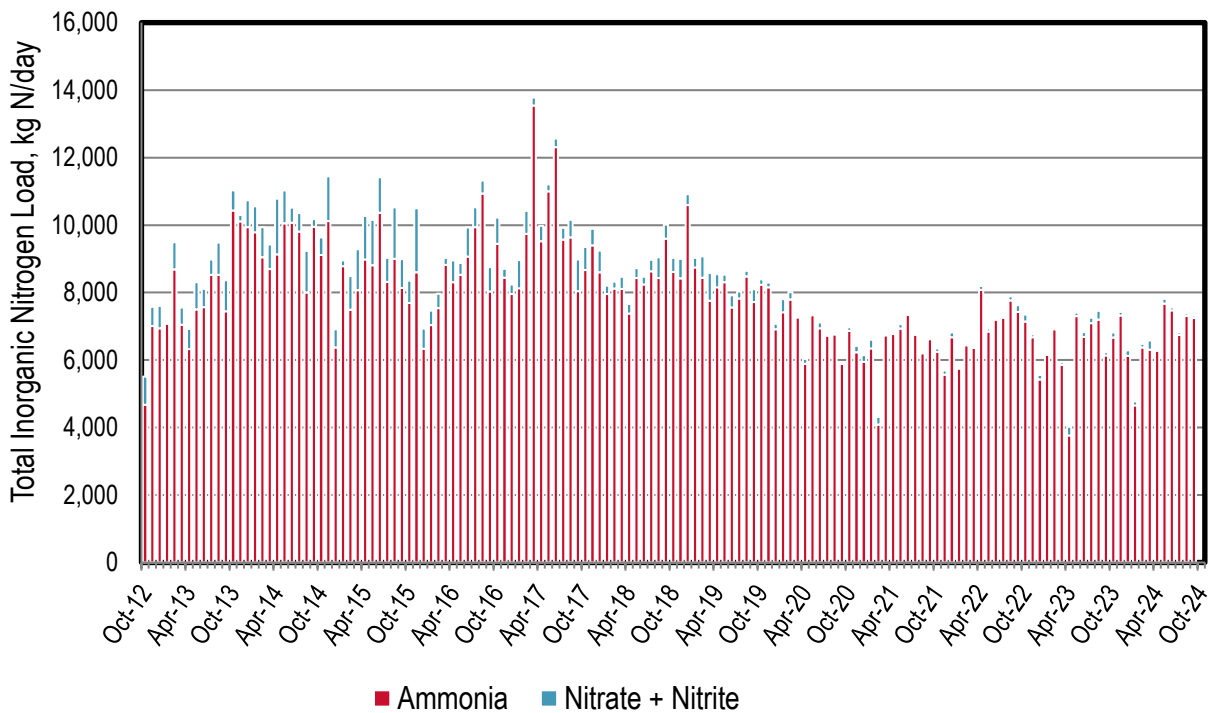


Figure 25-3. Discharge: SFPUC Southeast Monthly Nitrogen Loads

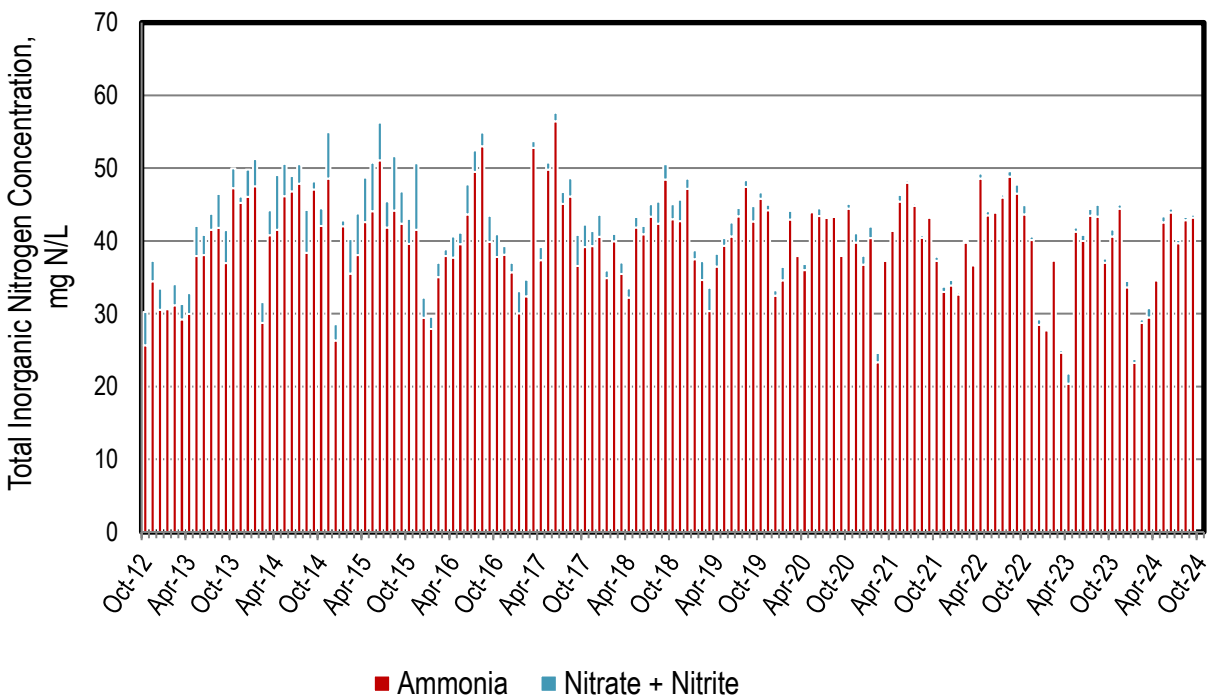


Figure 25-4. Discharge: SFPUC Southeast Monthly Nitrogen Concentrations

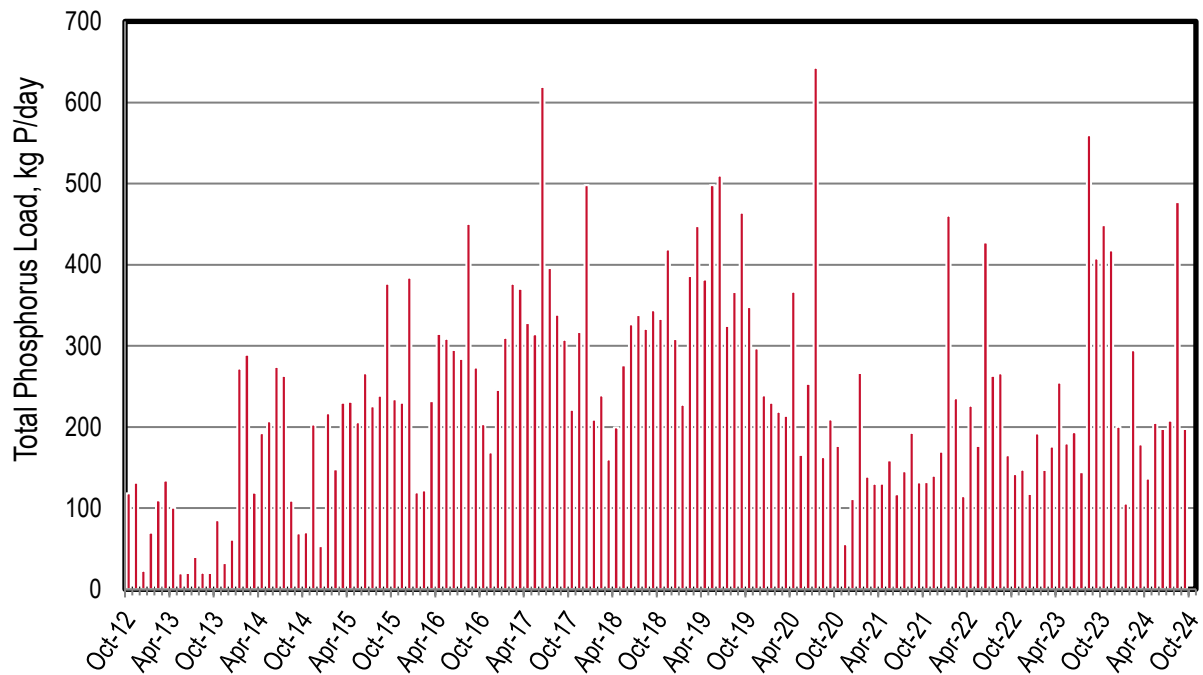


Figure 25-5. Discharge: SFPUC Southeast Monthly Phosphorus Loads

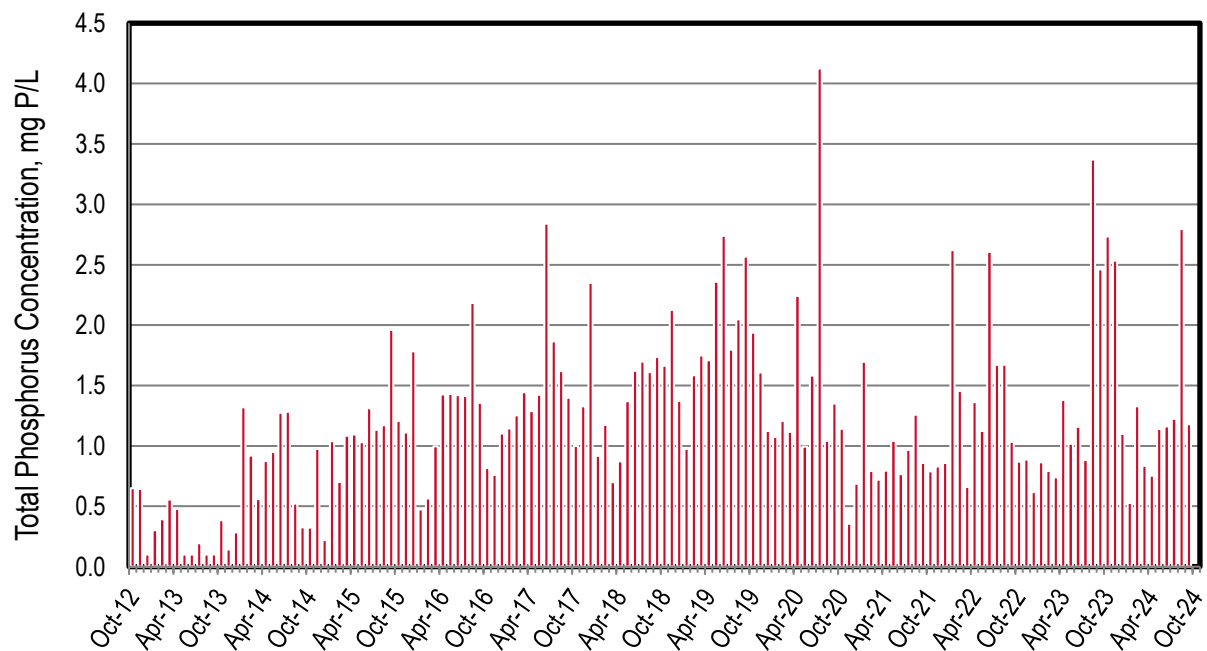


Figure 25-6. Discharge: SFPUC Southeast Monthly Phosphorus Concentrations

Recycled Water

No recycled water was produced or distributed this past year.

26 Sausalito-Marin City Sanitary District (SMCSD)

SMCSD discharges to the San Francisco Bay. The plant has approximately 6,500 service connections and permitted capacity of 1.8 mgd ADWF. The average dry season discharge flow this past year was approximately 0.96 mgd. The plant performs partial nitrification using a trickling filter.

The following observations are made based upon the figures and table in the subsequent pages:

◆ Discharge:

- ▲ The average monthly dry season flow values for 2021/2022 were the lowest since nutrient sampling was initiated under the Section 13267 Letter Data in 2012.
- ▲ The plant was under construction from June 2017 to June 2020 with upgrades to improve treatment capacity and performance. During a portion of this period, as required to complete improvements, the plant used one of two sedimentation tanks and fixed film reactors which compromised treatment performance.
- ▲ Nutrient loads do not appear to track with flows during wet weather events.
- ▲ Historically, NO_x has represented the majority of the nitrogen species discharged as would be expected since this plant nitrifies. Over the last couple years, the distribution between ammonia and NO_x has been more evenly split.
- ▲ Total phosphorus concentrations range from 0.8 to 6.5 mg P/L. This suggests occasional P removal as typical concentrations at treatment plants is approximately 4 to 6 mg P/L. The removal mechanism is most likely from metal salt addition at the headworks.
- ▲ Based on Table 26-1 statistics for the entire dry season dataset, there appears to be an emerging downward trend for flow, nitrate plus nitrite, and TIN loads. There appears to be no emerging upward trend for ammonia and total phosphorus loads. Note: the statistical analysis excluded data while the plant was under construction.

- ◆ Recycled Water: No recycled water was produced or distributed this past year. All treatment plant processes utilize reclaimed utility water.

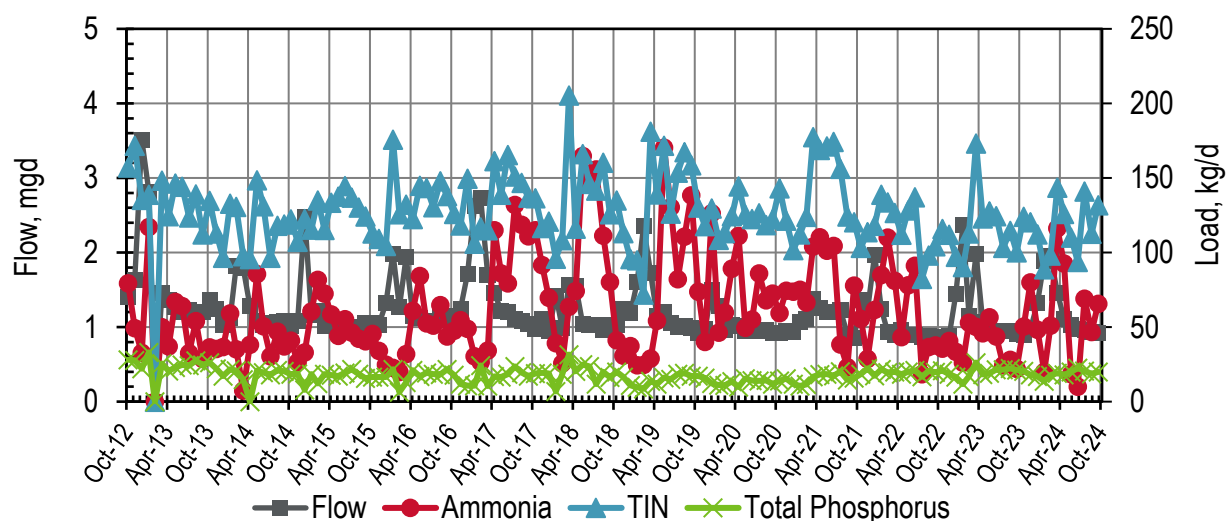


Figure 26-1. Discharge: SMCSD Monthly Flows and Loads

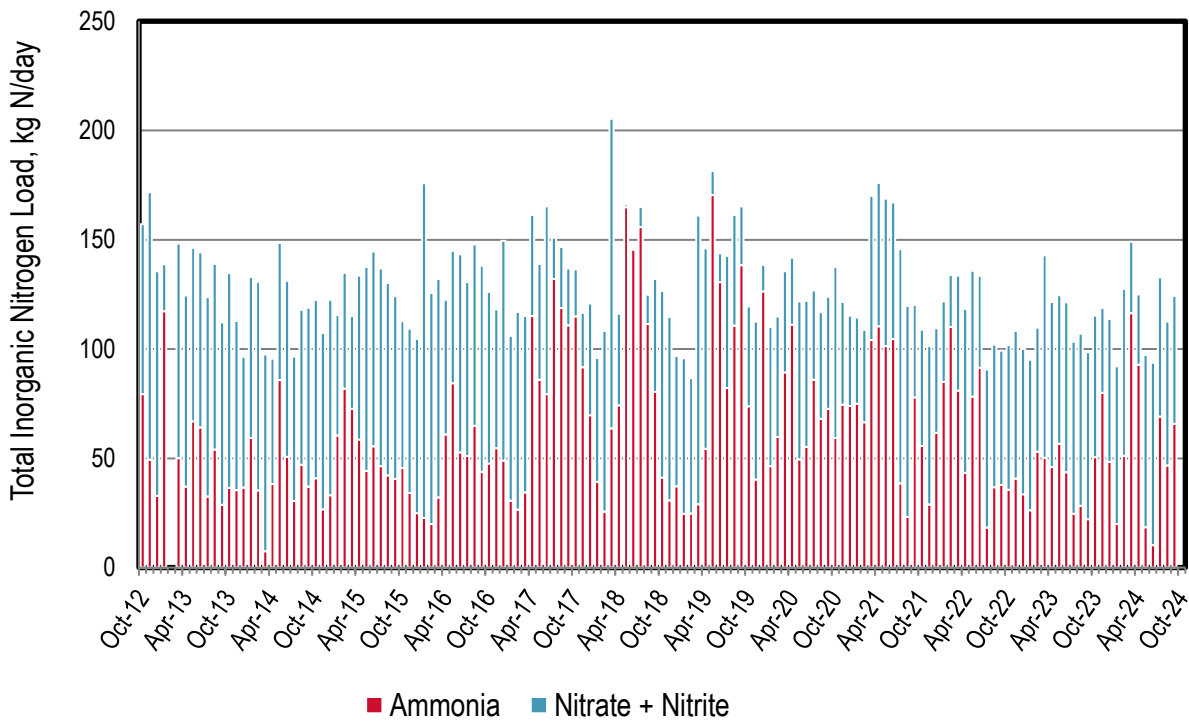


Figure 26-2. Discharge: SMCS D Monthly Nitrogen Loads

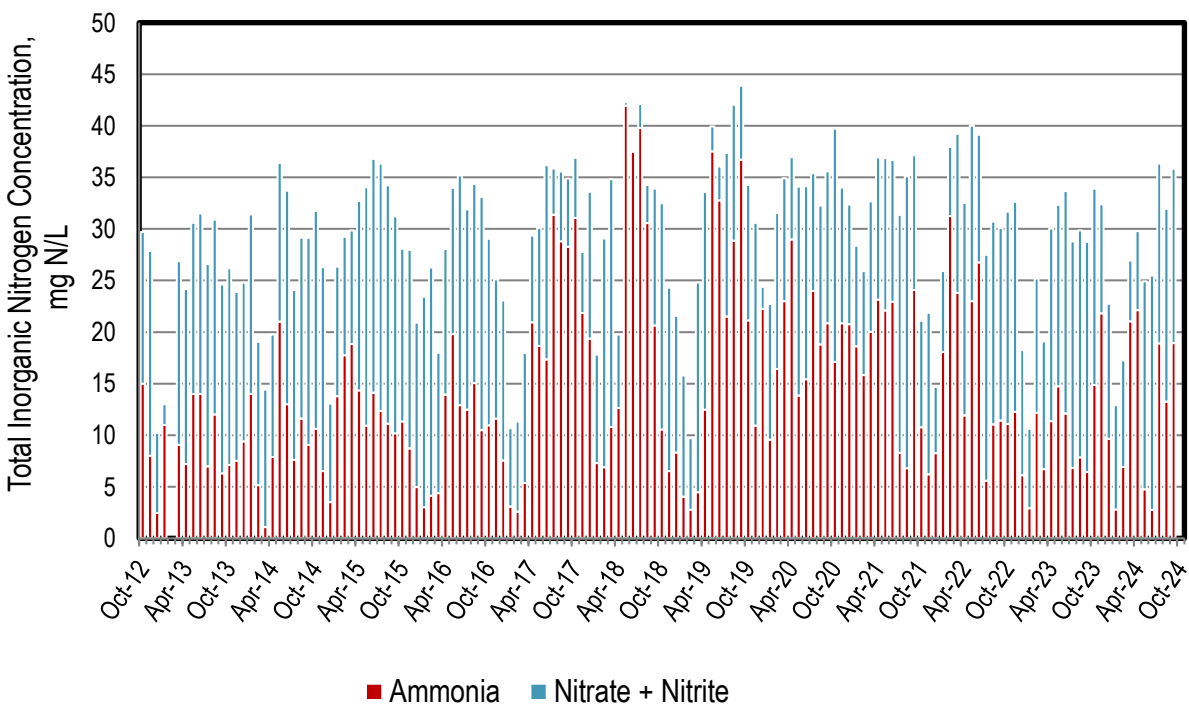


Figure 26-3. Discharge: SMCS D Monthly Nitrogen Concentrations

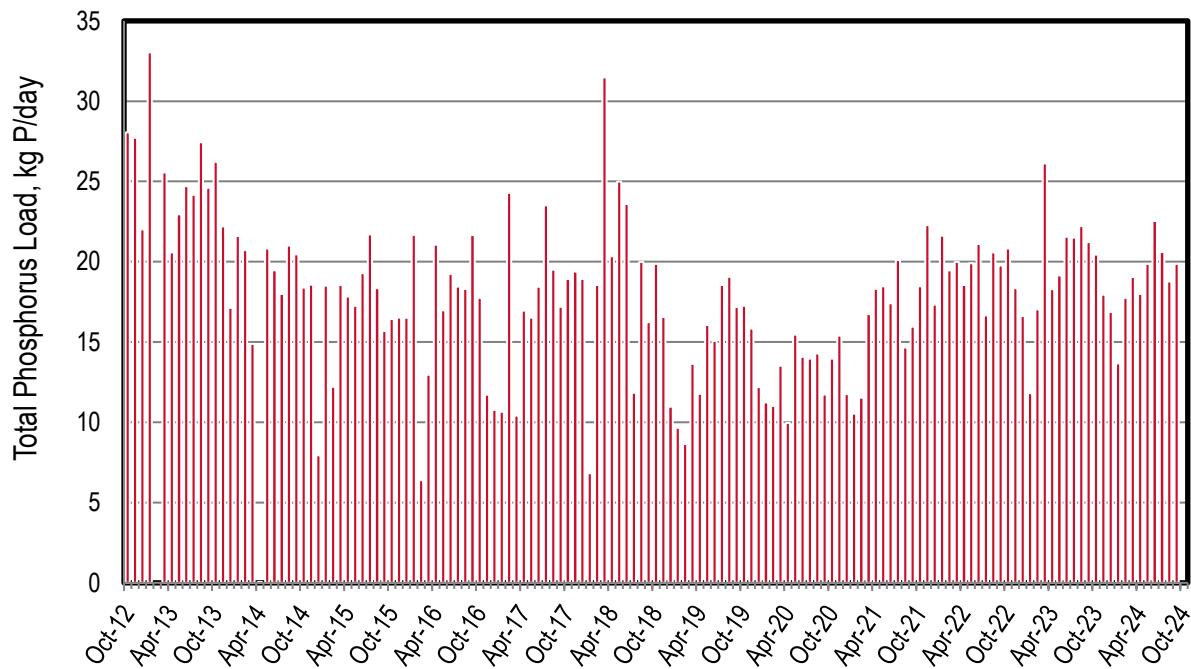


Figure 26-4. Discharge: SMCSD Monthly Phosphorus Loads

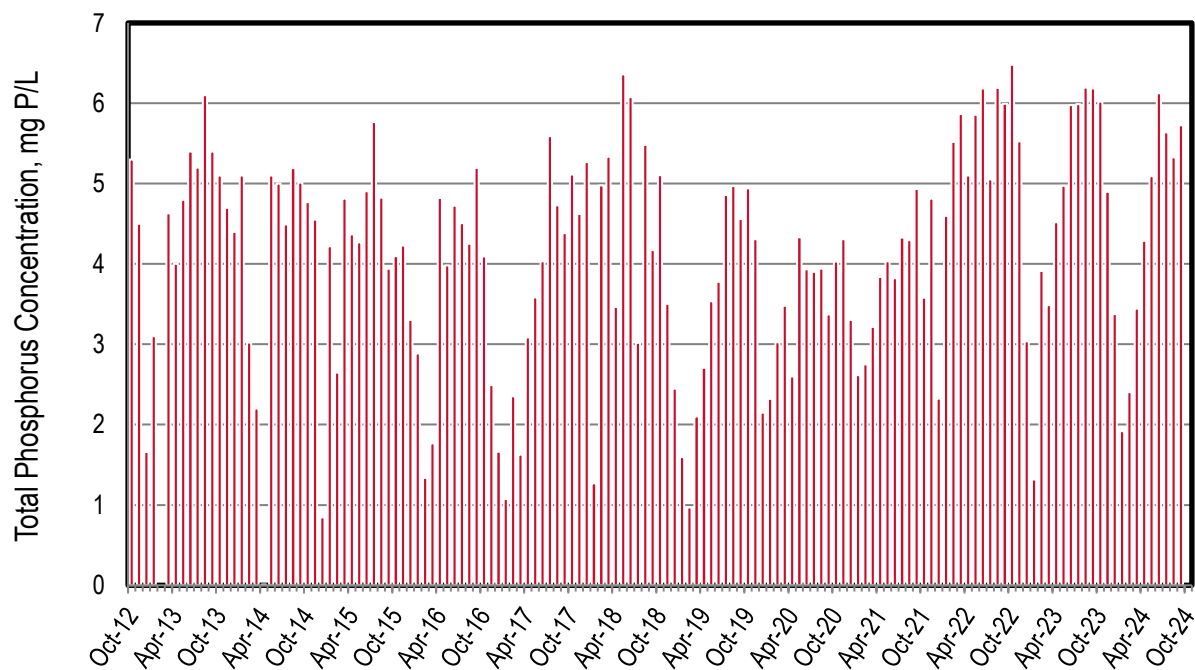


Figure 26-5. Discharge: SMCSD Monthly Phosphorus Concentrations

Table 26-1. Discharge: SMCSD Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	1.40	79.4	77.8	157	28.0
Nov-12	1.63	49.3	122	172	27.7
Dec-12	3.52	32.7	103	136	22.0
Jan-13	2.82	117	21.5	139	33.0
Feb-13	--	--	--	--	--
Mar-13	1.46	50.0	98.3	148	25.6
Apr-13	1.36	37.1	87.4	124	20.6
May-13	1.27	66.9	79.4	146	23.0
Jun-13	1.21	64.1	80.1	144	24.7
Jul-13	1.23	32.5	91.1	124	24.2
Aug-13	1.19	54.0	85.0	139	27.4
Sep-13	1.21	28.7	83.4	112	24.6
Oct-13	1.36	36.5	98.2	135	26.2
Nov-13	1.25	35.4	77.5	113	22.2
Dec-13	1.03	36.6	60.0	96.6	17.1
Jan-14	1.12	59.3	73.7	133	21.6
Feb-14	1.82	35.3	95.4	131	20.7
Mar-14	1.79	7.44	90.1	97.6	14.9
Apr-14	1.28	38.2	57.4	95.7	0.0484
May-14	1.08	85.7	62.9	149	20.8
Jun-14	1.03	50.6	80.6	131	19.5
Jul-14	1.06	30.5	66.0	96.5	18.0
Aug-14	1.07	47.0	71.0	118	21.0
Sep-14	1.08	37.1	81.9	119	20.5
Oct-14	1.02	40.9	81.4	122	18.4
Nov-14	1.08	26.6	80.8	107	18.6
Dec-14	2.48	33.1	89.4	123	7.94
Jan-15	1.16	60.5	55.0	115	18.5
Feb-15	1.22	81.8	53.1	135	12.2
Mar-15	1.02	72.6	42.5	115	18.6
Apr-15	1.08	58.6	75.0	134	17.8
May-15	1.07	44.2	93.5	138	17.3
Jun-15	1.04	55.5	89.2	145	19.3
Jul-15	0.996	46.5	90.4	137	21.7
Aug-15	1.01	42.2	87.9	130	18.4
Sep-15	1.05	40.5	83.7	124	15.7

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-15	1.06	45.5	67.3	113	16.4
Nov-15	1.03	34.0	75.3	109	16.5
Dec-15	1.32	24.8	79.7	105	16.5
Jan-16	1.99	22.7	153	176	21.7
Feb-16	1.27	19.9	106	126	6.40
Mar-16	1.94	32.1	100	132	13.0
Apr-16	1.16	60.9	61.6	123	21.1
May-16	1.13	84.4	60.5	145	17.0
Jun-16	1.08	52.7	90.7	143	19.2
Jul-16	1.08	51.1	79.4	131	18.5
Aug-16	1.14	64.8	83.1	148	18.3
Sep-16	1.10	43.7	94.3	138	21.7
Oct-16	1.15	47.6	78.4	126	17.8
Nov-16	1.24	54.6	63.5	118	11.7
Dec-16	1.71	48.9	101	150	10.8
Jan-17	2.63	30.5	75.5	106	10.7
Feb-17	2.73	26.5	90.5	117	24.3
Mar-17	1.69	34.4	80.7	115	10.4
Apr-17	1.45	115	46.3	161	16.9
May-17	1.22	86.0	52.9	139	16.5
Jun-17	1.21	79.3	86.1	165	18.4
Jul-17	1.11	132	19.0	151	23.5
Aug-17	1.09	119	28.0	147	19.5
Sep-17	1.04	111	26.0	137	17.2
Oct-17	0.979	115	21.5	137	18.9
Nov-17	1.11	91.6	24.9	117	19.4
Dec-17	0.951	69.7	51.1	121	18.9
Jan-18	1.42	39.2	56.6	95.9	6.83
Feb-18	0.986	25.7	82.7	108	18.5
Mar-18	1.56	63.7	142	205	31.5
Apr-18	1.55	74.2	42.0	116	20.4
May-18	1.04	165	1.29	166	25.0
Jun-18	1.03	146	0.669	146	23.6
Jul-18	1.04	156	9.16	142	11.8
Aug-18	0.965	111	13.5	160	20.0
Sep-18	1.03	80.3	51.7	126	16.2
Oct-18	1.03	41.1	85.3	135	19.9

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-18	1.25	30.8	83.9	113	16.6
Dec-18	1.19	37.2	59.5	95.8	11.0
Jan-19	1.60	24.5	71.2	94.9	9.66
Feb-19	2.36	24.7	62.0	72.0	8.64
Mar-19	1.72	29.1	132	181	13.7
Apr-19	1.15	54.3	91.9	139	11.8
May-19	1.20	170	11.0	172	16.1
Jun-19	1.05	131	13.2	126	15.1
Jul-19	1.01	82.1	60.6	154	18.5
Aug-19	1.01	111	50.6	167	19.1
Sep-19	0.997	138	27.0	159	17.2
Oct-19	0.923	73.8	45.8	130	17.2
Nov-19	0.973	40.2	72.3	118	15.8
Dec-19	1.50	126	12.2	130	12.2
Jan-20	1.28	46.4	63.7	109	11.2
Feb-20	0.963	59.8	55.1	113	11.0
Mar-20	1.03	89.4	46.3	125	13.5
Apr-20	1.01	111	30.6	144	9.96
May-20	0.945	49.5	72.3	125	15.5
Jun-20	0.947	55.2	66.9	122	14.1
Jul-20	0.947	86.0	40.9	126	14.0
Aug-20	0.958	68.1	48.8	118	14.3
Sep-20	0.921	72.6	51.2	122	11.7
Oct-20	0.917	59.3	78.3	143	14.0
Nov-20	0.945	74.5	46.9	121	15.4
Dec-20	0.942	73.9	41.3	102	11.8
Jan-21	1.07	75.0	39.3	112	10.5
Feb-21	1.11	66.4	42.3	124	11.5
Mar-21	1.38	104	65.9	178	16.7
Apr-21	1.26	110	65.7	169	18.3
May-21	1.21	101	67.6	171	18.5
Jun-21	1.21	105	62.5	174	17.4
Jul-21	1.23	38.5	107	156	20.1
Aug-21	0.902	23.1	96.6	124	14.7
Sep-21	0.855	77.8	42.3	120	15.9
Oct-21	1.36	55.6	53.2	103	18.5
Nov-21	1.22	28.8	72.5	114	22.3

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-21	1.97	61.6	47.9	118	17.3
Jan-22	1.24	84.9	37.0	139	21.6
Feb-22	0.933	110	23.7	134	19.5
Mar-22	0.901	81.0	52.6	127	20.0
Apr-22	0.962	43.4	74.9	112	18.6
May-22	0.899	78.1	57.8	128	19.9
Jun-22	0.903	91.3	42.2	137	21.1
Jul-22	0.871	18.4	72.3	82.3	16.7
Aug-22	0.879	36.8	65.3	98.0	20.6
Sep-22	0.873	37.7	61.6	104	19.8
Oct-22	0.850	35.6	66.2	116	20.8
Nov-22	0.879	40.7	67.6	112	18.4
Dec-22	1.45	33.5	66.5	97.1	16.6
Jan-23	2.37	26.2	68.9	90.3	11.8
Feb-23	1.15	53.0	56.8	113	17.0
Mar-23	1.98	50.2	92.7	173	26.1
Apr-23	1.07	46.0	75.6	123	18.3
May-23	1.02	56.7	67.8	128	19.1
Jun-23	0.954	43.7	77.8	124	21.6
Jul-23	0.950	24.5	78.9	103	21.5
Aug-23	0.949	28.2	78.9	115	22.2
Sep-23	0.908	22.1	76.5	100	21.2
Oct-23	0.898	50.4	64.7	124	20.4
Nov-23	0.969	80.0	38.7	120	18.0
Dec-23	1.32	48.3	65.4	112	16.9
Jan-24	1.89	19.9	72.3	88.9	13.7
Feb-24	1.95	51.1	76.4	98.1	17.8
Mar-24	1.46	116	32.8	143	19.0
Apr-24	1.11	92.8	32.2	126	18.0
May-24	1.03	18.5	78.7	110	19.9
Jun-24	0.973	10.2	83.6	93.7	22.5
Jul-24	0.967	69.1	63.7	141	20.6
Aug-24	0.932	46.7	65.9	113	18.8
Sep-24	0.917	65.7	58.6	132	19.9

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dry Season Average	1.04	69.4	62.8	133	19.2
Dry Season Trend **,***	Down	None	Down	Down	None
Wet Season Average	1.37	55.1	67.5	123	16.8
Average Annual	1.23	61.1	65.5	127	17.8

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

*** The plant was under construction from June 2017 to June 2020 with upgrades to improve treatment capacity and performance. During a portion of this period, as required to complete improvements, the plant has been using one of two sedimentation tanks and fixed film reactors which has compromised the overall treatment performance. As a result, corresponding data from June 2017 to July 2018 was excluded from the statistical analysis as it is not reflective of plant treatment capacity and performance.

Recycled Water

No recycled water was produced or distributed this past year. All treatment plant processes utilize reclaimed utility water.

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27 Sonoma Valley County Sanitation District

Sonoma Valley County Sanitation District (District) discharges to Schell Slough, Ringstrom Bay, and various restoration management units which are connected to San Pablo Bay. The District's treatment plant has approximately 17,939 equivalent single-family dwellings (ESD) and a permitted discharge capacity of 3.0 mgd ADWF. The plant has a wet weather treatment capacity of 16 mgd. The plant performs nitrogen removal using an activated sludge process.

The following observations are made based upon the figures and table in the subsequent pages:

◆ Discharge

- ▲ Between 4/2019 and 11/2021, the District did not discharge. Relatively large wet weather events result in the need to discharge to the Bay.
- ▲ There are no emerging dry season trends as Sonoma Valley is prohibited from discharging to Schell Slough during the dry season. There have been two exceptions, May 2017 and May 2023, where discharge occurred due to relatively wet months. Sonoma Valley is only allowed to discharge if flows entering the plant >6 mgd or storage is 50% or more full.
- ▲ There are only 30 out of 144 months in which they discharged to Schell Slough. The water was all recycled during the other months.
- ▲ The plant has met Level 2 total inorganic nitrogen levels (i.e., 15 mg N/L) developed under the Scoping and Evaluation Plan for the 1st Watershed Permit (R2-2014-0014) for all but five months since sampling began in 2012. Such levels typically occur during relatively high levels of precipitation.

◆ Recycled Water

- ▲ Based on Table 1-2, the plant averaged 0.77 mgd of recycled water in the 2023 calendar year. Uses included landscape and agricultural irrigation, as well as other non-potable uses including construction site dust control, sewer flushing, and wetland restoration.
- ▲ Based on Table 27-3 through Table 27-5, the plant averaged the diversion of <1 kg Ammonia-N/d, 32 kg TIN-N/d, and 4 kg P/d away from the San Francisco Bay through recycled water in 2023.

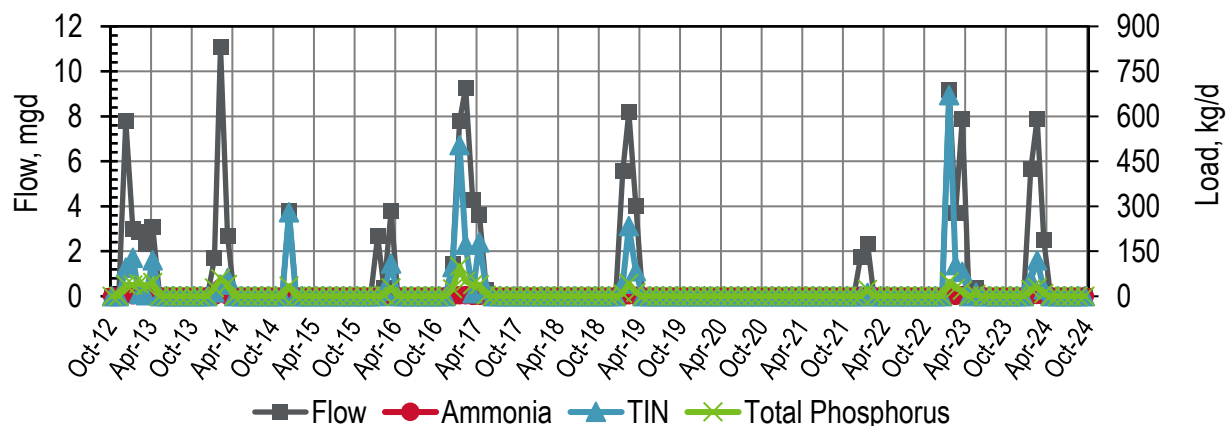


Figure 27-1. Discharge: Sonoma Valley Monthly Flows and Loads

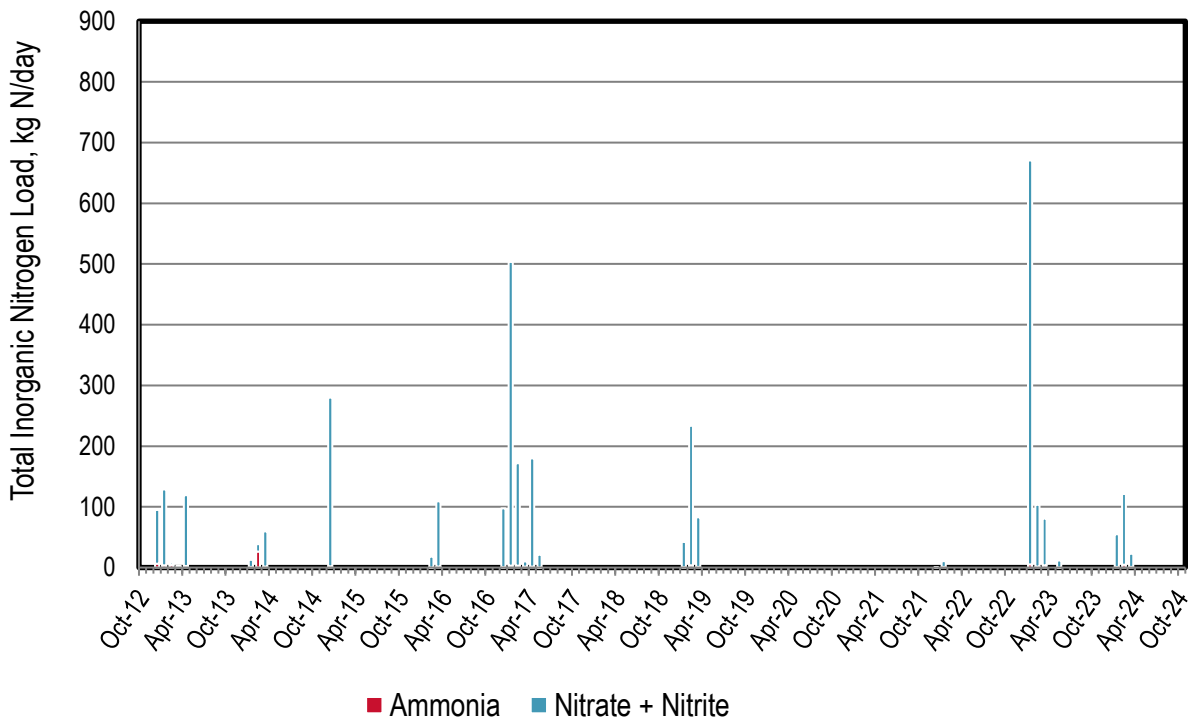


Figure 27-2. Discharge: Sonoma Valley Monthly Nitrogen Loads

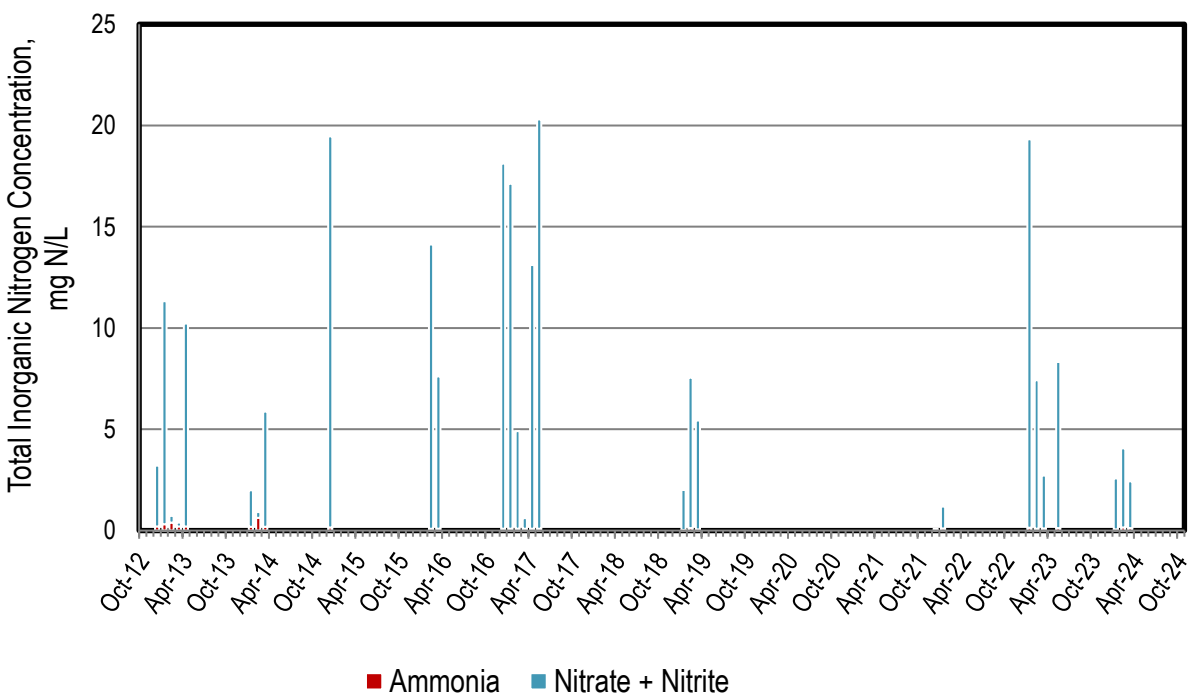


Figure 27-3. Discharge: Sonoma Valley Monthly Nitrogen Concentrations

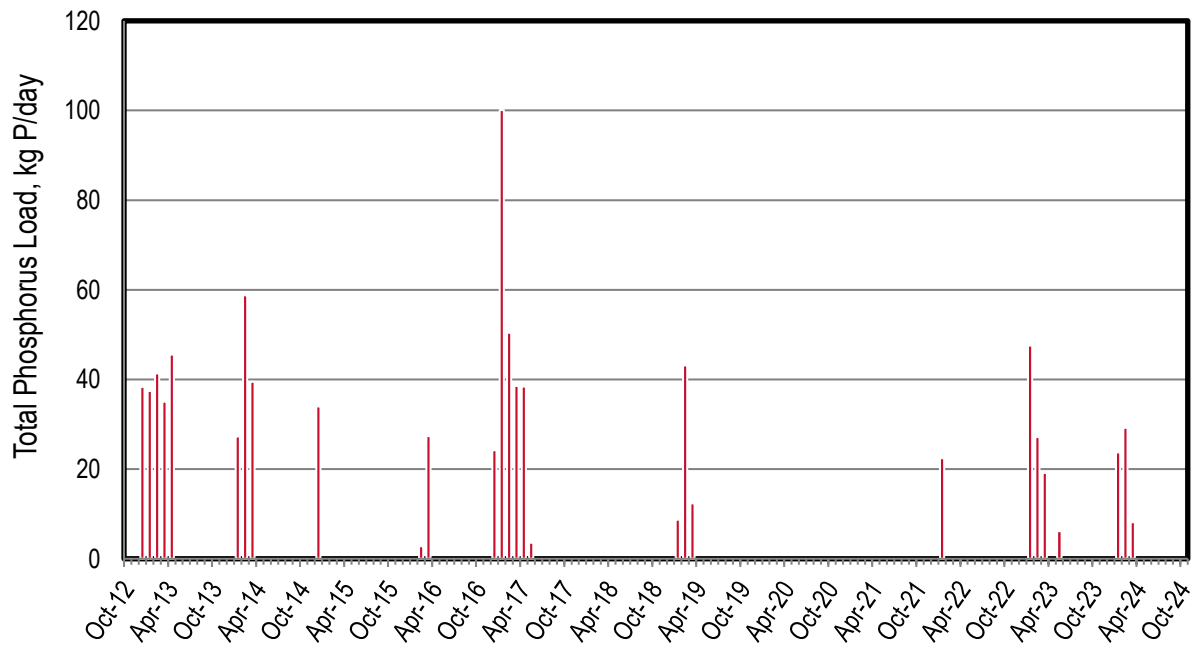


Figure 27-4. Discharge: Sonoma Valley Monthly Phosphorus Loads

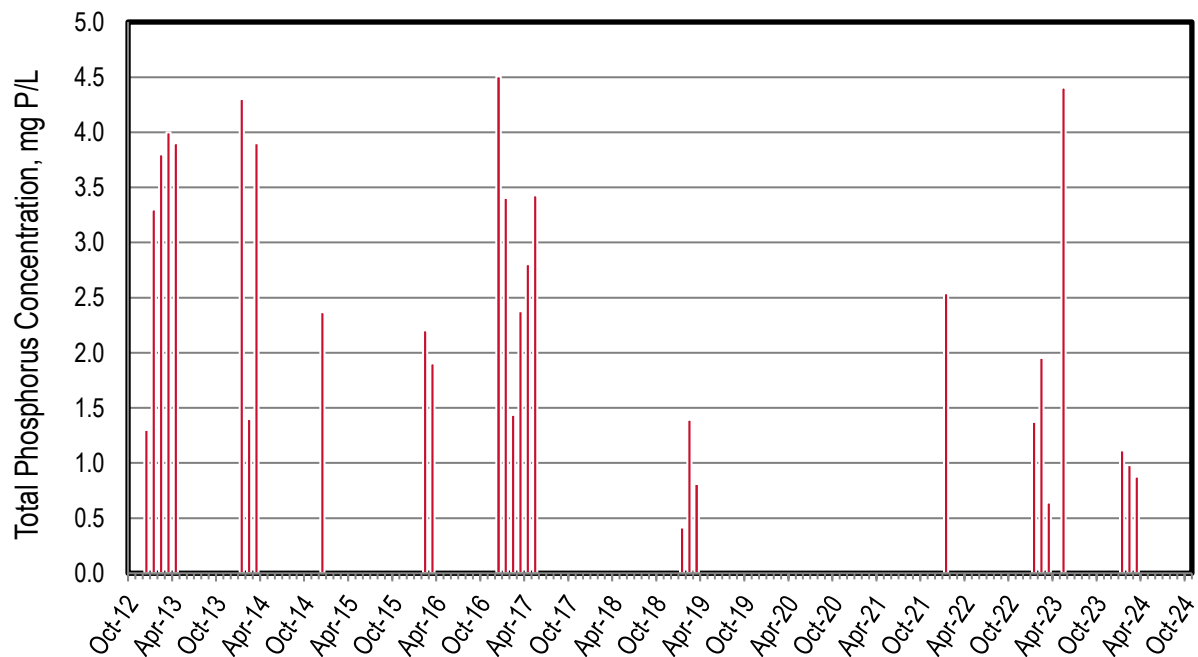


Figure 27-5. Discharge: Sonoma Valley Monthly Phosphorus Concentrations

Table 27-1. Discharge: Sonoma Valley Monthly Flows and Loads¹

Month, Year	Average Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	0	0	0	0	0
Nov-12	0	0	0	0	0
Dec-12	7.80	6.19	88.5	94.7	38.3
Jan-13	3.00	3.63	125	128	37.4
Feb-13	2.88	4.25	3.67	7.92	41.4
Mar-13	2.32	1.84	1.55	3.39	35.1
Apr-13	3.09	2.45	117	119	45.6
May-13	0	0	0	0	0
Jun-13	0	0	0	0	0
Jul-13	0	0	0	0	0
Aug-13	0	0	0	0	0
Sep-13	0	0	0	0	0
Oct-13	0	0	0	0	0
Nov-13	0	0	0	0	0
Dec-13	0	0	0	0	0
Jan-14	1.68	1.14	11.5	12.6	27.3
Feb-14	11.1	26.4	11.9	38.3	58.7
Mar-14	2.68	1.82	57.8	59.6	39.5
Apr-14	0	0	0	0	0
May-14	0	0	0	0	0
Jun-14	0	0	0	0	0
Jul-14	0	0	0	0	0
Aug-14	0	0	0	0	0
Sep-14	0	0	0	0	0
Oct-14	0	0	0	0	0
Nov-14	0	0	0	0	0
Dec-14	3.80	2.14	278	280	34.0
Jan-15	0	0	0	0	0
Feb-15	0	0	0	0	0
Mar-15	0	0	0	0	0
Apr-15	0	0	0	0	0
May-15	0	0	0	0	0
Jun-15	0	0	0	0	0
Jul-15	0	0	0	0	0
Aug-15	0	0	0	0	0

