San José-Santa Clara
Regional Wastewater Facility

2013
Annual Self Monitoring Report

Reporting Period:
January 1 – December 31, 2013

San José-Santa Clara Regional Wastewater Facility
2013 Annual Self Monitoring Report

San José-Santa Clara Regional Wastewater Facility Annual Reports are posted on the City of San Jose website at:
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The Plant has a new name and a new logo. The San Jose/Santa Clara Water Pollution Control Plant was rechristened as the "San José-Santa Clara Regional Wastewater Facility" in March 2013. The round shape symbolizes the earth. The four panels represent the juncture of land, water, infrastructure and habitat – a fitting representation of the Facility's location and mission.

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On the Cover: Secondary clarifiers A-4 and A-3 with the Secondary Blower Building in the background.

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BACKGROUND

The Annual Self-Monitoring Report for San Jose/Santa Clara Water Pollution Control Plant (recently renamed the San José-Santa Clara Regional Wastewater Facility), is prepared in accordance with NPDES Permit Number CA-0037842, Water Board Order Number R2-2009-0038. The Annual Self-Monitoring Report is required both by specific NPDES permit provision and Regional Standard Provisions (Attachment G) attached to the Permit:

1. **NPDES Permit Provisions:**

Permit Provisions VI.C.4.a through 4.d. require inclusion in each Annual Self-Monitoring Report a description or summary of review and any applicable changes for the following documents:

a. Wastewater Facilities Status Report
b. Reliability Status Report
c. O&M Manual Update
d. Contingency Plan for Operations Under Emergency Conditions

Provision VI.C.2.c: An Avian Botulism Control Program annual report is required by February 28 each year.

Provision VI.C.2.d. Assessment of marsh habitat and documentations of changes to marsh habitat to determine potential impacts to endangered species was required in 2010 and 2012.

2. **NPDES Permit Attachment G, pages G-17 thru G-18 (Section V.C.1.f.) calls for information to be included in Annual SMR reports as summarized below:**

1) Annual compliance summary table of treatment plant performance …;

2) Comprehensive discussion of treatment plant performance and permit compliance …;

3) Both tabular and graphical summaries of monitoring data if parameters are monitored at a frequency of monthly or greater;

4) List of approved analyses, including the following:
(i) List of analyses for which the Discharger is certified;
(ii) List of analyses performed for the Discharger by a separate certified laboratory; and
(iii) List of "waived" analyses, as approved;

5) Plan view drawing or map showing the Discharger's facility, flow routing, and sampling and observation station locations;

6) Results annual SWPP Plan facility inspection – *Not Applicable for the San Jose/Santa Clara Water Pollution Control Plan because all storm water is routed to headworks*…; and

7) Results of facility report reviews: … the O&M Manual, the Contingency Plan, the Spill Prevention Plan, and Wastewater Facilities Status Report. ...

1. ANNUAL SELF MONITORING REPORT

This report summarizes 2013 discharge monitoring results for the San José-Santa Clara Regional Wastewater Facility (also referred to as the "Facility" or the "Plant"). In 2013, the Facility maintained 100% compliance with all NPDES Effluent limitations.

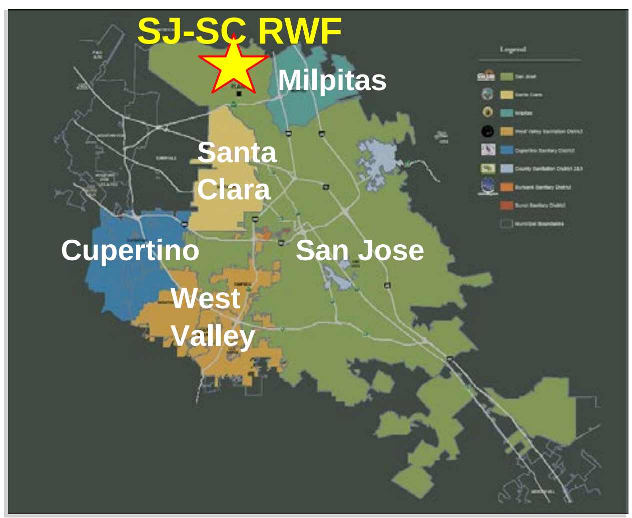
The Facility also continues to meet NPDES permit provision E-VIII (page E-9 of the permit) by participating in the San Francisco Bay Regional Monitoring Program (RMP) in collaboration with the other BACWA agencies.

Descriptive Statistics Employed In This Report. Calculations of monthly and yearly averages summarized in this report utilize actual reported results for quantified and estimated values. Non-detected values are substituted with corresponding Method Detection Level (MDL) values. Tables and Graphs also substitute the MDL for non-detected results. Use of the MDL in lieu of zero for non-detected (ND) values may overestimate actual "true" values of measured constituents found in Facility Influent and Effluent.

Annual average calculations for water quality constituents were determined from monthly average results (i.e. weighted) except for constituents that were measured on a daily or repeating weekly schedule (e.g. 3 or 5 times per week).

Facility Description. The Facility receives wastewater from roughly 1.4 million residents and more than 16,000 commercial and industrial facilities and discharges to the southern end of the San Francisco Bay. The City of San Jose manages the San José -Santa Clara Regional Wastewater Facility for the following Cities or agencies:

- San José,
- Santa Clara,
- Milpitas,
- Cupertino Sanitary District,
- County Sanitation Districts 2-3, and
- Burbank Sanitary District, and
- West Valley Sanitation District (Campbell, Los Gatos, Monte Sereno, and Saratoga)



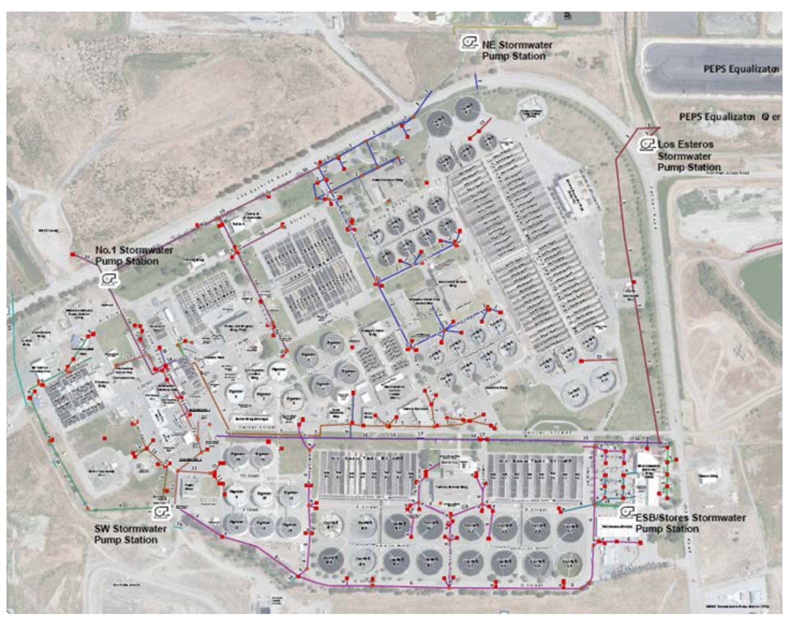
Treatment Process: The wastewater treatment process consists of screening and grit removal, primary sedimentation, secondary (biological nutrient removal) treatment, secondary clarification, filtration, disinfection, and dechlorination.

Facility Map

Water Pollution Control Plant: flow routing and influent and effluent sampling stations.

Facility Storm Water Conveyance System

The treatment facility is bermed and graded to capture all spills and stormwater on site. There are 20 stormwater collection systems that convey flows to 6 pump stations. The stormwater pump stations direct all captured water back to facility headworks for treatment. The stormwater catch basin system has capacity to contain at least several hundred thousand gallons of spilled process waters if such an event occurs.



a. Facility Flows

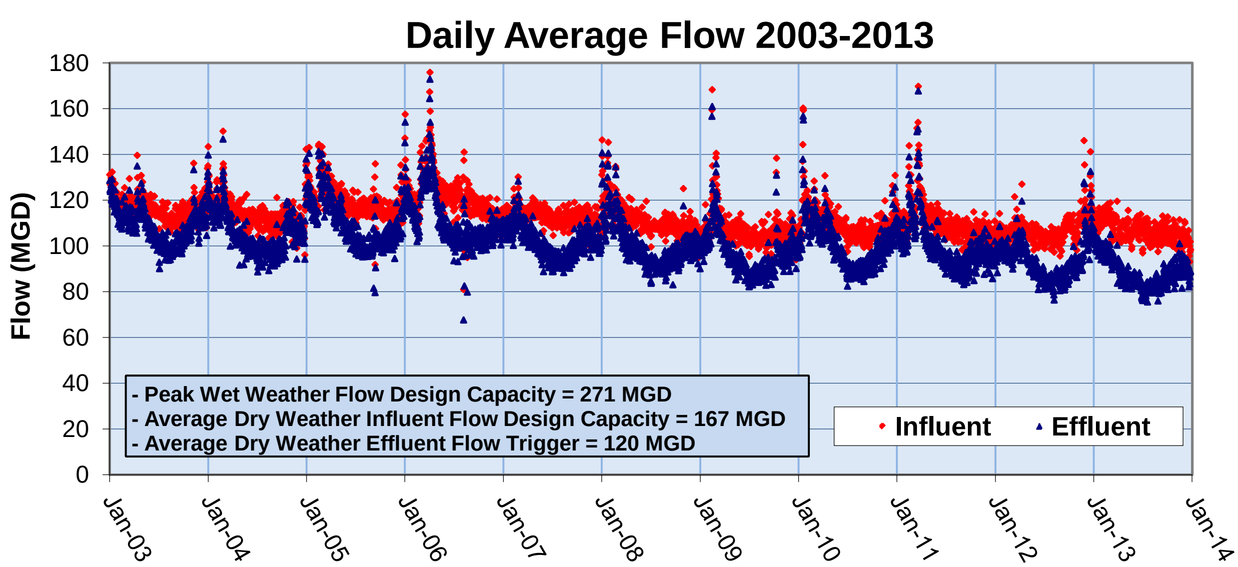
Daily average Effluent flows for 2013 are shown in the table below. The peak average monthly flow of 101.2 MGD occurred in January 2013.

- **Average Dry Weather Influent Flow (ADWIF)** is the highest five-weekday period from June through October. For 2013, ADWIF was 110.3 MGD and occurred from September 16th through September 20th.
- **Average Dry Weather Effluent Flow (ADWEF)** is the lowest average Effluent flow for any three consecutive months between the months of May and October. For 2013, ADWEF was 82.3 MGD and occurred during the months of July to September.

Facility Effluent continued a long-term decreasing trend. Effluent flows are equivalent to those measured in the late 1970s.

In June 2013, a bad flow meter was discovered on the Recycled Water 16" line. The meter apparently had over reported flows since October 2012. Total Recycled Water Delivered is the summed flows from a 60" line and the 16" line, and this number factors into the calculation of total influent. After detection of this problem, all Facility influent flows and loads have been corrected and recalculated.

	Facility Effluent Flow (MGD) (Recent Years)			ADWIF Limit = 167 MGD	ADWEF Limit = 120 MGD
	Low	**High**	**Average**	**ADWIF**	**ADWEF**
2011	**83.2**	**167.7**	**100.3**	**113.0**	**91.2**
2012	**76.4**	**132.6**	**93.6**	**111.4**	**85.3**
2013	**75.6**	**107.8**	**88.9**	**110.3**	**82.3**



b. Biosolids and material

Roughly one million gallons per day (1 MGD) of digester effluent flows to the Residual Sludge Management (RSM) area. Digester effluent contains 2% solid material after 2 to 3 weeks of the anaerobic digestion process. The wet digester effluent is pumped to sludge lagoons where it consolidates for 3 to 4 years. After the consolidation phase the material is pumped to drying beds for one drying season. The dried material is hauled by truck roughly 2 miles to the adjacent Newby Island Landfill where biosolids are used as Alternate Daily Cover. Prior to shipment, biosolids are analyzed for chemical pollutants and human pathogens to ensure they meet EPA "Class A" biosolid standards.

CAT 963 Track Loader at work.

In March 2013, the Facility purchased two new CAT 963 track loaders to replace old "SCAT" machines that are now out of service. The new CAT loaders have quick disconnect fittings to allow easy change-out of custom sludge-mixing auger heads with conventional bucket loaders. This allows these tractors to perform a wider range of jobs. The new loaders were immediately put into service. Concentration of Diesel Range Organics (DRO) and Organic Range Organics (ORO) in Biosolids dropped considerably. Evidently this is the result of retirement of the old "SCATs" that leaked fuel.

Biosolids Hauled

	Truck Loads	Wet Tons	Total Solids	Volatile Solids	Dry Metric Tons -DMT
2011	4915	78,754	90%	27%	64,188
2012	4723	75,570	92%	21%	62,934
2013	4057	**72,882**	**89%**	**23%**	**58,844**

Grit, Grease, and Screenings. Grit and screenings are collected near the headworks facility. Grease is floating material that is accumulated in the primary and secondary clarifiers. These materials are partially dewatered prior to being hauled to the local landfill.

Grit, Grease, & Screenings Hauled (Tons)

	Grit	Grease	Screenings
2011	906	558	664
2012	436	576	577
2013	**351**	**591**	**642**

Concentrations in Biosolids (mg/kg)

	2011	2012	2013
Antimony	ND	ND	**ND**
Arsenic	4.0	2.6	**3.3**
Barium	230	178	**210**
Beryllium	ND	ND	**ND**
Cadmium	0.89	1.3	**ND**
Chromium	58	122	**42**
(Cr STLC)	1.1	1.8	**N/A**
Cobalt	8.7	23	**7.7**
Copper	200	238	**180**
Lead	20	17	**15**
Mercury	0.72	0.69	**0.89**
Molybdenum	4.0	5.1	**3.9**
Nickel	48	88	**41**
Selenium	3.2	2.4	**ND**
Thallium	ND	ND	**ND**
Vanadium	38	88	**32**
Zinc	370	360	**300**
Cyanide	2.2	1.4	**2.2**
Xylene	ND	ND	**ND**
DRO organics	220	1200	**19**
ORO organics	880	4830	**34**

c. Effluent Monitoring

Chemical Analyses of Facility influent and effluent are mostly performed by the Facility's in-house laboratory. A full list of analyses for which the lab is certified is attached.

Monitoring requirements from Tables 6 and 7 of the NPDES permit and monitoring frequency specified in Table E-4 of permit attachment E (Monitoring and Reporting Program) are summarized below:

Effluent Limitations for Conventional Pollutants (From permit Table 6)			
	Average Monthly Effluent Limit (AMEL)	Maximum Daily Effluent Limit (MDEL)	Frequency
$CBOD_5$ (BOD may be substituted)	10 mg/l	20 mg/l	Weekly
Total Suspended Solids (TSS)	10 mg/l	20 mg/l	Weekly
Oil and Grease	5 mg/l	10 mg/l	Quarterly
Total Ammonia	3 mg/l	8 mg/l	Monthly
	Instantaneous Minimum	Instantaneous Max	
pH	6.5	8.5	Daily
Total Chlorine Residual	N/A	0.0 mg/l	Hourly
Turbidity	N/A	10 NTU	Daily
Dissolved Oxygen	5.0 mg/l	N/A	Daily
	30-day geometric mean		
Enterococcus Bacteria	35 CFU		5 x Week

Effluent Limitations for Toxic Pollutants (From permit Table 7)			
	AMEL	MDEL	Frequency
Copper	11 ug/l	19 ug/l	Monthly
Nickel	25 ug/l	33 ug/l	Monthly
Cyanide	5.7 ug/l	14 ug/l	Monthly
Dioxin - TEQ	N/A	6.3×10^{-5} ug/l *(Interim)	2 x year
Heptachlor	0.00021 ug/l	0.00042 ug/l	Quarterly
Tributyltin	0.0061 ug/l	0.012 ug/l	Quarterly

Effluent limits for Mercury and PCBs are established in the Mercury and PCBs Watershed Permit, Permit # CA0038849, Order No. R2-2012-0096. Permit reissuance in 2012 removed the methylmercury monitoring requirement and reduced the annual mass allocation to 0.8 kg/yr.

Effluent Limitations for Mercury and PCBs				
	AMEL ug/l	MDEL ug/l	Annual Mass	Frequency
Mercury	0.025	0.027	0.8 kg/yr	Monthly
PCBs	0.00039	0.00049	N/A	Quarterly

1) Conventional Pollutants and Loadings

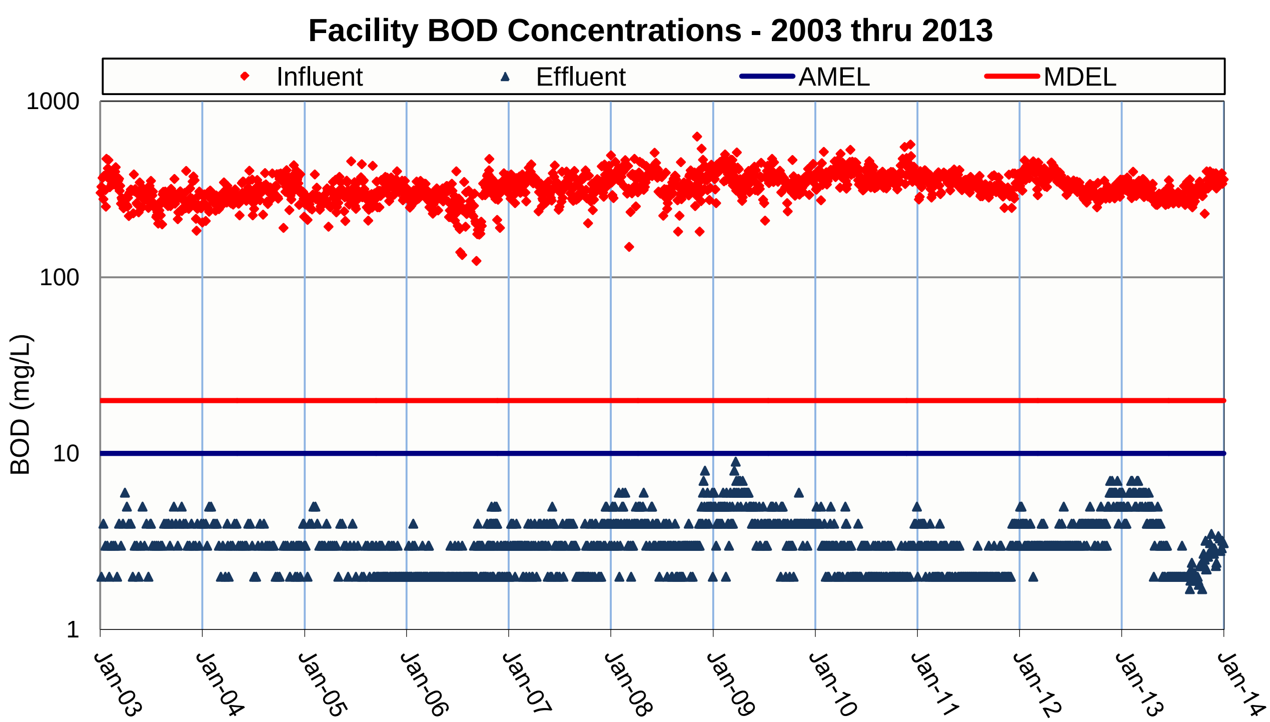
a) Effluent Limitations

The 2009 NPDES Permit established effluent limitations for Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), BOD & TSS Percent Removal, Oil & Grease, pH, Total Chlorine Residual, Turbidity, Total Ammonia, and *Enterococcus* bacteria.

Biochemical Oxygen Demand (BOD): As defined by the American Heritage Science Dictionary, Biochemical Oxygen Demand is: "The amount of oxygen required by aerobic microorganisms to decompose the organic matter in a sample of water, such as one polluted by sewage. It is used as a measure of the degree of water pollution."

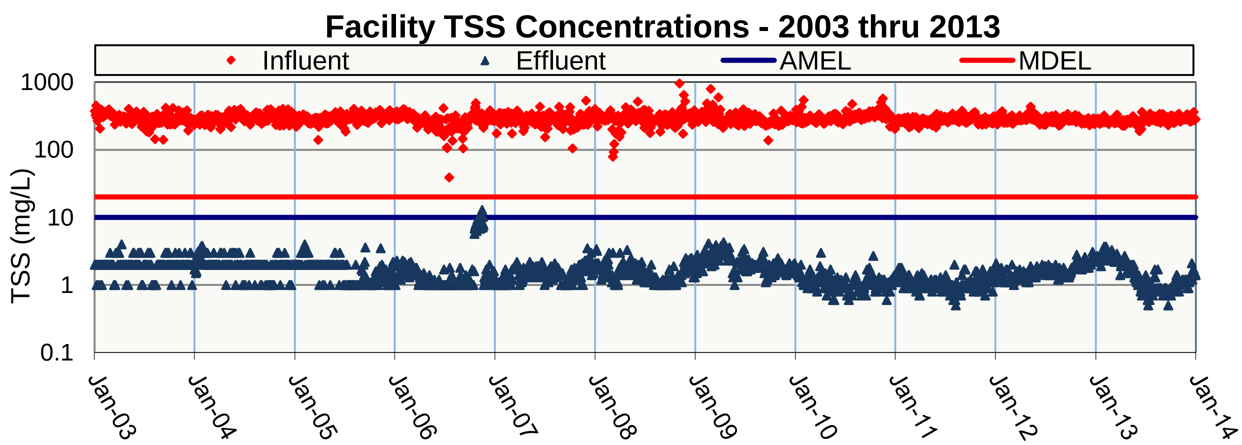
The secondary aeration process (aka: the Biological Nutrient Removal or BNR Process) cultivates microbes that consume oxygen and organic material. Roughly 50% of the energy used at the Facility is expended in blowing low pressure air through the secondary aeration basins in the effort to remove BOD.

BOD (mg/L)							AMEL = 10 mg/L MDEL = 20 mg/L
	Influent			Effluent			*Removal*
	Low	High	**Average**	Low	High	**Average**	
2011	**248**	**410**	**341**	**2**	**4**	**3**	**99%**
2012	**250**	**462**	**345**	**2**	**7**	**4**	**99%**
2013	**230**	**400**	**312**	**2**	**7**	**3**	***99%***



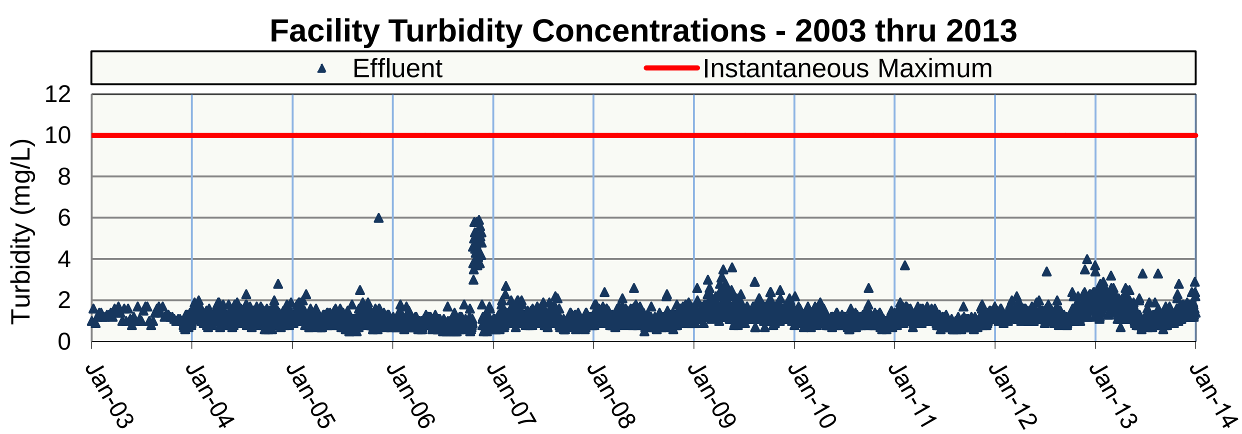
Total Suspended Solids (TSS): TSS is a measure of solid material suspended in water. Suspended solids settle out of the water column throughout the Facility treatment train: roughly half is removed in Primary settling tanks, another 40 to 45 percent is removed in Secondary/BNR aeration basins. The last 10 to 20 milligrams per liter are removed by the filtration process. This was demonstrated in November 2006 when the filtration unit was partially by-passed during installation of new filter influent pumps. The increase in both TSS and Turbidity in effluent at that time can be seen in graphs below.

TSS (mg/L)					AMEL = 10 mg/L MDEL = 20 mg/L		
	Influent			Effluent			*Removal*
	Low	High	Average	Low	High	Average	
2011	**210**	**379**	**276**	**0.5**	**2.0**	**1.1**	**99.6%**
2012	**228**	**436**	**286**	**1.0**	**3.1**	**1.7**	**99.4%**
2013	**189**	**364**	**279**	**0.5**	**3.7**	**1.6**	***99.4%***



Turbidity:

	Turbidity 2013 (NTU)			High Limit = 10 NTU
Effluent	**Low**	**High**	**Average**	2012 Average
	0.6	**3.3**	**1.5**	1.4



Oil & Grease: For 2013, Oil and Grease measurements ranged from 0.7 to 1.4 and averaged 1.0 mg/l. This was within the Effluent Limits of 5 mg/l (AMEL) and 10 mg/l (MDEL).

pH: Effluent pH ranged from 7.0 to 7.9 standard units (S.U.). This was within the Effluent Limits of 6.5 & 8.5 S.U.

Total Chlorine Residual: The Facility complies with Chlorine Residual monitoring requirements using the Water Board's Alternative Chlorine Compliance Strategy described in the 2009 NPDES Permit. Under this strategy, discrete readings are recorded from continuous chlorine monitoring equipment every hour on the hour, for a total of 24 readings (samples analyzed) per day. In 2013, residual chlorine was not detected in final effluent at the outfall.

