Affordable Desalination Collaboration
Monthly Technical Progress Report
Covering the Month of September-2010

TWDB Contract No. 0804830845

CONTRACTOR – Affordable Desalination Collaboration
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Addressed To: Texas Water Development Board
Attention: Contract Administrator
P.O. Box 13231
Austin, TX 78711-3231

RESEARCH PROJECT – Optimizing Brackish Water Reverse Osmosis for Affordable Desalination

BOARD APPROVAL DATE – April 21, 2008

CONTRACT INITIATION DATE – September 15, 2008

STUDY COMPLETION DATE – June 13, 2011

FINAL REPORT DEADLINE – June 13, 2011

TOTAL STUDY COSTS – $ 1,356,683

BOARD SHARE OF THE TOTAL STUDY COSTS- the lesser of $496,783 or the total combined amount corresponding to the percentages of TWDB funding for each of the tasks shown in exhibit C.

LOCAL SHARE OF THE TOTAL STUDY COSTS - $859,900 in cash and $0.00 in-kind services or the amount remaining after the total combined amount corresponding to the percentages of TWDB funding for each of the tasks shown in Exhibit C.

PAYMENT SUBMISSION SCHEDULE - Monthly

Date Submitted: 10-10-10

Signed, Reviewed by designated representative

1. **Project Objective:** The objectives of the Affordable Desalination Collaboration (ADC) are to demonstrate affordable, reliable and environmentally responsible reverse osmosis desalination technologies and to provide a platform by which cutting edge technologies can be tested and measured for their ability to reduce the overall cost of the reverse osmosis (RO) treatment process

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2. **Project Description / Background:** A key challenge facing inland desalination today is to develop a new generation of reverse osmosis plants that deliver high-quality, fresh water at reduced economic and environmental cost. Two key areas of focus that will help achieve these goals are the energy consumption and the achievable RO recoveries of inland brackish water systems.

   The ADC was formed in 2004 to fund and execute the first part (ADC I), which became a multiple phase project funded under the California Department of Water Resources Proposition 50 program. Under the program the ADC built and operated a demonstration plant at the United States Navy's Seawater Desalination Test Facility in Pt. Hueneme, California. The ADC achieved remarkable results by desalinating seawater at energy levels between 6.0-6.9 kWh/kgal (1960-2250 kWh/acre-ft).

   This project funded by the Texas Water Development Board (TWDB) and titled "Optimizing Brackish Water Reverse Osmosis for Affordable Desalination" will pursue the following demonstration, and development tasks.

   1. Test and demonstrate state of the art isobaric energy recovery technology in an optimized brackish water design. The ADC expects to achieve 15-30% energy savings over traditional brackish water systems even where energy recovery turbines are applied.
   2. Develop and demonstrate new process designs that are possible as a result of the isobaric energy recovery technologies. As a natural result of the pressure exchanger (PX) technology in particular, there are new kinds of flow schemes that can improve the performance of higher recovery brackish water systems. We will use the ADC pilot system to test and demonstrate these new flow schemes in order to push the recoveries beyond what has been traditionally achievable.

   The ADC represents a unique collaboration leading government agencies, municipalities, RO manufacturers, consultants and professionals that are working together to improve the designs and technology applied in state of the art desalination systems. Our demonstration plant, processes and personnel have been pre-qualified and proven to meet project goals and produce valid data on the operation of desalination systems. Our outreach and information sharing efforts have been extensive and reached a wide range of audiences. In short, the ADC is an established leader in the field of reverse osmosis technology and we are uniquely qualified to conduct the proposed project and disseminate the results to the appropriate audiences.

3. **Monthly Progress and Status:**

   Our pilot system was shutdown most of September while we awaited a new set of second stage RO membranes to ship from Hydranuatics. The membranes arrived on September 28th and were installed on September 30th and October 1st. The plant was restarted on October 1st and set to the base line point of 14.9 gfd and 80% recovery. We plan to run the plant for approximately 2 weeks at the base line to ripen/break in the new membranes and then we will begin the 2 month unbalanced demonstration point (task 9) at 75% RO-85% system recovery and 14.9 gfd.

4. **Percent Complete of Total Project:** ~ 80 %

5. **Deliverables:**

Trade Show/Conference/Publication	Date(s)	Author(s)	Presenter	TWDB Submittal
Joint ADC-AMTA workshop, Annual Conference, Austin, Texas	July 2009	n/a	Various	Q2-09
Innovative Designs to Be Tested in ADC	Sept/Nov 2007	John P. MacHarg	n/a	Q2-09
Q2 and Q3 2009 Progress Report	Nov 2009	John MacHarg	n/a	Nov-2009
October 2009 Progress Report	Oct-2009	John MacHarg	n/a	April-2010
November 2009 Progress Report	Nov-2009	John MacHarg	n/a	April-2010
December 2009 Progress Report	Dec-2009	John MacHarg	n/a	April-2010
January 2010 Progress Report	Jan-2010	John MacHarg	n/a	April-2010
February 2010 Progress Report	Feb-2010	John MacHarg	n/a	April-2010
March 2010 Progress Report	Mar-2010	John MacHarg	n/a	April-2010
April 2010 Progress Report	May-2010	John MacHarg	n/a	May-2010
May 2010 Progress Report	June-2010	John MacHarg	n/a	June-2010
June 2010 Progress Report	July-2010	John MacHarg	n/a	July-2010
July 2010 Progress Report	Aug-2010	John MacHarg	n/a	Aug-2010
August 2010 Progress Report	Sept-2010	John MacHarg	n/a	Sept-2010

6. **Schedule Status:** The project is on schedule.

7. **Plans for Next Month:** In October we will "break in" the new second stage membranes and begin the demonstration phase of the unbalanced test protocol (Task 9).

8. **Attachments:** n/a

Task and % Complete Progress Table

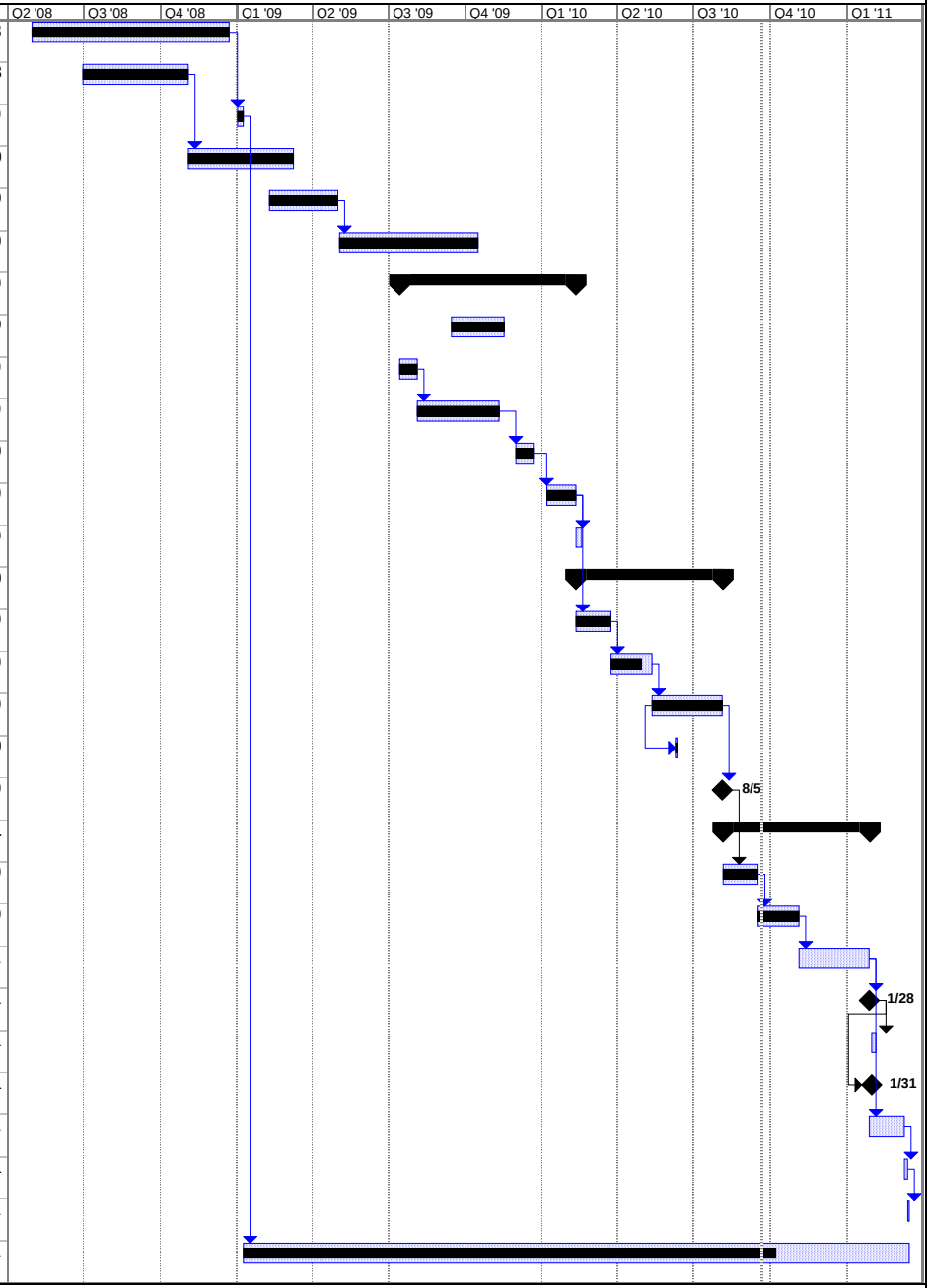
Agreement Number 0804830845	Starting Date: 1-7-09	Completion Date: 6-13-11	Month-Year September-10	13	PERCENT OF			
Grantee Agency Name: Affordable Desalination Collaboration		% Time Elapsed 78%	Total Grant Funds used $ 227,976	Billing this report n/a				
Name of Project: Optimizing Brackish Water Reverse Osmosis for Affordable Desalination								

TASKS	YEAR / MONTH	2009 Qtr 3	2009 Qtr 4	2010 Qtr 1	2010 Qtr 2	2010 Qtr 3	2010 Qtr 4	Project	Task Complete Last Report	Task Complete This Report	Project Complete
Task 1: Finalize Agreements with local test site/agency								7%	100%	0%	7%
Task 2: Attain permits								7%	100%	0%	7%
Task 3: Reconfigure system for interstage optimized design								13%	100%	0%	13%
Task 4: Decommission equipment at Port Hueneme								8%	100%	0%	8%
Task 5: Install and commission equipment on site.								8%	100%	0%	8%
Task 6: Execute multiple point optimization search								10%	100%	0%	10%
Task 7: Run 2 month demo at most affordable point								17%	100%	0%	17%
Task 8: Execute unbalanced multiple point optimization search								10%	100%	0%	10%
Task 9: Run 2 month demo at unbalanced most affordable point								17%	0%	0%	0%
Task 10: Member/general workshop								3%	0%	0%	0%
Show Progress by Use of Bar Chart	**Scheduled =**							100%			80%
	Completed =										

Schedule

Project Schedule Gant Chart.

ID	Task Name	Duration	Start	Finish
1	TWDB Agreement development	168 days	Thu 5/1/08	Mon 12/22/08
2	Develop tentative agreement with local water agency/test site	90 days	Tue 7/1/08	Mon 11/3/08
3	Final TWDB agreement signed / Project Begins	5 days	Fri 1/2/09	Thu 1/8/09
4	Detailed negotiations and planning with local agency/test site	90 days	Tue 11/4/08	Mon 3/9/09
5	Develop detailed test protocol	60 days	Mon 2/9/09	Fri 5/1/09
6	Permitting/agreements	120 days	Mon 5/4/09	Fri 10/16/09
7	**Install and commission Equipment on site**	**151 days**	**Wed 7/15/09**	**Wed 2/10/10**
8	Prepare site, wells, piping for ADC equipment	45 days	Tue 9/15/09	Mon 11/16/09
9	Decomission and reconfigure equipment at Port Hueneme	15 days	Wed 7/15/09	Tue 8/4/09
10	Reconfigure system for Interstage-PX hybrid design	70 days	Wed 8/5/09	Tue 11/10/09
11	Ship equipment to Texas	15 days	Tue 12/1/09	Mon 12/21/09
12	Install and commission equipment on site	25 days	Thu 1/7/10	Wed 2/10/10
13	Submit project update report to TWDB	5 days	Thu 2/11/10	Wed 2/17/10
14	**Optimized Isobaric Energy Recovery Demonstration**	**126 days**	**Thu 2/11/10**	**Thu 8/5/10**
15	Flush and base line membranes	30 days	Thu 2/11/10	Wed 3/24/10
16	variable flux and recovery optimization search	35 days	Thu 3/25/10	Wed 5/12/10
17	Most affordable point (24/7 for 2 months)	60 days	Thu 5/13/10	Wed 8/4/10
18	Clean membranes	2 days	Thu 6/10/10	Fri 6/11/10
19	Complete Interstage-PX Hybrid testing	1 day	Thu 8/5/10	Thu 8/5/10
20	**High Recovery Process Design Testing**	**126 days**	**Fri 8/6/10**	**Fri 1/28/11**
21	Flush and base line membranes	30 days	Fri 8/6/10	Thu 9/16/10
22	Unbalance variable flux and recovery search	35 days	Fri 9/17/10	Thu 11/4/10
23	PX unbalanced most affordable point (24/7 for 2 months)	60 days	Fri 11/5/10	Thu 1/27/11
24	Complete Unbalanced PX testing	1 day	Fri 1/28/11	Fri 1/28/11
25	Submit project update report to TWDB	5 days	Mon 1/31/11	Fri 2/4/11
26	Complete testing	1 day	Mon 1/31/11	Mon 1/31/11
27	Write final report	30 days	Fri 1/28/11	Thu 3/10/11
28	Submit final report, billing, conclude project	2 days	Fri 3/11/11	Mon 3/14/11
29	Member/general workshop and publish results	2 days	Tue 3/15/11	Wed 3/16/11
30	Project Duration	569 days	Fri 1/9/09	Wed 3/16/11