Month, Year	Average Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Sep-15	0	0	0	0	0
Oct-15	0	0	0	0	0
Nov-15	0	0	0	0	0
Dec-15	0	0	0	0	0
Jan-16	2.67	--	--	--	--
Feb-16	0.335	0.127	17.8	17.9	2.79
Mar-16	3.80	1.44	108	109	27.3
Apr-16	0	0	0	0	0
May-16	0	0	0	0	0
Jun-16	0	0	0	0	0
Jul-16	0	0	0	0	0
Aug-16	0	0	0	0	0
Sep-16	0	0	0	0	0
Oct-16	0	0	0	0	0
Nov-16	0	0	0	0	0
Dec-16	1.42	0.539	96.9	97.5	24.2
Jan-17	7.78	2.94	500	503	100
Feb-17	9.27	2.96	169	172	50.4
Mar-17	4.29	1.54	8.48	10.0	38.6
Apr-17	3.62	1.37	178	180	38.4
May-17	0.275	0.0912	21.0	21.1	3.56
Jun-17	0	0	0	0	0
Jul-17	0	0	0	0	0
Aug-17	0	0	0	0	0
Sep-17	0	0	0	0	0
Oct-17	0	0	0	0	0
Nov-17	0	0	0	0	0
Dec-17	0	0	0	0	0
Jan-18	0	0	0	0	0
Feb-18	0	0	0	0	0
Mar-18	0	0	0	0	0
Apr-18	0	0	0	0	0
May-18	0	0	0	0	0
Jun-18	0	0	0	0	0
Jul-18	0	0	0	0	0
Aug-18	0	0	0	0	0

Month, Year	Average Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Sep-18	0	0	0	0	0
Oct-18	0	0	0	0	0
Nov-18	0	0	0	0	0
Dec-18	0	0	0	0	0
Jan-19	5.55	0.458	41.7	42.1	8.70
Feb-19	8.19	3.60	230	234	43.1
Mar-19	4.03	0.881	82.0	82.9	12.3
Apr-19	0	0	0	0	0
May-19	0	0	0	0	0
Jun-19	0	0	0	0	0
Jul-19	0	0	0	0	0
Aug-19	0	0	0	0	0
Sep-19	0	0	0	0	0
Oct-19	0	0	0	0	0
Nov-19	0	0	0	0	0
Dec-19	0	0	0	0	0
Jan-20	0	0	0	0	0
Feb-20	0	0	0	0	0
Mar-20	0	0	0	0	0
Apr-20	0	0	0	0	0
May-20	0	0	0	0	0
Jun-20	0	0	0	0	0
Jul-20	0	0	0	0	0
Aug-20	0	0	0	0	0
Sep-20	0	0	0	0	0
Oct-20	0	0	0	0	0
Nov-20	0	0	0	0	0
Dec-20	0	0	0	0	0
Jan-21	0	0	0	0	0
Feb-21	0	0	0	0	0
Mar-21	0	0	0	0	0
Apr-21	0	0	0	0	0
May-21	0	0	0	0	0
Jun-21	0	0	0	0	0
Jul-21	0	0	0	0	0
Aug-21	0	0	0	0	0

Month, Year	Average Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Sep-21	0	0	0	0	0
Oct-21	0	0	0	0	0
Nov-21	0	0	0	0	0
Dec-21	1.73	0.582	0	0	0
Jan-22	2.34	0.977	9.47	10.5	22.5
Feb-22	0	0	0	0	0
Mar-22	0	0	0	0	0
Apr-22	0	0	0	0	0
May-22	0	0	0	0	0
Jun-22	0	0	0	0	0
Jul-22	0	0	0	0	0
Aug-22	0	0	0	0	0
Sep-22	0	0	0	0	0
Oct-22	0	0	0	0	0
Nov-22	0	0	0	0	0
Dec-22	0	0	0	0	0
Jan-23	9.18	5.12	665	670	47.6
Feb-23	3.68	1.36	102	103	27.2
Mar-23	7.89	3.42	77.5	80.9	19.1
Apr-23	0	0	0	0	0
May-23	0.371	0.168	11.5	11.7	6.17
Jun-23	0	0	0	0	0
Jul-23	0	0	0	0	0
Aug-23	0	0	0	0	0
Sep-23	0	0	0	0	0
Oct-23	0	0	0	0	0
Nov-23	0	0	0	0	0
Dec-23	0	0	0	0	0
Jan-24	5.63	0.625	53.7	54.3	23.7
Feb-24	7.90	3.85	116	118	29.2
Mar-24	2.47	1.12	21.6	22.7	8.19
Apr-24	0	0	0	0	0
May-24	0	0	0	0	0
Jun-24	0	0	0	0	0
Jul-24	0	0	0	0	0
Aug-24	0	0	0	0	0

Month, Year	Average Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Sep-24	0	0	0	0	0
Dry Season Average	0.0108	0.00433	0.541	0.546	0.162
Dry Season Trend **	--**	--**	--**	--**	--**
Wet Season Average	1.55	0.986	37.8	38.7	10.5
Average Annual	0.908	0.577	22.3	22.8	6.18

1 For non-detects after October 1, 2023, 1/2 of the method detection limit was used to quantify values. Prior to October 1, 2023, non-detect values used the provided method detection limit.

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** No dry season trending analysis was performed on Sonoma Valley as the facility has only discharged once during the dry season since sampling began in 2012.

Recycled Water

Table 27-2. Recycled Water: Sonoma Valley County Sanitation District Yearly Recycled Water Flows Diverted from the Bay

Year**	Flow Diverted*, Acre-Feet (mgd)							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	0 (0)	6 (0.01)	0 (0)	0 (0)	801 (0.72)	0 (0)	2 (<0.01)	809 (0.72)
2020	0 (0)	7 (0.01)	0 (0)	0 (0)	1,440 (1.28)	0 (0)	4 (<0.01)	1,450 (1.29)
2021	0 (0)	33 (0.03)	0 (0)	0 (0)	1,380 (1.23)	0 (0)	560 (0.50)	1,970 (1.76)
2022	0 (0)	28 (0.02)	0 (0)	0 (0)	1,320 (1.18)	0 (0)	298 (0.27)	1,650 (1.47)
2023	0 (0)	28 (0.02)	0 (0)	0 (0)	845 (0.75)	0 (0)	3 (<0.01)	876 (0.77)
Average	0 (0)	20 (0.02)	0 (0)	0 (0)	1,157 (1.03)	0 (0)	173 (0.15)	1,351 (1.20)

* Assumes 100% of the recycled flow is diverted from the Bay

** Calendar year as opposed to California's water year (October 1 through September 30)

Table 27-3. Recycled Water: Sonoma Valley County Sanitation District Yearly Recycled Water Ammonia Load Diverted from the Bay

Year**	Average Ammonia Load Diverted*, kg N/d							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	0	<1	0	0	<1	0	<1	<1
2020***	--***	--***	--***	--***	--***	--***	--***	--***
2021	0	<1	0	0	<1	0	<1	1
2022	0	<1	0	0	<1	0	<1	1
2023	0	<1	0	0	<1	0	<1	<1
Average	0	<1	0	0	<1	0	<1	1

* Assumes 100% of the recycled load is diverted from the Bay

** Calendar year as opposed to California's water year (October 1 through September 30)

*** No bay discharge during this calendar year (i.e., all the effluent used for recycled water applications)

Table 27-4. Recycled Water: Sonoma Valley County Sanitation District Yearly Recycled Water TIN Load Diverted from the Bay

Year**	Average Total Inorganic Nitrogen Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	<1	0	0	14	0	<1	19
2020***	--***	--***	--***	--***	--***	--***	--***	--***
2021****	--****	--****	--****	--****	--****	--****	--****	--****
2022	0	<1	0	0	5	0	1	7
2023	0	<1	0	0	9	0	<1	9
Average	0	<1	0	0	6	0	<1	6

* Assumes 100% of the recycled load is diverted from the Bay

** Calendar year as opposed to California's water year (October 1 through September 30)

*** No bay discharge during this calendar year (i.e., all the effluent used for recycled water applications)

**** No TIN effluent samples during this calendar year as there was limited discharge to the Bay

Table 27-5. Recycled Water: Sonoma Valley County Sanitation District Yearly Recycled Water Total Phosphorus Load Diverted from the Bay

Year**	Average Total P Load Diverted*, kg P/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	<1	0	0	3	0	<1	9
2020***	--***	--***	--***	--***	--***	--***	--***	--***
2021****	--****	--****	--****	--****	--****	--****	--****	--****
2022	0	<1	0	0	11	0	3	14
2023	0	<1	0	0	3	0	<1	3
Average	0	<1	0	0	3	0	1	4

* Assumes 100% of the recycled load is diverted from the Bay

** Calendar year as opposed to California's water year (October 1 through September 30)

*** No bay discharge during this calendar year (i.e., all the effluent used for recycled water applications)

**** No Total P effluent samples during this calendar year as there was limited discharge to the Bay

28 South San Francisco-San Bruno

South SF-San Bruno discharges to Lower San Francisco Bay (referred to as South Bay in the Group Annual Report). The plant has a permitted capacity of 13 mgd ADWF and a peak wet weather capacity of 30 mgd (blending allowable above 30 mgd). The average dry season discharge flow this past year was 8.3 mgd. The process includes a conventional activated sludge system.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Influent

- ▲ Note: limited to data since July 2019; quarterly data is required but more is provided for various parameters.
- ▲ The flow reduction across the plant is negligible.
- ▲ The nitrogen load reduction values across the plant ranges from approximately 5 to 60 percent. This load reduction is attributed primarily to a combination of biosolids management, biological assimilation, and/or occasional load reduction in the activated sludge system.
- ▲ The phosphorus load reduction across the plant ranges from approximately 20 to 95 percent. Such a load reduction is attributed to a combination of biological assimilation for growth, chemical precipitation, biosolids management, and biological removal.
- ▲ Based on Table 28-1's statistical analysis for the entire dry season dataset, ammonia, TIN, TKN, and TN loads have an emerging upwards trend (flow, nitrite plus nitrate and phosphorus have no trends).

◆ Discharge

- ▲ TIN loads generally increase with flow during wet weather events.
- ▲ The plant is in the process of maintaining stable partial nitrification year-round, even during wet weather. Thus, the majority of the discharged nitrogen consists of ammonia, regardless of season.
- ▲ Ammonia loads are occasionally greater than TIN loads, and TIN monthly loads occasionally differ from the sum of ammonia and NOx monthly loads. This is attributed to sampling frequency as ammonia is sampled daily and other nitrogen species bimonthly.
- ▲ Total phosphorus concentrations range from 0.2 to 9 mg P/L. The plant has reliably produced discharge of less than 3 mg P/L the past two dry seasons, with the exception of August 2024. This has resulted in considerable total P load reduction across the plant as noted.
- ▲ Based on Table 28-2 statistics for the entire dry season dataset, Ammonia and TIN loads appear to be trending upwards. In contrast, flow and total P loads appear to be trending downwards. Nitrite plus nitrate loads have no trend.

◆ Recycled Water: No recycled water was produced or distributed this past year.

Influent

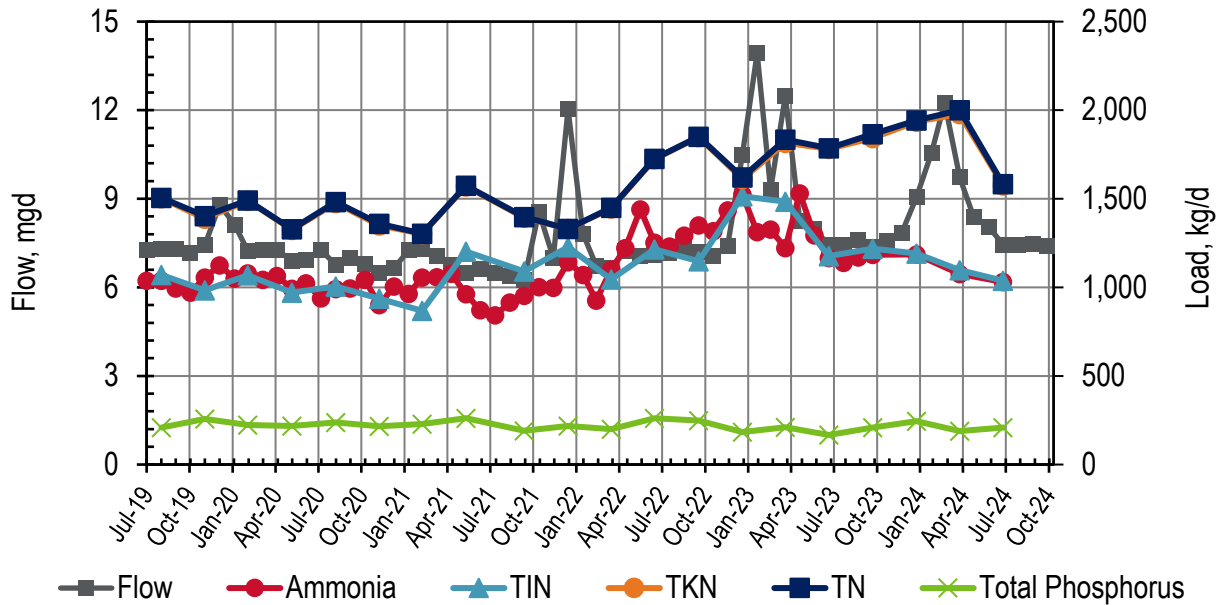


Figure 28-1. Influent: South SF-San Bruno Monthly Flows and Loads

Note: the ammonia/TIN loads and TKN/Total N loads are comparable. The ammonia and TKN values are located behind TIN and Total N load lines, respectively.

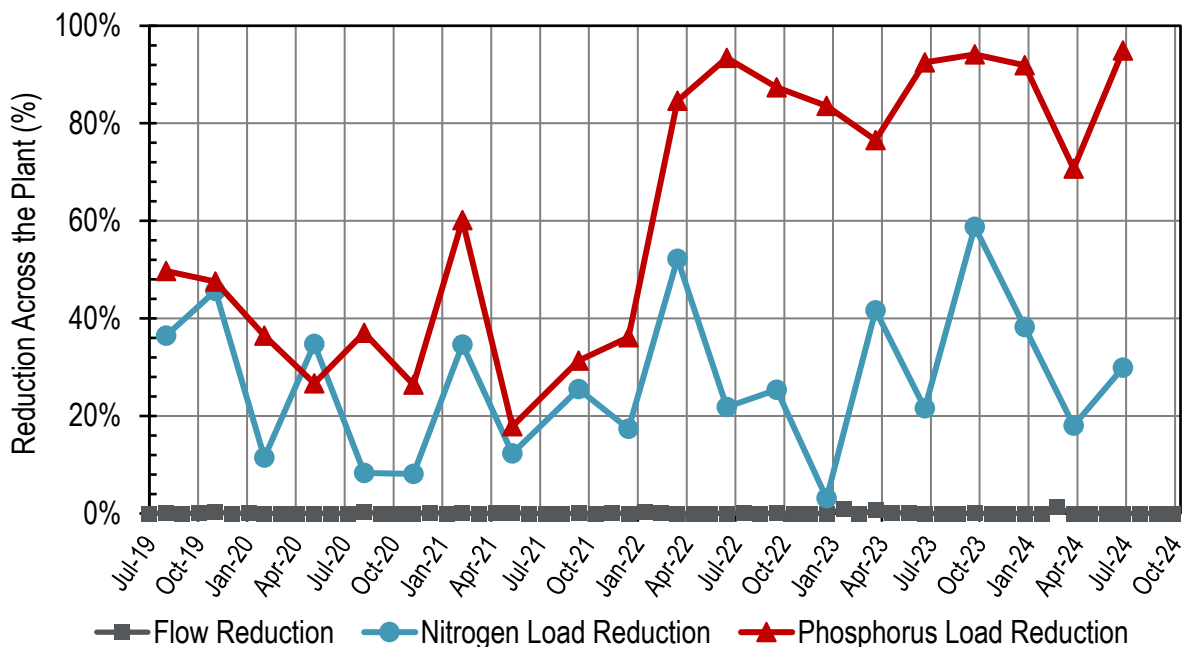


Figure 28-2. Influent: South SF-San Bruno Monthly Reductions Across the Plant

Note: Influent TN was compared against Discharge TIN for calculating nitrogen load reduction.

Table 28-1. Influent: South SF-San Bruno Monthly Flows and Loads*

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN **	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-19	7.27	1,040	--	--	--	--	--
Aug-19	7.29	1,040	1.11	1,070	1,500	1,510	209
Sep-19	7.32	994	--	--	--	--	--
Oct-19	7.17	971	--	--	--	--	--
Nov-19	7.43	1,060	13.3	984	1,390	1,400	257
Dec-19	8.80	1,120	--	--	--	--	--
Jan-20	8.14	1,050	--	--	--	--	--
Feb-20	7.23	1,080	1.10	1,070	1,490	1,490	223
Mar-20	7.28	1,040	--	--	--	--	--
Apr-20	7.26	1,060	--	--	--	--	--
May-20	6.91	992	4.41	972	1,320	1,330	218
Jun-20	6.93	1,020	--	--	--	--	--
Jul-20	7.26	938	--	--	--	--	--
Aug-20	6.76	990	7.09	1,010	1,480	1,480	238
Sep-20	6.98	995	--	--	--	--	--
Oct-20	6.80	1,040	--	--	--	--	--
Nov-20	6.49	901	8.92	936	1,350	1,360	216
Dec-20	6.65	1,010	--	--	--	--	--
Jan-21	7.25	964	--	--	--	--	--
Feb-21	7.29	1,060	1.09	868	1,300	1,300	228
Mar-21	7.08	1,060	--	--	--	--	--
Apr-21	6.76	1,080	--	--	--	--	--
May-21	6.49	963	2.88	1,200	1,570	1,570	262
Jun-21	6.62	872	--	--	--	--	--
Jul-21	6.48	842	--	--	--	--	--
Aug-21	6.39	915	--	--	--	--	--
Sep-21	6.26	952	2.03	1,090	1,390	1,400	191
Oct-21	8.56	1,000	--	--	--	--	--
Nov-21	7.00	998	--	--	--	--	--
Dec-21	12.0	1,140	1.36	1,230	1,330	1,330	218
Jan-22	7.81	1,070	--	--	--	--	--
Feb-22	6.73	925	--	--	--	--	--
Mar-22	6.66	1,100	4.31	1,040	1,450	1,450	200
Apr-22	7.25	1,220	--	--	--	--	--
May-22	7.06	1,440	--	--	--	--	--
Jun-22	7.11	1,250	1.83	1,220	1,720	1,730	261
Jul-22	7.18	1,230	--	--	--	--	--

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN **	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Aug-22	7.30	1,290	--	--	--	--	--
Sep-22	7.20	1,350	2.04	1,150	1,850	1,850	249
Oct-22	7.07	1,320	--	--	--	--	--
Nov-22	7.42	1,430	--	--	--	--	--
Dec-22	10.5	1,520	8.92	1,510	1,610	1,620	184
Jan-23	13.9	1,310	--	--	--	--	--
Feb-23	9.30	1,330	--	--	--	--	--
Mar-23	12.5	1,220	17.3	1,480	1,820	1,830	211
Apr-23	8.26	1,530	--	--	--	--	--
May-23	7.97	1,290	--	--	--	--	--
Jun-23	7.43	1,170	2.77	1,180	1,780	1,780	167
Jul-23	7.43	1,140	--	--	--	--	--
Aug-23	7.60	1,170	--	--	--	--	--
Sep-23	7.38	1,180	22.8	1,220	1,840	1,870	209
Oct-23	7.59	--	--	--	--	--	--
Nov-23	7.85	--	--	--	--	--	--
Dec-23	9.06	1,190	6.32	1,190	1,940	1,940	245
Jan-24	10.6	--	--	--	--	--	--
Feb-24	12.2	--	--	--	--	--	--
Mar-24	9.73	1,080	21.1	1,100	1,980	2,000	189
Apr-24	8.38	--	--	--	--	--	--
May-24	8.05	--	--	--	--	--	--
Jun-24	7.45	1,030	7.45	1,040	1,580	1,580	209
Jul-24	7.43	--	--	--	--	--	--
Aug-24	7.46	--	--	--	--	--	--
Sep-24	7.41	--	--	--	--	--	--
Dry Season Average	7.16	1,090	5.44	1,110	1,600	1,610	221
Dry Season Trend	None	Up	None	Up	Up	Up	None
Wet Season Average	8.34	1,130	8.37	1,140	1,560	1,570	217
Average Annual	7.82	1,110	6.91	1,130	1,580	1,590	219

* South SF-San Bruno typically samples more than the required influent ammonia quarterly sampling. This dataset includes this additional sampling.

** The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values. The Total Nitrogen value is calculated by adding “TKN” and “Nitrate + Nitrite”.

*** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

Discharge

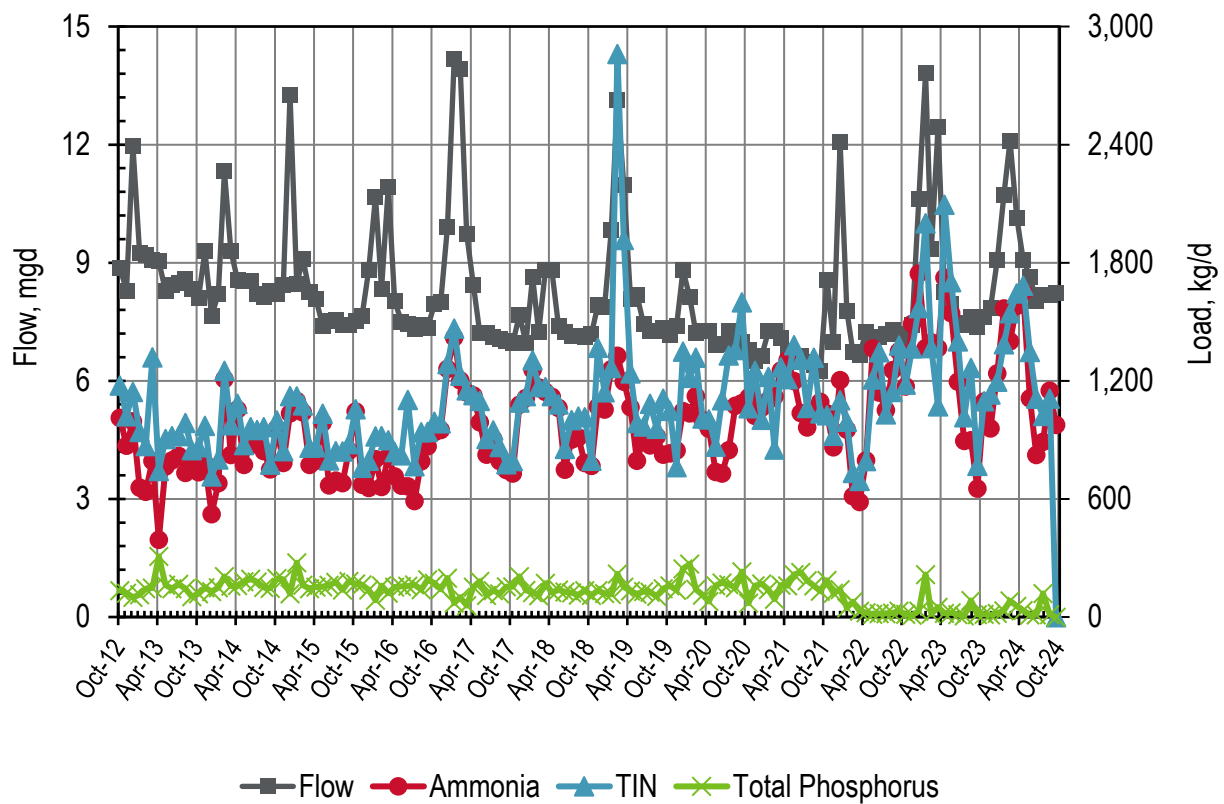


Figure 28-3. Discharge: South SF-San Bruno Monthly Flows and Loads

Table 28-2. Discharge: South SF-San Bruno Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	8.88	1,010	164	1,180	134
Nov-12	8.30	870	151	1,020	121
Dec-12	12.0	995	149	1,140	101
Jan-13	9.24	658	284	942	114
Feb-13	9.21	637	233	870	144
Mar-13	9.08	793	527	1,320	147
Apr-13	9.04	393	349	742	308
May-13	8.28	766	139	905	162
Jun-13	8.43	797	124	920	145
Jul-13	8.51	820	99.6	919	167
Aug-13	8.58	733	254	986	144

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Sep-13	8.35	789	59.9	849	104
Oct-13	8.11	736	127	862	118
Nov-13	9.29	779	193	972	149
Dec-13	7.65	523	191	714	130
Jan-14	8.21	681	121	802	150
Feb-14	11.3	1,210	42.7	1,250	206
Mar-14	9.31	824	150	975	157
Apr-14	8.56	1,050	29.4	1,080	160
May-14	8.53	774	100	874	181
Jun-14	8.55	889	77.4	966	194
Jul-14	8.22	876	74.4	950	178
Aug-14	8.13	844	122	966	151
Sep-14	8.28	752	22.8	774	147
Oct-14	8.22	960	39.2	999	197
Nov-14	8.43	783	59.7	843	191
Dec-14	13.3	1,040	87.7	1,120	119
Jan-15	8.45	1,100	23.5	1,120	276
Feb-15	9.11	1,040	36.8	1,080	162
Mar-15	8.26	774	88.0	861	144
Apr-15	8.09	794	68.5	863	152
May-15	7.39	989	45.2	1,030	155
Jun-15	7.52	669	127	796	162
Jul-15	7.54	693	150	843	178
Aug-15	7.41	680	161	842	138
Sep-15	7.42	845	34.1	879	182
Oct-15	7.52	1,050	10.9	1,060	169
Nov-15	7.64	673	86.8	759	164
Dec-15	8.83	657	137	794	138
Jan-16	10.7	803	115	919	85.0
Feb-16	8.35	661	258	919	159
Mar-16	10.9	817	82.8	899	122
Apr-16	8.02	714	125	839	152
May-16	7.51	668	153	822	155
Jun-16	7.44	665	438	1,100	158
Jul-16	7.31	590	178	768	164
Aug-16	7.42	791	149	940	140

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Sep-16	7.35	868	73.0	940	191
Oct-16	7.95	940	53.3	993	171
Nov-16	8.01	951	34.1	986	140
Dec-16	9.92	1,260	25.5	1,290	197
Jan-17	14.2	1,420	44.9	1,470	70.8
Feb-17	13.9	1,200	24.9	1,230	101
Mar-17	9.73	1,140	11.9	1,150	58.9
Apr-17	8.43	1,130	2.79	1,130	152
May-17	7.22	990	108	1,100	181
Jun-17	7.21	826	78.7	904	110
Jul-17	7.12	904	44.6	949	134
Aug-17	7.06	793	72.4	865	119
Sep-17	7.02	748	28.4	776	154
Oct-17	6.96	730	62.2	792	154
Nov-17	7.68	1,080	10.9	1,090	205
Dec-17	6.96	1,110	10.1	1,120	135
Jan-18	8.64	1,260	48.2	1,310	125
Feb-18	7.23	1,170	3.93	1,170	108
Mar-18	8.81	1,140	23.5	1,170	172
Apr-18	8.82	1,120	3.25	1,120	125
May-18	7.39	1,060	17.7	1,080	138
Jun-18	7.24	749	105	855	129
Jul-18	7.15	901	51.9	1,000	122
Aug-18	7.15	913	31.7	1,020	113
Sep-18	7.12	783	39.0	1,020	134
Oct-18	7.19	769	45.7	794	110
Nov-18	7.92	1,070	30.6	1,370	135
Dec-18	7.88	1,060	20.7	1,140	119
Jan-19	9.84	1,260	20.0	1,270	116
Feb-19	13.1	1,330	17.4	2,860	220
Mar-19	11.0	1,200	18.0	1,920	153
Apr-19	8.10	1,070	23.3	1,240	133
May-19	8.17	795	66.4	987	116
Jun-19	7.44	909	26.8	969	129
Jul-19	7.27	873	61.1	1,080	126
Aug-19	7.28	919	24.5	957	105

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Sep-19	7.34	826	38.3	1,110	144
Oct-19	7.17	832	57.7	1,050	159
Nov-19	7.41	846	84.4	762	135
Dec-19	8.81	1,050	63.9	1,350	245
Jan-20	8.13	1,040	23.4	1,220	269
Feb-20	7.23	1,120	11.8	1,320	142
Mar-20	7.28	1,000	13.9	1,010	112
Apr-20	7.26	957	77.0	1,000	79.3
May-20	6.91	738	86.7	867	160
Jun-20	6.94	730	104	1,100	173
Jul-20	7.26	848	170	1,330	165
Aug-20	6.75	1,070	26.2	1,360	150
Sep-20	6.99	1,090	12.3	1,600	230
Oct-20	6.80	1,120	8.23	1,060	70.9
Nov-20	6.50	1,020	4.31	1,250	159
Dec-20	6.64	1,060	14.7	1,000	169
Jan-21	7.26	1,100	3.65	1,220	140
Feb-21	7.28	1,120	3.49	852	90.9
Mar-21	7.09	1,250	5.67	1,270	162
Apr-21	6.76	1,310	11.5	1,210	159
May-21	6.48	1,200	19.6	1,380	215
Jun-21	6.64	1,040	18.9	1,310	228
Jul-21	6.48	965	27.3	1,060	185
Aug-21	6.39	1,050	21.9	1,320	159
Sep-21	6.26	1,090	22.3	1,040	131
Oct-21	8.57	1,030	27.9	1,030	187
Nov-21	6.99	864	34.6	922	122
Dec-21	12.1	1,200	76.1	1,100	139
Jan-22	7.79	952	27.9	993	46.3
Feb-22	6.73	614	70.0	733	78.1
Mar-22	6.66	585	167	693	30.8
Apr-22	7.25	796	38.0	792	21.8
May-22	7.07	1,370	52.7	1,210	14.3
Jun-22	7.12	1,140	30.7	1,350	17.2
Jul-22	7.18	1,050	112	1,030	17.8
Aug-22	7.30	1,260	29.1	1,140	20.4

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Sep-22	7.19	1,350	2.78	1,380	31.4
Oct-22	7.07	1,170	55.0	1,180	13.5
Nov-22	7.42	1,490	6.34	1,360	9.85
Dec-22	10.6	1,750	11.1	1,570	30.2
Jan-23	13.8	1,370	18.9	2,000	217
Feb-23	9.35	1,400	63.8	1,370	15.6
Mar-23	12.4	1,370	4.11	1,070	49.6
Apr-23	8.25	1,720	3.11	2,100	19.0
May-23	7.96	1,540	5.98	1,700	22.6
Jun-23	7.48	1,200	40.6	1,400	12.5
Jul-23	7.43	895	97.7	1,010	6.90
Aug-23	7.61	899	84.2	1,270	83.4
Sep-23	7.38	653	147	769	12.3
Oct-23	7.63	1,100	47.4	1,100	13.6
Nov-23	7.85	959	57.2	1,130	10.8
Dec-23	9.07	1,240	64.2	1,200	19.9
Jan-24	10.7	1,570	51.9	1,390	31.9
Feb-24	12.1	1,400	18.9	1,540	81.8
Mar-24	10.1	1,580	16.1	1,640	55.4
Apr-24	9.08	1,650	4.50	1,680	33.9
May-24	8.65	1,110	128	1,350	10.8
Jun-24	8.02	823	217	1,110	10.6
Jul-24	8.18	891	92.9	1,020	120
Aug-24	8.19	1,150	105	1,110	12.7
Sep-24	8.23	977			
Dry Season Average	7.49	910	85.3	1,050	124
Dry Season Trend**	Down	Up	None	Up	Down
Wet Season Average	8.80	1,040	68.0	1,140	126
Average Annual	8.26	984	75.1	1,100	125

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

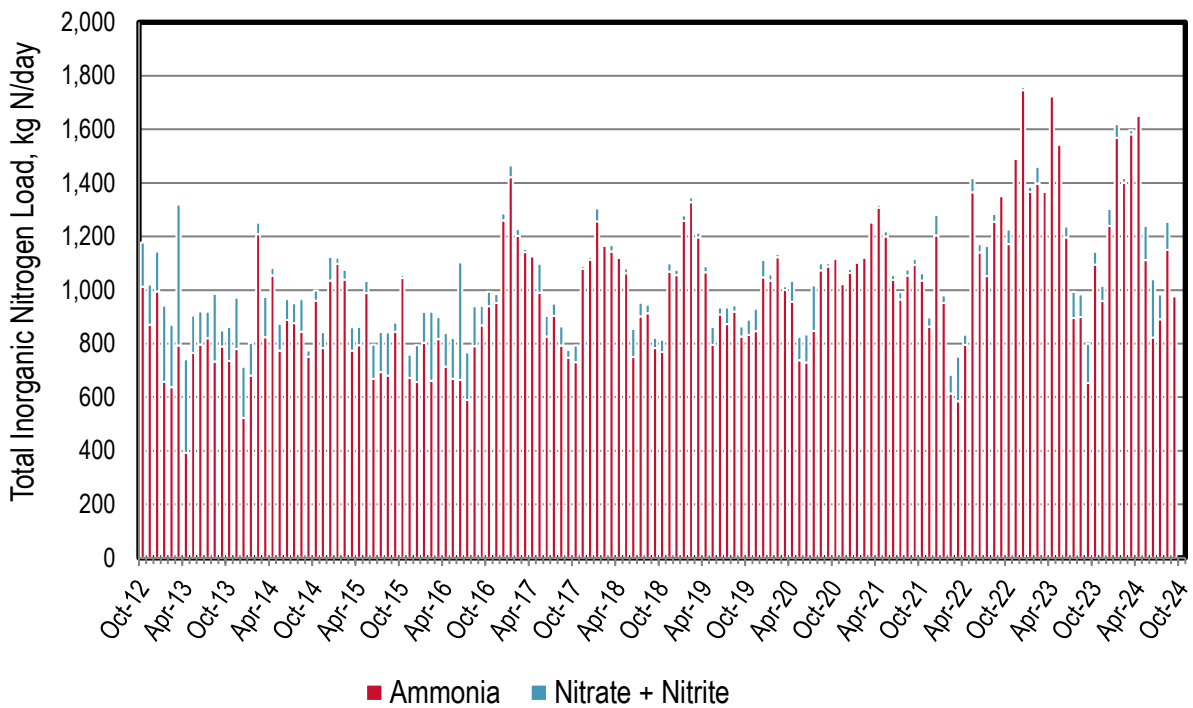


Figure 28-4. Discharge: South SF-San Bruno Monthly Nitrogen Loads

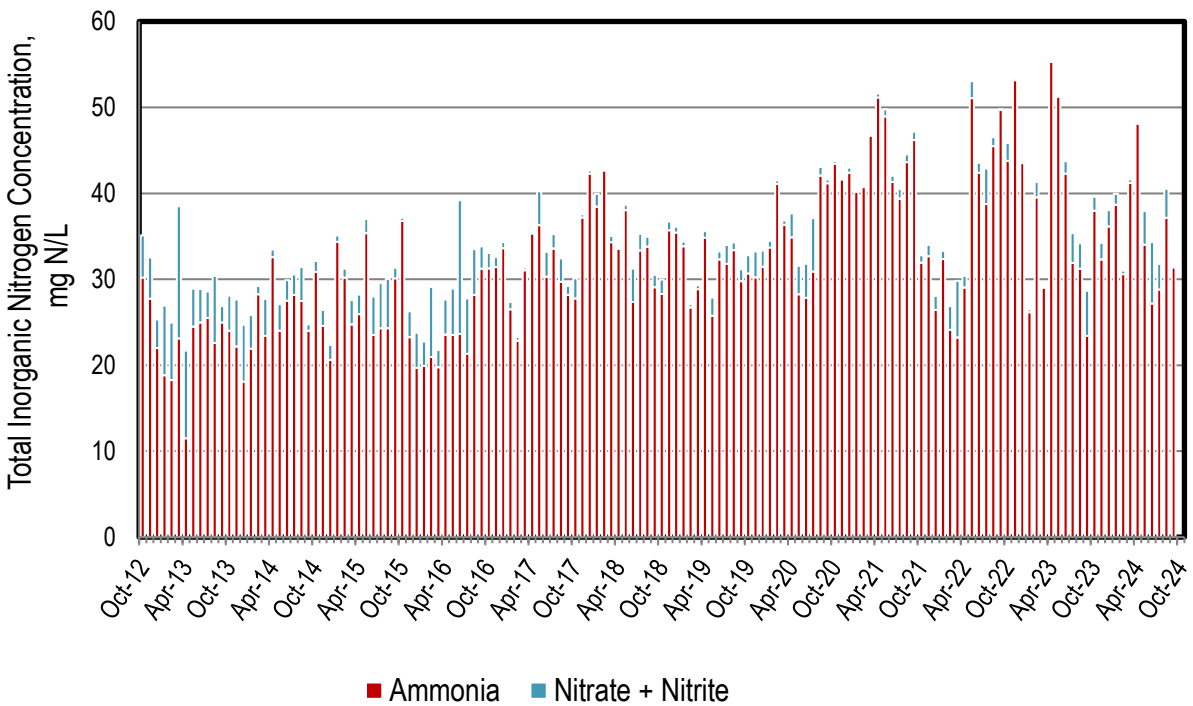


Figure 28-5. Discharge: South SF-San Bruno Monthly Nitrogen Concentrations

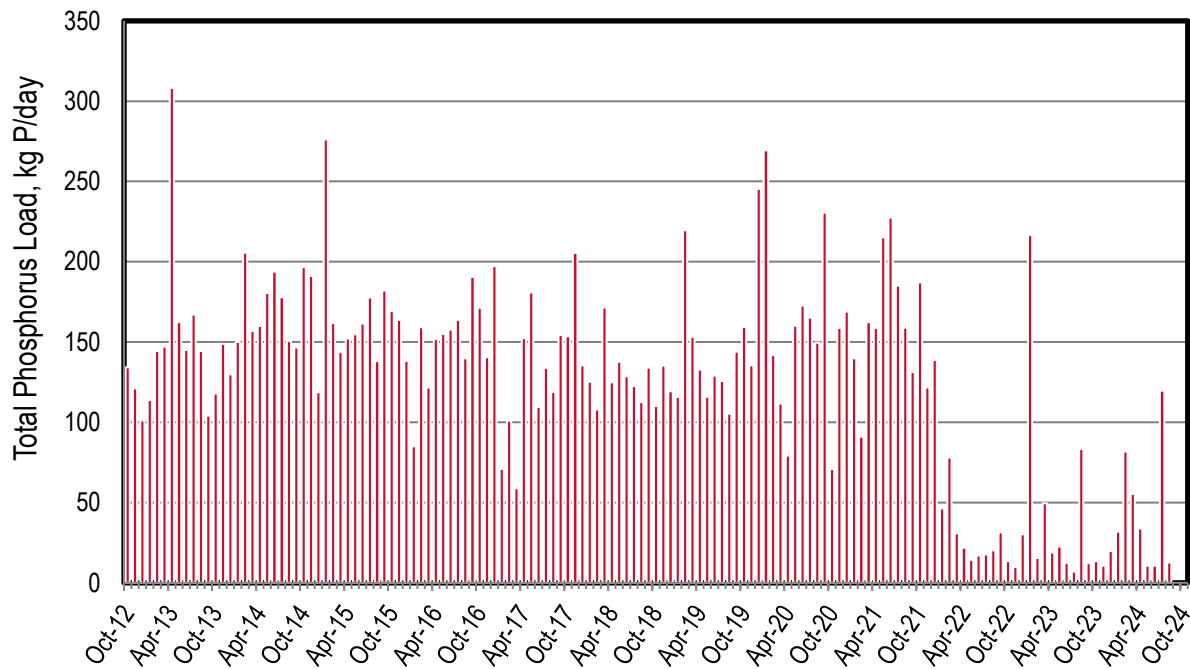


Figure 28-6. Discharge: South SF-San Bruno Monthly Phosphorus Loads

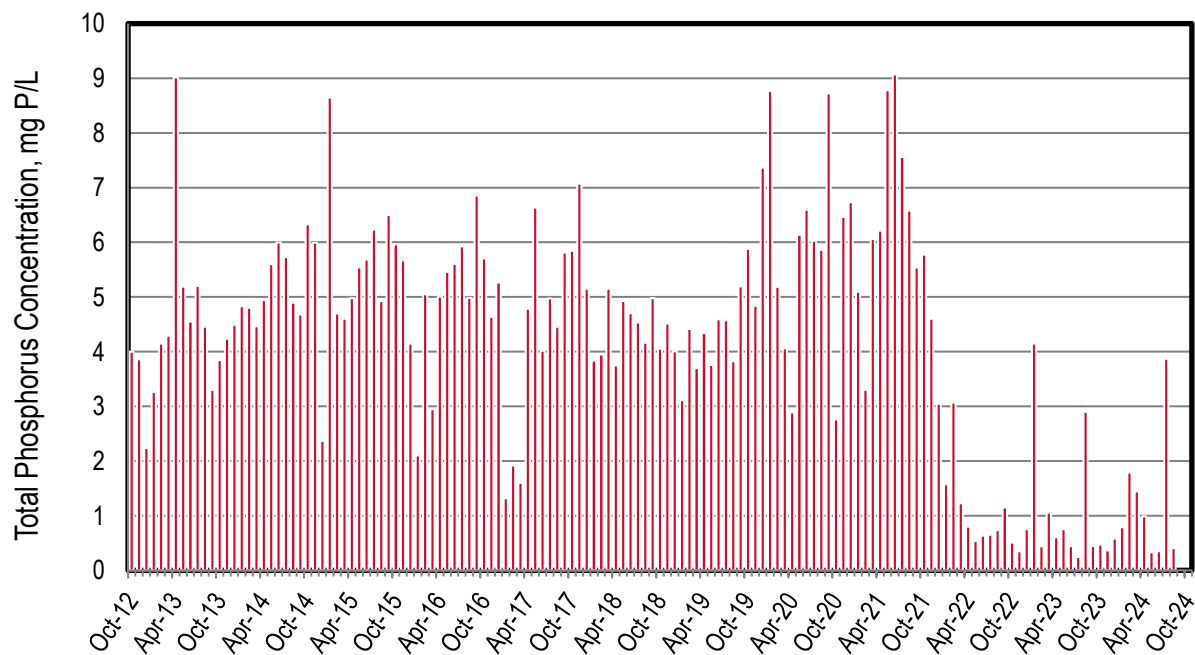


Figure 28-7. Discharge: South SF-San Bruno Monthly Phosphorus Concentrations

Recycled Water

No recycled water was produced or distributed this past year.