Total Ammonia:

Total Ammonia N (mg/l)			AMEL = 3 MDEL = 8
Effluent	**Low**	**High**	**Average**
2011	**0.3**	**2.6**	**0.8**
2012	**0.2**	**2.5**	**0.7**
2013	**0.5**	**2.0**	**0.7**

Enterococcus Bacteria: The Effluent Limit for *Enterococcus* is 35 colonies per 100 mL as a rolling 30-day geometric mean. Effluent enterococci concentrations ranged from 1.0 to 4.2 Colony Forming Units (CFU) per 100 mL and averaged 1.2 CFU during 2013.

b) Other Conventional Water Quality Parameters

Dissolved Oxygen: Dissolved oxygen (DO) concentrations in Effluent were above the receiving water Water Quality Objective of 5 mg/L throughout 2013. The 3-month rolling median value for DO percent saturation ranged from 73% to 79% in 2013.

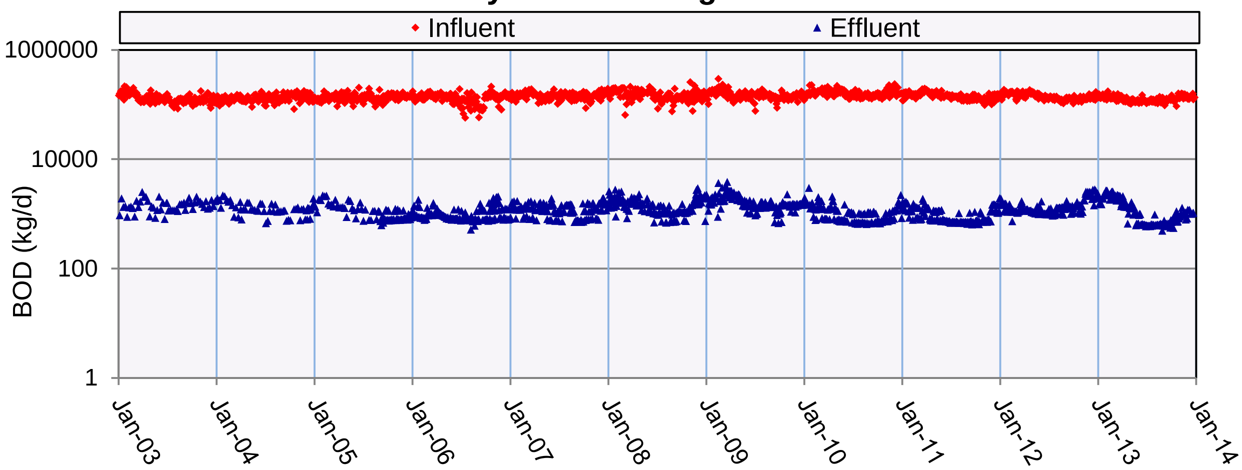
DO Concentrations 2013				Min = 5.0 mg/L
	Low	**High**	**Average**	2012 Average
Effluent (mg/L)	**6.1**	**7.9**	**7.1**	7.1
Saturation (%)	**64.8**	**91.7**	**78.9**	78.6

Temperature: Average Effluent temperatures for 2013 ranged from 15.0 to 25.4^{o} C and averaged 20.6^{o} C.

c) **BOD, TSS and Ammonia Loadings:** Loads are calculated by multiplying each daily concentration by the corresponding daily average flow.

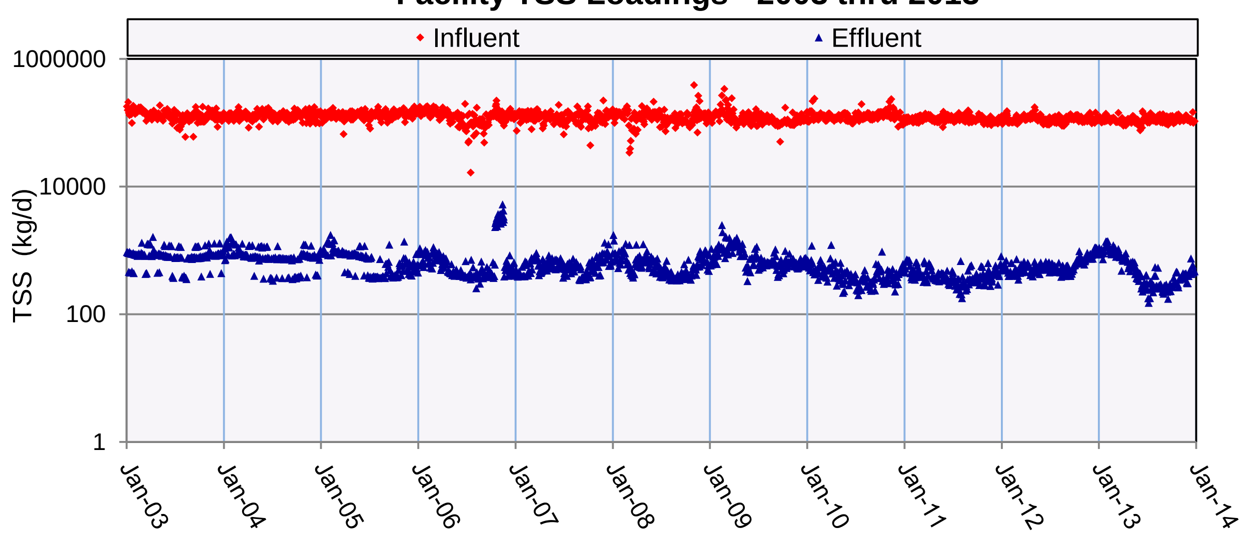
BOD Loadings 2013 (kg/d)					
	Low	**High**	**Total**	**Average**	2012 Average
Influent	**92,928**	**173,887**	**46,222,618 (kg)**	**126,637**	140,150
Effluent	**490**	**2677**	**433,922 (kg)**	**1,189**	1340

Facility BOD Loadings - 2003 thru 2013

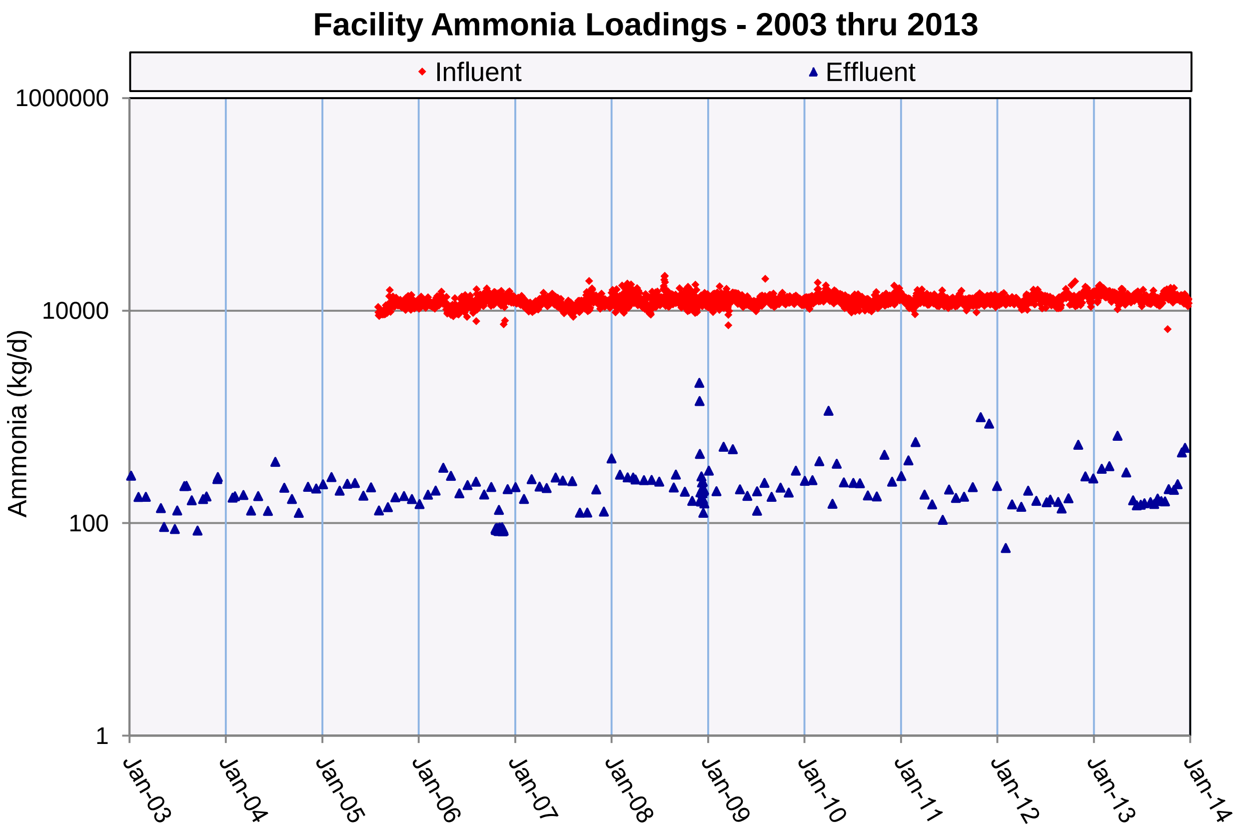


TSS Loadings 2013 (kg/d)					
	Low	**High**	**Total**	**Average**	2012 Average
Influent	**76,219**	**151,581**	**41,161,794 (kg)**	**112,772**	116,299
Effluent	**151**	**1,400**	**200,687 (kg)**	**550**	589

Facility TSS Loadings - 2003 thru 2013



Ammonia Loadings 2013 (kg/d)					
	Low	**High**	**Total**	**Average**	2012 Average
Influent	**6,711**	**17,498**	**4,946,399 (kg)**	**13,552**	12,852
Effluent	**147**	**665**	**39,230 (kg)**	**285**	200



1) Priority Pollutants

The Facility is required to perform twice per year monitoring of the 126 priority pollutants listed in NPDES permit Table C of Attachment G. Most of these are organic compounds that are never detected in effluent. The Facility has specific effluent limitations for 7 priority pollutants: Copper, Nickel, Cyanide, Dioxin, Heptachlor, Tributyltin, and Mercury. 10 additional metals, methylmercury, and a few of the organic compounds from the priority pollutant list are typically detected at concentrations below the applicable Water Quality Objective.

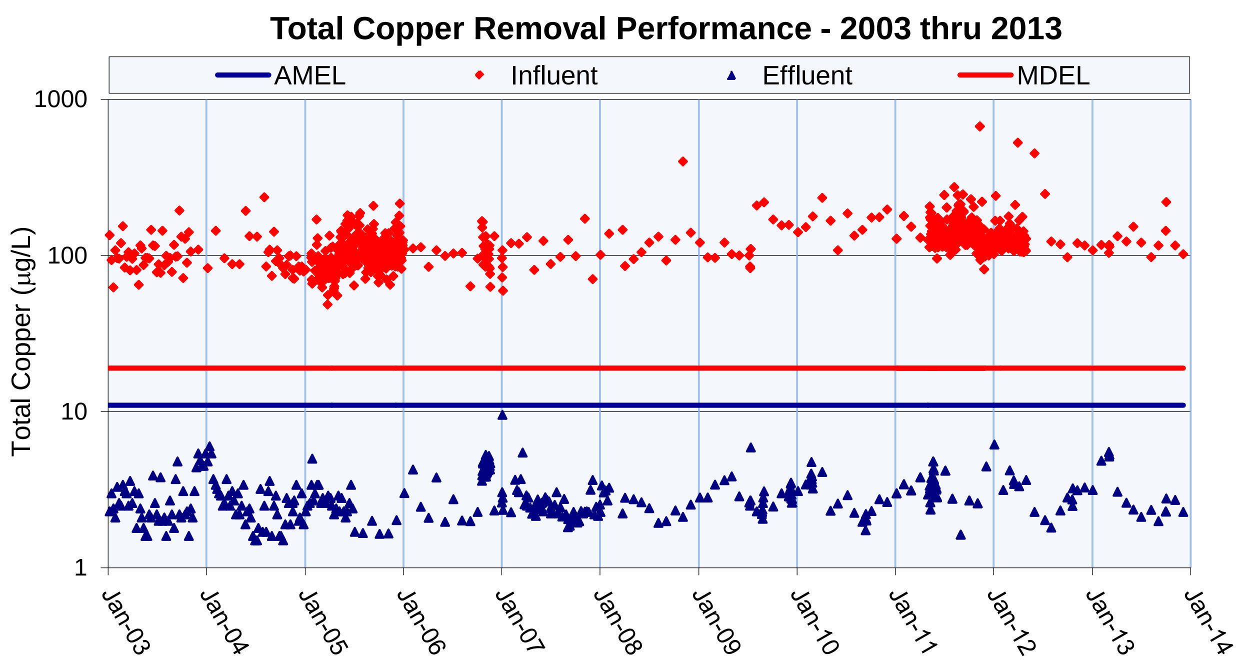
a) Effluent Limitations

The 2009 NPDES Permit established Effluent limitations for Copper, Nickel, Cyanide, Dioxin-TEQ, Heptachlor, and Tributyltin. The 2008 Mercury Watershed NPDES Permit added Effluent limitations for Mercury. Results for these priority pollutants are summarized below.

Copper:

Copper (ug/L)							AMEL = 11 ug/L MDEL = 19 ug/L
	Influent			**Effluent**			*Removal*
	Low	High	**Average**	Low	High	**Average**	
2011	**82**	**671**	**145**	**1.63**	**4.80**	**3.12**	*98%*
2012	**98**	**528**	**160**	**1.81**	**6.16**	**3.14**	*98%*
2013	**98**	**1060**	**148**	**1.99**	**5.52**	**2.94**	***98%***

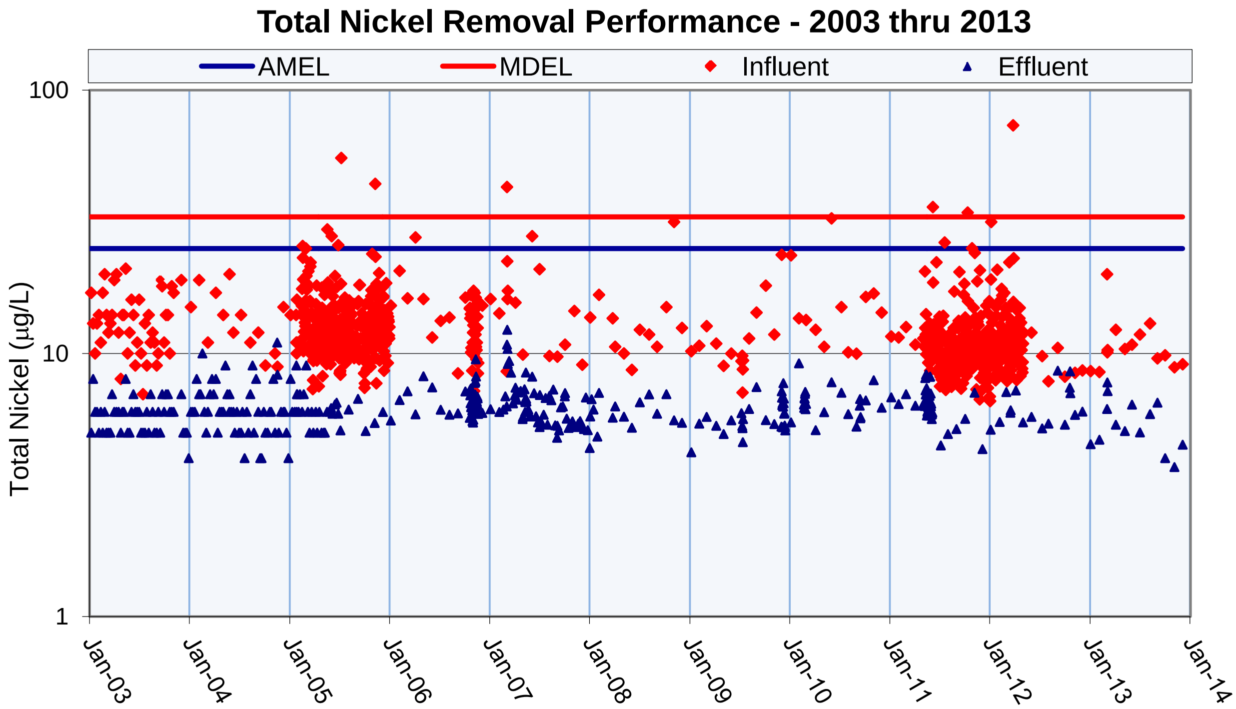
**On 10/2/2013 a high copper concentration in influent was measured at 1060 ug/L. This data point was excluded from the above calculations and the removal chart. A summary of the occurrence is below.*



On 2 October 2013, ICPMS analysis detected a copper concentration of 1060 µg/L in Facility influent. The copper concentration in effluent samples from 10/2/2013 was much lower and more typical at 2.29. Copper concentrations in influent samples from 10/1/2013 and 10/3/2013 were 140 and 220 µg/L, which is also consistent with typical influent copper concentrations. The abnormally high influent copper concentration on October 2nd seems to have been a random event. This single data point, one order of magnitude higher than any other, was excluded from calculations of average influent concentration, percent removal calculation, and the above chart.

Nickel:

Nickel (ug/L)							AMEL = 25 ug/L MDEL = 33 ug/L
	Influent			Effluent			*Removal*
	Low	High	**Average**	Low	High	**Average**	
2011	**6.69**	**36.0**	**11.37**	**4.33**	**8.31**	**5.92**	*48%*
2012	**6.59**	**73.6**	**10.39**	**5.13**	**8.60**	**6.13**	*41%*
2013	**8.50**	**20.0**	**10.52**	**3.70**	**7.76**	**5.22**	***50%***

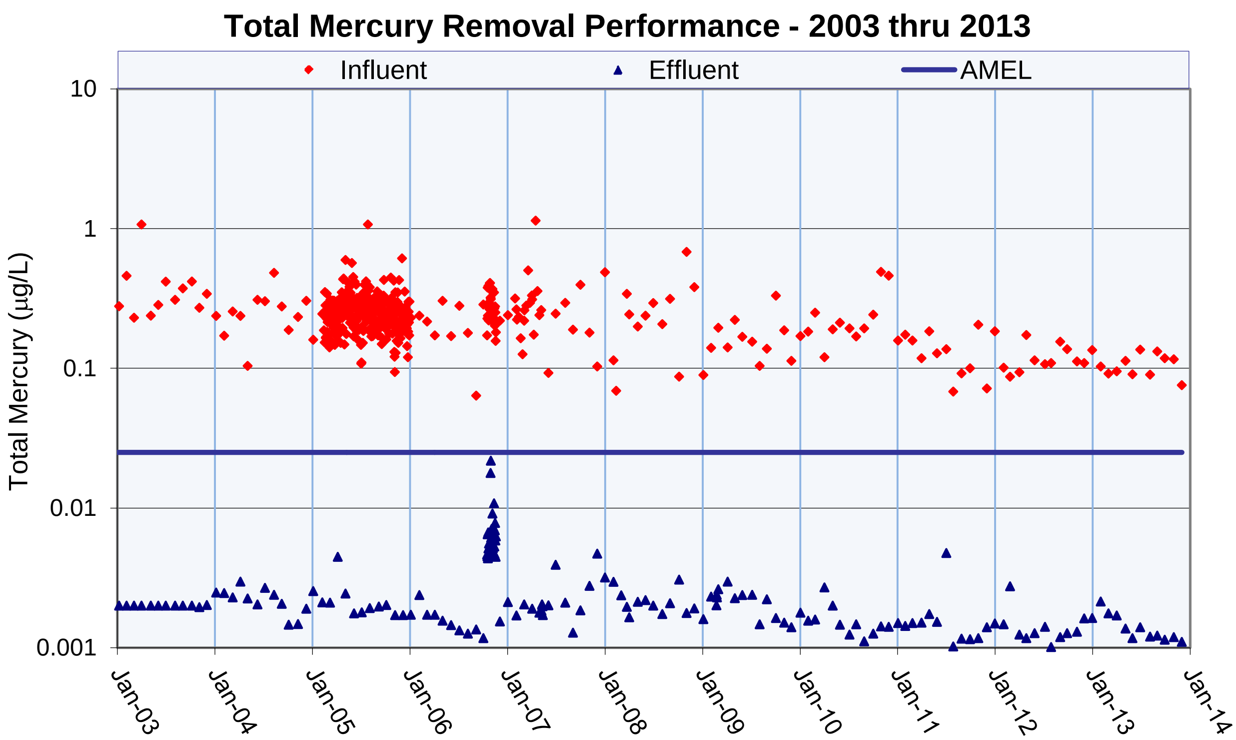


Cyanide: The Facility produces a small amount of cyanide from chloramination disinfection.

Cyanide (ug/L)							AMEL = 5.7 ug/L MDEL = 14 ug/L
	Influent			Effluent			*Removal*
	Low	High	**Average**	Low	High	**Average**	
2011	**0.4 (ND)**	**1.4 (DNQ)**	**0.7**	**0.4 (DNQ)**	**6.5**	**1.9**	*NA*
2012	**0.4 (ND)**	**1.7 (DNQ)**	**0.7**	**0.6 (DNQ)**	**8.4**	**2.2**	
2013	**0.4 (ND)**	**3.5 (DNQ)**	**0.9**	**0.8 (ND)**	**2.8**	**1.9**	

Mercury:

Mercury (ug/L)							AMEL = 0.025 ug/L
	Influent			Effluent			***Annual Load*** *Kg/yr*
	Low	High	**Average**	Low	High	**Average**	
2011	**0.068**	**0.205**	**0.133**	**0.00102**	**0.00476**	**0.00166**	*0.2313*
2012	**0.087**	**0.184**	**0.123**	**0.00101**	**0.00275**	**0.00143**	*0.1862*
2013	**0.076**	**0.136**	**0.108**	**0.00110**	**0.00214**	**0.00142**	***0.1767***



Dioxin-TEQ: The 2009 NPDES Permit established an interim Effluent concentration limit for Dioxin-TEQ (toxic equivalence) of 6.3 x 10^{-5} ug/l and a monitoring frequency of twice per year. None of the 17 dioxin congeners were detected in Facility Effluent in 2011, 2012 or 2013.

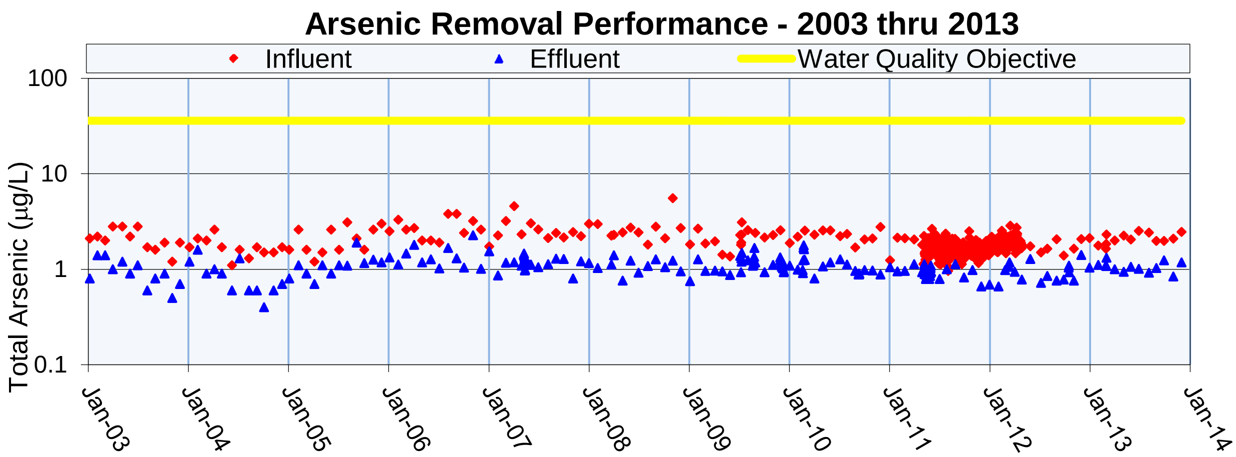
Heptachlor: The monthly average effluent limitation for heptachlor is 0.00021 ug/l based on a human health water quality criterion. Heptachlor was not detected in quarterly influent or effluent samples in 2013.