Project: ADC TWDB Brackish Demons
Date: Mon 9/20/10

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
Split
External Tasks
Project Summary
Group By Summary
Deadline

Data

TIME				CALCULATED PARAMETERS					TEMP	PRESSRE								FLOWS						MAIN PANEL KW METER				VFD KW METER			
		Operation	System	RO	Ave. Sys. Flux	1st Stage Flux	2nd Stage Flux	Power	Influent	P_{CF-in}	P_{CF-out}	$P_{PX-Feed\ In}$	$P_{PX-conc\ out}$	PX-HP out RO 1 fe	$P_{RO\ 2\ feed}$	C-RO1 PX Booster i	P_{C-RO2}	P_{P-SYS}	$Q_{F-HP\ Pump}$	$Q_{PX\ HP-out}$	$Q_{Feed\ PX-In}$	$Q_{P-Stage\ 1}$	$Q_{P-Stage\ 2}$	Q_{P-SYS}	A_{sys}	P HP/PX	P booster	Power	PX power	HP Power	Feed Pump	
Date	Time	Time	Recovery %	Recovery %	Gfd	Gfd	Gfd	kWh/m3	Temp F	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	amp	(kw)	(kw)	Factor	(kw)	(kw)	(kw)	Notes
MM/DD/YY	hh:mm	hh.hh							17	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes												**Membrane Ripening Period (BASELINE)**												1							
02/11/10	13:00	12335.8	69.0%	79.7%	14.14	14.91	12.60	0.69	70.0	32.5	30.5	29.0	23.8	175	200	150	178	21.3	80.0	21.00	37.02	58.00	24.50	82.50	19.50	12.90	4.1	0.700	1.70	10.1	3.4	
02/11/10	17:06	12339	74.4%	80.0%	12.09	13.37	9.51	0.59	71.0	31.5	29.7	29.0	26.5	155	170	133.7	158	14.5	70.5	17.62	24.26	52.00	18.50	70.50	14.50	9.48	3.3	0.753	1.10	7.5	2.2	
02/12/10	9:01	12355.1	73.2%	79.9%	14.06	14.91	12.34	0.67	70.5	32.5	30.0	29.2	25.5	175	195	150	178	20.5	80.0	20.64	30.01	58.00	24.00	82.00	19.40	12.54	4.3	0.775	1.60	9.9	3.6	
02/18/10	15:41	12357.5	76.1%	80.5%	14.14	14.91	12.60	0.67	71.0	32.5	30.0	29.2	26.5	170	190	148	172	17.2	80.0	20.02	25.97	58.00	24.50	82.50	19.15	12.49	3.86	0.771	1.60	9.8	2.6	Total product data is calculated.
02/25/10	13:10	12375.3	76.0%	80.2%	14.14	15.04	12.34	0.66	70.0	32.3	30.0	29.3	26.5	171	190	149	172	17.2	81.0	20.40	26.02	58.50	24.00	82.50	18.77	12.40	3.12	0.779	1.60	9.7	2.4	
02/26/10	15:41	124000	76.3%	80.2%	14.23	15.17	12.34	0.66	70.5	32.5	30.0	29.2	26.3	172	190	150	172.5	17.3	80.5	20.50	25.78	59.00	24.00	83.00	18.94	12.52	3.36	0.777	1.60	9.8	1.9	Plant was shut off when arrived due to l
02/27/10	12:27	12420.7	76.0%	80.0%	14.13	15.04	12.29	0.66	72.0	32.3	30.0	29.3	26.2	172	191	150	175	17.2	81.0	20.66	26.03	58.50	23.90	82.40	19.30	12.29	3.19	0.778	1.60	9.7	1.9	
02/28/10	12:00	12444.2	76.1%	79.9%	14.23	15.17	12.34	0.65	71.5	32.5	30.2	29.3	26.5	172	191	150	175	17.3	80.0	20.93	26.03	59.00	24.00	83.00	19.23	12.27	3.27	0.776	1.50	9.6	2	
03/01/10	14:04	12470.4	76.1%	80.1%	14.13	15.04	12.29	0.65	71.0	32.5	30.0	29.5	26.3	172	191	150	175	17.2	80.0	20.48	25.89	58.50	23.90	82.40	18.86	12.21	3.147	0.787	1.50	9.6	1.8	
03/02/10	12:05	12492.4	76.1%	80.3%	14.23	15.30	12.09	0.65	71.0	32.2	31.0	29.4	26.5	172	191	150	175	17.0	81.0	20.37	26.05	59.50	23.50	83.00	18.76	12.24	3.43	0.784	1.40	9.7	2.2	
03/03/10	15:06	12519.4	75.8%	80.0%	14.09	15.17	11.93	0.65	73.0	32.2	30.1	29.3	26.2	173	191	150	175	17.3	80.0	20.56	26.22	59.00	23.20	82.20	19.44	12.19	3.33	0.780	1.50	9.7	2.1	Vessel 1 is leaking water from end cap
03/04/10	12:21	12540.6	76.0%	79.9%	14.19	15.30	11.98	0.65	73.0	32.5	30.2	29.3	26.3	172	191	150	176	17.2	81.0	20.84	26.12	59.50	23.30	82.80	19.28	12.27	3.44	0.784	1.50	9.7	2.3	
03/05/10	14:25	12563.8	75.8%	79.9%	14.23	15.38	11.93	0.66	73.0	32.5	30.0	29.2	29.2	172	191	150	177	17.3	80.0	20.94	26.54	59.80	23.20	83.00	18.88	12.37	3.14	0.790	1.50	9.8	1.6	Plant was shut off when arrived due to l
03/06/10	11:20	12584.8	76.1%	80.1%	14.14	15.17	12.09	0.65	73.0	32.3	29.9	29.4	26.3	174	192	151	178	17.4	80.0	20.51	25.95	59.00	23.50	82.50	18.60	12.22	3.11	0.783	1.50	9.7	1.8	
03/07/10	13:42	12611.1	75.7%	79.7%	14.09	15.17	11.93	0.65	74.0	32.5	30.1	29.3	26.2	174	192	150	178	17.3	80.0	20.97	26.34	59.00	23.20	82.20	18.89	12.21	3.15	0.782	1.50	9.7	1.7	
03/08/10	15:20	12636.8	76.0%	80.2%	14.40	15.43	12.34	0.64	73.0	32.5	30.0	29.2	26.3	175	193	151	179	17.2	79.0	20.74	26.49	60.00	24.00	84.00	18.44	12.28	3.36	0.784	1.40	9.8	1.9	
03/09/10	14:02	12659.5	76.2%	80.4%	14.38	15.43	12.29	0.64	73.0	33.0	30.1	29.4	26.2	175	193	151	179	17.1	80.0	20.48	26.23	60.00	23.90	83.90	18.66	12.25	3.25	0.784	1.50	9.7	1.8	
03/10/10	12:55	12681.7	76.5%	80.3%	14.57	15.69	12.34	0.64	71.0	32.5	29.9	29.3	26.1	176	194	152	178	17.1	80.0	20.90	26.04	61.00	24.00	85.00	18.95	12.30	3.36	0.773	1.50	9.7	1.9	
03/11/10	12:45	12702.8																													Plant was shut off when arriaved due to
03/12/10	15:45																														Plant down for new piping. Up and runn
03/13/10	13:00	12705.2																													Plant was shut down when arriaved due
03/16/10	15:50	12705.8	76.3%	80.6%	14.71	16.71	10.70	0.67	70.0	32.8	30.1	29.2	26.5	179	196	158	180	18.0	88.0	20.66	26.60	65.00	20.80	85.80	19.89	13.07	2.7	0.775	1.40	10.6	1	Plant start up after replacing old rotor an
03/26/10	16:18	12718.1	75.8%	79.7%	14.43	16.51	10.29	0.70	74.0	32.2	30.0	29.5	26.5	186	207	162	190	17.6	87.0	21.45	26.88	64.20	20.00	84.20	20.06	13.47	2.722	0.782	1.50	10.8	0.8	plant start up after new filters, cleaned o
03/27/10	16:20	12720.45	72.2%	79.7%	13.89	16.20	9.26	0.67	72.0	31.0	28.0	29.2	25.8	182	200	165	188	17.5	85.0	20.68	31.13	63.00	18.00	81.00	18.85	12.27	2.566	0.773	1.20	10.1	1	Cartridge Filget Pressure Gause has a cr
04/02/10	15:26	12726	67.1%	71.3%	12.17	12.86	10.80	0.62	72.0	32.2	30.0	29.3	25.0	142	171	120	149	15.0	73.0	28.64	34.88	50.00	21.00	71.00	15.41	9.92	2.7	0.765	2.00	6.9	1.1	
04/02/10	17:50	12728.4	61.2%	71.0%	12.17	12.86	10.80	0.61	72.0	33.0	30.2	29.0	22.0	141	170	119	145	15.0	73.0	28.93	45.04	50.00	21.00	71.00	15.32	9.81	2.723	0.765	2.00	6.8	1.2	
04/08/10	14:43	12731.8	62.0%	71.8%	12.17	12.86	10.80	0.60	73.0	32.9	30.2	29.3	22.5	135	165	111	140	10.7	74.0	27.88	43.53	50.00	21.00	71.00	15.14	9.64	2.69	0.768	2.10	6.6	1.1	
04/09/10	15:00	12740.1	62.1%	72.4%	12.26	12.86	11.06	0.60	75.0	32.9	30.1	29.2	22.5	135	165	111	139	11.0	73.0	27.23	43.61	50.00	21.50	71.50	15.50	9.70	3.921	0.752	2.00	6.6	3.2	
04/10/10	12:00	12761.2	62.1%	71.6%	12.26	12.86	11.06	0.60	75.0	32.8	30.2	29.3	22.7	136	165	111	139	10.9	74.0	28.42	43.61	50.00	21.50	71.50	15.32	9.68	3.709	0.754	2.10	6.6	2.9	
04/11/10	13:11	12786.3	62.0%	71.7%	12.27	12.86	11.11	0.60	76.0	32.9	30.3	29.2	23.3	135	165	111	139	11.0	73.0	28.21	43.85	50.00	21.60	71.60	16.19	9.71	3.14	0.753	2.10	6.6	2.8	
04/12/10	17:07	12814.3	62.1%	71.5%	12.26	12.86	11.06	0.60	77.0	32.9	30.3	29.2	22.5	135	165	111	140	11.1	73.0	28.49	43.68	50.00	21.50	71.50	14.90	9.78	3.649	0.751	2.20	6.7	2.9	
04/21/10	15:33	12833	62.2%	71.7%	12.26	12.86	11.06	0.59	76.0	32.9	30.3	29.3	22.6	130	160	108	135	11.2	73.0	28.17	43.37	50.00	21.50	71.50	14.85	9.55	3.344	0.756	2.10	6.4	2.5	
04/23/10	15:50	12853.3	62.6%	70.6%	12.31	12.86	11.21	0.60	70.0	33.0	30.3	29.5	22.8	131	161	109	136	11.3	73.0	29.94	42.98	50.00	21.80	71.80	15.59	9.74	3.915	0.750	2.20	6.6	2.7	
04/24/10	11:38	12873.1	62.5%	71.1%	12.31	12.93	11.06	0.59	73.0	32.9	30.2	29.4	22.6	131	161	109	136	11.2	73.0	29.16	43.11	50.30	21.50	71.80	15.64	9.65	3.883	0.750	2.10	6.5	2.7	
04/25/10	10:55	12896.4	62.5%	71.4%	12.34	13.11	10.80	0.59	74.0	33.0	30.2	29.3	22.6	131	161	109	138	11.0	73.0	28.84	43.22	51.00	21.00	72.00	15.47	9.60	3.808	0.750	2.20	6.5	2.7	
04/26/10	17:11	12926.2	62.1%	71.6%	12.17	12.86	10.80	0.59	78.0	32.9	30.3	29.5	22.7	131	161	109	138	11.0	73.0	28.13	43.41	50.00	21.00	71.00	15.15	9.56	3.768	0.746	2.10	6.5	2.6	
04/27/10	13:32	12946.5	62.8%	72.0%	12.53	13.11	10.75	0.57	75.0	32.9	30.3	29.4	22.5	132	162	109	138	11.3	74.0	28.37	43.26	51.00	20.90	73.10	14.94	9.46	3.254	0.755	2.10	6.4	1.7	New flow rate/totalizer fixed and registe
04/28/10	16:24	12973.4	71.4%	79.8%	14.18	15.69	10.18	0.60	78.0	32.9	30.2	29.5	25.1	159.0	178.0	137.0	161.0	14.3	85.0	20.87	33.16	61.0	19.8	82.70	18.10	11.24	3.513	0.765	1.40	8.8	2.4	Adjusted flows to baseline 80% recovery
04/29/10	12:25	12993.4	71.3%	80.0%	14.21	15.94	9.93	0.60	76.0	33.0	30.2	29.4	25.3	160.1	180	138	163	13.8	84.5	20.68	33.29	62.00	19.30	82.90	17.75	11.31	3.457	0.769	1.40	8.9	2.3	
04/30/10	17:02	13017.5	71.3%	79.8%	14.16	16.20	9.51	0.60	72.0	33.0	30.3	29.4	25.2	162.0	180.0	141.0	165.0	11.5	84.5	20.88	33.20	63.00	18.5	82.60	17.10	11.28	2.814	0.769	1.30	9.0	1.1	
05/01/10	12:09	13036.6	71.4%	79.8%	14.14	16.25	9.41	0.60	73.0	32.8	30.1	29.5	25.2	167.0	183.0	144.0	170.0	13.8	84.5	20.86	33.10	63.20	18.3	82.50	16.85	11.27	2.524	0.772	1.30	8.9	0.8	
05/02/10	13:07	13061.6	71.2%	79.4%	14.09	16.28	9.21	0.60	74.0	32.9	30.0	28.8	24.5	168.0	185.0	145.0	170.0	13.8	84.5	21.33	33.18	63.30	17.9	82.20	17.66	11.27	2.94	0.770	1.30	9.0	1.6	
05/03/10	17:06	13089.6	71.2%	79.6%	14.18	16.35	9.05	0.60	76.0	33.0	30.0	29.4	25.0	168.0	186.0	145.0	170.0	13.6	84.5	21.22	33.38	63.60	17.6	82.70	17.26	11.25	2.487	0.772	1.30	9.8	0.8	
05/05/10	16:00	13112.6	70.9%	79.8%	14.14	16.38	9.15	0.60	77.0	34.5	32.0	31.0	27.0	168.0	185.0	145.0	170.0	13.8	84.0	20.86	33.91	63.70	17.8	82.50	16.50	11.28	2.52	0.781	1.30	9.1	1.2	
05/06/10	16:32	13137.2	70.3%	79.6%	14.07	16.41	8.85	0.60	78.0	35.0	32.2	31.0	26.8	169.0	186.0	145.0	171.0	14.0	84.0	21.10	34.74	63.80	17.2	82.10	17.42	11.27	2.473	0.781	1.30	8.9	0.9	
05/07/10	15:03	13155.8	71.2%	79.6%	14.14	16.46	8.85	0.59	79.0	33.2	30.1	29.5	25.1	161.0	180.0	139.0	165.0	6.1	84.5	21.17	33.38	64.00	17.2	82.50	16.34	11.02	2.537	0.785	1.30	8.7	1	Pressures reflect permeate deflection to
05/08/10	13:15	13178	71.2%	79.7%	14.09	16.71	8.74	0.59	76.0	33.0	30.2	29.5	25.3	162.0	181.0	140.0	165.0	5.7	85.0	20.98	33.19	65.00	17.0	82.20	16.92	11.06	2.598	0.774	1.20	8.8	1.1	
05/09/10	14:06	13202.8	71.1%	79.1%	14.13	16.53	8.69	0.59	79.0	33.1	30.1	29.4	25.2	161.0	181.0	140.0	166.0	5.8	85.0	21.76	33.44	64.30	16.9	82.40	15.61	11.02	2.45	0.776	1.30	8.7	0.9	
05/10/10	17:44	13230.5	71.2%	79.2%	14.09	16.66	8.38	0.59	79.0	33.2	30.1	29.6	25.2	162.0	181.0	141.0	167.0	5.9	84.5	21.64	33.29	64.80	16.3	82.20	15.53	11.06	2.508	0.776	1.30	8.8	0.9	
05/11/10	14:52	13251.6	71.2%	79.1%	14.11	16.71	8.33	0.59	79.0	33.3	30.2	29.4	25.2	163.0	182.0	141.0	168.0	5.7	84.0	21.68	33.21	65.00	16.2	82.30	16.10	11.04	2.597	0.779	1.20	8.9	1.1	
05/12/10	16:00	13276.7	71.3%	79.4%	14.13	16.84	8.28	0.59	77.0	33.5	30.3	29.5	25.2	165.0	182.0	142.0	168.0	5.8	84.3	21.42	33.20	65.50	16.1	82.40	17.17	11.10	2.62	0.778	1.20	8.8	1.1	
05/13/10	14:20	13299.2	71.1%	79.2%	14.09	16.92	8.18	0.60	78.0	33.7	30.2	29.5	25.1	165.0	183.0	142.0	169.0	5.7	84.0	21.55	33.41	65.80	15.9	82.20	17.28	11.13	2.971	0.773	1.20	8.8	1.6	
05/20/10	12:18	13327	70.8%	79.6%	14.11	15.22	11.31	0.58	78.0	32.8	30.2	29.3	25.0	151.0	171.0	129.0	154.0	5.8	85.0	21.05	33.96	59.20	22.0	82.30	17.01	10.92	2.922	0.773	1.50	8.4	2.1	Data reflects 19 hrs running after cleanir
05/22/10	12:49	13360.4	72.4%	80.8%	14.85	16.41	11.52	0.61	79.0	33.0	30.2	29.3	25.2	160.0	179.0	138.0	162.0	6.8	88.0	20.53	33.03	63.80	22.4	86.60	17.90	11.91	2.905	0.774	1.40	9.3	2	
05/23/10	13:39	13385.2	72.2%	81.0%	14.86	16.38	11.42	0.60	79.0	33.1	30.2	29.2	25.1	161.0	180.0	138.0	163.0	6.7	88.0	20.32	33.31	63.70	22.2	86.70	18.02	11.88	2.513	0.781	1.50	9.4	1.4	
05/24/10	12:32	13408.1	72.4%	81.1%	14.85	16.46	11.42	0.61	78.0	33.1	30.2	29.4	25.0	161.0	180.0	138.0	164.0	6.8	88.0	20.20	33.01	64.00	22.2	86.60	17.71	11.93	2.593	0.781	1.40	9.4	1.3	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes												**12 gfd flux**																			
05/25/10	12:40	13432.2	70.9%	81.2%	12.10	13.89	8.23	0.50	78.0	32.0	29.9	29.3	26.0	138	151	120	139	3.5	71.7	16.36	28.92	54.00	16.00	70.6	11.08	7.96	2.105	0.740	0.80	6.1	0.9	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes												**BASELINE**																			

