

Appendix A – November MOR	2-8
Appendix B – UV Bypass	9-10
Appendix C – UV Integration Formula	11-13
Appendix D – Alarms and Shutdowns	14-16
Appendix E – Laboratory and On-Line Methods	17-20
Appendix F – pH Meter Calibration	21-22
Appendix G – Nitrate/Nitrite Instrument Calibration	23-24
Appendix H – Temperature and pH Measurements During a CIP	25-31
Appendix I – Flow Meters	32-40
Appendix J – Plant Operation Manual	41-250
Appendix K – Backflow Prevention	251-252
Appendix L – WWTP Treatment.....	253-255
Appendix M - Labeling	256-265
Appendix N – Potential Contamination and Backflow Issues	266-267
Appendix O – NSF Certification.....	268-269
Appendix P – Hydrogen Peroxide Bulk Storage Tank.....	270-277
Appendix Q – Chemical Tank Labels	278-283
Appendix R – Sulfuric Acid Spill Containment.....	284-285
Appendix S – RO CIP Tank	286-287
Appendix T – Hinged Flap Valve on the Product Water Tank	288-289

Appendix A – November MOR

RAW WATER PRODUCTION FACILITY - MONTHLY OPERATING REPORT

CRMWD RWPF - BIG SPRING PLANT

RECLAIMING TREATED EFFLUENT FOR RAW SURFACE WATER BLENDING

Summary Page

PUBLIC WATER

SYSTEM NAME: Colorado River Municipal Water District

PLANT NAME

OR NUMBER: Raw Water Production Facility - Big Spring Plant

PWS ID No.: 1140038

Plant ID No.: RWPF

Report for

the Month of: November 2013

Operator's Signature:

I certify that I am familiar with the information contained in this report and that,
to the best of my knowledge, the information is true, complete, and accurate.

Robert Hildreth

Certificate No. & Grade: Surface water B WS0010990

Date: December 10, 2013

TREATMENT PLANT PERFORMANCE

Number of filtrate readings above 0.15 NTU: 1

No. of cond. readings with 20% increase: 0

Number of days when plant was on-line but individual filter
turbidity data was not collected: 0

RAW WATER PRODUCTION FACILITY - MONTHLY OPERATING REPORT

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

WATER SUPPLY DIVISION/PUBLIC DRINKING WATER SECTION (MC-155)

P.O. BOX 13087, AUSTIN, TEXAS 78711-3087

RAW WATER PRODUCTION FACILITY - MONTHLY OPERATING REPORT

CRMWD RWPF - BIG SPRING PLANT

RECLAIMING TREATED EFFLUENT FOR RAW SURFACE WATER BLENDING

Flow Page

PLANT DATA PAGE: 2

PUBLIC WATER SYSTEM NAME: Colorado River Municipal municipal Water District

PWS ID No.: 1140038

MONTH: Nov-13

Date	Source Water Volume	Source Highest Turbidity	Membrane Filter Volumes			Reverse Osmosis Volumes									Product Water Volume	Blend Water Volume	Maximum Blend Ratio
	(MG)	(NTU)	Train A Filtrate (MG)	Train B Filtrate (MG)	Total Filtrate (MG)	Train A Feed (MG)	Train B Feed (MG)	Total Feed (MG)	Train A Concen. (MG)	Train B Concen. (MG)	Total Concen. (MG)	Train A Permeate (MG)	Train B Permeate (MG)	Total Permeate (MG)	(MG)	(MG)	(% PW)
01	2.34	2.93	1.20	1.05	2.26	1.14	1.10	2.25	0.30	0.30	0.60	0.84	0.80	1.64	1.87	12.91	14.20
02	2.11	3.59	0.97	1.04	2.02	1.01	0.99	2.00	0.27	0.26	0.53	0.74	0.73	1.47	1.47	12.90	14.30
03	2.14	5.32	0.99	1.01	2.00	1.23	0.74	1.97	0.31	0.19	0.50	0.92	0.55	1.47	1.53	11.94	16.10
04	2.14	3.43	0.99	1.04	2.03	1.18	0.79	1.97	0.29	0.21	0.51	0.88	0.58	1.46	1.38	12.61	14.10
05	2.66	3.24	1.27	1.21	2.48	1.18	1.17	2.35	0.29	0.30	0.60	0.88	0.87	1.75	1.97	12.90	14.00
06	2.66	4.62	1.21	1.28	2.49	1.18	1.17	2.35	0.29	0.30	0.60	0.89	0.87	1.75	1.83	12.94	13.90
07	2.53	6.18	1.19	1.12	2.31	0.77	1.18	1.95	0.22	0.29	0.52	0.54	0.89	1.43	1.54	12.92	14.20
08	2.51	3.58	1.07	1.19	2.26	1.18	0.74	1.92	0.29	0.20	0.49	0.89	0.55	1.43	1.56	12.87	14.10
09	2.07	4.83	1.29	0.80	2.09	1.17	0.90	2.07	0.30	0.27	0.57	0.87	0.63	1.50	1.21	12.87	13.80
10	1.77	5.27	1.15	0.44	1.59	1.17	0.33	1.50	0.30	0.14	0.44	0.87	0.19	1.06	1.19	12.87	8.30
11	2.08	6.81	1.00	1.00	2.00	1.18	0.74	1.92	0.29	0.20	0.49	0.88	0.55	1.43	1.80	11.34	16.60
12	1.95	3.88	0.87	0.90	1.77	0.47	1.18	1.65	0.12	0.29	0.42	0.35	0.88	1.23	1.42	11.17	16.30
13	1.95	5.01	0.92	0.94	1.86	0.55	1.18	1.73	0.15	0.29	0.44	0.40	0.88	1.28	1.31	13.02	13.90
14	2.04	3.22	0.40	1.40	1.80	0.56	1.18	1.74	0.18	0.29	0.47	0.38	0.88	1.26	1.36	12.91	13.90
15	1.96	4.78	1.00	0.85	1.86	0.96	0.45	1.41	0.27	0.15	0.42	0.69	0.30	0.99	1.09	12.29	13.90
16	3.23	5.62	1.46	1.53	2.98	1.18	1.17	2.35	0.29	0.30	0.60	0.88	0.87	1.75	1.84	11.95	16.20
17	2.98	3.91	1.24	1.45	2.69	1.18	1.02	2.20	0.29	0.28	0.57	0.88	0.74	1.63	1.72	10.94	16.20
18	0.08	4.23	0.42	1.34	1.76	1.18	0.43	1.61	0.29	0.13	0.42	0.88	0.30	1.19	0.08	12.59	14.20
19	1.82	10.12	0.92	0.88	1.80	0.95	0.87	1.82	0.24	0.24	0.48	0.71	0.63	1.34	1.48	12.34	16.40
20	1.62	5.84	0.58	0.87	1.45	0.76	0.63	1.39	0.22	0.21	0.43	0.55	0.42	0.97	0.99	12.45	16.40
21	2.85	6.51	1.39	1.27	2.67	1.18	1.14	2.32	0.29	0.29	0.59	0.88	0.85	1.73	1.76	10.91	16.40
22	2.61	9.39	1.21	1.27	2.48	1.18	0.95	2.13	0.29	0.27	0.56	0.88	0.68	1.57	1.61	11.90	16.40
23	0.86	6.53	0.30	0.35	0.65	0.48	0.20	0.68	0.13	0.06	0.20	0.35	0.13	0.48	0.51	12.97	13.90
24	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
25	0.28	6.03	0.27	0.00	0.27	0.14	0.07	0.21	0.08	0.06	0.14	0.07	0.00	0.07	0.00	0.00	0.00
26	0.73	5.51	0.71	0.00	0.71	0.17	0.16	0.33	0.08	0.07	0.15	0.09	0.08	0.18	0.00	2.27	0.00
27	0.53	5.83	0.49	0.00	0.49	0.04	0.30	0.34	0.02	0.10	0.12	0.02	0.20	0.22	0.00	0.00	0.00
28	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
29	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
30	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Total	50.51		24.54	24.24	48.78	23.37	20.77	44.13	6.13	5.72	11.84	17.24	15.05	32.29	32.51		
Avg	1.94		0.94	0.93	1.88	0.90	0.80	1.70	0.24	0.22	0.46	0.66	0.58	1.24	1.25		
Max	3.23	10.12	1.46	1.53	2.98	1.23	1.18	2.35	0.31	0.30	0.60	0.92	0.89	1.75	1.97		
Min	0.08		0.27	0.00	0.27	0.04	0.07	0.21	0.02	0.06	0.12	0.02	0.00	0.07	0.00		