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Sunnyvale discharges to a tributary of the Lower South Bay. It has approximately 28,300 service connections with a permitted average dry weather flow (ADWF) capacity of 29.5 mgd and a peak wet weather flow capacity of 40 mgd. The permitted ADWF capacity will be reduced to 19.5 mgd as part of the ongoing plant upgrades design. This past dry season average discharge flow was approximately 10.5 mgd. The plant currently nitrifies using oxidation ponds followed by nitrifying trickling filters and filtration. Significant denitrification occurs in the oxidation ponds primarily during the dry season.

The following observations are made based upon the figures and table in the subsequent pages:

◆ Influent/Reduction across the Plant

- ▲ Note: limited to data since July 2019; quarterly data is required but more data is provided for various parameters.
- ▲ Based on the limited average monthly values in Table 1-1, flows have a downward dry season trend whereas all the nutrient parameters have no emerging dry season trend.
- ▲ The flow reduction across the plant on any particular day can be upwards of 50 percent. The periods with high flow reduction in 2020 were due to emergency repairs on a major conveyance pipeline from the oxidation ponds that resulted in a reduction of discharge flows. Flow reduction in recent years has been less pronounced, but still reached 40 percent in 2024. The reduction is attributed to a combination of the emergency repairs in 2020, recycled water production, temporary storage in the oxidation ponds, and/or evaporation from the oxidation ponds.
- ▲ The nitrogen load reduction values across the plant is seasonal with values from 0 to 95 percent. This load reduction is attributed primarily to biological assimilation, biosolids management, load reduction in the oxidation ponds, and load diversion with recycled water.
- ▲ The phosphorus load reduction across the plant is less seasonal than nitrogen with values from 0 to 75 percent. This load reduction is attributed primarily to biological assimilation, biosolids management, chemical precipitation, and load diversion associated with recycled water.

◆ Discharge

- ▲ Nitrogen species and total phosphorus loads typically increase with flow during wet weather events and are typically greater and more variable than the dry season loads.
- ▲ The nitrifying trickling filters typically experience a decline in nitrification performance during colder months as evidenced by higher ammonia levels in the discharge and occasional ammonia spikes. This is a common phenomenon for nitrifying trickling filters exacerbated by occasional cold temperatures in the oxidation ponds.
- ▲ The plant has seasonal denitrification as evidenced by ADWF TIN values that typically range from 10 to 30 mg N/L as compared with the 40 to 60 mg TN-N/L measured in the influent. Denitrification occurs in the oxidation ponds during the summer months.

- ▲ NO_x is the majority of the nitrogen species discharged, regardless of season. This would be expected since this plant nitrifies year-round (with reduced nitrification in the oxidation ponds and the trickling filters as noted).
- ▲ Total P concentrations are wide ranging (from approximately 1.8 to >12 mg P/L.)
- ▲ Based on Table 1-2 statistics for the entire dry season dataset, flow, nitrate + nitrite and TIN loads have an emerging upwards trend, whereas all other parameters have no trends.

◆ Recycled Water

- ▲ No water was recycled in 2023 due to the growth of “picoalgae” in the oxidation ponds that could not be completely removed in downstream treatment processes, resulting in elevated turbidity levels that exceeded the 2 NTU turbidity limit for recycled water. Historical recycle uses have included golf course irrigation, landscape irrigation, and industrial application. This problem is expected to be remedied when the new activated sludge system comes on line in 2028.
- ▲ Based on Table 1-4 through Table 1-6, the plant diverted on average 3 kg ammonia-N/day, 16 kg TIN-N/day, and 4 kg P/day from the Bay between 2019-2023.

Influent

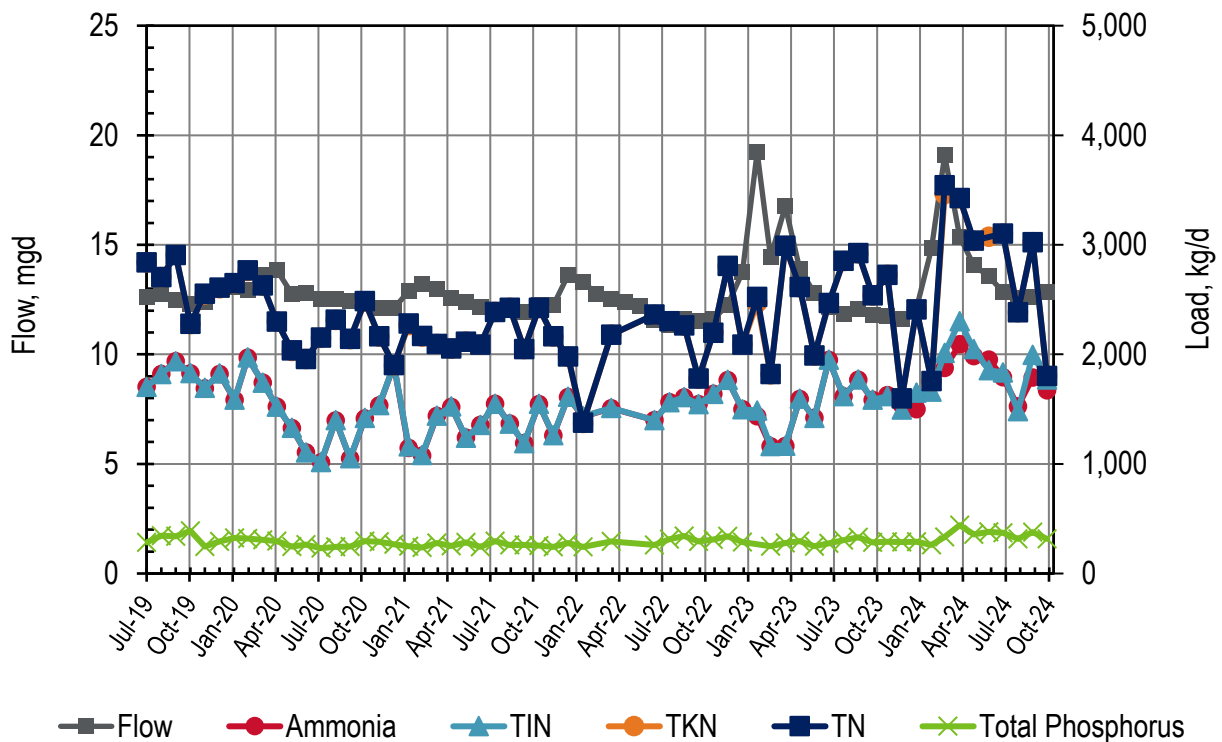


Figure 29-1. Influent: Sunnyvale Monthly Flows and Loads

Note: the ammonia/TIN loads and TKN/Total N loads are comparable. The ammonia and TKN values are located behind TIN and Total N load lines, respectively.

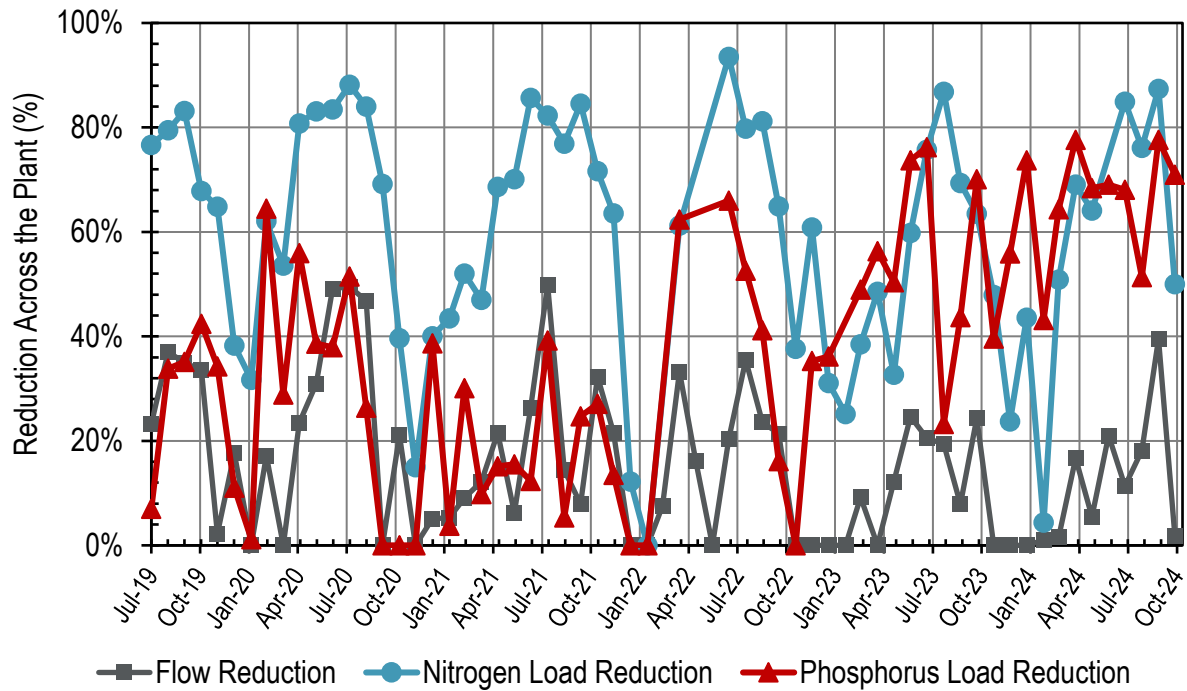


Figure 29-2. Influent: Sunnyvale Monthly Reductions Across the Plant

Note: Influent TN was compared against Discharge TIN for calculating nitrogen load reduction.

Table 29-1. Influent: Sunnyvale Monthly Flows and Loads^{1,*}

Month, Year	Flow	Ammonia*	Nitrate + Nitrite*	TIN*,**	TKN*	Total N*,**	Total P*
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-19	12.6	1,700	--	1,700	2,840	2,840	284
Aug-19	12.8	1,820	--	1,820	2,710	2,710	344
Sep-19	12.5	1,940	--	1,940	2,910	2,910	339
Oct-19	12.3	1,830	1.70	1,830	2,280	2,280	389
Nov-19	12.4	1,690	4.22	1,690	2,550	2,550	246
Dec-19	13.0	1,820	4.43	1,830	2,600	2,610	292
Jan-20	13.1	1,580	1.23	1,590	2,650	2,650	324
Feb-20	12.9	1,970	4.96	1,970	2,760	2,770	318
Mar-20	13.6	1,740	0.394	1,740	2,630	2,630	307
Apr-20	13.9	1,520	--	1,520	2,300	2,300	295
May-20	12.8	1,330	4.29	1,330	2,030	2,040	246
Jun-20	12.8	1,100	0.388	1,110	1,960	1,960	263
Jul-20	12.6	1,010	3.29	1,020	2,150	2,150	231
Aug-20	12.5	1,400	3.50	1,400	2,310	2,320	242
Sep-20	12.4	1,050	3.22	1,050	2,140	2,140	246

Month, Year	Flow	Ammonia*	Nitrate + Nitrite*	TIN*,**	TKN*	Total N*,**	Total P*
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Oct-20	12.3	1,420	3.54	1,420	2,480	2,480	295
Nov-20	12.1	1,530	2.77	1,540	2,160	2,160	289
Dec-20	12.1	1,900	3.60	1,910	1,900	1,900	267
Jan-21	12.9	1,150	14.8	1,160	2,270	2,280	249
Feb-21	13.2	1,080	5.43	1,080	2,160	2,170	236
Mar-21	13.0	1,440	0.400	1,440	2,090	2,090	277
Apr-21	12.6	1,520	3.19	1,520	2,050	2,050	251
May-21	12.4	1,240	0.568	1,240	2,110	2,120	285
Jun-21	12.2	1,360	0.366	1,360	2,090	2,090	242
Jul-21	12.0	1,550	0.183	1,550	2,390	2,390	294
Aug-21	12.0	1,370	0.462	1,370	2,420	2,420	261
Sep-21	11.9	1,190	0.454	1,190	2,050	2,050	260
Oct-21	12.3	1,550	3.07	1,550	2,420	2,420	254
Nov-21	12.2	1,260	2.79	1,260	2,160	2,170	243
Dec-21	13.6	1,610	2.70	1,610	1,980	1,980	277
Jan-22	13.3	1,430	2.40	1,430	1,370	1,380	243
Feb-22	12.8	--	--	--	--	--	--
Mar-22	12.5	1,510	1.40	1,510	2,180	2,180	292
Apr-22	12.4	--	--	--	--	--	--
May-22	12.2	--	--	--	--	--	--
Jun-22	11.6	1,400	1.54	1,400	2,360	2,360	262
Jul-22	11.3	1,560	1.29	1,560	2,300	2,300	312
Aug-22	11.6	1,610	1.58	1,610	2,260	2,260	343
Sep-22	11.5	1,540	1.21	1,550	1,780	1,780	292
Oct-22	11.6	1,640	1.06	1,640	2,200	2,200	310
Nov-22	12.3	1,770	1.71	1,770	2,810	2,810	339
Dec-22	13.7	1,500	1.10	1,500	2,090	2,090	288
Jan-23	19.2	1,440	53.1	1,490	2,470	2,520	--
Feb-23	14.4	1,160	2.27	1,160	1,820	1,820	249
Mar-23	16.8	1,160	3.30	1,170	2,990	2,990	277
Apr-23	13.9	1,590	2.70	1,600	2,610	2,610	296
May-23	12.8	1,420	1.76	1,420	1,990	1,990	250
Jun-23	12.2	1,950	2.79	1,950	2,460	2,470	274
Jul-23	11.9	1,620	1.73	1,620	2,850	2,850	303
Aug-23	12.0	1,770	1.79	1,770	2,920	2,920	332
Sep-23	11.8	1,580	1.60	1,590	2,540	2,540	283

Month, Year	Flow	Ammonia*	Nitrate + Nitrite*	TIN*,**	TKN*	Total N*,**	Total P*
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Oct-23	11.7	1,630	0.919	1,620	2,730	2,730	290
Nov-23	11.6	1,540	0.904	1,500	1,600	1,600	288
Dec-23	12.1	1,500	1.80	1,650	2,410	2,410	290
Jan-24	14.8	1,730	25.4	1,660	1,760	1,760	262
Feb-24	19.1	1,880	80.7	2,010	3,460	3,540	334
Mar-24	15.4	2,090	1.18	2,300	3,420	3,430	441
Apr-24	14.1	1,980	1.11	2,050	3,040	3,040	357
May-24	13.5	1,950	1.06	1,860	3,070	--	382
Jun-24	12.9	1,790	1.01	1,830	3,100	3,100	373
Jul-24	12.6	1,530	0.985	1,480	2,380	2,380	316
Aug-24	12.6	1,790	0.982	2,000	3,020	3,020	378
Sep-24	12.8	1,670	3.26	1,770	1,800	1,800	315
Dry Season Average	12.3	1,530	1.64	1,540	2,410	2,380	295
Dry Season Trend ***	Down	None	None	None	None	None	
Wet Season Average	13.4	1,580	7.51	1,600	2,380	2,380	293
Average Annual	12.9	1,560	4.99	1,570	2,390	2,380	294

1 For non-detects after October 1, 2023, 1/2 of the method detection limit was used to quantify values. Prior to October 1, 2023, non-detect values used the provided method detection limit.

* Sunnyvale typically samples more than the required influent quarterly nutrient sampling. This dataset includes this additional sampling.

** The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values. The Total Nitrogen value is calculated by adding "TKN" and "Nitrate + Nitrite".

*** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

Discharge

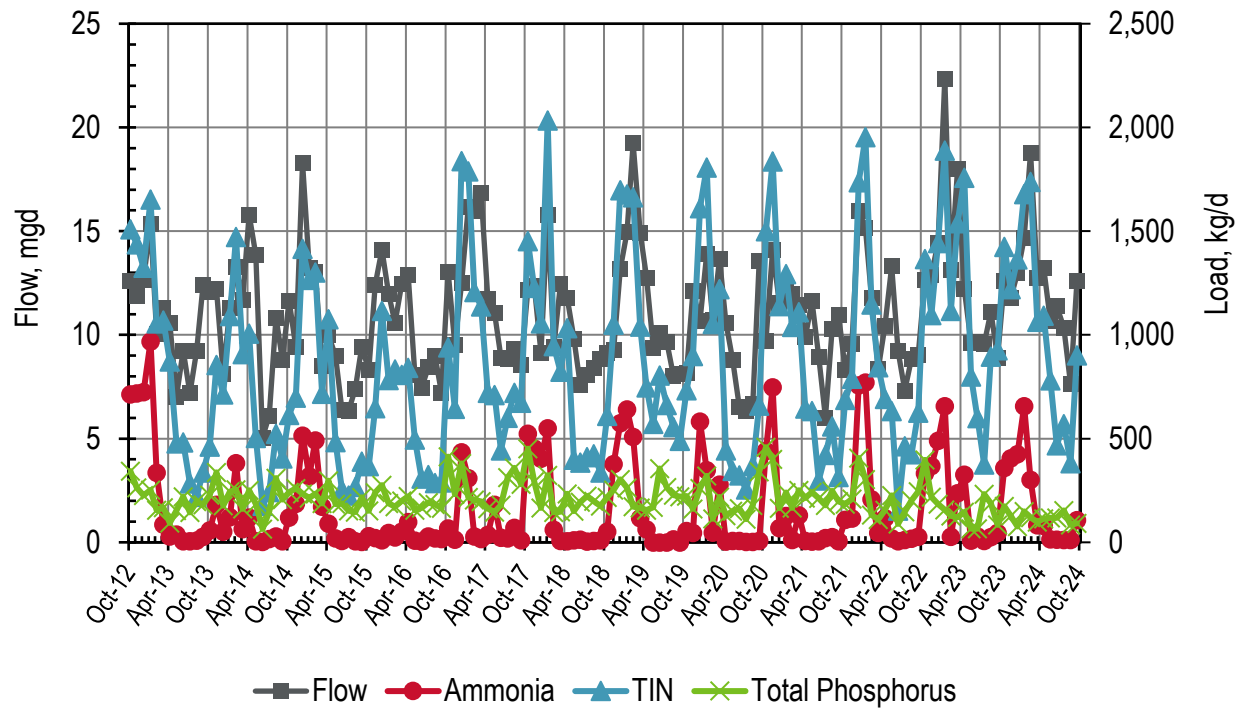


Figure 29-3. Discharge: Sunnyvale Monthly Flows and Loads

Table 29-2. Discharge: Sunnyvale Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	12.6	714	795	1,510	343
Nov-12	11.9	719	718	1,440	263
Dec-12	12.6	724	600	1,320	226
Jan-13	15.4	968	685	1,650	252
Feb-13	10.1	336	720	1,060	155
Mar-13	11.3	86.3	983	1,070	167
Apr-13	10.6	28.8	844	872	94.3
May-13	7.04	37.9	439	477	154
Jun-13	9.25	5.51	477	482	220
Jul-13	7.19	5.62	279	285	145
Aug-13	9.23	8.30	212	220	198
Sep-13	12.4	26.7	310	337	181
Oct-13	12.6	58.5	404	463	228
Nov-13	11.9	181	675	856	338

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-13	12.6	52.4	661	714	177
Jan-14	15.4	121	971	1,090	244
Feb-14	10.1	382	1,090	1,470	254
Mar-14	11.3	64.7	843	908	162
Apr-14	10.6	120	887	1,010	251
May-14	7.04	5.24	498	503	185
Jun-14	9.25	1.91	175	177	64.4
Jul-14	6.12	16.2	228	244	149
Aug-14	10.8	29.5	495	524	309
Sep-14	8.81	6.36	399	405	206
Oct-14	11.7	120	495	615	241
Nov-14	9.40	186	512	698	260
Dec-14	18.3	515	901	1,420	234
Jan-15	13.2	319	948	1,270	214
Feb-15	13.1	491	811	1,300	234
Mar-15	8.52	173	544	717	187
Apr-15	9.99	91.1	985	1,080	297
May-15	8.99	19.9	465	485	184
Jun-15	6.40	7.57	246	253	188
Jul-15	6.33	25.5	201	227	152
Aug-15	7.41	6.27	262	268	145
Sep-15	9.43	3.37	386	390	217
Oct-15	8.29	30.5	338	368	152
Nov-15	12.4	21.0	627	648	241
Dec-15	14.1	10.9	1,110	1,120	276
Jan-16	12.0	45.8	737	783	188
Feb-16	10.6	23.8	810	834	173
Mar-16	12.5	51.5	756	808	200
Apr-16	12.9	97.9	744	842	222
May-16	8.08	9.09	488	497	155
Jun-16	7.44	4.69	303	308	166
Jul-16	8.45	28.3	296	324	192
Aug-16	8.99	20.0	267	287	183
Sep-16	7.22	16.0	273	289	165
Oct-16	13.0	68.1	872	940	413
Nov-16	9.51	13.2	631	644	233

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-16	12.5	434	1,400	1,840	380
Jan-17	16.2	310	1,480	1,790	217
Feb-17	16.0	29.0	1,180	1,210	205
Mar-17	16.8	15.8	1,120	1,140	196
Apr-17	11.7	36.4	685	721	163
May-17	11.1	182	530	711	146
Jun-17	8.91	22.4	421	444	181
Jul-17	8.87	19.7	582	602	312
Aug-17	9.33	69.8	651	721	359
Sep-17	8.55	10.7	663	673	281
Oct-17	12.2	524	928	1,450	451
Nov-17	12.4	453	774	1,230	293
Dec-17	9.15	404	652	1,060	166
Jan-18	15.8	550	1,480	2,030	323
Feb-18	9.43	61.5	885	946	144
Mar-18	12.5	7.03	816	823	147
Apr-18	11.8	4.99	1,030	1,030	233
May-18	9.82	11.0	388	399	151
Jun-18	7.57	13.2	372	385	194
Jul-18	8.07	4.20	408	412	224
Aug-18	8.42	7.67	417	425	199
Sep-18	8.83	11.1	326	337	176
Oct-18	9.12	52.2	559	611	217
Nov-18	9.27	377	673	1,050	252
Dec-18	13.2	574	1,120	1,700	303
Jan-19	15.0	641	1,040	1,680	264
Feb-19	19.2	509	1,160	1,660	172
Mar-19	14.9	116	924	1,040	167
Apr-19	12.8	62.1	685	747	155
May-19	9.39	0	571	571	170
Jun-19	10.1	0	804	804	356
Jul-19	9.68	0	663	663	264
Aug-19	8.03	14.9	541	556	228
Sep-19	8.11	0	490	490	220
Oct-19	8.19	55.6	678	733	224
Nov-19	12.1	46.3	852	898	162

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-19	10.7	582	1,030	1,610	260
Jan-20	13.9	348	1,460	1,810	320
Feb-20	10.7	47.4	1,010	1,050	113
Mar-20	13.7	278	944	1,220	218
Apr-20	10.6	4.76	438	443	130
May-20	8.81	6.90	338	345	151
Jun-20	6.52	6.84	317	324	163
Jul-20	6.34	2.93	252	255	112
Aug-20	6.67	3.39	366	370	178
Sep-20	13.6	6.86	653	660	340
Oct-20	9.72	441	1,060	1,500	458
Nov-20	14.1	747	1,090	1,840	400
Dec-20	11.5	69.1	1,070	1,140	164
Jan-21	12.2	128	1,170	1,290	240
Feb-21	12.0	12.1	1,030	1,040	165
Mar-21	11.4	131	978	1,110	250
Apr-21	9.88	7.57	638	645	213
May-21	11.6	4.40	629	633	241
Jun-21	8.95	5.63	293	299	212
Jul-21	6.01	20.7	401	422	179
Aug-21	10.3	25.4	534	560	247
Sep-21	11.0	6.17	310	316	196
Oct-21	8.30	110	577	687	185
Nov-21	9.60	115	674	789	210
Dec-21	16.0	757	980	1,740	407
Jan-22	15.1	771	1,180	1,950	303
Feb-22	11.8	208	929	1,150	132
Mar-22	8.35	46.4	798	845	110
Apr-22	10.4	117	677	691	155
May-22	13.3	20.3	610	633	227
Jun-22	9.23	5.28	148	153	89.2
Jul-22	7.32	12.1	453	465	148
Aug-22	8.87	18.5	407	426	202
Sep-22	9.05	27.4	598	625	245
Oct-22	12.7	333	1,030	1,370	397
Nov-22	12.9	368	728	1,100	219

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Dec-22	14.5	490	953	1,440	184
Jan-23	22.4	657	1,230	1,890	156
Feb-23	13.1	27.5	1,090	1,120	127
Mar-23	18.0	237	1,300	1,540	121
Apr-23	12.2	327	1,430	1,760	147
May-23	9.64	8.89	791	800	65.7
Jun-23	9.66	28.9	570	599	65.2
Jul-23	9.56	7.66	368	376	233
Aug-23	11.1	25.2	871	896	187
Sep-23	8.91	46.2	881	927	84.6
Oct-23	12.6	360	1,050	1,420	175
Nov-23	11.8	405	899	1,220	127
Dec-23	13.0	425	957	1,360	76.1
Jan-24	14.7	657	1,160	1,680	149
Feb-24	18.8	302	1,450	1,740	119
Mar-24	12.8	82.1	1,030	1,060	98.8
Apr-24	13.3	79.8	1,040	1,090	113
May-24	10.7	14.6	759	782	118
Jun-24	11.4	13.4	454	468	119
Jul-24	10.3	11.2	561	570	154
Aug-24	7.64	12.7	370	382	84.5
Sep-24	12.6	107	754	902	91.5
Dry Season Average	9.04	18.3	454	473	186
Dry Season Trend **	Up	None	Up	Up	None
Wet Season Average	12.5	259	904	1,160	219
Average Annual	11.1	159	716	872	205

* The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

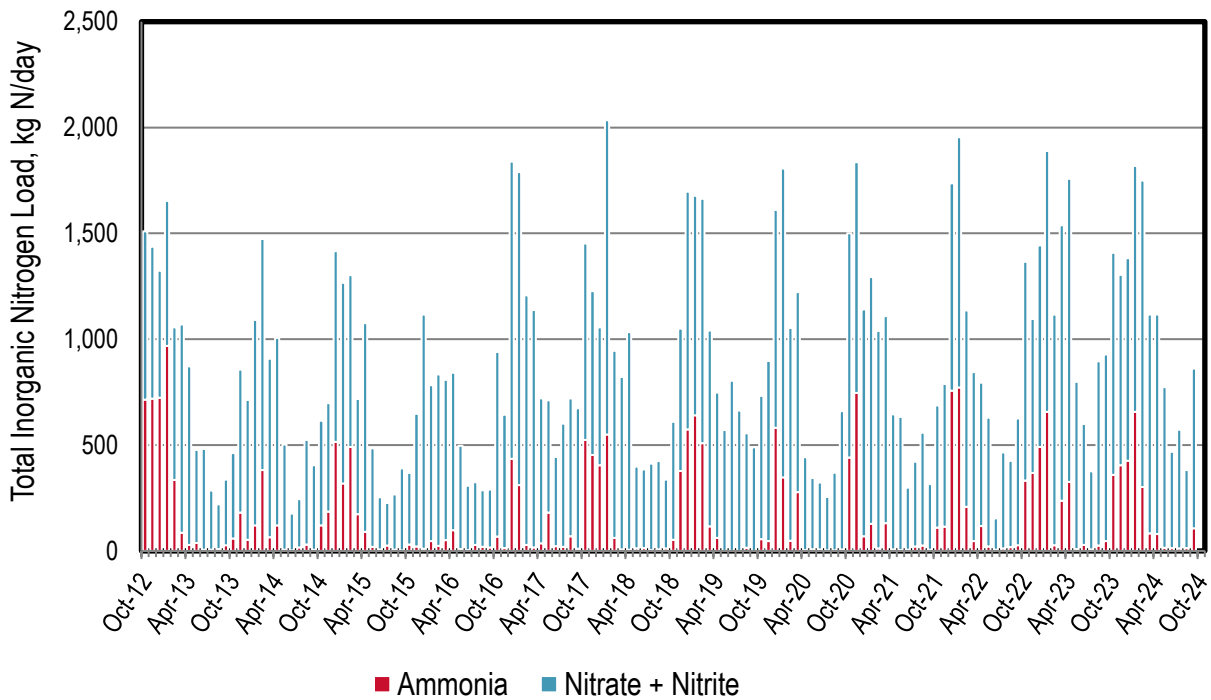


Figure 29-4. Discharge: Sunnyvale Monthly Nitrogen Loads

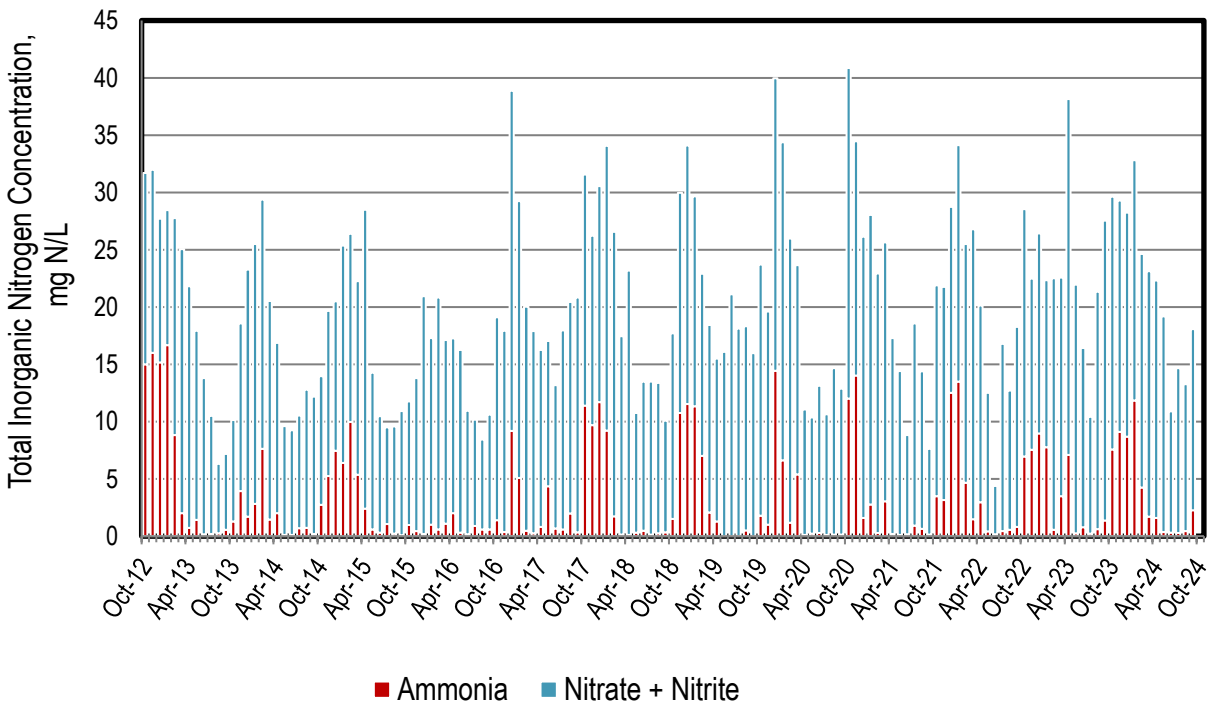


Figure 29-5. Discharge: Sunnyvale Monthly Nitrogen Concentrations

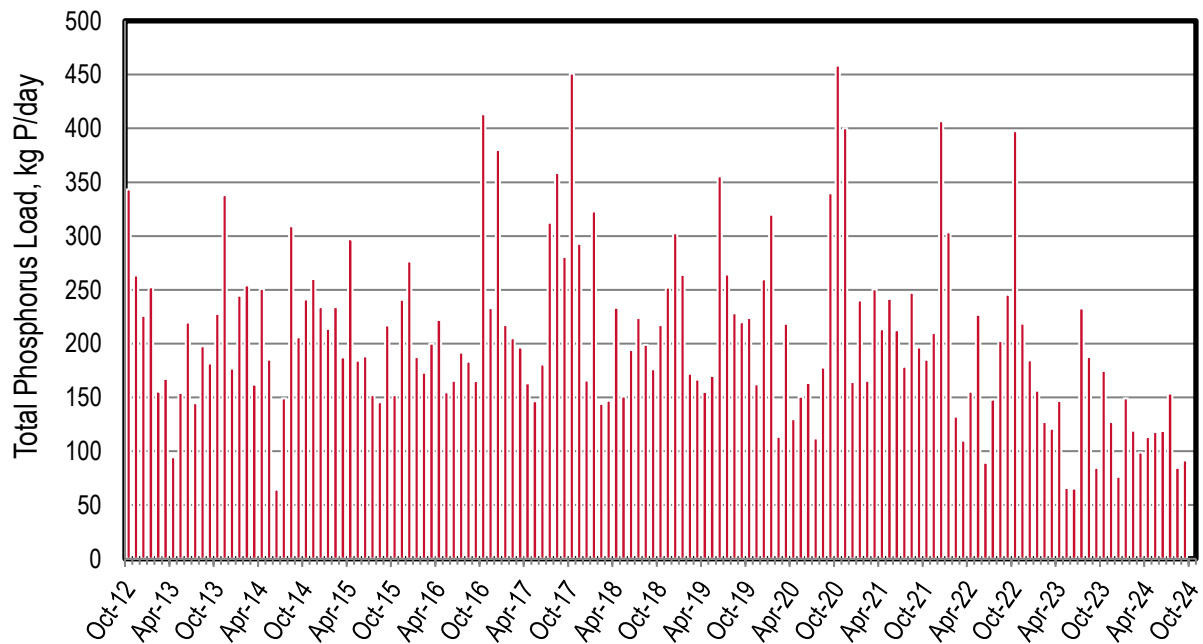


Figure 29-6. Discharge: Sunnyvale Monthly Phosphorus Loads

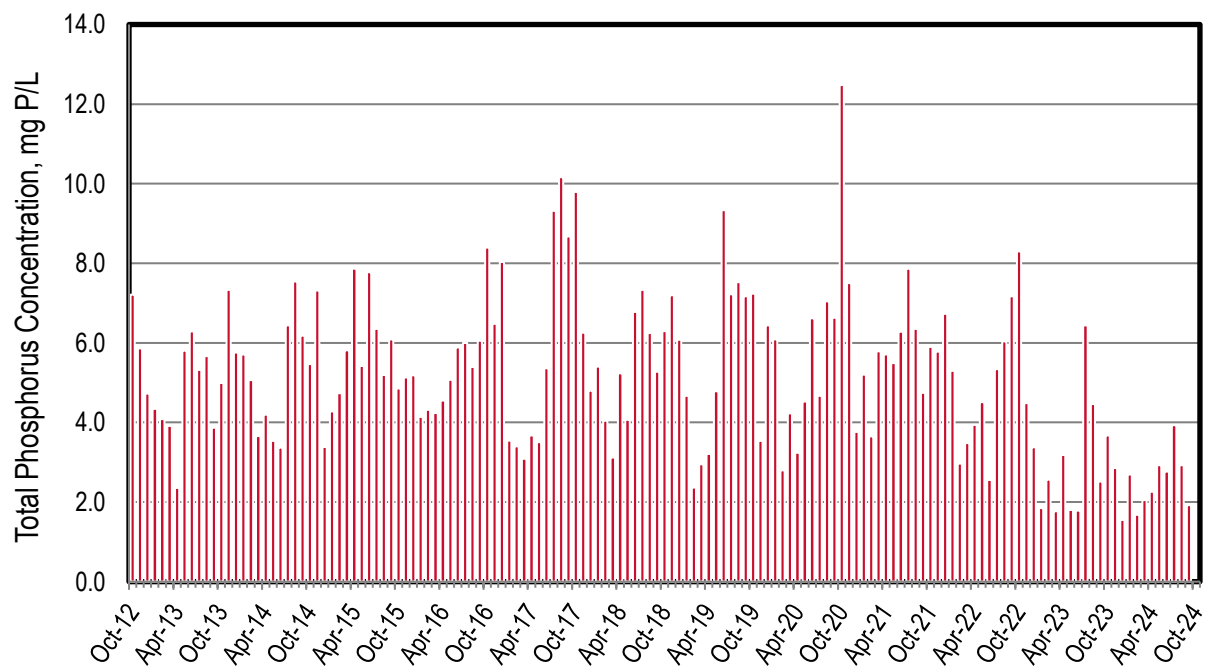


Figure 29-7. Discharge: Sunnyvale Monthly Phosphorus Concentrations

Recycled Water

Table 29-3. Recycled Water: City of Sunnyvale Yearly Recycled Water Flows Diverted from the Bay

Year**	Flow Diverted*, Acre-Feet (mgd)							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	121 (0.11)	156 (0.14)	0 (0)	9 (0.01)	0 (0)	0 (0)	0 (0)	286 (0.26)
2020	111 (0.10)	219 (0.20)	0 (0)	10 (0.01)	0 (0)	0 (0)	0 (0)	340 (0.31)
2021	114 (0.10)	209 (0.19)	0 (0)	5 (<0.01)	0 (0)	0 (0)	0 (0)	328 (0.29)
2022	40 (0.04)	63 (0.06)	0 (0)	2 (<0.01)	0 (0)	0 (0)	0 (0)	105 (0.10)
2023	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Average	77 (0.07)	129 (0.12)	0 (0)	5 (<0.01)	0 (0)	0 (0)	0 (0)	212 (0.19)

* Assumes 100% of the recycled flow is diverted from the Bay

** Calendar year as opposed to California's water year (October 1 through September 30)

Table 29-4. Recycled Water: City of Sunnyvale Yearly Recycled Water Ammonia Load Diverted from the Bay

Year**	Average Ammonia Load Diverted*, kg N/d							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	2	2	0	0.1	0	0	0	4
2020	2	3	0	0.1	0	0	0	5
2021	1	2	0	<1	0	0	0	3
2022	1	1	0	<1	0	0	0	2
2023	0	0	0	0	0	0	0	0
Average	1	2	0	<1	0	0	0	3

* Assumes 100% of the recycled load is diverted from the Bay

** Calendar year as opposed to California's water year (October 1 through September 30)

Table 29-5. Recycled Water: City of Sunnyvale Yearly Recycled Water TIN Load Diverted from the Bay

Year**	Average Total Inorganic Nitrogen Load Diverted*, kg N/d							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	9	12	0	1	0	0	0	22
2020	9	17	0	1	0	0	0	27
2021	7	14	0	<1	0	0	0	22
2022	3	5	0	<1	0	0	0	8
2023	0	0	0	0	0	0	0	0
Average	6	10	0	<1	0	0	0	16

* Assumes 100% of the recycled load is diverted for all recycled water applications

** Calendar year as opposed to California's water year (October 1 through September 30)

Table 29-6. Recycled Water: City of Sunnyvale Yearly Recycled Water Total Phosphorus Load Diverted from the Bay

Year**	Average Total P Load Diverted*, kg P/d							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	2	3	0	<1	0	0	0	5
2020	2	4	0	<1	0	0	0	7
2021	2	4	0	<1	0	0	0	6
2022	1	1	0	<1	0	0	0	2
2023	0	0	0	0	0	0	0	0
Average	1	2	0	<1	0	0	0	4

* Assumes 100% of the recycled load is diverted for all recycled water applications

** Calendar year as opposed to California's water year (October 1 through September 30)

30 Silicon Valley Clean Water (SVCW)

SVCW discharges to the South Bay. The plant services a population of approximately 200,000 and has a permitted ADWF capacity of 29 mgd. The average dry season discharge flow this past year was approximately 12.7 mgd. The plant performs tertiary treatment using a trickling filter complemented with an activated sludge system followed by mono-media or dual-media filtration.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Influent

- ▲ Note: limited to data since July 2019; quarterly data is required but more is provided for various parameters. Based on the limited data, there are no emerging trends for the evaluated parameters.
- ▲ Flow reduction in 2023/2024 was the highest since data collection began, and exceeded 10% for the first time in July 2024.
- ▲ The nitrogen load reduction value across the plant is upwards of 30 percent. This load reduction is attributed to biological assimilation and biosolids management.
- ▲ The phosphorus load reduction across the plant is upwards of 50 percent. This load reduction is attributed to chemical precipitation and biological assimilation.