Tributyltin: The Facility's Permit limit for tributlytin is 0.0061 ug/L as a monthly average. Tributyltin was not detected in quarterly effluent samples in 2013.

b) Priority Pollutant Metals

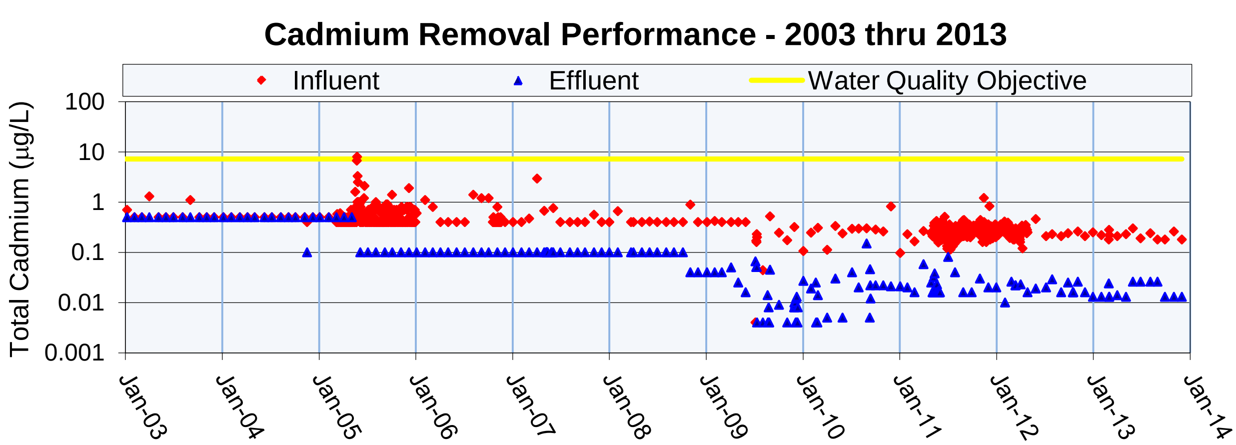
Arsenic:

Arsenic (ug/L)							WQO = 36 ug/L
	Influent			Effluent			*Removal*
	Low	High	**Average**	Low	High	**Average**	
2011	**0.96**	**2.65**	**1.72**	**0.66**	**1.13**	**0.95**	*45%*
2012	**1.39**	**2.86**	**1.77**	**0.66**	**1.41**	**0.91**	*49%*
2013	**1.64**	**2.52**	**2.13**	**0.84**	**1.32**	**1.04**	***51%***



Cadmium:

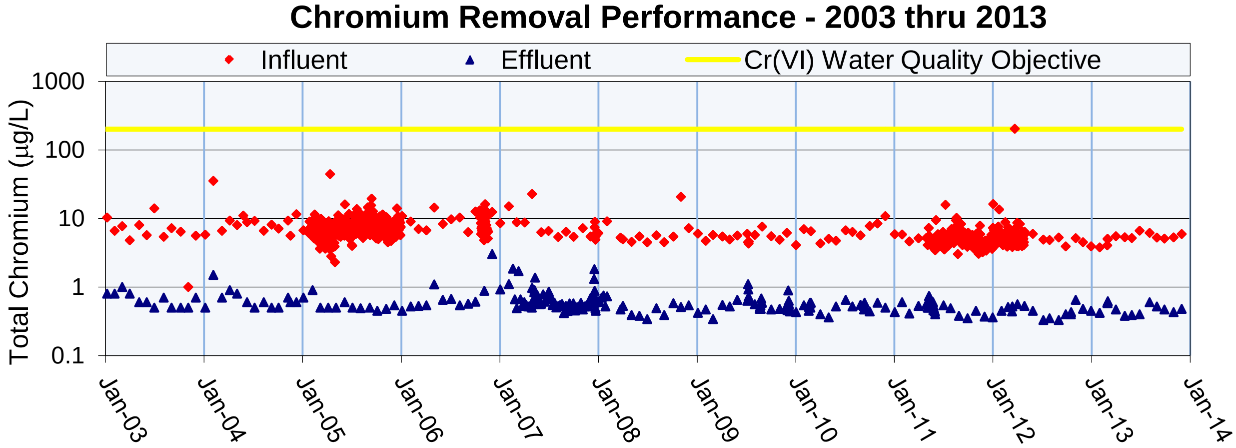
Cadmium (ug/L)							WQO = 7.3 ug/L
	Influent			Effluent			*Removal*
	Low	High	**Average**	Low	High	**Average**	
2011	**0.10 (DNQ)**	**1.21**	**0.24**	**0.016 (ND)**	**0.081 (DNQ)**	**0.029**	*88%*
2012	**0.12 (DNQ)**	**0.46**	**0.26**	**0.010 (ND)**	**0.029(DNQ)**	**0.020**	*92%*
2013	**0.18 (DNQ)**	**0.30**	**0.23**	**0.013 (ND)**	**0.026(DNQ)**	**0.020**	***92%***



Total Chromium (substituted for Hexavalent Chromium): The 2009 NPDES Permit allows measurement of total chromium instead of hexavalent chromium in Facility Effluent.

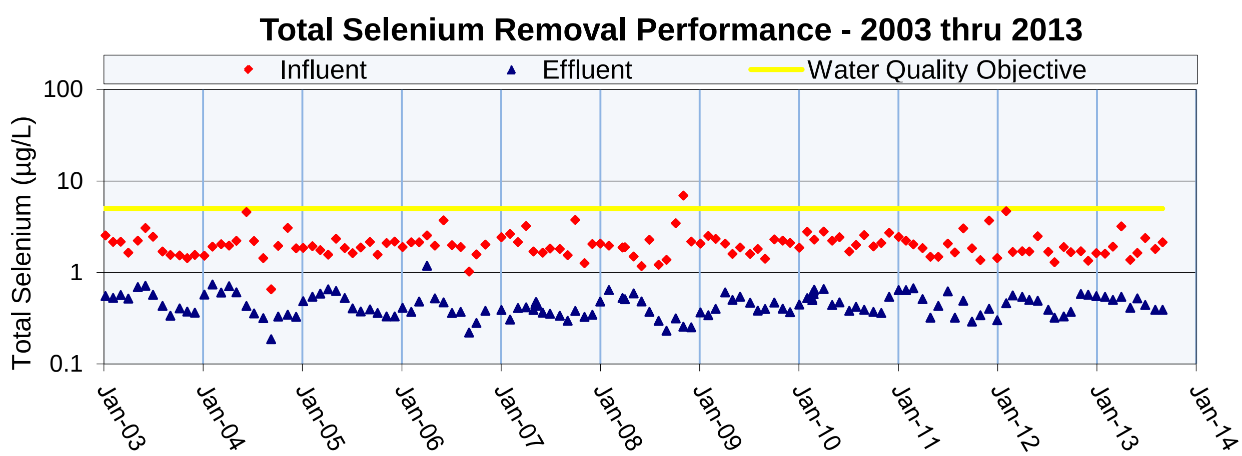
Chromium (ug/L)							WQO = 200 ug/L
	Influent			Effluent			Removal
	Low	High	Average	Low	High	Average	
2011	3.02	15.8	5.14	0.35	0.74	0.46	*91%*
2012	3.60	203*	5.70	0.33	0.65	0.45	*92%*
2013	3.78	6.63	**5.23**	0.38	0.62	**0.47**	***91%***

**A single unusually high influent concentration was detected on 26 March, 2012. Effluent concentrations were unaffected.*



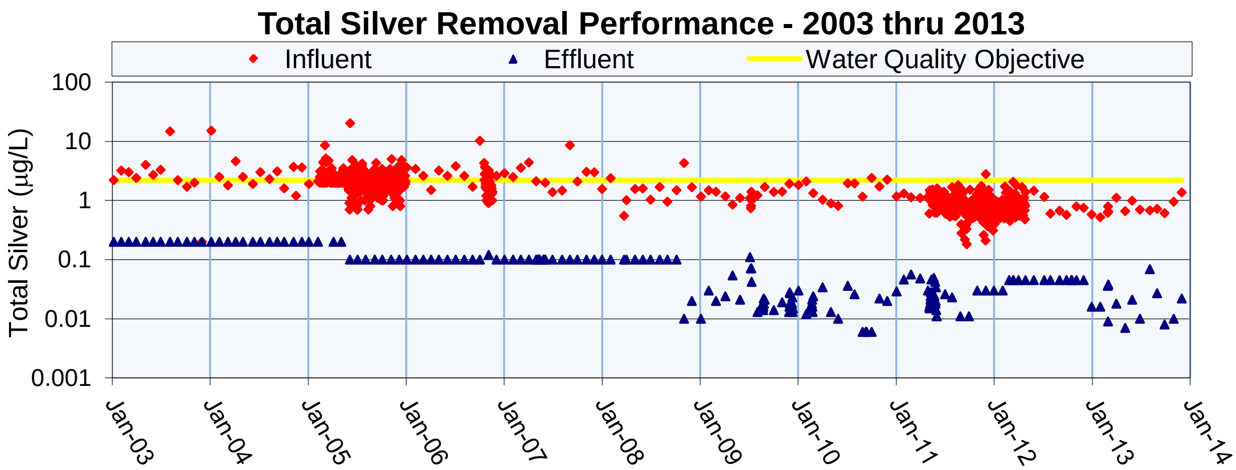
Selenium:

Selenium (ug/L)							WQO = 5 ug/L
	Influent			Effluent			Removal
	Low	High	Average	Low	High	Average	
2011	1.36	3.68	2.09	0.29	0.67	0.47	*77%*
2012	1.29	4.65	1.93	0.30	0.58	0.45	*77%*
2013	1.37	3.18	**1.96**	0.39	0.55	**0.48**	***76%***



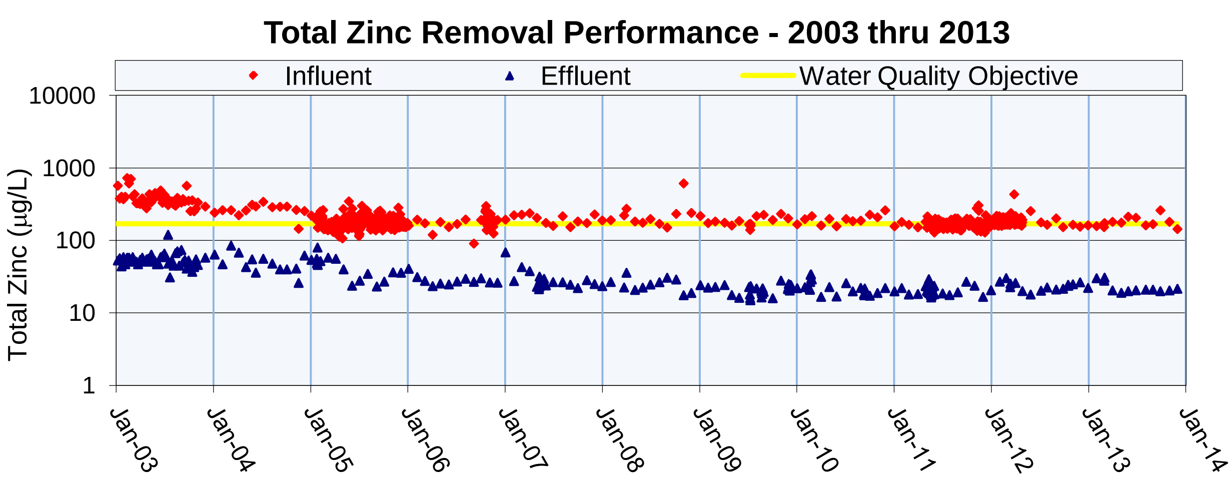
Silver:

Silver (ug/L)							WQO = 2.2 ug/L
	Influent			**Effluent**			*Removal*
	Low	High	**Average**	Low	High	**Average**	
2011	**0.18**	**2.9**	**1.00**	**0.011 (ND)**	**0.056 (DNQ)**	**0.029**	*99%*
2012	**0.31**	**2.06**	**0.90**	**0.030 (ND)**	**0.045 (ND)**	**0.043**	*95%*
2013	**0.52**	**1.37**	**0.80**	**0.007 (DNQ)**	**0.069 (DNQ)**	**0.021**	***97%***



Zinc:

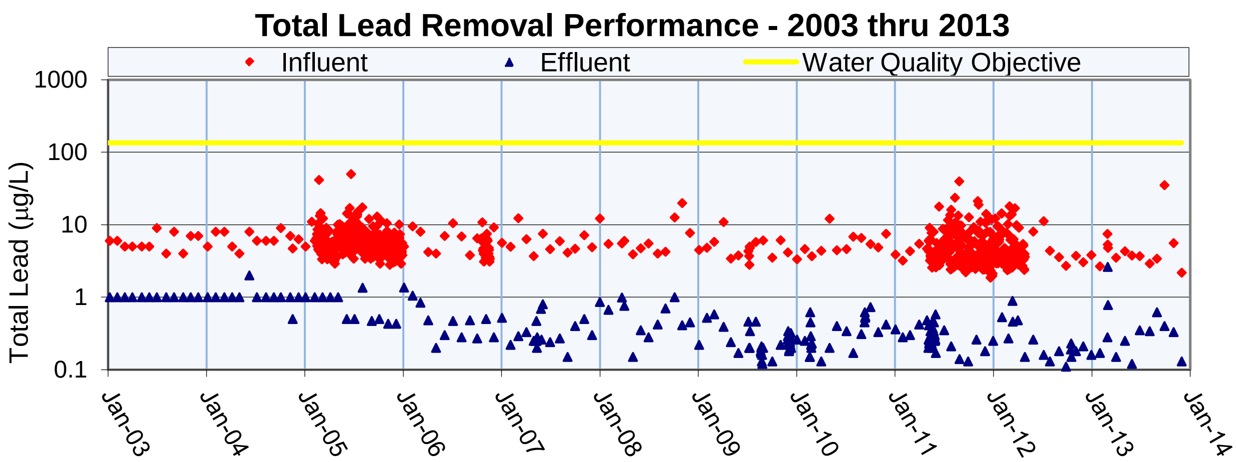
Zinc (ug/L)							WQO = 170 ug/L
	Influent			**Effluent**			*Removal*
	Low	High	**Average**	Low	High	**Average**	
2011	**129**	**306**	**166**	**16.4**	**29.3**	**20.1**	*88%*
2012	**153**	**434**	**183**	**18.0**	**30.3**	**23.1**	*87%*
2013	**144**	**261**	**182**	**19.0**	**30.8**	**22.1**	***88%***



Lead:

Lead (ug/L)							WQO = 135 ug/L
	Influent			Effluent			Removal
	Low	High	Average	Low	High	Average	
2011	1.86	39.7	4.84	0.13	0.58	0.27	*94%*
2012	1.97	18.0*	4.98*	0.11	0.89	0.27	*95%**
2013	**2.18**	**35.2**	**6.41**	**0.12**	**2.62**	**0.35**	***94%***

**On 3/16/12, an anomalously high lead concentration in influent was measured at 266,000 ug/L. This data point was excluded from the above calculations and the removal chart.*



c) Non-Priority Metals

Antimony:

Antimony (ug/L)				WQO = 640
	Effluent			*Removal*
	Low	High	**Average**	
2011	0.32	0.46	0.38	*NA*
2012	0.33	0.46	0.39	
2013	0.32	0.49	0.41	

Beryllium: There are no current recommended EPA water quality criteria for beryllium. However, published literature suggests chronic toxicity of beryllium may be as low as 5.3 ug/L.

Beryllium (ug/L)				WQO = NA
	Effluent			*Removal*
	Low	High	**Average**	
2011	0.005 (ND)	0.015 (ND)	0.012	*NA*
2012	0.005 (ND)	0.0085 (ND)	0.005	
2013	0.005 (ND)	0.0100 (ND)	0.007	

Thallium:

Thallium (ug/L)				WQO = 6.3 (CTR)
	Effluent			*Removal*
	Low	High	**Average**	
2011	0.005 (ND)	0.080 (DNQ)	0.024	*NA*
2012	0.002 (ND)	0.067 (DNQ)	0.032	
2013	0.004 (ND)	0.7	0.147	

d) Organics

Organic priority pollutants are measured semi-annually in Effluent: March and September each year. Of 113 compounds analyzed, only two were detected in Facility Effluent in 2013.

Volatile Organic Compounds (VOCs): Two VOCs were detected in Effluent in 2013. Both VOCs were well below California Toxic Rule (CTR) Water Quality Objectives (WQO).

Volatile Organic Compounds (ug/L)	March 2013	September 2013	CTR WQO
Chloroform	1.5	2.4	470
Dichlorobromomethane	ND	0.52 (DNQ)	46

Semi-Volatile Organic Compounds: No semi volatile organic compounds were detected in Facility Effluent in 2013. During the past four years, of all the semi-volatile organics, only Bis (2-Ethylhexyl) phthalate was detected, but not quantified (DNQ) at 1.60 ug/l in 2010.

Legacy Pesticides: No legacy pesticides were detected in Effluent in 2013.

Polynuclear Aromatic Hydrocarbons (PAHs): No PAH compounds were detected in 2013.

The Facility generally does not detect PAHs in effluent. However, Indeno(1,2,3-cd) Pyrene was detected but not quantified (very low DNQ value of 0.009 µg/L) on 1 March 2011. This value is well below the lowest applicable water quality objective of 0.049 µg/L, but the single DNQ value in 2011 will likely result in a permit limit upon reissuance of the current NPDES Permit. This is because a single quantified value was measured at a receiving water station using a different analytical method in 1995. Because of this exceedance of the water quality objective in the receiving water 18 years ago, any detection of this PAH in effluent likely triggers reasonable potential and therefore a permit limit.

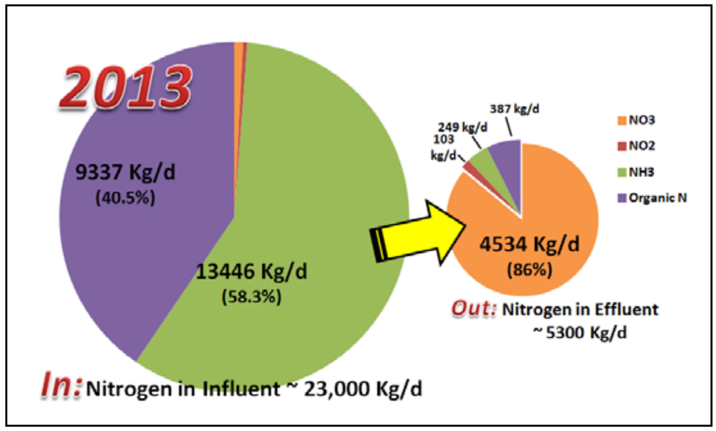
Polychlorinated biphenyls (PCBs): In accordance with the Mercury and PCBs Watershed Permit, Permit # CA0038849, reissued as Order No. R2-2012-0096, PCBs are measured semi-annually as total aroclors using USEPA method 608 for regulatory compliance. PCBs were not detected using this method. The Facility is also required to measure total PCBs by congener quarterly using USEPA Proposed Method 1668c. Method 1668c data are for information purposes and were collected in March, June, September, and December. PCBs congeners are analyzed and reported as the sum of a subset of 40 congeners (known as the “SFEI 40”) plus co-elutes. The SFEI 40 provided the basis for the impairment and loads assessments in the San Francisco Bay PCBs TMDL approved by the EPA in 2010. PCBs as congeners were not quantified in the June, September, and December samples. In March 2013, the sum of quantified PCBs congeners was 24.7 pg/L.

e) Nutrients

Effluent Nutrient Loadings in 2013

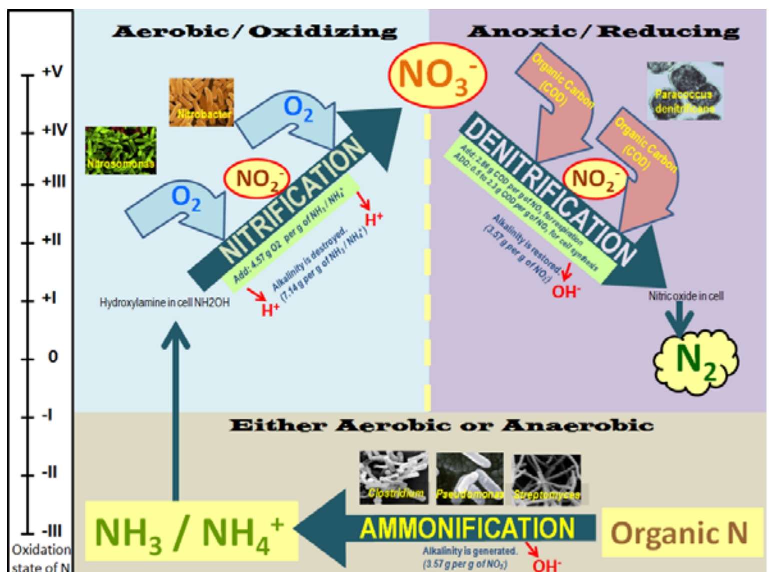
Total Nitrogen in effluent averaged 5273 kg/d during 2013. Most of the discharged nitrogen was in the form of nitrate (NO_3). Over 77% of total nitrogen was removed.

The 23060 kg/d of nitrogen that arrived at the Facility was predominantly ammonia and organic nitrogen. Nitrate made up the bulk of the smaller amount of discharged nitrogen. The remainder was converted to nitrogen gas and released to the atmosphere. To varying degrees, the Facility treatment train carries out a portion of each of the major steps of the "Nitrogen Cycle" with the exception of nitrogen fixation:



Ammonification: Organic Nitrogen in urea and protein compounds is decomposed to release ammonia. Ammonification takes place in the sewer collection system, in the Primary setting tanks, and to a small degree in the Secondary/BNR aeration process.

Nitrification: Ammonia is oxidized to nitrite (NO_2) and nitrate (NO_3) with Secondary/BNR aeration. This is a two step process that involves the cultivation and growth of two families of bacteria in the BNR tanks. Nitrosomonas bacteria consume ammonia and expel nitrite. Nitrobacter bacteria consume nitrite and expel nitrate. Both types of bacteria require an enormous amount of oxygen (O_2) for cellular respiration: 2 moles of O_2 per mole of NH_3/NH_4^+ oxidized.

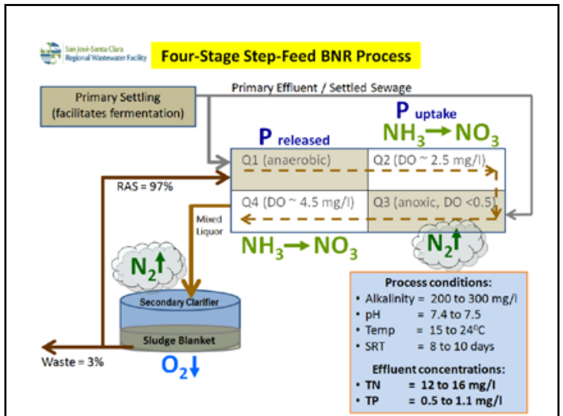


Biological removal of nitrogen involves three different types of bacterial communities that generally thrive in different environments.

Denitrification: NO_3 is converted to nitrogen gas (N_2) anaerobically. Unlike nitrification, denitrification occurs in an anoxic environment and utilizes a different type of microbe. In the absence of oxygen, *Proteobacteria* like Paracoccus *denitrificans* "*respire*" nitrate and expel nitrogen gas. Interestingly, Paracoccus *denitrificans* is also identified as a "Phosphorus Accumulating Organism" (PAO) that helps remove phosphates from wastewater. This is why a BNR process that removes nitrogen, may also remove phosphorus to some degree.

The BNR Process. The San Jose-Santa Clara Regional Wastewater Facility employs a "Biological Nutrient Removal" (BNR) process to treat ammonia in sewage. The Step-Feed BNR process effectively converts almost all ammonia to nitrate ($NH_3 \rightarrow NO_3$) by alternating the levels of aeration in the secondary aeration basins. Each of the facility's 24 aeration basins is divided into four "Quad Tanks" (Q1through Q4). Aeration levels are adjusted so that:

- Q1 tank in each of the aeration basins is anaerobic - deprived of all oxygen and nitrate. Primary Effluent and Return Activated Sludge (RAS) are introduced into this tank.
- Q2 is aerobic,
- Q3 is anoxic – deprived of oxygen but not nitrate. Primary Effluent is also added (step-fed) to this tank,
- Q4 is aerobic.

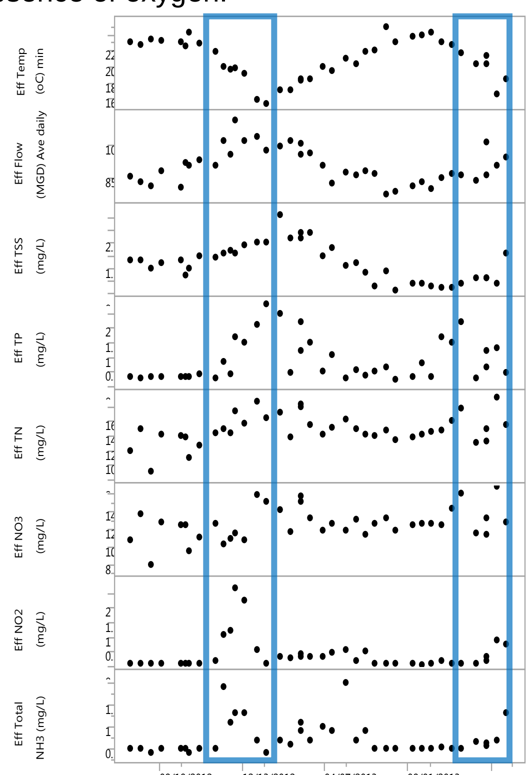


Schematic of the four-stage BNR process in the Quad Tanks Q1 thru Q4.

The first stage anaerobic zone serves as a "selector" that partially screens out aerobic microbes that would rapidly exploit volatile fatty acids (otherwise known as, soluble BOD) in the Primary Effluent. The anaerobic microbes that are favored tend to use the nutrient forms of nitrogen and phosphorus as electron acceptors in the absence of oxygen.

Effect of Seasons on Nutrient Removal. The average concentrations of Total Nitrogen (TN) and Total Phosphorus (TP) in Facility effluent during 2013 were 15.5 and 1.1 mg/L, respectively. Biological phosphorus removal is relatively insensitive to temperature changes; however nitrification and denitrification are affected by temperature, as can be seen from the spikes in NO_2 and NH_3 as the temperature dropped to 16.5 (from 21.3) on 5 December. The NO_2 spike indicates less efficient transformation to NO_3 to N_2. In 2012 the temperature drop was accompanied with rain and associated lagoon supernatant flow which simultaneously added substantial ammonia load to the Facility.

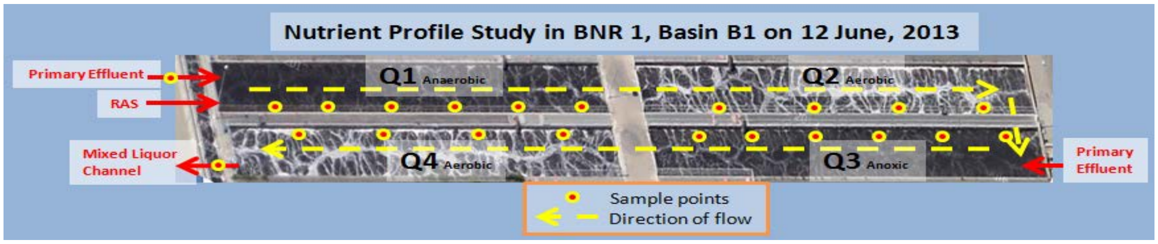
In the wet season, with increasing flow and decreasing effluent temperature, TP in the effluent increased; this could be due to process changes (e.g. increasing aeration) to optimize nitrogen transformations during periods of lower temperatures and also may be related to the increased load of Total Suspended Solids (TSS) in the effluent.