SUBMITTED BY: Robert Hildreth WS0010990

RAW WATER PRODUCTION FACILITY - MONTHLY OPERATING REPORT

CRMWD RWPF - BIG SPRING PLANT

RECLAIMING TREATED EFFLUENT FOR RAW SURFACE WATER BLENDING

Microfiltration Page

PLANT DATA PAGE: 3

PUBLIC WATER SYSTEM NAME: Colorado River Municipal Water District

PWS ID No.: 1140038

MONTH: Nov-13

Date	MF Turbidity			Direct Integrity Tests - Train A					Direct Integrity Tests - Train B					Chemical Cleaning Events				Average Daily Flux	
	Highest Train A Filt. Turb. (mNTU)	Highest Train B Filt. Turb. (mNTU)	Highest Filtrate Turbidity (mNTU)	Starting Test Pressure (psi)	Ending Test Pressure (psi)	Ending Time (HH:mm)	Test Duration (min.)	Decay Pressure Rate (psi/min.)	Starting Test Pressure (psi)	Ending Test Pressure (psi)	Ending Time (HH:mm)	Test Duration (min.)	Decay Pressure Rate (psi/min.)	Enhanced FM Comp.		CIP Completed		Train A (gfd)	Train B (gfd)
														Train A (HH:mm)	Train B (HH:mm)	Train A (HH:mm)	Train B (HH:mm)		
1	0.013	0.012	0.013	27.73	27.73	0	5.00	0.00	26.92	26.92	0	5.00	0.00	X	9:20	X	X	30.86	26.69
2	0.018	0.012	0.018	27.70	27.68	0	5.00	0.00	26.83	26.84	0	5.00	0.00	12:25	X	X	X	23.85	25.91
3	0.012	0.013	0.013	27.75	27.69	0	5.00	0.01	26.84	26.80	0	5.00	0.01	X	14:10	X	X	23.73	24.11
4	0.013	0.012	0.013	27.59	27.55	0	5.00	0.01	26.78	26.69	0	5.00	0.02	23:45	X	X	X	25.20	26.63
5	0.014	0.013	0.014	27.74	27.71	0	5.00	0.01	26.80	26.78	0	5.00	0.00	X	20:50	X	X	32.13	30.91
6	0.013	0.013	0.013	27.89	27.83	0	5.00	0.01	26.99	26.94	0	5.00	0.01	22:00	X	X	X	30.59	32.62
7	0.028	0.019	0.028	27.73	27.67	0	5.00	0.01	26.76	26.72	0	5.00	0.01	X	21:00	X	X	29.98	28.31
8	0.013	0.013	0.013	27.54	27.51	0	5.00	0.01	26.78	26.71	0	5.00	0.01	23:55	X	X	X	27.49	30.33
9	0.021	0.015	0.021	27.77	27.74	0	5.00	0.01	26.70	26.70	0	5.00	0.00	0:20	X	X	X	32.82	20.22
10	0.015	0.016	0.016	27.61	27.56	0	5.00	0.01	27.02	26.98	11	5.00	0.01	21:50	16:00	X	X	28.91	11.06
11	0.014	0.021	0.021	27.73	27.69	0	5.00	0.01	26.97	26.92	0	5.00	0.01	X	X	X	X	25.58	25.41
12	0.016	0.019	0.019	27.68	27.63	0	5.00	0.01	26.83	26.79	0	5.00	0.01	X	X	X	X	22.04	22.79
13	0.016	0.016	0.016	27.43	27.39	0	5.00	0.01	26.60	26.58	0	5.00	0.01	15:00	9:30	X	X	23.00	23.62
14	0.017	0.016	0.017	27.80	27.75	15	5.00	0.01	26.66	26.61	0	5.00	0.01	X	X	15:15	X	10.42	35.46
15	0.020	0.034	0.034	27.40	27.43	7	5.00	0.00	27.30	27.23	17	5.00	0.01	X	5:20	X	15:25	24.55	21.59
16	0.025	0.014	0.025	27.63	27.59	0	5.00	0.01	26.67	26.61	0	5.00	0.01	22:45	X	X	X	36.79	39.30
17	0.017	0.015	0.017	27.79	27.73	0	5.00	0.01	26.84	26.82	0	5.00	0.00	X	8:35	X	X	31.22	35.73
18	0.020	0.013	0.020	27.85	27.80	15	5.00	0.01	26.84	26.80	0	5.00	0.01	X		X	X	10.66	34.14
19	0.022	0.016	0.022	27.59	27.55	0	5.00	0.01	26.75	26.71	0	5.00	0.01	15:40	2:05	X	X	23.63	22.07
20	0.022	0.017	0.022	27.89	27.85	8	5.00	0.01	27.01	26.95	8	5.00	0.01	X	X	X	X	14.76	21.75
21	0.023	0.031	0.031	27.80	27.79	0	5.00	0.00	26.90	26.88	0	5.00	0.01	X	14:45	X	X	34.67	33.04
22	0.049	0.012	0.049	27.53	27.49	0	5.00	0.01	26.76	26.74	0	5.00	0.00	5:00	X	X	X	30.32	32.64
23	0.019	0.017	0.019	27.37	27.37	0	5.00	0.00	26.60	26.55	0	5.00	0.01	14:00	X	X	X	7.63	8.29
24	x	x	x	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.00	0.00
25	0.500	0.000	0.500	27.56	27.52	10	5.00	0.01	X	X	X	X	X	X	19:25	X	X	7.07	0.00
26	0.020	0.000	0.020	27.30	27.26	0	5.00	0.01	X	X	X	X	X	X	X	X	X	18.06	0.00
27	0.017	0.000	0.017	27.35	27.30	0	5.00	0.01	X	X	X	X	X	X	X	X	X	12.29	0.00
28	x	x	x	X	X	X	X	X	X	X	X	X	X	X	X	X	X	x	x
29	x	x	x	X	X	X	X	X	X	X	X	X	X	X	X	X	X	x	x
30	x	x	x	X	X	X	X	X	X	X	X	X	X	X	X	X	X	x	x

SUBMITTEL Max 0.500 0.034 0.500

RAW WATER PRODUCTION FACILITY - MONTHLY OPERATING REPORT

CRMWD RWPF - BIG SPRING PLANT
RECLAIMING TREATED EFFLUENT FOR RAW SURFACE WATER BLENDING
Reverse Osmosis Page

PLANT DATA PAGE: 4

PUBLIC WATER SYSTEM NAME: Colorado River Municipal Water District

PWS ID No.: 1140038

MONTH: Nov-13

Date	RO Perm. Conductivity Increase				CIP Completed		Average Daily Flux	
	Highest Train A Increase		Highest Train B Increase		Train A	Train B	Train A	Train B
	(µS/cm)	%	(µS/cm)	%	(HH:mm)	(HH:mm)	(gfd)	(gfd)
1	15.64	X	9.92	X	X	X	9.91	9.52
2	15.64	X	11.82	X	X	X	8.68	8.59
3	13.35	X	5.72	X	X	X	10.31	6.05
4	8.77	X	3.43	X	X	X	10.31	6.77
5	9.15	X	3.81	X	X	X	10.31	10.20
6	11.06	X	11.44	X	X	X	10.31	10.20
7	3.05	X	3.43	X	17:00	X	6.59	10.31
8	2.67	X	2.29	X	X	19:30	10.31	6.52
9	13.35	X	3.81	X	X	X	10.17	7.62
10	6.10	X	1.14	X	X	X	10.17	2.60
11	1.14	X	0.76	X	X	X	10.31	6.45
12	1.91	X	8.39	X	X	X	4.08	10.31
13	3.43	X	4.20	X	13:00	X	4.69	10.31
14	4.58	X	11.06	X	X	X	4.65	10.31
15	1.53	X	0.76	X	X	X	8.15	3.83
16	2.29	X	1.91	X	X	X	10.31	10.17
17	4.96	X	1.14	X	X	X	10.31	8.81
18	2.29	X	6.48	X	X	15:25	10.31	3.65
19	9.92	X	3.43	X	X	X	8.31	7.41
20	7.63	X	3.05	X	X	X	6.44	5.33
21	8.39	X	1.14	X	X	X	10.31	9.99
22	4.20	X	2.67	X	X	X	10.31	8.19
23	1.91	X	3.05	X	X	X	4.19	1.54
24	x	X	x	X	X	X	x	x
25	1.91	X	0.00	X	X	X	0.91	0.25
26	1.14	X	1.14	X	X	18:45	1.28	1.22
27	0.38	X	0.76	X	X	X	0.25	2.50
28	x	X	x	X	X	X	x	x
29	x	X	x	X	X	X	x	x
30	x	X	x	X	X	X	x	x
Max	15.64	X	11.82	X				