◆ Discharge

- ▲ Nitrogen species loads typically increases with flow during wet weather events. Furthermore, nitrogen species wet season loads are typically greater and more variable than the dry season loads.
- ▲ Ammonia is the majority of the nitrogen species discharged, regardless of season. This would be expected since this plant does not nitrify. Minor unintentional nitrification was observed during the 2024 dry season, leading to the highest nitrate + nitrite load since data collection began in 2012.
- ▲ Total phosphorus concentrations are wide ranging, from approximately 1.6 to 5.9 mg P/L.
- ▲ Based on Table 30-2 statistics for the entire dry season dataset, ammonia, TIN, and total phosphorus are trending upwards. Flow and nitrate + nitrite are trending neither upwards nor downwards across the entire dry season dataset.

◆ Recycled Water

- ▲ Based on Table 1-2, the plant averaged 0.5 mgd of recycled water from 2019-2023. Uses include landscape irrigation, industrial application, and other non-potable uses such as on-site plumbing.
- ▲ Based on Table 24-3 through Table 24-5, the plant diverted on average 99 kg ammonia-N/day, 100 kg TIN-N/day, and 9 kg P/day away from the Bay from 2019-2023.

Influent

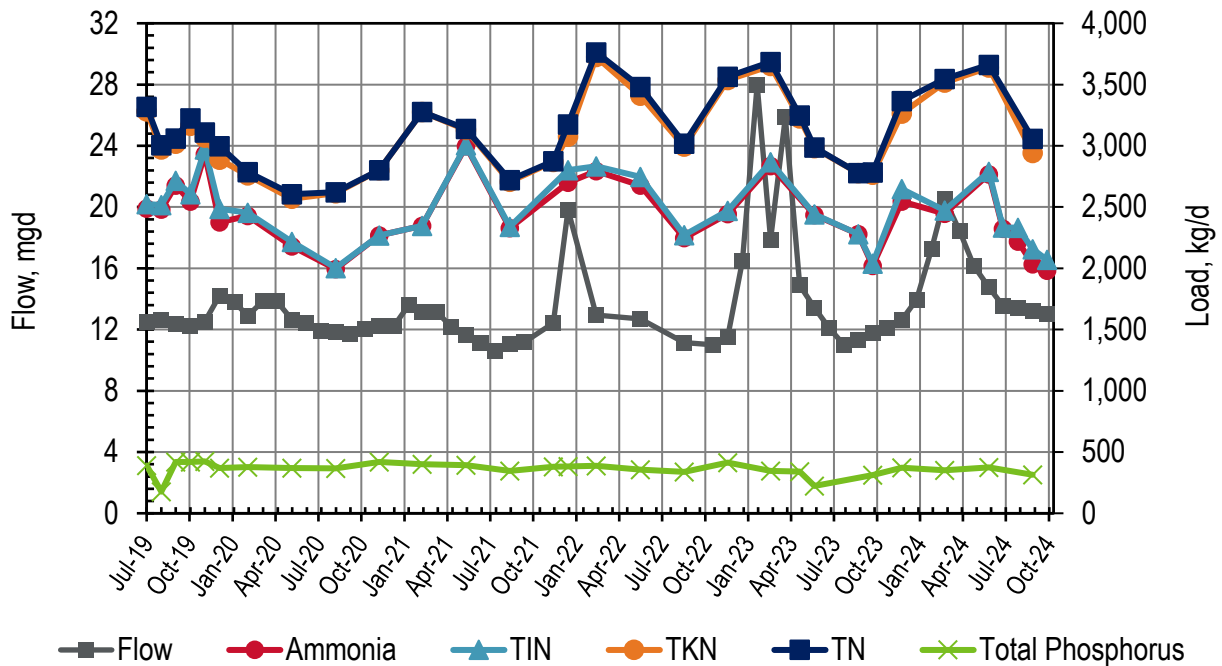


Figure 30-1. Influent: SVCW Monthly Flows and Loads

Note: the ammonia/TIN loads and TKN/Total N loads are comparable. The ammonia and TKN values are located behind TIN and Total N load lines, respectively.

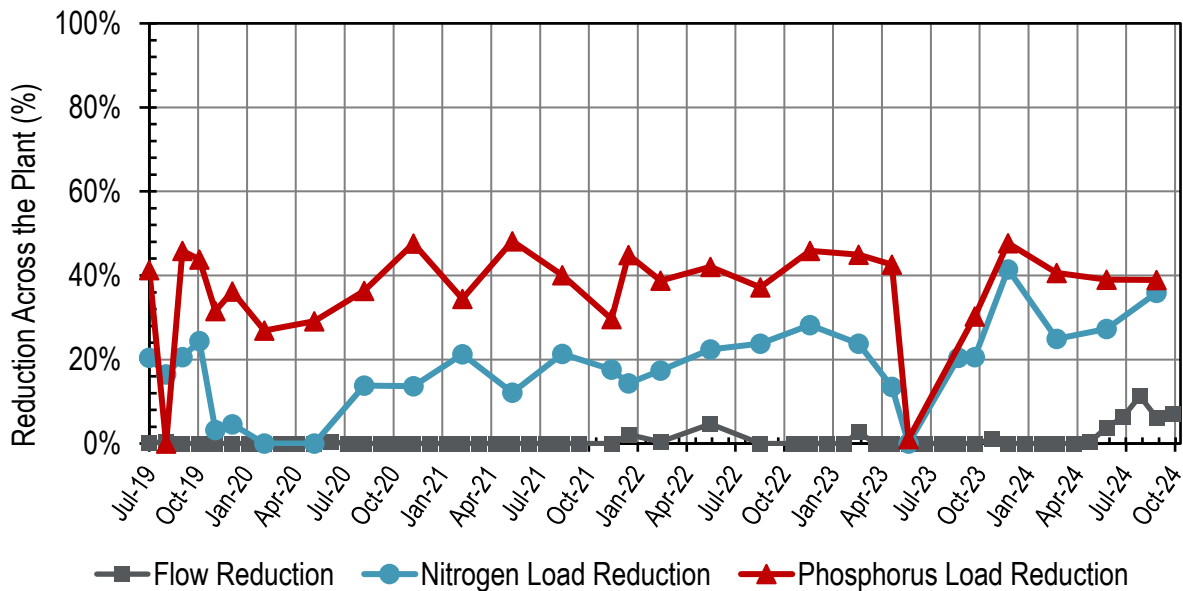


Figure 30-2. Influent: SVCW Monthly Reductions Across the Plant

Note: Influent TN was compared against Discharge TIN for calculating nitrogen load reduction.

Table 30-1. Influent: SVCW Monthly Flows and Loads*

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN **	TKN	Total N **	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-19	12.5	2,490	36.1	2,520	3,280	3,320	390
Aug-19	12.6	2,480	34.7	2,520	2,970	3,010	177
Sep-19	12.4	2,680	40.3	2,720	3,020	3,060	419
Oct-19	12.2	2,540	59.8	2,600	3,170	3,230	420
Nov-19	12.5	2,930	40.9	2,970	3,070	3,110	424
Dec-19	14.2	2,380	109	2,480	2,890	3,000	368
Jan-20	13.8	--	--	--	--	--	--
Feb-20	12.9	2,430	27.4	2,450	2,760	2,790	376
Mar-20	13.9	--	--	--	--	--	--
Apr-20	13.8	--	--	--	--	--	--
May-20	12.6	2,180	37.2	2,220	2,570	2,600	368
Jun-20	12.4	--	--	--	--	--	--
Jul-20	11.9	--	--	--	--	--	--
Aug-20	11.9	2,000	7.80	2,000	2,610	2,620	366
Sep-20	11.7	--	--	--	--	--	--
Oct-20	12.1	--	--	--	--	--	--
Nov-20	12.2	2,270	0	2,270	2,800	2,800	418
Dec-20	12.2	--	--	--	--	--	--
Jan-21	13.6	--	--	--	--	--	--
Feb-21	13.2	2,350	0	2,350	3,280	3,280	401
Mar-21	13.1	--	--	--	--	--	--
Apr-21	12.2	--	--	--	--	--	--
May-21	11.6	3,000	7.74	3,010	3,130	3,140	394
Jun-21	11.1	--	--	--	--	--	--
Jul-21	10.6	--	--	--	--	--	--
Aug-21	11.1	2,330	12.1	2,340	2,710	2,720	347
Sep-21	11.2	--	--	--	--	--	--
Oct-21	--	--	--	--	--	--	--
Nov-21	12.4	--	7.52	--	2,870	2,880	381
Dec-21	19.8	2,700	99.8	2,800	3,080	3,180	383
Jan-22	--	--	--	--	--	--	--
Feb-22	13.0	2,790	37.4	2,830	3,730	3,760	387
Mar-22	--	--	--	--	--	--	--
Apr-22	--	--	--	--	--	--	--
May-22	12.7	2,680	71.1	2,750	3,410	3,480	355
Jun-22	--	--	--	--	--	--	--
Jul-22	--	--	--	--	--	--	--

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN **	TKN	Total N **	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Aug-22	11.1	2,250	23.7	2,270	2,990	3,020	337
Sep-22	--	--	--	--	--	--	--
Oct-22	11.0	--	--	--	--	--	--
Nov-22	11.5	2,440	25.2	2,470	3,540	3,560	414
Dec-22	16.5	--	--	--	--	--	--
Jan-23	28.0	--	--	--	--	--	--
Feb-23	17.9	2,840	31.3	2,870	3,650	3,680	347
Mar-23	25.9	--	--	--	--	--	--
Apr-23	14.9	--	21.4	--	3,230	3,250	341
May-23	13.4	2,440	5.15	2,440	2,980	2,990	222
Jun-23	12.1	--	--	--	--	--	--
Jul-23	11.0	--	--	--	--	--	--
Aug-23	11.3	2,280	0.421	2,280	2,780	2,780	--
Sep-23	11.8	2,020	18.0	2,040	2,760	2,780	313
Oct-23	12.1	--	--	--	--	--	--
Nov-23	12.6	2,550	102	2,650	3,260	3,370	373
Dec-23	13.9	--	--	--	--	--	--
Jan-24	17.2	--	--	--	--	--	--
Feb-24	20.5	2,450	27.2	2,470	3,520	3,540	352
Mar-24	18.4	--	--	--	--	--	--
Apr-24	16.2	--	--	--	--	--	--
May-24	14.8	2,770	20.2	2,790	3,640	3,660	376
Jun-24	13.5	2,320	19.0	2,330	--	--	--
Jul-24	13.4	2,220	86.7	2,330	--	--	--
Aug-24	13.2	2,030	111	2,160	2,940	3,060	314
Sep-24	13.0	1,980	89.9	2,070	--	--	--
Dry Season Average	12.2	2,360	36.6	2,400	2,990	3,020	337
Dry Season Trend ***	None	None	None	None	None	None	None
Wet Season Average	15.0	2,560	42.1	2,600	3,200	3,240	385
Average Annual	13.7	2,440	39.1	2,480	3,090	3,130	362

* SVCW occasionally samples more than the required influent ammonia quarterly sampling. This dataset includes this additional sampling.

** The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values. The Total Nitrogen value is calculated by adding "TKN" and "Nitrate + Nitrite".

*** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

Discharge

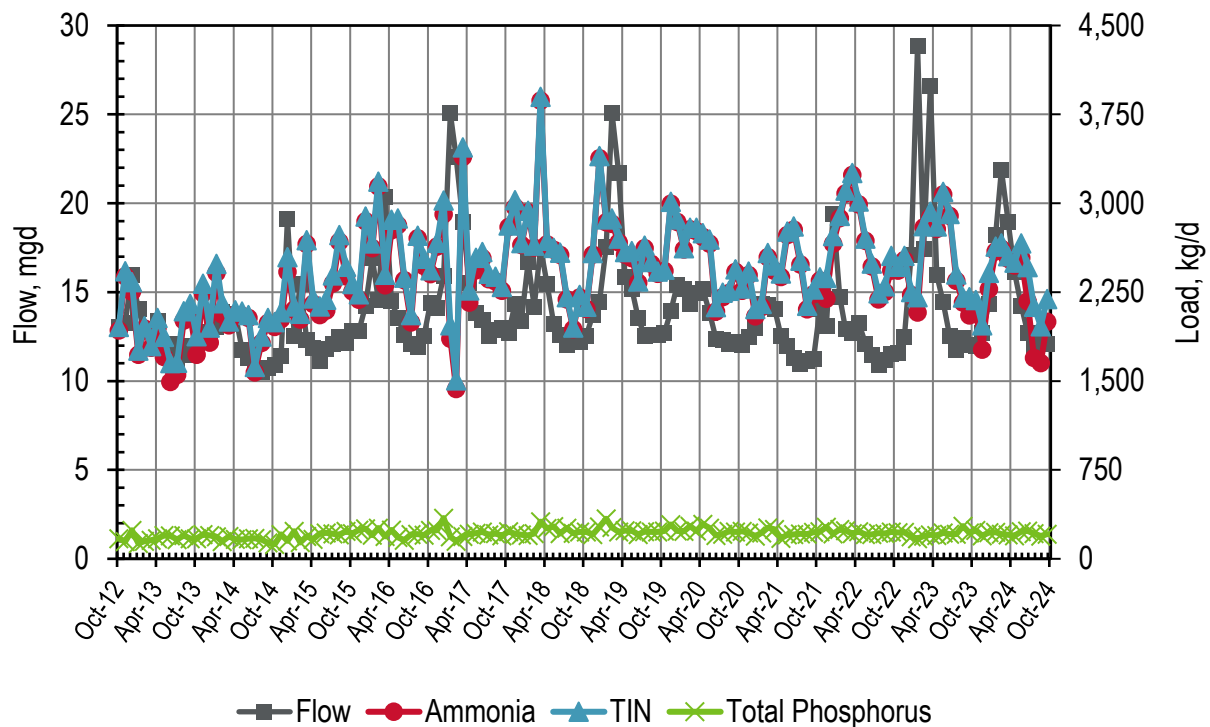


Figure 30-3. Discharge: SVCW Monthly Flows and Loads

Table 30-2. Discharge: SVCW Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	13.1	1,930	30.2	1,960	171
Nov-12	13.3	2,380	44.2	2,430	146
Dec-12	16.0	2,260	80.0	2,340	240
Jan-13	14.1	1,720	33.4	1,760	130
Feb-13	12.9	1,940	19.4	1,960	149
Mar-13	13.0	1,780	14.6	1,800	156
Apr-13	13.4	1,950	81.0	2,030	170
May-13	12.0	1,700	171	1,870	197
Jun-13	12.1	1,490	159	1,650	195
Jul-13	11.3	1,550	103	1,660	164
Aug-13	12.0	2,010	77.7	2,090	196
Sep-13	11.5	2,060	94.7	2,150	171
Oct-13	11.7	1,720	157	1,880	170

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-13	12.8	2,240	81.6	2,320	204
Dec-13	12.7	1,820	127	1,950	198
Jan-14	13.0	2,420	74.1	2,490	187
Feb-14	13.9	2,060	94.0	2,160	147
Mar-14	13.3	1,970	32.4	2,000	188
Apr-14	13.8	2,060	38.7	2,100	164
May-14	11.8	2,050	35.4	2,090	163
Jun-14	11.3	2,030	24.4	2,060	169
Jul-14	10.7	1,580	43.4	1,620	174
Aug-14	10.5	1,820	54.2	1,880	163
Sep-14	10.7	1,990	45.4	2,030	136
Oct-14	10.9	1,960	38.9	2,000	123
Nov-14	11.4	2,020	59.4	2,080	206
Dec-14	19.1	2,420	122	2,550	152
Jan-15	12.6	2,100	28.0	2,130	233
Feb-15	15.5	2,020	48.6	2,070	138
Mar-15	12.3	2,660	32.8	2,690	189
Apr-15	11.9	2,150	47.7	2,200	165
May-15	11.1	2,060	71.8	2,130	214
Jun-15	11.8	2,100	91.6	2,190	219
Jul-15	12.1	2,320	67.9	2,390	--
Aug-15	12.5	2,680	57.2	2,730	204
Sep-15	12.2	2,380	81.9	2,470	233
Oct-15	12.8	2,260	62.6	2,320	215
Nov-15	12.8	2,190	46.9	2,230	243
Dec-15	14.2	2,850	39.8	2,890	253
Jan-16	16.9	2,620	40.3	2,660	200
Feb-16	14.6	3,140	42.5	3,190	260
Mar-16	20.3	2,310	87.8	2,400	189
Apr-16	14.5	2,770	89.3	2,860	243
May-16	13.6	2,820	57.8	2,870	182
Jun-16	12.6	2,350	23.6	2,370	158
Jul-16	12.1	2,000	61.0	2,060	206
Aug-16	11.9	2,700	23.1	2,730	209
Sep-16	12.6	2,470	60.9	2,530	199
Oct-16	14.4	2,400	32.6	2,440	239

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-16	14.1	2,630	32.1	2,670	242
Dec-16	15.9	2,910	115	3,020	344
Jan-17	25.1	1,860	115	1,970	187
Feb-17	22.6	1,430	72.1	1,510	149
Mar-17	19.0	3,390	80.6	3,470	190
Apr-17	15.5	2,160	103	2,270	209
May-17	13.9	2,440	106	2,540	217
Jun-17	13.4	2,540	49.6	2,590	228
Jul-17	12.6	2,360	46.8	2,410	203
Aug-17	12.8	2,340	41.8	2,380	213
Sep-17	13.0	2,260	31.7	2,300	194
Oct-17	12.7	2,800	15.9	2,820	230
Nov-17	14.4	2,970	62.0	3,030	210
Dec-17	13.4	2,650	16.5	2,670	202
Jan-18	16.7	2,920	14.2	2,940	197
Feb-18	14.2	2,630	16.6	2,640	213
Mar-18**	17.5	3,870	33.7	3,900	315
Apr-18	15.5	2,660	29.2	2,690	256
May-18	13.2	2,610	16.7	2,630	272
Jun-18	12.6	2,570	20.0	2,590	212
Jul-18	12.0	2,190	21.4	2,210	259
Aug-18	12.4	1,940	12.3	1,950	216
Sep-18	12.2	2,210	21.5	2,230	228
Oct-18	12.6	2,110	17.6	2,130	228
Nov-18	13.7	2,570	13.8	2,580	205
Dec-18	14.5	3,380	18.8	3,400	271
Jan-19	17.6	2,840	24.4	2,870	338
Feb-19	25.1	2,830	46.9	2,870	265
Mar-19	21.7	2,670	32.9	2,700	228
Apr-19	15.8	2,570	23.7	2,590	238
May-19	15.2	2,540	61.4	2,600	238
Jun-19	13.5	2,330	11.8	2,340	205
Jul-19	12.5	2,620	23.2	2,640	229
Aug-19	12.6	2,490	17.5	2,510	228
Sep-19	12.6	2,410	19.0	2,430	227
Oct-19	12.7	2,430	12.4	2,440	236

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-19	13.9	3,000	15.8	3,010	290
Dec-19	15.4	2,840	20.1	2,860	235
Jan-20	15.2	2,610	10.9	2,620	233
Feb-20	14.4	2,780	13.5	2,790	275
Mar-20	15.0	2,770	31.0	2,800	237
Apr-20	15.2	2,720	32.7	2,750	293
May-20	13.8	2,660	34.2	2,690	261
Jun-20	12.4	2,090	37.7	2,120	198
Jul-20	12.3	2,210	36.5	2,250	208
Aug-20	12.1	2,240	19.2	2,260	233
Sep-20	12.2	2,420	23.1	2,440	227
Oct-20	12.1	2,260	19.4	2,280	233
Nov-20	12.5	2,390	29.6	2,420	219
Dec-20	13.0	2,050	63.2	2,110	192
Jan-21	14.4	2,130	26.2	2,150	220
Feb-21	14.3	2,550	35.3	2,580	263
Mar-21	14.1	2,430	44.1	2,480	249
Apr-21	12.6	2,380	30.1	2,410	173
May-21	12.0	2,730	30.7	2,760	204
Jun-21	11.3	2,780	26.2	2,810	204
Jul-21	11.0	2,490	32.3	2,520	212
Aug-21	11.1	2,110	28.9	2,140	208
Sep-21	11.3	2,230	40.7	2,270	223
Oct-21	14.1	2,350	27.4	2,380	231
Nov-21	13.1	2,200	173	2,370	268
Dec-21	19.4	2,660	63.1	2,720	211
Jan-22	14.7	2,880	20.0	2,900	249
Feb-22	12.9	3,090	23.6	3,110	237
Mar-22	12.7	3,240	17.5	3,260	213
Apr-22	13.3	2,990	21.9	3,020	230
May-22	12.1	2,680	19.7	2,700	206
Jun-22	11.5	2,470	24.6	2,490	205
Jul-22	10.9	2,190	51.2	2,240	217
Aug-22	11.2	2,250	49.9	2,300	212
Sep-22	11.5	2,430	125	2,560	227
Oct-22	11.6	2,430	33.5	2,470	221

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-22	12.5	2,520	34.2	2,560	224
Dec-22	17.1	2,230	24.9	2,250	186
Jan-23	28.9	2,080	129	2,210	170
Feb-23	17.4	2,800	11.8	2,810	191
Mar-23	26.6	2,880	46.7	2,930	202
Apr-23	16.0	2,790	20.9	2,810	196
May-23	14.4	3,080	20.6	3,100	220
Jun-23	12.6	2,890	15.8	2,910	210
Jul-23	11.8	2,350	54.2	2,400	207
Aug-23	12.4	2,160	42.0	2,210	275
Sep-23	12.1	2,060	155	2,210	218
Oct-23	12.0	2,080	102	2,180	241
Nov-23	12.7	1,770	208	1,970	195
Dec-23	14.4	2,280	136	2,410	221
Jan-24	18.2	2,600	39.5	2,640	224
Feb-24	21.9	2,620	44.6	2,660	209
Mar-24	19.0	2,530	22.5	2,560	204
Apr-24	16.1	2,480	23.0	2,500	194
May-24	14.2	2,540	121	2,660	229
Jun-24	12.7	2,170	288	2,460	236
Jul-24	11.9	1,700	433	2,130	213
Aug-24	12.4	1,650	311	1,960	192
Sep-24	12.1	2,000	153	2,190	209
Dry Season Average	12.2	2,280	68.0	2,350	210
Dry Season Trend ***	None	Up	None	Up	Up
Wet Season Average	15.2	2,460	50.2	2,510	215
Average Annual	14.0	2,380	57.6	2,440	213

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** One of the monthly nutrient sampling events (n=2) occurred during the maximum daily flow for that month. The loads are atypically high for this particular day due to a likely flushing phenomenon in the collection system.

*** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

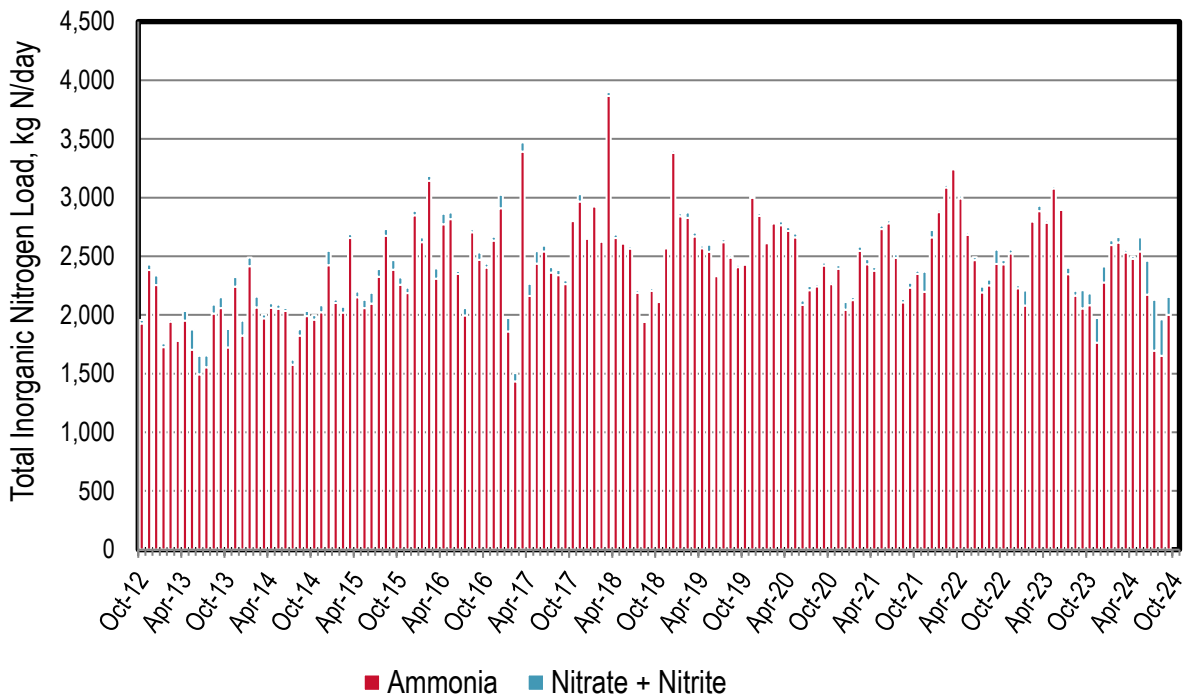


Figure 30-4. Discharge: SVCW Monthly Nitrogen Loads

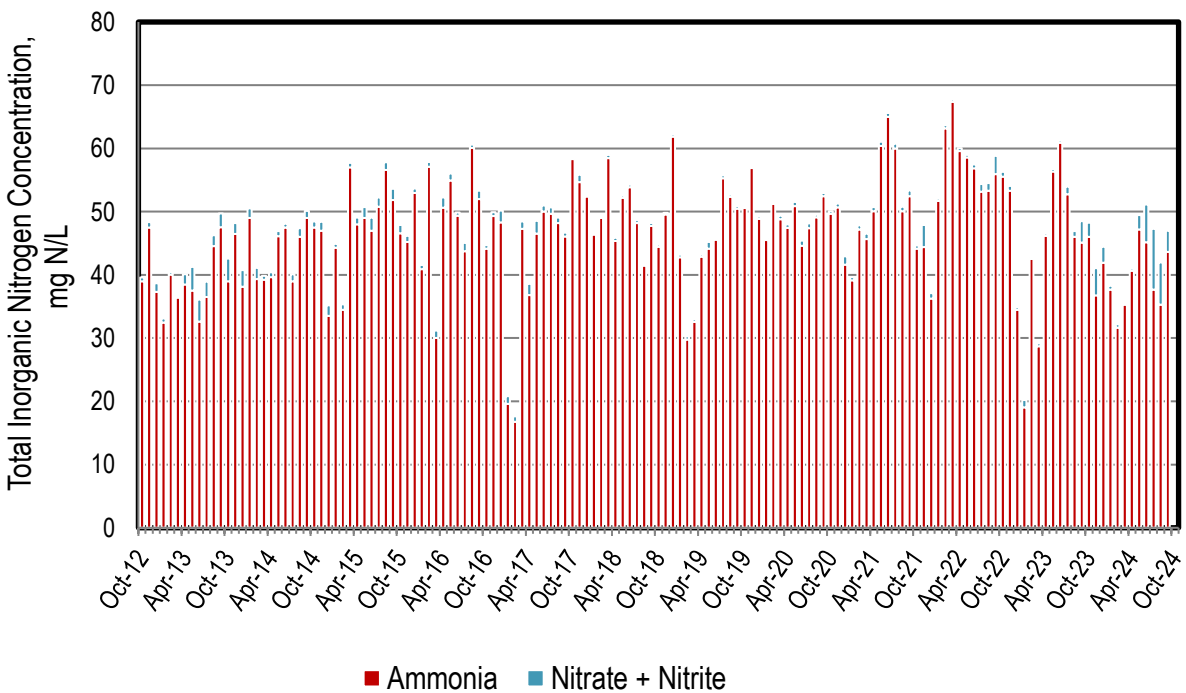


Figure 30-5. Discharge: SVCW Monthly Nitrogen Concentrations

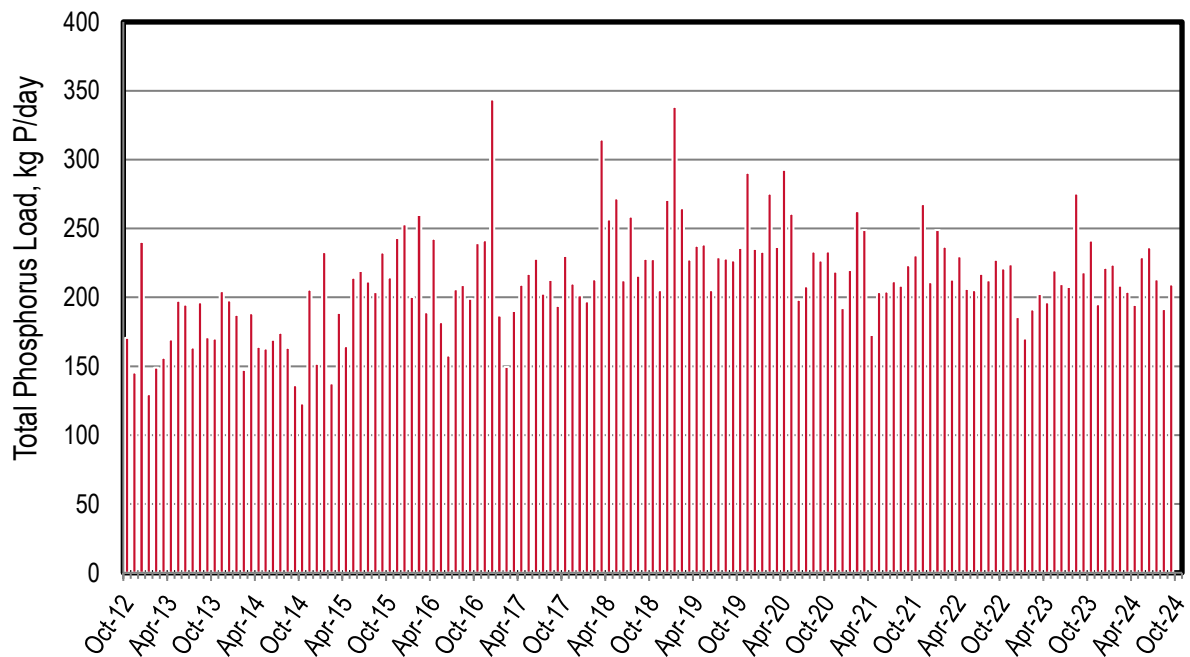


Figure 30-6. Discharge: SVCW Monthly Phosphorus Loads

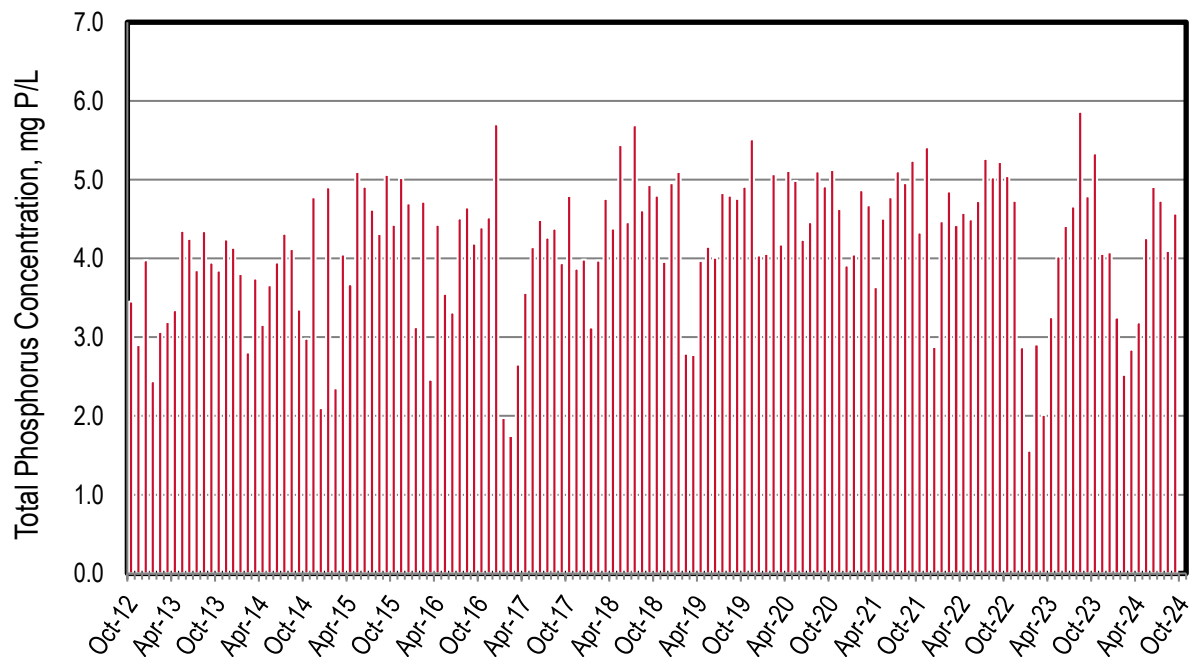


Figure 30-7. Discharge: SVCW Monthly Phosphorus Concentrations

Recycled Water

Table 30-3. Recycled Water: SVCW Yearly Recycled Water Volume Diverted from the Bay

Year**	Flow Diverted*, Acre-Feet (mgd)							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0 (0)	603 (0.54)	0 (0)	15 (0.01)	0 (0)	0 (0)	9 (0.01)	627 (0.56)
2020	0 (0)	450 (0.40)	0 (0)	7 (0.01)	0 (0)	0 (0)	2 (<0.01)	460 (0.41)
2021	0 (0)	714 (0.64)	0 (0)	9 (0.01)	0 (0)	0 (0)	12 (0.01)	735 (0.66)
2022	0 (0)	653 (0.58)	0 (0)	18 (0.02)	0 (0)	0 (0)	10 (0.01)	680 (0.61)
2023	0 (0)	539 (0.48)	0 (0)	16 (0.01)	0 (0)	0 (0)	9 (0.01)	564 (0.50)
Average	0 (0)	592 (0.53)	0 (0)	13 (0.01)	0 (0)	0 (0)	9 (0.01)	613 (0.55)

* Assumes 100% of the recycled flow is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 30-4. Recycled Water: SVCW Yearly Recycled Water Ammonia Load Diverted from the Bay

Year**	Average Ammonia Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	90	0	2	0	0	2	94
2020	0	73	0	2	0	0	<1	75
2021	0	121	0	2	0	0	2	125
2022	0	118	0	4	0	0	2	124
2023	0	73	0	2	0	0	2	76
Average	0	95	0	2	0	0	1	99

* Assumes 100% of the recycled load is diverted from the Bay

** **Calendar year as opposed to California's water year (October 1 through September 30)**

Table 30-5. Recycled Water: SVCW Yearly Recycled Water TIN Load Diverted from the Bay

Year**	Average Total Inorganic Nitrogen Load Diverted*, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	91	0	2	0	0	2	95
2020	0	74	0	2	0	0	<1	75
2021	0	123	0	2	0	0	2	127
2022	0	120	0	4	0	0	2	126
2023	0	74	0	2	0	0	2	78
Average	0	96	0	2	0	0	1	100

* Assumes 100% of the recycled load is diverted for all recycled water applications

** Calendar year as opposed to California's water year (October 1 through September 30)

Table 30-6. Recycled Water: SVCW Yearly Recycled Water Total P Load Diverted from the Bay

Year**	Average Total P Load Diverted*, kg P/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	0	8	0	<1	0	0	<1	9
2020	0	7	0	<1	0	0	<1	7
2021	0	11	0	<1	0	0	<1	11
2022	0	10	0	<1	0	0	<1	10
2023	0	6	0	<1	0	0	<1	6
Average	0	8	0	<1	0	0	<1	9

* Assumes 100% of the recycled load is diverted for all recycled water applications

** Calendar year as opposed to California's water year (October 1 through September 30)

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31 Sanitary District No. 5 of Marin County – Tiburon Treatment Plant

The Tiburon Treatment Plant discharges to the Central Bay. The service area has a population of approximately 8,400. The plant has a permitted ADWF capacity of 0.98 mgd and a peak wet weather capacity of 2.3 mgd. This past dry season had flows of approximately 0.48 mgd. The plant performs secondary treatment using an activated sludge treatment process.

The plant is classified as a minor discharger (<1 mgd permitted capacity) and thus not required to sample as frequently as the major dischargers (>1 mgd permitted capacity). The minor dischargers are required to sample twice per year under the Nutrient Watershed Permit. As a result, there are several months of nutrient data gaps.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Discharge:

- ▲ Flow values are provided over the entire study period. The remaining nutrient species only have monthly sampling for the first year of sampling, followed by occasional sampling thereafter (e.g., ammonia samples are more frequent).
- ▲ Ammonia is the majority of the nitrogen species discharged, regardless of season (except for January 2013, September 2020, January 2022, and July 2023). This would be expected since this plant does not nitrify.
- ▲ Total phosphorus concentrations are wide ranging from approximately 1.4 to 6.5 mg P/L. Typical effluent TP concentrations range from 4 to 6 mg P/L.
- ▲ Based on Table 31-1 statistics for the entire dry season dataset, flow appear to be trending down, while ammonia has no trend. No statistical analysis was performed on other nutrient species due to the limited number of samples required for minor dischargers.

◆ Recycled Water: No recycled water was produced or distributed this past year.

