City of Clearwater Water Quality and System Information
USE THIS WATER QUALITY FOR PROJECTIONS

ANALYTE	RO1	RO2
Alkalinity, Total as CaCO3 mg/l	184	183
Alkalinity,Bicarbonate (CaCO3) mg/l	184	183
Arsenic mg/l	0.021	0.002
Barium mg/l	0.026	0.048
Boron mg/l	0.04	0.16
Bromide mg/l	0.99	17.10
Calcium mg/l	105	195
Chloride mg/l	249	1450
Dissolved Organic Carbon mg/l	1.9	2.77
Iron mg/l	0.10	0.02
Magnesium mg/l	13.7	86.8
Manganese mg/l	0.011	0.010
Nitrogen, Ammonia mg/l	0.56	0.41
Orthophosphate as P mg/l	0.06	0.11
Potassium mg/l	2.2	24.8
Silica mg/l	24.3	18.6
Sodium mg/l	93.5	814.0
Strontium mg/l	0.26	1.39
Sulfate mg/l	20.0	160.0
Total Dissolved Solids mg/l	594	2880
Total Organic Carbon mg/l	1.9	2.8
FIELD PARAMETERS		
Field pH Std. Units	7.3	7.2
Field Specific Conductance umhos/cm	1103	5305
Field Temperature deg C	25.2	25.0
Field Oxygen, Dissolved mg/l	1.19	0.91
FLOW (Per Train)		
FEEDWATER FLOW GPM	1112	1495
1ST STAGE PERMEATE FLOW GPM	677	1025
1ST STAGE CONCENTRATE FLOW GPM	435	470
2ND STAGE PERMEATE FLOW GPM	188	170
FINAL CONCENTRATE FLOW	247	300
RECOVERY RATE	78%	80%

THE FOLLOWING PAGES ARE FOR REFERENCE

CITY OF CLEARWATER INDIVIDUAL WELL SAMPLES FOR RO1 (2019-2020)

ANALYTE	SEC/ PRI MCL	RO1 23	RO1 31	RO1 48	RO1 65	RO1 66	RO1 73	RO1 74	RO1 75	RO1 78	RO1 81r	RO1 80	RO1 1`1	RO1 1`2	RO1 1`3	RO1 1`4	RO1 1`5	RO1 51r
Alkalinity, Total as CaCO3 mg/l		172	205	212	156	185	180	147	169	187		240			178	181		
Alkalinity,Bicarbonate (CaCO3) mg/l		172	205	212	156	185	180	147	169	187		240			178	181		
Arsenic mg/l	0.01 PRI	0.0066	0.0082	0.0327	0.0152	0.0052	0.0456	0.0089	0.0062	0.0783		0.0185			0.0116	0.0129		
Barium mg/l	2 PRI	0.0293	0.0228	0.0237	0.023	0.0346	0.0301	0.0279	0.0248	0.0219		0.0236			0.0212	0.0263		
Boron mg/l		0.0495	0.0379	0.0344	0.0324	0.0341	0.0353	0.0424	0.0408	0.0285		0.0411			0.0357	0.05		
Bromide mg/l		1.7	0.64	0.57	0.78	1.4	0.88	2.9	0.74	0.81		0.23			0.62	0.57		
Calcium mg/l		122	103	106	92.6	139	99.5	134	96.2	83.2		103			85.4	91.4		
Chloride mg/l	250 SEC	330	221	180	215	444	286	493	225	140		86.4			192	172		
Dissolved Organic Carbon mg/l		1.9	3.4	1.9	2.1	2	1.7	1.6	2.4	1.2		1.4			1.6	1.6		
Field pH Std. Units		7.16	7.2	7.17	7.33	7.26	7.29	7.32	7.19	7.33		7.22			7.3	7.27		
Field Specific Conductance umhos/cm		1320	970	925	976	1558	1225	1865	1061	875.8		749			876	830		
Field Temperature deg C		25.8	25.1	25.1	25.6	25.5	24.6	24.6	24.7	24.4		25.1			25.9	25.4		
Iron mg/l	0.3 SEC	0.969	0.458	0.0646	0.019	0.319	0.366	0.0353	0.0653	0.154		1.19			0.468	0.13		
Magnesium mg/l		14.6	12.7	13	10.2	16.1	16.6	17.7	10.1	14.4		15.2			12.3	11.5		
Manganese mg/l	.05 SEC	0.0319	0.0207	0.0027	0.0067	0.0108	0.0078	0.006	0.018	0.0024		0.0199			0.0153	0.009		
Nitrogen, Ammonia mg/l		0.35	0.65	0.18	0.97	0.55	0.67	0.89	1	0.083					0.37	0.45		
Orthophosphate as P mg/l		0.024	0.12	0.059	0.078	0.063	0.038	0.068	0.086	0.022		0.056			0.079	0.036		
Field Oxygen, Dissolved mg/l		1.19	0.9	1.58	0.51	0.32	1.5	1.27	1.34	2.03		0.87			1.79	1.03		
Potassium mg/l		2.75	1.85	1.48	2.41	2.3	2.6	3.28	2.42	0.94		2.9			1.73	1.49		
Silica mg/l		26.3	25.5	28.9	15.8	18.5	26.1	15.3	17.4	37		31.3			25.9	24		
Sodium mg/l		117	79	63.3	91.4	166	106	193	88.6	47.4		32.2			77.2	60.3		
Strontium mg/l		0.26	0.275	0.269	0.223	0.352	0.279	0.342	0.245	0.211		0.195			0.223	0.294		
Sulfate mg/l	250 SEC	36.6	7	16.7	13.4	31.3	19.8	31.8	7.3	12.9		36.7			15.6	10.6		
Total Dissolved Solids mg/l	500 SEC	684	537	523	532	834	652	986	552	447		429			489	468		
Total Organic Carbon mg/l		1.9	3.3	1.8	2.2	2	1.7	1.9	2.4	1		1.4			1.7	1.7		