RAW WATER PRODUCTION FACILITY - MONTHLY OPERATING REPORT

CRMWD RWPF - BIG SPRING PLANT

RECLAIMING TREATED EFFLUENT FOR RAW SURFACE WATER BLENDING

UV - Advanced Oxidation

PLANT DATA PAGE: 5

PUBLIC WATER SYSTEM NAME: Colorado River Muncipal Water District

PWS ID No.: 1140038

MONTH: Nov-13

Date	UV Feed Trans.		Flow Rates		Sensor Reading		UV Dose Measured (D _{val})			UV Power Level			Lamps Out of Service			Virus Inactivation			Off-Spec Events	
	Lowest Trans. %	Highest Trans. %	Lowest Flow Rate (MGD)	Highest Flow Rate (MGD)	Lowest Reactor 1 (mW/cm ²)	Lowest Reactor 2 (mW/cm ²)	Lowest Reactor 1 Dose (mJ/cm ²)	Lowest Reactor 2 Dose (mJ/cm ²)	Lowest Reactor Dose (mJ/cm ²)	Lowest Reactor 1 Power %	Lowest Reactor 2 Power %	Lowest Reactor Power %	Max Reactor 1 Lamps Out #	Max Reactor 2 Lamps Out #	Max Total Lamps Out #	Lowest Reactor 1 LRV	Lowest Reactor 2 LRV	Lowest Total Virus LRV	Volume (MG)	Duration (hrs)
1	100.00	100.00	0.87	1.79	99.5	100.0	132.03	132.03	132.03	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
2	100.00	100.00	0.88	1.78	99.4	100.0	132.12	132.12	132.12	62.0	62.0	62.0	0	0	0	2	2	4	0.00	0.00
3	100.00	100.00	0.89	1.78	99.5	100.0	132.15	132.15	132.15	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
4	100.00	100.00	0.89	1.79	99.5	100.0	131.89	131.89	131.89	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
5	100.00	100.00	0.89	1.79	99.5	100.0	132.07	132.07	132.07	62.0	62.0	62.0	0	0	0	2	2	4	0.00	0.00
6	100.00	100.00	0.89	1.79	99.5	100.0	132.08	132.08	132.08	64.0	64.0	64.0	0	0	0	2	2	4	0.00	0.00
7	100.00	100.00	0.88	1.79	99.5	100.0	132.08	132.08	132.08	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
8	100.00	100.00	0.89	1.79	99.5	100.0	132.10	132.10	132.10	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
9	100.00	100.00	0.87	1.79	99.5	100.0	132.09	132.09	132.09	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
10	100.00	100.00	0.87	1.79	99.5	100.0	132.12	132.12	132.12	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
11	100.00	100.00	0.87	1.79	99.5	100.0	132.13	132.13	132.13	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
12	100.00	100.00	0.89	1.79	99.5	100.0	132.08	132.08	132.08	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
13	100.00	100.00	0.88	1.79	99.5	100.0	132.09	132.09	132.09	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
14	100.00	100.00	0.86	1.79	99.5	100.0	132.12	132.12	132.12	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
15	100.00	100.00	0.88	1.78	99.2	100.0	132.18	132.18	132.18	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
16	100.00	100.00	0.87	1.79	99.5	99.8	132.12	132.12	132.12	64.0	64.0	64.0	0	1	1	2	2	4	0.00	0.00
17	100.00	100.00	0.87	1.79	99.5	99.8	132.09	132.09	132.09	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
18	100.00	100.00	0.87	1.78	99.5	99.8	132.16	132.16	132.16	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
19	100.00	100.00	0.87	1.79	99.5	99.8	132.14	132.14	132.14	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
20	100.00	100.00	0.87	1.79	0.0	99.8	0.00	132.05	0.00	0.0	60.0	0.0	72	0	72	0	2	0	0.03	0.67
21	100.00	100.00	0.89	1.79	99.5	99.8	132.07	132.07	132.07	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
22	100.00	100.00	0.87	1.90	99.5	99.8	125.97	125.97	125.97	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
23	100.00	100.00	0.89	1.78	99.5	99.8	132.23	132.23	132.23	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
24	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
25	100.00	100.00	0.88	1.78	0.0	99.8	0.00	132.26	0.00	0.0	60.0	0.0	72	0	72	0	2	0	0.02	0.33
26	0.00	100.00	0.89	1.78	99.5	100.0	0.00	0.00	0.00	60.0	60.0	60.0	0	0	0	0	0	0	0.00	0.00
27	100.00	100.00	0.88	1.79	99.5	99.8	131.66	131.66	131.66	60.0	60.0	60.0	0	0	0	2	2	4	0.00	0.00
28	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
29	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
30	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Max		100.0		1.9									72	1	72					
Min	0.0		0.9		0.0	99.8	0.0	0.0	0.0	0.0	60.0	0.0				0	0	0		
Total																			0.05	1.00

SUBMITTED BY: Robert Hildreth WS0010990

MONTH: Nov/1/2013

Date	Chemical Usage							Final Product Water Quality	
	Sodium Hypochl.	Sulfuric Acid	Caustic Soda	Citric Acid	Sodium Bisulfite	Anti Scalant	Hydrogen Peroxide	Nitrate	Nitrite
	(gals.)	(gals.)	(gals.)	(gals.)	(gals.)	(gals.)	(gals.)	mg/l	mg/l
1	14.83	10.89	x	x	6.55	13.23	0.25	0.63	<0.15
2	x	9.69	x	x	5.79	11.36	0.22	0.61	x
3	15.35	9.56	x	x	7.05	8.06	0.22	0.36	x
4	15.59	9.54	1.53	x	6.77	13.42	0.22	0.35	<0.15
5	8.05	11.40	0.58	x	6.77	12.51	0.26	0.39	<0.15
6	8.02	11.40	1.30	x	6.77	13.63	0.26	0.37	<0.15
7	8.16	9.43	1.56	1.23	4.39	11.44	0.21	0.61	<0.15
8	8.20	9.33	5.10	2.24	6.77	12.09	0.21	0.71	<0.15
9	x	10.04	x	x	6.73	10.64	0.23	0.56	x
10	13.86	7.25	x	x	6.71	9.33	0.16	0.51	x
11	x	9.33	x	x	6.77	12.70	0.21	0.56	<0.15
12	x	7.98	x	4.61	2.67	6.76	0.18	0.48	<0.15
13	24.24	8.37	x	x	3.13	13.30	0.19	0.50	<0.15
14	46.58	8.42	42.79	1.21	3.19	13.50	0.19	0.41	<0.15
15	x	6.86	2.55	18.30	5.53	8.72	0.16	0.58	<0.15
16	14.13	11.39	x	x	6.77	12.77	0.26	0.46	x
17	x	10.65	0.82	1.72	6.76	8.78	0.24	0.41	x
18	6.89	7.80	1.90	x	6.76	12.45	0.18	0.46	<0.15
19	7.04	8.82	5.15	1.42	5.46	5.36	0.20	0.78	<0.15
20	x	6.76	x	x	4.39	12.93	0.15	0.60	<0.15
21	21.57	11.27	2.32	0.52	6.76	13.15	0.26	0.65	<0.15
22	x	10.33	x	x	6.76	7.95	0.23	0.35	<0.15
23	20.32	3.29	x	x	2.77	1.52	0.07	0.94	x
24	x	x	x	x	x	x	x	x	x
25	x	1.02	6.84	9.86	0.83	1.11	0.02	0.53	<0.15
26	x	1.60	25.02	6.17	0.98	1.32	0.04	0.81	<0.15
27	4.22	1.64	x	x	0.21	0.94	0.04	0.09	<0.15
28	x	x	x	x	x	x	x	x	x
29	x	x	x	x	x	x	x	x	x
30	x	x	x	x	x	x	x	x	x
Total	237.06	214.06	97.44	47.29	134.03	248.98	4.85		

