

**Redwood Shores Lagoon  
January 2016  
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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**February 2016**



**RESULTS** - Water quality results for each site is provided below in Table format for 2016 to allow comparison of results from month to month.

## SITE R-1

	Ortho		Fecal		Dissolved							
	Phosphate	Nitrate as N	Fecal	Coliform	Water	Oxygen	DO		PH	PH		
Months	mg/l	mg/l	Coliform	MPN/100 ml	Temp	(DO)	mg/l	PH	Lower	Upper	Salinity	Turbidity
			MPN/100 ml	Limit	C°	mg/l	Limit	PH	Limit	Limit	ppt	NTU
1.16	0.11	ND	7.8	1,000	13.3	11.87	5	8.2	6.5	8.5	28.17	2.93
2.16				1,000			5		6.5	8.5		
3.16				1,000			5		6.5	8.5		
4.16				1,000			5		6.5	8.5		
5.16				1,000			5		6.5	8.5		
6.16				1,000			5		6.5	8.5		
7.16				1,000			5		6.5	8.5		
8.16				1,000			5		6.5	8.5		
9.16				1,000			5		6.5	8.5		
10.16				1,000			5		6.5	8.5		
11.16				1,000			5		6.5	8.5		
12.16				1,000			5		6.5	8.5		

## SITE R-2

	Ortho		Fecal		Dissolved							
	Phosphate	Nitrate as N	Fecal	Coliform	Water	Oxygen	DO		PH	PH		
Months	mg/l	mg/l	Coliform	MPN/100 ml	Temp	(DO)	mg/l	PH	Lower	Upper	Salinity	Turbidity
			MPN/100 ml	Limit	C°	mg/l	Limit	PH	Limit	Limit	ppt	NTU
1.16	ND	ND	11	1,000	14	10.43	5	1	6.5	8.5	35.41	12.7
2.16				1,000			5		6.5	8.5		
3.16				1,000			5		6.5	8.5		
4.16				1,000			5		6.5	8.5		
5.16				1,000			5		6.5	8.5		
6.16				1,000			5		6.5	8.5		
7.16				1,000			5		6.5	8.5		
8.16				1,000			5		6.5	8.5		
9.16				1,000			5		6.5	8.5		
10.16				1,000			5		6.5	8.5		
11.16				1,000			5		6.5	8.5		
12.16				1,000			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
1.16	0.19	ND	11.9	9.51	5	5.3	6.5	8.5	35.79	26
2.16					5		6.5	8.5		
3.16					5		6.5	8.5		
4.16					5		6.5	8.5		
5.16					5		6.5	8.5		
6.16					5		6.5	8.5		
7.16					5		6.5	8.5		
8.16					5		6.5	8.5		
9.16					5		6.5	8.5		
10.16					5		6.5	8.5		
11.16					5		6.5	8.5		
12.16					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
1.16	ND	ND	13.8	4.61	5	6.1	6.5	8.5	35.98	10.1
2.16					5		6.5	8.5		
3.16					5		6.5	8.5		
4.16					5		6.5	8.5		
5.16					5		6.5	8.5		
6.16					5		6.5	8.5		
7.16					5		6.5	8.5		
8.16					5		6.5	8.5		
9.16					5		6.5	8.5		
10.16					5		6.5	8.5		
11.16					5		6.5	8.5		
12.16					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
1.16	ND	ND	13.5	11.4	5	2.4	6.5	8.5	34.67	11.6
2.16					5		6.5	8.5		
3.16					5		6.5	8.5		
4.16					5		6.5	8.5		
5.16					5		6.5	8.5		
6.16					5		6.5	8.5		
7.16					5		6.5	8.5		
8.16					5		6.5	8.5		
9.16					5		6.5	8.5		
10.16					5		6.5	8.5		
11.16					5		6.5	8.5		
12.16					5		6.5	8.5		

**NUTRIENTS** – Orthophosphate as P (ORP) was detected in two of the sites in a range between 0.11 and 0.19 mg/l. The lowest site for ORP was at R-1 measuring 0.11 mg/l while R-3 measured 0.19 mg/l. ORP concentration decreased at every site, except for R-3 where it stayed the same, in comparison to December. Nitrate as N was not detected at any site 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

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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 7.8 MPN/100 mL and 11 MPN/100mL for R-1 and R-2, respectively. Coliform levels decreased in R-1 and increased in R-2 in comparison to December 2015. 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) levels in December exceeded the 5.0 mg/l threshold for every site except R-4. DO was highest at Site R-1 (11.87 mg/l) and lowest at Site R-4 (4.61 mg/l). Water temperature increased at every site over January except for R-3, with temperatures ranging from 11.9 to 14.0 C. PH measurements were below the lower limit at every site except for R-1, ranging from 1.0 to 8.2. These pH values are unusually low and suspect. Despite the water quality monitoring probe being recalibrated in the field, and again registering low pH values, it is thought that the pH sensor may need to be replaced and/or the water quality probe may require servicing by the manufacturer. The water quality technician resampled two sites on 2/3/16 after testing the probe against a pH 7 solution and found pH values of pH 7.9 for site R-2 and pH 7.7 for R-5. Salinity measurements varied from approximately 28.17 ppt. to a maximum of 35.98 ppt. Turbidity was within limits and varied between 2.93 and 26 NTU. It was noted in the field data sheet that the pumps were not running in R-4 during the time of sampling, but the pumps were running in R-5.