Table 4 October 2019 WTP-2 Sampling

Parameters	Units	Scenario A: Typical TDS Well Water Quality [1]						Scenario B: Higher TDS Well Water Quality [2]		
		RO2 Feed Water (without RO1 Concentrate) Sample ID: 1-F	RO2 Combined Permeate Sample ID: 1-P	RO1 Concentrate at RO1 Sample ID: 2-C1	RO1 Concentrate at RO2 Sample ID: 2-C2	RO2 Feed Water with RO1 Concentrate Sample ID: 3-F	RO2 Combined Permeate w/ RO1 Concentrate Sample ID: 3-P	RO2 Feed Water (without RO1 Concentrate) Sample ID: 4-F	RO2 Combined Permeate Sample ID: 4-P	RO2 Concentrate Sample ID: 4-C
Lab Sample Analysis										
Aluminum	ug/L	30.7 U	30.7 U	30.7 U	30.7 U	30.7 U	30.7 U	30.7 U	30.7 U	30.7 U
Barium	ug/L	34.8	0.84 U	115	114	54.6	0.84 U	47.6	0.84 U	233
Boron	ug/L	81.8	59.9	31.7 I	32.0 I	69.4	50.4	160	120	285
Calcium	mg/L	145	1.61	450	468	230	2.66	195	2.42	892
Iron	ug/L	99.9	9.2 U	23.9 I	20.7 I	79.2	9.2 U	26.2 I	9.2 U	122
Magnesium	mg/L	49.9	0.564	58.8	58.6	52.1	0.656	86.8	1.08	410
Manganese	ug/L	8.6	0.42 U	40.7	41.2	16.5	0.42 U	10.2	0.42 U	47.7
Potassium	mg/L	11.5	0.576 I	7.65	7.7	10.6	638 I	24.8	1.36	120
Silica	mg/L	18.6	0.692	88.6	90.4	36.9	1.36	18.6	0.724	80.2
Sodium	mg/L	483	30.7	374	389	468	32.7	814	53.5	3530
Strontium	ug/L	944	10.5	1140	1150	986	11.9	1390	18.6	6790
Total Hardness (as $CaCO_3$)	mg/L	568	6.34	1360	1410	788	9.35	818	10.5	3850
Iron, Dissolved	ug/L	41.3	9.2 U	17.9 I	19.6 I	79	9.2 U	21.5 I	9.2 U	116
Manganese, Dissolved	ug/L	8.2	0.42 U	40.4	40.6	16.5	0.42 U	9.9	0.42 U	43.5
Silica, Dissolved	ug/L	18,400	649	90,900	87,100	35,000	1,290	17,400	724	83,600
Arsenic	ug/L	2.1	0.71 I	45.7	47.4	13.1	5.5	1.6	0.5 U	6.1
Total Dissolved Solids	mg/L	1880	76	2510	2630	2120	80	2880	164	13.6
Total Alkalinity (as $CaCO_3$)	mg/L	172	8.9	642	646	294	11.9	183	11.3	729
Bromide	mg/L	11.5	0.78	13.5	3.3	11.1	0.17	17.1	1.2	80.7
Chloride	mg/L	927	39.7	914	943	958	42.8	1450	86.4	6440
Fluoride	mg/L	0.26	0.034 U	1.1	1.1	0.40	0.034 U	0.22 I	0.034 U	0.68 U
Sulfate	mg/L	95.1	3.1 I	97.4 I	101	90.8	2.7 I	160	5.0 I	762
Nitrogen, Ammonia	mg/L	0.40	0.035 U	2.1	2.1	0.82	0.037 I	0.41	0.035 U	1.8
Nitrogen, Nitrate	mg/L	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Nitrogen, Nitrite	mg/L	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Orthophosphate as P	mg/L	0.074	0.0038 U	0.20	0.20	0.11	0.0038 U	0.11	0.0038 U	0.53
Total Phosphorus (as P)	mg/L	0.05 U	0.05 U	0.5	0.63	0.16	0.05 U	0.085 I	0.05 U	0.43

