

**Redwood Shores Lagoon
September 2015
Monthly Water Quality Monitoring Report**



Prepared for

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

Prepared by

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October 2015

RESULTS - Water quality results for each site is provided below in Table format for 2015 to allow comparison of results from month to month.

SITE R-1

	Ortho		Fecal	Fecal		Dissolved							
	Phosphate	Nitrate as N	Coliform	Coliform	Water	Oxygen	DO		PH	PH			
Months	mg/l	mg/l	MPN/100 ml	MPN/100 ml	Temp	(DO)	mg/l	Limit	Lower	Upper	Salinity	Turbidity	
				Limit	C°				Limit	Limit	ppt	NTU	
1.15	0.18	ND	>1,600	1,000	12.1	15.49	5	5	8.4	6.5	8.5	28.39	6.81
2.15	0.17	ND	7.8	1,000	16.8	15.01	5	5	8.7	6.5	8.5	22.2	5.94
3.15	0.15	ND	13	1,000	18.3	7.79	5	5	8.4	6.5	8.5	27.17	9.4
4.15	0.27	ND	7.8	1,000	18.7	6.24	5	5	8	6.5	8.5	27.91	22.2
5.15	0.21	ND	7.8	1,000	18.6	7.76	5	5	8	6.5	8.5	28.02	20.1
6.15	0.23	ND	22	1,000	23	9.02	5	5	8.3	6.5	8.5	26.15	12.1
7.15	0.22	ND	7.8	1,000	23.1	8.87	5	5	8.3	6.5	8.5	24.44	12.4
8.15	0.23	ND	7.8	1,000	23	8.25	5	5	7.2	6.5	8.5	25.88	11.5
9.15	0.22	ND	4.5	1,000	21.2	9.72	5	5	8	6.5	8.5	27.88	8.69
10.15				1,000			5	5		6.5	8.5		
11.15				1,000			5	5		6.5	8.5		
12.15				1,000			5	5		6.5	8.5		

SITE R-2

	Ortho		Fecal	Fecal		Dissolved							
	Phosphate	Nitrate as N	Coliform	Coliform	Water	Oxygen	DO		PH	PH			
Months	mg/l	mg/l	MPN/100 ml	MPN/100 ml	Temp	(DO)	mg/l	Limit	Lower	Upper	Salinity	Turbidity	
				Limit	C°				Limit	Limit	ppt	NTU	
1.15	0.16	ND	2	1,000	13	7.76	5	5	2.8	6.5	8.5	35.12	21.7
2.15	0.13	ND	7.8	1,000	15.8	3.51	5	5	8.4	6.5	8.5	30.25	14.3
3.15	0.25	ND	2	1,000	17.6	5.45	5	5	8	6.5	8.5	31.11	60.4
4.15	0.23	ND	46	1,000	17.5	5.84	5	5	7.7	6.5	8.5	31.56	23.5
5.15	0.25	ND	17	1,000	17.6	6.65	5	5	7.9	6.5	8.5	31.58	22.2
6.15	0.34	ND	4.5	1,000	22.8	5.16	5	5	7.7	6.5	8.5	27.71	28.7
7.15	0.36	ND	7.8	1,000	23.2	7.27	5	5	7.4	6.5	8.5	27.88	30.9
8.15	0.37	ND	23	1,000	22.2	6.35	5	5	7.5	6.5	8.5	26.74	25.7
9.15	0.33	ND	ND	1,000	20.2	3.32	5	5	7.5	6.5	8.5	29.59	19.7
10.15				1,000			5	5		6.5	8.5		
11.15				1,000			5	5		6.5	8.5		
12.15				1,000			5	5		6.5	8.5		