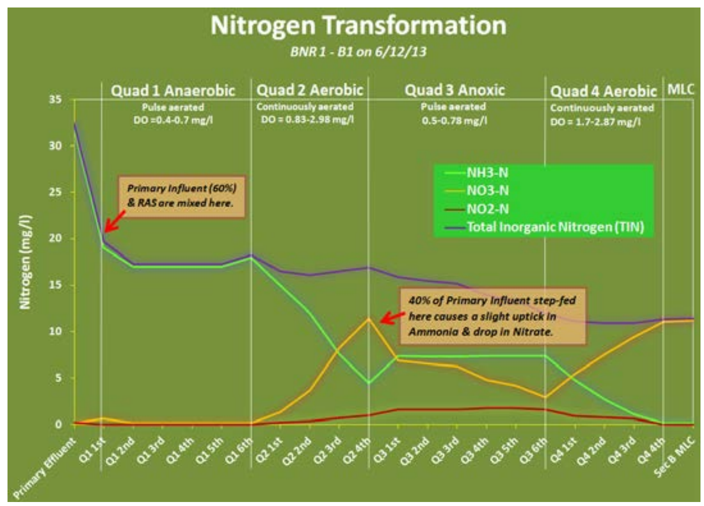
Scatterplots showing effluent characteristics over time (July 2012 – December 2013).

Measuring Nutrient Removal in the BNR Process. The Facility's process engineers performed a special study of nutrient removal in several different secondary/BNR process tanks using different aeration configurations. Aeration basin B1 in the BNR1 area used the typical aeration configuration and is illustrated here.

On 6/12/2013, process water in aeration basin B1 in the BNR 1 area was sampled at influent, effluent, and at 40-foot intervals in quad tanks. Nutrient concentrations were measured: Total Inorganic Nitrogen (TIN), Ammonium (NH_4), Nitrate (NO_3), Nitrite (NO_2), & Phosphorus (as P)



This survey demonstrated where the nitrogen and phosphorus transformations were occurring in the BNR process:

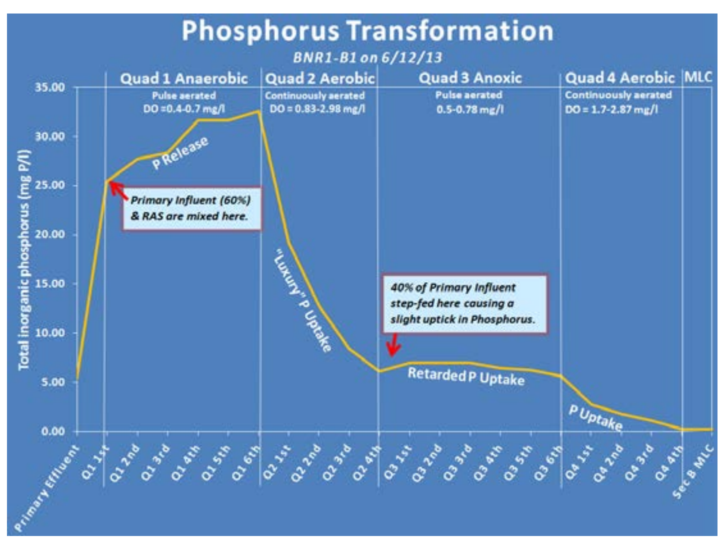


Nitrogen:

Ammonium (NH_4) concentrations continuously drop from 30 mg/l to 0.2 mg/l as wastewater passes through all four quad tanks. This mainly reflects conversion of NH4 to nitrite (NO_2) then to nitrate (NO_3).

Nitrate (NO_3) concentrations rise primarily in the aerobic chambers (Quads 2 and 4) confirming the ammonia oxidation.

Total Nitrogen drops in the anaerobic first and third quads. But, Total Nitrogen concentrations show a greater reduction between the mixed liquor flowing to the secondary clarifiers and the RAS returning to Quad 1, which is a result of denitrification (conversion of NO_3 to Nitrogen gas) in the clarifiers.



Phosphorus:

Phosphorus concentrations rise in the anaerobic first quad as Phosphorus Accumulating Organisms (PAOs) release phosphates to power metabolism in the absence of any other electron acceptors.

Phosphorus concentrations rapidly decline as PAOs are exposed to oxygen or nitrate in Quads 2, 3, and 4 and reabsorb phosphates into their cells.

2) Whole Effluent Toxicity

Rainbow Trout

Acute Toxicity. Final Effluent (FE) is tested monthly for acute toxicity using rainbow trout exposed to FE for 96 hours under flow-through conditions. The test endpoint is survival. Mean survival of rainbow trout in FE averaged 99.8% both in 2012 and in 2013 (*n*=12). These results were virtually identical to mean Control survival of 99.6% in 2013, indicating that there is no acute toxicity at all in FE. The Facility has never violated acute toxicity limits in 25-year history of flow-through testing. Since initiation of rainbow trout testing in October 2003, the lowest survival observed in a single FE test was 95.6%.

Ceriodaphnia

Chronic Toxicity. Chronic toxicity has been evaluated monthly using *Ceriodaphnia dubia* (water flea) since the early 1990s. The chronic *Ceriodaphnia dubia* test compares the 6-8 day reproduction in Control animals to animals exposed to varying concentrations of Facility FE. Chronic Toxic Units (TUc) are calculated for each test by dividing the highest concentration tested (100%) by the test IC25 (the concentration at which reproduction in effluent is reduced or inhibited by 25% compared to test control animals). A TUc greater than one indicates presence of toxicity. Twice per month accelerated testing is triggered by a 3-sample median value greater than 1 TUc or a single sample result greater or equal to 2 TUc.

Chronic Toxicity Summary
20 Years

Year	# Results Reported	# Results >1 but <2 TUc	# Results >2 TUc
1994	12	0	0
1995	11	0	0
1996	13	1	1
1997	12	2	0
1998	12*	3	0
1999	14	0	2
2000	12	0	0
2001	12	0	0
2002	12	0	0
2003	12	0	0
2004	12	0	1
2005	12	0	1
2006	11	0	0
2007	13	0	1
2008	12	0	0
2009	14*	1	2
2010	19*	3	2
2011	14	2	1
2012	13	1	1
2013	14	4	3

* Some tests in 1998, & 2009/10 were duplicate test events.

Chronic toxicity (reproductive inhibition) has been detected in Final Effluent on 32 occasions over 20 years. Detection of chronic toxicity in Effluent increased substantially from 2012 (2 incidents) to 2013 (7 incidents). Toxicity Reduction Evaluation (TRE) efforts in 2009 and 2010 determined that the likely cause/contributor of toxicity was an organic compound. Back-to-back toxicity hits in April and May 2013 triggered a second TRE. A TRE Workplan was finalized in June 2013, and the Facility held a half-day Chronic Toxicity Workshop headed by speakers from U.C. Berkeley, Pacific EcoRisk Laboratory and the Facility's Toxicology Laboratory to kick off the TRE effort.

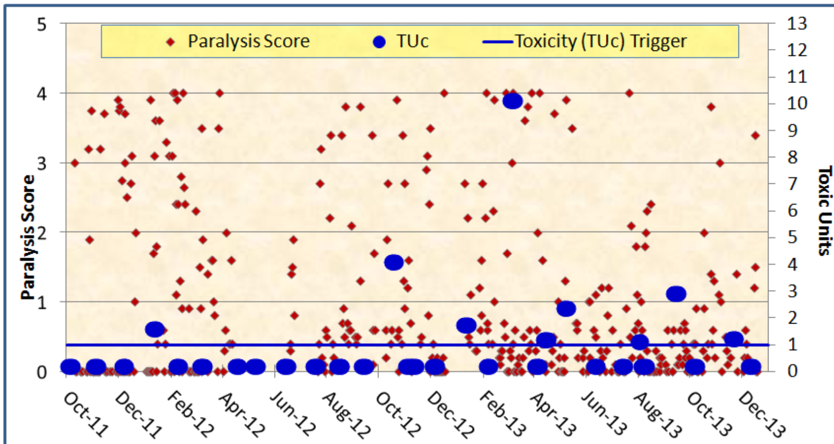
Chronic Test Results - 2013
(% Effluent)

TEST START DATE	SURVIVAL		REPRODUCTION				
	NOEC	LOEC	NOEC	LOEC	IC_{25}	TUc	TST
1/9/13	100	>100	25	50	58.1	1.7	Fail
2/4/13	100	>100	100	>100	>100	<1	Pass
3/4/13	100	>100	6.25	12.5	9.88	10.1	Fail
4/2/13	100	>100	100	>100	>100	<1	Pass
4/12/13	100	>100	100	>100	84.5	1.2	Fail
5/6/13	100	>100	50	100	42.7	2.3	Fail
6/10/13	100	>100	100	>100	>100	<1	Pass
7/12/13	100	>100	100	>100	>100	<1	Pass
8/1/13	100	>100	50	100	90.7	1.1	Fail
8/5/13	100	>100	100	>100	>100	<1	Pass
9/12/13	100	>100	25	50	34.6	2.9	Fail
10/4/13	100	>100	100	>100	>100	<1	Pass
11/19/13	100	>100	50	100	86.1	1.2	Fail
12/9/13	100	>100	100	>100	>100	<1	Pass

Over the past four years, the Facility conducted aggressive investigations to determine the cause(s) and source(s) of the toxicant(s) responsible for chronic toxicity, during both TRE and non-TRE periods. For example, the Facility conducted a pyrethroid study that included both chemical (Caltest Analytical Laboratory, Southern Illinois University) and toxicological (Don Weston, U.C. Berkeley) analyses during a non-TRE period. The Facility's June 2013 Chronic Toxicity Workshop and TRE Workplan summarized the many findings that have served to focus the current toxicity investigation.

Paralysis Tracking.

Paralysis in test animals (*C. dubia*) exposed to FE was discovered in late 2011 and has been tracked since that time. The incidence of paralysis in animals exposed to FE increased from 61% prior to 2013 (n=210) to 75% in 2013 (n=210). However, the magnitude of paralysis decreased from a mean of 1.1 prior to 2013 to a mean of 0.7 in 2013 (n=210). Paralysis is scored on a progressive scale from zero to 4, with 4 being complete paralysis.



***Ceriodaphnia* Toxicity (reproductive inhibition) & Paralysis Tracking**

- A synoptic study designed to track animal paralysis through all treatment process steps indicated that the agent(s) causing paralysis were coming in raw sewage but were effectively removed in the Biological Nutrient Removal (BNR) process (n=7). Paralysis in raw sewage ranged from 2.0 to 4.0 (4=complete paralysis) and averaged 3.4. The average paralysis score in Facility Effluent over the seven tests was 0.1. However, 75% of FE samples (n=210) evaluated in 2013 showed some level of paralysis.
- Paralysis effects appear to be reversible to a large extent. This may be significant in a 6-8 day FE test in which daily composite samples vary in their toxicity.
- The Facility's Laboratory has completed numerous studies to demonstrate that FE samples that produce high levels of paralysis in test animals, can, if used over several days of a 6-8 day test, result in reproduction inhibition. However, this is not obvious since several daily composite FE samples yielding high paralysis are required to have reproductive effects.
- Toxicity Identification Evaluations conducted from 2009 to 2013 have not yielded critical information regarding the toxicant(s) responsible for toxicity or paralysis.

Effluent Toxicity Events & Follow-up Actions (FE=Facility Final Effluent)

Test Date	TUc	Investigative Actions	Results
1/9/13	1.7	Re-screened 1/10/13 sample for paralysis on 1/17/13; no other action taken	Severe paralysis observed in 100% FE on Day 4 of test. Re-screened sample had a paralysis score of 1.6 (max. score = 4.0)
3/4/13	10.1	Analyzed 3/6/13 sample for pyrethroids. Re-screened 4 test samples for paralysis; Completed and submitted revised generic TRE workplan to Water Board.	Aborted broods & paralysis observed concurrently in FE test. One sample (3/6/13) continued to show moderately high paralysis (2.1-3.0) when re-screened 3/11 to 3/12/13. Bifenthrin & cypermethrin at estimated levels only; all other pyrethroids were non-detects.
4/12/13	1.18	No action. A few aborted broods observed in two highest FE concentrations. Significant IC25; NOEC = 100% FE.	Three deaths early in the 100% FE concentration responsible for significant effect on reproduction. Other animals in 100% FE had relatively reproduction.
5/6/13	2.34	Significant reduction in reproduction due primarily to aborted brood. Test animals healthy between broods. Complete Case-specific TRE Workplan.	All 6 FE samples were re-screened for paralysis. Some paralysis observed in samples used late in the test. The aborted broods observed early in test were atypical because paralysis was not present.
8/1/13	1.1	None; Toxicity too low to study	2nd test conducted 8/5-8/12/13 showed no toxicity.
9/12/13	2.9	TIE conducted by Pacific EcoRisk	10 TIE manipulations performed. Baseline was not toxic. Several manipulations increased toxicity over non-toxic baseline. Conclusion: Hydrophobic organic antagonist(s) may lessen toxicity of hydrophilic toxicant(s).
11/19/13	1.2	None; Toxicity too low to study	None

Chronic toxicity findings:

1. Conventional and priority pollutants do not appear to be responsible for chronic toxicity. These include, BOD, TSS, TDS, ammonia, chlorine, metals, cyanide, semi-volatile and volatile organic compounds, PCBs,

PAHs, and legacy (organochlorine) pesticides.
2. Several non-priority pollutants have also been ruled out. These include, diazinon, chlorpyrifos, alkylphenol ethoxylates, pyrethroids, fipronil, and vector control products.
3. An evaluation in 2013 detected no significant treatment upsets or changes to operations that would have contributed to detection of toxicity in effluent.
4. Maintenance practices, such as sewer cleaning or pesticide application, by the six sewer collection system agencies do not appear to contribute to the incidence of chronic toxicity or paralysis in animals exposed to FE.
5. TIE information suggests a hydrophilic toxicant and a hydrophobic antagonist. The antagonist lessens the amount of toxicity observed by changing bioavailability or enhancing the test organism's natural metabolic detoxification pathways.
6. UC Berkeley study and Pacific EcoRisk TIE investigations suggest that the toxicant is metabolically deactivated by the Cytochrome P450 group of enzymes. One group of such metabolically deactivated compounds is pyrethroid insecticides. These pesticides are synergized by piperonyl butoxide, a chemical which takes out the organism's ability to metabolically deactivate pyrethroids, thereby increasing their toxicity. However, chemical & toxicological studies rule out pyrethroids as the source of chronic toxicity.
7. The lack of FE sample toxicity persistence during holding is a major impediment to current TRE/TIE investigations.

The Facility conducted a chronic Effluent Toxicity Characterization Program (ETCP) Study in 2013. *Ceriodaphnia dubia*, the Facility's current test species, was the only species of five tested that was sensitive to Facility effluent.

It is now clear that "traditional" toxicants are not causing chronic toxicity in Facility effluent. Conventional TIE techniques may not be sufficient to determine the identity and sources of the detections. Future work includes continued paralysis tracking and the development of techniques designed to study influent samples upstream of the Facility to determine the utility of identifying toxicants by their source.

2013 Chronic Toxicity – Species Screening Study Results

Month	Test Round	Test Species	Organism type	Test Duration	Chronic Endpoint	IC_{25}	TU_C	TST*	Percent Effect*	Testing Lab
August	1	*Thalassiosira pseudonana*	Marine Diatom	96 Hours	Growth	> 100%	< 1.0	Pass	-201.0	PERL
August	1	*Mytilus galloprovincialis*	Bivalve	48 Hours	Normal Development	> 100%	< 1.0	Pass	-0.8	PERL
August	1	*Pimephales promelas*	Fathead Minnow	7 Days	Growth (Biomass)	> 100%	< 1.0	Pass	-11.0	PERL
August	1	*Menidia beryllina*	Inland Silverside	7 Days	Growth (Biomass)	> 100%	< 1.0	Pass	-7.1	PERL
August	1	*Ceriodaphnia dubia*	Water Flea	6-8 Days	Reproduction	90.7%	1.1	Fail	27.1	PERL
September	2	*Thalassiosira pseudonana*	Marine Diatom	96 Hours	Growth	> 100%	< 1.0	Pass	-73.4	PERL
September	2	*Pimephales promelas*	Fathead Minnow	7 Days	Growth (Biomass)	> 100%	< 1.0	Pass	-0.4	PERL
September	2	*Ceriodaphnia dubia*	Water Flea	6-8 Days	Reproduction	34.6%	2.9	Fail	57.3	PERL
October	3	*Thalassiosira pseudonana*	Marine Diatom	96 Hours	Growth	> 100%	< 1.0	Pass	-49.0	PERL
October	3	*Pimephales promelas*	Fathead Minnow	7 Days	Growth (Biomass)	> 100%	< 1.0	Pass	-7.6	PERL
October	3	*Ceriodaphnia dubia*	Water Flea	6-8 Days	Reproduction	> 100%	< 1.0	Pass	-25.8	RWF Lab

* Evaluated at 100% Effluent; % Effect = % Reduction from Control (negative results - effect > Control)

2. FACILITY ANNUAL REPORT UPDATES

The following annual update reports are submitted in accordance with NPDES Permit Provisions VI.C.4.a. thru 4.d.

- **a. Wastewater Facilities Status Report**
- **b. Reliability Status Report**
- **c. Operations & Maintenance Manual (O&M Manual) Update**
- **d. Contingency Plan for Operations Under Emergency Conditions**

a. WASTEWATER FACILITY STATUS

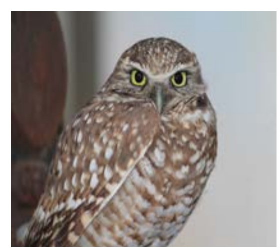
NPDES Permit Provision VI.C.4.a requires annual update of Wastewater Facilities Status. This encompasses major wastewater facility operations or capital improvements over the past year. Activities that involve planning, assessing, and upgrading Facility assets are divided into four areas: 1) Master Planning, 2) General Facility Status, and 3) an Operational Assessment.

1) Master Planning – 2013

The Plant Master Plan Environmental Impact Report (EIR) was certified by the San José Planning Commission and the modified preferred alternative was adopted by the City Councils of San José and Santa Clara. The EIR provided required analysis under the California Environmental Quality Act (CEQA) to identify impacts associated with the build-out of the Master Plan, along with required mitigations for those impacts. The Draft EIR was made available for public review for 60 days during January through February 2013 and resulted in nearly 400 individual comments. Final certification of the EIR occurred in November 2013 by San José's City Council, and in December 2013 by Santa Clara's City Council. The Master Plan has now moved into its implementation phase.

South Bay Shoreline Study. City staff worked with project sponsors of the South San Francisco Bay Shoreline Study: the US Army Corps of Engineers, the California Coastal Conservancy, and the Santa Clara Valley Water District. The study envisions a flood protection levee along the northerly boundary of the Plant's operational area. At this time, the future levee will stretch from the Union Pacific railroad line north of Alviso to the west, cut across Artesian Slough and follow the southern and eastern boundary of salt pond A18 before terminating in the north near the Coyote Creek bypass channel. Construction of this levee will be coordinated with Plant Master Plan projects and could possibly affect the phase-out of biosolids lagoons currently on or near the proposed levee alignment.

Burrowing Owl Habitat. The Western Burrowing Owl is listed by State of California as a species of special concern. In June 2013, RWF staff continued with habitat improvements for Burrowing Owls in the RWF bufferlands by expanding the managed area eastward into almost the entire 180-acre owl habitat preserve. Post-breeding season surveys indicate that owl numbers are increasing on-site. Additional surveys are planned before and after the 2014 breeding season.



Partnered Developments on Facility Bufferlands.

- **Silicon Valley Advanced Water Purification Center (SVAWPC).** In 2012, practically all construction was completed for the SVAWPC. The facility is located to the east of the RWF along Zanker Road. This is a joint project by the Santa Clara Valley Water District (District) and the City of San José to produce purified water and blend it back into the existing South Bay Water Recycling pipeline to improve the overall quality of

recycled water. In 2013, pre-commissioning of the facility began. As the first facility of its size and type, commissioning the facility has been very technical and time-consuming. This facility will be operational in mid-2014.

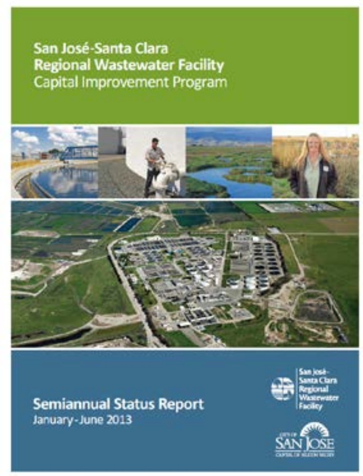
- **Zero Waste to Energy Development (ZWED).** A privately owned ZWED facility was constructed in 2013 on the north side of Los Esteros Road directly across from the RWF. ZWED is leasing RWF bufferland for an initial 30-year period through June 30, 2042. The official grand opening was held in November 2013. The ZWED facility began accepting organic waste streams from commercial establishments in December. ZWED is now processing waste through a dry fermentation anaerobic digestion system to generate bio-methane for conversion to electricity. The facility is being constructed in three phases, with each phase consisting of a building of approximately 60,000 square feet that can process approximately 75,000 tons of waste annually.

2) General Facility Status – 2013

a) Capital Improvement Program Semiannual Status Reports

Beginning in June 2013, the San Jose-Santa Clara Regional Wastewater Facility began publishing and posting to the City of San Jose website semiannual status reports to describe projections and current status of the CIP program. The first report, covering January – June 2013, is posted here: http://www.sanjoseca.gov/CivicAlerts.aspx?AID=494. The report for the remainder of 2013 will be posted at the same web location in early 2014.

An easy way to find the reports without the web link is to google the words: "San Jose Wastwater CIP"; the top hits will take you to the San Jose website or the reports themselves in pdf format.



From the website:

Projects for the Capital Improvement Program

The Plant Master Plan recommended over 100 projects to be part of a 30-year Capital Improvement Program (CIP). These projects are broken up into three phases:

- Phase 1: $450 million (2012-2021) for repair and rehabilitation project
- Phase 2: $416 million (2013-2021) for new biosolids dewatering and drying as well as new energy generation
- Phase 3: $1,124 million (2021-2040) for projects related to possible regulatory changes and ongoing repair and rehabilitation

a) Power

The Facility generates about half of its own power from the methane gas that is produced from the digesters. The digester gas is blended with a smaller portion of natural gas from PG&E and used as fuel for Engine Generators (E-1 through E-6, and EG-1 through EG-3) and the 1.4MW Fuel Cell to produce electricity. The blend gas is also used as fuel for the facility's six Cooper-Bessemer Engine Blowers (A-1 through B-3) located in the Secondary Blower Building. The remainder of the power demand is supplied as electricity purchased off the grid from PG&E.

Generators. In 2013, two of the three diesel Engine Generators were repaired and brought back on line. The Facility is now able to generate over 9 MW of electrical power as long as all three fully functional engine generators and the fuel cell are operating. Diesel generators are extremely reliable, even after decades of use, but operations can be limited due to availability of replacement parts.

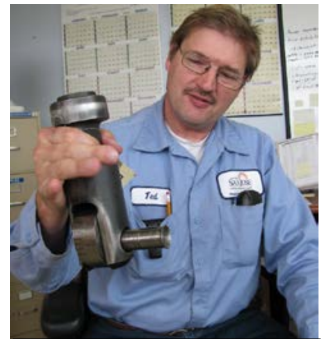
- E-5, a much older standby generator, ran up a total of 5,000 to 6,000 hours to compensate for the power gap until repairs were complete on EG-1 and EG-3.
- EG-3 was put in service in July 2013 after replacement of a broken camshaft tappet and general

Engine-Driven Generators & Fuel Cell

Generator	Location	Capacity (KW)	Year Built / Overhauled	Operational Status
E-1	P&E Building	800	1953	Retired - Used for Spare Parts
E-2	P&E Building	800	1953	Used for Standby
E-3	P&E Building	800	1953	Used for Standby
E-5	P&E Building	1,750	1962	Used for Standby
E-6	P&E Building	1,750	1962	Retired - Used for Spare Parts
EG-1	Building 40	2,800	1994	Operational
EG-2	Building 40	2,800	1983	Operational
EG-3	Building 40	2,800	1983	Operational
Fuel Cell	East Side	1,400	2012	Out of Service in October 2013
Total Capacity		8,400		

overhaul repairs such as replaced piston rings, rebuilt cylinder heads, and rebuilt turbochargers. The new tappet was fabricated by Cameron Compression Systems based on original specifications for the 1980s-era engine. This engine should now provide reliable service for the next 3 to 4 years.

- EG-1 was brought on line in October once broken cams were replaced on the camshaft.
- A 30% design to install 4 new back-up generators in the vicinity of the Facility's electrical substation #1 is complete. This project will be advertised for bids in 2014.