SOUTHERN ANALYTICAL LABORATORIES, INC.
110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 FAX 813-855-2218

City of Clearwater Water Department
1650 N. Arcturas Ave.
Clearwater, FL 33765

May 11, 2016
Work Order: 1605722

Laboratory Report

Project Name **Membrane Specific Water Quality Analyses**

Sample Description	**RO #1 Raw**
Matrix	**Drinking Water**
SAL Sample Number	**1605722-01**
Date/Time Collected	**04/26/16 07:30**
Collected by	**Client**
Date/Time Received	**04/26/16 09:15**

Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Inorganics								
Ammonia as N	mg/L	0.44	EPA 350.1	0.040	0.009		04/27/16 10:57	1
Bicarbonate Alkalinity	mg/L	170	SM 2320B	8.0	2.0		04/26/16 12:03	1
Carbonate Alkalinity	mg/L	2.0 U	SM 2320B	8.0	2.0		04/26/16 12:03	1
Chloride	mg/L	220	EPA 300.0	4.0	2.0	04/27/16 15:56	04/28/16 19:50	10
Color	Color Units	5	SM 2120B	5	5		04/26/16 14:31	1
Fluoride	mg/L	0.29	EPA 300.0	0.040	0.010	04/27/16 15:56	04/28/16 14:46	1
Nitrate (as N)	mg/L	0.01 U	EPA 353.2	0.04	0.01		04/27/16 17:32	1
Nitrite (as N)	mg/L	0.01 U	SM 4500NO2-B	0.04	0.01		04/27/16 17:32	1
Phosphorous - Total as P	mg/L	0.10 U	SM 4500P-E	0.40	0.10	04/26/16 13:59	04/27/16 14:55	10
Sulfate	mg/L	19	EPA 300.0	0.60	0.20	04/27/16 15:56	04/28/16 14:46	1
Total Alkalinity	mg/L	170	SM 2320B	8.0	2.0		04/26/16 12:03	1
Total Dissolved Solids	mg/L	610	SM 2540C	10	10	04/27/16 08:12	04/28/16 14:12	1
Total Hardness as CaCO3	mg/L	300	SM 2340B	33	1.9	04/28/16 11:37	04/28/16 14:07	10
Total Organic Carbon	mg/L	1.6	SM 5310B	1.0	0.060		05/06/16 10:38	1
Inorganic, Dissolved								
Dissolved Organic Carbon	mg/L	1.5	SM 5310B	1.0	0.060		05/06/16 21:23	1
Metals								
Arsenic	mg/L	0.014	EPA 200.8	0.0050	0.00093	04/29/16 10:29	05/02/16 16:04	1
Barium	mg/L	0.050 U	EPA 200.7	1.0	0.050	04/28/16 11:37	04/28/16 14:07	10
Calcium	mg/L	98	EPA 200.7	5.0	0.42	04/28/16 11:37	04/28/16 14:07	10
Iron	mg/L	0.20 U	EPA 200.7	1.0	0.20	04/28/16 11:37	04/28/16 14:07	10
Magnesium	mg/L	12	EPA 200.7	5.0	0.20	04/28/16 11:37	04/28/16 14:07	10
Manganese	mg/L	0.011 I	EPA 200.7	0.10	0.010	04/28/16 11:37	04/28/16 14:07	10
Potassium	mg/L	2.0	EPA 200.7	0.50	0.10	04/28/16 11:37	04/28/16 14:07	10
Sodium	mg/L	89	EPA 200.7	5.0	1.3	04/28/16 11:37	04/28/16 14:07	10
Strontium	mg/L	0.23 I	EPA 6010	1.0	0.084	04/28/16 11:37	04/28/16 14:07	10
Metals, Dissolved								
Arsenic	mg/L	0.025	EPA 200.8	0.0050	0.00093		05/02/16 16:08	1
Iron	mg/L	0.10	EPA 200.7	0.10	0.020		05/03/16 11:28	1
Silicon	mg/L	13	EPA 200.7	0.050	0.010		05/02/16 12:12	1
Microbiology								