# Field Results

Redwood Shores Lagoon  
Monthly Water Quality Monitoring Field Data

Date: <u>1/21/16</u>	Name(s) of Field Personnel: <u>Richard Chaffey</u>
Weather Conditions	Air Temperature: <u>50'</u>
Wind Conditions: <u>Light</u> / Moderate / High	Percent Cloud: <u>50%</u>
<b>Field Measurements</b>	

Sampling Station	Time	Maximum Depth (ft)	Sample Depth (ft)	Water Temp °C	Dis. Oxy. Mg/l	pH units	Salinity ppt	Turbidity NTU
R-1	1142	4.0'	2.0'	13.3	11.87	8.2	28.17	2.93
R-2	1055	4.0'	2.0'	14.0	10.43	1.0	35.41	12.7
R-3	0947	2.0'	1.0'	11.9	9.51	5.3	35.79	26.0
R-4	0754	5.0'	2.5'	13.8	4.61	6.1	35.98	10.1
R-5	0849	5.0'	2.5'	13.5	11.40	2.4	34.67	11.6

<p>Samples for the following test will be collected for laboratory analyses</p> <ul style="list-style-type: none"> <li>• Nitrate-N</li> <li>• Ortho-P04-P (preservative required, do not rinse bottle)</li> <li>• Fecal Coliform Bacteria (R-1 and R-2 only)</li> </ul>
<p>Notes &amp; Observations about floatables, oil &amp; grease, films, scum water discoloration, algae, aquatic plant growth and presence of dead wildlife:</p> <p>R-1- _____ _____</p> <p>R-2- _____ _____</p> <p>R-3- <u>Tide coming thru bell-pipes at time of sample.</u> _____</p> <p>R-4- <u>Pumps not running at time of sample.</u> _____</p> <p>R-5- <u>Pumps running at time of sample.</u> _____</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:  
01/28/16 11:18

	Result	Reporting Limit	Dilution	Batch	Prepared	Analyzed	Method	Note
<b>R-1 (16A1977-01)</b>		<b>Sample Type: Water</b>			<b>Sampled: 01/21/16 11:42</b>			
Conventional Chemistry Parameters by APHA/EPA Methods:								
Orthophosphate as P	0.11 mg/L	0.10	1	AA63895	01/22/16 14:00	01/22/16 15:25	SM4500-PE	
Anions by EPA Method 300.0								
Nitrate as N	ND mg/L	4.0	20	AA63888	01/22/16 11:09	01/22/16 11:09	EPA 300.0	
Microbiological Parameters by APHA Standard Methods:								
Fecal Coliforms	7.8 MPN/100mL	1.8	1	AA63945	01/21/16 18:00	01/24/16 18:00	SM9221	
<b>R-2 (16A1977-02)</b>		<b>Sample Type: Water</b>			<b>Sampled: 01/21/16 10:55</b>			
Conventional Chemistry Parameters by APHA/EPA Methods:								
Orthophosphate as P	ND mg/L	0.10	1	AA63895	01/22/16 14:00	01/22/16 15:25	SM4500-PE	
Anions by EPA Method 300.0								
Nitrate as N	ND mg/L	4.0	20	AA63888	01/22/16 11:25	01/22/16 11:25	EPA 300.0	
Microbiological Parameter by APHA Standard Methods:								
Fecal Coliforms	11 MPN/100mL	1.8	1	AA63945	01/21/16 18:00	01/24/16 18:00	SM9221	
<b>R-3 (16A1977-03)</b>		<b>Sample Type: Water</b>			<b>Sampled: 01/21/16 09:47</b>			
Conventional Chemistry Parameters by APHA/EPA Methods:								
Orthophosphate as P	0.19 mg/L	0.10	1	AA63895	01/22/16 14:00	01/22/16 15:25	SM4500-PE	



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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: 01/28/16 11:18
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	Result	Reporting Limit	Dilution	Batch	Prepared	Analyzed	Method	Note
<b>R-3 (16A1977-03)</b>		<b>Sample Type: Water</b>			<b>Sampled: 01/21/16 09:47</b>			
<b>Anions by EPA Method 300.0</b>								
Nitrate as N	ND mg/L	4.0	20	AA63888	01/22/16 11:41	01/22/16 11:41	EPA300.0	
<b>R-4 (16A1977-04)</b>		<b>Sample Type: Water</b>			<b>Sampled: 01/21/16 07:54</b>			
<b>Conventional Chemistry Parameters by APHA/EPA Methods:</b>								
Orthophosphate as P	ND mg/L	0.10	1	AA63895	01/22/16 14:00	01/22/16 15:25	SM4500-PE	
<b>Anions by EPA Method 300.0</b>								
Nitrate as N	ND mg/L	4.0	20	AA63888	01/22/16 11:57	01/22/16 11:57	EPA300.0	
<b>R-5 (16A1977-05)</b>		<b>Sample Type: Water</b>			<b>Sampled: 01/21/16 08:49</b>			
<b>Conventional Chemistry Parameters by APHA/EPA Methods:</b>								
Orthophosphate as P	ND mg/L	0.10	1	AA63895	01/22/16 14:00	01/22/16 15:25	SM4500-PE	
<b>Anions by EPA Method 300.0</b>								
Nitrate as N	ND mg/L	4.0	20	AA63888	01/22/16 12:13	01/22/16 12:13	EPA300.0	

**END OF REPORT**