TIME				CALCULATED PARAMETERS					TEMP	PRESSRE									FLOWS						MAIN PANEL KW METER				VFD KW METER			
		Operation	System	RO	Ave. Sys. Flux	1st Stage Flux	2nd Stage Flux	Power	Influent	P_{CF-in}	P_{CF-out}	$P_{PX-Feed\ In}$	$P_{PX-conc\ out}$	PX-HP out RO 1 fe	$P_{RO\ 2\ feed}$	C-RO1 PX Booster i	P_{C-RO2}	P_{P-SYS}	$Q_{F-HP\ Pump}$	$Q_{PX\ HP-out}$	$Q_{Feed\ PX-In}$	$Q_{P-Stage\ 1}$	$Q_{P-Stage\ 2}$	Q_{P-SYS}	A_{sys}	P HP/PX	P booster	Power	PX power	HP Power	Feed Pump	
Date	Time	Time	Recovery %	Recovery %	Gfd	Gfd	Gfd	kWh/m3	Temp F	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	amp	(kw)	(kw)	Factor	(kw)	(kw)	(kw)	Notes
MM/DD/YY	hh:mm	hh.hh							17	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
05/26/10	12:00	13455.5	72.0%	80.8%	14.88	16.46	11.31	0.61	79.0	33.1	30.2	29.5	25.1	162	181	139	165	6.9	88.1	20.60	33.75	64.00	22.00	86.8	17.67	12.05	2.612	0.786	1.50	9.5	1.4	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes											**14.9 gfd flux**																				
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes											**BASELINE**																				
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes											**16 gfd flux**																				
05/27/10	9:19	13476.8	72.9%	81.5%	15.98	20.47	12.34	0.66	78.0	33.5	30.2	29.5	24.9	177	197	150	180	8.5	95.0	21.20	34.56	79.60	24.00	93.2	20.65	13.98	3.374	0.793	1.70	11.2	2.6	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes											**BASELINE**																				
05/27/10	19:05	13486.6	72.4%	80.8%	14.88	16.46	10.95	0.61	79.0	33.1	30.2	29.5	25.1	163	182	140	168	6.7	88.1	20.57	33.09	64.00	21.30	86.8	15.39	11.98	2.984	0.765	1.40	9.5	2	
05/29/10	11:37	13508.1	72.5%	80.8%	14.90	16.59	10.90	0.61	80.0	33.0	0.2	29.4	25.2	164	183	141	178	7.0	88.3	20.64	32.90	64.50	21.20	86.9	16.89	12.03	2.779	0.776	1.40	9.4	1.7	
05/30/10	11:40	13532.2	72.4%	80.8%	14.86	16.51	10.80	0.61	80.0	33.1	30.2	29.6	25.1	165	184	141	178	6.9	88.2	20.55	33.04	64.20	21.00	86.7	17.38	12.10	2.882	0.776	1.40	9.5	1.9	
05/31/10	11:00	13555.5	72.4%	81.2%	14.86	16.71	10.75	0.61	79.0	33.0	30.1	29.4	25.1	166	185	141	170	7.0	88.0	20.13	33.07	65.00	20.90	86.7	17.97	12.09	2.997	0.777	1.40	9.6	2.1	
06/01/10	12:01	13580.5	72.4%	80.8%	14.85	16.84	10.59	0.62	79.0	33.0	30.2	29.3	25.0	168	185	142	171	6.9	88.0	20.64	33.08	65.50	20.60	86.6	20.90	12.15	2.762	0.770	1.40	9.6	1.7	
06/02/10	13:00	13605.5	72.4%	81.1%	14.86	16.92	10.39	0.62	80.0	33.2	30.1	29.3	25.0	168	187	143	171	7.2	88.2	20.23	33.13	65.80	20.20	86.7	20.07	12.19	3.092	0.776	1.40	9.6	2.2	
06/03/10	12:25	13628.9	72.4%	80.8%	14.90	16.97	10.29	0.62	79.5	33.1	30.2	29.3	25.1	168	187	142	172	7.0	88.0	20.67	33.15	66.00	20.00	86.9	20.49	12.20	2.761	0.777	1.40	9.7	1.7	
06/05/10	13:24	13653.6	72.0%	80.5%	14.86	16.97	10.23	0.62	81.0	33.1	30.2	29.5	25.1	168	186	142	171	6.9	88.1	20.95	33.68	66.00	19.90	86.7	15.89	12.13	3.41	0.777	1.40	9.7	2.6	
06/06/10	13:24	13677.6	72.1%	80.3%	14.81	16.97	10.13	0.62	81.0	33.2	30.1	29.3	25.0	169	187	143	171	7.0	88.0	21.19	33.49	66.00	19.70	86.4	17.18	12.15	2.941	0.786	1.40	9.7	2.1	
06/07/10	12:32	13700.7	72.3%	80.8%	14.85	17.10	9.87	0.62	80.0	33.1	30.1	29.4	25.0	170	188	145	172	7.2	88.0	20.54	33.25	66.50	19.20	86.6	19.95	12.19	3.196	0.784	1.40	9.6	2.6	
06/08/10	12:00	13724.2	72.2%	80.6%	14.81	17.13	9.77	0.62	80.0	33.2	30.1	29.4	25.1	170	189	146	172	7.2	88.0	20.73	33.34	66.60	19.00	86.4	18.97	12.26	3.376	0.788	1.30	9.8	2.7	
06/09/10	11:03	13747.2	72.2%	80.6%	14.85	17.23	9.67	0.62	80.5	33.3	30.2	29.2	25.0	171	189	147	175	7.0	88.1	20.89	33.40	67.00	18.80	86.6	18.77	12.27	3.363	0.784	1.30	9.8	2.7	
06/10/10	11:00	13771.2	72.0%	80.8%	14.88	17.31	9.46	0.62	80.0	33.5	30.3	29.4	25.1	172	190	148	175	7.2	88.1	20.69	33.74	67.30	18.40	86.8	18.91	12.32	3.442	0.780	1.40	9.8	2.6	
06/12/10	12:30	13796.5	72.2%	81.2%	14.88	17.33	9.41	0.62	80.0	33.5	30.3	29.5	25.0	172	190	148	175	7.0	88.0	20.09	33.50	67.40	18.30	86.8	19.48	12.27	3.527	0.783	1.30	9.8	2.8	
06/13/10	16:07	13824.2	72.1%	80.2%	14.81	17.49	9.26	0.63	80.0	33.8	30.1	29.5	25.0	173	191	149	176	7.0	88.0	21.30	33.39	68.00	18.00	86.4	18.66	12.34	3.538	0.781	1.30	9.9	2.7	
06/15/10	12:16	13862.6	71.9%	80.5%	14.79	17.54	8.85	0.62	80.0	34.0	30.1	29.3	25.2	174	191	150	178	7.0	88.0	20.84	33.78	68.20	17.20	86.3	19.78	12.22	3.373	0.782	1.30	9.9	2.8	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes											**12 gfd flux 75% Recovery**																				
06/16/10	11:40	13886	67.4%	76.2%	12.05	14.27	7.30	0.53	80.0	33.0	30.5	29.4	25.0	141	160	121	145	3.5	71.8	21.90	33.94	55.50	14.20	70.3	12.82	8.38	2.795	0.756	1.10	6.3	2.1	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes											**14.9 gfd flux 75% Recovery**																				
06/17/10	12:18	13910.7	67.5%	75.9%	14.90	17.23	9.82	0.66	80.0	35.0	30.6	29.4	24.0	171	196	143	176	7.0	88.0	27.53	41.76	67.00	19.10	86.9	19.35	12.95	4.169	0.787	1.90	9.8	3.8	Raw water feed pressure very low about
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes											**16 gfd flux 75% Recovery**																				
06/18/10	8:39	13931	66.7%	75.9%	16.03	18.46	11.26	0.72	79.5	36.0	30.8	29.3	21.0	182	212	150	189	8.1	94.5	29.73	46.66	71.80	21.90	93.5	22.70	15.26	4.615	0.809	2.50	11.7	4.8	Raw water feed pressure very low about
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes											**BASELINE**																				
06/22/10	11:38	13972.7	72.5%	81.1%	14.88	17.74	8.38	0.63	81.0	35.2	30.1	29.3	25.0	178	195	154	180	7.1	88.2	20.21	32.94	69.00	16.30	86.8	19.41	12.45	3.07	0.782	1.30	10.1	2.5	
06/23/10	12:32	13997.6	71.5%	81.0%	14.86	18.26	7.66	0.64	81.0	35.3	30.2	29.4	25.1	188	203	165	190	7.0	88.3	20.34	34.50	71.00	14.90	86.7	19.23	12.64	2.474	0.787	1.10	10.3	1.6	Main plant switched one well 97 to 512,
06/24/10	22:48	14019.3	71.6%	80.8%	14.81	18.44	7.66	0.65	80.0	35.3	30.1	29.5	25.0	190	208	169	192	7.0	88.1	20.54	34.27	71.70	14.90	86.4	19.25	12.85	2.748	0.785	1.20	10.6	1.9	
06/26/10	12:17	14042.0	71.5%	80.9%	14.85	18.49	7.66	0.65	80.0	35.5	30.2	29.2	24.8	190	208	169	192	6.9	88.3	20.50	34.48	71.90	14.90	86.6	20.25	12.84	2.483	0.783	1.10	10.7	1.7	
06/29/10	11:46	14073.6	71.4%	80.9%	14.85	18.51	7.20	0.67	79.0	35.1	30.1	29.3	24.8	200	215	179	202	7.0	88.4	20.48	34.65	72.00	14.00	86.6	19.94	13.12	3.135	0.778	1.10	10.9	2.6	
06/30/10	11:32	14096.1	71.4%	81.1%	14.86	18.62	7.10	0.67	79.0	35.2	30.1	29.4	24.9	200	217	180	203	7.1	88.2	20.25	34.78	72.40	13.80	86.7	20.39	13.15	2.889	0.778	1.00	11.1	2.6	
07/07/10	11:34	14119.9	71.4%	81.1%	14.83	18.51	7.61	0.66	79.0	35.1	30.2	29.2	24.7	195	211	173	198	7.0	88.2	20.22	34.60	72.00	14.80	86.5	20.02	13.03	3.18	0.782	1.10	10.8	2.5	
07/08/10	10:47	14143.2	71.3%	81.1%	14.90	18.21	7.97	0.63	78.0	34.9	30.2	29.4	24.8	181	198	160	183	7.1	88.1	20.23	34.92	70.80	15.50	86.9	18.91	12.45	2.918	0.791	1.20	10.2	2.2	
07/10/10	15:00	14182.8	71.4%	80.6%	14.85	18.08	7.97	0.64	78.0	34.8	30.2	29.3	24.9	181	199	160	185	7.1	88.0	20.84	34.72	70.30	15.50	86.6	19.36	12.53	3.132	0.780	1.20	10.2	2.6	
07/11/10	10:26	14202.3	71.0%	80.6%	14.86	18.00	7.87	0.63	78.0	34.8	30.2	29.2	24.7	181	199	159	184	7.0	88.0	20.93	35.34	70.00	15.30	86.7	18.90	12.46	3.106	0.784	1.20	10.3	2.6	
07/13/10	12:17	14252.1	71.0%	80.8%	14.90	18.00	7.97	0.63	79.0	34.8	30.2	29.2	24.5	180	198	159	182	5.9	88.1	20.71	35.53	70.00	15.50	86.9	19.28	12.44	3.111	0.786	1.20	10.2	2.7	
07/14/10	12:12	14276.0	71.9%	80.2%	14.86	18.00	7.97	0.63	80.0	34.8	30.1	29.2	25.0	180	198	158	182	5.8	88.0	21.41	33.95	70.00	15.50	86.7	19.04	12.40	3.084	0.784	1.10	10.1	2.4	
07/15/10	12:14	14300.1	71.6%	80.7%	14.85	18.00	8.02	0.63	80.0	34.8	30.3	29.2	25.0	181	198	159	182	5.5	88.0	20.77	34.30	70.00	15.60	86.6	18.74	12.43	2.984	0.786	1.10	10.1	2.4	
07/17/10	12:10	14324.6	71.9%	80.8%	14.85	18.00	7.97	0.63	80.0	34.7	30.2	29.4	25.0	180	198	158	182	5.7	88.4	20.53	33.92	70.00	15.50	86.6	18.74	12.44	3.125	0.782	1.10	10.3	2.6	
07/18/10	12:32	14348.9	71.8%	80.9%	14.83	18.00	7.97	0.63	80.0	34.5	30.2	29.6	25.0	180	198	159	182	5.5	88.2	20.48	34.00	70.00	15.50	86.5	20.15	12.43	3.112	0.782	1.20	10.2	2.5	
07/19/10	12:02	14372.5	71.7%	80.6%	14.81	18.26	7.77	0.63	80.0	34.8	30.1	29.3	25.0	180	197	159	183	5.5	88.2	20.73	34.16	71.00	15.10	86.4	18.93	12.40	3.193	0.784	1.10	10.1	2.6	
07/20/10	12:00	14396.4	71.7%	80.5%	14.81	18.13	7.87	0.63	79.0	34.7	30.2	29.3	25.0	180	198	159	182	5.8	88.3	20.90	34.08	70.50	15.30	86.4	18.54	12.41	2.934	0.786	1.20	10.2	2.3	
07/21/10	12:26	14420.8	71.7%	81.0%	14.83	18.00	7.82	0.63	80.0	34.6	30.3	29.3	24.9	180	198	159	183	5.7	88.4	20.27	34.16	70.00	15.20	86.5	18.59	12.39	3.06	0.785	1.20	10.2	2.5	
07/22/10	12:30	14444.9	71.7%	80.7%	14.83	18.00	7.82	0.63	80.0	34.9	30.2	29.4	25.0	180	198	159	184	5.8	88.3	20.63	34.10	70.00	15.20	86.5	18.95	12.35	3.857	0.789	1.10	10.2	2.6	
07/25/10	13:30	14492.0	72.0%	80.7%	14.85	18.00	7.82	0.63	79.0	34.7	30.2	29.3	24.9	180	197	158	182	5.6	88.4	20.68	33.72	70.00	15.20	86.6	18.76	12.37	3.915	0.776	1.10	10.1	3.5	
07/27/10	12:10	14537.9	71.8%	81.0%	14.85	18.13	7.87	0.63	77.0	34.8	30.2	29.5	24.9	180	197	158	182	5.8	88.2	20.30	34.02	70.50	15.30	86.6	19.40	12.41	3.838	0.780	1.20	10.1	3.4	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes											**12 gfd flux 85% Recovery**																				
07/28/10	12:44	14560.6	74.7%	86.4%	12.00	15.38	4.27	0.52	80.0	33.0	29.9	29.5	27.0	161	170	148	162	3.0	71.3	11.03	23.76	59.80	8.30	70	12.77	8.20	2.896	0.754	0.40	6.9	1.9	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes											**14.9 gfd flux 85% Recovery**																				
07/29/10	13:48	14584.9	74.8%	86.2%	14.88	18.57	6.27	0.63	80.0	34.3	30.2	29.2	26.0	190	201	171	192	6.8	89.0	13.92	29.22	72.20	12.20	86.8	19.05	12.37	3.21	0.780	0.70	10.6	2.8	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes											**16 gfd flux 85% Recovery**																				
07/30/10	12:15	14607.4	73.1%	85.9%	16.01	20.06	7.10	0.67	80.0	35.0	30.5	29.3	24.8	201	213	181	204	7.5	94.2	15.35	34.31	78.00	13.80	93.4	21.93	14.23	3.691	0.789	0.90	12.3	3.5	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes											**BASELINE**																				
07/31/10	14:07	14633.3	71.3%	81.0%	14.85	18.26	7.71	0.63	78.0	34.9	**30.3**	29.5	24.8	181	198	160	185	5.8	88.2	20.36	34.80	71.00	15.00	86.6	19.29	12.42	2.723	0.786	1.20	10.2	1.8	
08/01/10	14:10	14657.3	71.5%	81.1%	14.95	18.26	7.71	0.63	78.0	35.0	**30.2**	29.3	24.9	181	199	160	187	5.8	88.2	20.30	34.73	71.00	15.00	87.2	19.34	12.49	2.684	0.785	1.20	10.3	1.8	