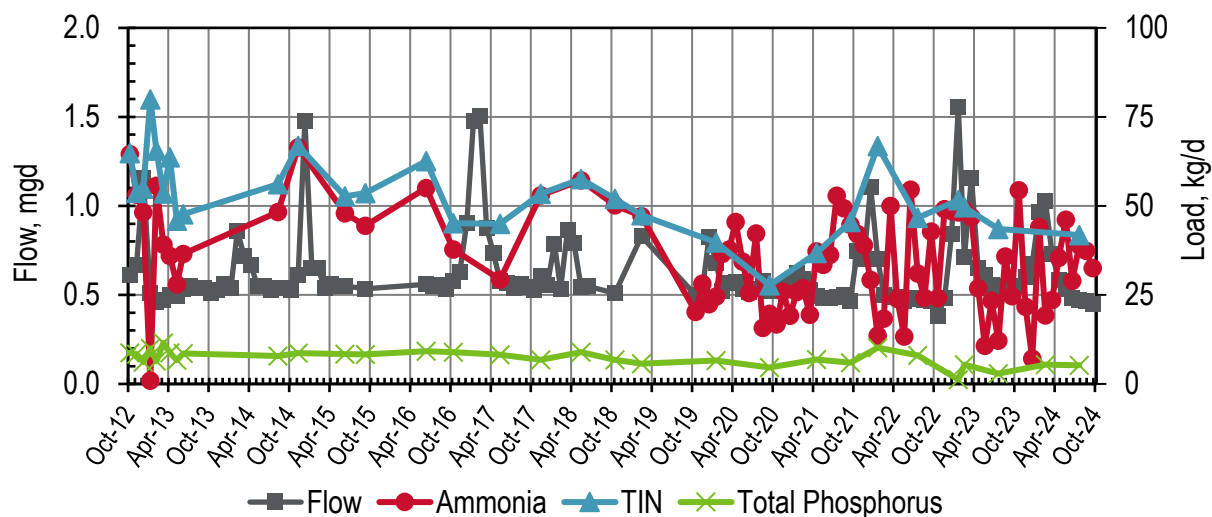


Figure 31-1. Discharge: Tiburon Monthly Flows and Loads

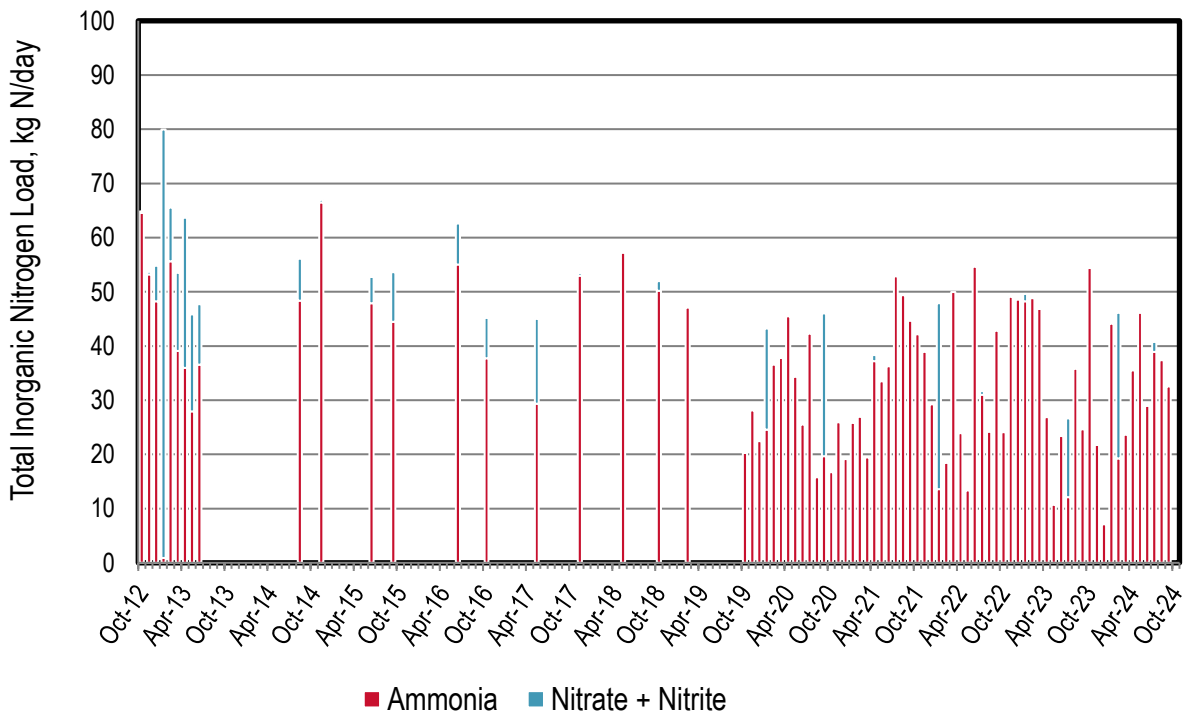


Figure 31-2. Discharge: Tiburon Monthly Nitrogen Loads

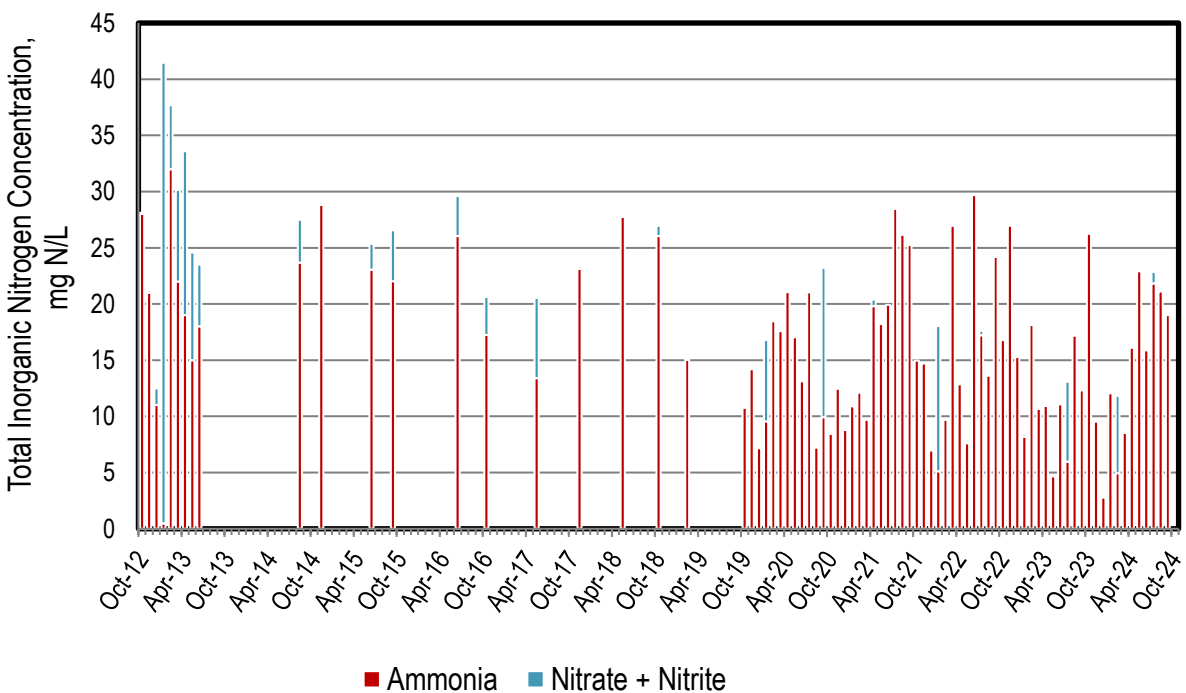


Figure 31-3. Discharge: Tiburon Monthly Nitrogen Concentrations

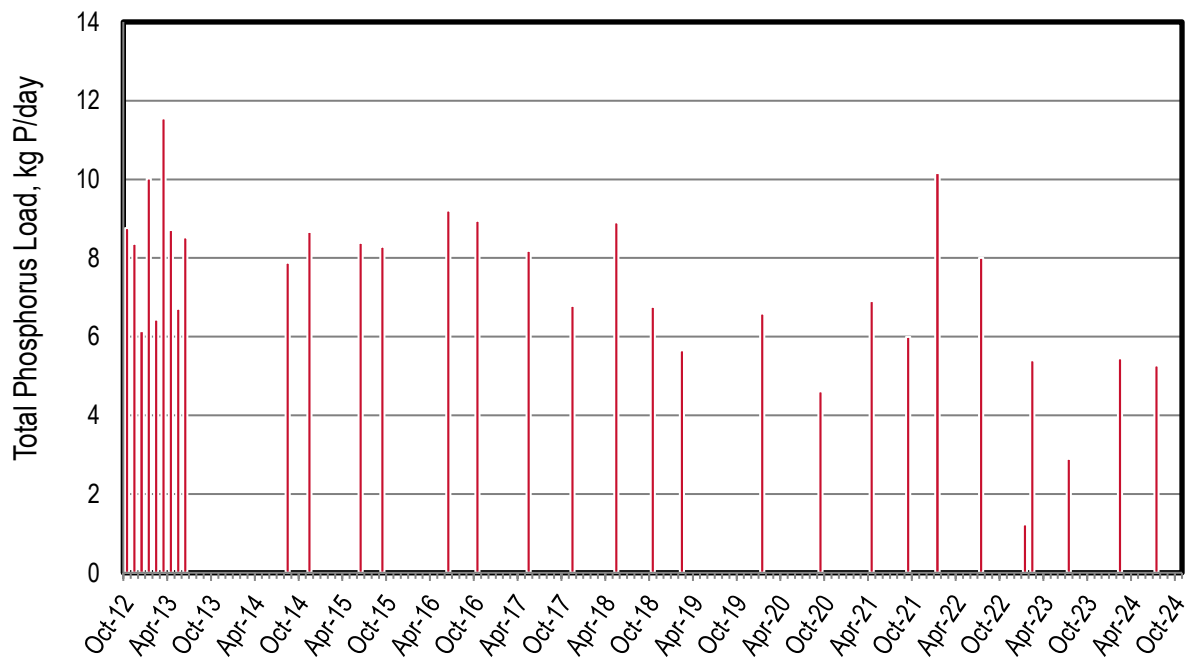


Figure 31-4. Discharge: Tiburon Monthly Phosphorus Loads

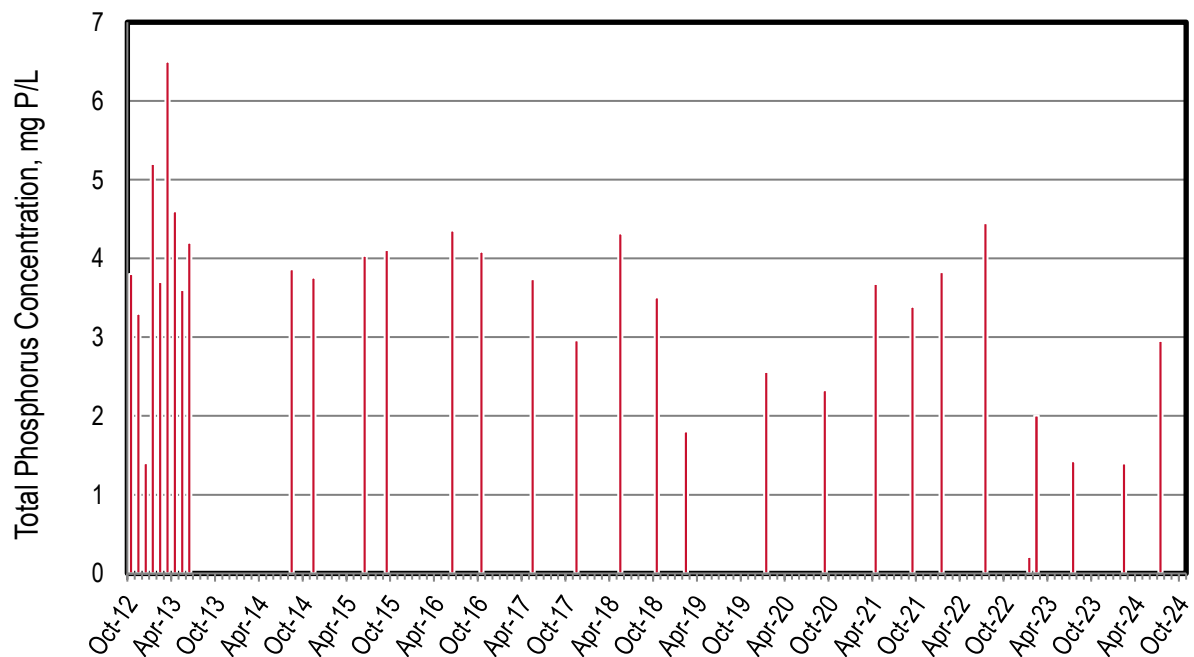


Figure 31-5. Discharge: Tiburon Monthly Phosphorus Concentrations

Table 31-1. Discharge: Tiburon Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	0.610	64.6	0.284	64.8	8.76
Nov-12	0.670	53.2	0.484	53.7	8.36
Dec-12	1.16	48.2	6.58	54.8	6.14
Jan-13	0.510	0.906	79.1	80.0	10.0
Feb-13	0.460	55.6	9.91	65.6	6.43
Mar-13	0.470	39.1	14.4	53.5	11.5
Apr-13	0.501	36.0	27.6	63.6	8.71
May-13	0.493	28.0	17.9	45.8	6.71
Jun-13	0.537	36.5	11.2	47.7	8.53
Jul-13	0.550	--	--	--	--
Aug-13	0.540	--	--	--	--
Sep-13	0.540	--	--	--	--
Oct-13	0.510	--	--	--	--
Nov-13	0.530	--	--	--	--
Dec-13	0.560	--	--	--	--
Jan-14	0.540	--	--	--	--
Feb-14	0.860	--	--	--	--
Mar-14	0.720	--	--	--	--
Apr-14	0.670	--	--	--	--
May-14	0.550	--	--	--	--
Jun-14	0.550	--	--	--	--
Jul-14	0.530	--	--	--	--
Aug-14	0.540	48.3	7.78	56.1	7.88
Sep-14	0.540	--	--	--	--
Oct-14	0.530	--	--	--	--
Nov-14	0.610	66.5	0.455	66.9	8.66
Dec-14	1.48	--	--	--	--
Jan-15	0.650	--	--	--	--
Feb-15	0.650	--	--	--	--
Mar-15	0.540	--	--	--	--
Apr-15	0.560	--	--	--	--
May-15	0.550	--	--	--	--
Jun-15	0.550	47.9	4.83	52.7	8.38
Jul-15	--	--	--	--	--
Aug-15	--	--	--	--	--

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Sep-15	0.534	44.5	9.16	53.6	8.29
Oct-15	--	--	--	--	--
Nov-15	--	--	--	--	--
Dec-15	--	--	--	--	--
Jan-16	--	--	--	--	--
Feb-16	--	--	--	--	--
Mar-16	--	--	--	--	--
Apr-16	--	--	--	--	--
May-16	--	--	--	--	--
Jun-16	0.559	55.0	7.60	62.6	9.20
Jul-16	0.550	--	--	--	--
Aug-16	0.557	--	--	--	--
Sep-16	0.536	--	--	--	--
Oct-16	0.579	37.8	7.41	45.2	8.94
Nov-16	0.628	--	--	--	--
Dec-16	0.904	--	--	--	--
Jan-17	1.48	--	--	--	--
Feb-17	1.51	--	--	--	--
Mar-17	0.876	--	--	--	--
Apr-17	0.735	--	--	--	--
May-17	0.579	29.4	15.6	45.0	8.18
Jun-17	0.566	--	--	--	--
Jul-17	0.540	--	--	--	--
Aug-17	0.559	--	--	--	--
Sep-17	0.546	--	--	--	--
Oct-17	0.529	--	--	--	--
Nov-17	0.606	53.0	0.424	53.4	6.78
Dec-17	0.558	--	--	--	--
Jan-18	0.788	--	--	--	--
Feb-18	0.534	--	--	--	--
Mar-18	0.866	--	--	--	--
Apr-18	0.790	--	--	--	--
May-18	0.545	57.2	0.339	57.6	8.90
Jun-18	0.549	--	--	--	--
Jul-18	--	--	--	--	--
Aug-18	--	--	--	--	--

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Sep-18	--	--	--	--	--
Oct-18	0.510	50.2	1.76	51.9	6.76
Nov-18	--	--	--	--	--
Dec-18	--	--	--	--	--
Jan-19	--	--	--	--	--
Feb-19	0.830	47.1	0.314	47.4	5.65
Mar-19	--	--	--	--	--
Apr-19	--	--	--	--	--
May-19	--	--	--	--	--
Jun-19	--	--	--	--	--
Jul-19	--	--	--	--	--
Aug-19	--	--	--	--	--
Sep-19	--	--	--	--	--
Oct-19	0.499	20.2	--	--	--
Nov-19	0.524	28.1	--	--	--
Dec-19	0.828	22.4	--	--	--
Jan-20	0.681	24.6	18.6	39.7	6.59
Feb-20	0.523	36.5	--	--	--
Mar-20	0.568	37.8	--	--	--
Apr-20	0.571	45.5	--	--	--
May-20	0.533	34.3	--	--	--
Jun-20	0.515	25.5	--	--	--
Jul-20	0.532	42.3	--	--	--
Aug-20	0.578	15.8	--	--	--
Sep-20	0.524	19.7	26.3	27.7	4.61
Oct-20	0.523	16.7	--	--	--
Nov-20	0.551	25.9	--	--	--
Dec-20	0.576	19.1	--	--	--
Jan-21	0.626	25.8	--	--	--
Feb-21	0.588	26.9	--	--	--
Mar-21	0.529	19.4	--	--	--
Apr-21	0.497	37.2	1.09	36.8	6.90
May-21	0.486	33.5	--	--	--
Jun-21	0.482	36.3	--	--	--
Jul-21	0.491	52.9	--	--	--
Aug-21	0.499	49.4	--	--	--

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Sep-21	0.468	44.7	0.0727	45.5	6.00
Oct-21	0.745	42.2	--	--	--
Nov-21	0.701	38.9	--	--	--
Dec-21	1.11	29.2	--	--	--
Jan-22	0.703	13.6	34.3	66.8	10.2
Feb-22	0.501	18.4	--	--	--
Mar-22	0.490	50.0	--	--	--
Apr-22	0.492	23.9	--	--	--
May-22	0.465	13.3	--	--	--
Jun-22	0.487	54.6	--	--	--
Jul-22	0.476	31.0	0.681	46.7	8.01
Aug-22	0.470	24.2	--	--	--
Sep-22	0.468	42.8	--	--	--
Oct-22	0.379	24.1	--	--	--
Nov-22	0.482	49.1	--	--	--
Dec-22	0.840	48.5	--	--	--
Jan-23	1.56	48.2	1.38	51.6	1.23
Feb-23	0.713	48.8	0.310	49.6	5.40
Mar-23	1.16	46.8	--	--	--
Apr-23	0.650	26.9	--	--	--
May-23	0.610	10.7	--	--	--
Jun-23	0.559	23.4	--	--	--
Jul-23	0.538	12.1	14.5	43.5	2.90
Aug-23	0.551	35.8	--	--	--
Sep-23	0.530	24.7	--	--	--
Oct-23	0.548	54.4			
Nov-23	0.603	21.7			
Dec-23	0.676	7.12			
Jan-24	0.967	44.1			
Feb-24	1.03	19.3	26.9	30.9	5.45
Mar-24	0.731	23.6			
Apr-24	0.583	35.5			
May-24	0.533	46.1			
Jun-24	0.482	29.0			
Jul-24	0.472	38.9	1.82	41.8	5.27
Aug-24	0.468	37.4			

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Sep-24	0.453	32.5			
Dry Season Average	0.515	35.1	9.06	48.2	7.14
Dry Season Trend**,***	Down	None	***	***	***
Wet Season Average	0.698	35.0	12.9	54.2	7.36
Average Annual	0.628	35.0	11.3	51.7	7.27

* The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

*** No statistical dry season trending analysis was performed on nutrient species (except ammonia) due to the limited number of samples required for minor dischargers.

Recycled Water

No recycled water was produced or distributed this past year.

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32 Treasure Island

Treasure Island discharges to the Central Bay. The plant has a permitted capacity of 2.0 mgd ADWF and a peak wet weather capacity of 4.4 mgd. It had a dry season flow of approximately 0.30 mgd this past dry season. The plant currently nitrifies using trickling filters.

The following observations are made based upon the figures and table in the subsequent pages:

◆ Discharge

- ▲ The plant fully nitrified through April 2015 at which time one of the plant's two trickling arm filters became inoperable until March 2016. While the arm was inoperable, the discharge ammonia concentrations increased but have since recovered to discharge concentrations that typically range between 2 to 4 mg N/L. Note: the ammonia levels are typically at non-detect values.
- ▲ NO_x represents the majority of nitrogen species discharged as would be expected since this plant nitrifies (with the exception of the period when the trickling filter arm was inoperable).
- ▲ Since July 2020, the plant has produced a stable and reliable discharge Total P load of approximately 2 to 4 kg P/d (except for an excursion in January 2022 and August 2023).
- ▲ Based on the entire dataset for dry season average monthly values, nitrate + nitrite and TIN are trending upwards while the remaining parameters (Flow, Ammonia, and Total P) are neither trending upwards nor downwards.

◆ Recycled Water: No recycled water was produced or distributed this year.

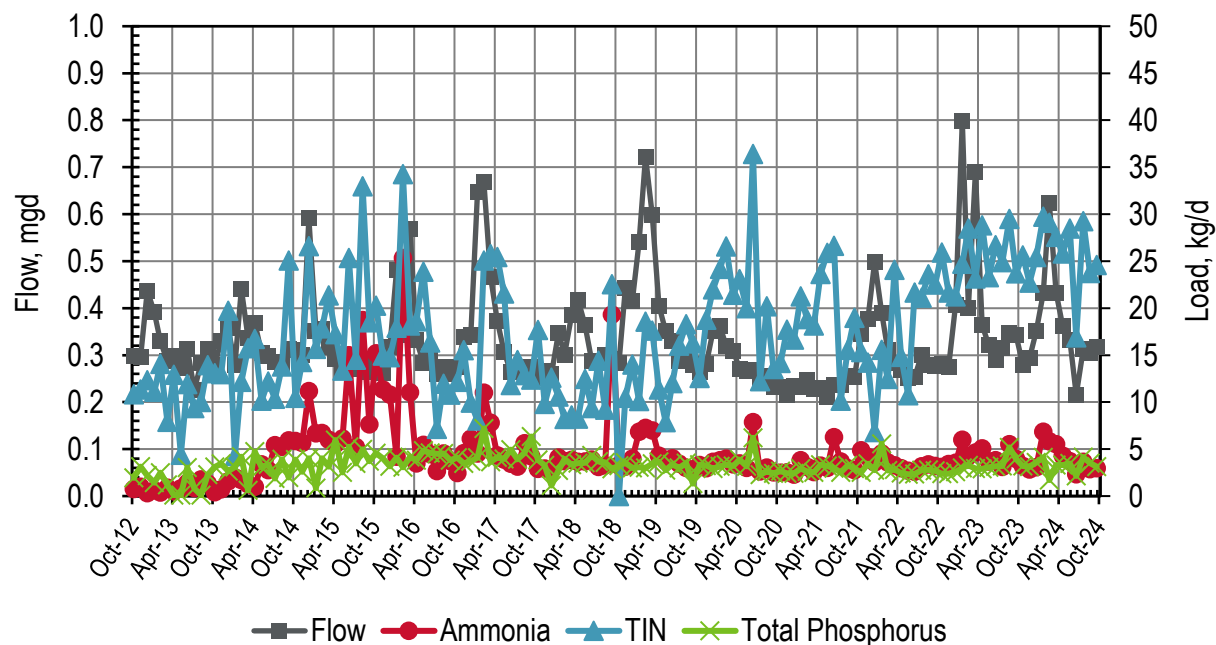


Figure 32-1. Discharge: Treasure Island Monthly Flows and Loads

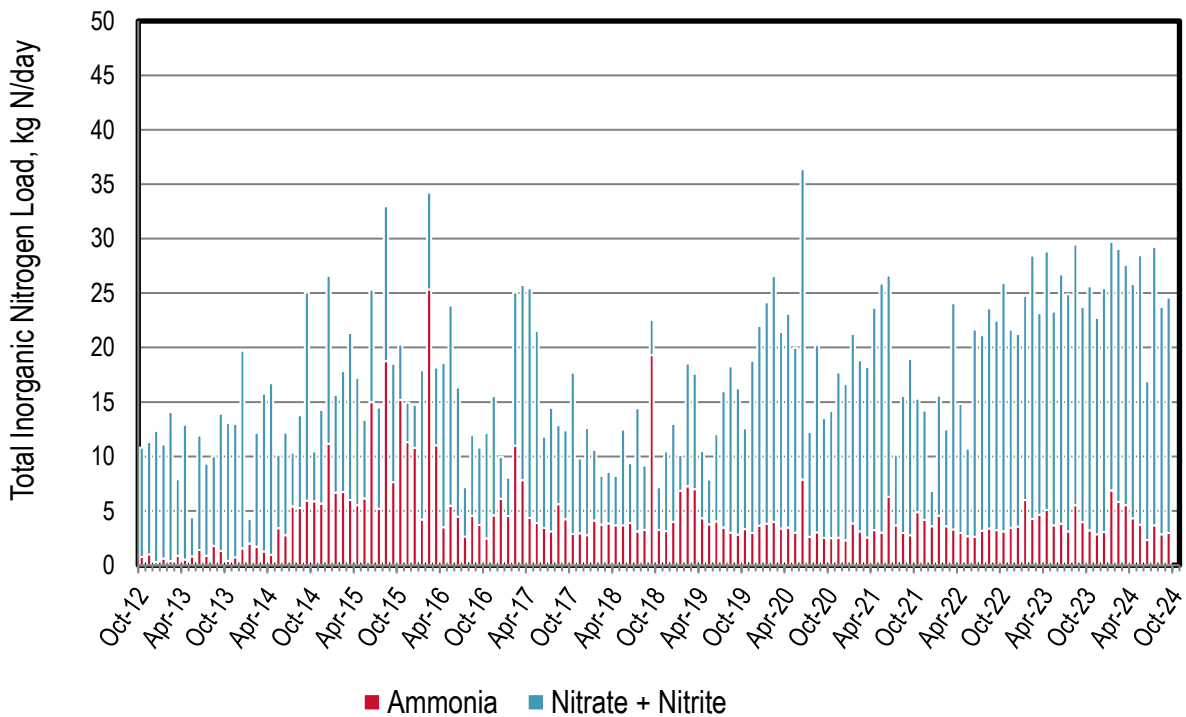


Figure 32-2. Discharge: Treasure Island Monthly Nitrogen Loads

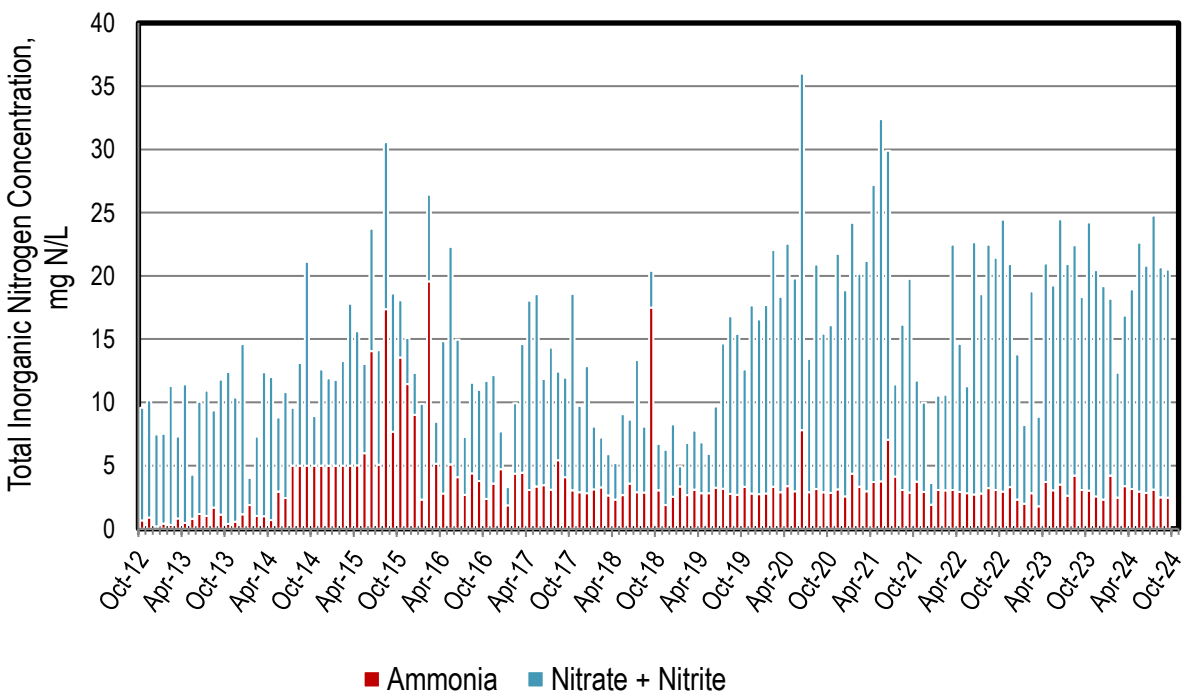


Figure 32-3. Discharge: Treasure Island Monthly Nitrogen Concentrations

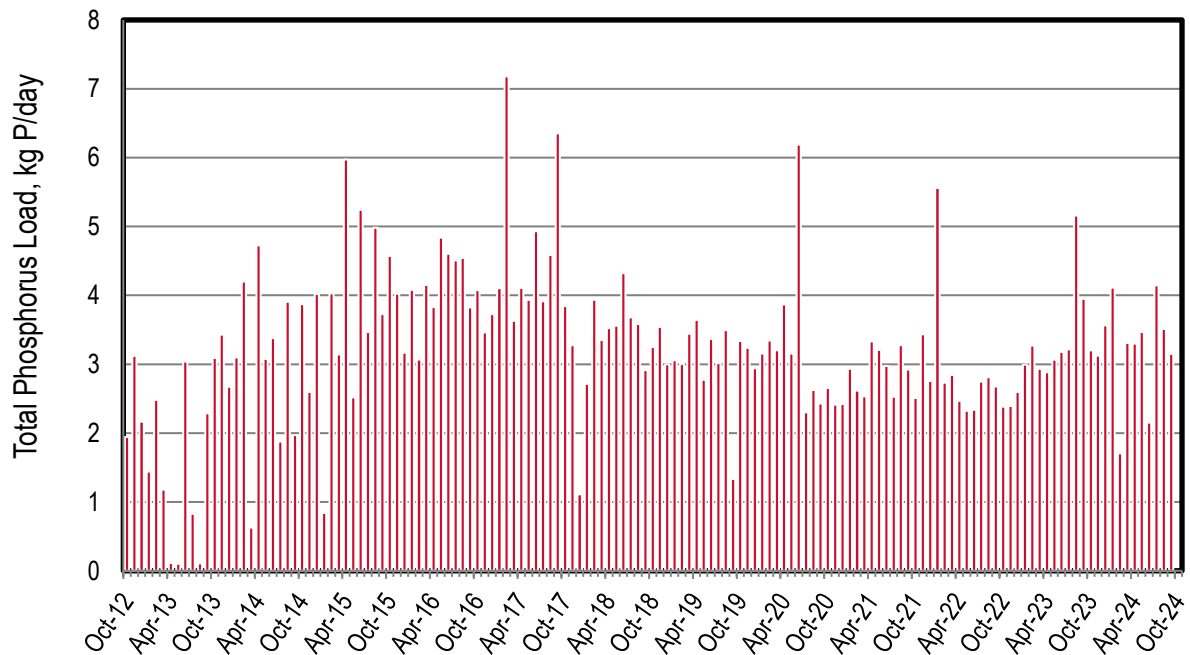


Figure 32-4. Discharge: Treasure Island Monthly Phosphorus Loads

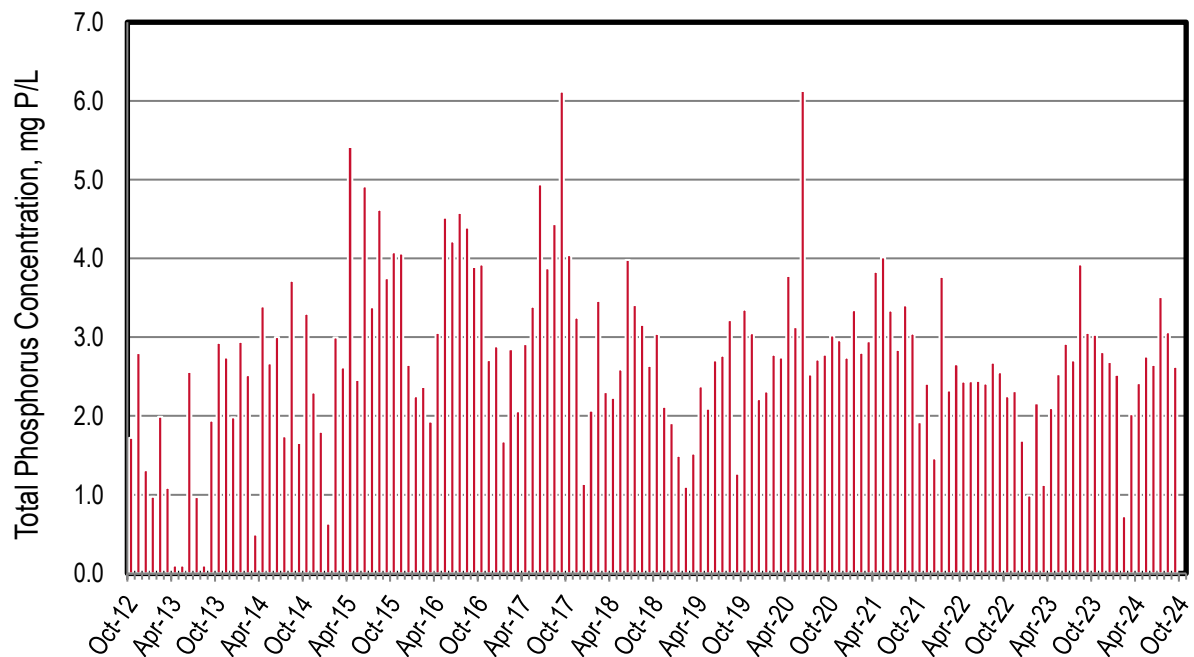


Figure 32-5. Discharge: Treasure Island Monthly Phosphorus Concentrations

Table 32-1. Treasure Island Monthly Flows and Loads¹

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	0.299	0.757	10.1	10.8	1.94
Nov-12	0.295	1.00	10.3	11.3	3.12
Dec-12	0.437	0.297	12.0	12.3	2.16
Jan-13	0.391	0.602	10.5	11.1	1.44
Feb-13	0.330	0.387	13.7	14.1	2.48
Mar-13	0.287	0.872	7.04	7.91	1.18
Apr-13	0.299	0.509	12.4	12.9	0.113
May-13	0.272	0.802	3.59	4.40	0.103
Jun-13	0.314	1.40	10.5	11.9	3.04
Jul-13	0.226	0.863	8.49	9.35	0.829
Aug-13	0.283	1.79	8.23	10.0	0.107
Sep-13	0.312	1.32	12.6	13.9	2.29
Oct-13	0.299	0.411	12.7	13.1	3.09
Nov-13	0.295	0.713	12.3	13.0	3.43
Dec-13	0.437	1.55	18.2	19.7	2.67
Jan-14	0.391	1.99	2.25	4.25	3.10
Feb-14	0.330	1.69	10.5	12.2	4.20
Mar-14	0.287	1.27	14.5	15.7	0.630
Apr-14	0.299	0.976	15.7	16.7	4.73
May-14	0.272	3.39	6.77	10.2	3.08
Jun-14	0.314	2.75	9.43	12.2	3.38
Jul-14	0.286	5.40	4.94	10.3	1.88
Aug-14	0.278	5.26	8.53	13.8	3.91
Sep-14	0.314	5.94	19.1	25.1	1.97
Oct-14	0.311	5.87	4.60	10.5	3.87
Nov-14	0.299	5.66	8.62	14.3	2.60
Dec-14	0.591	11.2	15.4	26.6	4.02
Jan-15	0.352	6.66	9.01	15.7	0.840
Feb-15	0.356	6.72	11.1	17.8	4.03
Mar-15	0.317	6.00	15.4	21.4	3.14
Apr-15	0.292	5.52	11.7	17.2	5.97
May-15	0.271	6.14	7.22	13.4	2.52
Jun-15	0.282	15.0	10.3	25.3	5.24
Jul-15	0.271	5.20	9.30	14.5	3.47
Aug-15	0.285	18.7	14.2	33.0	4.98

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Sep-15	0.263	7.63	10.9	18.5	3.73
Oct-15	0.297	15.2	5.09	20.3	4.58
Nov-15	0.262	11.3	3.62	15.0	4.03
Dec-15	0.317	10.8	3.98	14.8	3.17
Jan-16	0.480	4.19	13.7	17.9	4.08
Feb-16	0.343	25.3	8.90	34.2	3.07
Mar-16	0.569	11.0	7.14	18.2	4.15
Apr-16	0.331	3.48	15.1	18.6	3.83
May-16	0.283	5.45	18.4	23.9	4.84
Jun-16	0.289	4.45	11.9	16.3	4.60
Jul-16	0.260	2.65	4.51	7.16	4.51
Aug-16	0.274	4.55	7.42	12.0	4.55
Sep-16	0.260	3.71	7.09	10.8	3.82
Oct-16	0.275	2.45	9.70	12.2	4.07
Nov-16	0.338	4.58	11.0	15.5	3.46
Dec-16	0.342	6.10	3.85	9.95	3.73
Jan-17	0.648	4.52	3.52	8.04	4.10
Feb-17	0.668	11.0	14.1	25.1	7.18
Mar-17	0.466	7.81	17.9	25.7	3.63
Apr-17	0.373	4.34	21.1	25.5	4.11
May-17	0.307	3.87	17.7	21.6	3.94
Jun-17	0.264	3.44	8.38	11.8	4.93
Jul-17	0.267	3.12	11.3	14.5	3.91
Aug-17	0.274	5.61	7.26	12.9	4.59
Sep-17	0.275	4.23	8.17	12.4	6.35
Oct-17	0.252	2.88	14.8	17.7	3.85
Nov-17	0.267	2.92	6.90	9.82	3.28
Dec-17	0.259	2.76	9.85	12.6	1.11
Jan-18	0.347	4.09	6.50	10.6	2.71
Feb-18	0.301	3.72	4.49	8.22	3.94
Mar-18	0.385	3.84	4.75	8.59	3.35
Apr-18	0.418	3.66	4.57	8.23	3.52
May-18	0.364	3.67	8.79	12.5	3.56
Jun-18	0.287	3.88	5.49	9.37	4.32
Jul-18	0.286	3.11	11.3	14.4	3.68
Aug-18	0.301	3.26	5.92	9.18	3.58

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Sep-18	0.292	19.3	3.21	22.5	2.91
Oct-18	0.283	3.26	3.92	--	3.25
Nov-18	0.442	3.13	7.32	10.5	3.54
Dec-18	0.416	--	--	--	--
Jan-19	0.541	6.85	3.27	10.1	3.06
Feb-19	0.723	7.27	11.3	18.6	3.00
Mar-19	0.599	6.98	10.6	17.6	3.45
Apr-19	0.405	4.31	6.19	11.3	3.64
May-19	0.351	3.75	4.12	7.87	2.77
Jun-19	0.329	4.02	8.01	12.0	3.36
Jul-19	0.288	3.45	12.5	16.0	3.01
Aug-19	0.288	3.00	15.3	18.3	3.50
Sep-19	0.278	2.82	13.4	16.2	1.33
Oct-19	0.264	3.32	9.25	12.6	3.34
Nov-19	0.281	2.96	15.8	18.8	3.24
Dec-19	0.352	3.64	18.3	22.0	2.94
Jan-20	0.361	3.82	20.3	24.2	3.15
Feb-20	0.319	3.99	22.6	26.6	3.35
Mar-20	0.309	3.38	18.0	21.4	3.20
Apr-20	0.271	3.46	19.6	23.1	3.87
May-20	0.267	3.00	17.0	20.0	3.16
Jun-20	0.267	7.88	28.5	36.4	6.19
Jul-20	0.241	2.62	9.62	12.2	2.30
Aug-20	0.256	3.03	17.2	20.2	2.63
Sep-20	0.231	2.53	11.0	13.5	2.43
Oct-20	0.233	2.50	11.7	14.2	2.66
Nov-20	0.216	2.53	15.2	17.7	2.41
Dec-20	0.234	2.27	14.4	16.7	2.42
Jan-21	0.232	3.83	17.4	21.2	2.93
Feb-21	0.247	3.10	15.7	18.8	2.62
Mar-21	0.227	2.54	15.7	18.2	2.53
Apr-21	0.230	3.22	20.4	23.6	3.33
May-21	0.211	2.99	22.9	25.9	3.21
Jun-21	0.236	6.27	20.4	26.6	2.97
Jul-21	0.235	3.68	6.48	10.2	2.53
Aug-21	0.255	2.95	12.6	15.5	3.28

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Sep-21	0.254	2.75	16.2	19.0	2.92
Oct-21	0.346	4.86	10.4	15.3	2.51
Nov-21	0.377	4.16	10.1	14.2	3.44
Dec-21	0.499	3.58	3.24	6.82	2.75
Jan-22	0.391	4.54	11.0	15.6	5.56
Feb-22	0.311	3.57	8.91	12.5	2.73
Mar-22	0.283	3.28	20.8	24.1	2.84
Apr-22	0.268	2.96	11.9	14.8	2.47
May-22	0.252	2.68	8.04	10.7	2.32
Jun-22	0.253	2.60	19.1	21.7	2.34
Jul-22	0.301	3.17	18.0	21.1	2.75
Aug-22	0.278	3.37	20.2	23.6	2.81
Sep-22	0.278	3.21	19.3	22.5	2.68
Oct-22	0.281	3.11	22.8	25.9	2.39
Nov-22	0.274	3.42	18.2	21.6	2.39
Dec-22	0.408	3.54	17.7	21.3	2.60
Jan-23	0.799	5.98	18.8	24.7	2.99
Feb-23	0.401	4.27	24.2	28.5	3.27
Mar-23	0.691	4.63	18.5	23.2	2.93
Apr-23	0.364	5.09	23.7	28.8	2.88
May-23	0.320	3.68	19.6	23.3	3.07
Jun-23	0.289	3.82	22.9	26.7	3.18
Jul-23	0.314	3.11	21.8	24.9	3.21
Aug-23	0.348	5.53	24.0	29.5	5.16
Sep-23	0.342	3.95	19.8	23.7	3.95
Oct-23	0.280	1.60	22.4	24.0	3.20
Nov-23	0.294	1.42	19.9	21.3	3.12
Dec-23	0.351	1.53	22.4	23.9	3.56
Jan-24	0.432	3.43	22.9	26.3	4.12
Feb-24	0.623	2.91	23.3	26.2	1.71
Mar-24	0.433	2.76	22.1	24.8	3.31
Apr-24	0.361	2.15	21.5	23.7	3.30
May-24	0.333	1.86	24.8	26.6	3.47
Jun-24	0.215	1.15	14.6	15.8	2.15
Jul-24	0.312	1.83	25.6	27.4	4.14
Aug-24	0.304	1.43	20.9	22.3	3.52

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Sep-24	0.317	1.48	21.7	23.1	3.15
Dry Season Average	0.283	4.23	13.3	17.8	3.30
Dry Season Trend**	None	None	Up	Up	None
Wet Season Average	0.367	4.28	13.0	17.4	3.18
Average Annual	0.332	4.26	13.1	17.4	3.23

1 Per Order R2-2024-0013 Table E-3 footnote [2], for non-detect results for samples on October 1, 2023 and after, half of the method detection limit was used to quantify estimated load values. Prior to October 1, 2023, non-detect values used the method detection limit.

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

Recycled Water

No recycled water was produced or distributed this past year.

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33 Vallejo Flood & Wastewater District

Vallejo discharges to San Pablo Bay and it has approximately 37,845 service connections. The plant has a permitted ADWF capacity of 15.5 mgd and a peak wet weather capacity of 60 mgd. The average dry season discharge flows this past year are approximately 8.62 mgd dry season. The plant performs secondary treatment using a trickling filter/solids contact process.

The following observations are made based upon the figures and tables in the subsequent pages:

◆ Influent and Reduction Across the Plant

- ▲ Note: limited to data since July 2019; quarterly required but more provided for various parameters. Based on the limited average monthly values in Table 33-1, ammonia dry season loads are trending downwards, whereas dry season phosphorus loads are trending upwards. All other monitored parameters have no emerging trends.
- ▲ The flow reduction across the plant is negligible.
- ▲ The nitrogen load reduction values across the plant ranges from approximately 30 to 60 percent. This load reduction is attributed primarily to a combination of biological assimilation, biosolids management, and/or biological load reduction in the trickling filter/solids contact process.
- ▲ The phosphorus load reduction across the plant ranges from approximately 15 to 75 percent (sampling from 10/2020 had an abnormally high total P load reduction). The load reduction is attributed to a combination of chemical precipitation, biological assimilation, and/or biosolids management.

◆ Discharge

- ▲ The average monthly dry season flow values for 2024 increased compared to 2023 (from 7.8 to 8.6 mgd).
- ▲ During the initial two years of data, TIN was comprised of approximately equal parts Ammonia and NOx. Since the end of 2014, ammonia comprises the majority of the nitrogen species.
- ▲ The phosphorus concentrations range from 1.1 to 5.3 mg P/L. A portion of the total P is removed across the plant as noted.
- ▲ Based on Table 33-1 statistics for the entire dry season dataset, flow, nitrite plus nitrate, and total P loads are trending downwards. Note: the last several years of ammonia and TIN loads have been relatively flat.

◆ Recycled Water: No recycled water was produced or distributed this past year.

Influent

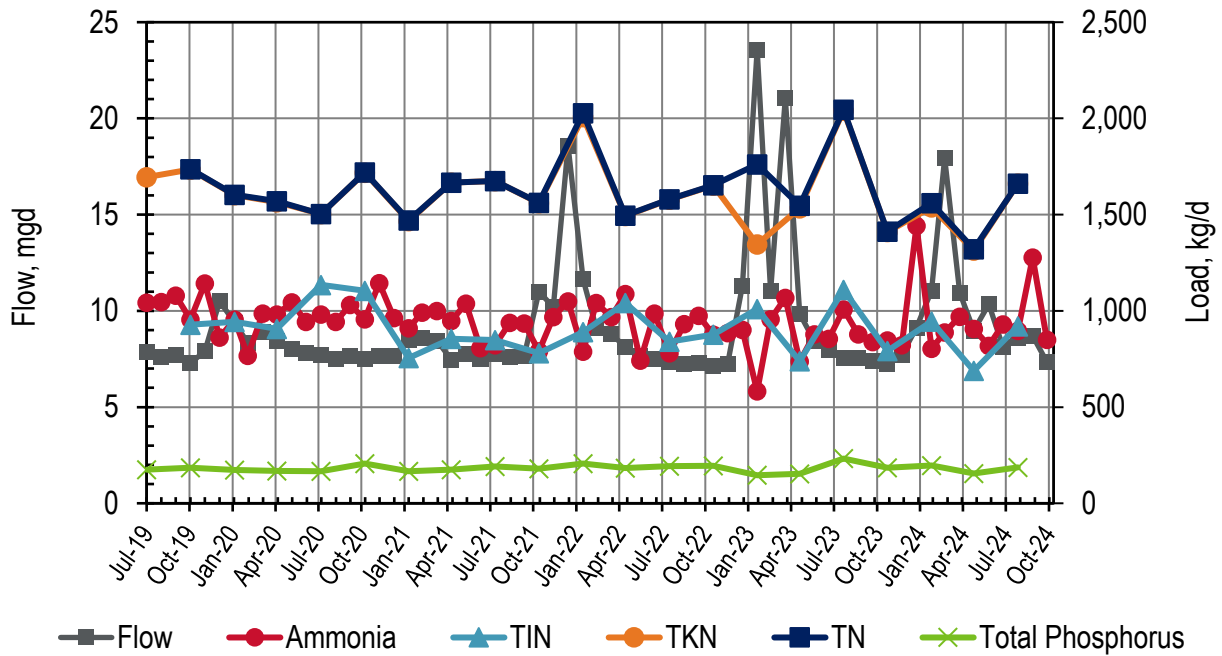


Figure 33-1. Influent: Vallejo Monthly Flows and Loads

Note: the ammonia/TIN loads and TKN/Total N loads are comparable. The ammonia and TKN values are located behind TIN and Total N load lines, respectively.

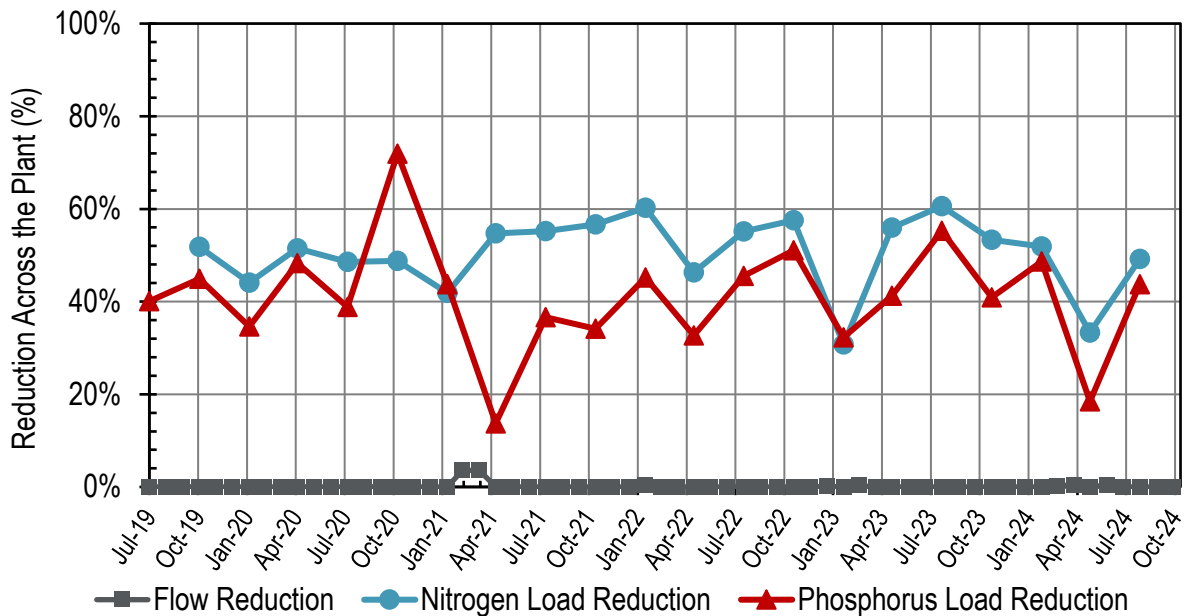


Figure 33-2. Influent: Vallejo Monthly Reductions Across the Plant

Note: Influent Total N was compared against Discharge TIN for calculating nitrogen load reduction.