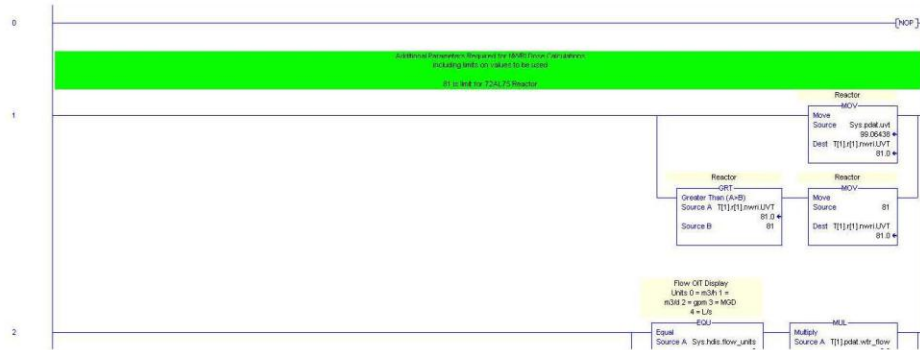
Appendix B – UV Bypass



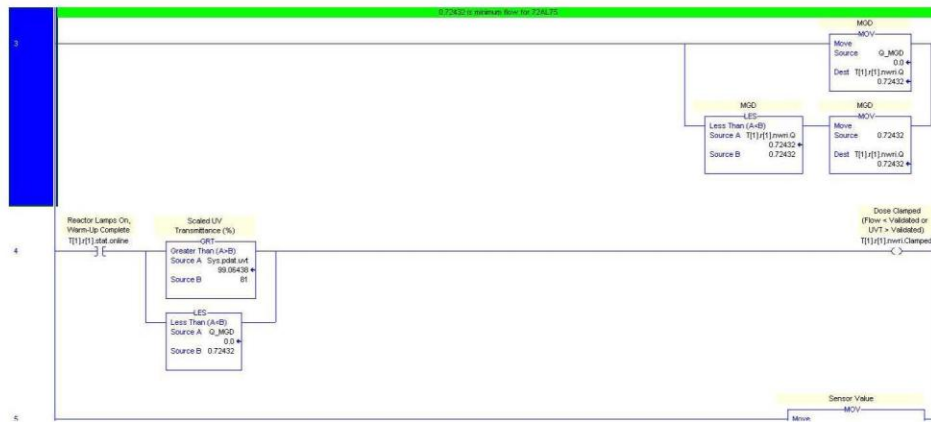
Appendix C – UV Integration Formula

Big Springs Logic Snapshots for UV Dose Calculations.

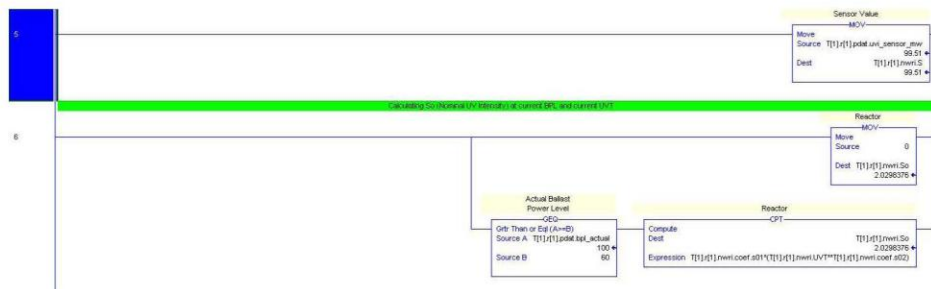
Logic to limit UV Transmittance to no higher than 81%

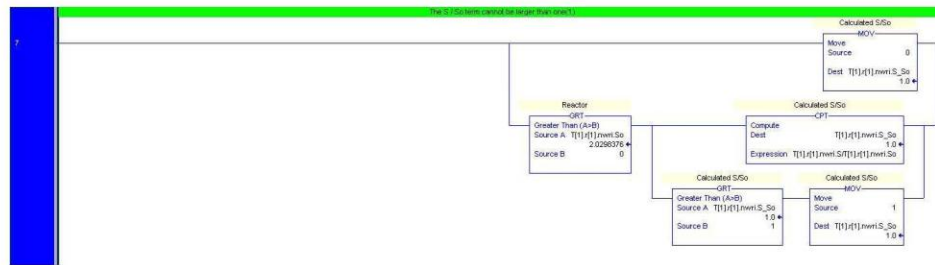


Logic to limit UV system flow rate to no lower than 503 gpm (0.72432 MGD)

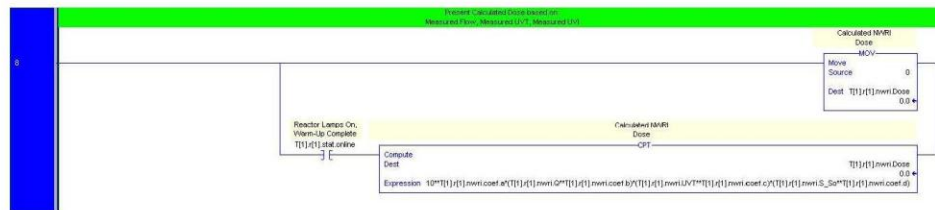


Logic to limit S/So to 1.0 or less





Validation Dose Calculation



Appendix D – Alarms and Shutdowns

Recommended Testing for TCEQ Compliance

Source Water System:

1. **Turbidity.** Confirm high turbidity response by placing turbidimeter calibration tray (“Ice-pick”) in sample well. Hold signal output during placement and release when setup is ready. System should turn source water pumps off, switch valves at vault, and pump with small pump until acceptable turbidity is restored and operator resumes normal operation. Check set points for high condition.

Microfiltration System (Check separately for each skid):

2. **Filtrate Turbidity.** Force high filtrate turbidity by disconnecting sample tube, draining sample well and filling with unfiltered source water. Hold signal output during placement and release when setup is ready. Confirm that high turbidity alarm is triggered and skid is locked out until alarm is acknowledged.
3. **DIT.** Force DIT failure condition by allowing air to release through loosened spare filter air connection during pressure hold phase (setpoint may also be reduced to decrease air release required). Confirm that failure alarm is activated and skid is locked out from forward operation. If setpoint is changed, make sure normal value is restored. Tighten air connection after completion of test.

Reverse Osmosis System (Check separately for each skid):

4. **Conductivity.** Force high permeate conductivity (at least 100 mS/cm above base reading) by placing conductivity sensor in elevated conductivity solution. Hold signal output during placement and release when setup is ready. System should record single high value for 5 minute reading and remain in operation. Maintain high conductivity sample exposure for up to 15 minutes. System should indicate high conductivity alarm and shut down.

Ultraviolet Oxidation

5. **UV Transmittance.** Manually enter low UV Transmittance (<40%) at Trojan panel. RO Permissive should be immediately suspended, resulting in “UV Not Ready” indication and shutdown of both RO skids. Restart with normal transmittance should allow normal operation to resume.
6. **UV Dose.** Disconnect sensor from UV reactor. (Each reactor to be tested independently). Clear “End Cap Open” alarm. RO Permissive should be immediately suspended, resulting in shutdown of RO skids upon completion of the startup cycle. Restart with sensor in place should allow normal operation to resume.
7. **UV Lamps.**

- a. Disconnect one ballast, shutting down 2 lamps. (UV must be powered down to disconnect ballast.) System should alarm the reduced lamp condition, but should continue to operate normally.
- b. Disconnect second ballast (opposite reactor), shutting down 4 lamps total. System should alarm the excessive lamp out condition, and suspend the RO Permissive, resulting in shutdown of RO skids upon completion of the startup cycle. (Operation will be interrupted by UV powerdown.)
- c. Reconnect all ballasts. Alarms should stop and system should restart normally.