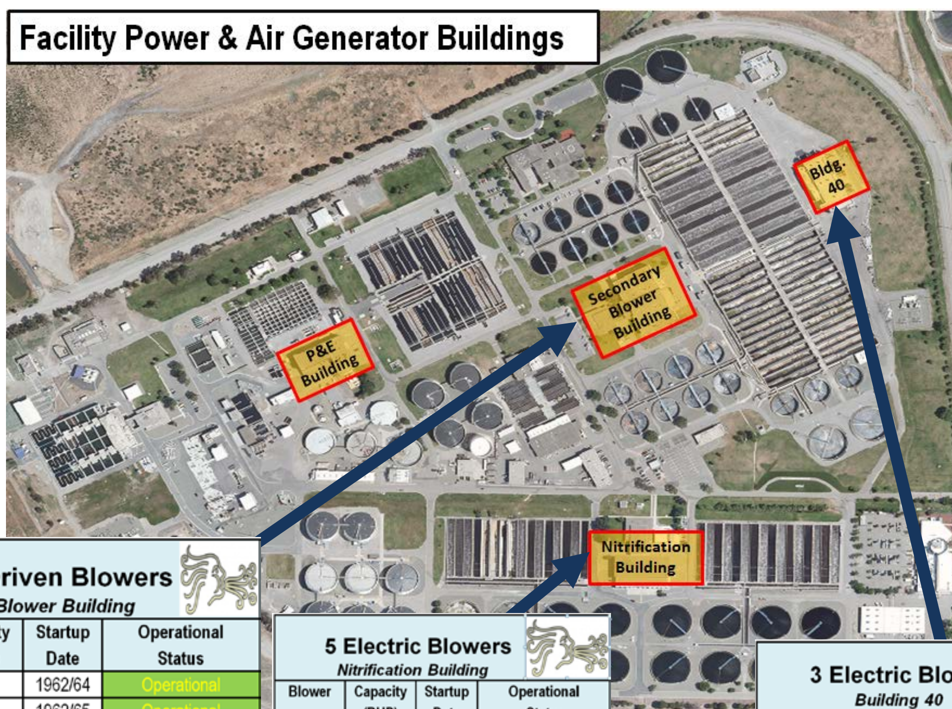


Mech. Sup. Ted Peck shows the broken Tappet

Blowers: The Facility maintains six engine-driven blowers (Cooper-Bessemer) and eight electric blowers that provide low pressure air to the secondary aeration basins. Currently, in typical operation, two engine-driven blowers are sufficient for secondary (BNR-1) aeration demand, and two electric blowers are sufficient to cover the nitrification area (BNR-2).

This reflects a considerable drop in peak aeration demand over the decades and improvement in energy efficiency as a result of implementation of the Biological Nutrient Removal (BNR) process: in the late 1970s through the mid-1980s, the entire mix of 14 blowers were required to meet the peak aeration demand in late summer.

The secondary area (BNR-1) has both engine-driven and electric blowers available for use. At this time, use of the engine-driven blowers is favored because of the relatively high price of electricity compared to natural gas. Plus, the Cooper-Bessemer engine generators automatically generate waste heat that is captured to warm the digesters.



6 Engine-Driven Blowers
Secondary Blower Building

Blower	Capacity (BHP)	Startup Date	Operational Status
A-1	2,345	1962/64	Operational
A-2	2,345	1962/65	Operational
A-3	2,345	1962/66	Operational
B-1	1,855	1962/67	Operational
B-2	1,855	1962/68	Operational
B-3	1,855	1962/69	Operational

5 Electric Blowers
Nitrification Building

Blower	Capacity (BHP)	Startup Date	Operational Status
N-1	2,250	1979	Operational
N-2	2,250	1979	Operational
N-3	2,250	1979	Operational
N-4	2,250	1979	Operational
N-5	2,250	1979	Out of Service

3 Electric Blowers
Building 40

Blower	Capacity (BHP)	Startup Date	Operational Status
EB-1	4,000	1983	Used for Standby
EB-2	4,000	1983	Used for Standby
EB-3	4,000	1983	Used for Standby

Fuel cell. The 1.4 MW fuel cell owned by UTS BioEnergy LLC ran reliably through September 2013. In October, the scrubber system was disconnected to allow replacement of the iron sponge that cleans digester gas to fuel cell standards. As the scrubber was being serviced, the fuel cell itself, "the cube," was damaged by a burst of high BTU natural gas that resulted in the need for substantial repair work. The unit is expected to be back in service in early 2014 following a required burn-in period.

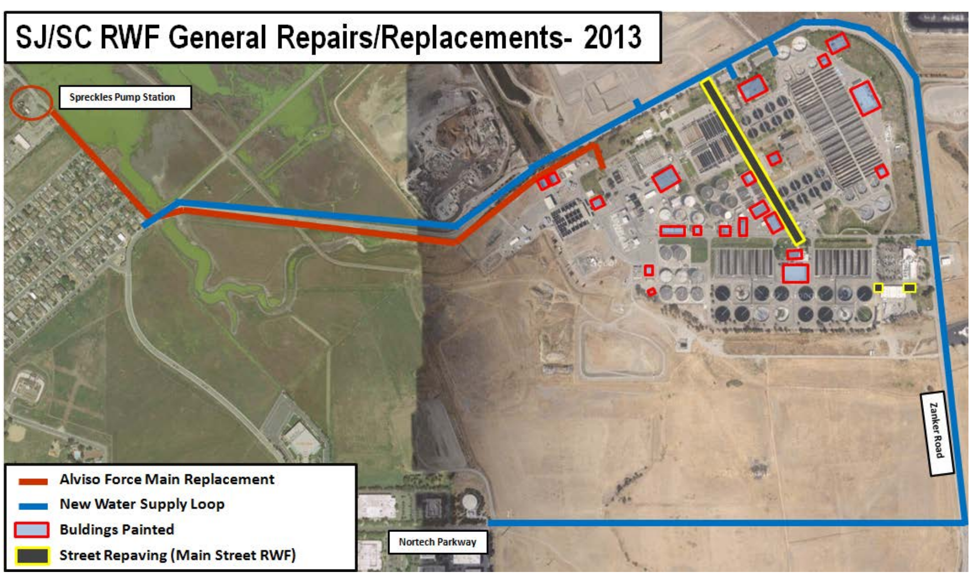
b) <u>General Repairs and Replacement</u>

The following replacement projects were completed in 2013:

- **Alviso Force Main Replacement.** 5000 feet of sanitary force main that delivers sewage from the Spreckles Pump Station in the Alviso district was replaced by the City of San Jose Public Works, Hydraulic Services Division.
- **Water Supply Loop.** A new, more reliable, 12 inch and 18 inch water supply line was installed to replace the single 6 inch line that had supplied the Facility for over 40 years. Roughly 5 miles of new water supply loop was installed in partnership between the Facility, the City of San Jose Municipal Water division, and the Zero Waste to Energy Development (ZWED). The new line forms a loop around the Plant from Nortech Parkway to Grand Boulevard in Alviso.

Building repainted in bone white and safety blue

- **Street Repairs/Road Repaving.** Roughly 1400 feet of the Facility's Main Street was repaved. Drainage areas adjacent to either side of the stores warehouse were also repaved.
- **Building Painting.** Staff repainted 25 buildings around the facility.



3) Operational Assessment

Facility operational status is monitored 24 hours a day by a Shift Supervisor and Computer Room Operator. The day-to-day operations are reviewed each week at a roundtable meeting of all Area Supervisors. This allows each Area Supervisor to point out changes to operational parameters and inform of potential impacts to other areas of Plant operations. Highlights of Facility operations in 2013:

a) Headworks

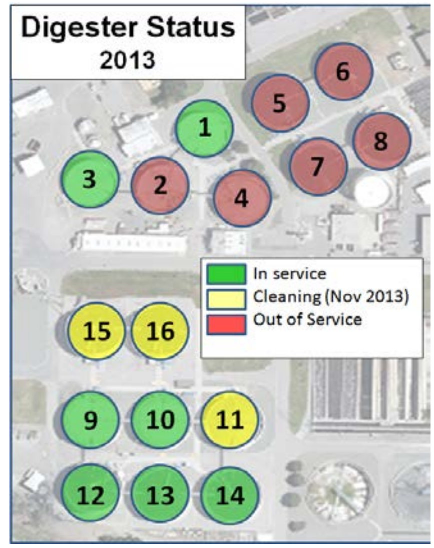
Facility headworks include both a new headworks area (Headworks 2 or HW2) an old headworks area (HW1) and an upstream Emergency Basin Overflow Structure (EBOS) that receives flow from the main interceptor lines. Each headworks unit consists of bar screens and grit removal chambers to capture and remove screenings and grit material.

- The newer HW2 operated for over 8 months in 2013; from 29 January to 21 August, and again from 4 September through 23 October.
- As HW2 was operating, all three vortex grit classifiers were run simultaneously. It was found that the three vortex units working together provide adequate grit removal.
- The new Duperon Flex Rake ran well over the portion of year that HW2 was operating. This alternate bar screen design appears to provide superior performance and reliability compared to the two traditional bar screens that operate beside it.
- Grit detritors and classifiers in the older HW1 area were repaired, partially rebuilt, sandblasted and painted.
- The Interim Ferric Chloride ($FeCl_3$) dosing station was installed at the EBOS in March 2013. This interim station is controlling hydrogen sulfide (H_2S) concentrations in raw sewage entering the Facility until a permanent station is built.

b) Primary Clarifiers

- Primary tanks B-8 and B-9 were completely rehabilitated in 2013: chains, sprockets, flights, tracks, and shafts were replaced and various other repairs were performed.
- One of the Primary Area's two scum pump stations was taken off-line and rebuilt. A chopper pump was installed to replace one of the three existing scum pumps as a pilot to evaluate performance in handling screenings and plastic buildup.

c) Digesters



Digester Status. There are 16 digesters that can process sewage sludge. Ten digesters, 1, 3, 9, 10, 11, 12, 13, 14, 15, and 16, are available for operations.

- Digesters 11, 15, and 16 were cleaned from September through December and are awaiting painting of gas piping and mechanical reconnection. 518 tons of screened material was collected and hauled away and 1.2 MG of water was used during the cleaning process.
- A temporary 8" line was installed from the digesters to a pump station that directs flow of digester cleaning waste to the vicinity of the Residual Sludge Management (RSM) area for storage and hauling. Part of a permanent 12" line was installed on the RSM side. The new line will expedite future digester cleaning.
- A $45M contract was awarded to Brown and Caldwell in October 2013. The contract work will rehabilitate digesters 5, 6, 7, and 8 with new covers and mixing systems and rehabilitate the heating systems and gas piping. The scope also includes rehabilitation of DAF tanks to facilitate co-thickening of primary and secondary sludge.

Digester Gas Compressors. Compressors CG-1, CG-3, and CG-4 continue to function, however the 2012 Energy Condition Assessment identified these compressors as the highest priority for upgrade due to their Remaining Useful Life (RUL) of 0 to 3 years. A 30% design to upgrade the compressors is complete. A contract will be advertised for bids in 2014.

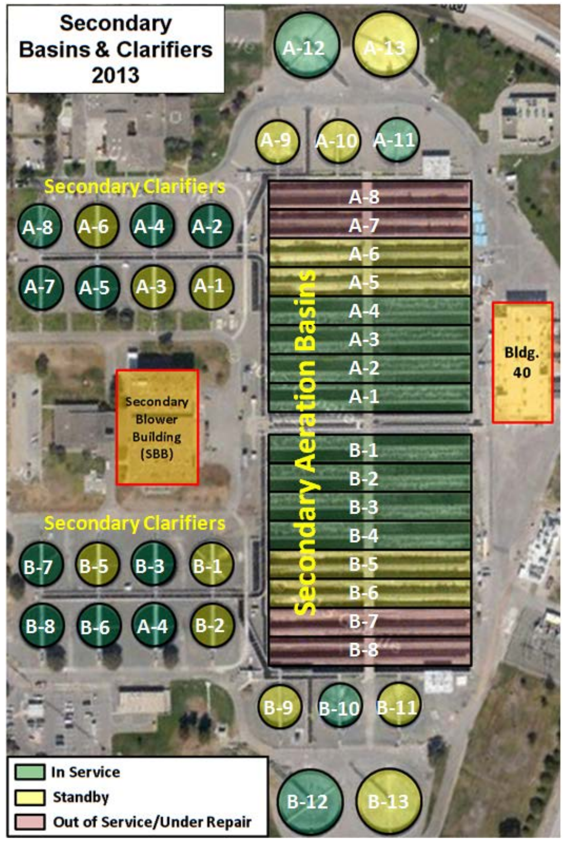
Digester Gas Holder. The small gas holder continued to provide all digester gas storage in 2013. This unit has sufficient gas storage capacity, but limitations of the smaller gas piping system presented challenges. Demand from the Facility's three gas compressors cause pressure oscillations that resulted in digester gas releases early in 2013. This problem was solved by replacing the old Pressure Release Valves (PRVs) on top of each digester with counter-balance PRVs that could accommodate the pressure swings. The design for a new 50,000 cubic foot, piston-type, dry-seal, gas holder is complete. This will eventually replace the large gas holder that failed in 2012. The Facility is currently advertising for bids.

Dissolved Air Flotation (DAF) System Improvements. This work involved replacement of a corroded 36" and 30" manifold connected to four primary effluent pressure flow pumps in the Sludge Control basement. A new 30" butterfly valve was installed and existing 24" check valves and knife gate valves on the discharge side of each pump were replaced.

d) Biological Nutrient Removal (BNR)

The Biological Nutrient Removal (BNR) Process is carried out in two locations, historically referred to the "Secondary" and "Nitrification" areas. In 1997/98, the aeration basins in each area were adjusted to perform the 4-stage, step-feed, BNR process that continues to be employed.

Secondary Area. Secondary basins A-1 through A-4 and B-1 through B-4 are all in service. These basins are fitted with fine bubble diffusers which more efficiently aerate the secondary tanks and save energy. A disadvantage to fine bubble diffusers is that they have a shorter service life (4 to 5 years) and suffer UV damage if left exposed in an empty tank. The older coarse bubble diffusers are less efficient, but essentially last forever.



- Secondary basins A-5, A-6, B-5, and B-6 were out of service in 2013, but available for emergency use if additional aeration capacity was needed. These basins are fitted with coarse bubble diffusers.
- Secondary basins A-7, A-8, B-7, and B-8 are out of service and undergoing rehabilitation. Electrical rehabilitation of all four basins continues. Basin A-7 and A-8 effluent gates that discharge into the Mixed Liquor Channel were replaced in 2013.
- WAS Magmeter. A new, more accurate, magmeter was installed to monitor the flow of Waste Activated Sludge (WAS) from the northern secondary area B-side. This follows the 2012 replacement of the A-side WAS meter. The two new meters now provide accurate flow monitoring of sludge wasting for the entire secondary (BNR-1) area that encompasses roughly 60% of the secondary aeration basins and clarifiers.

Nitrification Area. All 8 nitrification basins are in service and fitted with fine bubble diffusers.

- Maintenance repairs, patching, and painting were performed on mechanical parts in Nitrification clarifiers A-8 and B-8. The "tow bro" sludge collector systems were rehabilitated to alleviate corrosion.
- Nitrification clarifier B-13 was completely sandblasted and repainted.
- Variable Frequency Drives (VFDs) were installed on the remaining two of four nitrification area Return Activated Sludge (RAS) and Waste Activated

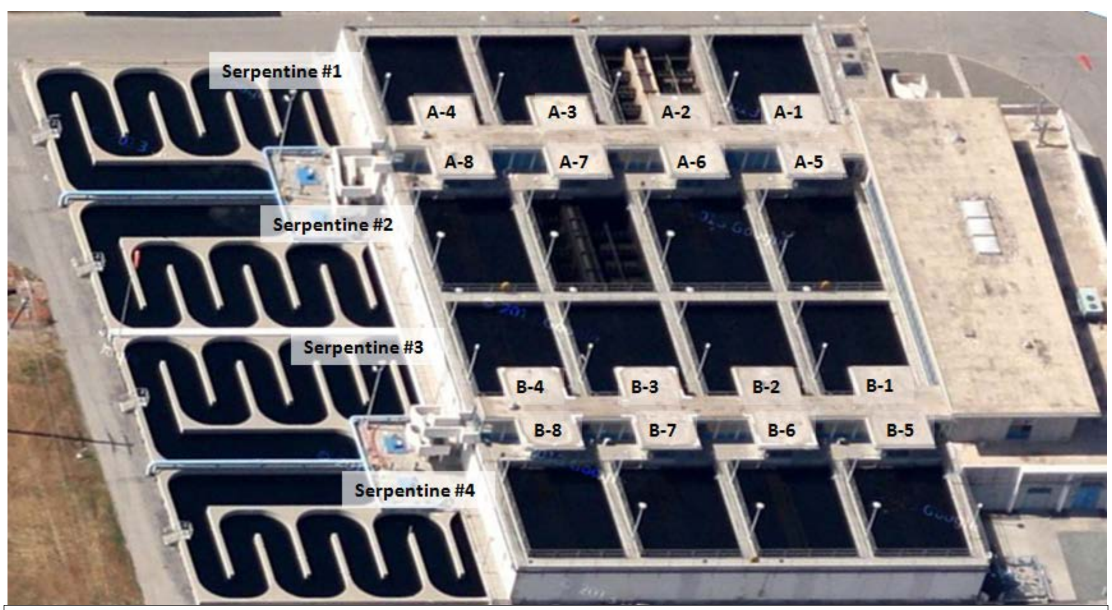
Maintenance work on Nitrification Area clarifier A-8

Sludge (WAS) pumps. All RAS pumps can now be operated remotely from the facility DCS.

- Fiber-optic connections were added to Motor Control Centers and graphics were added to DCS software so that nitrification area clarifiers can be remotely monitored and operated.

e) Filtration & Disinfection

- Filter bed A-4 continued to be run with monomedia and steel drain plates. This configuration appears to provide comparable, if not slightly better, performance compared to the more expensive dual-media filters. This arrangement will be considered as an option when the other filters are due for media replacement.
- The 24 inch effluent valve for filter bed A-2 was replaced, and the filter bed was topped off with anthracite media.
- From July through October, half of the Facility's filtration capacity was dedicated to recycled water production: filter beds B-1 through B-4 were used to produce recycled water in addition to beds B-5 through B-8. During that time, Serpentine Tank #3 was taken out of service.
- One of two pumps in the disinfection area that supply Facility process water (recirculated final effluent, also referred to as "No. 3 Water") experienced cavitation and had to be taken out of service for repair. Staff is drawing from recycled water to supplement process water supply until this pump is back on line.
- The Facility's two 12,500 gallon sodium hypochlorite day tanks were taken out of service in 2013 due to cracked discharge fittings. Staff have been routing sodium hypochlorite directly from the three 30,000 gallon main storage tanks until the day tanks can be replaced in early 2014.



Filter Building & Serpentine Tanks

b. PLANT RELIABILITY REPORT UPDATE

Permit Provision VI.C.4.a. requires annual review and update of the Plant Reliability Report. Facility reliability is assessed in three general areas: 1) infrastructure (asset) management, 2) personnel and procedures, and 3) financial resources.

1) Plant Infrastructure / Asset Management

Asset Management Group.

The Asset Management Group oversees implementation of the Computerized Maintenance Management System (CMMS) and the Geographic Information System (GIS).

CMMS. Work continues on developing a comprehensive Asset Management System. CMMS software was updated to Infor EAM version 10.1.2 and fully implemented in late 2013. Additional modules to this software will be integrated in 2014. The system is currently tracking over 14,400 vertical and linear assets and 4,800 inventory items. Preventative maintenance activities are in place for over 2,000 pieces of equipment, and are continually monitored in the CMMS system. Work orders, requisitions and purchase orders are generated through CMMS allowing the system to track labor and material costs. The Asset Management team also continues to improve the asset registry and asset tagging and identification process. Plans are being developed to connect the GIS and the CMMS system to improve the usability of both systems.

Underground Utility Identification. In 2013, Geographic Information System (GIS) staff adopted the American Society of Civil Engineers - ASCE 38-02 "Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data." Staff also implemented the "Design-Phase Subsurface Utilities Conflict Analysis Process" which uses recognized subsurface utilities engineering investigative procedures. These standards and procedures reduce the likelihood of encountering undocumented buried utilities during construction.

Plant Map Viewer. The electronic inventory of data expanded to include 1,500 valves, 160 miles of piping, (including 27 miles of piping abandoned in place). Various process flow diagrams were added to allow electronic access within the Map Viewer.

In 2013, Map Viewer software, ArcGIS for Server Flex Viewer, was updated to version 3.4. Additionally, a Basemap Fader Tool was added to allow viewing of multiple basemaps at the same time. Layers inside the Map Contents Window were expanded to allow viewing in multiple windows. The Plant Map Viewer is accessible to all employees on the ESD intranet. The following new map layers were added to show additional features:

- **Pullboxes**. This layer shows Street Light, Communication, and Fiber Optic Pullboxes.
- **HWS/HWR Loop Vaults**. This layer shows Hot Water Send/Return (HWS/HWR) Loop Utility Vaults that feed into the Admin Bldg.
- **Buried Utilities Owned by Others**. This layer shows all buried utilities owned by PG&E, AT&T, Silicon Valley Power, San Jose MuniWater, CalPine, and the Santa Clara Valley Water District located on Facility Property.

- **Photos – Buried Utilities**. This layer shows 1,638 points throughout the Facility. When user mouse clicks on a point, a photo of the exposed buried utilities pops up. Each photo is linked to a set of GPS coordinates.

An example of improvements to the Plant Map Viewer user interface.

Process Control Systems.

The Process Control team maintains the automated systems and software that monitor and report thousands of process parameters throughout the facility.

Distributed Control System (DCS) Software and Hardware Improvements. In 2013 the process control specialists began work with contractor, ABB, to migrate system graphics to the upgraded DCS system. In-house specialists also made a number of changes to input/output (IO) cards, created and implemented various DCS configuration system management tools, and created new NOVAX historical data reports:

- Diagnostic software was written for the DCS to auto-diagnose certain electrical problems.
- The new DCS connections to switchgears M1, M3 and 115KV yard are complete. Major electrical parameters and the annunciator panels associated with each section of those facilities are now monitored through the DCS. Energy data from these switchgears is saved in NOVAX and is included in the Facility's overall electrical report of power consumption throughout the facility.
- Most Motor Control Centers (MCCs) are now monitored from Distributed Control System (DCS). This allows remote monitoring of MCC operational status, and eventually will allow some remote start-up capability for a number of additional pieces of equipment.
- The DCS now monitors additional Fire alarms and tunnel exhaust fans
- The operations computer room now has remote control over variable speed drives and clarifier starts and stops,
- The NOVAX system now retains elapsed run time historical data for over 600 motors.
- Multiple DCS panels were constructed, installed and commissioned for the DCS upgrade by in-house staff.

2) Personnel

208 positions work directly under the Deputy Director of Wastewater Management to support the San José-Santa Clara Regional Wastewater Facility (formerly known as San José/Santa Clara Water Pollution Control Plant). Within this group, there were a total of 51 vacant positions as of December 31st, 2013. The vacancies include:

2 Air Conditioning Mechanics,2 Assistant Heavy Diesel Equipment Operator Mechanics, 2 Engineering Technicians, 3 Industrial Electricians, 2 Instrument Control Technicians, 1 Wastewater Maintenance Superintendent, 1 Painter, 2 Process & Systems Specialists, 1 Senior Engineer, 1 Senior Engineering Technician, 1 Senior Industrial Electrician, 1 Warehouse Worker, 9 Wastewater Attendants, 7 Wastewater Mechanics, 1 Wastewater Mechanical Supervisor, 5 Wastewater Operators, 8 Wastewater Operations Forepersons, and 2 Wastewater Senior Mechanics.

The Facility is supported by three principal divisions: Operations, Mechanical Maintenance, and Energy and Automation. Additional support is provided by the Planning and Development Division, the Sustainability and Compliance Division and the Facility Environmental Laboratory.

Operations Division. The Operations Division is assigned 72 positions and is responsible for the daily control of the water treatment processes. A minimum of 8 personnel are on site at all times under the oversight of a Wastewater Operations Foreperson.

Facility Maintenance Division. The Facility Maintenance Division is assigned 73 positions. It is organized in five sections:

- The Corrective Maintenance section repairs all mechanical equipment including, pumps, piping, rotating equipment, and structures.
- The Preventative Maintenance section oversees maintenance planning and scheduling.
- The Paint section provides protective coatings for equipment and infrastructure.
- The Maintenance Control Center maintains all buildings on site and is responsible for landscaping, warehouse, and land management.
- Asset Management develops and supports the computerized maintenance management system and geographical information services.

Energy and Automation Division. The Energy and Automation Division is assigned 55 positions and maintains the electrical infrastructure, power generation, instrumentation, and process control systems. It is organized in four sections: Electrical, Instrument Control, Power & Air, and Process Control. This Division also oversees Facility energy use and purchase of natural gas, landfill gas and electricity.

CIP Division. As of the end of December, CIP Division is assigned 31 positions from both Environment Services Department and Public Works, including 5 vacancies. The division is comprised of five groups: CIP Pre-Design Studies/O&M Support, CIP Design, Electrical Engineering, CIP Construction, and CIP Program Management.

Environmental Compliance and Safety. Regulatory compliance and land use planning is overseen by 12 members of this group under the Environmental Services Department, Sustainability and Compliance Division. These personnel are comprised of environmental and regulatory analysts who monitor, report, and handle corrective action related to the National Pollutant Discharge Elimination System (NPDES) permit, air emissions permit, and health and safety regulations.

Environmental Laboratory. The Facility's on-site laboratory is staffed with 28 personnel: 13 laboratory chemists, biologists and technicians support wastewater operations; and the remainder of laboratory staff perform trace analytical work and client services.

3) Finance

The Facility operates through a Joint Powers Agreement (JPA) under an "Agreement between San Jose and Santa Clara Respecting Sewage Treatment Plant" dated May 6, 1959. In accordance with this master agreement, the Facility is jointly owned by both cities and is administered and operated by the City of San Jose. The Facility service area includes additional tributary sanitary sewer collection agencies, including the following municipalities, sanitary sewer districts, and unincorporated County territory: San Jose, Santa Clara, Milpitas, Cupertino Sanitary District, West Valley Sanitation District, County Sanitation District Nos. 2-3, and Burbank Sanitary District. Each agency retains sole ownership and responsibility of its own sanitary sewer collection system. Through a series of additional "Master Agreements for Wastewater Treatment," the six additional tributary collection systems hold the rights to a share of Facility treatment capacity.

Each agency prepares its revenue program annually by establishing sewer service and use charges. Rates are adopted by ordinance or resolution of the governing body of each Agency. The Agencies' revenue programs are submitted to the City of San Jose, as the administering agency, for review to determine conformity with State Water Board revenue program guidelines.