Table 33-1. Influent: Vallejo Monthly Flows and Loads*

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-19	7.86	1,040	Non-Detect	**	1,690	**	175
Aug-19	7.63	1,050	--	--	--	--	--
Sep-19	7.72	1,080	--	--	--	--	--
Oct-19	7.29	956	2.14	927	1,740	1,740	185
Nov-19	7.90	1,140	--	--	--	--	--
Dec-19	10.5	861	--	--	--	--	--
Jan-20	9.40	955	1.26	944	1,600	1,600	173
Feb-20	8.34	767	--	--	--	--	--
Mar-20	8.93	986	--	--	--	--	--
Apr-20	8.42	982	3.57	907	1,570	1,570	167
May-20	8.01	1,040	--	--	--	--	--
Jun-20	7.84	943	--	--	--	--	--
Jul-20	7.72	982	1.09	1,140	1,500	1,500	167
Aug-20	7.50	942	--	--	--	--	--
Sep-20	7.67	1,030	--	--	--	--	--
Oct-20	7.52	957	1.75	1,100	1,720	1,720	207
Nov-20	7.69	1,140	--	--	--	--	--
Dec-20	7.67	963	--	--	--	--	--
Jan-21	8.50	910	3.74	755	1,470	1,470	167
Feb-21	8.61	991	--	--	--	--	--
Mar-21	8.47	999	--	--	--	--	--
Apr-21	7.47	947	Non-Detect	856	1,670	1,670	175
May-21	7.75	1,040	--	--	--	--	--
Jun-21	7.51	806	--	--	--	--	--
Jul-21	7.78	822	Non-Detect	849	1,670	1,670	191
Aug-21	7.63	939	--	--	--	--	--
Sep-21	7.66	935	--	--	--	--	--
Oct-21	11.0	791	2.22	779	1,560	1,560	181
Nov-21	10.2	968	--	--	--	--	--
Dec-21	18.6	1,050	--	--	--	--	--
Jan-22	11.6	788	20.1	890	2,010	2,030	206
Feb-22	9.12	1,040	--	--	--	--	--
Mar-22	8.79	968	--	--	--	--	--
Apr-22	8.14	1,090	1.74	1,040	1,490	1,490	183
May-22	7.69	742	--	--	--	--	--
Jun-22	7.51	987	--	--	--	--	--
Jul-22	7.33	780	1.40	840	1,580	1,580	193
Aug-22	7.26	932	--	--	--	--	--

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Sep-22	7.31	975	--	--	--	--	--
Oct-22	7.14	877	1.65	877	1,650	1,650	195
Nov-22	7.28	886	--	--	--	--	--
Dec-22	11.3	902	--	--	--	--	--
Jan-23	23.6	582	415	1,010	1,350	1,760	146
Feb-23	11.0	957	--	--	--	--	--
Mar-23	21.1	1,070	--	--	--	--	--
Apr-23	9.85	738	12.8	738	1,530	1,550	153
May-23	8.42	878	--	--	--	--	--
Jun-23	7.95	854	--	--	--	--	--
Jul-23	7.54	1,010	4.25	1,110	2,040	2,050	232
Aug-23	7.54	877	--	--	--	--	--
Sep-23	7.40	839	--	--	--	--	--
Oct-23	7.23	847	1.68	791	1,410	1,410	185
Nov-23	7.70	821	--	--	--	--	--
Dec-23	9.13	1,440	--	--	--	--	--
Jan-24	11.1	803	22.2	945	1,540	1,560	197
Feb-24	17.9	888	--	--	--	--	--
Mar-24	10.9	970	--	--	--	--	--
Apr-24	8.98	907	7.33	688	1,310	1,320	156
May-24	10.3	818	--	--	--	--	--
Jun-24	8.12	929	--	--	--	--	--
Jul-24	8.58	897	1.05	919	1,660	1,660	187
Aug-24	8.71	1,280	--	--	--	--	--
Sep-24	7.33	851	--	--	--	--	--
Dry Season Average	7.83	939	1.56	971	1,690	1,690	191
Dry Season Trend ***	None	Down	None	None	None	None	Up
Wet Season Average	10.2	941	33.2	884	1,570	1,610	178
Average Annual	9.17	940	25.3	905	1,610	1,630	182

* Vallejo typically samples more than the required influent ammonia quarterly sampling. This dataset includes this additional sampling.

** The Total Inorganic Nitrogen value is calculated by adding the "Ammonia" and "Nitrate + Nitrite" values for days when sampling occurred. The Total Nitrogen value is calculated by adding "TKN" and "Nitrate + Nitrite" for days when sampling occurred. For instances when ammonia, nitrate + nitrite, or TKN are non-detect, the TIN and Total N values were not calculated. Note: the ammonia sampling is more frequent than the other nitrogen species which can lead to average monthly ammonia values being greater than average monthly TIN values.

*** Refer to the Section 3.8 in the main body for a description on the statistical analysis. Insufficient samples to perform statistical trending on nutrient loads (except for ammonia)

Discharge

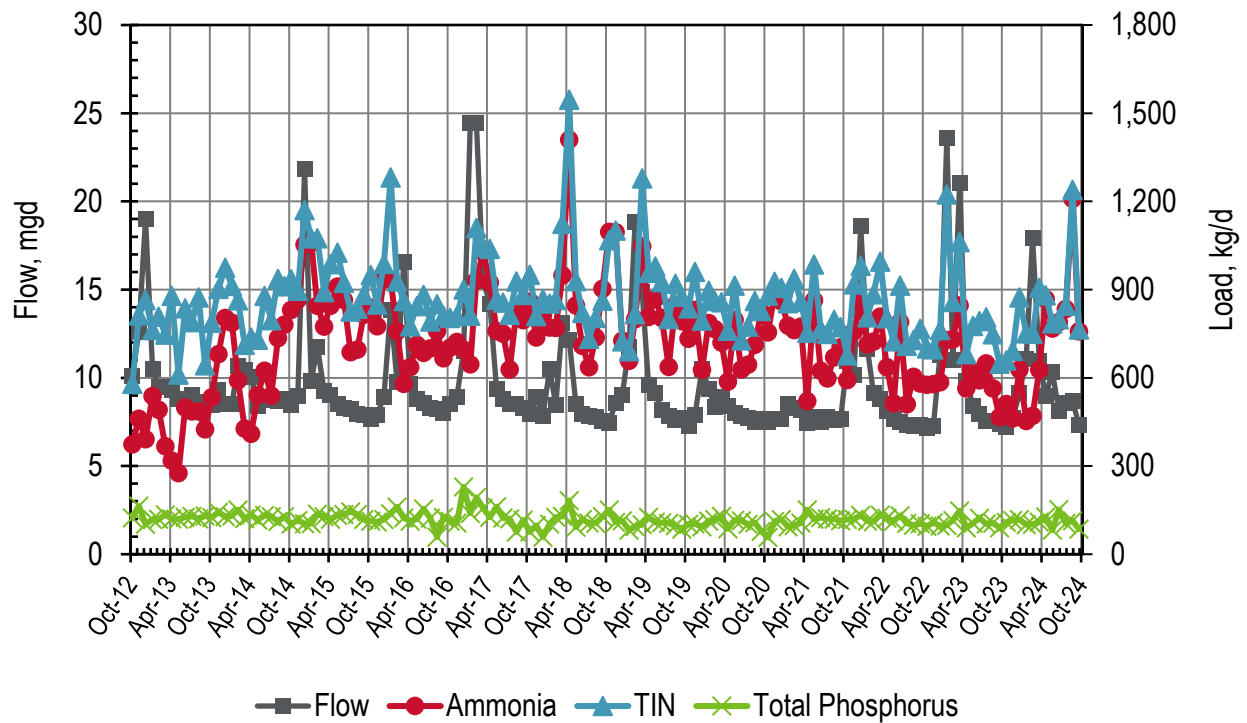


Figure 33-3. Discharge: Vallejo Monthly Flows and Loads

Table 33-2. Discharge: Vallejo Monthly Flows and Loads

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Oct-12	10.1	374	206	580	123
Nov-12	12.6	461	352	813	164
Dec-12	19.0	391	474	865	103
Jan-13	10.5	539	224	762	118
Feb-13	9.48	492	317	809	120
Mar-13	9.51	368	379	747	135
Apr-13	9.30	318	561	879	121
May-13	8.80	276	336	612	120
Jun-13	8.63	499	338	837	126
Jul-13	9.04	486	304	790	130
Aug-13	8.65	486	387	873	121
Sep-13	8.65	426	218	643	131
Oct-13	8.49	535	253	788	125

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-13	9.31	681	222	903	144
Dec-13	8.52	804	171	975	129
Jan-14	8.51	788	126	913	130
Feb-14	10.7	592	272	864	152
Mar-14	10.4	428	285	713	122
Apr-14	10.1	410	327	738	134
May-14	8.43	542	188	731	116
Jun-14	8.92	624	256	880	133
Jul-14	8.77	540	256	796	128
Aug-14	8.73	736	201	937	112
Sep-14	8.81	781	131	912	129
Oct-14	8.49	831	105	936	103
Nov-14	8.97	867	30.4	897	116
Dec-14	21.8	1,050	118	1,170	104
Jan-15	9.83	1,060	15.9	1,080	105
Feb-15	11.8	846	229	1,070	137
Mar-15	9.28	775	117	892	129
Apr-15	9.01	846	142	987	120
May-15	8.53	911	115	1,030	132
Jun-15	8.32	865	58.6	924	136
Jul-15	8.28	688	138	826	144
Aug-15	7.99	696	140	836	135
Sep-15	7.93	815	68.0	883	119
Oct-15	7.65	839	111	950	113
Nov-15	7.92	776	74.3	850	110
Dec-15	8.92	935	52.9	988	118
Jan-16	13.9	934	348	1,280	138
Feb-16	9.77	758	170	928	161
Mar-16	16.6	580	281	862	124
Apr-16	9.69	637	139	776	113
May-16	8.84	713	131	844	119
Jun-16	8.56	686	197	883	155
Jul-16	8.32	701	91.8	793	122
Aug-16	8.23	760	91.1	851	58.4
Sep-16	8.04	667	145	812	126
Oct-16	8.55	703	102	805	114

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-16	8.90	722	88.4	811	106
Dec-16	11.5	696	205	901	229
Jan-17	24.5	646	166	812	140
Feb-17	24.4	931	178	1,110	193
Mar-17	15.5	1,030	16.8	1,050	157
Apr-17	14.2	924	114	1,040	126
May-17	9.37	760	107	867	161
Jun-17	8.81	751	106	856	124
Jul-17	8.54	629	187	815	121
Aug-17	8.51	824	104	928	76.0
Sep-17	8.30	797	86.0	883	117
Oct-17	7.95	860	91.7	951	76.5
Nov-17	8.94	737	73.7	811	98.2
Dec-17	7.87	815	53.5	868	58.2
Jan-18	10.5	771	82.3	853	103
Feb-18	8.46	771	94.5	865	126
Mar-18	13.1	948	176	1,120	130
Apr-18	12.2	1,410	136	1,550	182
May-18	8.51	846	83.4	930	92.8
Jun-18	7.94	709	113	822	118
Jul-18	7.87	636	116	734	106
Aug-18	7.78	738	66.6	805	106
Sep-18	7.59	903	54.0	863	129
Oct-18	7.45	1,100	12.7	1,070	151
Nov-18	8.60	1,100	6.07	1,100	109
Dec-18	9.05	727	50.6	725	114
Jan-19	11.8	659	106	691	83.1
Feb-19	18.8	800	150	817	94.9
Mar-19	14.9	1,050	230	1,280	101
Apr-19	9.61	807	151	958	127
May-19	9.13	870	109	979	109
Jun-19	8.17	804	122	926	108
Jul-19	7.86	638	163	801	105
Aug-19	7.63	848	72.1	920	97.5
Sep-19	7.72	793	82.6	876	85.3
Oct-19	7.29	733	104	837	102

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-19	7.90	831	130	961	104
Dec-19	10.5	628	168	796	93.2
Jan-20	9.40	787	110	897	113
Feb-20	8.34	766	95.9	862	118
Mar-20	8.93	721	49.6	857	130
Apr-20	8.42	588	195	761	86.6
May-20	8.01	798	92.6	915	116
Jun-20	7.84	629	124	728	115
Jul-20	7.72	646	153	774	102
Aug-20	7.50	713	76.9	862	107
Sep-20	7.67	825	45.5	828	78.2
Oct-20	7.52	755	58.6	880	58.0
Nov-20	7.69	883	54.7	927	112
Dec-20	7.67	861	45.9	907	119
Jan-21	8.50	778	76.5	855	93.9
Feb-21	8.30	762	174	936	97.6
Mar-21	8.17	775	84.9	860	106
Apr-21	7.47	521	233	755	151
May-21	7.75	864	121	986	120
Jun-21	7.51	625	141	766	125
Jul-21	7.78	599	152	750	121
Aug-21	7.63	671	127	797	119
Sep-21	7.66	704	69.0	773	114
Oct-21	11.0	593	84.0	677	119
Nov-21	10.2	759	159	918	120
Dec-21	18.6	852	129	982	133
Jan-22	11.6	714	91.9	806	113
Feb-22	9.12	724	161	885	111
Mar-22	8.79	808	187	996	133
Apr-22	8.14	637	166	803	123
May-22	7.69	514	211	725	113
Jun-22	7.51	790	125	914	132
Jul-22	7.33	511	199	709	105
Aug-22	7.26	604	125	729	98.5
Sep-22	7.31	581	186	767	105
Oct-22	7.14	576	124	701	95.6

Month, Year	Flow	Ammonia	Nitrate + Nitrite	TIN*	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg P/day
Nov-22	7.28	579	119	698	108
Dec-22	11.3	585	178	763	96.9
Jan-23	23.6	729	495	1,220	98.8
Feb-23	11.0	732	127	859	116
Mar-23	21.1	847	216	1,060	148
Apr-23	9.85	564	116	681	90.1
May-23	8.42	623	153	776	105
Jun-23	7.95	592	202	794	122
Jul-23	7.54	650	157	806	104
Aug-23	7.54	565	184	749	106
Sep-23	7.40	467	181	648	90.6
Oct-23	7.23	512	148	659	109
Nov-23	7.70	463	229	692	115
Dec-23	9.13	628	245	873	119
Jan-24	11.1	454	298	751	101
Feb-24	17.9	471	280	751	103
Mar-24	10.9	628	279	907	109
Apr-24	8.98	868	12.7	881	127
May-24	10.3	768	17.4	785	82.4
Jun-24	8.12	790	9.66	800	152
Jul-24	8.58	834	10.9	845	105
Aug-24	8.71	1,210	30.5	1,240	114
Sep-24	7.33	758	6.79	765	86.3
Dry Season Average	8.17	696	138	832	115
Dry Season Trend **	Down	None	Down	None	Down
Wet Season Average	10.9	729	164	891	119
Average Annual	9.76	715	153	867	117

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values for days when sampling occurred. Note: the ammonia sampling is typically more frequent than the other nitrogen species which can lead to average monthly ammonia values being greater than average monthly TIN values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

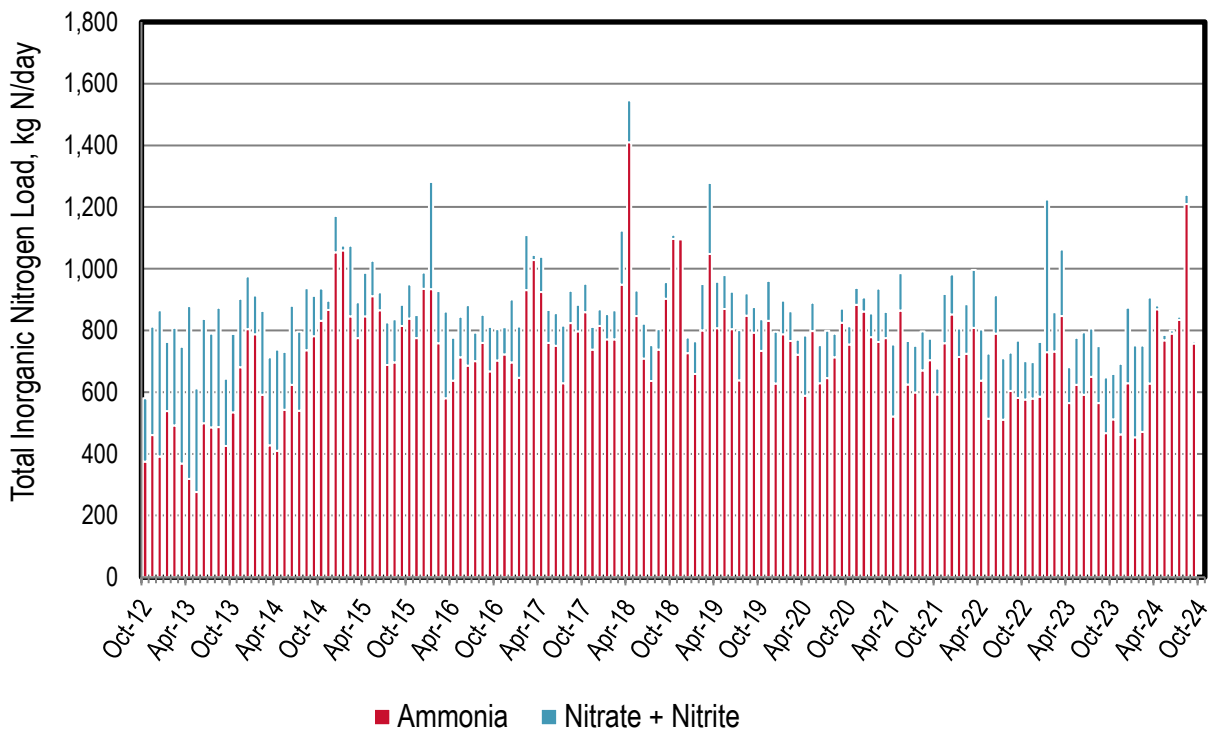


Figure 33-4. Discharge: Vallejo Monthly Nitrogen Loads

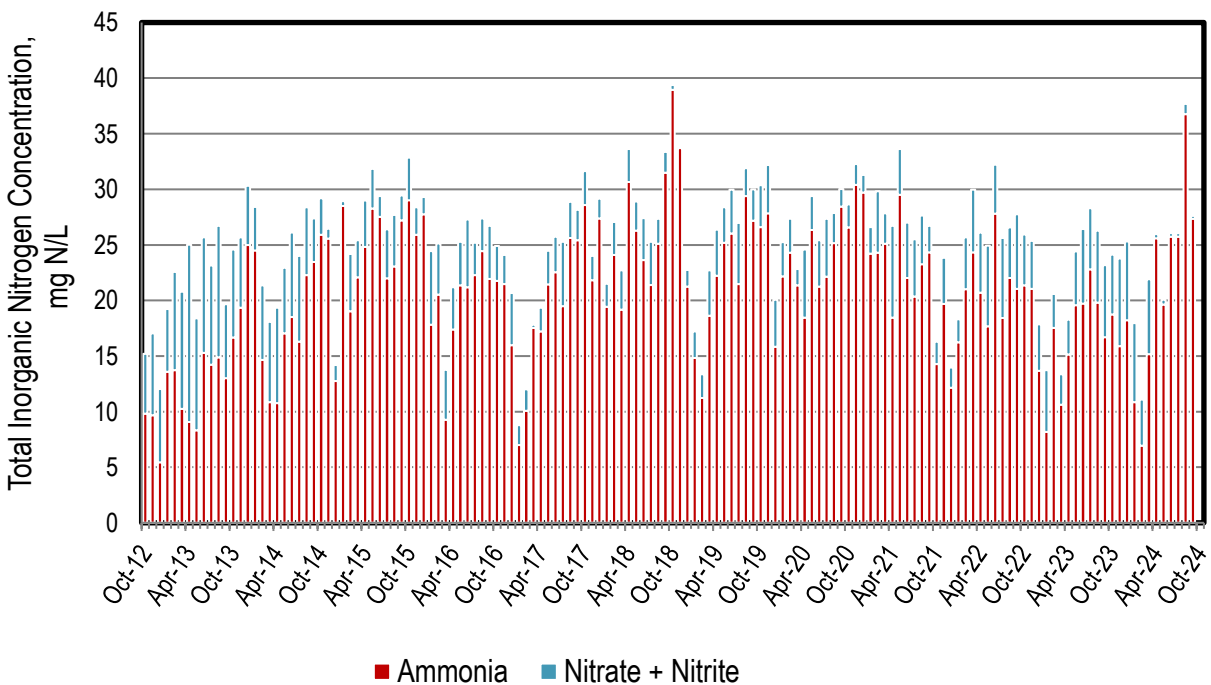


Figure 33-5. Discharge: Vallejo Monthly Nitrogen Concentrations

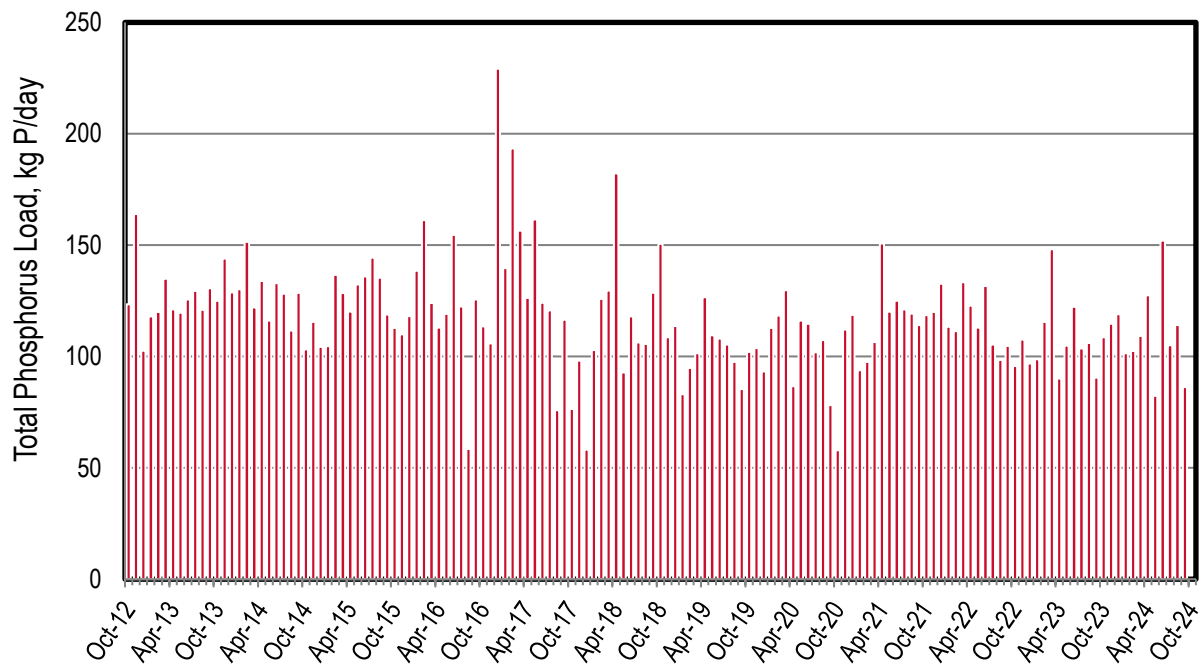


Figure 33-6. Discharge: Vallejo Monthly Phosphorus Loads

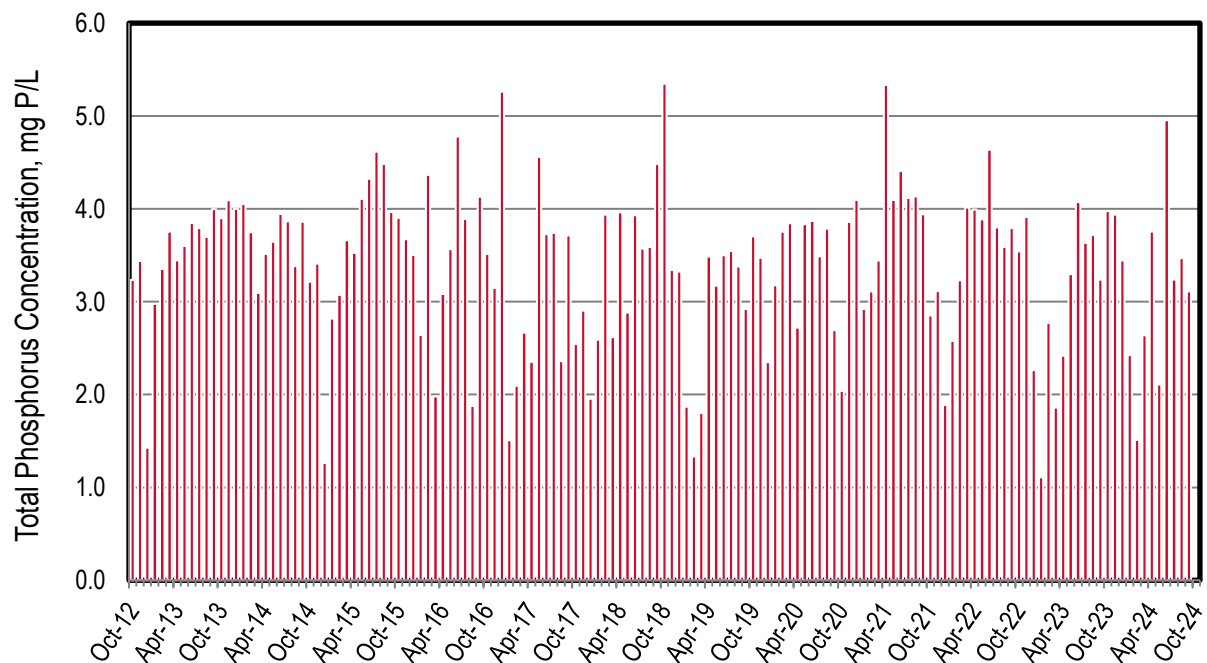


Figure 33-7. Discharge: Vallejo Monthly Phosphorus Concentrations

Recycled Water

No recycled water was produced or distributed this past year.

34 West County Wastewater - City of Richmond Joint Outfall

West County Wastewater (WCW) and the City of Richmond (Richmond) share a common outfall and NPDES permit discharge point. The joint outfall discharges to the Central San Francisco Bay with a combined permitted capacity of 28.5 mgd ADWF (12.5 mgd ADWF for WCW and 16.0 mgd ADWF for the City of Richmond) and a combined wet weather capacity of 41 mgd (21 mgd for WCW and 20 mgd for Richmond). Note: Richmond's plant has wet weather capacity greater than 20 mgd but is limited to 20 mgd by the secondary treatment system. Prior to the end of 2024, the joint outfall was owned and operated by the West County Agency, a Joint Powers Authority (JPA) which was dissolved at the direction of its Board, through a nearly three-year process ending on the final day of 2024. Because of this history, and because the Permit establishes combined interim and final effluent limitations for WCW and Richmond, loads from the two agencies are tracked together in this Group Annual Report. The two individual agencies are jointly responsible for compliance.

While Richmond's plant provides conventional secondary treatment, WCW's plant was upgraded to a Modified Ludzack-Ettinger (MLE) activated sludge process circa 2017. It is noteworthy that the Richmond plant has completed substantial upgrades, including to its secondary process. One major change was the conversion from mechanical mixing to fine bubble diffused air. Modifications include an anoxic area where primary effluent enters and is then distributed to the aeration basins. While the Richmond's modified design is not intended to remove nutrients per se, there may be some incidental ammonia reduction and time will show to what extent, if any, that benefit is observed. The average dry season discharge flow this past year was approximately 6.52 mgd.

The following observations are made based upon the figures and tables in the subsequent pages:

- ◆ Influent (combined flows and loads for both treatment plants):
 - ▲ Limited to data since July 2019; quarterly required but more occasionally provided.
 - ▲ The flow reduction across the plants averages just below 50 percent. The October and December 2021 wet weather events drastically reduced the flow reduction, but it was short-lived as evidenced by a 40 percent reduction in January 2022. The primary contributor to such flow reductions are recycled water projects at the nearby Chevron Refinery which accepts WCW treatment plant effluent after polishing and distribution by the East Bay Municipal Utility District (EBMUD).
 - ▲ The nitrogen and phosphorus load reduction values across the plant are reliably above 70 percent (with the exception of total P in September 2022). This load reduction is attributed to a combination of recycled water to the Chevron Refinery, biological assimilation, biosolids management, and/or biological load reduction at both plants.
 - ▲ Based on Table 34-1's statistical analysis, there are no emerging dry season trends.
- ◆ Discharge (combined flows and loads for both treatment plants at the common outfall):
 - ▲ The Richmond Plant represents the majority of the discharge flow and loads (data not shown). The WCW Plant recycles a large portion of their year-round flows, with some dry weather months above 90%.

- ▲ The average monthly dry season flows for 2023/2024 increased from 2022/2023, despite the relatively wet year in 2022/2023.
 - ▲ Wet season nutrient loads are typically greater and more variable than dry season loads.
 - ▲ Ammonia represents the majority of the nitrogen species discharged. This is expected as the Richmond Plant represents most of the discharge load and they do not nitrify. WCW's effluent ammonia level is typically less than 0.1 mg/l and needs to be below 2.0 mg/l for effective operation of EBMUD's two reclamation facilities (North Richmond Water Reclamation Plant and Richmond Advanced Recycle Expansion (RARE) Water Project.
 - ▲ Total phosphorus concentrations vary between 0.5 to 9.3 mg P/L. The three largest values are from the 2022 and 2023 dry seasons. The basis for such values is unclear but there may be a connection to the Covid-19 pandemic. Changes to the influent profile could be a result of the transition in the residential and businesses sectors.
 - ▲ Based on Table 34-2 statistics for the entire dry season dataset, ammonia loads, and TIN loads are trending downwards, while flow, nitrate + nitrate and total phosphorus have no trend.
- ◆ Recycled Water:
- ▲ Based on Table 8-3, the plants have averaged 4.9 mgd of Recycled Water from 2019-2022 calendar years. The key user is Industrial (nearby Chevron facility).
 - ▲ Based on Table 8-4 through Table 8-6, the plants have averaged the diversion of 3 kg ammonia-N/d, 112 kg TIN-N/d, and 34 kg P/d from the Bay through recycled water from 2019-2022 calendar years.

Influent

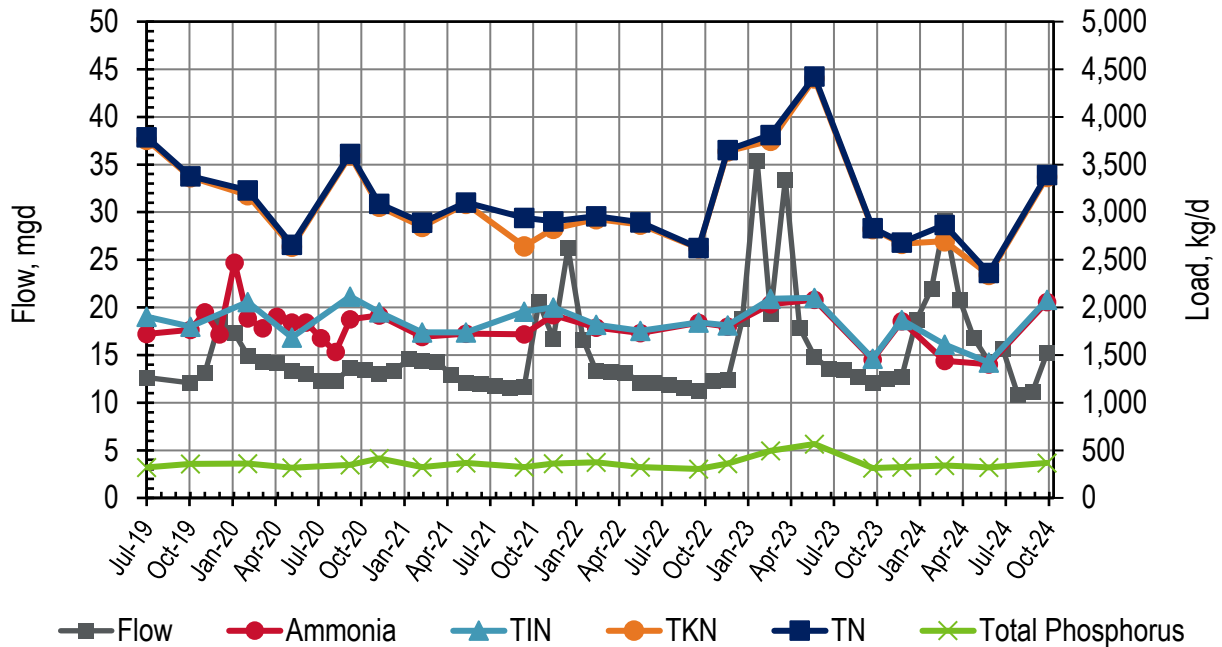


Figure 34-1. Influent: Monthly Flows and Loads for Both Treatment Plants

Note: the TKN/Total N loads are comparable. The TKN values are located behind the Total N loads.

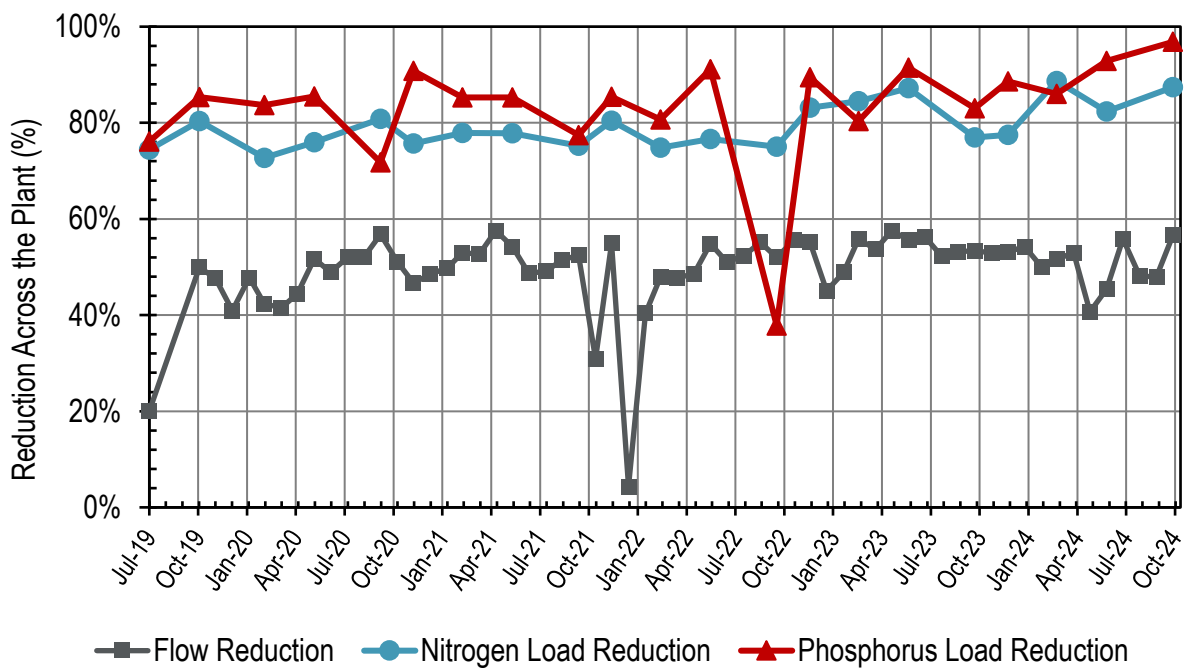


Figure 34-2. Influent: Monthly Reductions Across Both Treatment Plants

Note: Influent Total N was compared against Discharge TIN for calculating nitrogen load reduction.

Table 34-1. Influent: Monthly Flows and Loads for Both Treatment Plants*

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-19	12.6	1,720	25.2	1,900	3,760	3,790	321
Aug-19	--	--	--	--	--	--	--
Sep-19	--	--	--	--	--	--	--
Oct-19	12.1	1,770	8.27	1,800	3,370	3,380	359
Nov-19	13.1	1,950	--	--	--	--	--
Dec-19	18.5	1,720	--	--	--	--	--
Jan-20	17.3	2,470	--	--	--	--	--
Feb-20	15.0	1,880	50.0	2,060	3,180	3,230	362
Mar-20	14.3	1,780	--	--	--	--	--
Apr-20	14.2	1,900	--	--	--	--	--
May-20	13.4	1,840	22.0	1,690	2,640	2,660	318
Jun-20	13.0	1,840	--	--	--	--	--
Jul-20	12.3	1,680	--	--	--	--	--
Aug-20	12.2	1,530	--	--	--	--	--
Sep-20	13.7	1,880	14.5	2,120	3,600	3,610	347
Oct-20	13.4	--	--	--	--	--	--
Nov-20	13.0	1,920	31.9	1,950	3,060	3,090	416
Dec-20	13.3	--	--	--	--	--	--
Jan-21	14.6	--	--	--	--	--	--
Feb-21	14.4	1,690	44.5	1,740	2,850	2,890	323
Mar-21	14.3	--	--	--	--	--	--
Apr-21	12.9	--	--	--	--	--	--
May-21	12.1	1,720	14.5	1,740	3,090	3,100	368
Jun-21	12.0	--	--	--	--	--	--
Jul-21	11.7	--	--	--	--	--	--
Aug-21	11.5	--	--	--	--	--	--
Sep-21	11.7	1,720	11.9	1,960	2,640	2,940	323
Oct-21	20.5	--	--	--	--	--	--
Nov-21	16.7	1,920	79.2	2,000	2,830	2,900	361
Dec-21	26.2	--	--	--	--	--	--
Jan-22	16.6	--	--	--	--	--	--
Feb-22	13.3	1,790	30.8	1,820	2,930	2,960	374
Mar-22	13.2	--	--	--	--	--	--
Apr-22	13.2	--	--	--	--	--	--
May-22	12.1	1,730	24.0	1,760	2,870	2,890	323
Jun-22	12.0	--	--	--	--	--	--

Month, Year	Flow	Ammonia*	Nitrate + Nitrite	TIN**	TKN	Total N**	Total P
	mgd	kg N/day	kg N/day	kg N/day	kg N/d	kg N/d	kg P/day
Jul-22	11.9	--	--	--	--	--	--
Aug-22	11.6	--	--	--	--	--	--
Sep-22	11.3	1,840	4.10	1,840	2,620	2,620	304
Oct-22	12.3	--	--	--	--	--	--
Nov-22	12.4	1,800	15.3	1,810	3,640	3,650	360
Dec-22	18.7	--	--	--	--	--	--
Jan-23	35.4	--	--	--	--	--	--
Feb-23	19.3	2,030	58.6	2,090	3,750	3,810	496
Mar-23	33.4	--	--	--	--	--	--
Apr-23	17.8	--	--	--	--	--	--
May-23	14.9	2,080	19.8	2,100	4,400	4,420	566
Jun-23	13.5	--	--	--	--	--	--
Jul-23	13.4	--	--	--	--	--	--
Aug-23	12.8	--	--	--	--	--	--
Sep-23	12.1	1,450	9.07	1,460	2,820	2,830	316
Oct-23	12.5	--	--	--	--	--	--
Nov-23	12.7	1,860	14.1	1,870	2,670	2,680	325
Dec-23	18.7	--	--	--	--	--	--
Jan-24	22.0	--	--	--	--	--	--
Feb-24	29.1	1,440	172	1,610	2,700	2,870	340
Mar-24	20.8	--	--	--	--	--	--
Apr-24	16.8	--	--	--	--	--	--
May-24	14.3	1,400	18.3	1,420	2,340	2,360	320
Jun-24	15.6	--	--	--	--	--	--
Jul-24	10.8	--	--	--	--	--	--
Aug-24	11.2	--	--	--	--	--	--
Sep-24	15.2	2,060	23.4	2,080	3,370	3,390	369
Dry Season Average	12.7	1,750	17.0	1,820	3,110	3,150	352
Dry Season Trend ***	None	None	None	None	None	None	None
Wet Season Average	17.2	1,860	50.4	1,870	3,100	3,150	372
Average Annual	15.3	1,810	32.9	1,850	3,100	3,150	361

* WCW typically samples more than the required influent nutrient quarterly sampling. This dataset includes this additional sampling.

** The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values. The Total Nitrogen value is calculated by adding “TKN” and “Nitrate + Nitrite”.

*** Refer to the Section 3.8 in the main body for a description on the statistical analysis. Insufficient samples to perform statistical trending on the dataset.