Raw Water Production Facility
TCEQ Automatic Performance Triggers
Verification Testing Record

Test No.	Description	Test Date	Action Confirmed?	Witnessed by
1.	Source Water Turbidity	8-20-13	Yes	R. Hildreth [D. Sloan]
2. A.	MF Filtrate Turbidity – Skid A	8-20-13	Yes	R. Hildreth [D. Sloan]
2. B.	MF Filtrate Turbidity – Skid B	8-20-13	Yes	R. Hildreth [D. Sloan]
3. A.	Direct Integrity Test Failure – Skid A	8-20-13	Yes	R. Hildreth [D. Sloan]
3. B.	Direct Integrity Test Failure – Skid B	8-20-13	Yes	R. Hildreth [D. Sloan]
4. A.	Excessive Conductivity Increase – Skid A	8-23-13	Yes	R. Hildreth [D. Sloan]
4. B.	Excessive Conductivity Increase – Skid B	8-21-13	Yes	R. Hildreth [D. Sloan]
5.	UV Transmittance	8-21-13	Yes	R. Hildreth [D. Sloan]
6. A.	UV Dose – Reactor 1	8-21-13	Yes	R. Hildreth [D. Sloan]
6. B.	UV Dose – Reactor 2	8-21-13	Yes	R. Hildreth [D. Sloan]
7.	UV Lamps	8-21-13	Yes	R. Hildreth [D. Sloan]

Appendix E – Laboratory and On-Line Methods

LAB APPROVAL FORM

PUBLIC WATER
SYSTEM NAME:
PWS ID No.:

Colorado River Municipal Water District

1140038

PLANT NAME
OR NUMBER:
Date:

Raw Water Production
Facility - Big Spring Plant
12/20/13

I certify that I am familiar with the information contained in this report and that, to the best of my knowledge, the information is true, complete, and accurate.

Operator's
Signature*:



Certificate No. &
Grade*:

Surface water B WS0010990

*or, for labs, Lab
Analyst's signature,
name, title and
phone number

Analyte	Method ¹ (& Analyzer Type)	Accuracy	Calibration		Records Retention
			Frequency	Method	
Turbidity/ source	Hach 1720E Standard Methods 2130B, USEPA 180.1, Hach Method 8195	±5% of reading from 40 - 100 NTU	90 days	Hach 1720E Low Range Turbidimeter manual, cat. # 6010018, May 2007, edition 7. Section 5.5	
Turbidity / microfilters / feed water	(2)Hach 1720E Standard Methods 2130B, USEPA 180.1, Hach Method 8195	±5% of reading from 40 - 100 NTU	90 days	Hach 1720E Low Range Turbidimeter manual, cat. # 6010018, May 2007, edition 7. Section 5.5	
Turbidity/ Microfilters/Filtrate	(2)Hach Filtertrac 660sc USEPA method 10133	± 5 % of reading	90 days	Hach FT660sc user manual,doc. #023.53.8022 1 Jan. 2012, edition 2. Calibration, page 10	
pH / inline	Rosemount 3900 vp 660sc	95-99%	30 days	Rosemount Instruction Manual PN51- 1056, rev.D, Nov2007, section 7.2	

pH / handheld	Myron I UltrameterII 6PFC	+/- 1% of reading	Daily	Myron L. Company Instrucion Manual, June 2011, Section VII, page 15	
Temperature	(2) Rosemount 148HNNAU2XA	TBD	TDB	TBD	
TOC	City of Odessa Lab				
UV254	Trojan OptiView	Not Given in Manufacture specs	30 days	Trojan instruction manual PN 905251 Rev B 06/18/2008 Calibration section page 12-17	
UV254 / bench top	Trojan Bluebox Photometer (on order)	Not Given in Manufacture specs	Weekly	Trojan instruction manual PN 905263 Rev A 10/15/2010 Meter Operation - Calibration section	
Nitrate / Product Water	Hach NISE sc Method Potentiometric ion-selective measurement	5 % of measured value +0.2 mg/L (with standard solutions) NO3-N	Weekly	Hach user manual DOC23.53.90 137, Section 4.6	
Alkalinity	N/R				
Disinfectant					
Free Chlorine ²	N/R				
Total Chlorine ²	N/R				
Chlorine dioxide ³	N/R				
Chlorite ³ (at point of entry)	N/R				
Calcium ⁴	N/R				19

Phosphate ⁴	N/R			
------------------------	-----	--	--	--

1. If your system conducts the test, enter the method that you use or identify the make and model number of the instrument or test kit that you use to run the test. If samples are sent to an outside lab, enter the name of the lab that runs the test for you. If you are not required to run one or more of the tests, write 'Not Required' next to the tests that you do not run.
2. If your system does not add ammonia at any point during the treatment process, you must list a free chlorine method. If your system adds ammonia at any point during the treatment process, you should be able to run both Free and Total Chlorine tests.
3. Systems that use chlorine dioxide must list the method that they use to measure these analytes.
4. Required only if your system is reporting water quality parameters for the Lead/Copper Rule.

TCEQ-10450 (02/02)

Appendix F – pH Meter Calibration



Pall Corporation

Pall Advanced Separations Systems
839 NYS Rte. 13
PO Box 5630
Cortland, NY 13045 USA
607.753.6041 phone
607.756.1862 fax
www.pall.com

August 9, 2013

Mr. Robert Hildreth
Plant Supervisor
Big Spring Water Reclamation Plant
3500 FM 700
Big Spring, TX 79721

Robert,

In reference to the Texas Commission on Environmental Quality request during our call on August 8, 2013 regarding clarification of recommended buffers for calibration of the pH probe and meter provided for the Pall MF/RO cleaning processes, Pall recommends using NIST traceable pH buffers of 4, 7 and 10. The use of buffers for calibration procedures can be found in the Pall O&M Components manual including Rosemount's operation and maintenance manual(s) for Rosemount pH sensor MODEL 396/396VP/397/398/398VP, SECTION 3.2 CALIBRATION USING BUFFER SOLUTIONS and Transmitter model 1056 Instruction Manual, PN 51-1056/rev.D dated November 2007.

Please feel free to contact Steve Lahn or myself if you have any questions or need additional information.

Sincerely,

A handwritten signature in black ink, appearing to read "Lisa M. Druke".

Lisa M. Druke
Process Engineer

Cc: Steve Lahn, Project Manager

Filtration, Separation, Solution_™

Appendix G – Nitrate/Nitrite Instrument Calibration

HACH COMPANY
PO Box 389
Loveland, Colorado USA 80539-0389
Phone 970-669-3050 • Fax 970-669-2932



ISO 9001 Certified

Systems for Analysis

CERTIFICATE OF CONFORMANCE

As an ISO 9001 certified company we are expected to meet the most rigorous international quality system standards. The scope of our certification is the design, manufacture, delivery, and service of systems for analysis, including all instruments and chemicals manufactured by Hach Company.

This instrument works with other Hach products to provide you with accurate, reliable results. By using Hach's prepared reagents with Hach methods and instrumentation, you will get the best performance from the analysis system.

We certify that the product described herein was tested in accordance with our quality system procedures and, to the best of our knowledge, conforms to published specifications.

Test equipment used for the verification of Hach manufactured instruments is calibrated using standards traceable to National Institute of Standards and Technology (NIST) standards. Where such standards do not exist, the basis for calibration is documented.

Hach Company

Today's Date: 10/3/13

Product Model Name: DR/890 Colorimeter

Product Catalog Number: 48470-00

Product Serial Number: 030590025685

Customer: _____

PO #: _____

8201-02-01, Product Cert, Rev 4, 4/97

Appendix H – Temperature and pH Measurements During a CIP



Pall Corporation

Pall Advanced Separations Systems

839 NYS Rte. 13
PO Box 5630
Cortland, NY 13045 USA
607.753.6041 phone
607.756.1862 fax
www.pall.com

Big Spring, TX 02.00362
Operation Protocol

The following is a recommended protocol for operating the Pall Micro-filtration (MF) System and Reverse Osmosis System (RO) at the Big Spring Water Reclamation Treatment Plant for the startup and operation of the microfiltration system. This protocol may need to be revised as the plant actually begins producing water. The experience gained during the startup and performance test will help verify this protocol.

