Redwood Shores Lagoon
January 2019
Monthly Water Quality Monitoring Report

Prepared for

Redwood City
Public Works Services Department
1400 Broadway
Redwood City, CA 94063-2594

Prepared by

Clean Lakes, Inc.
P. O. Box 3186
Martinez, CA 94553

February 2019

City of Redwood City staff member Richard Chaffey performed the January monthly monitoring on January 22, 2019. Weather conditions were sunny, the air temperature was 52 F, and light winds were recorded.

General water quality measurements for dissolved oxygen, clarity (as turbidity), salinity, pH, and temperature were recorded at Sites R-1 thru R-5. Nutrients, nitrate as N, and dissolved ortho-phosphate as P were sampled at R-1 thru R-5 via laboratory analysis. Water samples were collected for Fecal Coliform analysis at Sites R-1 and R-2. During each sample visit observations are noted for floatables, oil/grease films and scum, water discoloration, algae and aquatic plant growth, and any presence of dead birds or fish. Water Quality Objectives for Redwood Shores Lagoon is provided below as well Dissolved Oxygen (DO) requirements in Non-Salmonid waters by which to compare field and laboratory results.

Table 1. Redwood Shores Lagoon Water Quality Objectives

Parameter	Criteria	
pH	6.5 – 8.5	
Dissolved oxygen	Minimum of 5.0 mg/L	
Chlorophyll-a	50.0 ug/l	
Fecal coliform bacteria	A median not to exceed 240 MPN/100 mL in 5 consecutive samples with no single sample exceeding 1,000 MPN/100 mL	
Color	No significant increase over that in sloughs	
Oil, grease, and visable films	None	
Floatables	None	
Aquatic growths	None sufficient to cause nuisance conditions	
Turbidity in Belmont, Steinberger and Bay sloughs that receive lagoon discharge	Background Levels 50 NTU 50-100 NTU 100 NTU	Max. Incremental Increase 5 NTU 10 MTU 10 % of background

II. NON-SALMONID WATERS	DO mg/l
A. Early life stages	
No production impairment	6.5
Slight production impairment	5.5
Moderate production impairment	5
Severe production impairment	4.5
Limit to avoid acute mortality	4
B. Other life stages	
No production impairment	6
Slight production impairment	5
Moderate production impairment	4
Severe production impairment	3.5
Limit to avoid acute mortality	3

RESULTS - Water quality results for each site is provided below in Table format for 2019 to allow comparison of results from month to month.

SITE R-1

				Fecal		Dissolved						
	Ortho		Fecal	Coliform	Water	Oxygen	DO		PH	PH		
	Phosphate	Nitrate as N	Coliform	MPN/100 ml	Temp	(DO)	mg/l		Lower	Upper	Salinity	Turbidity
Months	mg/l	mg/l	MPN/100 ml	Limit	C°	mg/l	Limit	PH	Limit	Limit	ppt	NTU
1.19	ND	ND	79	1,000	11.8	6.22	5	8.2	6.5	8.5	21.36	6.25
2.19				1,000			5		6.5	8.5		
3.19				1,000			5		6.5	8.5		
4.19				1,000			5		6.5	8.5		
5.19				1,000			5		6.5	8.5		
6.19				1,000			5		6.5	8.5		
7.19				1,000			5		6.5	8.5		
8.19				1,000			5		6.5	8.5		
9.19				1,000			5		6.5	8.5		
10.19				1,000			5		6.5	8.5		
11.19				1,000			5		6.5	8.5		
12.19				1,000			5		6.5	8.5		

SITE R-2

				Fecal		Dissolved						
	Ortho		Fecal	Coliform	Water	Oxygen	DO		PH	PH		
	Phosphate	Nitrate as N	Coliform	MPN/100 ml	Temp	(DO)	mg/l		Lower	Upper	Salinity	Turbidity
Months	mg/l	mg/l	MPN/100 ml	Limit	C°	mg/l	Limit	PH	Limit	Limit	ppt	NTU
1.19	ND	ND	79	1,000	12.4	5.89	5	8	6.5	8.5	23.44	12.8
2.19				1,000			5		6.5	8.5		
3.19				1,000			5		6.5	8.5		
4.19				1,000			5		6.5	8.5		
5.19				1,000			5		6.5	8.5		
6.19				1,000			5		6.5	8.5		
7.19				1,000			5		6.5	8.5		
8.19				1,000			5		6.5	8.5		
9.19				1,000			5		6.5	8.5		
10.19				1,000			5		6.5	8.5		
11.19				1,000			5		6.5	8.5		
12.19				1,000			5		6.5	8.5		

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SITE R-3

				Dissolved						
	Ortho		Water	Oxygen	DO		PH	PH		
	Phosphate	Nitrate as N	Temp	(DO)	mg/l		Lower	Upper	Salinity	Turbidity
Months	mg/l	mg/l	C°	mg/l	Limit	PH	Limit	Limit	ppt	NTU
1.19	ND	ND	12.5	7.22	5	7.9	6.5	8.5	26.38	38.7
2.19					5		6.5	8.5		
3.19					5		6.5	8.5		
4.19					5		6.5	8.5		
5.19					5		6.5	8.5		
6.19					5		6.5	8.5		
7.19					5		6.5	8.5		
8.19					5		6.5	8.5		
9.19					5		6.5	8.5		
10.19					5		6.5	8.5		
11.19					5		6.5	8.5		
12.19					5		6.5	8.5		