Florida Certification Number: E84129
NELAP Accredited

Francis I. Daniels, Laboratory Director
Leslie C. Boardman, Q.A. Manager

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City of Clearwater Water Department
1650 N. Arcturas Ave.
Clearwater, FL 33765

May 11, 2016
Work Order: 1605722

Laboratory Report

Project Name **Membrane Specific Water Quality Analyses**

Sample Description	**RO #1 Raw**
Matrix	**Drinking Water**
SAL Sample Number	**1605722-01**
Date/Time Collected	**04/26/16 07:30**
Collected by	**Client**
Date/Time Received	**04/26/16 09:15**

Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Heterotrophic Plate Count	CFU/ml	1 U	SM 9215B	1	1	04/26/16 12:36	04/28/16 10:57	1

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May 11, 2016
Work Order: 1605722

* Qualifiers, Notes and Definitions

Results followed by a "U" indicate that the sample was analyzed but the compound was not detected. Results followed by "I" indicate that the reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

A statement of estimated uncertainty of test results is available upon request.

For methods marked with **, all QC criteria have been met for this method which is equivalent to a SAL certified method.

Test results in this report meet all the requirements of the NELAC standards. Any applicable qualifiers are shown below.

Questions regarding this report should be directed to :

Kathryn Nordmark
Telephone (813) 855-1844 FAX (813) 855-2218
Kathryn@southernanalyticallabs.com

SOUTHERN ANALYTICAL LABORATORIES, INC.
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ACCREDITED IN ACCORDANCE WITH

CHAIN OF CUSTODY

Client: City of Clearwater Water Departme
Project: Membrane Specific Water Quality /
Project Number: Membrane Specific Water Quality
Project Manager: Barry LeCavalier
SAL Workorder Number: 1605722
SAL Project Manager: Kathryn Nordmark

Number	Sample Identification	Matrix	Type	Sampled Date/Time	Container	Qty	Analyses
01	Sample Name RO#1 Raw	Water	Grab	4/26/16 7:30AM	1 125mL P sterile, Na2S2O3 1 1LP, Cool 1 250ml aG, Cool 1 250ml P, Cool 1 250mL P, H2SO4 1 250mL P, HNO3 2 TOC-40mlV, HCl	8	Alkalinity, Ammonia, AS 200.8, AS Diss 200 BA 200.7, CA 200.7, Chloride 300.0, Color, FE 200.7, FE Diss 200.7, Fluoride 300.0, Hardness-Total, HPC, K 200.7, MG 200.7, M 200.7, NA 200.7, Nitrate 300.0, Nitrite 300.0 Phosphorus Total, SI Diss 200.7, Solids, Tot Dissolved (TDS), SR 6010, Sulfate 300.0, T

Page 4 of 4

Relinquished By: [signature]	Date/Time: 04/22/16 1630	Relinquished By: [signature]	Date/Time: 4/26/16 0915
Received By: [signature]	Date/Time:	Received By: K Nordmark	Date/Time: 4/26/16 0915
Relinquished By:	Date/Time:	Relinquished By:	Date/Time:
Received By:	Date/Time:	Received By:	Date/Time: