

Colorado Springs Utilities It's how we're all connected

PROVIDING VALUE IN REAL-TIME FOR WATER TREATMENT

AND ACROSS THE ORGANIZATION



Colorado Springs Utilities – 4 Service Utility





217.273 Meters 4 Hydro Electric Plants **2 Gas Plants** 2 Coal Plants Contracted Solar Generating Capacity 1164MW's





137,619 Meters 6 Water Plants: Treatment Capacity 286 MGD's





2 Treatment Facilities 1 Solids Handling Facility 19 Lift Stations

The Challenge

New Water Treatment Infrastructure

- Antiquated Reporting System
- Sut we did have:
 - Physical Infrastructure in Place
 - Technical Infrastructure in Place

Now the business needs help...what do you do?

Providing Value in Real-Time

• What did it take?

Each Plant needed 20 reports for

- Conveyance
- Compliance
- Process
- Management Analytics

Based on their individual permits, treatment capacity, specific treatment processes and existing instrumentation

- Mobile Device Capability
- Adhoc Analytics & Excel Reporting Capabilities what other CSU groups are doing
- Energy Monitoring and Management for WW



Enterprise Information Infrastructure

The PI Collective

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PI Data Warehouse Primary PI Data Warehouse Secondary PI Asset Framework PI Asset Framework PI Notifications PI Abicus

PI WebServer PI Coresight PI Manual Logger PI Webparts Integrator PI To GIS Integrator

PI SDK & PI System Management Tools for Discovery, Failover, Failback and Load Distribution Services

Source PI Servers

H2O PI Server	Remotes Server	Drake PI Server	Drake EP PI Server	Nixon PI Server	Front Range PI Server

Data Flow from Water Treatment Plants – Mesa, UP & NG

RSLINX









RSVIEW

PLC's at each Plant

MESA	
[PAC]	
[PAC}	
UP	
NG	

RW API – RSLINX and PI OPC Interface

NG [Northgate Ga

H20 PI Server & 17 Interfaces



PiServers



PI Collective

PI Data Warehouse - Primary



MSH2OPI – Water PI Server



PI Data Warehouse - Secondary



PI Asset Framework & PI Notifications



PI Web Apps - PI Coresight

Water Treatment Real-Time Assets

- Mesa Data Streams = 1275
- McCullough Data Streams = 719
- Pine Valley Data Streams = 599
- Ute Pass Data Streams = 379
- Bailey Data Streams = 3664
- Fountain Valley PI Tags = 382
- RTU's/SCADA Data Streams =14078
 Total Water Treatment Data Streams = 20,714

Wastewater PI Assets

LVWTP PI Tags = 1866

JDP PI Tags = 2908

OSR- PI Tags = 854

Total Waste Water Treatment PI Tags = 5,628

SDS Reporting

• 5 Compliance Reports, 1 Water Conveyance Report and 14 Process & Performance Reports

State Compliance Reports:

- State MOR
- Disinfection Profile Benchmark Calculator
- 15 Minute Turbidity Report
- Filter Backwash Recycling Rule Recordkeeping Form
- Monthly Percent Backwash Report

• Water Conveyance Reports:

SDS Daily Flows

• Process & Performance Reports:

- Daily Treatment Report which includes :
- Plant Overview Summary
- Flow Summary
- Energy Summary
- Filter Performance
- Chemical Usage for 9 areas
- Filter Backwash
- Monthly Chemical Usage Report
- Monthly Treatment Report
- Lab Analysis Report
- Lab Analysis for 9 areas
- Lab/Online Comparison Report
- Lab analysis online vs manual reads with % variance
- Raw Water Report
- Daily, Weekly, Monthly and YTD production with Avg and Max values.
- Daily Filter Summary Report

d Darley WITH Main WITH M Page WITH	Water Treatment Plants
toliology WTP toa Valley WTP touttain Valley WTP	Compliance & Performance Reporting
late Standar 22 Receite Rec	Ed Bailoy Mesa Mecullough VVTP VVTP VVTP
	Fountain Valley Ute Pass Pine Valley WTP WTP WTP



Colorado Springs Utilities **TPS Reports**

Plant Reports

Ed Bailey WTP

Fountain Valley WTP

Mesa WTP

McCullough WTP

Pine Valley WTP

Ute Pass WTP

Management Reports

Monthly Plant Reports

Water Accounting Reports



	Coresight Reports
1. Daily Treat	ment
2. Filter Sum	nary
3 Dally Raw	Water

a. addit i sain i rana	
4. Daily Lab Analysis (PG1)	
5. Daily Lab Analysis (PG2)	
6. Monthly Chem Cost	
7. Online Lab Comparison	
8. SDS Partner Flows	

Excel Reports

Run Report	Report Histor
1.MOR	1. MOR
2. Benchmark Disinfection Report	
3. Monthly Lab Analysis	
4. Monthly Turbidity	
5. Monthly Chemical Usage	
6. Monthly Treatment Report	
7. TPS Report	
8. Daily Chemical Usage	



Moathly Operating Report (MOR) Summary Forr Submit Online at www.wqcdcompliance.com/login Guidance available at www.colorado.gov/cdphe/swtr

Telleu Bei	ckground - PWS In	put Talus	Blus Backgra		Ra	Backgrown	a -	
	P	ublic Yatı	er System Informati	an Sec	tion			
PWS ID:	C+#12115#	PWS Hame:	Colorado Springo Blililizo	HOR Tape	: c	!:!/#:!		
Panilily ID:	183	Paulily Haur:	Saalbers Beliarry System WTP	Heelk:	7 141	Year: 3		
Caalual Prraaa:		E=-il:		Phane:		5 IP. -!		