SITE R-4

				Dissolved						
	Ortho		Water	Oxygen	DO		PH	PH		
	Phosphate	Nitrate as N	Temp	(DO)	mg/l		Lower	Upper	Salinity	Turbidity
Months	mg/l	mg/l	C°	mg/l	Limit	PH	Limit	Limit	ppt	NTU
1.19	ND	ND	11.6	5.77	5	7.7	6.5	8.5	25.46	13.5
2.19					5		6.5	8.5		
3.19					5		6.5	8.5		
4.19					5		6.5	8.5		
5.19					5		6.5	8.5		
6.19					5		6.5	8.5		
7.19					5		6.5	8.5		
8.19					5		6.5	8.5		
9.19					5		6.5	8.5		
10.19					5		6.5	8.5		
11.19					5		6.5	8.5		
12.19					5		6.5	8.5		

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SITE R-5

				Dissolved						
	Ortho		Water	Oxygen	DO		PH	PH		
	Phosphate	Nitrate as N	Temp	(DO)	mg/l		Lower	Upper	Salinity	Turbidity
Months	mg/l	mg/l	C°	mg/l	Limit	PH	Limit	Limit	ppt	NTU
1.19	ND	ND	12.4	7.62	5	8	6.5	8.5	22.44	8.21
2.19					5		6.5	8.5		
3.19					5		6.5	8.5		
4.19					5		6.5	8.5		
5.19					5		6.5	8.5		
6.19					5		6.5	8.5		
7.19					5		6.5	8.5		
8.19					5		6.5	8.5		
9.19					5		6.5	8.5		
10.19					5		6.5	8.5		
11.19					5		6.5	8.5		
12.19					5		6.5	8.5		

NUTRIENTS – Orthophosphate as P (ORP) was below the detection limit at every site in January. ORP concentrations decreased in all five sites, in comparison to December. Nitrate as N was below the detection limit at all sites in January.

Phosphorus and nitrogen are essential nutrients for the plants and animals that make up the aquatic food web. Since phosphorus is the nutrient in short supply in most fresh waters, even a modest increase in phosphorus can, under the right conditions, set off a whole chain of undesirable events in a stream including accelerated plant growth, algae blooms, low dissolved oxygen, and the death of certain fish, invertebrates, and other aquatic animals.

There are many sources of phosphorus, both natural and human. These include soil and rocks, wastewater treatment plants, runoff from fertilized lawns and cropland, failing septic systems, runoff from animal manure storage areas, disturbed land areas, drained wetlands, water treatment, and commercial cleaning preparations.

Inorganic nitrate as N should be less than 0.3 mg/L to avoid algal blooms. Excessive concentrations of nitrate in lakes and streams greater than about 5 milligrams per liter (measured as nitrogen), depending on the water body, can cause excessive growth of algae and other plants, leading to accelerated eutrophication or "aging" of lakes, and occasional loss of dissolved oxygen. Animals and humans cannot use inorganic forms of nitrogen.

Since phosphorus is often scarce in freshwater ecosystems, it is typically a limiting nutrient, meaning that it limits the amount of life the system can sustain. When humans add phosphate-rich sewage or agricultural runoff, algae growth may no longer be limited by the scarcity of phosphorus in its environment and may grow out of control. In order to control algae growth, the EPA recommends that phosphate levels not exceed 0.05 milligrams per liter for streams discharging into lakes or reservoirs, 0.1 milligrams per liter for lakes and reservoirs, and 0.1 milligrams per liter for other streams and rivers.

FECAL COLIFORM - The fecal coliform levels were measured at 79 MPN/100mL for sites R-1 and R-2. Coliform levels increased in both sites, in comparison to December. Fecal coliform levels did not exceed the established limits. Single sample results over 1,000 MPN/100mL are considered to exceed limits.

GENERAL WATER QUALITY ANALYSIS – The Dissolved Oxygen (DO) levels in January exceeded the 5.0 mg/l threshold in all of the sites. DO was highest at Site R-5 (7.62 mg/l) and lowest at Site R-4 (5.77 mg/l). The water temperature decreased at all five sites in January, with temperatures ranging from 11.6 to 12.5 C. PH measurements were within the limit at every site, ranging from 7.7 to 8.2. Salinity measurements varied from approximately 21.36 ppt. to a maximum of 26.38 ppt. Turbidity was within limits and varied between 6.25 and 38.7 NTU. It was noted in the field data sheet that the pumps were running at the time of sampling in sites R-4 and R-5.