TIME				CALCULATED PARAMETERS					TEMP	PRESSRE									FLOWS						MAIN PANEL KW METER				VFD KW METER			
		Operation	System	RO	Ave. Sys. Flux	1st Stage Flux	2nd Stage Flux	Power	Influent	P_{CF-in}	P_{CF-out}	$P_{PX-Feed\ In}$	$P_{PX-conc\ out}$	PX-HP out RO 1 fe	$P_{RO\ 2\ feed}$	C-RO1 PX Booster i	P_{C-RO2}	P_{P-SYS}	$Q_{F-HP\ Pump}$	$Q_{PX\ HP-out}$	$Q_{Feed\ PX-In}$	$Q_{P-Stage\ 1}$	$Q_{P-Stage\ 2}$	Q_{P-SYS}	A_{sys}	P HP/PX	P booster	Power	PX power	HP Power	Feed Pump	
Date	Time	Time	Recovery %	Recovery %	Gfd	Gfd	Gfd	kWh/m3	Temp F	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	amp	(kw)	(kw)	Factor	(kw)	(kw)	(kw)	Notes
MM/DD/YY	hh:mm	hh.hh							17	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
08/02/10	11:48	14678.9	71.3%	80.6%	14.88	18.13	7.71	0.63	78.0	34.9	**30.2**	29.4	24.9	181	199	160	185	6.0	88.0	20.89	34.98	70.50	15.00	86.8	19.19	12.46	2.554	0.785	1.20	10.2	1.7	
08/03/10	12:55	14704.0	71.5%	81.1%	14.91	18.26	7.77	0.63	78.0	35.0	**30.1**	29.2	24.8	181	199	160	185	6.0	88.0	20.21	34.75	71.00	15.10	87	19.51	12.43	2.546	0.784	1.20	10.2	1.8	
08/04/10	12:06	14727.2	71.4%	80.5%	14.93	18.00	7.71	0.63	79.0	34.9	**30.1**	29.3	24.8	182	199	160	186	5.9	88.2	21.05	34.97	70.00	15.00	87.1	18.74	12.48	2.853	0.787	1.20	10.2	1.8	
08/05/10	12:23	14751.5	71.4%	80.5%	14.90	18.00	7.66	0.63	79.0	35.0	**30.2**	29.1	24.8	182	199	160	185	6.0	88.0	21.10	34.85	70.00	14.90	86.9	18.92	12.49	2.698	0.786	1.20	10.2	1.5	
08/07/10	14:13	14775.2	71.4%	81.0%	14.85	18.00	7.71	0.62	79.0	34.9	**30.1**	29.3	25.0	180	198	158	181	5.7	88.1	20.30	34.66	70.00	15.00	86.6	18.57	12.24	2.858	0.786	1.10	10.0	1.9	
08/08/10	12:57	14798.0	71.1%	80.6%	14.78	17.74	7.71	0.63	79.0	34.9	**30.2**	29.3	24.9	180	198	158	182	5.9	88.2	20.75	34.96	69.00	15.00	86.2	18.73	12.28	3.062	0.781	1.20	10.0	2.3	
08/09/10	10:45	14819.8	77.7%	81.1%	14.81	18.00	7.66	0.62	78.0	35.0	**30.1**	29.4	24.9	180	198	158	182	5.7	88.0	20.20	24.74	70.00	14.90	86.4	18.78	12.26	3.007	0.783	1.10	10.1	2	
08/11/10	12:27	14868.9	71.3%	80.4%	14.88	18.00	7.71	0.63	79.0	35.1	**30.3**	29.3	25.0	180	199	159	181	5.8	89.0	21.22	34.95	70.00	15.00	86.8	19.07	12.38	3.034	0.780	1.20	10.1	2.1	
08/12/10	12:58	14893.4	71.3%	80.9%	14.86	18.00	7.66	0.63	79.0	35.2	**30.1**	29.5	25.0	181	199	159	185	5.9	88.0	20.51	34.82	70.00	14.90	86.7	18.79	12.36	2.631	0.788	1.10	10.2	1.8	
08/17/10	16:57	14894.6	71.5%	81.0%	14.85	16.20	11.06	0.62	82.0	33.1	**30.1**	29.5	25.0	169	189	145	171	5.8	88.2	20.31	34.44	63.00	21.50	86.6	18.07	12.15	2.792	0.783	1.40	9.6	1.6	
08/18/10	12:09	14913.9	71.5%	80.6%	14.85	16.46	10.70	0.61	81.0	33.5	**30.2**	29.6	25.0	169	188	143	171	5.5	88.2	20.90	34.56	64.00	20.80	86.6	18.57	12.09	2.95	0.785	1.40	9.5	1.1	
08/19/10	12:40	14938.4	71.6%	80.5%	14.85	16.97	10.03	0.62	80.0	33.3	**30.1**	29.5	25.0	170	190	148	175	5.8	89.0	20.97	34.40	66.00	19.50	86.6	18.60	12.14	3.042	0.785	1.40	9.6	1.4	
08/21/10	19:19	14969.8	71.6%	80.9%	14.85	16.97	9.77	0.61	80.0	33.5	**30.2**	29.3	25.0	170	189	148	172	5.8	88.0	20.45	34.35	66.00	19.00	86.6	18.39	12.01	3.135	0.778	1.30	9.7	1.5	
08/22/10	18:54	14993.4	71.5%	81.0%	14.86	15.43	9.51	0.62	80.0	33.2	**30.2**	29.3	25.0	171	189	148	173	5.9	89.0	20.30	34.52	60.00	18.50	86.7	18.23	12.14	3.382	0.778	1.30	9.7	1.9	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes													**14.9 gfd flux 75-75% Recovery**																		
08/24/10	17:10	15031.8	66.1%	76.0%	14.88	16.46	11.31	0.64	78.0	34.0	**30.5**	29.3	22.5	165	191	140	170	6.5	88.0	27.42	44.42	64.00	22.00	86.8	19.54	12.66	3.226	0.789	2.10	9.5	1.8	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes													**14.9 gfd flux 75-80% Recovery**																		
08/25/10	12:21	15051.0	81.1%	75.7%	14.90	16.97	10.29	0.68	77.0	32.0	**29.9**	29.0	27.0	183	210	159	189	6.5	89.0	27.88	20.30	66.00	20.00	86.9	19.90	13.49	2.556	0.795	2.00	10.2	0.9	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes													**14.9 gfd flux 75-85% Recovery**																		
08/26/10	12:10	15073.4	84.7%	75.5%	14.91	17.74	8.23	0.71	78.0	36.0	**34.5**	35.0	34.0	210	235	185	212	6.5	89.0	28.25	15.74	69.00	16.00	87	20.69	13.97	2.507	0.802	1.80	11.2	0.9	Main plant is experirencing problems wi
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes													**BASELINE 14.9 gfd flux 80-80% Recovery**																		
08/26/10	21:41	15082.9	71.7%	81.1%	14.90	17.74	8.74	0.62	78.0	33.8	**30.2**	29.3	25.0	179	195	158	181	7.0	89.0	20.31	34.25	69.00	17.00	86.9	18.28	12.31	2.736	0.784	1.20	10.1	0.9	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes													**14.9 gfd flux 80-80% Recovery**																		
08/28/10	12:06	15108.0	71.3%	81.1%	14.90	17.74	8.74	0.62	79.0	33.8	**30.1**	29.2	25.0	178	192	154	180	5.8	88.0	20.31	34.91	69.00	17.00	86.9	18.25	12.25	3.28	0.778	1.20	9.9	1.8	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes													**14.9 gfd flux 80-85% Recovery**																		
08/29/10	12:34	15132.2	86.1%	79.1%	14.90	18.51	7.10	0.70	79.0	32.0	29.3	29.0	27.9	212	231	93	218	6.5	89.0	22.90	14.01	72.00	13.80	86.9	20.11	13.87	2.558	0.792	1.20	11.5	0.9	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes													**14.9 gfd flux 75-90% Recovery**																		
08/30/10	12:00	15155.7	90.8%	75.4%	14.88	21.09	2.06	0.90	79.0	33.2	**31.0**	30.5	30.0	310	332	290	317	6.0	89.0	28.37	8.83	82.00	4.00	86.8	25.10	17.72	2.457	0.822	1.10	15.6	0.9	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes													**BASELINE 14.9 gfd flux 80-80% Recovery**																		
09/02/10	13:12	15159.2	68.0%	80.6%	14.81	18.51	5.40	0.65	80.0	33.6	**30.5**	29.3	23.5	191	210	175	198	7.0	88.0	20.85	40.60	72.00	10.50	86.4	18.88	12.68	3.481	0.780	1.00	10.9	2.5	
09/03/10	13:00	15183.0	68.1%	79.8%	14.88	19.80	4.47	0.65	79.0	33.7	**30.5**	29.2	23.0	200	218	180	205	7.0	88.0	21.95	40.58	77.00	8.70	86.8	19.07	12.82	3.222	0.784	1.00	10.8	2.4	

Water Quality Data

TIME			pH			CONDUCTIVITY										TDS												TURBIDITY		SDI	OTHER				
Date MM/DD/YY	Time hh:mm	Operation Time hh.hh	pH pH_{F-sys} SC5	pH_{P-sys} SC11	pH_{C-sys} SC7	Conductivity (mS/cm) C_{CF-out} SC3	$C_{F-PX-out}$ SC6	C_{F-sys} SC5	$C_{P-total\ sys}$ SC11	$C_{P-1st\ stage\ 1}$ SC14	$C_{P-1st\ stage\ 2}$	$C_{P-2nd\ stage}$ SC10	$C_{P-interstage}$ SC 13	C_{C-sys} SC12	$C_{C-PX-out}$ SC7	TDS (mg/L) TDS_{CF-out} SC3	$TDS_{F-PX-out}$ SC6	% Inc @ memb ir	TDS_{F-sys} SC5	TDS_{P-sys} SC11	$TDS_{P-1st\ stage\ 1}$ SC14	$TDS_{P-1st\ stage\ 2}$	$TDS_{P-2nd\ stage}$ SC10	$TDS_{interstage}$ SC 13	TDS_{C-sys} SC12	$TDS_{C-PX-out}$ SC7	Turbidity (NTU) NTU_{MF-in} SC1	NTU_{CF-out} meter	Density Index SDI_{CF-out} CART	V_{TANK} (gallons)	Inhibitor Pump Speed (gph)	HP VFD Speed (Hertz)	PX VFD Speed (Hertz)	FEED VFD Speed (Hertz)	Notes
			25	26	27	28	29	30	31	32	33	34	35	36	37	28	29		30	31	32	33	34	35	36	37	30	38		39	40	41-02	42-02	43-02	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes																**Membrane Ripening Period**																		
02/11/10	16:15	12338.00	7.90	6.50	7.99	4490	nd	4529	237.2	139.6	135.4	473.5	9470	18.26	13.45		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.037	nd	20	20/30	53.35	42.51	51.32	
02/11/10	17:16	12339.00	7.98	6.50	8.12	4514	nd	4626	294	166.3	160.8	659.7	10.11	18.52	15.5		nd	nd		192.10	106.60	102.80	447.40	8487.00	16.98	13.85	nd	0.032	nd	20	20/30	45.79	35.86	45.07	
02/12/10	9:11	12355.30	7.86	6.88	6.86	4477	nd	4505	274.1	158.1	155	559.2	9539	18.62	15.04	3461.00	nd	0.8%	3487.00	177.90	101.00	98.84	376.50	7958.00	17.11	13.33	nd	0.029	nd	20	20/30	53.50	41.54	52.58	
02/18/10	15:52	12357.60	7.77	6.60	7.99	4464	nd	4617	293.7	170.6	167.8	597.7	9633	18.53	16.27	3446.00	nd	3.9%	3581.00	191.80	109.20	107.10	404.20	802.00	17.09	14.53	nd	0.035	nd	20	20/30	53.58	41.72	47.18	
02/25/10	13:22	12375.40	7.88	6.50	8.14	4490	nd	4651	304.6	178.5	175.1	625.4	9679	18.62	16.22	3477.00	nd	4.4%	3629.00	201.30	114.70	112.40	423.80	8085.00	17.05	14.51	nd	0.037	nd	20	20/30	53.67	41.46	40.60	
02/26/10	15:54	12400.20	7.84	6.51	7.99	4499	nd	4622	300	176.7	174.1	613.1	9680	18.65	16.3	3463.00	nd	3.2%	3573.00	196.20	113.30	111.70	414.80	8046.00	17.09	14.59	nd	0.055	nd	19.5	20/30	53.70	41.54	42.60	
02/27/10	12:35	12420.90	7.85	6.52	7.95	4492	nd	4649	299.9	176.8	174.1	612.7	9727	18.67	16.32	3482.00	nd	3.9%	3619.00	196.00	113.50	111.60	415.70	8090.00	17.16	14.59	nd	0.029	nd	19.5	20/30	53.64	41.42	41.10	
02/28/10	12:04	12444.30	7.87	6.53	7.97	4495	nd	4650	296.1	175.9	173.1	598.2	9707	18.55	16.22	3478.00	nd	4.2%	3624.00	193.70	113.30	111.00	405.30	8095.00	17.04	14.52	nd	0.029	nd	19	20/30	53.70	41.57	42.51	
03/01/10	14:20	12470.60	7.85	6.54	8.09	4488	nd	4655	297.5	177.5	173.9	604.1	9714	18.19	16.21	3464.00	nd	4.1%	3605.00	194.70	113.90	111.50	409.10	8089.00	16.61	14.51	nd	0.028	nd	19	20/30	53.64	41.46	40.61	
03/02/10	12:18	12492.60	7.87	6.56	8.05	4478	nd	4603	301.5	178.1	175.2	622.2	9813	18.71	16.21	3452.00	nd	3.2%	3563.00	197.20	114.30	112.40	421.40	8176.00	17.18	14.49	nd	0.026	nd	19	20/30	53.64	41.04	44.27	
03/03/10	15:14	12519.50	7.78	6.47	7.88	4479	nd	4615	299.8	179.1	176	614.5	9759	18.48	16.19	3449.00	nd	4.0%	3588.00	197.30	114.90	112.80	415.70	8124.00	16.89	14.48	nd	0.026	nd	18.5	20/30	53.58	41.25	43.07	
03/04/10	12:40	12540.90	7.76	6.46	7.99	4472	nd	4597	298.6	179.2	176	612.7	9768	18.44	16.18	3443.00	nd	3.0%	3548.00	195.00	115.00	112.90	414.10	8116.00	16.82	14.42	nd	0.027	nd	18.5	20/30	53.58	41.34	43.00	
03/05/10	14:39	12564.10	7.75	6.46	7.82	4472	nd	4605	299.6	179.9	176.3	611.2	9737	18.36	16.09	3444.00	nd	3.1%	3551.00	195.60	115.60	113.00	413.90	8120.00	16.74	14.35	nd	0.027	nd	18.5	20/30	53.67	41.46	40.86	
03/06/10	11:33	12585.00	7.83	6.50	7.92	4510	nd	4631	298.4	180	176.4	606.8	9728	17.96	16.02	3481.00	nd	3.0%	3586.00	195.10	115.60	113.40	410.90	8084.00	15.64	14.28	nd	0.027	nd	18	20/30	53.64	41.48	39.36	
03/07/10	13:55	12611.30	7.77	6.47	7.86	4470	nd	4622	297.8	180.4	177.5	608.6	9747	18.21	15.98	3441.00	nd	3.6%	3566.00	194.80	115.80	113.90	411.50	8105.00	16.57	14.26	nd	0.028	nd	17.8	20/30	53.58	41.46	37.80	
03/08/10	15:33	12637.00	7.86	6.36	7.85	4476	nd	4613	299.1	180.1	176	615.4	9828	18.37	16.07	3454.00	nd	3.2%	3566.00	196.50	115.80	112.90	417.80	8181.00	16.76	14.10	nd	0.028	nd	17.8	20/30	53.67	41.13	40.79	
03/09/10	14:14	12659.70	7.76	6.15	7.97	4612	nd	4789	311.1	-	-	-	-	-	-	3579.00	nd	4.0%	3721.00	204.30	-	-	-	-	-	-	nd	-	nd	-	-	-	-	-	Plant shut down during data collection due t
03/10/10	13:07	12681.90	7.77	6.33	7.96	4481	nd	4649	298.6	180.8	177.2	611.3	9849	18.27	16.1	3440.00	nd	5.1%	3614.00	195.40	116.00	113.70	414.20	8254.00	16.68	14.37	nd	0.028	nd	17.8	20/30	53.70	41.37	41.23	
03/16/10	16:04	12706.10	7.79	6.53	7.91	4487	5038	4510	332.8	195.7	192.3	768.4	10.64	18.84	16.33	3470.00	3920.00	13.0%	3477.00	219.20	126.30	124.20	524.50	8954.00	17.27	14.61	nd		nd	17.8	20/30	55.34	40.08	35.04	
03/26/10	16:29	12718.20	7.80	6.60	7.85	5250	6456	5419	388.2	235.7	232	870.7	12.19	20.28	18.22	4103.00	5166.00	25.9%	4245.00	257.20	152.90	150.50	598.80	10.43	18.84	16.60	nd	0.034	nd	17.8	20/30	54.80	41.95	30.00	
03/27/10	16:28	12720.58	7.80	6.69	7.75	5274	5705	5286	407.1	242.9	237.9	978.4	12.4	20.56	16.71	4140.00	4510.00	8.9%	4133.00	270.50	157.60	154.50	677.30	10.62	19.20	15.01	nd	0.030	nd	17.8	20/30	52.62	38.79	30.00	
04/02/10	15:35	12726.22	7.79	6.78	7.80	4134	4787	4197	255.9	182.4	178.7	444.6	8147	12.96	11.48	3168.00	3709.00	17.1%	3206.00	165.90	117.30	114.60	297.50	6647.00	11.16	9740.00	nd	0.033	nd	17.6	50/90	46.28	45.73	35.73	
04/02/10	17:57	12728.58	7.65	6.69	7.77	4072	4247	4098	232.6	166.1	163.3	396.4	7633	12.2	9857	3118.00	3282.00	5.3%	3125.00	151.10	106.20	104.40	263.00	6183.00	10.43	8204.00	nd	0.033	nd	17.5	50/90	46.26	46.20	33.38	
04/08/10	14:50	12731.97	7.60	6.60	7.66	4060	4242	4092	240.3	169.6	167	409.9	7705	12.4	10.01	3071.00	3215.00	4.7%	3075.00	154.40	107.40	105.70	269.80	6205.00	10.51	8265.00	nd	0.029	nd	17	50/90	46.29	46.11	33.26	
04/09/10	15:10	12740.34	7.70	6.38	7.73	4003	4175	4035	235	166.7	164.1	401.3	7545	12.22	9887	3017.00	3171.00	5.1%	3029.00	151.00	105.50	103.70	263.70	6054.00	10.33	8143.00	nd	0.033	nd	16.1	50/90	46.26	46.14	48.02	
04/10/10	12:11	12761.37	7.66	6.41	7.64	4011	4187	4040	230.8	164.9	162.5	388.6	7499	12.12	9845	3021.00	3165.00	4.8%	3044.00	148.40	104.30	102.70	255.00	5997.00	10.25	8115.00	nd	0.027	nd	14.2	50/90	46.25	46.55	46.67	
04/11/10	13:17	12786.47	7.65	6.43	7.65	4009	4169	4054	231	165.2	162.4	386.9	7510	12.1	9836	3026.00	3149.00	4.1%	3051.00	148.50	104.50	102.60	253.80	6007.00	10.22	8097.00	nd	0.032	nd	12	50/90	46.20	46.88	50.79	
04/12/10	17:15	12814.43	7.73	6.46	7.75	4053	4222	4088	232.8	167.1	164.4	389.6	7562	12.13	9951	3053.00	3193.00	4.6%	3079.00	149.70	105.70	103.90	255.60	6047.00	10.24	8200.00	nd	0.028	nd	23	50/90	46.23	46.96	43.79	Filled up anti-scallent tank with 10:1 dilutio
04/21/10	15:44	12833.22	7.49	6.21	7.65	4065	4249	4121	241.2	172.1	169.6	406.8	7598	12.26	10.01	3063.00	3216.00	5.0%	3107.00	155.00	109.10	107.40	267.40	6079.00	10.37	8253.00	nd	0.032	nd	21.3	50/90	46.26	46.73	46.90	
04/23/10	16:00	12853.47	7.62	6.31	7.72	4035	4148	4051	234.2	168.1	165.5	391.8	7522	12.09	10.04	3033.00	3141.00	3.6%	3062.00	150.70	106.40	104.80	257.60	6039.00	10.22	8266.00	nd	0.035	nd	19.3	50/90	46.41	47.29	46.65	
04/24/10	11:46	12873.25	7.54	6.33	7.65	4059	4274	4131	238.7	171.2	168.2	400.6	7607	12.15	9979	3068.00	3248.00	5.9%	3120.00	153.50	108.50	106.50	263.30	6091.00	10.27	8231.00	nd	0.033	nd	17.4	50/90	46.32	46.99	46.77	
04/25/10	11:03	12896.51	7.53	6.30	7.63	4055	4196	4091	238.1	171.4	168.4	402.4	7614	12.11	9916	3058.00	3171.00	3.7%	3084.00	153.10	108.60	106.60	264.50	6096.00	10.23	8172.00	nd	0.037	nd	15.5	50/90	46.29	46.99	46.86	
04/26/10	17:16	12926.28	7.37	6.22	7.37	4044	4212	4081	238.4	171.5	168.7	408.5	7650	12.14	9929	3040.00	3184.00	4.7%	3073.00	153.10	108.60	106.70	268.50	6125.00	10.25	8179.00	nd	0.035	nd	12.2	50/90	46.26	46.85	46.97	
04/27/10	13:39	12946.67	7.55	6.33	7.66	3880	4037	3915	219.6	156.3	153.7	378.7	7495	11.77	9598	2913.00	3047.00	4.6%	2938.00	141.10	98.72	97.02	248.40	5902.00	9920.00	7891.00	nd	0.032	nd	20.2	50/90	46.32	46.49	37.58	Filled up anti-scallent tank with 10:1 dilutio
04/28/10	16:40	12973.68	7.39	6.13	7.41	4024	4223	4032	268	164.9	162.9	394.3	9134	15.74	12.33	3021.00	3138.00	3.9%	3032.00	171.90	104.30	102.30	397.60	7489.00	13.83	10.43	nd	0.032	nd	17.6	50/90	52.53	41.07	44.58	
04/29/10	12:43	12993.73	7.55	6.21	7.57	4131	4275	4141	277	171.5	168.5	620.4	9452	16.07	12.63	3118.00	3238.00	3.8%	3124.00	178.10	108.70	106.60	415.60	7746.00	14.18	10.72	nd	0.030	nd	15.5	50/90	52.59	41.16	44.17	
04/30/10	5:09	13017.66	7.68	6.29	7.59	4280	4438	4287	298.2	181.6	178.1	696.9	10.06	17.01	13.14	3253.00	3375.00	3.8%	3250.00	192.90	115.50	113.10	470.60	8308.00	15.13	11.22	nd	0.029	nd	13.2	50/90	52.57	40.08	30.77	Had to adjust % salinity, main plant had swi
05/01/10	12:17	13036.81	7.59	6.26	7.63	4329	4442	4343	301	185.6	182.1	711.6	10.17	17.05	13.17	3288.00	3354.00	2.0%	3297.00	194.80	118.20	115.90	478.80	8418.00	15.18	11.26	nd	0.030	nd	11.6	50/90	52.45	40.05	32.22	During data collection 5 salinity was low. 5
05/02/10	13:14	13061.76	7.65	6.36	7.65	4366	4505	4372	301.6	186.9	183	721.4	10.32	17.07	13.4	3320.00	3431.00	3.3%	3320.00	195.20	119.10	116.50	485.40	8555.00	15.24	11.47	nd	0.030	nd	9.2	50/90	52.44	40.16	30.73	After data collection, filled up anti-scallent t
05/03/10	17:25	13089.94	7.55	6.34	7.61	4377	4581	4387	303.1	188.1	184.3	721.4	10.33	16.98	13.32	3325.00	3495.00	5.1%	3331.00	196.10	120.00	117.30	485.80	8560.00	15.08	11.39	nd	0.031	nd	21.5	50/90	52.41	40.31	33.44	
05/05/10	16:14	13112.90	7.52	6.36	7.52	4391	4585	4418	309.2	191.5	187.5	742.8	10.35	16.97	12.83	3342.00	3488.00	4.4%	3352.00	200.20	122.00	119.40	500.10	8552.00	15.06	10.91	nd	0.032	nd	19	50/90	52.38	40.32	30.00	
05/06/10	16:39	13137.32	7.35	6.30	7.35	4390	4512	4407	306	190.8	187.1	739.6	10.41	16.94	13.34	3318.00	3433.00	3.5%	3343.00	198.00	121.60	119.10	497.60	8622.00	15.03	11.42	nd	0.032	nd	16.8	50/90	52.32	40.17	34.96	
05/07/10	15:09	13155.95	7.62	6.38	7.52	4405	4587	4428	309.8	192.8	188.8	755.2	10.55	17.1	13.44	3342.00	3497.00	4.6%	3361.00	200.60	122.90	120.20	508.80	8758.00	15.20	11.53	nd	0.029	nd	15	50/90	52.38	40.17	31.56	
05/08/10	13:21	13178.14	7.67	7.39	7.52	4397	4591	4408	305.7	190.2	186.3	748.2	10.56	17.01	13.4	3343.00	3501.00	4.7%	3349.00	198.00	121.30	118.60	504.20	8774.00	15.13	11.48	nd	0.031	nd	12.8	50/90	52.38	40.02	38.78	
05/09/10	14:12	13203.00	7.48	6.22	7.42	4396	4549	4423	304.3	191.2	187.2	749.3	10.59	16.96	13.45	3335.00	3464.00	3.9%	3357.00	196.80	121.80	119.10	504.60	8785.00	15.08	11.51	nd	0.031	nd	10.3	50/90	52.32	40.11	35.45	
05/10/10	17:50	13230.63	7.53	6.32	7.46	4389	4576	4421	302.2	190.6	186.6	750.6	10.65	16.94	13.48	3329.00	3487.00	4.7%	3350.00	195.40	121.40	118.80	505.70	8849.00	15.08	11.54	nd	0.031	1.22	22	50/90	52.35	40.11	31.42	Filled up anti-scallent tank with 10:1 dilutio
05/11/10	14:58	13251.77	7.54	6.29	7.42	4400	4575	4431	302.8	191.5	187.7	758.3	10.7	16.93	13.47	3336.00	3486.00	4.5%	3364.00	195.80	122.00	119.50	511.10	8895.00	15.07	11.54	nd	0.026	1.33	20.1	50/90	52.35	40.05	32.02	
05/12/10	16:03	13276.85	7.54	6.31	7.50	4402	4585	4417	300.8	190.5	186.7	757.7	10.76	16.94	13.4	3347.00	3507.00	4.8%	3355.00	194.50	121.50	118.90	511.20	8961.00	15.05	11.47	nd	0.026		17.5	50/90	52.38	39.99	33.03	
05/13/10	14:25	13299.21	7.55	6.29	7.56	4401	4546	4423	302.6	192.3	188.2	767.3	10.78	16.86	13.36	3342.00	3473.00	3.9%	3362.00	195.70	122.60	119.80	517.70	8998.00	15.01	11.47	nd	0.026	1.68	15.6	50/90	52.35	39.81	38.08	
05/20/10	12:25	13327.52	7.44	6.39	7.59	4342	4450	4352	241.2	146.6	142.4	500.3	9385	17.09	13.31	3293.00	3383.00	2.7%	3300.00	155.00	92.44	89.72	331.60	7690.00	15.18	11.37	nd	0.031	nd	12.5	50/90	52.32	41.72	43.42	
05/22/10	12:55	13360.50	7.50	6.27	7.42	4304	4462	4320	257.6	152.5	147.5	560.2	9708	18.02	13.77	3252.00	3394.00	4.4%	3270.00	165.20	96.04	92.82	372.50	7980.00	16.17	11.91	nd	0.032	nd	9.3	50/90	55.02	41.40	34.15	After data collection, filled up anti-scallent t
05/23/10	13:44	13385.34	7.50	6.29	7.45	4321	4473	4345	262.6	155.5	151.2	575.6	9797	18.06	13.79	3274.00	3403.00	3.9%	3291.00	168.50	98.06	95.23	383.00	8057.00	16.20	11.94	nd	0.029	nd	22	50/90	55.02	41.40	41.31	
05/24/10	12:37	13408.19	7.61	6.33	7.56	4330	4505	4358	264.2	156.9	152.3	580.5	9813	18.08	13.83	3286.00	3434.00	4.5%	3306.00	169.60	99.04	96.10	386.60	8077.00	16.26	11.98	nd	0.029	1.12	19.7	50/90	55.08	41.43	42.56	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes																**12 gfd flux**																		
05/25/10	12:46	13432.34	7.56	6.32	7.59	4310	4446	4351	321.1	189.8	184.7	771.5	10.16	17.41	12.95	3265.00	3391.00	3.9%	3300.00	208.40	120.90	117.40	520.90	8403.00	15.54	11.03	nd	0.028	1.13	17.3	50/90	44.93	34.63	30.00	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes																**BASELINE**																		
05/26/10	12:03	13455.64	7.57	6.33	7.55	4293	4446	4318	262.6	157.5	153.1	576.9	9742	17.78	13.69	3246.00	3379.00	4.1%	3270.00	168.40	99.34	96.51	382.90	8022.00	15.66	11.84	nd	0.027	0.998	15	50/90	55.28	41.92	41.55	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes																**14.9 gfd flux**																		
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes																**BASELINE**																		
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes																**16 gfd flux**																		
05/27/10	9:27	13477.02	7.53	6.26	7.54	4289	4441	4296	251.8	147.9	143.7	558.1	9826	18.39	14.02	3248.00	3376.00	3.9%	3253.00	161.50	93.18	90.50	371.10	8089.00	16.59	12.16	nd	0.025	0.922	12.7	50/90	59.56	43.62	43.10	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes																**BASELINE**																		
05/27/10	19:11	13486.77	7.46	6.27	7.42	4303	4418	4324	269.6	159.8	155.4	608.2	9929	17.99	13.75	3247.00	3351.00	3.2%	3273.00	172.70	100.80	97.96	406.80	8161.00	16.14	11.89	nd	0.027	nd	11.8	50/90	55.14	41.25	35.20	
05/29/10	11:41	13508.21	7.52	6.30	7.45	4359	4498	4391	280.8	166.5	161.7	637.5	10.1	18.17	13.98	3298.00	3428.00	3.9%	3332.00	180.60	105.20	102.10	427.20	8379.00	16.33	12.12	nd	0.027	nd	24.8	50/90	55.17	41.31	42.70	
05/30/10	11:45	13532.27	7.51	6.33	7.46	4359	4509	4381	280.7	166.6	161.9	637.7	10.07	18.05	13.87	3303.00	3432.00	3.9%	3323.00	180.50	105.30	102.30	427.20	8282.00	16.19	12.01	nd	0.024	nd	22.4	50/90	55.20	41.31	41.25	
05/31/10	11:05	13555.60	7.50	6.25	7.45	4368	4496	4397	280.9	167.6	162.7	642.5	10.11	17.95	13.84	3309.00	3418.00	3.3%	3336.00	180.60	106.00	102.80	430.50	8348.00	16.10	11.98	nd	0.025	nd	20.2	50/90	55.20	41.31	41.06	
06/01/10	12:08	13580.65	7.59	6.36	7.58	4383	4533	4402	280.9	168.2	163.2	649	10.18	17.92	13.87	3323.00	3450.00	3.8%	3344.00	180.70	106.50	103.10	435.10	8409.00	16.07	12.00	nd	0.024	nd	17.8	50/90	55.20	41.28	42.33	
06/02/10	13:07	13605.53	7.55	6.39	7.48	4391	4503	4405	283.7	169.2	164.2	660.4	10.21	17.88	13.78	3322.00	3428.00	3.2%	3342.00	182.60	107.10	103.70	442.70	8436.00	16.00	11.92	nd	0.028	1.17	15.1	50/90	55.20	41.25	43.46	
06/03/10	12:30	13629.03	7.68	6.43	7.74	4431	4589	4450	282.1	168.9	163.9	664.8	10.45	18.07	14.14	3363.00	3498.00	4.0%	3379.00	181.50	106.80	103.50	445.80	8639.00	16.41	12.27	nd	0.026	nd	12.8	50/90	55.17	41.25	43.61	New Myron L meter readings