Please contact a Pall Service Engineer if changes in the plant performance are experienced.

Feed Water:

Tertiary effluent from conventional municipal wastewater treatment plant (activated sludge that is clarified and sand filtered).

MF System Design:

2.5 MGD MF Feed Water
2.38 MGD Net MF Filtrate
Flux = 32.9 GFD at 20°C
2 AP8 units, each with 78 modules and 8 blank spaces
Module Type: UNA-620A

RO System Design:

2.38 MGD RO Feed Water
1.782 MGD Net RO Permeate at 20 °C
Flux = 10.5 GFD at 20° C
Recovery = 75%
2 RO Skids, Skid Array: 24:12 (6 elements each), 216 elements total/skid
Membrane Type: Toray TML20-400

MF SYSTEM OPERATION PROTOCOL

PROCESS DESCRIPTION SUMMARY

The MF system is to operate in level control mode based on the MF/RO Break Tank (T-50) with the intention of providing reliable feed water supply to the RO system. The level of the Source Water Tank (T-30) will also be monitored to ensure that there is sufficient water available to the MF system.

FLUX MAINTENANCE (FM) PROTOCOL

Flux Maintenance is a frequent cleaning process used to remove solids from the membrane surface mechanically. FM consists of an Air Scrub (AS) followed by a Feed Flush (FL). Air Scrub consists of coarse bubble agitation on the feed side of the membranes within each module while the reverse filtration pump (P-2) pushes filtrate back through the membranes to the drain. Feed Flush consists of the feed pumps (P-1A and P-1B) pushing feed through the feed side of the membrane modules to drain.

Volume Interval: 23,400 gallons (approximately 26 minutes at 957 gpm per rack)

Time Interval: not to exceed 50 minutes

Air Scrub Duration: 60 seconds

Air Scrub Air Flow: 234 scfm (3 scfm/module)

Air Scrub Reverse Filtration Flow: 624 gpm (8 gpm/module)

Feed Flush Duration: 20 seconds duration

Feed Flush Flow: 1404 gpm (18 gpm/module) (~75% pump speed)

Feed Flush Volume: 468 gallons

EXCESS RECIRCULATION (XR)

XR may not be necessary for this system if the tertiary effluent quality is good, but some small amount (5%-10%) is recommended to help ensure that solids do not build up at the XR port over time.

DIRECT INTEGRITY TEST (IT) PROTOCOL

IT will be automatically implemented at a frequency as required by the regulatory agency. The methodology developed by Pall Corporation to comply with the US Environmental Protection Agency's Membrane Filtration Guidance Manual shall be followed.

ENHANCED FLUX MAINTENANCE (EFM) PROTOCOL

Enhanced Flux Maintenance is a cleaning process that uses relatively dilute chemical solution to reduce the impact of membrane foulants that resist mechanical removal. This allows for longer Clean In Place intervals, less offline time, and reduced chemical consumption overall. For this system there are two preset EFM recipes (detailed below).

EFM - Chlorine Wash:

Chlorine Solution EFM

Volume Interval: 2,449,470 gallons of Filtrate produced per rack

Time Interval: 2 days

1,660 – gallons (assumed batch size, will vary based on interconnecting pipe volume)

1,653.1 – gallons of RO Permeate

500 ppm Chlorine – 6.9 gallons of 12.5% Sodium Hypochlorite per batch

Solution Temperature = 35 °C (95°F)

Circulation Time = 30 minutes

Flow on feed side only.

Rinse with 1,660 gallons of RO Permeate

EFM - Acid Wash:

Citric Acid Solution

Operator Initiated on an as-needed basis, assumed to be 1-2 weeks

Time Interval: not less than 15 days (once at midpoint of CIP interval)

1,660 – gallons (assumed batch size, will vary based on interconnecting pipe volume)

1,633.1 – gallons of RO Permeate

1.0% Citric Acid – 26.9 gallons of 50% Citric Acid per batch

Solution Temperature = 35 °C (95°F)

Circulation Time = 30 minutes

Flow on feed side only.

Rinse with 1,660 gallons of RO Permeate

General Recipe for EFM:

1. Rack Drain to drain – 8.3 minutes
2. Solution Wash on feed side for 32 minutes includes time to transfer solution to the Rack
3. Rack Forced & Gravity Drain to Neut – 11.5 minutes
4. Rack Rinse - ~1,660 gallons of RO Permeate on feed side of membranes – 2.3 minutes
5. Rack Forced & Gravity Drain to Neut – 11.5 minutes
6. Rack Rinse – ~1,660 gallons of RO Permeate on feed side of membranes – 2.3 minutes
7. Recipe End

Note: Standard FM follows completion of the EFM - 2 minutes.

CLEAN IN PLACE (CIP) PROTOCOL

Clean In Place is a longer duration cleaning process that uses chemical solutions to remove all foulants from the membrane.

Interval: Every 30 days or if the specific flux (permeability) reaches 1.5 gfd/psi; whichever comes first. Do not exceed 30 days regardless of the plant flows, TMP, specific flux, or anything less than written recommendation from the Pall Process Engineer assigned to this project.

STEP 1 - Caustic/Chlorine Wash:

Caustic/Chlorine Solution for CIP

1,660 – gallons (assumed batch size, will vary based on interconnecting pipe volume)

1,618 – gallons of RO Permeate

1% Caustic – 21.5 gallons per batch of 50% caustic

1500 ppm NaOCl – 20.5 gallons of 12.5% Sodium Hypochlorite per batch

Solution Temperature = 35 °C (95°F)

Circulation Time = 120 minutes

Flow on feed side only.

Rinse with 1,660 gallons of RO Permeate, 1 time (1,660 gallons)

Confirm pH of Caustic Batch after initial mix, target pH of 12.

STEP 2 – Acid Wash:

Citric Acid Solution for CIP

1,660 – gallons (assumed batch size, will vary based on interconnecting pipe volume)

1,606 – gallons of RO Permeate

.0% Citric Acid – 54 gallons of 50% Citric Acid per batch

Solution Temperature = 35 °C (95°F)

Circulation Time = 60 minutes

Flow on feed side only.

Rinse with 1660 gallons of RO Permeate with each rinse

Confirm pH of Acid Batch after initial mix, target pH range of 2 – 3.

General Recipe for CIP:

1. CIP Rack Drain to Drain
2. Caustic Wash on feed side for 120 minutes
3. Caustic Drain to Neut
4. CIP Rack Rinse - Rinse volume = ~1,660 gallons
5. Rack Forced & Gravity Drain
6. Acid Wash on feed side for 60 minutes
7. Acid Drain to Neut
8. CIP Rack Rinse - Rinse volume = ~1,660 gallons
9. Rack Gravity & Forced Drain
10. CIP Rack Rinse - Rinse volume = ~1,660 gallons
11. Recipe End

Note: FM occurs automatically following CIP – 2 minutes.

RO SYSTEM OPERATION PROTOCOL

RO System Design:

Number of Skids: 2 Trains

Configuration per Train: 1st Pass RO:
- Stage 1: 24 pressure vessels (6 elements each)
- Stage 2: 12 pressure vessels (6 elements each)

Membranes: Toray TML20-400

Pretreatment^[1]:

Antiscalant: Vitec 3000, Dosage Setpoint varies based on water quality

Guidelines for antiscalant dosage [based on 01/31/2013 analysis]:

- a. Phosphate levels upto 6 ppm - antiscalant dosage = 2 ppm
- b. Phosphate levels between 6-7 ppm, increase antiscalant dosage = 4 ppm
- c. Phosphate levels 7 - 8 ppm, increase antiscalant dosage = 5 ppm
- d. Silica levels above 30 ppm, contact Pall/Avista Technologies

Sodium Bisulfite: Enabled, ORP Setpoint = 325 mV

Sulfuric Acid: Enabled, pH Setpoint = 6.5

Anti-biofoulant: Off line procedure approved by TCEQ, Circulation Time = 30 minutes; Concentration = 100 ppm; Circulation Flow per Stage = : 288-480 gpm (25 – 40 gpm/8” vessel)

Expected Feed Flow per Train^[1]: 825 gpm

Expected Feed Temperature^[1]: 10 - 30 °C

Expected Recovery^[1]: 75 %

Expected Permeate Flow per Train^[1]: 618 gpm at 20 °C

^[1] Based on CRMWD Agreement, CMD08163 Big Spring Water Reclamation Project dated August, 2010

RO CLEAN IN PLACE (CIP) PROTOCOL

Clean In Place is a cleaning process that uses chemical solutions to remove all foulants from the membrane.

Interval: If the permeate flow decreases 15%, stage 1 or stage 2 dP increases by 50%. The estimated CIP interval is 90 days. Contact the Pall Process Engineer assigned to this project prior to performing an RO CIP for review of performance data during the warranty period. Do not exceed 365 days regardless of the flows, pressures, or anything less than written recommendation from the Pall Process Engineer assigned to this project.

STEP 1 – Acid Wash:

Citric Acid Solution for CIP

1.0% Citric Acid – Target pH of 2.5 - 3.0

RO CIP tank level: 50%

CIP solution volume per Stage: ~900 gallons [total volume including vessel hold up ~1275 gallons]

Citric Acid Stock Solution (50% concentration) Volume per Batch = 20 gallons

Confirm pH with each stage cleaned.

Solution Temperature = 35 °C (95°F)

Circulation Time = 60 minutes

Circulation Flow per Stage = : 288-480 gpm (25 – 40 gpm/8” vessel)

Circulation Pressure = <40 psi

Rinses – 3-4 permeate water rinses

STEP 2 - Caustic Wash:

Caustic Solution for CIP

0.1% Caustic – Target pH of 10.5 – 11.5

RO CIP tank level: 50%

CIP solution volume: ~900 gallons [total volume including vessel hold up ~1275 gallons]

Sodium Hydroxide Solution (50% Concentration) Volume per batch = 1.8 gallon

Confirm pH with each stage cleaned

Solution Temperature = 35 °C (95°F)

Circulation Time = 60 minutes

Circulation Flow = 288-480 gpm (25 – 40 gpm/8” vessel)

Circulation Pressure = <40 psi

Rinses – 3-4 permeate water rinses

Appendix I – Flow Meters

Production Flow Facility Calibration Data

Ave. Miguel de Cervantes 111, Complejo Industrial Chihuahua, Chihuahua, Mexico 31109

Model number: **8711SSE040U1N0D1DW**Serial Number: **0173149**Trace Number: **278595401**Sales Order: **3204146**Calibration Date: **Jan 12, 2012**Calibration Number: **1009805410056011**Transmitter S/N: **MMT0335613**

Run #	Flow rate % FS ¹	Velocity ft/s	Velocity m/s	Flow rate US gpm	Flow rate m ³ /hr	Deviation % rate
1	100.3%	10.0	3.06	398	90.4	0.04%
2	100.3%	10.0	3.06	398	90.4	0.00%
3	100.3%	10.0	3.06	398	90.4	0.04%
4	29.5%	2.9	0.90	117	26.6	0.03%
5	29.5%	2.9	0.90	117	26.6	0.08%
6	29.5%	2.9	0.90	117	26.6	0.11%
7	11.4%	1.1	0.35	45.4	10.3	0.11%
8	11.4%	1.1	0.35	45.3	10.3	0.16%
9	11.2%	1.1	0.34	44.3	10.1	0.01%

1180**Calibration conditions:**

Water temperature = 73.4 °F (23.0 °C) Water conductivity > 200 µMho

¹100% flow rate = 10 ft/sec (3.05 m/s) in schedule 40 pipe.

Measuring and test equipment used in the manufacture and inspection of the above flowmeter are directly traceable to the National Institute of Standards and Technology to meet the intent of ANSI Z540-1-1994.



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Q4 - Calibration Data Sheet Consistent with ISO 10474 3.1B or EN 10204 3.1

Customer Information Name: PALL ADVANCED SEPARATIONS SYST Purchase Order: 31724	Manufacturing Information Sales order: 3204146 Line Number: 5
Device Information Device Type: Magnetic Flowmeter Tag Line 1: Serial number: 0338511 Model number: 8732EST2A1N0DA1M4D1 Output: Hart	Calibration Information Calibration Date: March 05, 2012 4mA point: 0 ft/sec 20mA point: 30 ft/sec

Transmitter Calibration Test

Test Station Calibration Information - Consistent with ISO 10474 3.1B

Test Velocity (ft/s)	Test Velocity (m/s)	Measured Velocity (ft/s)	Measured Velocity (m/s)	Deviation % rate
30.00	9.14	29.996773	9.143016	-0.010758%
1.00	0.305	1.000624	0.304990	0.062348%

This is to certify that the Magnetic Flowmeter listed above meets the applicable product specifications. Measuring and test equipment used in the manufacture and inspection of the above flowmeter are directly traceable to the National Institute of Standards and Technology to meet the intent of ANSI Z540-1-1994.

QUALITY MANAGER

Production Flow Facility Calibration Data

Ave. Miguel de Cervantes 111, Complejo Industrial Chihuahua, Chihuahua, Mexico 31109

Model number: **8711SSE080U1N0D1DW**Serial Number: **0167177**Trace Number: **188622501**Sales Order: **3032872**Calibration Date: **Mar 08, 2011**Calibration Number: **0898405408607011**Transmitter S/N: **MMT0316515**

Run #	Flow rate % FS ¹	Velocity ft/s	Velocity m/s	Flow rate US gpm	Flow rate m ³ /hr	Deviation % rate
1	100.0%	10.0	3.05	1560	354	0.05%
2	100.0%	10.0	3.05	1560	354	0.02%
3	100.0%	10.0	3.05	1560	354	0.02%
4	30.1%	3.0	0.92	470	107	-0.03%
5	30.1%	3.0	0.92	470	107	-0.07%
6	30.1%	3.0	0.92	470	107	-0.04%
7	10.7%	1.1	0.33	167	37.9	0.07%
8	10.6%	1.1	0.32	166	37.7	0.03%
9	10.6%	1.1	0.32	166	37.7	0.07%

1180

Calibration conditions:

Water temperature = 73.4 °F (23.0 °C) Water conductivity > 200 µMho

¹100% flow rate = 10 ft/sec (3.05 m/s) in schedule 40 pipe.

Measuring and test equipment used in the manufacture and inspection of the above flowmeter are directly traceable to the National Institute of Standards and Technology to meet the intent of ANSI Z540-1-1994.

Production Flow Facility Calibration Data

Ave. Miguel de Cervantes 111, Complejo Industrial Chihuahua, Chihuahua, Mexico 31109

Model number: **8711SSE080U1N0D1DW**Serial Number: **0167353**Trace Number: **186278201**Sales Order: **3018579**Calibration Date: **Mar 11, 2011**Calibration Number: **0883206008458011**Transmitter S/N: **MMT0316943**

Run #	Flow rate % FS ¹	Velocity ft/s	Velocity m/s	Flow rate US gpm	Flow rate m ³ /hr	Deviation % rate
1	100.7%	10.1	3.07	1570	357	0.12%
2	100.7%	10.1	3.07	1570	357	0.08%
3	100.7%	10.1	3.07	1570	357	-0.04%
4	30.5%	3.1	0.93	476	108	-0.03%
5	30.5%	3.1	0.93	476	108	-0.05%
6	30.5%	3.1	0.93	476	108	0.03%
7	10.8%	1.1	0.33	169	38.4	0.00%
8	10.8%	1.1	0.33	169	38.4	-0.16%
9	10.8%	1.1	0.33	169	38.4	0.12%

1483

Calibration conditions:

Water temperature = 74.8 °F (23.8 °C) Water conductivity > 200 µMho

¹100% flow rate = 10 ft/sec (3.05 m/s) in schedule 40 pipe.