The Contributing Agencies

2014-2018 Capital Improvement Program (CIP). The 2014-2018 Adopted CIP provides funding of $725.1 million, of which $183.5 million is allocated for 2013-2014. Revenues for the five-year CIP are derived from several sources:

- $202.8 million: transfers from the City of San Jose Sewer Service and Use Charge Fund,
- $15.5 million: transfers from the San Jose Sewage Treatment Plant Connection Fee Fund,
- $203.6 million: contributions from the other the City of Santa Clara and other tributary agencies,
- $3.6 million: Interest earnings,
- $1.9 million: Calpine Metcalf Energy Center Facilities Repayments, and
- $2.0 million: Federal grants from the US Bureau of Reclamation and Water SMART grant.
- $177 million: single bond issuance

Contributions from the City of Santa Clara and other agencies total $203.6 million, which represents a $130.1 million (63.9%) increase compared to the 2013-2017 Adopted CIP. The most significant increases to the program reflect the incorporation of the Package 2 projects, namely the New Bio-solids Facility project and the Energy Generation Improvement project.

The CIP Packaged Approach. The 2014-2018 CIP was adapted to reflect the Plant Master Plan as well as a new "packaged approach" for implementation of recommended capital improvement projects:

Package 1, includes critical treatment process rehabilitation projects. These projects are estimated to average $40 million per year over the next 10 years. Current rate models for the 5-year CIP suggest rate increases of 3% for three years beginning in 2014-2015 would be needed to fund Package 1. This estimate could change and does not include the costs for any Package 2 projects that would be undertaken in later years.

Package 2, will include new technology projects that replace existing treatment processes rather than rehabilitating existing infrastructure. Examples include the transition from existing open air bio-solids drying to mechanical dewatering and drying, installation of new gas turbines to replace existing engine generators, and new filtration technology to replace existing gravity filters. The estimated cost for these projects is between $400 and $500 million over the next five to seven years.

Package 3, which is not included in this CIP, will include projects that are to be constructed beyond the 10 to 15 year horizon (beyond 2021). These include end-of-life-cycle replacements for existing infrastructure and new projects driven by regulatory requirements. The estimated cost for Package 3 is 1.1 billion, with annual spending and timing of implementation still undefined.

Reserve Funds. The Wastewater Facility continues to maintain a Reserve for Equipment Replacement of $5.0 million according to its Master Agreement guideline, Clean Water Financing Authority (CWFA) Bond Covenants, and the State Water Resources Control Board's (SWRCB) Fund Loan Agreement policy.

Table below provides 2012-2013 actual CIP expenditures & encumbrances as of June 30, 2013.

2012-2013 Capital Improvement Program Year-end Expenditure Summary				
	Appn	**Project**	**Expenditure on 6/30/2013**	**Current Encumbrances**
1	4120	PLANT MASTER PLAN	969,992.51	587,508.08
2	4127	DIGESTER REHAB	23,935.80	51,372.21
3	4332	EQUIPMENT REPLACEMENT	1,425,208.87	297,330.00
4	4341	PLANT ELECTRICAL RELIABILITY	935,827.04	450,185.00
5	4679	ALTERNATIVE DISINFECTION	14,948.73	1.00
6	4931	INACTIVE LAGOONS BIO SOLIDS RM	0.00	0.00
7	5690	PLANT INFRASTRUCTURE IMPVT	1,269,701.12	2,289,600.72
8	5691	UNANTICIPATED/CRITICAL REPAIRS	0.00	0.00
9	5957	PUBLIC ART	68,714.17	109,000.00
10	6000	CITY-WIDE & PW CAP SUPPRT COST	503,402.11	0.00
11	6508	SBWR RESEVOIR FACILITY	174,435.46	288,186.02
12	6584	PAYMENT FOR CWFA TRUSTEE	0.00	0.00
13	6589	REVISED SBAP-SBWR EXTENSION	314,402.34	4,718,470.41
14	7073	HEADWORKS ENHANCEMENT	154,268.94	39,911.43
15	7074	SECNDARY & NITRFCTN CLARFR REH	10,375.77	0.00
16	7161	RECOVERY ACT SBWR PHASE 1C	53,394.26	0.00
17	7224	ADVNCD PROCS CONTRL & AUTOMATN	72,693.29	506,229.00
18	7225	DAF DISSOLUTION REHAB & ODOR	226,931.12	522,850.00
19	7226	E PRIMARY REHAB-SEISMIC & ODOR	0.00	0.00
20	7227	FILTER IMPVTS	0.00	0.00
21	7228	FINE BUBBLE MEMBRANE DIFF CONV	0.00	0.00
22	7229	FUEL CELL	15,014.56	0.00
23	7230	IRON SALT FEED STATION	15,412.29	0.00
24	7231	WAREHOUSING ADDITIONS	0.00	0.00
25	7362	SBWR BACKUP WATER SUPPLY	1,361,474.30	112,878.00
26	7364	SBWR MASTER PLAN	599,635.33	1,426,704.67
27	7393	T.P. ENGINE REBUILD	1,395,991.82	467,134.44
28	7394	T.P. DISTRIBUTD CONTROL SYSTEM	341,005.25	2,015,710.55
29	7395	URGENT & UNSCHEDULD T.P. REHAB	537,463.21	884,900.42
30	7396	T.P. STREET RESURFACING	209,559.53	307,598.00
31	7397	T.P. FIRE MAIN REPLACEMENT	1,267,581.59	0.00
32	7448	HEADWRKS #1 REPAIR & REPLACE	64,083.02	65,365.66
33	7449	HEADWORKS NO. 2 EXPANSION	144,192.85	152,519.19
34	7450	BNR 1 & BNR 2 CONNECTION	0.00	0.00
35	7451	NEW FILTER TECHNOLOGY	82,542.37	41,717.69
36	7452	BIOSOLIDS TRANSITION TECHNLGY	0.00	0.00
37	7453	COMB HEAT&PWR EQUIP REPR&RHAB	477,701.01	181,982.74
38	7454	COMB HEAT&PWR TECH EVALUATION	391,156.27	796,666.45
39	7455	SBWR SYS RLBLTY&INFRA RPLCMNT	88,450.41	0.00
40	7456	PRELIMINARY ENGINEERING	242,493.81	2,062.00
41	7481	PROGRAM MANAGEMENT	662,919.63	414,813.75
42	7626	SB WATER RECYCL MST PLN REIMB	39,013.44	560,986.56
		TOTAL	**14,153,922.22**	**17,291,683.99**

Operating and Maintenance Budget. In the 2013-2014 Operating and Maintenance Budget, one reduction of $100,000 in the Worker's Compensation Claims appropriation was adopted due to a revision in a projection given by the Human Resources Department. Since these funds were either previously appropriated, or a reduction from the Proposed Budget, this does not change the TPAC distribution amounts for FY13-14. These changes will be realized by TPAC members via credits in future billings

TREATMENT PLANT OPERATING FUND

FISCAL YEAR 2013-2014 ADOPTED

Budget Summary	2011-2012 Adopted Actuals	2012-13 Adopted Actuals	2013-14 Proposed Budget	2013-14 Adopted Budget
Personal Services	37,799,884	38,438,094	43,735,011	43,735,011
Non-personal Expenses	22,842,937	23,055,591	27,667,518	27,667,518
Equipment	523,232	900,000	900,000	900,000
Inventory	323,010	344,934	400,000	400,000
Department Expenses	61,489,063	62,738,619	72,702,529	72,702,529
Overhead	6,429,975	6,610,459	8,380,904	8,380,904
City Hall Debt Service	850,879	948,041	1,068,233	1,068,233
Workers' Compensation	409,304	412,008	700,000	600,000
City Services	814,210	1,052,177	1,366,039	1,366,039
Additional Pension Costs	760,873			
City Expenses	9,265,241	9,022,685	11,515,176	11,415,176
TOTAL EXPENSES	$70,754,304	$71,761,304	$84,217,705	$84,117,705

ESTIMATED COST DISTRIBUTION

2013-14 Estimated Total Gallons Treated (MG)	(1) Percent of Total Sewage Treated	City / District	2013-14 Projected
25,704.54	64.604	City of San Jose	$54,408,006
5,441.40	13.968	City of Santa Clara	11,763,529
31,145.94	78.572	Sub-Total	$66,171,535
3,316.14	8.502	West Valley Sanitation Distric	7,160,189
1,971.41	5.193	Cupertino Sanitary District	4,373,425
2,308.66	6.454	City of Milpitas	5,435,411
382.919	1.003	Sanitation District # 2 - 3	844,704
105.419	0.276	Burbank Sanitary District	232,441
8,084.55	21.428	Sub-Total	$18,046,170
39,230.49	100	TOTAL	$84,217,705

(1) Composite of four parameters (flow, BOD, SS, ammonia). Source 2013-14 Revenue

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Regulatory fees and membership dues. Permit fees and membership dues with professional organizations that represent the wastewater industry are a small but essential component of the overall Plant budget.

Major Permit Fees – 2012-2013		
Fees	**Agency**	**Amount**
Permit: Annual NPDES Fee	State Water Resources Control Board	$495,897
Permit: Annual RMP Participation	Regional Monitoring Program – SFEI	$252,065
Permit: Annual Air Permit Fee	Bay Area Air Quality Management District	$77,819
Related Membership Dues		
Membership: BACWA Annual Dues	Bay Area Clean Water Agencies	$156,000
Membership: WERF Research Dues	Water Environment Research Foundation	$40,059
Membership: NACWA Annual Dues	National Association of Clean Water Agencies	$43,750
Membership: CASA Annual Dues	California Association of Sanitation Agencies	$18,000
Membership: Water Reuse Subscriber Dues	Water Reuse Association	$25,000
Membership: Water Reuse Membership	Water Reuse Association	$8,624
Membership: Green Cities California Fund	The San Diego Foundation	$10,000
Membership: Western Recycled Water Coalition	Western Recycled Water Coalition	$14,997

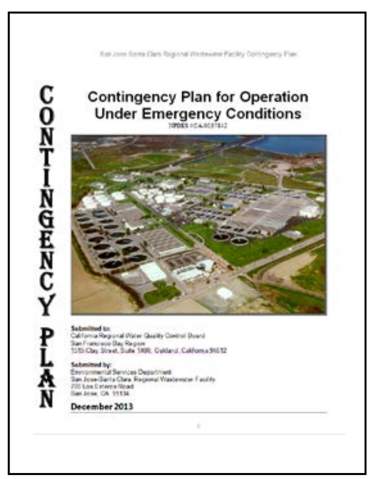
c. O&M MANUAL UPDATE

The Facility Online O&M Manual (OLM) is posted electronically on the RWF intranet server. The manual provides a searchable reference library describing Facility processes, equipment, and operational procedures. As SOPs are approved, they are copied in the OLM and referenced to the SharePoint SOP library.

As of 2013, the Facility Operations Division moved additional existing SOPs to the SharePoint library and now has 375 SOPs either drafted, approved, or pending approval. The Maintenance Division developed a new O&M manual library in the SharePoint system and now has 146 SOPs posted. The Energy and Automation Division posted 39 SOPs.

d. CONTINGENCY PLAN UPDATE

In 2013, sections were revised to reflect the Facility staff reorganization and title changes. Remaining information about Chlorine level alarms was removed after the alarm panels were deactivated this year.



3. ENVIRONMENTAL MONITORING

a. Avian Botulism Monitoring


SAN FRANCISCO BAY
BIRD OBSERVATORY

Avian Disease Prevention Program
Monitoring in Artesian and Alviso Sloughs
June – November 2013

Prepared For:
City of San Jose
Environmental Services Department

Prepared By:
Natalie Washburn, Waterbird Program Coordinator

San Francisco Bay Bird Observatory
524 Valley Way, Milpitas, CA 95035

27 November 2013

In accordance with Permit Provision VI.C.2.c., since 1983 the San José-Santa Clara Regional Wastewater Facility has contracted with the San Francisco Bay Bird Observatory (SFBBO) to monitor for avian botulism outbreaks in the vicinity of the wastewater discharge from June through November.

In 2013, no outbreaks of avian botulism were detected. A total of 16 dead birds were collected and 13 sick birds observed within the survey area of Artesian and Alviso sloughs. None of the dead or sick birds were identified as having avian botulism.

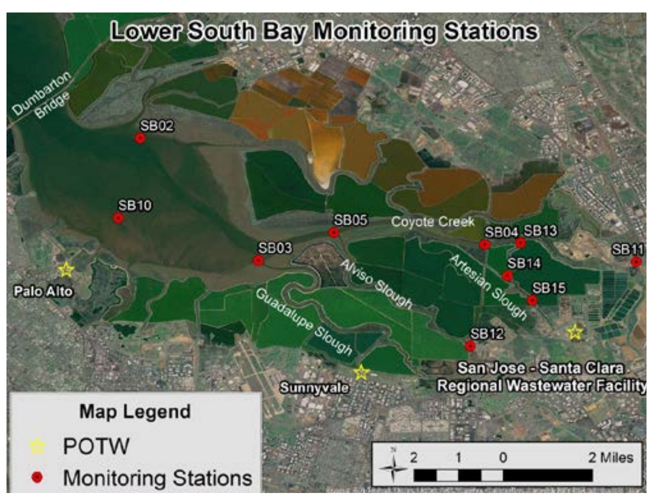
The full Avian Botulism Report is posted on the City of San Jose web site at: http://www.sanjoseca.gov/Archive.aspx?AMID=156&Type=&ADID

b. South Bay Monitoring

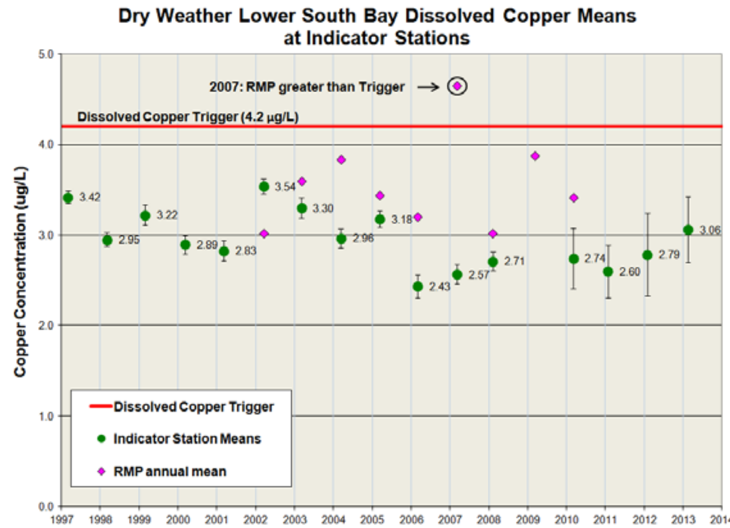
The South Bay Monitoring program is a long-term monitoring program for surface water quality in Lower South San Francisco Bay (South of the Dumbarton Bridge). The City of San Jose has conducted ambient water quality for more than 5 decades with monitoring frequency and parameters changing as science advances our understanding of the Bay and regulatory priorities shift. The Facility has monitored the Lower South San Francisco Bay for water quality parameters (pH, Dissolved Oxygen (DO), Temperature, and Turbidity) monthly from 1965 to 2009, providing long-term measurements of the health of the receiving waters immediately downstream of effluent discharge. Nutrient monitoring (Ammonia, Nitrate, Nitrite, and Phosphate) was added in the mid-1970s. The data demonstrate dramatic improvements in Lower South Bay Water Quality as treatment upgrades were implemented in the 1970s and 1990s.

Below is a summary of the current South Bay Monitoring effort.

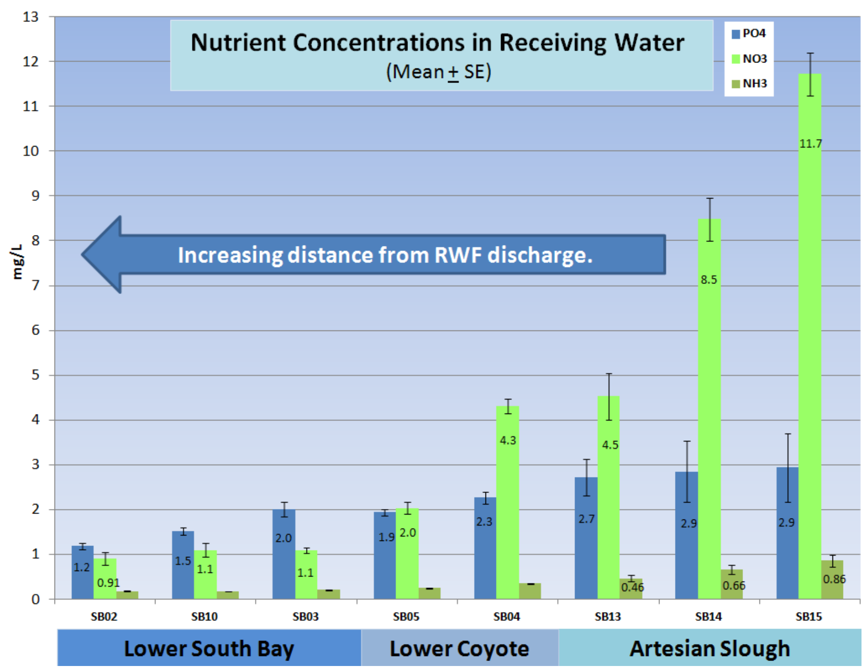
Quarterly metals, nutrients, and water chemistry. San José-Santa Clara Regional Wastewater Facility biologists perform quarterly monitoring for metals, nutrients, and water chemistry in Lower South San Francisco Bay receiving water by boat at 10 stations. Monitoring of concentrations of total and dissolved metals was added to ambient water quality monitoring in 1997 in response to concerns about ambient dissolved copper and nickel levels. This monitoring tracks seasonal and annual trends for a variety of pollutants of concern.



Copper Action Plan. The Facility's current NPDES permit requires implementation of additional "Copper Action Plan" tasks if the three-year rolling mean dissolved copper concentration of Lower South Bay exceeds 4.2 µg/l. Data collected by both Facility staff and the San Francisco Bay Regional Monitoring Program (RMP) show that the dissolved copper three-year rolling mean remains below the 4.2 µg/l trigger level in the Lower South Bay. RMP data indicated concentrations above the trigger on one instance in 2007 but that higher concentration has not been seen since, and the three year rolling mean never exceeded the trigger. It is increasingly doubtful that the dissolved copper concentration in the Bay will ever exceed the 4.2 µg/l trigger.



Nutrient Monitoring. The Facility continues to monitor nutrients in Artesian Slough and the lowest reach of Coyote Creek monthly. Facility final effluent nutrient concentrations are well documented. This additional 22 months of receiving water data describes attenuation of nutrients as they flow away from the Plant. Phosphate and Ammonia concentrations nearest the outfall are only slightly higher than concentrations measured in the Lower South Bay. Higher nitrate concentrations attenuate rapidly as effluent mixes and reacts with Bay water in Artesian Slough and the lower reach of Coyote Creek. Dilution accounts for at least 70% of the initial nitrate attenuation with 30% likely lost to assimilation by phytoplankton and other microbes.



c. Pond A18 Monitoring

Pond A18 is a shallow, slow circulating pond (up to a 62 day residence time) that is highly productive. During the summer, high respiration and decomposition rates, high algal biomass, and phytoplankton community succession or turnover cause A18 to be susceptible to low DO conditions (hypoxia).

Pond A18 was opened to circulation with Coyote Creek and Artesian Slough in February 2005. Since then, the City of San Jose (City) has monitored water quality of Pond A18 discharge water in accordance with Waste Discharge Requirements (WDR) Order No. R2-2005-0003 (Order). The City continuously monitors general water quality of Pond A18 during each dry season. The requirement to monitor the receiving water continuously during the dry season was lifted by the Water Board Executive Officer in 2013 because eight years of continuous general water quality monitoring indicated no negative impacts to receiving waters from pond discharges even during periods of pond hypoxia.

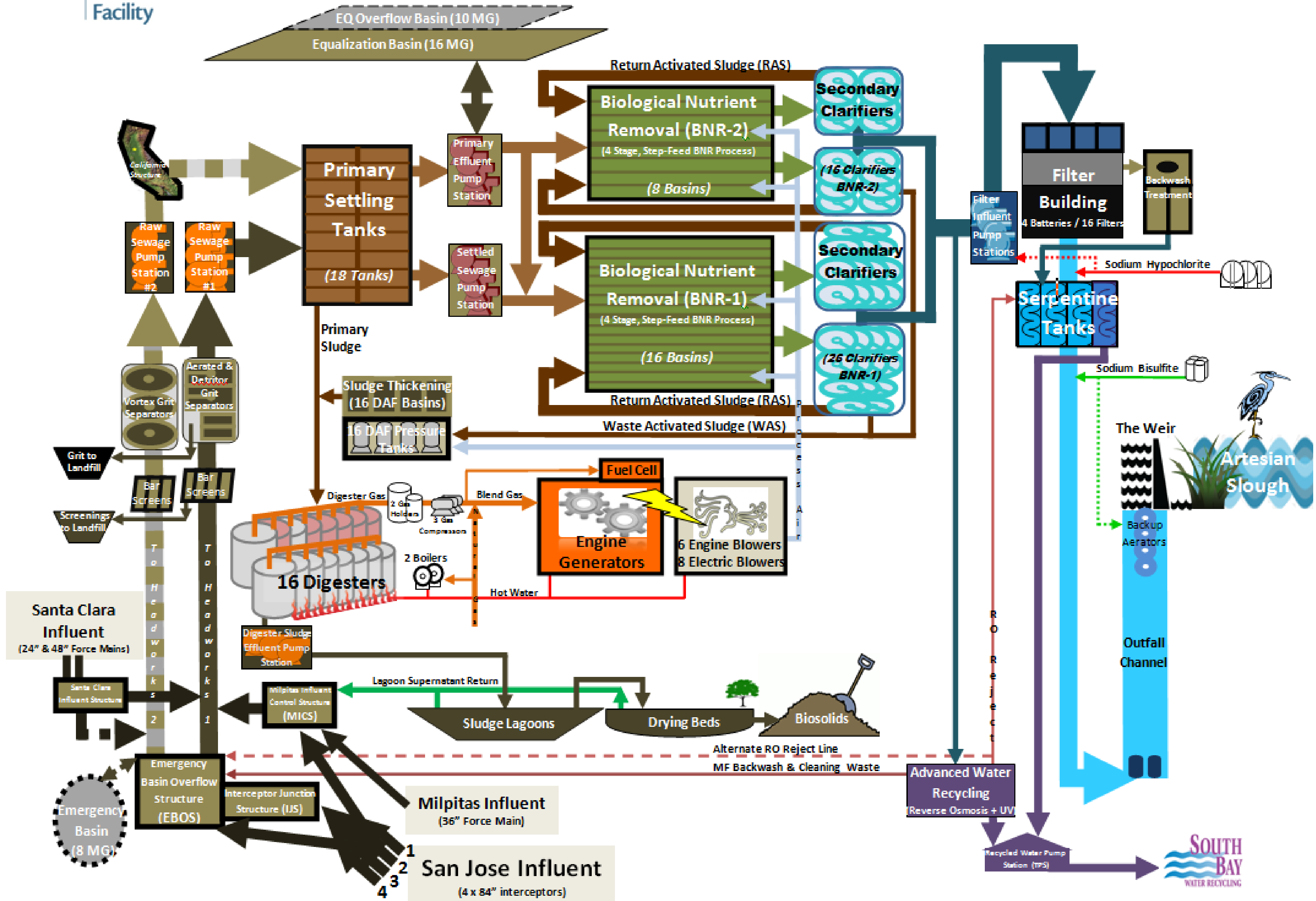
Per Water Board instruction, the City measured mercury, methylmercury, and associated parameters in sediments collected from the receiving waters (Artesian Slough) that A18 discharges to rather than from inside the pond. It is unclear if there is any correlation between these data and Pond A18 discharge. However, this information is useful in the broader context of mercury concentrations in the Lower South Bay and its tributaries; especially as the South Bay Salt Pond Restoration Project continues to proceed.

The full Pond A18 Annual Report is posted on the City of San Jose web site at: http://www.sanjoseca.gov/Archive.aspx?AMID=155&Type=&ADID=

San José-Santa Clara Regional Wastewater Facility

Revised: 2/2014

Process Schematic



ATTACHMENT A - Laboratory Accreditation

CALIFORNIA STATE

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM BRANCH

CERTIFICATE OF ENVIRONMENTAL ACCREDITATION

Is hereby granted to

San Jose/ Santa Clara WPCP Laboratory

ESD

4245 Zanker Road

San Jose, CA 95134

Scope of the certificate is limited to the
"Fields of Testing"
which accompany this Certificate.

Continued accredited status depends on successful completion of on-site, proficiency testing studies, and payment of applicable fees.

This Certificate is granted in accordance with provisions of Section 100825, et seq. of the Health and Safety Code.

Certificate No.: **1313**

Expiration Date: **09/30/2014**

Effective Date: **10/01/2012**

Richmond, California
subject to forfeiture or revocation

Fred Choske for
David Mazzera, Ph.D., Assistant Division Chief
Division of Drinking Water and Environmental Management

ATTACHMENT B – Net Environmental Benefit Discussion

Net Environmental Benefit of the San-Jose-Santa Clara RWF

The Facility's 5-year NPDES permit to discharge wastewater into the Lower South San Francisco Bay expires in May 2014 and will be reissued by the San Francisco Bay Regional Water Quality Control Board (Water Board) later in the year. The net impact, or "Net Environmental Benefit" (NEB), of Facility's discharge on local ecology is evaluated with each permit reissuance. The following discussion highlights key points of this evaluation.

Concerns in the 1980s, and what was done about them.

In the late 1980s, wastewater discharge from the Facility was 110 to 120 million gallon per day (MGD). There were serious concerns that this volume of discharge may have been impairing the downstream environment. These concerns resulted in a Water Board Cease and Desist Order (CDO No. 89-103) and a State Water Board Order (SWB Order No. 90-5) that acknowledged at the time that information was limited but ultimately determined that the Facility may have been impairing the local environment as a result of:

- Too much freshwater discharge converting salt marsh to freshwater marsh.
- High concentrations of heavy metals such as copper, cadmium, nickel, lead, etc.
- High concentrations of nitrogen and phosphorus nutrients that could cause eutrophication.
- An assumption that discharge of treated wastewater could contribute to outbreaks of Avian Botulism (acknowledging, however, that "the exact mechanisms for the outbreak and transmission of avian botulism are unclear …").