Water Quality Data

TIME			pH			CONDUCTIVITY										TDS											TURBIDITY		SDI	OTHER					
						Conductivity (mS/cm)										TDS (mg/L)											Turbidity (NTU)		Density Index		Inhibitor				
Date	Time	Operation Time	$pH_{F\text{-}sys}$	$pH_{P\text{-}sys}$	$pH_{C\text{-}sys}$	$C_{CF\text{-}out}$	$C_{F\text{-}PX\text{-}out}$	$C_{F\text{-}sys}$	$C_{P\text{-}total\ sys}$	$C_{P\text{-}1st\ stage\ 1}$	$C_{P\text{-}1st\ stage\ 2}$	$C_{P\text{-}2nd\ stage}$	$C_{\text{-}interstage}$	$C_{C\text{-}sys}$	$C_{C\text{-}PX\text{-}out}$	$TDS_{CF\text{-}out}$	$TDS_{F\text{-}PX\text{-}out}$	% Inc	$TDS_{F\text{-}sys}$	$TDS_{P\text{-}sys}$	$TDS_{P\text{-}1st\ stage}$	$TDS_{P\text{-}1st\ stage}$	$TDS_{P\text{-}2nd\ stage}$	$TDS_{interstage}$	$TDS_{C\text{-}sys}$	$TDS_{C\text{-}PX\text{-}out}$	$NTU_{MF\text{-}in}$	$NTU_{CF\text{-}out}$	$SDI_{CF\text{-}out}$	V_{TANK}	Pump Speed	HP VFD Speed	PX VFD Speed	FEED VFD Speed	Notes
MM/DD/YY	hh:mm	hh.hh	SC5	SC11	SC7	SC3	SC6	SC5	SC11	SC14		SC10	SC 13	SC12	SC7	SC3	SC6	@ memb ir	SC5	SC11	SC14		SC10	SC 13	SC12	SC7	SC1	meter	CART	(gallons)	(gph)	(Hertz)	(Hertz)	(Hertz)	
06/05/10	13:29	13653.70	7.58	6.44	7.66	4259	4374	4298	279.2	164	159.2	651.5	10.11	17.47	13.55	3308.00	3422.00	3.4%	3351.00	184.60	106.50	103.30	448.90	8659.00	16.05	12.06	nd	0.027	nd	25.3	50/90	55.14	41.16	45.95	Filled up anti scallent tank with 15 gallons o
06/06/10	13:30	13677.71	7.60	6.43	7.66	4274	4413	4295	276.4	164.7	159.6	658.4	10.17	17.63	13.31	3317.00	3447.00	3.9%	3344.00	182.70	106.90	103.60	453.50	8638.00	16.24	11.72	nd	0.032	nd	22.8	50/90	55.11	41.16	47.63	
06/07/10	12:38	13700.85	7.58	6.39	7.68	4256	4425	4268	272.4	143.2	158.7	657.1	10.24	17.52	13.57	3313.00	3458.00	4.4%	3324.00	179.90	106.00	103.10	453.00	8726.00	16.14	12.08	nd	0.026	nd	20.6	50/90	55.17	41.16	46.58	
06/08/10	12:05	13724.30	7.72	6.56	7.64	4269	4412	4301	272.6	164.7	159.8	663.5	10.26	17.43	13.49	3317.00	3449.00	4.0%	3352.00	180.10	107.20	103.70	457.40	8754.00	16.04	12.00	nd	0.027	nd	18	50/90	55.20	41.16	47.17	
06/09/10	11:08	13747.35	7.63	6.48	7.63	4262	4410	4280	271.8	164.6	159.8	668.2	10.3	17.42	13.57	3319.00	3454.00	4.1%	3336.00	179.60	107.00	103.80	460.80	8790.00	16.02	12.80	nd	0.029	1.43	15.9	50/90	55.17	41.16	47.46	
06/10/10	11:08	13771.35	7.51	6.42	7.60	4257	4385	4296	274.8	165.3	160	671.5	10.35	17.17	13.53	3310.00	3427.00	3.5%	3351.00	181.70	107.40	103.90	463.20	8840.00	15.75	12.04	nd	0.028	nd	13.3	50/90	55.22	41.13	47.61	
06/12/10	12:32	13796.64	7.56	6.44	7.59	4242	4410	4263	273.6	166.3	160.3	677.2	10.27	17.14	13.33	3303.00	3450.00	4.5%	3320.00	180.80	108.00	104.10	467.10	8768.00	15.74	11.84	nd	0.029	nd	10.2	50/90	55.20	41.10	47.21	
06/13/10	16:12	13824.30	7.67	6.55	7.63	4239	4343	4263	263.4	165.7	160.6	682.8	10.39	17.39	13.3	3298.00	3393.00	2.9%	3321.00	173.60	107.70	104.30	471.20	8872.00	16.00	11.82	nd	0.029	nd	22.8	50/90	55.20	41.13	47.77	Filled up anti scallent tank with 15 gallons o
06/15/10	12:21	13862.77	7.51	6.42	7.64	4241	4359	4248	275.1	167.7	162.5	710.9	10.58	17.33	13.06	3301.00	3405.00	3.2%	3310.00	181.90	109.10	105.50	491.30	9061.00	15.92	11.48	nd	0.026	nd	18.6	50/90	55.05	40.46	48.50	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes														**12 gfd flux 75% Recovery**																				
06/16/10	11:46	13886.18	7.57	6.47	7.63	4235	4343	4261	293.6	187.3	182	676	9697	14.64	**11.97**	3293.00	3391.00	3.0%	3318.00	194.90	122.60	119.00	466.40	8206.00	13.16	10.41	nd	0.026	.74, .71	16.3	50/90	45.06	38.47	43.88	SDI was done twice to comfirm first value
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes														**14.9 gfd flux 75% Recovery**																				
06/17/10	12:23	13910.80	7.54	6.44	7.66	4235	4358	4265	237	155.6	151	531.4	9554	15.09	**11.9**	3290.00	3404.00	3.5%	3321.00	156.40	100.90	97.83	362.70	8069.00	13.60	10.34	nd	0.026	0.935	13.8	50/90	55.55	45.79	53.88	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes														**16 gfd flux 75% Recovery**																				
06/18/10	8:46	13931.18	7.47	6.37	7.61	4236	4376	4264	214.6	143.1	138.9	457.7	9287	14.75	**11.74**	3304.00	3422.00	3.6%	3324.00	141.50	92.66	89.93	311.00	7831.00	13.26	10.19	nd	0.025	0.896	11.7	50/90	59.85	50.24	58.27	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes														**BASELINE**																				
06/22/10	11:42	13972.79	7.55	6.40	7.65	4276	4460	4312	285.4	174.8	169.4	768.9	10.97	17.56	**13.64**	3323.00	3492.00	5.1%	3363.00	189.10	114.00	110.30	532.20	9402.00	16.17	12.14	nd	0.027	nd	17.9	50/90	55.15	40.17	46.66	
06/23/10	12:39	13997.74	7.48	6.42	7.59	4914	5074	4937	352.6	215.9	209.3	1012	12.93	19.92	**15.14**	3874.00	4017.00	3.7%	3899.00	236.60	142.40	137.80	710.70	11.35	18.82	13.66	nd	0.026	nd	15.6	50/90	55.14	39.15	39.43	
06/24/10	22:53	14019.47	7.52	6.47	7.59	5037	5239	5057	365.2	223.6	216.7	1050	13.27	20.4	**15.71**	3991.00	4170.00	4.5%	4009.00	245.70	147.80	143.00	741.20	11.70	19.35	14.24	nd	0.026	nd	12.9	50/90	55.20	39.29	38.70	
06/26/10	12:22	14042.20	7.48	6.47	7.61	5108	5247	5134	374.3	229.9	223	1080	13.41	20.52	**15.94**	4050.00	4173.00	3.0%	4077.00	252.10	151.80	147.20	762.10	11.92	19.49	14.47	nd	0.026	nd	10.4	50/90	55.20	39.23	40.63	
06/29/10	11:52	14073.72	7.47	6.48	7.56	5721	5927	5742	458.5	281.3	272.6	1405	15.5	23.22	**17.54**	4597.00	4771.00	3.8%	4609.00	311.70	186.40	180.20	1004.00	14.03	22.55	16.18	nd	0.027	nd	7.5	50/90	55.25	38.20	49.92	
06/30/10	11:38	14096.30	7.50	6.49	7.57	5703	5893	5733	451.2	277.6	269.5	1369	15.38	23.02	**17.44**	4577.00	4741.00	3.6%	4600.00	306.50	183.70	178.00	977.10	13.92	22.28	16.07	nd	0.026	nd	19.9	50/90	55.25	38.53	45.94	
07/07/10	11:40	14120.08	7.48	6.50	7.58	5636	5832	5667	438.2	268.4	260.6	910.1	14.75	22.31	**17.04**	4524.00	4689.00	3.6%	4546.00	297.70	177.50	171.90	909.90	13.27	21.51	15.65	nd	0.029	nd	17.5	50/90	55.28	39.23	45.32	
07/08/10	10:53	14143.29	7.49	6.53	7.66	4575	4720	4598	318.5	192.9	187.2	900.6	11.94	18.81	**14.18**	3599.00	3721.00	3.4%	3614.00	212.80	126.60	122.70	630.60	10.38	17.57	12.71	nd	0.029	nd	15.2	50/90	55.25	39.35	42.70	
07/10/10	15:03	14182.90	7.54	6.50	7.68	4642	4764	4655	327.3	198.1	192.2	923.2	12.09	18.93	**14.39**	3650.00	3760.00	3.0%	3665.00	219.00	130.20	126.10	647.00	10.53	17.71	12.92	nd	0.030	nd	11	50/90	55.25	39.38	47.23	
07/11/10	10:30	14202.39	7.51	6.50	7.68	4645	4757	4656	327.2	198.2	192.1	919.4	12.06	18.89	**14.2**	3650.00	3756.00	2.9%	3663.00	218.90	130.20	126.00	644.40	10.50	17.66	12.72	nd	0.031	nd	9	50/90	55.22	39.40	47.05	
07/13/10	12:22	14252.26	7.63	6.53	7.65	4639	4779	4661	324.8	198.2	192.1	914.5	12.04	18.78	**14.71**	3648.00	3769.00	3.3%	3666.00	217.20	130.20	126.00	640.70	10.47	17.52	13.24	nd	0.029	0.46	24	50/90	55.20	39.46	44.82	Filled Anticscallent tank with 20 gals of 10:1
07/14/10	12:19	14276.22	7.54	6.52	7.65	4638	4829	4656	323.8	198	192.2	912.5	12.04	18.76	**14.5**	3644.00	3811.00	4.6%	3661.00	216.40	130.10	126.10	639.20	10.47	17.51	13.02	nd	0.028	nd	21.8	50/90	55.20	39.52	43.91	
07/15/10	12:18	14300.16	7.46	6.55	7.66	4632	4787	4663	324	198.3	192.2	916.1	12.04	18.78	**13.7**	3635.00	3774.00	3.8%	3667.00	216.50	130.20	126.10	641.50	10.48	17.53	13.35	nd	0.029	nd	19	50/90	55.17	39.46	41.31	
07/17/10	12:14	14324.69	7.50	6.56	7.66	4624	4798	4647	329.6	199.2	193.2	929.6	12.07	18.83	**14.48**	3633.00	3785.00	4.2%	3656.00	220.60	130.90	126.80	651.90	10.51	17.60	13.01	nd	0.028	nd	16.7	50/90	55.20	33.35	46.16	
07/18/10	12:37	14349.07	7.52	6.54	7.66	4615	4809	4625	324.3	197.7	191.9	917.5	12.01	18.71	**14.43**	3629.00	3795.00	4.6%	3636.00	216.90	129.90	125.90	642.80	10.44	17.47	12.96	nd	0.028	nd	14	50/90	55.23	39.40	46.25	
07/19/10	12:07	14372.57	7.54	6.52	7.65	4596	4725	4631	325.1	197.9	191.8	921.3	11.98	18.65	**14.29**	3606.00	3721.00	3.2%	3637.00	217.30	130.00	125.80	645.00	10.42	17.40	12.82	nd	0.027	nd	11.8	50/90	55.19	39.35	46.47	
07/20/10	12:03	14396.51	7.51	6.52	7.70	4617	4810	4640	324.9	197.5	192	919.3	12	18.63	**14.37**	3629.00	3796.00	4.6%	3646.00	217.20	129.80	125.80	643.60	10.44	17.38	12.90	nd	0.026	nd	9.2	50/90	55.22	39.40	43.45	Added 5 gallons of anticalled 10:1 dilutions
07/21/10	12:30	14420.97	7.50	6.54	7.68	4598	4720	4622	324.9	197.9	191.9	924.6	12.02	18.69	**14.35**	3610.00	3717.00	3.0%	3631.00	217.20	130.00	125.90	648.00	10.46	17.45	12.87	nd	0.026	0.697	11.3	50/90	55.17	39.29	43.27	