Measuring and test equipment used in the manufacture and inspection of the above flowmeter are directly traceable to the National Institute of Standards and Technology to meet the intent of ANSI Z540-1-1994.

Production Flow Facility Calibration Data

Ave. Miguel de Cervantes 111, Complejo Industrial Chihuahua, Chihuahua, Mexico 31109

Model number: **8711SSE040U1N0D1DW**Calibration Date: **Nov 05, 2009**Serial Number: **880156460**Calibration Number: **1015405210112011**Trace Number: **372304401**Transmitter: **8732E**Sales Order: **2434905**

Run #	Flow rate % FS ¹	Velocity ft/s	Velocity m/s	Flow rate US gpm	Flow rate m ³ /hr	Deviation % rate
1	101.4%	10.1	3.09	402	91.4	0.00%
2	101.1%	10.1	3.08	401	91.2	-0.01%
3	101.1%	10.1	3.08	401	91.1	0.01%
4	31.6%	3.2	0.96	125	28.5	0.02%
5	31.5%	3.2	0.96	125	28.4	-0.03%
6	31.3%	3.1	0.95	124	28.2	-0.02%
7	11.6%	1.2	0.35	46	10.5	-0.26%
8	11.6%	1.2	0.35	46	10.5	-0.05%
9	11.6%	1.2	0.35	46	10.5	0.02%

.011

Calibration conditions:

Water temperature = 75.7 °F (24.3 °C) Water conductivity > 200 µMho

¹100% flow rate = 10 ft/sec (3.05 m/s) in schedule 40 pipe.

Measuring and test equipment used in the manufacture and inspection of the above flowmeter are directly traceable to the National Institute of Standards and Technology to meet the intent of



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Q4 - Calibration Data Sheet Consistent with ISO 10474 3.1B or EN 10204 3.1

Customer Information Name: PALL ADVANCED SEPARATIONS SYST Purchase Order: 31724	Manufacturing Information Sales order: 3204146 Line Number: 5
Device Information Device Type: Magnetic Flowmeter Tag Line 1: Serial number: 0338510 Model number: 8732EST2A1N0DA1M4D1 Output: Hart	Calibration Information Calibration Date: March 05, 2012 4mA point: 0 ft/sec 20mA point: 30 ft/sec

Transmitter Calibration Test

Test Station Calibration Information - Consistent with ISO 10474 3.1B

Test Velocity (ft/s)	Test Velocity (m/s)	Measured Velocity (ft/s)	Measured Velocity (m/s)	Deviation % rate
30.00	9.14	29.999511	9.143851	-0.001631%
1.00	0.305	0.999456	0.304634	-0.054424%

This is to certify that the Magnetic Flowmeter listed above meets the applicable product specifications. Measuring and test equipment used in the manufacture and inspection of the above flowmeter are directly traceable to the National Institute of Standards and Technology to meet the intent of ANSI Z540-1-1994.

QUALITY MANAGER



SIEMENS**CALIBRATION REPORT****SITRANS F M MAGFLO**

Customer			
Converter type		Serial No.	
Sensor type	MAG5100W	Serial No.	7ME658 625201D122
Cal. Factor	81.193		
System Serial NO.	7ME658 109901U332		

Calibration Data

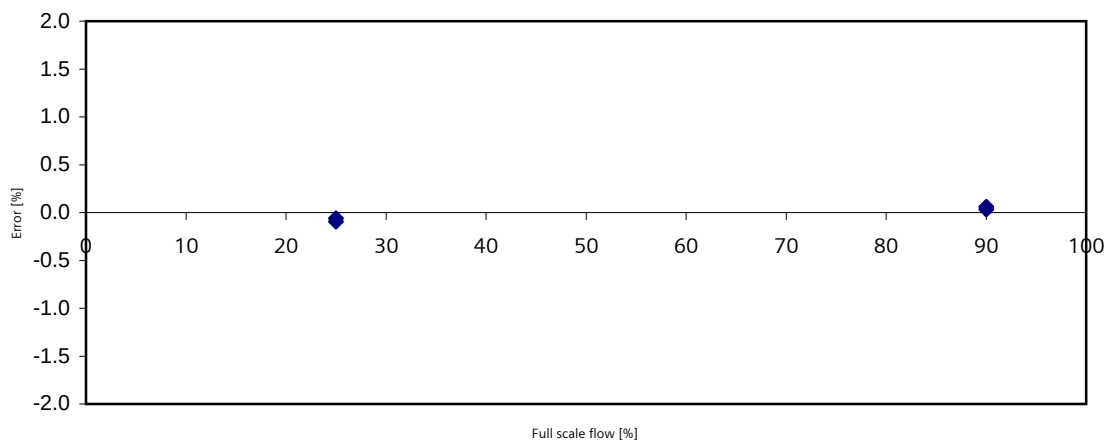
Full scale flow	361.111	L/S	Calibration liquid	Water
			Calibration rig	CN-RIG3

Calibration Settings

Frequency output	0-10000 Hz
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Calibration Results

Test No.	Full scale flow	Water Temp	True Flow-Rate	Flowmeter Frequency output		
				Output	Flowrate	Error
	[%]	[°C]	L/S	[Hz]	L/S	[%]
1	90	24.6	324.1050	8980.520	324.2960	0.06
2	90	24.7	324.1240	8978.730	324.2320	0.03
3	25	24.7	91.3939	2529.410	91.3398	-0.06
4	25	24.7	91.4196	2529.240	91.3336	-0.09
5						
6						
7						
8						
9						
10						



Calibrated by	hwl
Date	2012-04-01
Time	23:05:30

SIEMENS**CALIBRATION REPORT****SITRANS F M MAGFLO**

Customer			
Converter type		Serial No.	
Sensor type	MAG5100W	Serial No.	7ME658 706501D162
Cal. Factor	89.1769		
System Serial NO.	7ME658 110001U332		

Calibration Data

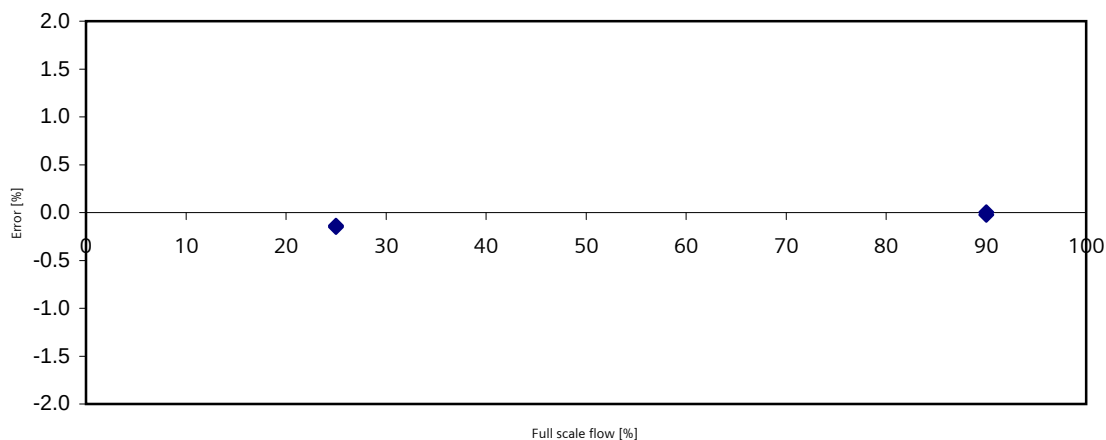
Full scale flow	472.222	L/S	Calibration liquid	Water
			Calibration rig	CN-RIG3

Calibration Settings

Frequency output	0-10000 Hz
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Calibration Results

Test No.	Full scale flow	Water Temp	True Flow-Rate	Flowmeter Frequency output		
				Output	Flowrate	Error
	[%]	[°C]	L/S	[Hz]	L/S	[%]
1	90	23.4	409.2750	8667.370	409.2920	0.00
2	90	23.4	409.2180	8663.800	409.1240	-0.02
3	25	23.5	132.5210	2802.500	132.3400	-0.14
4	25	23.4	132.5230	2802.180	132.3250	-0.15
5						
6						
7						
8						
9						
10						



Calibrated by	yrj
Date	2012-04-26 Time 18:24:58