Discharge

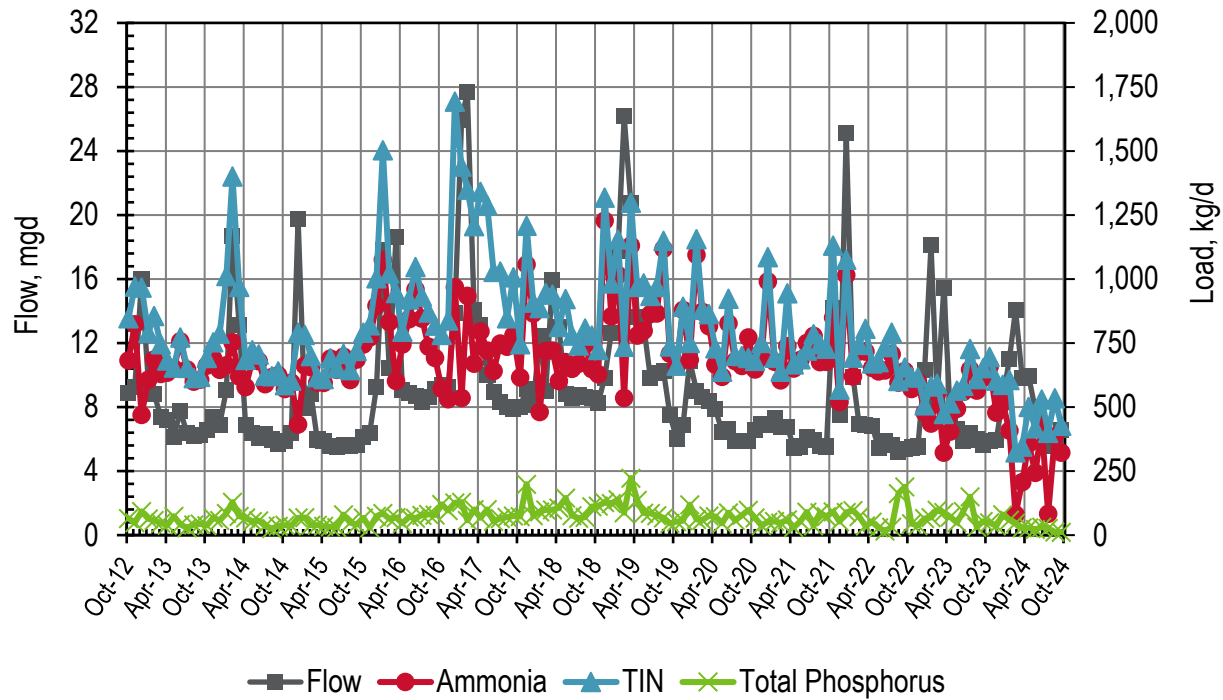


Figure 34-3. Discharge: Monthly Flows and Loads for Both Treatment Plants at the Common Outfall

Table 34-2. Discharge: Monthly Flows and Loads for Both Treatment Plants at the Common Outfall

Month, Year	Flow mgd	Ammonia kg N/day	Nitrate + Nitrite kg N/day	TIN* kg N/day	Total P kg P/day
Oct-12	8.85	682	166	848	65.5
Nov-12	9.27	824	147	971	49.0
Dec-12	16.0	470	497	967	92.6
Jan-13	9.55	607	182	789	63.4
Feb-13	8.81	686	169	856	57.4
Mar-13	7.40	631	116	747	47.3
Apr-13	7.22	635	47.0	682	38.5
May-13	6.16	652	3.26	655	73.4
Jun-13	7.77	758	15.3	773	41.7
Jul-13	6.36	648	6.13	654	28.8
Aug-13	6.23	601	12.7	613	39.8
Sep-13	6.24	608	10.4	618	43.6
Oct-13	6.60	662	30.3	692	38.0

Month, Year	Flow mgd	Ammonia kg N/day	Nitrate + Nitrite kg N/day	TIN* kg N/day	Total P kg P/day
Nov-13	7.42	690	63.6	754	67.3
Dec-13	6.93	646	141	787	57.6
Jan-14	9.09	664	348	1,010	85.2
Feb-14	18.7	753	647	1,400	129
Mar-14	13.1	620	349	969	73.7
Apr-14	6.89	579	106	685	67.3
May-14	6.16	681	40.4	722	53.9
Jun-14	7.77	680	25.6	706	56.9
Jul-14	6.33	590	34.5	624	37.0
Aug-14	5.98	618	3.84	622	26.8
Sep-14	5.71	626	15.0	641	35.7
Oct-14	5.88	571	15.0	586	39.4
Nov-14	6.37	596	7.47	604	36.5
Dec-14	19.8	433	358	791	68.3
Jan-15	7.93	662	121	783	68.5
Feb-15	8.85	656	43.2	700	39.4
Mar-15	5.98	596	21.9	617	39.0
Apr-15	5.91	595	14.7	610	35.1
May-15	5.60	689	1.51	691	33.1
Jun-15	5.57	646	6.68	653	29.8
Jul-15	5.66	697	11.6	709	79.9
Aug-15	5.58	606	38.2	645	48.4
Sep-15	5.66	686	32.9	719	41.5
Oct-15	6.15	745	46.5	792	67.9
Nov-15	6.41	772	47.0	819	29.5
Dec-15	9.24	896	108	1,000	73.9
Jan-16	17.8	1,080	427	1,500	84.8
Feb-16	10.4	833	189	1,020	64.3
Mar-16	18.6	602	344	946	68.8
Apr-16	9.06	745	50.2	795	46.2
May-16	8.87	843	77.4	921	71.6
Jun-16	8.71	960	88.0	1,050	66.0
Jul-16	8.35	846	86.0	932	78.2
Aug-16	8.64	736	134	869	81.2
Sep-16	9.12	693	126	819	78.9
Oct-16	9.42	572	210	782	120

Month, Year	Flow mgd	Ammonia kg N/day	Nitrate + Nitrite kg N/day	TIN* kg N/day	Total P kg P/day
Nov-16	9.25	531	308	839	96.7
Dec-16	13.9	968	725	1,690	127
Jan-17	25.9	536	903	1,440	128
Feb-17	27.7	935	414	1,350	58.3
Mar-17	14.1	671	536	1,210	100
Apr-17	13.2	796	544	1,340	67.4
May-17	10.0	721	567	1,290	99.8
Jun-17	8.99	641	388	1,030	54.2
Jul-17	8.32	749	280	1,030	65.6
Aug-17	8.01	736	112	848	70.1
Sep-17	7.91	781	226	1,010	75.0
Oct-17	8.04	616	131	747	72.4
Nov-17	9.12	1,060	151	1,210	199
Dec-17	8.16	867	41.8	908	76.5
Jan-18	12.5	481	406	887	91.3
Feb-18	9.04	720	226	946	99.1
Mar-18	16.0	722	218	939	98.6
Apr-18	13.0	602	211	814	106
May-18	8.83	677	245	922	145
Jun-18	8.57	651	129	780	76.5
Jul-18	8.73	670	71.9	741	66.9
Aug-18	8.65	744	64.3	808	70.7
Sep-18	8.60	649	131	780	111
Oct-18	8.29	629	117	724	114
Nov-18	9.82	1,230	89.8	1,320	127
Dec-18	12.7	855	128	983	124
Jan-19	17.8	1,020	139	1,150	139
Feb-19	26.2	536	201	736	88.1
Mar-19	20.7	1,130	167	1,300	223
Apr-19	13.7	780	190	970	137
May-19	13.1	799	186	984	86.9
Jun-19	9.82	864	71.7	935	85.3
Jul-19	10.1	866	104	969	76.8
Aug-19	10.3	1,120	32.0	1,150	67.3
Sep-19	7.49	709	28.1	737	45.9
Oct-19	6.05	659	3.30	663	52.6

Month, Year	Flow mgd	Ammonia kg N/day	Nitrate + Nitrite kg N/day	TIN* kg N/day	Total P kg P/day
Nov-19	6.87	880	12.9	893	56.7
Dec-19	10.9	684	67.0	751	119
Jan-20	9.03	1,090	61.8	1,160	61.8
Feb-20	8.63	873	17.6	881	59.2
Mar-20	8.35	816	32.2	864	75.2
Apr-20	7.88	666	63.0	729	72.1
May-20	6.46	619	19.8	639	46.2
Jun-20	6.63	827	96.6	923	88.1
Jul-20	5.92	680	20.4	701	57.1
Aug-20	5.86	661	39.7	701	77.1
Sep-20	5.91	773	53.3	693	98.0
Oct-20	6.56	647	34.1	681	67.8
Nov-20	6.95	694	57.3	751	38.2
Dec-20	6.85	991	94.9	1,090	51.1
Jan-21	7.31	677	16.5	694	53.9
Feb-21	6.79	605	34.5	639	47.4
Mar-21	6.76	738	34.8	945	60.0
Apr-21	5.49	651	7.58	667	30.2
May-21	5.54	684	5.38	688	54.2
Jun-21	6.15	751	7.37	721	90.7
Jul-21	5.97	779	13.3	785	36.9
Aug-21	5.59	676	9.12	747	87.7
Sep-21	5.56	678	10.1	729	72.9
Oct-21	14.2	850	24.4	1,130	91.1
Nov-21	7.54	520	48.6	569	52.6
Dec-21	25.1	1,020	60.2	1,080	89.5
Jan-22	9.92	619	74.1	694	96.9
Feb-22	6.93	718	25.7	744	72.3
Mar-22	6.89	717	19.8	806	36.6
Apr-22	6.79	654	16.8	671	51.2
May-22	5.46	640	13.8	676	28.7
Jun-22	5.89	644	10.4	735	16.3
Jul-22	5.66	707	18.5	791	31.8
Aug-22	5.21	596	6.85	602	163
Sep-22	5.41	641	14.1	655	189
Oct-22	5.49	572	45.4	617	44.6

Month, Year	Flow mgd	Ammonia kg N/day	Nitrate + Nitrite kg N/day	TIN* kg N/day	Total P kg P/day
Nov-22	5.56	600	16.7	616	38.0
Dec-22	10.3	479	28.6	507	65.2
Jan-23	18.1	436	144	581	68.7
Feb-23	8.53	554	36.8	591	97.4
Mar-23	15.5	323	151	474	88.7
Apr-23	7.57	405	110	515	71.8
May-23	6.61	494	71.6	565	48.5
Jun-23	5.90	560	24.0	584	92.7
Jul-23	6.42	647	80.1	727	150
Aug-23	5.97	565	44.2	609	31.6
Sep-23	5.64	614	39.0	653	53.7
Oct-23	5.88	658	31.7	696	48.4
Nov-23	5.97	479	125	604	36.9
Dec-23	8.55	516	71.1	587	80.8
Jan-24	11.0	409	197	606	58.6
Feb-24	14.1	81.0	243	324	47.6
Mar-24	9.79	207	139	346	28.9
Apr-24	9.95	357	145	502	29.3
May-24	7.82	244	174	417	22.7
Jun-24	6.89	424	106	530	31.3
Jul-24	5.60	84.3	316	400	26.8
Aug-24	5.81	386	149	535	12.2
Sep-24	6.59	323	105	428	11.7
Dry Season Average	7.05	670	80.9	750	64.4
Dry Season Trend **	None	Down	None	Down	Up
Wet Season Average	10.6	679	157	841	74.1
Average Annual	9.12	673	125	802	70.1

* The Total Inorganic Nitrogen value is calculated by adding the “Ammonia” and “Nitrate + Nitrite” values.

** Refer to the Section 3.8 in the main body for a description on the statistical analysis.

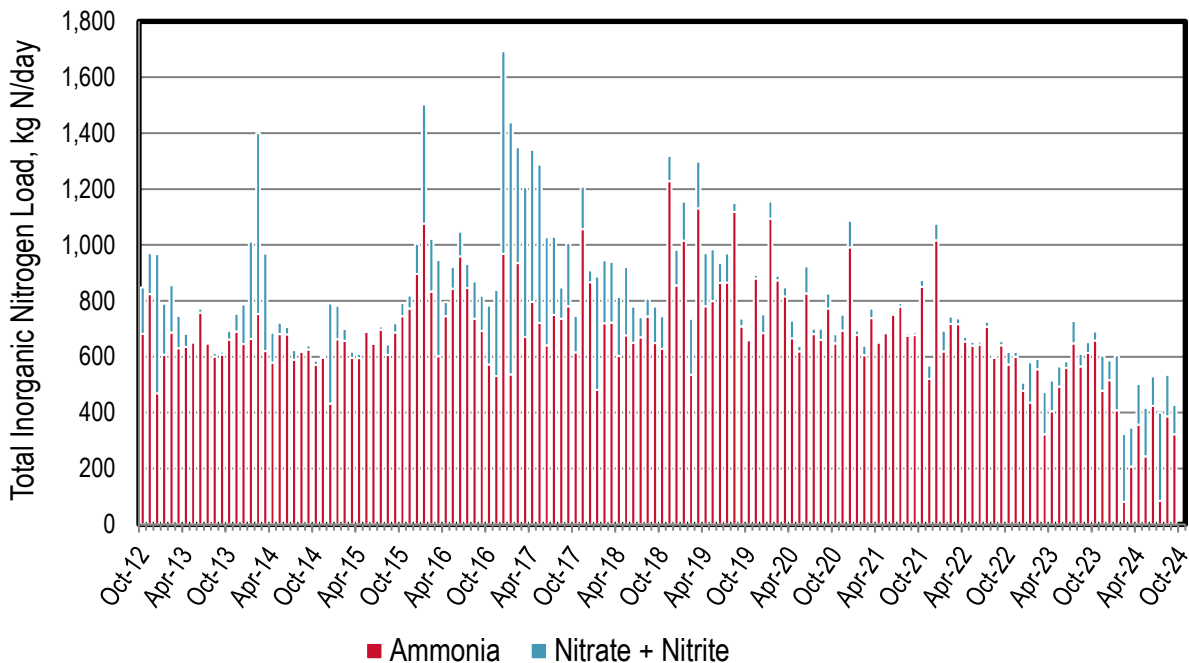


Figure 34-4. Discharge: Monthly Nitrogen Loads for Both Treatment Plants at the Common Outfall

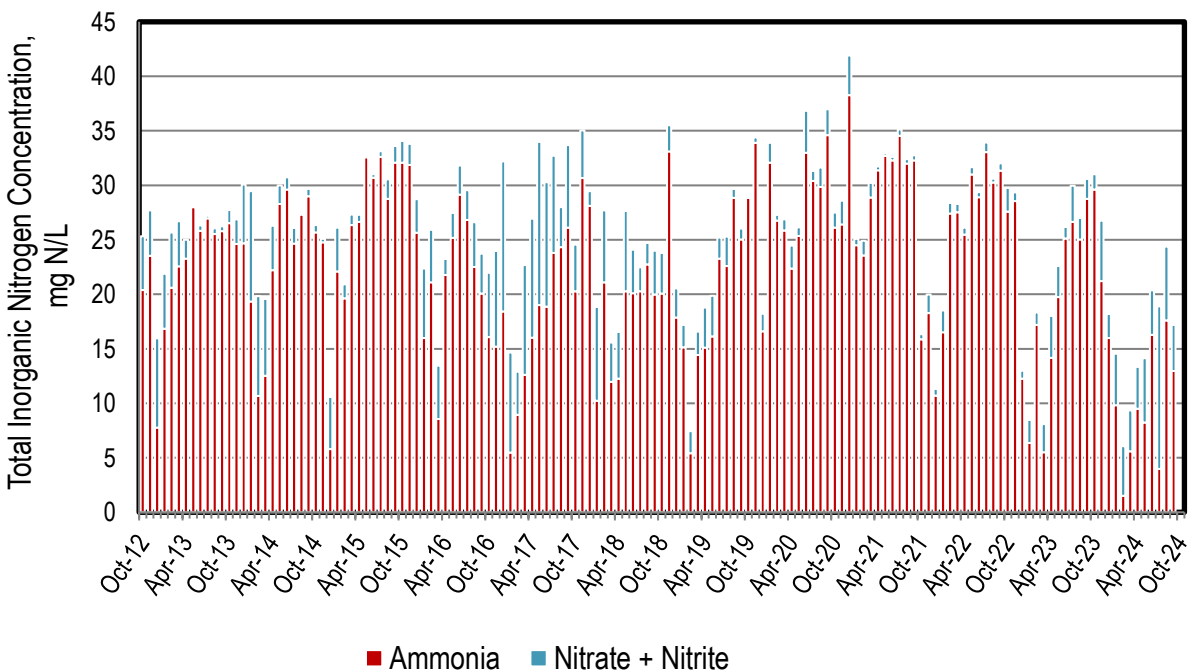


Figure 34-5. Discharge: Monthly Nitrogen Concentrations for Both Treatment Plants at the Common Outfall

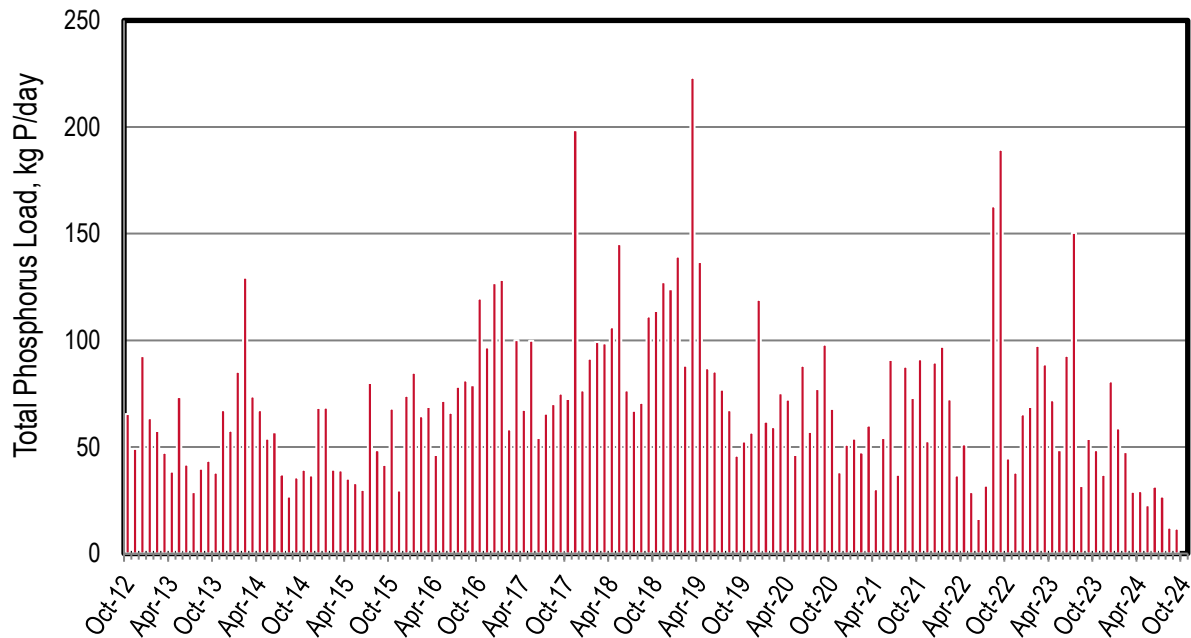


Figure 34-6. Discharge: Monthly Phosphorus Loads for Both Treatment Plants at the Common Outfall

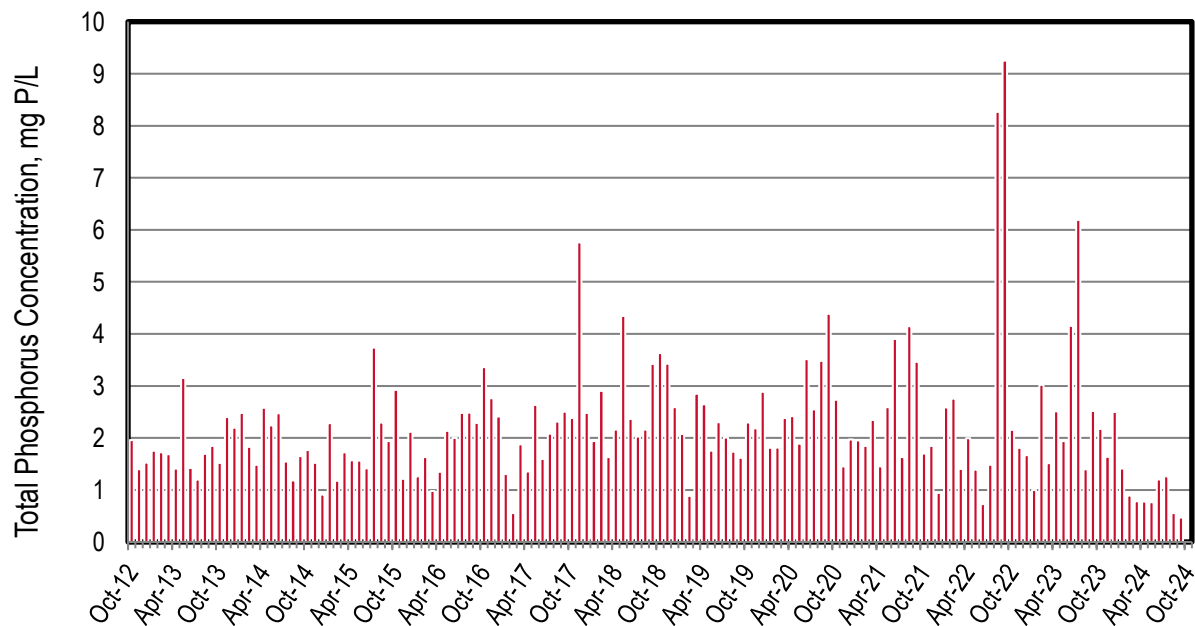


Figure 34-7. Discharge: Monthly Phosphorus Concentrations for Both Treatment Plants at the Common Outfall

Recycled Water

Table 34-3. Recycled Water: WCW Yearly Recycled Water Flows Diverted from the Bay*

Year**	Flow Diverted***, Acre-Feet (mgd)							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	--	--	--	5,160 (4.6)	--	--	--	5,160 (4.6)
2020	--	--	--	5,670 (5.1)	--	--	--	5,670 (5.1)
2021	--	--	--	5,870 (5.2)	--	--	--	5,870 (5.2)
2022	--	--	--	5,110 (4.6)	--	--	--	5,110 (4.6)
Average	--	--	--	5,450 (4.9)	--	--	--	5,450 (4.9)

* The loading values are based on water provided to both the RARE Project at the nearby Chevron Refinery and the North Richmond Water Reclamation Plant.

** Calendar year as opposed to California's water year (October 1 through September 30)

*** Assumes 100% of the recycled load is diverted from the Bay

Table 34-4. Recycled Water: WCW Yearly Recycled Water Ammonia Load Diverted from the Bay*

Year**	Average Ammonia Load Diverted***, kg N/d							Total
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	
2019	--	--	--	2	--	--	--	2
2020	--	--	--	2	--	--	--	2
2021	--	--	--	4	--	--	--	4
2022	--	--	--	3	--	--	--	3
Average	--	--	--	3	--	--	--	3

* The loading values are based on effluent values from the WCW Treatment Plant and its Wastewater Collection System as this represents the feed water to both the RARE Project at the nearby Chevron Refinery and the North Richmond Water Reclamation Plant.

** Calendar year as opposed to California's water year (October 1 through September 30)

*** Assumes 100% of the recycled load is diverted from the Bay

Table 34-5. Recycled Water: WCW Yearly Recycled Water Total Inorganic Nitrogen Load Diverted from the Bay*

Year**	Average Total Inorganic Nitrogen Load Diverted***, kg N/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	--	--	--	115	--	--	--	115
2020	--	--	--	123	--	--	--	123
2021	--	--	--	118	--	--	--	118
2022	--	--	--	91	--	--	--	91
Average	--	--	--	112	--	--	--	112

* The loading values are based on effluent values from the West County Wastewater District Treatment Plant and its Wastewater Collection System as this represents the feed water to both the RARE Project at the nearby Chevron Refinery and the North Richmond Water Reclamation Plant.

** Calendar year as opposed to California's water year (October 1 through September 30)

*** Assumes 100% of the recycled load is diverted from the Bay

Table 34-6. Recycled Water: WCW Yearly Recycled Water Total P Load Diverted from the Bay*

Year**	Average Total P Load Diverted***, kg P/d							
	Golf Course Irrigation	Landscape Irrigation	Commercial Application	Industrial Application	Agricultural Irrigation	Other Potable Uses	Other Non-Potable Uses	Total
2019	--	--	--	29	--	--	--	29
2020	--	--	--	42	--	--	--	42
2021	--	--	--	40	--	--	--	40
2022	--	--	--	23	--	--	--	23
Average	--	--	--	34	--	--	--	34

* The loading values are based on effluent values from the West County Wastewater District Treatment Plant and its Wastewater Collection System as this represents the feed water to both the RARE Project at the nearby Chevron Refinery and the North Richmond Water Reclamation Plant.

** Calendar year as opposed to California's water year (October 1 through September 30)

*** Assumes 100% of the recycled load is diverted from the Bay

Appendix B. Compliance Milestone Summary Report

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Bay Area Clean Water Agencies

Appendix B

Compliance Milestone Summary Report

2024

April 1, 2025



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1 Introduction

The Nutrient Watershed Permit (Permit) adopted by the Regional Water Board in July 2024 (Order R2-2024-0013) establishes final effluent limitations for Total Inorganic Nitrogen (TIN) for specific municipal wastewater dischargers to San Francisco Bay. The dischargers with final effluent limitations are listed in Table 4 of the Permit. The Permit also establishes a 10-year compliance schedule, such that the final effluent limitations do not go into effect until October 1, 2034.

Dischargers are required to submit information annually to demonstrate that they are making progress per the Permit's compliance schedule, with specific milestones listed in Table 5 of the Permit. This document summarizes that annual progress, as required by Provision 6.3.3 of the Permit.

BACWA collected the information in this report via an online questionnaire. A flow diagram illustrating the questions asked of Dischargers is shown in Figure 1. Multiple response pathways are available to Dischargers depending on their status. Dischargers may have a portfolio of strategies to meet final effluent limits for TIN, and some dischargers that already comply with the final effluent limits are pursuing additional nitrogen removal opportunities.

In alignment with the text of Provision 6.3.3, Dischargers were placed into three groups based on their response.

1. Early Actors
2. Compliance Pathway Identified
3. Compliance Alternatives Identified

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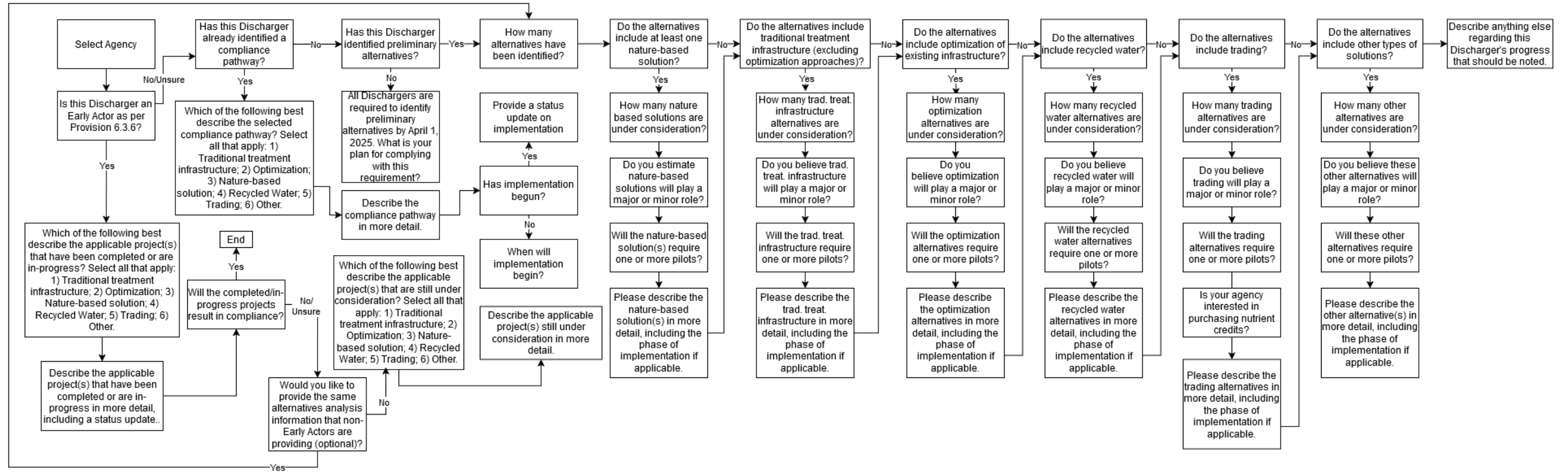


Figure 1. Compliance Questionnaire Provided to Dischargers

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2 Overview of Results

The distribution of the Dischargers among Groups 1, 2, and 3 is presented in Figure 2. The upper plot provides the number of Dischargers in each category, while the lower plot presents the Average Dry Weather Flow (ADWF) associated with the Dischargers in each group. Early Actors make up 55 percent of the listed Dischargers, while Groups 2 and 3 make up 17 percent and 28 percent, respectively. Collectively, the Early Actors represent 80 percent of the 798 mgd ADWF permitted capacity associated with the listed Dischargers, while Groups 2 and 3 represent 8 percent and 13 percent, respectively.

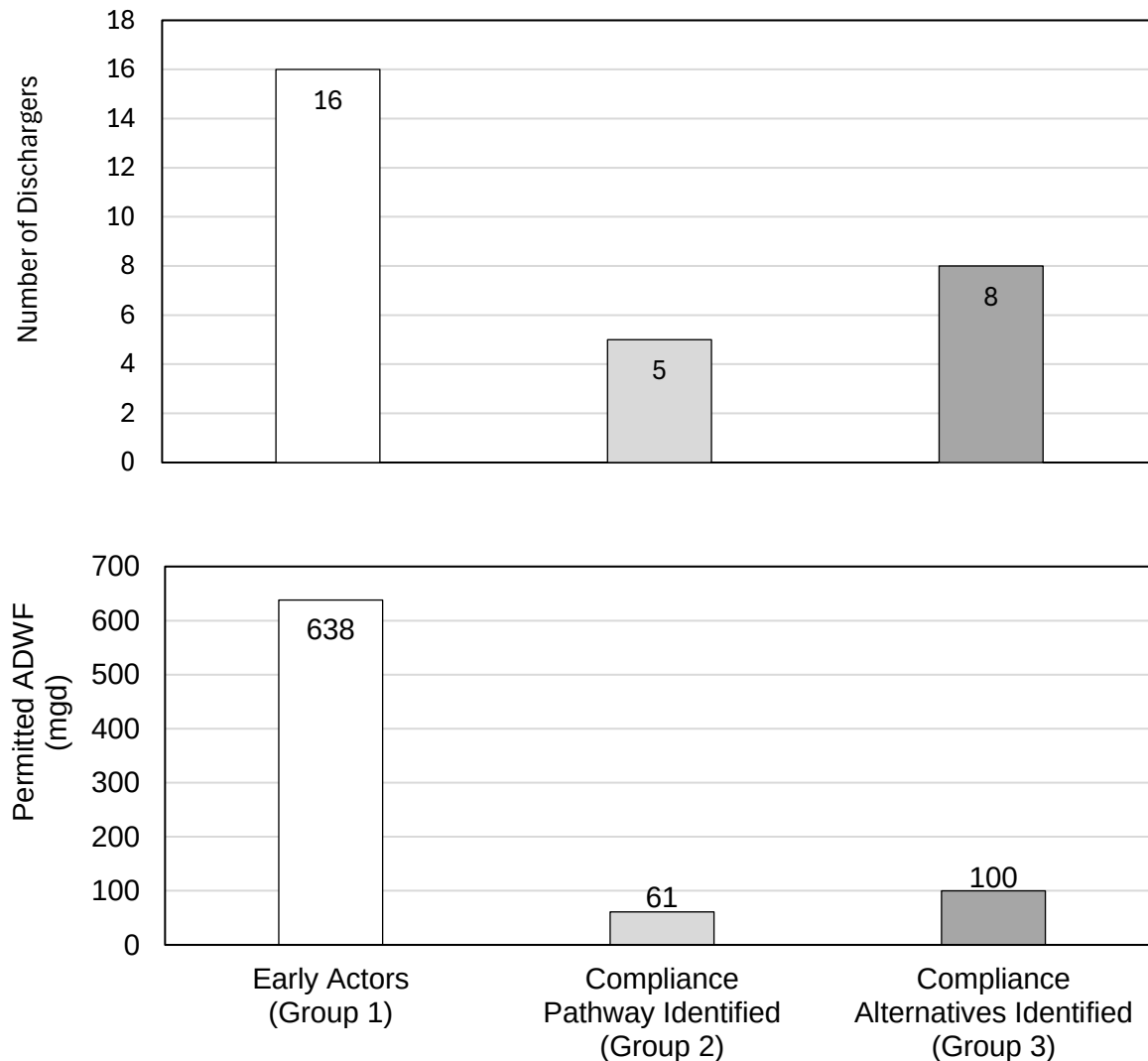


Figure 2. Distribution of Compliance Pathway Results by Grouping for all the Bay Area Treatment Plants (Top = Count by Grouping; Bottom = ADWF Permitted Capacity by Grouping)

The Dischargers also provided information on the types of compliance alternatives that are under consideration or have been completed. The compliance alternatives identified in the Permit are as follows:

- Nature-based Solution (NbS)
- Traditional Treatment Infrastructure (TTI)
- Optimization (OP)
- Recycled Water (RW)
- Nutrient Trading (NT)

Figure 3 presents the distribution of compliance alternatives among Groups 1, 2, and 3 based on the information provided by the Dischargers. Figure 3 shows a total of 64 projects for the 29 Dischargers listed in Table 1 as several Dischargers, including Early Actors, are pursuing multiple alternatives. Traditional treatment infrastructure represents the most common method of compliance, followed by optimization and recycled water. Nature-based solutions and nutrient trading are the least common. Based on these results, nature-based solutions are most common among Early Actors and have not been selected by any Discharger in Group 3 as a preliminary compliance alternative. This is likely because Nature-based Solutions are generally not feasible as a single solution and may be less attractive to Dischargers still in the initial phases of developing a compliance pathway.

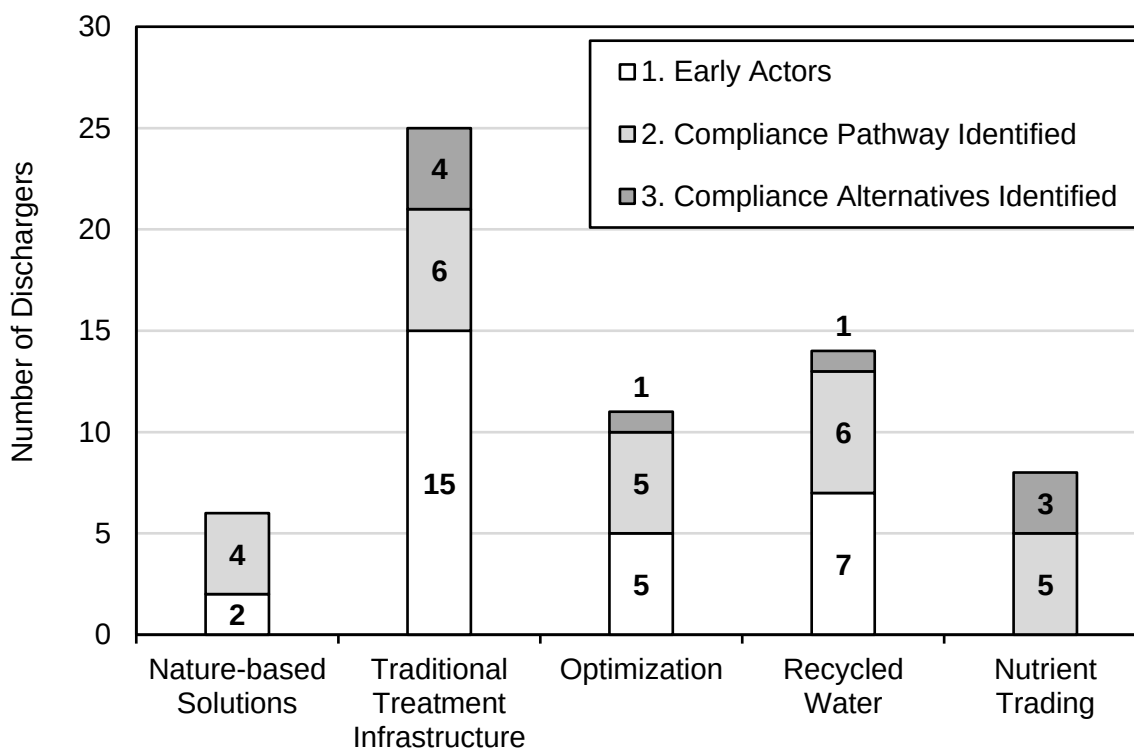


Figure 3. Distribution of Nutrient Reduction Strategies among Dischargers

Figure 4 presents a projection of load reductions that are anticipated due to projects currently underway by Early Actors (that are expected to result in compliance) and by agencies that have already identified a Compliance Pathway. Figure 4 includes the estimated 2024 dry season discharge load (43,700 kg N/d), the maximum historical load (55,000 kg N/d), the anticipated load accounting for in-progress and planned projects that are expected to result in compliance, and the Baywide TIN Load Limit in the 2024 Permit (26,700 kg N/d). The middle column in Figure 4 accounts for anticipated load reductions from two groups that represent a significant portion of the total TIN load: 1) Early Actors that anticipate meeting final effluent limits (i.e., “Yes” in Column E of Table 1) and 2) agencies that have already identified a compliance pathway (i.e., “2” in Column C of Table 1). There is no timeline associated with these load reductions. These Dischargers are assumed to discharge their final effluent limit as given in the 2024 Permit. All other agencies were conservatively assumed to discharge their 2024 dry season TIN discharge load. Figure 4 illustrates the planned TIN load reduction associated with in-progress and planned projects that are expected to result in final permit compliance. This approach does not account for the effects of population growth on TIN loads.

This approach suggests that in-progress or completed projects resulting in compliance and Dischargers that have identified a compliance pathway may provide an 18 percent reduction in TIN discharge load compared to the 2024 dry season TIN discharge loads. An additional 21 percent (approximately 9,100 kg N/d) reduction compared to the 2024 dry season TIN discharge load would be required to meet the Baywide final permit TIN limit of 26,700 kg N/d. Figure 4 illustrates that while significant progress has been made, several large Dischargers are unsure of compliance and/or know they will need more time.

Some Early Actors do not expect to achieve compliance with the 2024 Permit final effluent limits (Table 4 in R2-2024-0013) within the Compliance Schedule because their projects were designed based on targets in the 2019 Nutrients Watershed Permit (R2-2019-0017). These dischargers will need additional time to implement additional projects following completion of their early action projects. Further, some Early Actors are unsure whether their projects will result in compliance until they are commissioned and begin operation.

The information provided by the Dischargers is summarized in Table 1.

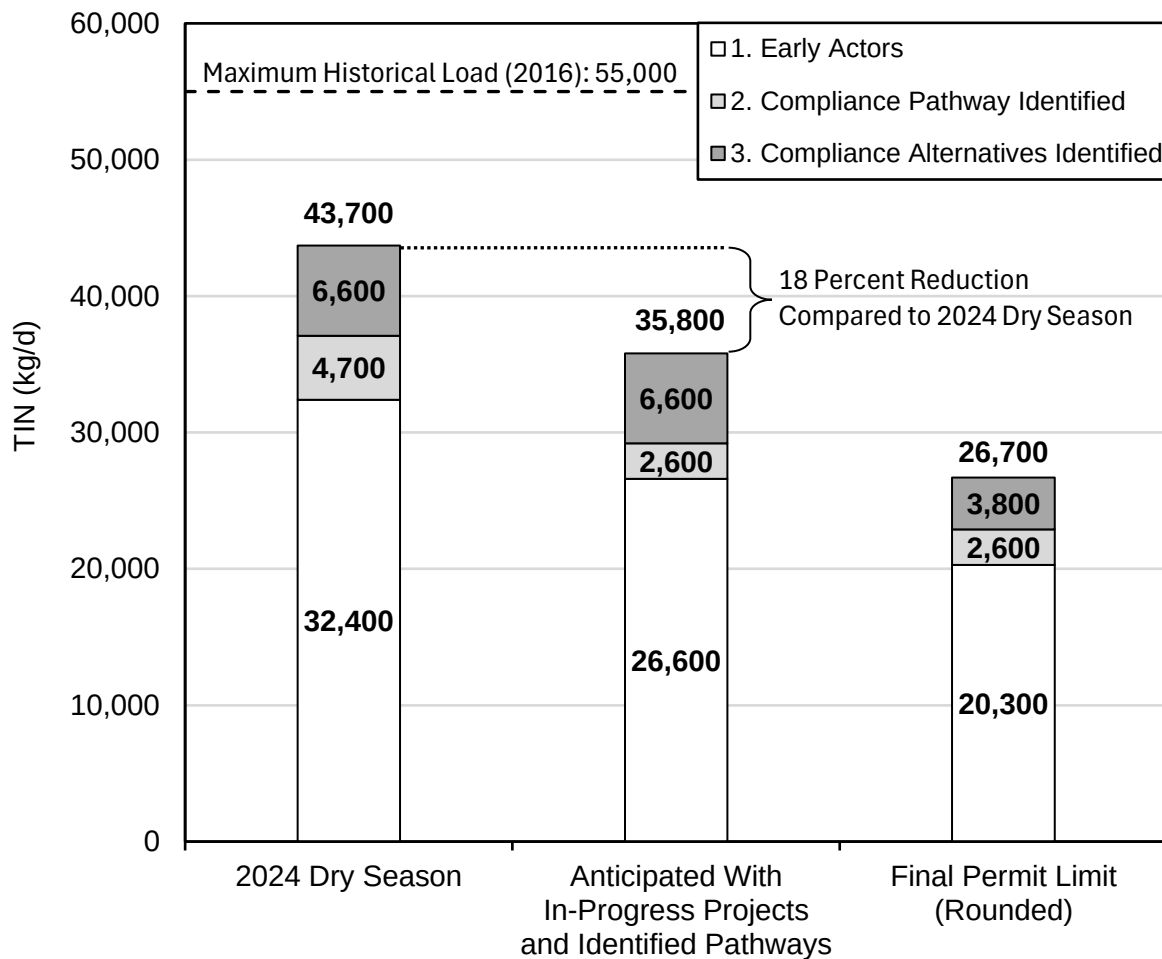


Figure 4. TIN Reduction Potential based on the Compiled Request for Information Results ^{*,**}

- * The middle column uses the 2024 Permit TIN load limit values for Early Actors that anticipate meeting final effluent limits (i.e., “Yes” in Column E of Table 1) and agencies that have already identified a compliance pathway (i.e., “2” in Column C of Table 1). The values for agencies that have identified compliance alternative(s) used their respective 2024 dry season values (i.e., “3” in Column C of Table 1) as their anticipated values are unclear at this time.
- ** The total values might vary from the sum of the listed values by plant due to rounding.

Table 1. Summary of Questionnaire Results (Color Coded by Grouping; White = Early Actor, Light Grey = Compliance Pathway Identified; Dark Grey = Compliance Alternatives Identified)

A. Discharger ^a	B. ADWF Permitted Capacity (mgd)	C. Group ^b	D. Early Actor	E. Will Meet Final Effluent Limit	F. Projects Completed or In-Progress	G. Anticipated Compliance Pathway	H. Prelim. Alternatives Include ^c					I. Interested in Purchasing Credits	J. Schedule Summary for Projects
							NbS ^d	TTI ^d	OP ^d	RW ^d	NT ^d		
American Canyon, City of	2.5	1	Yes	Yes	RW; TTI	-	-	-	-	-	-	-	Complete
Benicia, City of	4.5	3	No	-	-	-	Yes	Yes	Yes	Yes	Yes	Maybe	TBD
Burlingame, City of	5.5	3	No	-	-	-	No	Yes	Yes	Yes	No	-	TBD
Central Contra Costa Sanitary District	53.8	3	No	-	-	-	Yes	Yes	No	Yes	Yes	Maybe	TBD
Central Marin Sanitation Agency	10	2	No	-	-	TTI; OP	-	-	-	-	-	-	Alternative to be selected in 2025
City of Richmond Municipal SD	16	1	Yes	Yes	TTI	-	-	-	-	-	-	-	TBD
Delta Diablo	19.5	2	No	-	-	TTI; NT	-	-	-	-	-	-	Construction to begin in 2026
EBDA (DSRSD, City of Hayward, City of Livermore, Oro Loma SD, City of San Leandro, Union SD)	107.8	1	Yes	Unsure	NbS; TTI; OP; RW	-	-	-	-	-	-	Maybe	DSRSD: Complete. Hayward: 2030. Livermore: RW complete, treatment evaluation is underway. Oro Loma SD: Complete. San Leandro: 2026. Union SD: Phases in 2027, 2029, 2031.
EBMUD	120	1	Yes	Unsure	OP	-	-	-	-	-	-	-	TBD
Fairfield Suisun SD	23.7	1	Yes	Yes	TTI; OP	-	-	-	-	-	-	-	2033
Millbrae, City of	3	2	No	-	-	RW, NT	-	-	-	-	-	-	Pre-design activities in 2025
Mt. View SD	3.2	1	Yes	Yes	TTI, NbS	-	-	-	-	-	-	-	Complete, but pursuing additional alternatives with schedule TBD.
Novato SD	7	1	Yes	Unsure	TTI; RW	-	-	-	-	-	-	-	Complete
Palo Alto, City of	39	1	Yes	Yes	TTI	-	-	-	-	-	-	-	2028
Pinole, City of	4.06	1	Yes	Yes	TTI	-	-	-	-	-	-	-	TBD. Study underway.
Rodeo SD	1.14	3	No	-	-	-	Yes	No	Yes	No	Yes	Yes	TBD
San Jose/Santa Clara WPCP	167	1	Yes	No	TTI; OP; RW	-	No	Yes	Yes	Yes	No	-	See individual response
San Mateo, City of	15.7	1	Yes	Yes	TTI	-	-	-	-	-	-	-	2025
Sausalito-Marín City SD	1.8	3	No	-	-	-	No	Yes	Yes	Yes	Yes	Maybe	TBD
SD N. 5 of Marin County (Tiburon)	0.98	3	No	-	-	-	-	Yes	-	-	-	Yes	TBD
Sewerage Agency of Southern Marin	3.6	3	No	-	-	-	Yes	No	No	Yes	Yes	Maybe	TBD
SFO Airport	2.2	1	Yes	Yes	TTI; RW	-	-	-	-	-	-	-	TBD. 50 percent design for current phase in 2025.
SFPUC Southeast	85.4	1	Yes	Yes	-	TTI	-	-	-	-	-	-	TBD. Design-build contractor to be selected 2025.
SFPUC Treasure Island	2.0	1	Yes	Yes	TTI; RW	-	-	-	-	-	-	-	2026
Silicon Valley Clean Water	29	3	No	-	-	-	-	Yes	Yes	Yes	-	-	TBD. Evaluating 4 alternatives.
South San Francisco and San Bruno	13	2	No	-	-	TTI	-	-	-	-	-	-	TBD. Evaluating process modification alternatives in 2025.
Sunnyvale, City of	29.5	1	Yes	Yes	TTI	-	-	-	-	-	-	-	2028
Vallejo Flood and Wastewater District	15.5	2	No	-	-	TTI; NT	-	-	-	-	Yes	-	TBD. Evaluating process alternatives in more detail in 2025 and 2026.
West County Wastewater District	12.5	1	Yes	Yes	TTI; OP; RW	-	-	-	-	-	-	-	Complete

- a. Dischargers not included here due to dry season discharge prohibitions: Sonoma Valley County Sanitation District, Napa Sanitation District, City of Petaluma, and Las Gallinas Valley Sanitary District. Other Dischargers not included here: Crockett Community Services District (Port Costa Wastewater Treatment Facility) and Sanitary District Number 5 of Marin County (Paradise Cove Treatment Plant) (see Section 0).
- b. Group 1 consists of Early Actors; Group 2 consists of other Dischargers that have identified a compliance pathway; Group 3 consists of other Dischargers that have identified preliminary alternatives.
- c. In addition to projects listed under columns F and G.
- d. NbS = Nature-based Solutions, TTI = Traditional Treatment Infrastructure; OP = Optimization; RW = Recycled Water, and NT = Nutrient Trading.