Field Results

Redwood Shores Lagoon
Monthly Water Quality Monitoring Field Data

Date: 1/22/19 Name(s) of Field Personnel: Richard Chaffey

Weather Conditions Air Temperature: 52'

Wind Conditions: Light / Moderate / High Percent Cloud: 0 %

Field Measurements

Sampling Station	Time	Maximum Depth (ft)	Sample Depth (ft)	Water Temp°C	Dis. Oxy. Mg/l	pH units	Salinity ppt	Turbidity NTU
R-1	1218	4.0'	2.0'	11.8	6.22	8.2	21.36	6.25
R-2	1115	5.0'	2.5'	12.4	5.89	8.0	23.44	12.8
R-3	1000	2.0'	1.0'	12.5	7.22	7.9	26.38	38.7
R-4	0801	5.0'	2.5'	11.6	5.77	7.7	25.46	13.5
R-5	0853	5.0'	2.5'	12.4	7.62	8.0	22.44	8.21

Samples for the following test will be collected for laboratory analyses

- Nitrate-N
- Ortho-P04-P (preservative required, do not rinse bottle)
- Fecal Coliform Bacteria (R-1 and R-2 only)

Notes & Observations about floatables, oil & grease, films, scum water discoloration, algae, aquatic plant growth and presence of dead wildlife:

R-1-

R-2-

R-3-

R-4- Pumps running at time of sample.

R-5- Pumps running at time of sample.

Laboratory Results

Alpha Analytical Laboratories, Inc. email: clientservices@alpha-labs.com
Corporate: 208 Mason Street | Ukiah, CA 95482 | T: 707-468-0401 | F: 707-468-5267 | ELAP# 1551

Redwood City, City of - Redwood Shores	Project Manager: Michael Patolo	
1400 Broadway Street	Project: Redwood Shores Lagoon	Reported:
Redwood City, CA 94063	Project Number: Monthly Monitoring	02/08/19 15:50

	Result		Reporting Limit	Dilution	Batch	Prepared	Analyzed	Method	Note
R-1 (19A2704-01)		**Sample Type: Water**				**Sampled: 01/22/19 12:18**			
Conventional Chemistry Parameters by APHA/EPA Methods									
Orthophosphate as P	ND	mg/L	0.10	1	AA94336	01/24/19 07:30	01/24/19 14:08	SM4500-P E	
Anions by EPA Method 300.0									
Nitrate as N	ND	mg/L	5.0	25	AA94304	01/23/19 19:18	01/23/19 19:18	EPA 300.0	R-01
Microbiological Parameters by APHA Standard Methods									
Fecal Coliforms	79	MPN/100mL	1.8	1	AA94481	01/22/19 16:30	01/25/19 16:30	SM9221	
R-2 (19A2704-02)		**Sample Type: Water**				**Sampled: 01/22/19 11:12**			
Conventional Chemistry Parameters by APHA/EPA Methods									
Orthophosphate as P	ND	mg/L	0.10	1	AA94336	01/24/19 07:30	01/24/19 14:08	SM4500-P E	
Anions by EPA Method 300.0									
Nitrate as N	ND	mg/L	5.0	25	AA94304	01/23/19 19:35	01/23/19 19:35	EPA 300.0	R-01
Microbiological Parameters by APHA Standard Methods									
Fecal Coliforms	79	MPN/100mL	1.8	1	AA94481	01/22/19 16:30	01/25/19 16:30	SM9221	
R-3 (19A2704-03)		**Sample Type: Water**				**Sampled: 01/22/19 10:00**			
Conventional Chemistry Parameters by APHA/EPA Methods									
Orthophosphate as P	ND	mg/L	0.10	1	AA94336	01/24/19 07:30	01/24/19 14:08	SM4500-P E	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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Redwood City, City of - Redwood Shores	Project Manager: Michael Patolo	
1400 Broadway Street	Project: Redwood Shores Lagoon	Reported:
Redwood City, CA 94063	Project Number: Monthly Monitoring	02/08/19 15:50

	Result		Reporting Limit	Dilution	Batch	Prepared	Analyzed	Method	Note
R-3 (19A2704-03)			**Sample Type: Water**				**Sampled: 01/22/19 10:00**		
Anions by EPA Method 300.0									
Nitrate as N	ND	mg/L	5.0	25	AA94304	01/23/19 19:51	01/23/19 19:51	EPA 300.0	R-01
R-4 (19A2704-04)			**Sample Type: Water**				**Sampled: 01/22/19 08:01**		
Conventional Chemistry Parameters by APHA/EPA Methods									
Orthophosphate as P	ND	mg/L	0.10	1	AA94336	01/24/19 07:30	01/24/19 14:08	SM4500-P E	
Anions by EPA Method 300.0									
Nitrate as N	ND	mg/L	5.0	25	AA94304	01/23/19 20:08	01/23/19 20:08	EPA 300.0	R-01
R-5 (19A2704-05)			**Sample Type: Water**				**Sampled: 01/22/19 08:53**		
Conventional Chemistry Parameters by APHA/EPA Methods									
Orthophosphate as P	ND	mg/L	0.10	1	AA94336	01/24/19 07:30	01/24/19 14:08	SM4500-P E	
Anions by EPA Method 300.0									
Nitrate as N	ND	mg/L	5.0	25	AA94304	01/23/19 20:24	01/23/19 20:24	EPA 300.0	R-01

END OF REPORT