As a result of these concerns, long-term corrective actions were undertaken since 1990:

1. Water conservation & recycling programs and sewer collection system infiltration reduction has reduced RWF Average Dry-Weather Effluent Flows (ADWIF) from 100 to 110 MGD in the early '90s to less than 90 MGD today.
2. A 22-year marsh mapping project (discussed further below) documented that Facility fresh water effluent was not causing salt marsh to disappear. In fact, the study documented nearly across the board <u>increase</u> in salt marsh.
3. Industrial Waste Source Control/Inspection Programs and Pollution Prevention/Outreach Programs reduced the concentration of heavy metals in raw sewage, and this in-turn resulted in significant reductions in the metals concentrations in the effluent discharged.
4. In 1997-1998, the SJ-SC RWF converted its secondary treatment processes to perform Biological Nutrient Removal (BNR) resulting in significant reduction in nitrogen and phosphorus loads.
5. Avian Botulism monitoring and mitigation/management actions continue because the disease is always a threat in freshwater marshes with large numbers of waterfowl. The presence of a tertiary wastewater treatment plant is not known to affect outbreaks.

Today, in consideration of the 5-year permit reissuance, determination should be made that the high-quality water discharged from San Jose-Santa Clara Regional Wastewater Facility provides an overall "Net Environmental Benefit" to Artesian Slough, the lower reach of Coyote Creek, and the Lower South San Francisco Bay.

Net Environmental Benefit and Beneficial Uses.

According to EPA definition (1984): A finding of NEB "demonstrates that (1) full and uninterrupted protection will be given to all beneficial uses which could be of the receiving water … in the absence of point source discharges and (2) that there will be creation of new beneficial uses of fuller realization of existing uses beyond that which would occur in the absence of point source discharge." In other words, Net Environmental Benefit requires protection of existing beneficial uses and enhancement or addition of at least one beneficial use. Under this concept, the eight beneficial uses listed in the SJ-SC Regional Wastewater Facility NPDES permit should be used as a framework for evaluating NEB.

Beneficial Uses of Artesian Slough. SJ-SC RWF permit (NPDES Permit No, CA003842), Table 5, lists beneficial uses for Artesian Slough as tributary to Coyote Creek:

1. Wildlife Habitat (WILD)
2. Fish Spawning (SPWN)
3. Warm Freshwater Habitat (WARM)
4. Cold Freshwater Habitat (COLD)
5. Fish Migration (MIGR)
6. Non-contact Water Recreation (REC-2)
7. Contact Recreation (REC-1)
8. Groundwater Recharge (GWR)

<u>WILD, SPWN, WARM, COLD, or MIGR beneficial uses</u>. The first five beneficial uses, as listed here, reflect water quality parameters that impact habitat. Discharge of any parameter that impairs habitat use would be an impairment for one or more of these beneficial uses. For example, a key finding in State Water Board Order 90-5 in 1990 was that the SJ-SC RWF freshwater discharge was causing conversion of salt marsh into freshwater marsh. Since salt marsh provided habitat for the endangered species California clapper rain and salt marsh harvest mouse, discharge resulting in loss of salt marsh was considered impairment of the beneficial use #1 (WILD).

The San Francisco Bay Basin Plan, (http://www.waterboards.ca.gov/rwqcb2/basin_planning.shtml) lists certain water quality parameters as potentially impacting the WILD, SPWN, WARM, COLD, or MIGR beneficial uses. These include: dissolved oxygen, pH, alkalinity, salinity, turbidity, settleable matter, oil, toxicants, and specific disease organisms.

<u>REC-1 and REC-2 beneficial uses</u>. Discharge of waste that degrades human aesthetic enjoyment or recreation (e.g. hunting, fishing, hiking, site-seeing) is considered impairment. Conversely, discharge of water that improves receiving waters for these uses would be an enhancement. For these REC-1 and REC-2 uses the Basin Plan specifically refers to excessive algal growth as an impairment factor and, additionally, risk of waterborne disease in the case of REC-1.

<u>GWR</u> was listed in the Facility discharge permit as a beneficial use of Artesian Slough because Artesian Slough is tributary to Coyote Creek and upper reaches of Coyote Creek are used to recharge groundwater via percolation ponds. The GWR beneficial use should be stricken from the permit. Facility effluent flows to the lowest reach of Coyote Creek roughly 3 miles downstream from the edge of tidal influence. Groundwater recharge is performed at least 15 miles upstream from tidal influence. It is not physically possible for the facility effluent to impact this beneficial use.

SJ-SC RWF Impact on Seven Beneficial Uses.

A comprehensive assessment of available information today should determine that discharge from the SJ-SC Facility supports COLD and MIGR uses, and enhances WILD, SPWN, WARM, REC-1, and REC-2.

(Beneficial use definitions and descriptions are excerpted from the San Francisco Bay Basin Plan followed by discussion.)

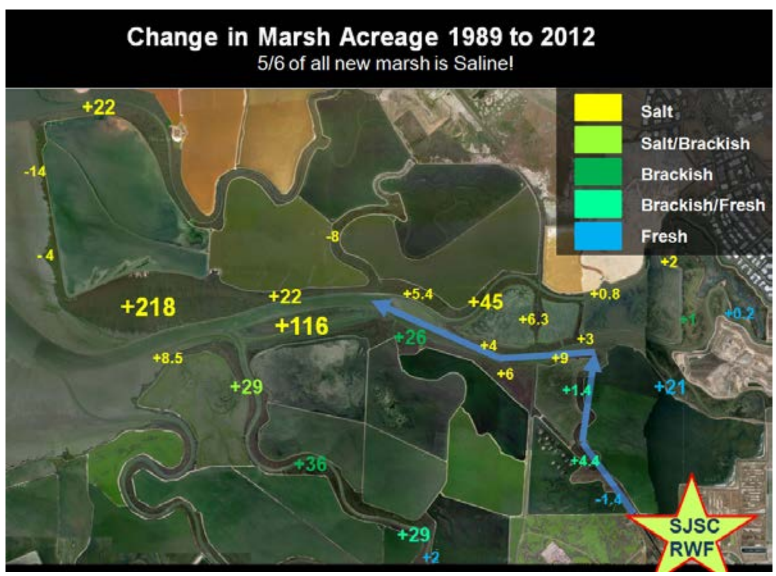
San Francisco Bay Basin Plan:

2.1.20 WILDLIFE HABITAT (WILD)

Uses of waters that support wildlife habitats, including, but not limited to, the preservation and enhancement of vegetation and prey species used by wildlife, such as waterfowl.

The two most important types of wildlife habitat are riparian and wetland habitats. These habitats can be threatened by development, erosion, and sedimentation, as well as by poor water quality.

The water quality requirements of wildlife pertain to the water directly ingested, the aquatic habitat itself, and the effect of water quality on the production of food materials. Waterfowl habitat is particularly sensitive to changes in water quality. Dissolved oxygen, pH, alkalinity, salinity, turbidity, settleable matter, oil, toxicants, and specific disease organisms are water quality characteristics particularly important to waterfowl habitat. Dissolved oxygen is needed in waterfowl habitats to suppress development of botulism organisms; botulism has killed millions of waterfowl. It is particularly important to maintain adequate circulation and aerobic conditions in shallow fringe areas of ponds or reservoirs where botulism has caused problems.



Two specific parameters of SJ-SC RWF discharge are documented as impacting the WILD beneficial use: freshwater discharge influence on salt marsh conversion and dissolved oxygen concentrations as they influence the local receiving water.

Fresh water discharge and salt marsh conversion. Discharge permits since 1989 have required the Facility to assess marsh acreage every year or two. The 16th and 17th vegetative assessments were performed by HT Harvey & Associates under contract. These compared current salt, brackish and fresh water marshes compared to the base-line assessment in 1989: As of 2012 there is now almost 600 acres of new marsh in the study area both upstream and downstream of the SJ-SC RWF discharge. Over 470 acres of the new marsh is salt marsh After 23 years of study, two conclusions are clear:

- Salt marsh acreage has increased immediately downstream of Artesian Slough
- The SJ-SC RWF discharge has negligible impact on salt marsh formation beyond Artesian Slough.

The nearly 500 acres of new salt marsh in the SJ-SC RWF study area does NOT include any new salt marsh that has formed as a result of the South Bay Salt Pond Restoration Project (SPRP). By 2013, the SPRP effort has opened 1,225 acres of former salt ponds to Bay circulation and the slow process of marsh restoration which will see a substantial portion of that area eventually support salt marsh.

The SJ-SC RWF continues to discharges a considerable volume of fresh water into this slough system, but 23 years of data shows that salt marsh is actually increasing.

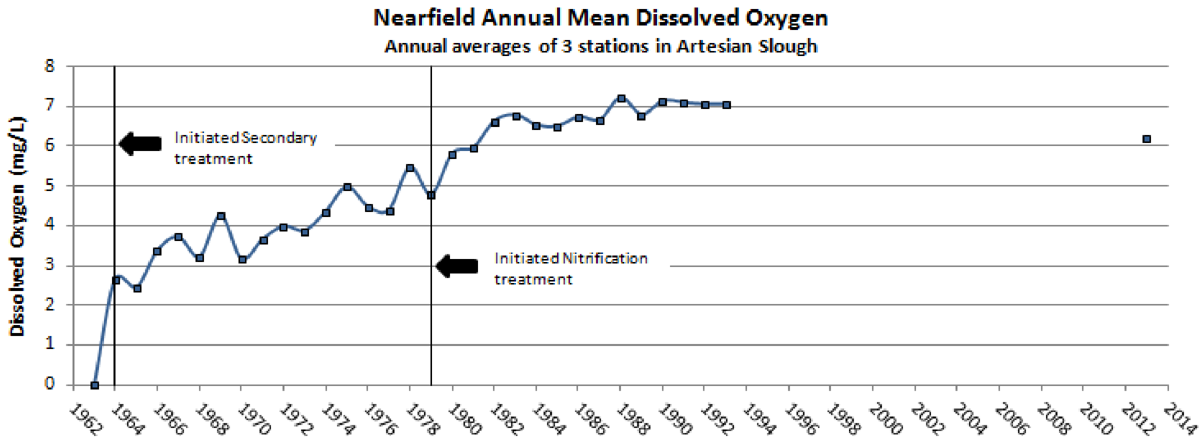
The following specific water quality parameters apply equally to WILD, SPWN, WARM, COLD, or MIGR beneficial uses:

Dissolved Oxygen: Regional and State Water Boards have long acknowledged that SJ-SC RWF discharge is highly oxygenated compared to receiving water in shallow Lower South Bay:

> *Order No. 89-013. "The discharge enhances dissolved oxygen levels and improves flushing in the South Bay. It enhances several beneficial uses: non-contact recreation, estuarine habitat, and commercial and sport fishing. …"*

Dissolved oxygen concentration in facility discharge is never allowed to fall below 6.5 mg/l without corrective action. This is well above the Water Quality Objective (WQO) of 5.0 mg/l. The dissolved oxygen concentration in Bay water in incoming tide is often measured below the WQO during the warm season in late summer and early fall. Extensive data from the vicinity of the discharge point in Artesian Slough shows many occasions in which the dissolved oxygen in our facility discharge is helping alleviate natural hypoxia.

Discharge of oxygen enriched water enhances all beneficial uses involving fish habitat: WILD, SPWN, WARM, COLD, MIGR, and others. Years of receiving water data clearly show a decades-long rise in DO concentrations as treatment plant processes were improved. Since addition of nitrification and filtration treatment in 1979, the facility transitioned from depressing receiving water DO concentrations to elevating them.



pH and Alkalinity: Effluent pH averages 7.5 and ranges from 7.1 to 7.6. Receiving water pH averages 7.7. There is no indication that facility discharge is depressing pH in receiving water. Effluent averages 252 mg/l hardness and 171 mg/l alkalinity. Receiving water hardness and alkalinity values, under the influence of Bay water salinity, are much higher than those of facility effluent. Effluent hardness and alkalinity are quickly overwhelmed in by higher values in Artesian Slough.

Turbidity and settleable matter: The SJ-SC RWF effluent carries virtually no turbidity or settleable matter to Artesian Slough.

Oil & Grease. Oil and Grease in effluent averages about 1.0 mg/l which is far below the average monthly effluent limit of 5.0.

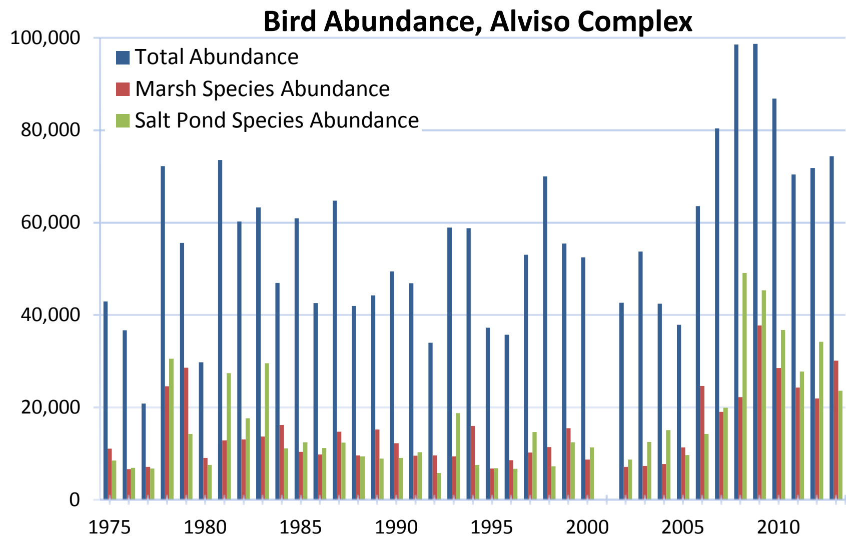
Toxicants. A number of other specific toxicants are monitored and are never detected at levels that would be toxic to aquatic life. In addition, the Facility performs monthly effluent Whole Effluent Toxicity (WET) Testing for both acute and chronic toxic effects. Over 20 years of testing using three different fish species (fathead minnows, threespine stickleback, and the current test species, larval rainbow trout), has never indicated an acute toxicity problem.

Unfortunately, chronic toxicity, using *Ceriodaphnia dubia* test animals, is occasionally detected. (See Annual Self Monitoring Report pages 24-26 of the 2013 report and pages 22-24 of the 2012 report for more detailed discussion.) Nonetheless, detections of chronic toxicity in lab animals have never appeared to cause or contribute to any toxic effects in aquatic life in the Facility outfall channel or the receiving waters of Artesian Slough.

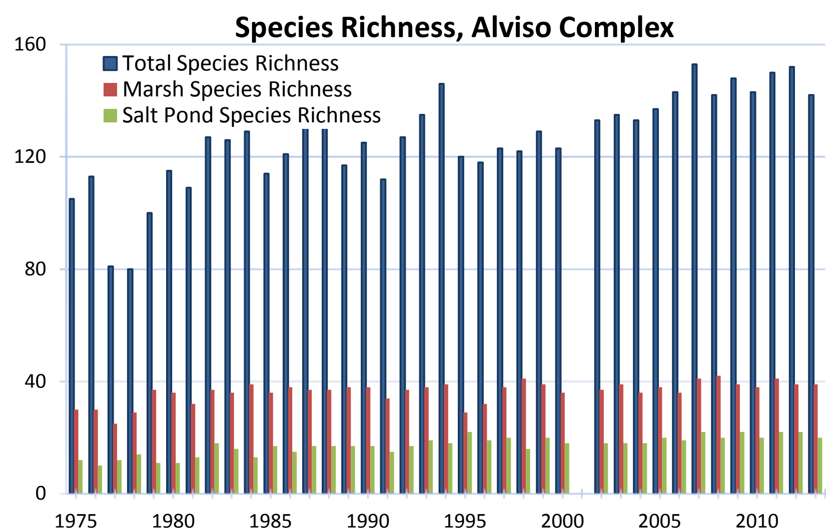
Disease organisms. The Facility filters and disinfects wastewater using sodium hypochlorite as disinfectant. Effluent disinfection bacteria counts are generally far below the permit limit of 35 colonies of *Enterococcus* bacteria per 100 mL.

Key Indicator of Wildlife Habitat – waterfowl & other birds.

Christmas Bird Counts. Support of waterfowl is an important element for evaluating the WILD beneficial use. The National Audubon Society Christmas Bird Count has tracked waterfowl numbers in the vicinity of Facility discharge since 1975. The numbers indicate that waterfowl abundance and species diversity are high and increasing.



The Audubon Christmas Bird Count (CBC) is a census of birds conducted by volunteer citizen scientists. The "Alviso Complex" CBC data, encompass the SJ-SC RWF and surrounding salt ponds and sloughs. The data show a significant increase in total bird abundance since the mid-2000s when the South Bay Salt Pond Restoration Project (SBSPRP) began opening up more habitat: Bird abundance measured below 40,000 individuals in 2005, the year that ponds A16, A17, and A18 opened for circulation. In 2006, ponds A19, A20, and A21 opened for passive restoration. By 2008, there was a surge in bird populations, over 98,500 individuals, as hardy species initially exploited the new habitat. Populations appear to have since stabilized at roughly double the 2005 census numbers, indicating the value of the new marsh habitat.

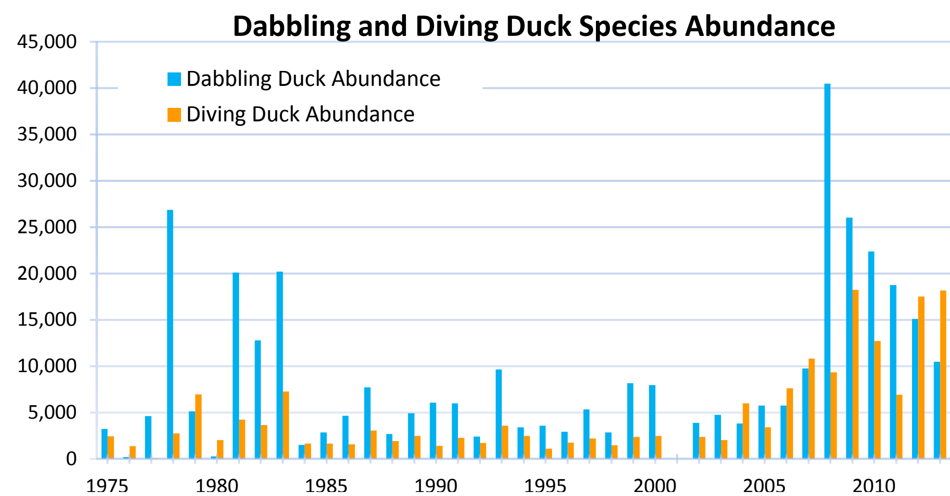


A key question for both the Facility and the SBSPRP was whether restoration of former salt ponds would benefit bird species that prefer brackish and fresh water marsh at the expense of species that were using the ponds when they made salt. If salt pond species declined, this would also suggest that Facility freshwater effluent could be doing more harm than good. Fortunately, the CBC data records significant increases in both marsh and salt pond bird populations:

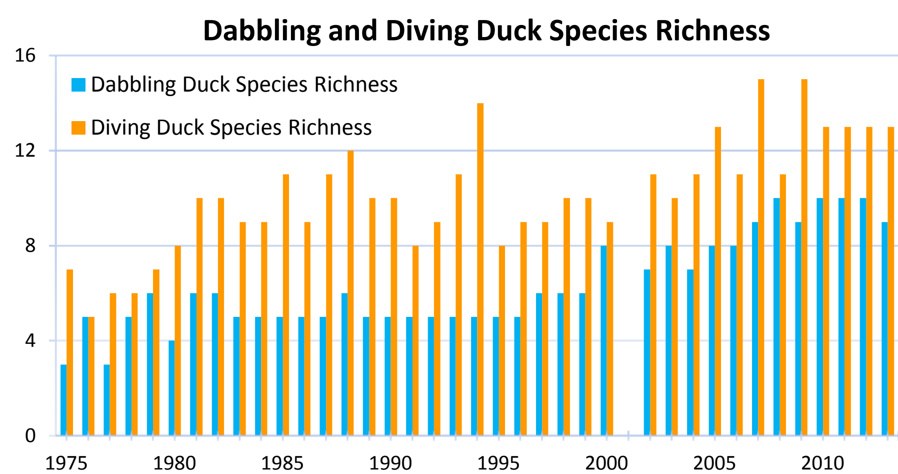
- Marsh birds increased from 11,050 individuals in 1975 to 30,152 birds in 2013.
- Salt pond birds increased from 8,530 individuals in 1975 to 23,635 in 2013.

The CBC census records the numbers of different species as "Total Species Richness." This data shows that more bird species are now visiting the Alviso Complex area in winter: from 105 species in 1975 to 142 species in 2013. Similarly, marsh species assemblages increased from 30 species in 1975 to 39 species in 2013. Salt pond species richness increased from 12 species recorded in 1975 to 20 species in 2013. Again, growth in diversity and abundance of "salt pond" bird species demonstrates that salt marsh habitat is available and growing.

The Facility is particularly interested in ducks because most duck species prefer freshwater marsh habitat and thus congregate in marshes that are enhanced by Facility effluent. Ducks also enhance human non-contact recreation (REC2) hunting and sightseeing. Dabbling ducks (i.e. mallards, shovelers, teals, gadwalls, etc.) are strongly attracted to freshwater marsh. Diving ducks (e.g. scoters, scaups, ruddy ducks, and buffleheads) prefer deeper water, whether salt or fresh. Tracking both dabbling and diving ducks may provide some indication of how habitat in the Alviso Complex is changing. To evaluate this phenomenon, the Facility collaborated with San Francisco Bay Bird Observatory (SFBBO) to distinguish between dabbling and diving duck species in the Audubon CBC data.

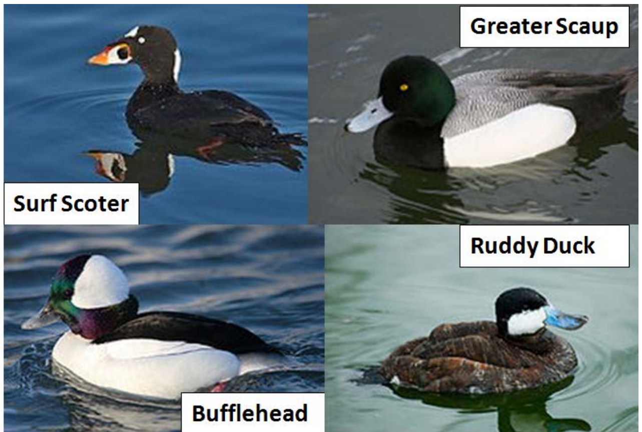


The CBC abundance data shows variable but generally increasing dabbling duck populations, from 3,237 individuals in 1975 to 10,466 birds in 2013. Diving ducks follow a similar pattern, increasing from 2,465 individuals in 1975 to 18,171 birds in 2013. The data appears to show an initial explosion of dabbling ducks in 2008. This could be a real reflection of mallard and shoveler early exploitation of new habitat or it could reflect changes to Audubon CBC bird count methodology as salt ponds became accessible in the Alviso Complex.

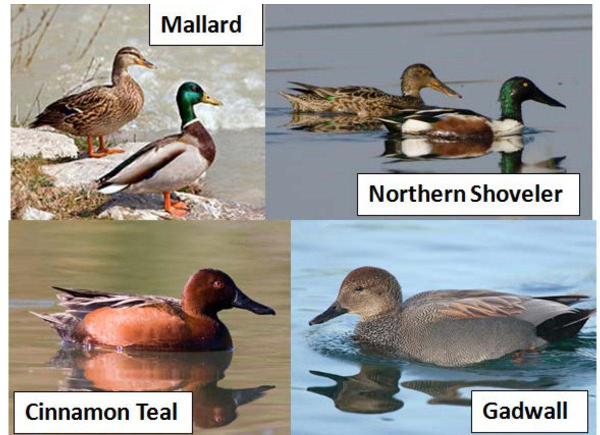


Species richness data, possibly a stronger indication of the improvement of duck habitat over time, shows that both dabblers and divers are increasingly attracted to the area. The dabbling duck assemblage increased from 3 species observed in 1975 to 9 species in

2013. Likewise, the diving duck species richness increased from 7 species recorded in 1975 to 13 species in 2013.



Diving Ducks typically found in vicinity of Artesian Slough



Dabbling Ducks

The Audubon CBC data is a valuable data set, but it is a voluntary effort that can suffer from lack of participants or changes to methodology. Fortunately, the expanded bird habitat is also being documented by researchers at the U.S. Geological Survey, working for the SBSPRP. Authors John Takekawa, Nicole Athearn, Brian Hattenbach, and Annie Schultz graciously gave permission to cite their 2006 paper "*Bird Monitoring for the South Bay Salt Pond Restoration Project",* which is posted on the SBSPRP webpage (http://www.southbayrestoration.org/pdf_files/USGS_SouthBaySP_Birds_2006.pdf). This bird monitoring is an ongoing project for which bird population data continues to be collected. A few excerpts from (Takekawa et al. 2006):

- The Alviso complex supported the greatest number of birds followed by Eden Landing and Ravenswood. Foraging guilds used the three complexes in different ways: gulls, ducks, and piscivores comprised more of the community in Alviso, whereas shorebirds and phalaropes were more abundant at Eden Landing and Ravenswood.
- ***Alviso.--*** We counted nearly a million birds from 67 species at the Alviso pond complex between Jul 2005 and Aug 2006 (Table 1, Figure 5). Alviso salt ponds comprised 57% of the total pond area but also 57% of the total birds counted. Alviso supported 96% of gulls, 84% of dabbling ducks, 83% of diving ducks, 74% of piscivores, and 71% of herons counted overall ...
- "Our monthly monitoring of pond water quality and bird use enabled us to document that winter bird use was substantially higher following breaching than in the previous two winters, and that the primary increase in bird numbers was found on ponds that had been affected by the breaches."