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
1.15	0.13	ND	12.3	6.38	5	8.7	6.5	8.5	33.39	49.2
2.15	0.15	ND	14.6	11.31	5	3.3	6.5	8.5	31.48	21.9
3.15	0.2	ND	16.4	7.48	5	7.8	6.5	8.5	26	46.5
4.15	0.2	ND	15.6	7.26	5	7	6.5	8.5	31.26	43.8
5.15	0.25	ND	18.2	7.56	5	7.2	6.5	8.5	31.43	46.2
6.15	0.3	ND	20.7	5.52	5	6.8	6.5	8.5	26.61	92.3
7.15	0.26	ND	20.9	5.86	5	2.9	6.5	8.5	27.59	57.4
8.15	0.41	ND	20.6	4.61	5	6.8	6.5	8.5	28.58	68.2
9.15	0.21	ND	17.6	7.43	5	7.9	6.5	8.5	30.67	21.8
10.15					5		6.5	8.5		
11.15					5		6.5	8.5		
12.15					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
1.15	0.12	ND	12.6	8.41	5	1.2	6.5	8.5	37.44	17.1
2.15	0.12	ND	15.4	12.08	5	8.2	6.5	8.5	29.05	15.9
3.15	0.27	ND	17.8	5.48	5	8.3	6.5	8.5	23.88	35.7
4.15	0.27	ND	18.7	3.52	5	7.1	6.5	8.5	32.09	23.1
5.15	0.29	ND	17.9	5.25	5	8.1	6.5	8.5	29.54	21.4
6.15	0.34	ND	23.5	6.61	5	8.2	6.5	8.5	25.55	15.8
7.15	0.46	ND	22.7	5.65	5	7.7	6.5	8.5	28.47	21.8
8.15	0.41	ND	22.8	7.61	5	8	6.5	8.5	27.62	18.4
9.15	0.39	ND	21.2	3.43	5	7.3	6.5	8.5	30.6	17.9
10.15					5		6.5	8.5		
11.15					5		6.5	8.5		
12.15					5		6.5	8.5		

SITE R-5

	Ortho		Water	Dissolved			PH	PH		
	Phosphate	Nitrate as N	Temp	Oxygen	DO		Lower	Upper	Salinity	Turbidity
Months	mg/l	mg/l	C°	(DO)	mg/l	PH	Limit	Limit	ppt	NTU
1.15	ND	ND	12	8.06	5	3.9	6.5	8.5	36.83	6.16
2.15	0.11	ND	16	10.51	5	8.2	6.5	8.5	28.63	6.09
3.15	0.2	ND	17.5	5.46	5	8	6.5	8.5	23.88	3.81
4.15	0.1	ND	17.3	4.61	5	7.6	6.5	8.5	32.4	2.98
5.15	0.26	ND	17.5	4.98	5	7.6	6.5	8.5	32.51	15.6
6.15	0.31	ND	21.2	5.74	5	7	6.5	8.5	25.7	7.18
7.15	0.39	ND	22.3	3.91	5	7	6.5	8.5	28.71	9.21
8.15	0.35	ND	21.7	5.57	5	7.3	6.5	8.5	25.32	10.4
9.15	0.33	ND	19.4	5.34	5	7.7	6.5	8.5	31.31	18.8
10.15					5		6.5	8.5		
11.15					5		6.5	8.5		
12.15					5		6.5	8.5		

NUTRIENTS – Orthophosphate as P (ORP) was detected at all sites in a range between 0.21 and 0.39 mg/l. The lowest site for ORP was at R-3 while R-4 measured the highest. ORP concentration decreased in every site in comparison to August. There were no detectable levels reported for Nitrate as N at any monitoring site.

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 4.5 MPN/100 mL and >1.8 MPN/100mL for R-1 and R-2, respectively. Coliform levels decreased in both sites in comparison to August 2015. The result for R-1 is relatively close to the laboratory detection limit of 1.8 MPN/100 ml, while R-2 is below the detection limit. Fecal coliform did not exceed established limits. Single sample results over 1,000 MPN/mL are considered to exceed limits.

GENERAL WATER QUALITY ANALYSIS – The Dissolved Oxygen (DO) level in September exceeded the 5.0 mg/l threshold for all of the sites except R-2 and R-4. DO was highest at Site R-1 (9.72 mg/l) and lowest at Site R-2 (3.32 mg/l). Water temperature decreased at every site over September with temperatures ranging from 17.6 to 21.2 C. PH measurements were within limits at all Sites. Salinity measurements varied from approximately 27.88 ppt. to a maximum of 31.31 ppt. Turbidity was within limits and varied between 8.69 and 21.8 NTU. It was noted in the field data sheet that the pumps were not running in R-4 during the time of sampling.