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3 Detailed Responses

Detailed responses provided by the Dischargers are provided below.

3.1 Groups 1, 2, and 3

The detailed responses provided by Group 1 (Early Actors), Group 2 (Compliance Pathway Identified), and Group 3 (Compliance Alternatives Identified) Dischargers are provided in Table 2. Groups 1, 2, and 3 provide an ADWF permitted capacity of 637.56, 61, and 100.32 mgd, respectively.

Table 2. Detailed Responses Provided by Dischargers (Sorted Alphabetically); White = Early Actor, Light Grey = Compliance Pathway Identified; Dark Grey = Compliance Alternatives Identified.

Group	Discharger	Detailed Response
1	American Canyon, City of	The City of American Canyon built a membrane bioreactor (MBR) plant that nitrifies and denitrifies. The City also has a robust recycled water program that will divert loads to irrigation.
3	Benicia, City of	BACWA worked with SFEI to develop a report of potential NbS for nutrient removal. The alternatives determined for Benicia include one potential site for open water wetlands to be utilized, and five potential sites where horizontal levees may be able to be used. Benicia will work with a consulting engineer to determine feasibility. From the 2018 HDR report we believe there are two potentially feasible upgrade projects. One to convert the gravity thickener or rotating biological contactors (RBC's) to treat belt filter press sidestream flows via Deammonification, considered an upgrade given the magnitude of the modifications needed. Second, to demolish existing RBC trains, add 2 aeration basins (1.07 MG) as MLE, retrofit existing aeration basins to MLE, add new aeration blowers, construct 1 new 75-ft diameter secondary clarifier, possibly construct caustic soda addition facilities, while maintaining ability to operate in contact stabilization mode for peak wet weather flows. Benicia will work with a consulting engineer to further assess and develop these two projects. Benicia will investigate feasibility of operating the plant to fully nitrify during dry season months without adversely impacting disinfection or other plant processes and final effluent compliance. Depending on the results may then investigate the feasibility of minor aeration system and tankage modifications to attain partial denitrification. There are 2 potential recycled water alternatives that may be considered. Benicia worked with Brown and Calwell to produce a feasibility report for a water reuse project to supply up to 2 MGD of

Group	Discharger	Detailed Response
		recycled water to a local refiner for use. Benicia also worked with Stantec Consulting Services Inc. on a Wastewater master plan update and major facility condition assessment. In this report a draft action plan is presented for a potential indirect potable reuse project. Benicia will work with a consulting engineer to determine feasibility. Benicia will work with BACWA towards developing a trading program and, based on the outcome, determine whether participation makes sense for Benicia. The City of Benicia is in the process of engaging a consulting engineer to review, assess and update previously identified potential nutrient removal alternatives. Based on those results, expected later in 2025, Benicia will refine its recommended pathway(s) towards compliance with final limits. More detailed planning, environmental studies, and design will follow beginning in 2026 to develop and implement future project(s) to ensure compliance.
3	Burlingame, City of	The preliminary compliance approaches may include traditional wastewater treatment infrastructure upgrades, optimization, recycled water, nature-based solutions, or a combination thereof. Due to space limitations at the WWTF, NbS are currently not a feasible approach and therefore will not be considered any further. However, optimization, wastewater treatment infrastructure upgrades, and recycled water approaches will be considered for further alternatives analysis. Non-Potable Reuse consists of modifying the WWTF to produce Title 22 water that would be diverted from San Francisco Bay. Anticipated improvements would include providing effluent filtration, additional disinfection, and potentially secondary process enhancements to improve filterability. Indirect or Direct Potable Reuse consists of modifying the WWTF and implementing a potable reuse project. Improvements to the secondary process may include constructing a membrane bioreactor and implementing advanced treatment including reverse osmosis, disinfection, and nutrient removal from the brine stream. Recycled water approaches alone may not be able to comply with the final TIN limits. Therefore, a combination of WWTF upgrades and recycled water implementation would be considered for evaluation. The alternatives identified include the following: Conventional Activated Sludge (CAS) Optimization. This alternative consists of operating the existing secondary process at longer solids retention times and utilizing existing infrastructure that is reserved for wet weather storage for treatment during the dry season. Structural and mechanical modifications will be needed to implement this alternative.

Group	Discharger	Detailed Response
		Activated Sludge Intensification. This alternative consists of optimizing the CAS system for nutrient removal and incorporating an intensification technology such as membrane aerated biofilm reactors (MABR) or densification. Intensification technologies will require less overall site area to implement but are not as mature as CAS and may require piloting and additional time for implementation. MABR is an intensification technology where membranes are installed in the anoxic zone of aeration basins. MABRs are efficient at growing nitrifiers and are effective at providing more nitrification nutrient removal capacity compared to CAS. Sludge Densification is an intensification technology that improves the settleability of an activated sludge system. By improving settleability, the activated sludge process can be operated at higher mixed liquor concentrations, resulting in more nutrient removal capacity within the same tankage. Reuse or Recycled Water Implementation. Non-Potable Reuse consists of modifying the WWTF to produce Title 22 water that would be diverted from San Francisco Bay. Anticipated improvements would include providing effluent filtration, additional disinfection, and potentially secondary process enhancements to improve filterability. Indirect or Direct Potable Reuse consists of modifying the WWTF and implementing a potable reuse project. Improvements to the secondary process may include constructing a membrane bioreactor and implementing advanced treatment including reverse osmosis, disinfection, and nutrient removal from the brine stream. Recycled water approaches alone may not be able to comply with the final TIN limits. Therefore, a combination of WWTF upgrades and recycled water implementation would be considered for evaluation.
3	Central Contra Costa Sanitary District (Central San)	Central San is considering nature-based solutions, including two potential configurations utilizing existing wet weather equalization basins; potential merger with Mt. View Sanitary District could divert a portion of Central San's flow for nutrient removal treatment; and a horizontal levee in the lower Walnut Creek watershed. Central San is evaluating traditional treatment infrastructure alternatives, which include secondary process conventional expansion with MLE, intensification with membrane aerated biofilm reactors (MABR), and/or densified activated sludge. The recycled water alternatives being evaluated include expansion of non-potable reuse, industrial water reuse, and potable reuse. Central San is interested in purchasing or exchanging nutrient credits between facilities/subembayments or through a centralized credit bank. BACWA will explore a potential trading program through the regional

Group	Discharger	Detailed Response
		planning study required under the Third Nutrient Permit. Several capital projects have been completed or are in progress at the treatment plant, with future nutrient removal considerations incorporated during the planning and design phases. These projects address key factors such as aging infrastructure and establish a solid foundation for Central San's compliance with nutrient limits. A selection of these projects is listed below: Aeration Basins Diffuser Replacement - Phase 1, DP 100019 (In Construction) -- Diffuser replacement and seismic upgrades to two of the four existing aeration tanks. Upgraded equipment will be essential for nutrient removal. Membrane Aerated Biofilm Reactor (MABR) Pilot Project (Completed November 2024) --Successfully demonstrated that MABR can remove TIN while being fed continuously with mixed liquor from Central San's treatment plant operating with a short solids retention time (SRT; 1.2- to 1.3-day SRT). Pilot was fed from various locations in existing treatment plant to identify best location for full-scale testing. Secondary Clarifier and Channel Improvements, DP 100047 (In Final Design) --Rehabilitate existing clarifiers and distribution channel concrete and coatings. Replace drain gates and other miscellaneous items. --Evaluate options for optimizing clarifier performance and hydraulic capacity, while ensuring improvements would remain effective for future nutrients removal operation. Ultraviolet (UV) Disinfection Replacement, DP 100012 (In Final Design) --The new UV Disinfection facilities will accept secondary effluent from any new secondary treatment facilities and allow the existing UV tank area to be repurposed for secondary treatment. Central San has recently selected consultants for the Nutrient Management Project, DP 100078. This project will identify viable nutrient mitigation alternatives to assist Central San in selecting an optimal solution, including a large-scale demonstration project of potential nutrient removal technologies, such as MABR and densification. The project will evaluate various potential recycled water opportunities and nature-based solutions, maximize the value of existing assets, and develop an optimal project phasing, schedule and delivery plan. The overarching goal is to comply with regulatory requirements on schedule,

Group	Discharger	Detailed Response
		while minimizing impact on Central San's ratepayers and integrating nutrient removal with multi-benefit projects.
2	Central Marin Sanitation Agency (CMSA)	As of February 2025, there are multiple alternatives being considered with a focus on traditional treatment infrastructure. Applicable technologies currently being considered include conventional nutrient removal (MLE and Bardenpho), intensified nutrient removal (MABR, DAS), post-secondary treatment, and side stream treatment. In addition to new traditional treatment infrastructure, the existing infrastructure will also be optimized to remove additional nutrients. The combined nutrient removal from the new traditional and optimized existing infrastructure will be enough to meet the permit limits. A final alternative will be selected by the fall of 2025, after which CMSA will begin pre-design of the selected alternative immediately. Final design and construction will follow.
1	City of Richmond Municipal SD	Project #1: aeration basins were converted from mechanical mixing & aeration to a diffused air aeration system. This system was put fully online in December of 2023, resulting in a decrease by about half of the sites nutrient loading to the Bay. Project #2 (Proposed): with the addition of three new screw presses for a thickening system, we have a proposed sidestream treatment project for nutrient reduction.
2	Delta Diablo (DD)	DD has selected biological nutrient removal technologies to achieve compliance with regulatory limits. Construction of five 1.5-million-gallon activated sludge tanks, or a combination of four new tanks with retrofits to existing tankage, will provide nutrient removal with the flexibility to operate in MLE plug flow and step-feed biological nutrient removal configurations. The systems will be designed with additional flexibility to accommodate intensification alternatives in the future, such as densification or membrane aerated biofilm reactor technologies. As of January 2025, the design for Phase 1 has reached the 30 percent milestone. The project is expected to go out to bid in late 2025, with construction anticipated to begin in 2026.

Group	Discharger	Detailed Response
1	East Bay Dischargers Authority (EBDA)	EBDA is a combined outfall system that discharges effluent for six treatment plants. The status of each plant's nutrient reduction efforts is summarized below. Because several of the major upgrades described herein were designed prior to development of the effluent limits in the current permit, EBDA anticipates that additional time will be needed to achieve compliance, consistent with permit provision 6.3.6. As outlined below, the EBDA agencies are already working to identify additional projects. Dublin San Ramon Services District In 1995, DSRSD and East Bay Municipal Utility District (EBMUD) formed a partnership called the DSRSD-EBMUD Recycled Water Authority (DERWA) to produce recycled water from DSRSD's wastewater treatment plant. The DERWA Program treats secondary effluent from the DSRSD Regional Wastewater Treatment Plant to produce disinfected tertiary recycled water suitable for irrigation and other approved uses, thereby diverting secondary effluent from discharging via the EBDA system into San Francisco Bay. The first deliveries of recycled water began in 2006 and have steadily grown ever since. DERWA recycled 1,569 million gallons in 2024, thereby reducing the percentage of effluent discharged into San Francisco Bay by 36 percent. During the dry months of May through September in 2024, DERWA recycled 1,199 gallons, reducing effluent flows and loads by 72 percent. Oro Loma Sanitary District Plant upgrades that resulted in nitrogen load reduction were completed in year 2019. The project involved the addition of additional activated sludge tankage, as well as modification of existing tankage to facilitate nitrogen removal. The new tankage and modified tankage offers the ability to operate in a continuous or step-feed aerobic-anoxic configuration. City of Hayward The City is currently at 90 percent design for nutrient upgrades, and construction is tentatively scheduled to begin in the Spring of 2026. Construction is anticipated to be completed in July 2030. This project will include: - Installation of a new pair of 1.5-million-gallon equalization/diurnal flow basins (3-million gallons total storage) to free up the site where the new biological nutrient removal (BNR) basins are going to be installed. - Installation of 5-1-million-gallon basins to operate with Anoxic selectors and a step feed BNR process. This will include constructing anoxic and aeration zones with surface wasting operations. A new blower building and an alkalinity control facility will also be constructed as well as a new return activated sludge (RAS) chlorination injection

Group	Discharger	Detailed Response
		system for foaming control. c. Installation of 1 new secondary clarifier with return-activated sludge pump station. d. Retrofitting and upgrading two existing secondary clarifier structures and mechanisms. e. Demolition and removal of the West Trickling filter, which will open the required area for a new grit facility in order to allow the new BNR basins to operate as efficiently and effectively as possible. In parallel with this major upgrade, Hayward is also working on the following future projects: • The City received a \$600,000 grant that will be used to further develop a conceptual design (30 percent design) for converting the former oxidation ponds into a free water surface wetland with horizontal levee to further treat/polish the secondary treated effluent. The City issued the RFP for the project in the fourth quarter of 2024 and is currently selecting a consultant. • The City awarded a contract for consulting services to develop a recycled water master plan for the City. The master plan includes identifying potential customers, the current recycled water treatment system quality and quantity to meet potential customer demands, and expansion goals and opportunities. City of Livermore Since the 1960s, the City has been producing recycled water for irrigation. During the last decade on average, the City recycled 1/3 of the effluent that could have been discharged to the Bay, with an even higher proportion during the dry months covered by the Permit. In addition its existing recycled water diversion, the City is considering the following nutrient reduction measures: • The City will evaluate if MLE or other processes can be accommodated by using redundant capacity (basin, blower), and upgrading the pumping and instrumentation. The evaluation will start in April 2025. • The City will expand recycled water use in the existing service area to accommodate future population growth. The demand increase is ongoing as more development is constructed. The City will also investigate the possibility of selling additional recycled water to neighboring agencies. • The City will explore trading options within the EBDA system. City of San Leandro San Leandro has been working on converting a disused treatment basin into a treatment wetland since 2018. This project will include an MABR nitrification system followed by distribution to a woodchip and vegetation seepage slope and then an open water pond system. The project has

Group	Discharger	Detailed Response
		been awarded grants from Measure AA through the San Francisco Bay Restoration Authority and the US EPA through the San Francisco Bay Water Quality Improvement Fund. The project will require stabilization of the material in the pond. In late 2024, a pilot test was performed to test the quantity of cement necessary for stabilization. The City expects to issue an Invitation for Bids in March 2025 and commence rough grading in late summer 2025. The remainder of the project is anticipated for construction in 2026. The project will treat approximately 20 percent of San Leandro's dry weather flow and remove about 95 percent of the nitrogen from that flow. In addition to the treatment wetland, San Leandro staff are working with consultants to develop a nutrient reduction roadmap. This involves modeling the treatment plant and proposing options for removing nitrogen. Options being investigated include treating belt press filtrate and returning it to headworks for denitrification and treating return activated sludge flow. The City has several tanks that are currently used for emergency storage that could be used for nitrification. The roadmap project will include planning level cost estimates of the recommended approaches. This will inform whether nutrient trading within the EBDA system is a viable option for the City. Staff are meeting with other EBDA members to discuss this option and have meet with Stanford researchers who may model various trading scenarios. San Leandro influent has a high degree of biochemical oxygen demand (BOD) variability which may cause problems with traditional nitrogen reduction approaches such as Modified Ludzack-Ettinger (MLE). Also under consideration are approaches that would remove nitrogen from the secondary effluent. These approaches include algae treatment or an offsite nature-based solution. Union Sanitary District (USD) Starting in 2015, USD's Enhanced Treatment and Site Upgrade Program was developed to renew and replace aging infrastructure, enhance wastewater treatment process, facilitate nutrient removal, and increase USD's resilience to extreme wet weather events and climate change. The ETSU Program includes the following project phases: • Phase 1A (in Construction): Retrofitting existing aeration basins to operate with anaerobic selector and a biological nutrient removal process. This will include constructing deoxygenation, anoxic, and flexible aeration zones; installing internal recycle pumps; and establishing new step-feed aeration and surface wasting operations.

Group	Discharger	Detailed Response
		Construction is anticipated to be completed by May 2027. • Phase 1B (Currently Bidding for Construction): Constructing four (4) 155-foot diameter secondary clarifiers, a mixed liquor control box, centralized return-activated sludge pump station, and effluent facilities. This will also include building new chlorination and dichlorination contact basins and a new effluent pump station and relocating the existing effluent force main. Construction is anticipated to be completed by August 2029. • Phase 1C (In Design): Retrofitting existing secondary clarifiers to operate as wet weather flow equalization basins. Construction is anticipated to be completed by January 2031 USD is also looking to partner with the South Bay Salt Pond Restoration project to identify, develop, and pilot a nature-based solution. This is a new and recent endeavor for USD.
1	East Bay Municipal Utility District (EBMUD)	EBMUD has been developing a full-scale biological nutrient removal (BNR) process since 2020, utilizing the existing treatment facilities at the Main Wastewater Treatment Plant. This pilot project operates during the dry season to test and maximize total inorganic nitrogen (TIN) removal by adjusting the secondary treatment process parameters. The pilot project has used increasingly large portions of the secondary treatment process since 2020. Over the last two years, the pilot project utilized 50 percent of the secondary treatment process consistently and piloted 75 percent for two months in 2024. Additional pilot testing will continue into the future. The BNR pilot project has reduced the annual average dry season Total Inorganic Nitrogen loads in 2023 and 2024 from the 2019-2023 average load listed in Table F-4 of the Nutrients Watershed Permit (R2-2024-0013). The listed 2019-2023 average load was 8,900 kg/day. The 2023 and 2024 average loads were 6,900 and 7,700 kg/day, respectively. As the pilot project expands and continues the average TIN loads are expected to drop further. EBMUD also provided the following information regarding future projects: Initial results from the BNR pilot study indicate that achieving nutrient goals is possible, but there will be no redundancy in the system. To address this, and the possibility that the BNR pilot will not meet nutrient goals, an Alternatives Analysis is being undertaken concurrently with the pilot project.

Group	Discharger	Detailed Response
		The District anticipates exploring two types of preliminary alternatives: Traditional Treatment Infrastructure and Optimization of Existing Infrastructure. The District prepared a Request for Proposals from nutrient removal experts to support the District in completing the alternatives analysis. As part of this project, the preliminary alternatives will be refined before performing subsequent technical analysis and selection of a compliance pathway. The alternatives analysis will be completed in parallel to the BNR pilot. Results/findings from each project will complement the other. Traditional Treatment Infrastructure: Preliminary alternatives that may be considered include options for capacity addition (i.e., adding new reactors for redundancy), intensification (e.g., hydrocyclone-based wasting to improve settling), split treatment, secondary process conversion, and sidestream treatment. Preliminary alternatives may also consider a combination of these options. Resource recovery via sidestream algal treatment is another solution that may be considered. This would require piloting to evaluate nitrogen recovery as an option instead of nitrogen removal. Optimization of Existing Infrastructure: Options to enhance the current pilot BNR performance and capacity by adjusting the solids retention time (SRT) and other operational changes are being considered. The piloting of this alternative has been ongoing before the release of the 2024 Nutrients Watershed Permit and significant nitrogen reduction has already been demonstrated for part of the dry weather season.
1	Fairfield Suisun SD (FSSD)	Project #1: Optimization - Lystek Direct Digestate Dilution Project - Implemented process interactions that allow FSSD digestate to be delivered directly to Lystek's biofertilizer reactors (i.e., no mechanical dewatering and the corresponding sidestream laden with nutrients). The estimated TIN load reduction is on the order of 10 to 15 percent. This Project was completed in October 2023. Project #2: Upgrade - Nitrogen Removal - Modifications to aeration basin activated sludge process to implement anoxic zones (Phase 1) and implement mixed liquor recycling (Phase 2) to improve denitrification. Phase 1 is scheduled for completion in 2027, and Phase 2 is estimated to be completed in 2033. After both Phases, FSSD is expected to meet its final TIN limit. FSSD has and will continue to explore recycled water and nature-based solution options. Implementation of a Recycled Water Master Plan is included in FSSD's current CIP. FSSD was also a part of the San Francisco Estuary Institute NbS study. FSSD is exploring these avenues

Group	Discharger	Detailed Response
		in the event of potential future changes in TIN limits or development of a trading program.
2	Millbrae, City of	In October 2024, the City completed a recycled water feasibility study for non-potable use. The City's wastewater treatment plant does not currently produce recycled water, so the study report provides recommendations for recycled water treatment and conveyance infrastructure improvements. The City is working on advancing its recycled water project towards implementation as recommended in the study report. To advance to full implementation, project partners (e.g. other neighboring agencies) and external funding are needed. The City plans to advance preparation of the basis of design and pre-design of the recycled water project in Calendar Year 2025. The recycled water project is not envisioned by itself to provide adequate reduction of nitrogen discharge to the San Francisco Bay for the City of Millbrae. Nutrient credit trading, which is not yet available to pursue, would be needed to provide the additional reduction needed for permit compliance. In October 2024, the City completed a recycled water feasibility study for non-potable use. The City's wastewater treatment plant does not currently produce recycled water, so the study report provides recommendations for recycled water treatment and conveyance infrastructure improvements. The City is working on advancing its recycled water project towards implementation as recommended in the study report. To advance to full implementation, project partners (e.g. other neighboring agencies) and external funding are needed. The City plans to advance preparation of the basis of design and pre-design of the recycled water project in Calendar Year 2025. The City expects that BACWA or other larger agencies will lead development of the program, and the City will participate once the program is established.

Group	Discharger	Detailed Response
1	Mt. View SD	The plant provides secondary treatment, including nitrification, using trickling filters. After treatment at the plant using traditional treatment infrastructure, nitrified effluent flows through Moorhen Marsh. The Marsh, constructed in 1974, was the first treatment wetland in the region. The marsh provides partial denitrification of effluent, with removal rates varying by season. Our facility already meets the final limit of 78 kg/day. We are still moving forward with investigating options for further nutrient reduction through the existing Moorhen Marsh to ensure breathing room with the limit. We are considering additional floating islands, configured and managed differently from current islands. We are also expecting a proposal by end of February 2025 for an alternate approach. Once that proposal is received, an approach will be selected and a timeline developed. Implementation of the project will begin in July 2025.
1	Novato SD	Project #1 Traditional Treatment Infrastructure NSD completed significant upgrades totaling over \$100 million to its treatment facilities in 2010 including addition of a Modified Ludzack-Ettinger (MLE) Process for biological nutrient removal. Project #2 Recycled Water NSD completed the first phase by adding a Recycled Water Facility to provide 0.85 MGD to North Marin Water District's purple pipes in 2012. The second phase of construction completed in 2019 brought the capacity of the Recycled Water Facility production to 1.7 MGD. Although NSD expects to be able to comply with the interim and final TIN limits, NSD is still evaluating additional projects. 1) Optimization Operational optimization of the Modified Ludzack-Ettinger (MLE) Process to improve removal of TIN. 2) Nature-based Solutions – NSD is participating in the wetlands' restoration projects described below, however, these projects are not directly under NSD's control. Therefore, while NSD cannot currently quantify any nutrient reductions that may result from the completion of these projects, NSD anticipates that they may be of future value for nutrient reduction. Bel Marin Keys Unit V: The California State Coastal Conservancy is restoring the Bel Marin Keys Unit V property to various habitat types. NSD is coordinating with this restoration, and NSD's outfall will be modified in conjunction with the restoration to provide treated effluent to

Group	Discharger	Detailed Response
		the site, supporting the development of brackish marsh habitat. https://www.scc.ca.gov/webmaster/project_sites/belmarin/grr-seir_intro.html Deer Island Basin Restoration: Marin County Flood Control District is in the process of restoring the Deer Island Basin (which is adjacent to NSD's treatment plant) to tidal marsh. The conceptual basis for this project includes incorporating wastewater discharge into future horizontal levees. https://www.sfei.org/documents/novato-creek-baylands-vision-integrating-ecological-functions-and-flood-protection-within https://flooddistrict.marincounty.gov/novato-creek-baylands-strategy-plan/ 3) Recycled Water NSD is currently able to produce and supply the North Marin Water District (NMWD) with 1.7 MGD of Title 22 recycled water for their purple pipe distribution system, or approximately half of NSD's dry weather flow. The current usage is approximately 1.3 MGD during the dry weather months so there is room for expansion/increased usage. However, current and future decisions on demand and supply of recycled water is driven by and under the control NMWD as the water supplier and not NSD; NSD only serves as a passive recycled water producer for NMWD.
1	Palo Alto, City of	The Palo Alto Regional Water Quality Control Plant is in the middle of a secondary treatment upgrade. This project involves reconfiguration of existing aeration basins to contain alternating nitrification and denitrification zones with eventual installation of membrane aerated biofilm reactors in the last stage of anoxic zones to enhance nitrogen removal. The project consists of six construction phases. As of this writing, Phase 1 of construction is near completion and has completed reconfiguration of one out of the four aeration basins. Upgraded aeration basins will be operated in nitrification mode until the fixed film reactors are decommissioned in Phase 5 of the project. Construction is ongoing and is anticipated to be completed in 2028. In addition to this project, smaller facility optimization, recycled water, and NbS projects that are anticipated to slightly decrease nutrient discharges are also in progress.

Group	Discharger	Detailed Response
1	Pinole, City of	The Pinole-Hercules Water Pollution Control Plant upgraded their treatment plant in 2019 with the ability to operate in either carbonaceous biochemical oxygen demand (cBOD) or nitrogen removal modes. As such, the plant should be listed as an early actor. To date, the plant primarily operates in cBOD mode as there are concerns with foaming associated with increasing the sludge age for nitrogen removal, as well as a low food:microorganism ratio issue in the middle of the night which is thought to impact sludge settleability. The plant is in the process of developing a strategy for addressing these challenges to operate in nitrogen removal mode.
3	Rodeo Sanitary District (RSD)	Living Levee - only in the preliminary understanding phase. RSD has been working with Chris Lim of the Contra Costa Resource Conservation District to see if there is a project and available funding/grants to implement such a project. RSD is looking to optimize the existing treatment system to see if a low nutrient discharge is possible. The primary focus will be the aeration basin system, primary flow routing into the aeration basin, other recirculation possibilities and control of centrifuge centrate. Only in the preliminary phase and no real analysis has been completed. RSD is not sure who we could trade with but the most logical would be the City of Pinole WPCP. RSD and the City of Pinole WPCP share a deep-water outfall into San Pablo Bay. Other discharges in the area would also be considered. Over the past 15 years, RSD has invested substantial capital to modernize its aging infrastructure and bring it into the 21st century. However, this work is far from complete. Numerous major projects remain critical to ensuring RSD can operate effectively and efficiently to protect public health and the environment. While RSD had also hoped to advance recycled water projects, budget constraints have made it impossible to pursue all initiatives simultaneously. As a result, some projects may face temporary delays or even permanent postponement to meet the increasingly stringent regulations imposed by State and Federal agencies, which continue to expand upon an already extensive regulatory framework.

Group	Discharger	Detailed Response
1	San Francisco Airport (SFO)	Project #1: The Recycled Water System Project will construct a new advanced water treatment plant (AWTP) downstream of the new sequence batch reactors. The AWTP will use microfiltration, reverse osmosis, and ultraviolet disinfection to create reusable non-potable water. Programming completed in June 2024 and 100 percent design is anticipated Spring 2025. Project #2: The Sequence Batch Reactor (SBR) Upgrade project will construct a new SBR equipped with aerobic granular sludge (AGS). The project will retrofit the existing SBRs with the same AGS technology, construct a new blower building, and install new infrastructure to operate, monitor, and maintain the new system. Programming is complete and 50 percent design is anticipated in May 2025.
1	San Francisco Public Utilities Commission Treasure Island (SFPUC TI)	The new Treasure Island Water Resource Recovery Facility (TIWRRF) is considered an early actor because construction was initiated prior to issuance of the 3rd Watershed Permit effective date; construction notice-to-proceed was issued August 2023. The objective of TIWRRF project is to provide tertiary treatment to achieve an average dry weather flow capacity of at least 1.3 million gallons per day (MGD) and peak wet weather flow of 3.9 MGD to support the ongoing and future development on Treasure Island and Yerba Buena Island. Project will produce recycled water for existing and future non-potable water demands. The following is the list of assets that has been designed and constructed: (1) Influent pumping structure consisting of solids handling submersible centrifugal pumps, (2) Fine screening and handling systems consisting of internally fed drum screens with 2 mm perforations and washer/compactor, (3) Biological Nutrient Removal and Membrane bioreactor (MBR) trains , (4) Ultraviolet disinfection system, (5) Solids handling facility consisting of waste activated sludge (WAS) holding tanks, aeration blowers, thickener feed pumps, rotary drum thickeners, sludge transfer/truck loading pumps, (6) Constructed wetland pond, (6) Odor control system consisting of bio trickling filter followed by carbon adsorber, and (7) Distributed Control System to integrate and optimize performance of all processes. Construction completion is planned for 2026.

Group	Discharger	Detailed Response
1	San Jose/Santa Clara WPCP	1. Upgrade of advanced secondary treatment system: previous conventional secondary treatment system followed by nitrification treatment operated in series was upgraded to a parallel biological nutrient removal (BNR) process. This upgrade, which was not required by any regulation, increased overall secondary basin and treatment capacity and incorporated denitrification (nitrogen removal) into the advanced secondary treatment system. The BNR system achieved approximately a 40 percent reduction of TIN from 1998 – 2019. 2. Recycled Water: secured one of the first Title 22 recycled water permits (95-117) in 1995 and in 1998 began a Title 22 recycled water program. Initial driver for recycled water was to keep dry season discharges below an average dry weather effluent flow of 120 mgd due to marsh conversion concerns. Since 1998, the south bay water recycling (SBWR) program has expanded from initially 1-2 mgd of dry season recycled water to 16 mgd of recycled water in the dry season and 11 mgd annual average. Today the SBWR diverts approximately 900 kg/day of TIN from the lower south bay. 3. Optimization of BNR: Following metering, flow, and sludge control instrumentation and automation equipment replacements and upgrades, optimized the existing advanced secondary BNR process by targeted reductions of DO in anoxic zones, mixed liquor channels, and clarifiers. This was accomplished by reducing aeration throughout the 4-stage BNR process but especially in treatment zones where it is currently used for mixing. The result was an increase in TIN removal in the BNR process from the previous 40 percent reduction to now a 55 percent reduction. San Jose also provided the following information: Upgrade of existing advanced secondary aeration basins. The existing BNR process will be upgraded to a new process (SND/inDense) that will reconfigure the aerated and anoxic zones of existing basins, install mechanical mixing in anoxic zones to replace pulsed aeration mixing, and install hydrocyclones to separate and more precisely select and control activated sludge. The process will achieve simultaneous nitrification and denitrification (SND) and improve sludge quality through inDense hydrocyclones. This upgrade is in planning/scoping phase. The upgrade technology has been evaluated and compared against other upgrade treatment options in terms of cost, scalability, ability to phase and utilize current footprint and existing infrastructure. Project has not been initiated or fully funded. RWF anticipates beginning initial phase of the project by end of 2025 after completion of a technical update of the 2014 plant master plan (update to be completed in spring 2025). First

Group	Discharger	Detailed Response
		step of initiation will identify the preferred procurement and project model pathway and timeline for project phases. RWF operators and engineers are continuously seeking opportunities to optimize and get the best removal out of our process while balancing energy, chemical, infrastructure, basin capacity, operational, and cost constraints as demonstrated by recent improvements in denitrification efficiency. "Ongoing and continuous efforts to expand non-potable recycled water with private companies and water retailers in San Jose, Santa Clara, and Milpitas. Current constraints are infrastructure expansion to deliver recycled water to more of the service area. Recently entered into agreement with water retailer San Jose Water Company for an additional 5 mgd of recycled water over the next 10 years. Expansion of non-potable reuse is an ongoing effort to identify interested new customers and existing customers interested in expanding recycled water use. The program has grown slowly but steadily over the past 26 years. A potable reuse project is in very early stages and under discussion with regional partner Valley Water. Any potable reuse project would need to include management or treatment of the reverse osmosis concentrate (ROC) through a technology treatment system or through a nature-based solution (NbS) in order to realize meaningful nitrogen reductions." Sidestream treatment: this may be a viable alternative to managing the concentrated centrate return from the mechanical dewatering facility that is expected to be commissioned and operational by end of 2025. A real-world evaluation of the strength of the centrate return would need to be conducted first, selection of technology, and feasibility and cost of a sidestream treatment system would also need to be evaluated. At this point, this is purely conceptual. RWF has done an initial evaluation of nature-based solutions. There are opportunities for NbS in the vicinity of the RWF, which include re-purposing areas currently and formerly used for solids management (lagoons and drying beds) as open-celled treatment wetlands. There is also the potential for a horizontal levee on the bayward side of the future south bay shoreline flood control levee. An ecotone levee is planned to be a feature of the future flood control levee. The levee project is led (and funded) by U.S. Army Corps of Engineering, Valley Water, and State Coastal Conservancy. The timeline for both the levee and the availability of the solids handling areas are approximately 10 years in the future. Additionally, the initial desktop evaluation indicates that the NbS options would not be sufficient to treat a large volume of RWF final

Group	Discharger	Detailed Response
		effluent. They would be more effective if used to treat a more concentrated waste stream such as reverse osmosis concentrate.
1	San Mateo, City of	Project #1: This project involves construction of a Biological Nutrient Removal (BNR) and MBR facility that will transition San Mateo away from a traditional activated sludge process. Facility is scheduled to start treatment in July 2025.
3	Sausalito-Marín City SD (SMCSD)	Traditional Treatment Infrastructure: 1. Secondary Process Modifications. 2. Sidestream Treatment 3. Recycled Water. Process Optimization: 1. Nitrifying Trickling Filters with Denitrifying Tertiary Filters. 2. Process optimization with use of Ferric Chloride to treat nutrients at headworks and at an offline tank of sidestreamed Reactivated Sludge(RAS). 3. Installation of Membrane Bioreactor (MBR) for dry weather nutrient removal and recycled water. Recycled Water 1. Installation of a 1 mgd Membrane Bioreactor (MBR) with UV Disinfection. 2. Conversion of one of two Secondary Sedimentation Basins into an aeration basin with the addition of UV disinfection after the existing tertiary Disc Filtration Issue an RFP for annual (capital and O&M) cost per kg N/Day to Bay Area POTWs. Regional Water Quality Control Board Negotiation - due to the size of our plant, the dry weather discharge volume of less than 1 MGD. the high dilution rate at discharge due to our location, unfairness of huge capital costs of a 40 percent reduction for small POTWs versus the large POTWs, and having to discharge recycled water into the bay due to having no water rights and no large customers in the area willing to take the water, we hope to be given consideration of our actual impact to San Francisco Bay.

Group	Discharger	Detailed Response
3	SD No. 5 of Marin County (Tiburon)	The District hired a consulting firm to evaluate the Districts options for preliminary alternatives as they were a minor discharger that did not receive an evaluation as part of the first regional nutrient watershed permit (R2-2014-0017). The evaluation suggests that the District move forward with one or more of the following alternatives: Sidestream Treatment to treat mechanical dewatering reject water. This stream is laden with 15 to 25 percent of the plant discharge nitrogen load. Seasonal MLE, whereby the sludge age would be increased in during the dry season foster ammonia removal, followed by creation of an anoxic zone within the existing aeration basins to facilitate biological denitrification. A concern with such a sludge age transition is the formation of nitrite associated with incomplete nitrification that could result in an increase in chlorine demand for several days (known as nitrite lock; on the order of five times greater than typical demand. Year-Round MLE: similar to alternative #1 with the exception that the District would operate in this mode year-round. The benefits of year-round operation would alleviate any concerns with nitrite lock, as well as the need to modify the biology a couple times per year. There are concerns with maintaining plant performance year-round. The compliance pathway will be more clearly defined in next year's update.
3	Sewerage Agency of Southern Marin (SASM)	Three potential sites have been identified as potential sites for a nature-based solution. These sites each have different limitations and are currently in the research phase. The Agency already supplies effluent to a recycled water plant owned by the City of Mill Valley with a capacity to treat and store approximately 0.1MGD. Acquiring and expanding this plant and identifying customers would be required to satisfy the nutrient reduction needs. This alternative is currently in the research phase. We are open to consider any viable and practical trading alternatives as we have a very small and restricted treatment plant site. We are researching what the options of partnering with CMSA could be and would welcome other partnerships if they help us comply with regulatory needs and make financial sense.
1	SFPUC Southeast Plant (SFPUC SEP)	The SFPUC considers itself an early actor in terms of the permit's recognition that early actors may be provided more time to comply with final limits. The SFPUC's construction of the new Treasure Island Facility includes biological nutrient removal and was started before approval of the 3rd Watershed Permit, which meets the permit definition of an early actor. The funding, contracting resources, and staff resources to implement improvements at Treasure Island and the Southeast Plants

Group	Discharger	Detailed Response
		are the same and rely on the same rate-payer base. For the Southeast Plant, the SFPUC will continue report on the status of improvements to SEP consistent with the requirements of Table 5 in 6.3.3.1. Based on a preliminary conceptual evaluation, the proposed project assumes a scope of work that includes: - the retrofit of the existing high purity oxygen activated sludge system to produce densified activated sludge; - the construction of a new biological nutrient removal system; - modification of existing aeration basins; - replacing the pure oxygen system; and - other major components, including supporting appurtenances and utilities. The proposed project includes planning, environmental review, progressive design-build contract procurement, design and construction, and closeout phases of the project. Note that the SFPUC requests to be considered an early actor because construction of the new Treasure Island Facility includes biological nutrient removal and was started before approval of the 3rd Watershed Permit. The funding, contracting resources, and staff resources to implement improvements at Treasure Island and the Southeast Plants are the same and rely on the same rate-payer base. Funding for this project has been approved in the capital improvement program budget based on an analysis of conceptual traditional infrastructure alternatives that was completed in 2023. The following planning started in 2024: - a project team has been assigned, - workshops to evaluate project delivery options have been completed, - updated flows and loads analysis and sensitivity analyses on population projections is underway, - coordination with the SFPUC Water Enterprise to evaluate synergies with water supply needs has been initiated, and - coordination with the SFPUC Power Enterprise to ensure adequate power supply has been initiated. The project delivery method of progressive design-build was selected in February 2025. A Needs Assessment Report is currently underway; thereafter, an Alternatives Analysis Report and a Conceptual Engineering Report will be completed. Design-build contractor is anticipated to be on board by end of 2025.

Group	Discharger	Detailed Response
3	Silicon Valley Clean Water (SVCW)	I wish to outline several strategic approaches that SVCW is currently evaluating in response to the new nutrient regulations: **Strategic Treatment Advancement Roadmap (STAR):** We are collaborating with Hazen and Sawyer to formulate a comprehensive plan to enhance our wastewater treatment plant. This plan will leverage our existing tank capacity and identify opportunities for process improvements. **Sidestream Treatment Approach:** After thorough analysis, we selected the DEMON process to remove nitrogen from the sidestream. **PureWater Peninsula Initiative:** SVCW is engaged in meaningful discussions with the San Francisco Public Utilities Commission and other relevant organizations to advance the PureWater Peninsula project. This initiative aims to employ advanced technology to treat recycled water sourced from SVCW and San Mateo wastewater treatment plants, ensuring compliance with drinking water standards. **Expansion of Recycled Water Delivery:** Furthermore, we are in ongoing discussions with Redwood City concerning the enhancement of our recycled water delivery capabilities as they expand their distribution system.
2	South San Francisco and San Bruno	In 2022 Contractors completed plant improvements prescribed in the ten-year Facility Plant Update. One of the major improvements to the activated sludge systems included the addition of anaerobic selectors to the aeration basins. Engineers designed the anaerobic selectors to improve secondary clarifier solids settleability. Although designed to control activated sludge bulking, the anaerobic selectors also facilitate enhanced biological phosphorus removal as evidenced by a total phosphorus load reduction of greater than 85 percent since commissioning. The compliance pathway consists of process modifications to the existing aeration basins to provide nutrient removal (Anaerobic zone, anoxic zone, and aeration zone). In July 2024, the City of South San Francisco-San Bruno entered into a contract with Hazen to design pathways for meeting the new nutrient permit. In October 2024, Hazen collected baseline data for the development of a Biowin model to assess the facility's capacity.

Group	Discharger	Detailed Response
		In January 2025, Hazen presented the available alternatives for consideration.
1	Sunnyvale, City of	New Secondary Treatment Facilities which include construction of a Conventional Activated Sludge system (MLE process) designed to achieve nitrification and partial denitrification, a DEMON (deammonification) sidestream treatment system , and more, that will help Sunnyvale to be less reliant on the current pond system that can be hard to control. This will also improve Recycled Water production. Construction completion due May 2028.
2	Vallejo Flood and Wastewater District	The compliance pathway consists of the addition of activated sludge tankage configured for nutrient removal (MLE). The District will explore nutrients credit trading if a program becomes available. The District is preparing to hire a program manager by the end of the year. At the same time, studies and sampling are underway to provide a foundation for future design activities.
1	West County Wastewater (WCW)	In 2017, WCW completed upgrades to its activated sludge process, converting to the Modified-Ludzack-Ettinger (MLE) configuration. Since August of 2019, effluent Total Inorganic Nitrogen has averaged 6.25 mg/l with a low value of 4.3 and a high of 10.0 mg/L. More recently, WCW has installed a dual core Neuros centrifugal blower as its main air supply for the aeration system. This project and associated control system stabilized dissolved oxygen levels in the aeration basins while reducing electrical consumption at the same time. In addition to the changes noted above, WCW, under agreement with, provides its final effluent to the East Bay Municipal Utility District for further treatment then provided to the Chevron in place of potable water. The recycled water is used for cooling towers and boiler makeup. During the dry weather season, about 90 percent of WCW effluent is recycled and does not impact San Francisco Bay.

3.2 Others

There are four agencies excluded from this Appendix: (i) City of Petaluma, ii) Las Gallinas Valley, iii) Napa Sanitation District Sanitary District, and iv) Sonoma Valley County Sanitation District) as they are subject to dry season discharge prohibitions. As a result, they do not have effluent limitations in Table 4 of the 2024 Permit.

There are three dischargers whose loads are already lower than the Permit's Table 4 final effluent limitations and are thus not currently planning or investigating alternatives for additional TIN load reductions. This list is expected to grow in coming years as agencies plan and implement actions identified in this appendix. As of 2025, the list includes:

- Two Facilities: i) **Crockett Community Services District (Port Costa Wastewater Treatment Facility)** and ii) **Sanitary District Number 5 of Marin County (Paradise Cove Treatment Plant)** are minor dischargers (less than 1 MGD) and their final effluent limits were developed differently from other dischargers, as described on page F-26 of the Permit. Their combined contribution is less than 0.02 percent of the aggregate dry season load to San Francisco Bay. These two facilities are not discussed further in this appendix.
- **The City of American Canyon** provides nutrient removal through treatment and recycled water diversions. The facility is listed as an “Early Actor” in this appendix.

4 Next Steps

This compliance milestone schedule report will be updated and submitted annually, as required by Section 6.3.3 of the 2024 Permit.

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