The bird census data from the Audubon CBC and Takekawa work performed for the SBSPRP were described in great detail here because they provide both an indication that Facility effluent is not degrading either WILD or REC2 beneficial uses and a strong suggestion that Facility effluent is likely enhancing these uses.

San Francisco Bay Basin Plan:

2.1.18 FISH SPAWNING (SPWN) *Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.*

Dissolved oxygen levels in spawning areas should ideally approach saturation levels. Free movement of water is essential to maintain well-oxygenated conditions around eggs deposited in sediments. Water temperature, size distribution and organic content of sediments, water depth, and current velocity are also important determinants of spawning area adequacy.

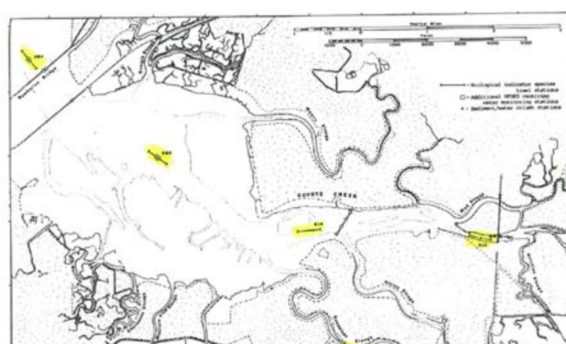
As mentioned above in the WILD beneficial use discussion, both Regional and State Water Boards have long acknowledged that discharge of oxygenated water into Artesian Slough provides an enhancement for some beneficial uses (WILD, SPWN, WARM, COLD, and MIGR, among others). The question is whether there is a net environmental benefit, i.e. whether the enhancement provided by freshwater flushing and oxygenation outweighs other impairments to beneficial uses that Facility discharge may be causing.

Key Indicator of Wildlife Habitat – Fish and mysids.

From 1981 through 1986, the San Jose-Santa Clara RWF, with the Cities of Sunnyvale and Palo Alto, collaborating as the South Bay Dischargers Authority, funded a joint project to study the Lower South Bay. The study included monthly otter trawls to survey fish populations in the lower reach of Coyote Creek. Coincidentally, identical fish trawl surveys at more stations, but at lower bi-monthly frequency, were reinitiated in 2012 by the Salt Pond Restoration Project via contract with the University of California, Davis, Department of Wildlife, Fish and Conservation Biology, Principal Investigator Jim Hobbs. The results of this more recent work is posted by the SPRP at:

- http://www.southbayrestoration.org/documents/technical/110712_Final%20Report_Monitoring%20the%20Respons%20of%20Fish%20Assemblages.pdf, and
- http://www.southbayrestoration.org/documents/technical/Hobbs_South%20Bay%20Salt%20Pond%20Restoration_Jan-June%202012_Summary.pdf

Hobbs (2011): Otter Trawl Sampling Stations in the Alviso Marsh Complex

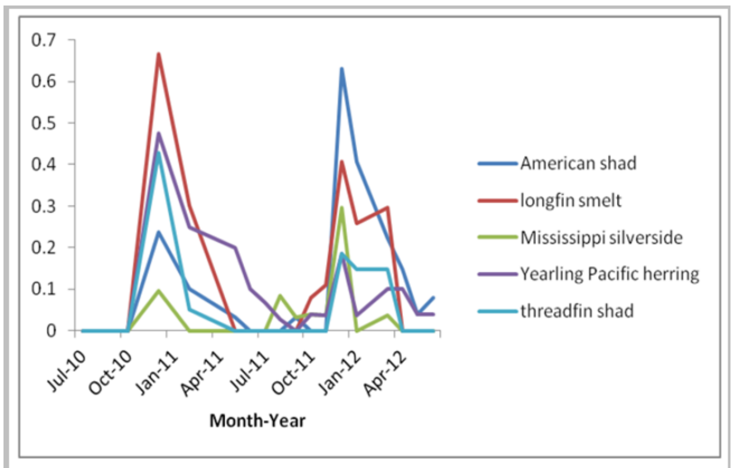


SBDA (1981-1986): Otter Trawl Sampling Stations

The more recent fish surveys by Jim Hobbs are focused on documenting fish community response to salt pond restoration, particularly in and near Ponds A6, A19, A20, and A21. The

SBDA surveys from 30 years ago were aimed at surveying fish populations downstream of the three wastewater treatment plants in the Lower South Bay. Both projects found similar numbers and species of fish in trawls of the lower reach of Coyote Creek and confluence with Lower South Bay this provides some assurance that fish populations have been stable in the main channel. However, the bulk of the newer Hobbs work is carried out in the newly opened ponds. This is the summary describing the Alviso Complex fish survey results from the 2011 report (emphasis added):

> "*Alviso Marsh Complex* The Alviso Marsh Complex has yielded more species than any other complex and has a higher average otter trawl CPUE than Bair Island or Eden's Landing. Otter trawl CPUE was highest in March 2012, when juvenile fish were rearing within the marsh, followed by September 2011, when the dominant species in the marsh were threespine stickleback and staghorn sculpin (Figure 20, 21). <u>Because of the habitat diversity within the marsh, especially the presence of freshwater inflow, we have found several euryhaline freshwater-dependent fish species within the Alviso Marsh Complex that we have not seen elsewhere</u> [i.e., prickly sculpin(*Cottus asper*) Sacramento sucker (*Catostomus occidentalis*)]. Migratory and resident juvenile fish CPUE within the Alviso Marsh Complex were considerably higher than any of the other sampled habitats, including the shoals and channel of the central South Bay, indicating that Alviso might be important as a nursery for some species [English sole (*Parophrys vetulus*) staghorn sculpin (*Leptocottus armatus)* Pacific herring (*Clupea pallasii*) and others]. In addition, CPUE for threespine stickleback within the Alviso Marsh Complex was higher than any other marsh by three orders of magnitude. <u>A distinct pelagic-fishes assemblage was also abundant in winter months and was only found in the Alviso Marsh Complex. This assemblage included the state-threatened longfin smelt (*Spirinchus thaleichthys*), American shad (*Alosa sapidissima*), and threadfin shad (*Dorosoma petenense*)</u> (Figure 20). Finally, all (71 individuals) striped bass (*Morone saxatilis*) captured via otter trawl were captured within the Alviso Marsh Complex.



Frequency of occurrence for pelagic fishes in the Alviso Marsh Complex.

Fish Community Study – 2-year report. Figure 21.

Longfin smelt caught in Lower Coyote Creek otter trawls near Artesian Slough.

The pelagic fish assemblage includes some species defined as succumbing to Pelagic Organism Decline (POD) in the Sacramento Delta. As in the Delta, these species congregate in less saline water during some portion of their life-cycle (usually the spawning portion). The presence of the pelagic fish assemblage in the vicinity of Artesian Slough provides the strongest indication that the San Jose-Santa Clara Regional Wastewater Facility is enhancing beneficial uses of WILD, SPWN, and COLD (these fish form much of the winter assemblage that prefer low temperatures).

San Francisco Bay Basin Plan:

2.1.19 WARM FRESHWATER HABITAT (WARM) *Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.*

The warm freshwater habitats supporting bass, bluegill, perch, and other fish are generally lakes and reservoirs, although some minor streams will serve this purpose where stream flow is sufficient to sustain the fishery. The habitat is also important to a variety of nonfish species, such as frogs, crayfish, and insects, which provide food for fish and small mammals. This habitat is less sensitive to environmental changes, but more diverse than the cold freshwater habitat, and natural fluctuations in temperature, dissolved oxygen, pH, and turbidity are usually greater.

The UC Davis fish surveys, and earlier SBDA surveys in the 1980s, indicate that populations of striped bass, northern anchovies, and mysids provide some indication of health of the warm freshwater habitat in vicinity of the SJ-SC RWF discharge. The general abundance and diversity of fish found in the Alviso Complex by the UC Davis group is generally higher than that found in the Ravenswood and Eden Landing restoration areas.

A Mysid

Dr. Hobbs attributes much of the greater numbers of fish in the Alviso complex to the abundance of mysids that are multiplying in the newly opened salt ponds. Mysids are tiny shrimp-like crustaceans that serve as a principal source of food for juvenal fish, and the fish come for the food. The juvenile fish, in turn, become food for the larger predators such as larger striped bass, bat rays, and leopard sharks. It is important to note that one of many causes attributed to the POD in the Sacramento River Delta is the decline to near absence of mysids in the Delta. Apparently the Alviso complex, including Artesian Slough, does not suffer this same problem

Mysids are invertebrates at the mid-point in the aquatic food web in a healthy estuarine environment. The presence of mysids itself indicates some degree of health of aquatic life at the microscopic scale.

Month/Species	ALVISO	RAVENSWOOD	EDEN
January			
No Catch	1		
rainwater killifish	1		
three-spine stickleback	1		2
topsmelt			25
March			
bay pipefish	1		
Mississippi silverside	12		
Pacific herring	37		
Pacific staghorn sculpin		9	
shiner surfperch		1	
topsmelt	1	7	
May			
bay pipefish	2		
diamond turbot		1	
English sole	7		
Mississippi silverside	27		
Northern anchovy	17		
Pacific staghorn sculpin	35	47	6
rainwater killifish	12		
shiner surfperch	1		
three-spine stickleback	18	10	10
topsmelt	64		20
yellowfin goby	6	3	3
June			
longjaw mudsucker	4		
Mississippi silverside	14		
Northern anchovy	10		
Pacific herring	1		
Pacific staghorn sculpin	19	14	
rainwater killifish	16		
shiner surfperch	1		
three-spine stickleback	28		
topsmelt	39	1	
yellowfin goby	27	48	

South Bay Salt Pond Restoration, Fish Monitoring Progress Report for Jan-June, 2012

Seine Net Catches in Marsh Complexes

Unfortunately, fish surveys commissioned by SBDA in the early 1980s did not look for mysids, so there is no information on their presence or absence prior to UC Davis information in 2012. The recent work has been documenting robust mysid reproduction in the former salt ponds known as the “island ponds,” A19, A20, and A21. UC Davis researchers also documented a large mysid population explosion that occurred within months of the reopening of ponds A16 and A17 in March 2013. This abundant food source was quickly exploited by large populations of bass and anchovies that were recovered in otter trawls in and immediately downstream of Artesian Slough in April, June, August, October, and November.

Dr. Hobbs shows mysids collected by zooplankton net at mid-point in Artesian Slough in June 2013

During summer months, Artesian Slough and the lower reach of Coyote Creek support a small amount of warm freshwater habitat. The freshwater habitat quickly transitions to salt habitat as the creek joins the Bay. Seagoing species such as anchovies, herring, and sculpin are attracted to the freshwater transition zone for use as a nursery and food source. Both SBDA fish surveys in the 1980s and the recent UC Davis work documented that the lower reach of Coyote Creek supports substantial populations of sculpin, anchovies, and striped bass, in the summer. These fish surveys provide strong confirmation that freshwater flushing and oxygenation from the SJ-SC RWF is enhancing the WARM beneficial use.

June 2013: Anchovies from otter trawl at Artesian Slough mid-point

November 2011: Otter trawl catch at confluence of Artesian Slough & Coyote Creek

San Francisco Bay Basin Plan:

2.1.3 COLD FRESHWATER HABITAT (COLD) *Uses of water that support cold water ecosystems, including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.*

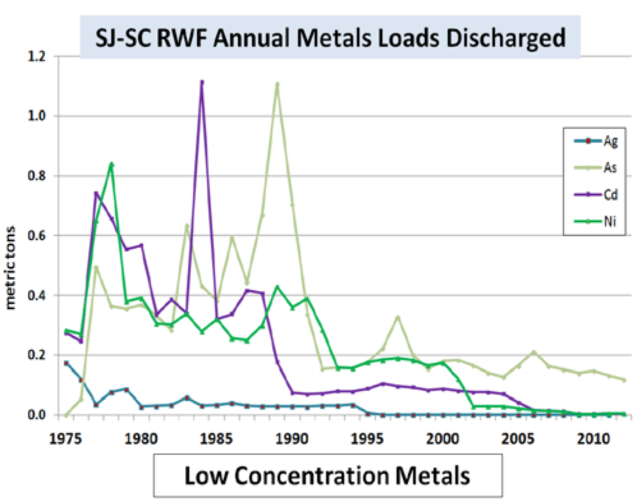
Cold freshwater habitats generally support trout and may support anadromous salmon and steelhead fisheries as well. Cold water habitats are commonly well-oxygenated. Life within these waters is relatively intolerant to environmental stresses. Often, soft waters feed cold water habitats. These waters render fish more susceptible to toxic metals, such as copper, because of their lower buffering capacity.

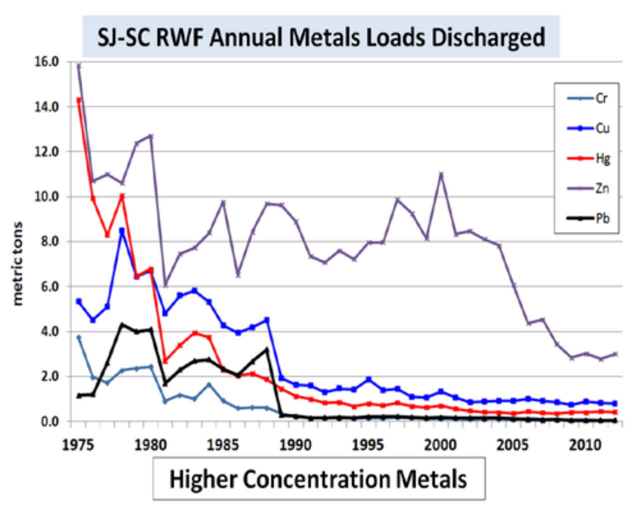
As noted in the discussion of the WILD beneficial use, The SJ-SC RWF crossed a threshold in 1979 with the commencement of a nitrification process. From that point on, oxygen concentrations in the in Artesian Slough rose. The Facility also continues to flush the habitat with freshwater, but during winter months, Facility effluent flow volume is frequently dwarfed by the freshwater flowing from upstream Coyote Creek.

COLD freshwater habitat in lower Coyote Creek supports a winter fish assemblage of shad, smelt, and silverside. These pelagic species are in decline in the Delta region which suggests they could be more sensitive indicators of impairment to the cold estuarine environment or are indicators of different stressors. The UC Davis researchers have documented presence of these fish in Artesian Slough itself during the winter months of 2011, 2012 and 2013.

A characteristic of the SJ-SC RWF effluent that could impact the COLD habitat and beneficial use is toxic metals. This was a specific concern mentioned in SWB Order 90-5 after review of data available in 1990. Until that time, the Facility was regularly exceeding effluent limitations for copper, nickel and some other heavy metals, albeit adverse impact on Artesian Slough aquatic life was never documented. Since then, various trends in industry and aggressive source control and pollution prevention programs have reduced effluent pollutant concentrations generally and metals concentrations in particular. For example, from 1990 to 2013 the average copper concentration dropped from 7.5 ppb to 2.9, nickel decreased from 11.0 ppb to 5.2.

Today, it should be sufficient to point out that the SJ-SC RWF has been surpassing all Water Quality Objectives and effluent limitations for toxic pollutants for over two decades. All metals concentrations and loads discharged by the Facility are a fraction of 1980s values.

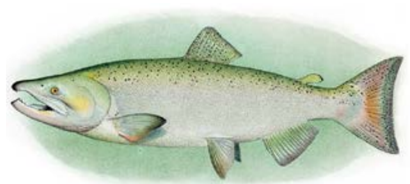




2.1.10 FISH MIGRATION (MIGR) *Uses of water that support habitats necessary for migration, acclimatization between fresh water and salt water, and protection of aquatic organisms that are temporary inhabitants of waters within the region.*

The water quality provisions acceptable to cold water fish generally protect anadromous fish as well. However, particular attention must be paid to maintaining zones of passage. Any barrier to migration or free movement of migratory fish is harmful. Natural tidal movement in estuaries and unimpeded river flows are necessary to sustain migratory fish and their offspring. A water quality barrier, whether thermal, physical, or chemical, can destroy the integrity of the migration route and lead to the rapid decline of dependent fisheries.

Water quality may vary through a zone of passage as a result of natural or human- induced activities. Fresh water entering estuaries may float on the surface of the denser salt water or hug one shore as a result of density differences related to water temperature, salinity, or suspended matter.


A Chinook

Coyote Creek itself supports a small population of fall run Chinook salmon that spawn in the upper reaches. It is well documented that the, then, relatively small salmon populations in Coyote Creek and the nearby Guadalupe River were decimated since the early1900s due to habitat loss, freshwater withdrawals, and dams and other barriers. There has been some recovery since the 1980s. This is largely due to barrier removals that have allowed some of these anadromous fish to return to their historic spawning grounds.

Facility effluent is slightly cooler in the summer months and substantially warmer in the winter compared to ambient temperatures in the lower Coyote and Lower South Bay. Temperature of effluent varies between 14.1 to 18.7^{o}C in January - the coldest month. Temperature data show that Facility effluent drops to Coyote Creek ambient temperature and within 1^{o}C of Bay temperature before it leaves Artesian Slough. The winter temperature would not pose a barrier to salmon migration. Adult fall run salmon seek freshwater for spawning in the late summer and fall before Facility effluent could present any abnormal temperature signal. Similarly, juvenile (smolts), can be reared in temperatures up to 18^{o}C without stress and migrate out to the ocean later in the Spring.

The Facility freshwater effluent at discharge is less dense than the more saline Bay water, particularly in the winter when effluent is comparatively warmer. The stratification has been measured at four stations in Artesian Slough and found to dissipate at all times of the year prior to passing into Coyote Creek and therefore poses no disruptive barrier to salmonids migration. The possibility that salmonid migration could be diverted due to attraction to freshwater in Artesian Slough has also been considered. Individual salmon are occasionally observed, but large numbers have never been encountered in Artesian Slough.

2.1.15 WATER CONTACT RECREATION (REC1) *Uses of water for recreational activities involving body contact with water where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, whitewater activities,* ***fishing****, and uses of natural hot springs.*

Water contact implies a risk of waterborne disease transmission and involves human health; accordingly, criteria required to protect this use are more stringent than those for more casual water-oriented recreation.

Excessive algal growth has reduced the value of shoreline recreation areas in some cases, particularly for swimming. Where algal growths exist in nuisance proportions, particularly bluegreen algae, all recreational water uses, including fishing, tend to suffer. One criterion to protect aesthetic quality of waters used for recreation from excessive algal growth is based on chlorophyll a.

2.1.16 NONCONTACT WATER RECREATION (REC2) *Uses of water for recreational activities involving proximity to water, but not normally involving contact with water where water ingestion is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.*

Water quality considerations relevant to noncontact water recreation, such as hiking, camping, or boating, and those activities related to tide pool or other nature studies require protection of habitats and aesthetic features. In some cases, preservation of a natural wilderness condition is justified, particularly when nature study is a major dedicated use.

One criterion to protect aesthetic quality of waters used for recreation from excessive algal growth is based on chlorophyll a.


Visitors at Don Edwards Alviso Education Center

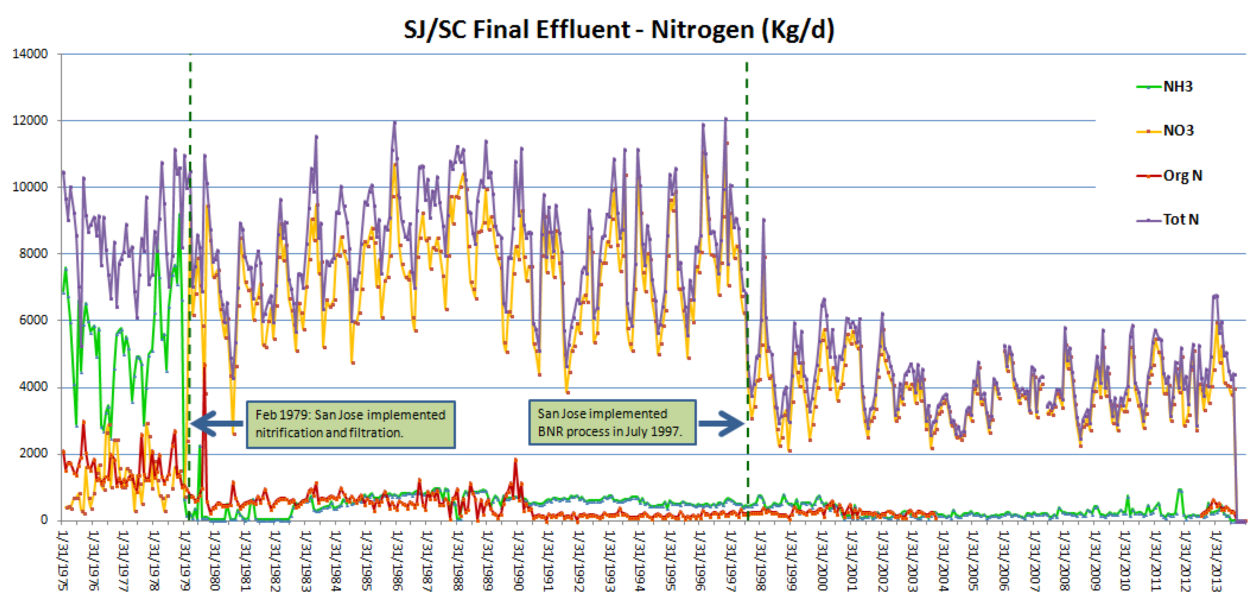
Fishing, hunting, and sightseeing are recreational activities routinely enjoyed by visitors to Artesian Slough daily or, in the case of hunting, seasonally. The slough supports a lush fresh and brackish water habitat that is attractive to humans, fish and waterfowl at all times of the year. In fact, the Alviso Education Center of the Don Edwards San Francisco Bay National Wildlife Refuge is located on the west side of the SJ-SC RWF effluent channel. The Center regularly welcomes visitors and hosts environment education events and provides access to trails that run along the west bank of Artesian Slough. The visual attraction of the Slough itself is one of the major draws for the Center.

Excessive algal growth has never been observed in Artesian Slough. It should also be pointed out that the Facility today discharges much lower concentration of nitrogen and phosphorus nutrients than it did in the 1980s and prior as a result of two significant wastewater treatment process changes: introduction of nitrification in 1979 and conversion to a Biological Nutrient Removal (BNR) process in 1997/98. The result of both of those changes was immediately detected in Facility effluent and far out into the receiving water.

Some fishermen and hunters observed in Artesian Slough June 2013-Jan 2014.

Prior to 1979, ammonia was the principal component of effluent total nitrogen discharged. Ammonia is a food source for bacteria that deplete oxygen in water. After commencement of the nitrification process, the Facilty discharged roughly the same quantity of total nitrogen, but the vast majority was nitrate (NO3). Nitrate can stimulate algal growth, but generally exerts less impact on an aquatic environment because it is quickly exploited as an electron acceptor (for cellular respiration) by bacteria that consume organic carbon in anoxic environments. Not surprisingly, average dissolved oxygen concentrations in Artesian Slough and Coyote Creek increased after this change was made.

However, a more significant reduction in nitrogen and phosphorus nutrient loads was accomplished when the Facility converted the secondary process to the BNR configuration. After the late 1990s, total nitrogen and total phosphorus loads have been a fraction of their previous levels. Considering the complexity of the estuarine environment, it may be impossible to guarantee that unsightly algal mats will never erupt, but all else being equal, the likelihood should be much lower after these improvements to Facility nutrient removal.



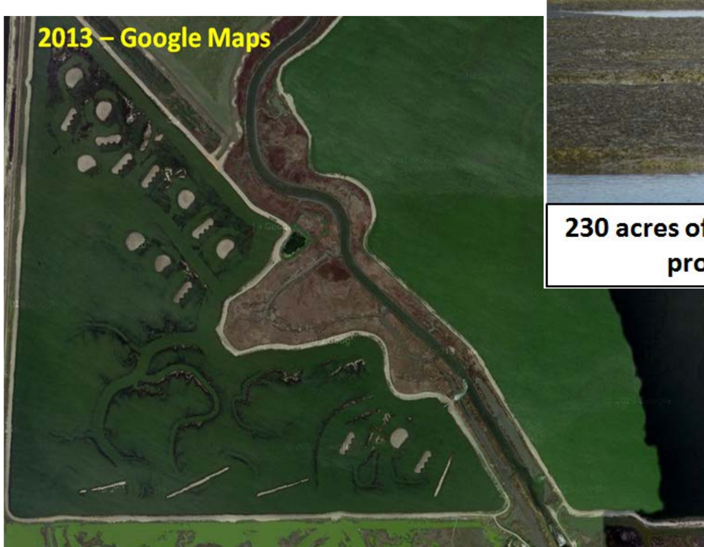
Conclusion.

Effluent discharged from the San Jose-Santa Clara Regional Wastewater Facility almost certainly enhances the beneficial uses of WILD, SPWN, WARM, REC-1, and REC-2. Those beneficial uses are given *"fuller realization of existing uses beyond that which would occur in the absence of the point source discharge … [from the Facility]."* The beneficial uses of COLD and MIGR are afforded at least *"uninterrupted protection."* Thus, the letter and the spirit of the EPA definition of Net Environmental Benefit are being met.

Given the information available today, it is fairly clear that the concerns expressed in State Board Order 90-5 are no longer applicable. The SJ-SC RWF has evolved and improved effluent quality. Changes to human practices and habits, such as water conservation and pollution prevention, have also contributed to reducing the volume and environmental stressors of the wastewater that the Facility treats. Habitat restoration is now converting former salt ponds to marsh. All of these factors are contributing to the notable improvement in the region's ecological health.

Black Crowned Night Herons – Artesian Slough 2014

230 acres of mudflats in A19 now support primary production that feeds the system



Pond A16, reopened in 2013, will provide more nesting habitat