07/22/10	12:33	14445.01	7.55	6.59	7.69	4595	4717	4610	326.7	198	191.9	932.1	12.09	18.76	**14.51**	3606.00	3716.00	3.1%	3622.00	218.70	130.10	126.00	654.10	10.52	17.54	13.04	nd	0.028	nd	9	50/90	55.20	39.17	46.19	main plant switch wells to 515. Added 5 gal
07/25/10	13:34	14492.08	7.61	6.56	7.70	4536	4673	4553	316.7	193.6	187.7	895.5	11.8	18.34	**14.23**	3560.00	3678.00	3.3%	3573.00	211.50	127.10	123.00	627.10	10.25	17.03	12.76	nd	0.031	nd	9.1	50/90	55.20	39.52	52.10	
07/27/10	12:12	14537.99	7.49	6.55	7.72	4524	4711	4537	313.6	192.5	186.6	882.9	11.73	18.17	**14.14**	3553.00	3715.00	4.6%	3561.00	209.50	126.40	122.30	617.60	10.18	16.89	12.67	nd	0.027	nd	4.7	50/90	55.22	39.64	51.89	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes														**12 gfd flux 85% Recovery**																				
07/28/10	12:57	14560.86	7.52	6.65	7.68	4527	4654	4539	495.2	283.4	274.8	2064	14.98	22.06	**14.67**	3548.00	3661.00	3.2%	3561.00	337.60	187.90	181.80	1526.00	13.51	21.23	13.20	nd	0.028	0.324	25	20/45	44.62	27.71	42.79	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes														**14.9 gfd flux 85% Recovery**																				
07/29/10	13:55	14585.09	7.56	6.57	7.71	4495	4643	4496	393.2	220.2	212.9	1428	14.04	22.58	**15.22**	3520.00	3651.00	3.7%	3523.00	265.50	145.40	140.30	1022.00	12.55	21.82	13.75	nd	0.037	0.381	24.6	23/45	55.37	33.75	48.49	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes														**16 gfd flux 85% Recovery**																				
07/30/10	12:20	14607.52	7.61	6.59	7.71	4489	4665	4501	365.7	204.4	197.6	1296	13.95	22.68	**14.55**	3520.00	3670.00	4.3%	3531.00	246.20	134.50	129.80	923.30	12.47	21.90	13.08	nd	0.028	0.394	24	25/45	59.53	35.83	52.10	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes														**BASELINE**																				
07/31/10	14:15	14633.42	7.57	6.58	7.62	4575	4778	4585	317.7	195.7	189.7	909.5	12.01	18.39	**14.22**	3596.00	3769.00	4.8%	3602.00	212.30	128.50	124.40	637.50	10.45	17.10	12.74	nd	0.028	nd	23.7	24/45	55.43	39.52	40.41	
08/01/10	14:14	14657.41	7.51	6.55	7.67	4570	4754	4592	317.2	195.6	190	909.5	11.37	18.38	**14.1**	3590.00	3749.00	4.4%	3608.00	211.80	128.50	124.60	637.20	9823.00	17.10	12.62	nd	0.031	nd	23	24/45	55.43	39.46	40.75	
08/02/10	11:54	14679.08	7.59	6.56	7.52	4595	4743	4584	316.6	195.4	189.5	907.8	12.02	18.42	**14.2**	3611.00	3738.00	3.5%	3600.00	211.40	128.30	124.30	635.90	10.46	17.12	12.72	nd	0.028	nd	22.4	24/45	55.41	39.58	38.78	
08/03/10	13:00	14704.18	7.62	6.54	7.69	4578	4706	4591	316.9	195.4	189.7	907.2	12	18.27	**14.16**	3597.00	3708.00	3.1%	3607.00	211.90	128.40	124.50	635.60	10.44	16.99	12.68	nd	0.028	nd	22	24/45	55.43	39.61	40.51	
08/04/10	12:14	14727.42	7.57	6.51	7.76	4570	4697	4592	312.6	195	189.3	899.9	11.96	17.86	**14.09**	3589.00	3698.00	3.0%	3606.00	208.60	128.10	124.20	630.50	10.40	16.52	12.61	ns	0.027	nd	21.7	24/45	55.40	39.67	39.78	
08/05/10	12:27	14751.64	7.50	6.50	7.72	4571	4713	4585	315.7	195.4	189.4	900.7	11.91	18.15	**13.97**	3590.00	3716.00	3.5%	3600.00	210.80	128.30	124.20	630.70	10.35	16.80	12.48	nd	0.027	nd	21.2	24/45	55.43	39.67	40.50	
08/07/10	14:18	14775.38	7.53	6.54	7.65	4551	4686	4546	318.1	195.1	188.7	902.3	11.8	18.25	**13.74**	3569.00	3690.00	3.4%	3567.00	212.60	128.20	123.70	631.60	10.25	16.86	12.26	nd	0.037	nd	20.7	24/45	55.11	39.64	38.14	
08/08/10	13:02	14798.11	7.49	6.56	7.61	4542	4691	4556	316.2	194.5	188.4	898.4	11.79	18.26	**14.05**	3565.00	3694.00	3.6%	3575.00	211.10	127.80	123.50	628.80	10.23	16.97	12.57	nd	0.037	nd	20	24/45	55.10	39.61	41.60	
08/09/10	10:50	14819.90	7.58	6.58	7.73	4551	4710	4566	314.8	193.5	187.8	895.1	11.81	18.17	**14.07**	3575.00	3711.00	3.8%	3585.00	210.30	127.10	123.20	626.70	10.26	16.88	12.60	nd	0.038	nd	19.7	24/45	55.11	39.67	41.68	
08/11/10	12:33	14869.06	7.59	6.60	7.67	4563	4697	4570	315.2	194.2	188.4	900.6	11.86	18.2	**14.07**	3582.00	3699.00	3.3%	3586.00	210.40	127.50	123.50	630.40	10.31	16.87	12.59	nd	0.038	nd	18.3	24/45	55.37	39.61	39.89	
08/12/10	13:03	14893.53	7.57	6.61	7.62	4539	4657	4567	314.1	193.7	187.4	899.3	11.85	18.2	**14.1**	3557.00	3665.00	3.0%	3583.00	209.60	127.20	122.80	629.60	10.29	16.87	12.63	nd	0.039	nd	18	24/45	55.40	39.64	42.86	
08/17/10	17:05	14894.82	7.48	6.58	7.62	4529	4649	4568	236.4	142.6	137.6	526.2	10.32	18.57	**14.31**	3544.00	3659.00	3.2%	3580.00	156.00	92.31	89.15	359.20	8808.00	17.31	12.82	nd	0.043	nd	17.9	24/45	55.08	41.60	39.05	
08/18/10	12:14	14913.98	7.48	6.59	7.67	4533	4661	4549	264	158.3	153.2	605.2	10.49	18.34	**14.26**	3549.00	3665.00	3.3%	3567.00	174.10	102.80	99.34	416.50	8976.00	17.02	12.78	nd	0.039	nd	17.7	24/45	55.05	41.31	39.28	
08/19/10	12:46	14938.52	7.47	6.57	7.65	4525	4672	4550	267	161.1	156.1	631.3	10.57	17.94	**14.23**	3553.00	3678.00	3.5%	3573.00	176.30	104.70	101.30	435.20	9064.00	16.63	12.76	nd	0.034	nd	17.2	24/45	55.13	41.31	37.07	
08/21/10	19:25	14969.95	7.53	6.68	7.65	4489	4606	4509	277.7	165.6	160.3	680.4	10.7	18.13	**14.04**	3511.00	3619.00	3.1%	3533.00	183.80	107.70	104.10	469.70	9186.00	16.85	12.56	nd	0.042	nd	16.4	24/45	55.05	40.45	31.86	
08/22/10	19:00	14993.54	7.40	6.66	7.67	4464	4581	4489	279.8	165.9	160.6	691.9	10.8	18.24	**14.09**	3480.00	3608.00	3.7%	3516.00	185.20	107.90	104.30	477.80	9274.00	16.95	12.61	nd	0.039	nd	16	24/45	55.37	40.31	39.56	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes														**14.9 gfd flux 75-75% Recovery**																				
08/24/10	17:16	15031.98	7.47	6.59	7.64	4471	4613	4505	240.6	155.4	150.9	503.7	9571	15.66	**12.58**	3505.00	3629.00	3.5%	3536.00	158.80	100.80	97.89	343.40	8097.00	14.20	11.02	nd	0.032	0.638	15.5	24/45	55.28	47.48	42.05	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes														**14.9 gfd flux 75-80% Recovery**																				
08/25/10	12:26	15051.15	7.77	6.56	7.63	4478	9531	5487	337.4	218.8	217.3	732.4	12.32	19.01	**19.04**	3511.00	8072.00	129.9%	4389.00	226.30	144.70	143.70	508.40	10.77	17.81	17.84	nd	0.028	0.6	15	24/45	55.55	46.67	31.60	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes														**14.9 gfd flux 75-85% Recovery**																				
08/26/10	12:16	15073.50	7.72	6.60	7.75	4484	15410	6556	489.2	308.5	307.1	1205	16.3	23.62	**23.74**	3514.00	13960.00	297.3%	5321.00	333.40	205.70	204.70	854.80	14.84	22.99	23.11	nd	0.036	nd	14.5	23/45	55.49	44.56	30.00	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes														**BASELINE 14.9 gfd flux 80-80% Recovery**																				
08/26/10	21:45	15082.99	7.60	6.62	7.68	4488	4685	4512	284.8	169.9	164.4	759.4	11.3	18.41	**14.12**	3522.00	3689.00	4.7%	3542.00	189.00	110.80	106.90	527.50	9769.00	17.09	12.65	nd	0.030	nd	14	24/45	55.60	39.35	31.82	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes														**14.9 gfd flux 80-80% Recovery**																				
08/28/10	12:12	15108.11	7.52	6.58	7.66	4525	4715	4546	292	173.5	168.3	778.3	11.36	18.46	**14.2**	3550.00	3714.00	4.6%	3569.00	194.00	113.20	109.60	540.60	9831.00	17.20	12.73	nd	0.030	nd	13.8	24/45	55.61	39.40	41.88	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes														**14.9 gfd flux 80-85% Recovery**																				
08/29/10	12:40	15132.58	7.73	6.66	7.70	4523	15160	5645	521.2	323.2	321.2	1542	17.76	25.65	25.66	3545.00	13690.00	286.2%	4607.00	355.70	216.00	214.60	1113.00	16.42	25.26	25.24	nd	0.037	0.711	13.2	23/45	55.60	39.40	30.48	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes														**14.9 gfd flux 75-90% Recovery**																				
08/30/10	12:03	15155.80	7.92	6.76	7.66	4536	26.670	9114	701.9	608.1	659	3500	31.84	33.6	**33.47**	3557.00	26450.00	643.6%	7666.00	484.50	418.60	454.50	2679.00	32.46	34.60	34.51	nd	0.037	nd	12.3	29/45	55.58	38.96	30.00	
Optimized Isobaric Energy Recovery Demonstration - Hydranautics ESPA 1 Membranes														**BASELINE 14.9 gfd flux 80-80% Recovery**																				
09/02/10	13:16	15159.30	7.49	6.68	7.67	4520	4725	4535	300	170.3	164.8	1202	13.04	18.05	**12.85**	3540.00	3717.00	5.0%	3556.00	199.60	110.90	107.10	852.60	11.47	16.73	11.28	nd	0.039	nd	12.2	24/45	55.14	37.68	45.20	
09/03/10	13:05	15183.12	7.53	6.53	7.64	4514	4795	4553	300	176.9	171.2	1404	13.67	17.65	**12.64**	3542.00	3784.00	6.8%	3575.00	199.70	115.60	111.60	1005.00	12.19	16.30	11.09	nd	0.030	nd	12	24/45	55.20	36.68	45.44	