Field Results

Redwood Shores Lagoon
Monthly Water Quality Monitoring Field Data

Date: <u>9/16/15</u>	Name(s) of Field Personnel: <u>Richard Chaffey</u>
Weather Conditions	Air Temperature: <u>58'</u>
Wind Conditions: <u>Light /</u> Moderate / High	Percent Cloud: <u>20 %</u>
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	1210	3.0'	1.5'	21.2	9.72	8.0	27.88	8.69
R-2	1105	6.0'	3.0'	20.2	3.32	7.5	29.59	19.7
R-3	1000	4.0'	2.0'	17.6	7.43	7.9	30.67	21.8
R-4	0755	6.0'	3.0'	21.2	3.43	7.3	30.60	17.9
R-5	0850	6.0'	3.0'	19.4	5.34	7.7	31.31	18.8

<p>Samples for the following test will be collected for laboratory analyses</p> <ul style="list-style-type: none"> • Nitrate-N • Ortho-P04-P (preservative required, do not rinse bottle) • Fecal Coliform Bacteria (R-1 and R-2 only)
<p>Notes & Observations about floatables, oil & grease, films, scum water discoloration, algae, aquatic plant growth and presence of dead wildlife:</p> <p>R-1- _____</p> <p>_____</p> <p>R-2- _____</p> <p>_____</p> <p>R-3- _____</p> <p>_____</p> <p>R-4- <u>Pumps not running at time of sample.</u></p> <p>_____</p> <p>R-5- _____</p> <p>_____</p>

Laboratory Results



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Redwood City, City of - Redwood Shores 1400 Broadway Street Redwood City, CA 94063	Project Manager: Brandon Gilmore Project: Redwood Shores Lagoon Project Number: Monthly Monitoring	Reported: 09/29/15 16:05
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	Result	Reporting Limit	Dilution	Batch	Prepared	Analyzed	Method	Note
R-1 (1511582-01)		Sample Type: Water			Sampled: 09/16/15 12:10			
Conventional Chemistry Parameters by APHA/EPA Methods								
Orthophosphate as P	0.22 mg/L	0.10	1	A151803	09/18/15 07:30	09/18/15 09:09	SM4500-P E	
Anions by EPA Method 300.0								
Nitrate as N	ND mg/L	1.0	5	A151719	09/17/15 18:19	09/17/15 18:19	EPA 300.0	R-01
Microbiological Parameters by APHA Standard Methods								
Fecal Coliforms	4.5 MPN/100mL	1.8	1	A152159	09/16/15 19:00	09/19/15 19:00	SM9221	
R-2 (1511582-02)		Sample Type: Water			Sampled: 09/16/15 11:05			
Conventional Chemistry Parameters by APHA/EPA Methods								
Orthophosphate as P	0.33 mg/L	0.10	1	A151803	09/18/15 07:30	09/18/15 09:09	SM4500-P E	
Anions by EPA Method 300.0								
Nitrate as N	ND mg/L	1.0	5	A151719	09/17/15 18:36	09/17/15 18:36	EPA 300.0	R-01
Microbiological Parameters by APHA Standard Methods								
Fecal Coliforms	ND MPN/100mL	1.8	1	A152159	09/16/15 19:00	09/19/15 19:00	SM9221	
R-3 (1511582-03)		Sample Type: Water			Sampled: 09/16/15 10:00			
Conventional Chemistry Parameters by APHA/EPA Methods								
Orthophosphate as P	0.21 mg/L	0.10	1	A151803	09/18/15 07:30	09/18/15 09:09	SM4500-P E	



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Redwood City, City of - Redwood Shores 1400 Broadway Street Redwood City, CA 94063	Project Manager: Brandon Gilmore Project: Redwood Shores Lagoon Project Number: Monthly Monitoring	Reported: 09/29/15 16:05
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	Result	Reporting Limit	Dilution	Batch	Prepared	Analyzed	Method	Note
R-3 (1511582-03)		Sample Type: Water			Sampled: 09/16/15 10:00			
Anions by EPA Method 300.0								
Nitrate as N	ND mg/L	10	50	A151719	09/18/15 03:35	09/18/15 03:35	EPA 300.0	R-01
R-4 (1511582-04)		Sample Type: Water			Sampled: 09/16/15 07:55			
Conventional Chemistry Parameters by APHA/EPA Methods								
Orthophosphate as P	0.39 mg/L	0.10	1	A151803	09/18/15 07:30	09/18/15 09:09	SM4500-P E	
Anions by EPA Method 300.0								
Nitrate as N	ND mg/L	10	50	A151719	09/18/15 03:52	09/18/15 03:52	EPA 300.0	R-01
R-5 (1511582-05)		Sample Type: Water			Sampled: 09/16/15 08:50			
Conventional Chemistry Parameters by APHA/EPA Methods								
Orthophosphate as P	0.33 mg/L	0.10	1	A151803	09/18/15 07:30	09/18/15 09:09	SM4500-P E	
Anions by EPA Method 300.0								
Nitrate as N	ND mg/L	10	50	A151719	09/18/15 04:08	09/18/15 04:08	EPA 300.0	R-01

END OF REPORT