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"If at ANT time the turbidity river above 1 MU the PMS must contact the department within 2									
Facility ID:	10-2		Required Number of Samples P. Day:	<u>د</u>					
NumberofSa	mplar Required:	Number of Sampler Taken:	1#6	Number of Plant Offs:	•				
Number of Da	yz Sampling Required:	31	Number of Days Sampling Met:	31	M&R Complied:	Tes			
Number of Samples Exceeding 1NTU 🔹 🔹			Highert Sample:	•	Max TT Complied:	Ter			
NumborofSa	umber of Sampler Exceeding 0.3 N1 • × Sampler Exceeding: • 95×TT Complied:				Ter				
-1f -s A	Microbial HT time the log ray	Treatmen in falls b	nt - Lug Inactivation Sum alou 1 tha PWS must cont	act t	Soction he department uithis	. 4#			
Facility ID: 111 Required Number of Sampler Per			6						
NumberofSa	mplar Required:	186	Number of Sampler Taken:	1#6	Number of Plant Offs:	•			
Number of Da	ys Sampling Required:	31	Number of Days Sampling Met:	31	M&R Complied:	Ter			
Number of Sa	mpler Belou 1 Batio:	•	Louast Retie :	7.3	Min TT Complied:	Tes			
Longert Dura	tion Belou Minimum:	H/A (Ha Talass Bolau Minimam	.)					
"If at ANT	time the residual	falls bela	u 0.2 mg/L the PWS murt	cant.	act the department b	y than			
Facility ID:	111								
Number of Sa	implar Required:	1#6	Number of Sampler Taken:	1#6	M&R Complied:	Tes			
Did the residu	al dirinfectant ever dro	p belou 0.2 n	ng/L for more than four (4) hours	H	EPRD TT Complied:	Ter			
lf the and	uer to question 4.	5. 6. az	7 ir Tar than plane virit j		y Saction compliance.com/for				
Facility ID:	111								
1. War oach fil	Iter monitored continuo	urly?				Tes			
2. Woro moar	uramants racordadavas	y 15 minuter	*?			Ter			
3. Warthoro a	failure of the continuo	arly manitari	ing a guipmant?			H			
4. War individ	ual filter level greater t	han 1.0 NTU i	in tua (2) conrecutive mearurem	ontr?		H			
5. War individ	ual filter level greater t	han 0.5 NTU	in tue (2) consocutivo moasurom	entra	fter an-line far mare than				
rour (4) hours	. SAMPON PLANE TO	no paper serve that	ww- 10 mary			H_			
s. War individ	ual filtor lovel greater t	han 1.0 NTU i	n tuo (2) conrecutive mearurem	ontrin	three (3) consecutive	H			

splay. Bailey TOC's Asset. Plant Effluent+	▼							₽ A	d Hoc Displa
		Bailey Water Treatme	nt Plant Summary	1	4			2	
Name	Description		Time	Value	Units	Trend	Minimum	Maximum	Average
Lab (Plant) Filter Effluent TOC	Plant Lab - Filte	r Combined Effluent TOC - Manual Entry	7/3/2017 12:00:00 PM	0.017	mgil		0.017	0.017	0.017
Lab (Plant) Filter Influent TOC	Plant Lab - Filte	r Infleunt Total Organic Carbon - Manual Entry	4/29/2017 9:00:00 AM	1.6	mgil		1.6	1.6	1.6
Lab (Plant) Raw Water TOC	Plant Lab - Raw	Water Total Organic Carbon (mgll) - Manual Entry	4/29/2017 9.00.00 AM	2.01	mgil		2.01	2.01	2.01
Plant Effluent Organic Carbon (Total) (mg/L)	WQ Lab Bailey	Effuent TOC	2/7/2018 7.57.00 AM	1.03		1	0.86614	1.03	0.9627
Plant Influent/Organic Carbon (Total)	WQ Lab Bailey	Influent TOC	1/10/2018 9 15:00 AM	2 08	mgil		2.08	2.08	2.0
Plant Reservoir Influent(Organic Carbon (Total) (mg1) WQ Lab Bailey	Res Influent TOC	2/7/2018 7:50:00 AM	0.68		/	0.00	1.0074	0.9323
In Plant Lab - Bailey Raw Wate 25 1. 1/12/2016/8-47/27 PM 31d 2/12/2016/8-47/27 PM	er Raw Water TOC 2.01 mg/l	In Plant Lab - Filter Influer	Titer Influent TOC	In P 15 -0.25 -1, 1/12/20	1ant 188.47	Lab - 27 PM 31d	Filter Eff	Iuent Fit 0.0 7.27 PM	er Effluent TOC 17 mg1
WQ Lab - Plant Influent 35 225 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	kganic Carbon (Tot .08 mgl	WQ Lab - Plant Reservoir Influ 215 1.5 1.0 1.122018.8/7.27 PM 314 2122018.8/7	Organic Carbon (To	WQ 2 15 - 1.5 - 1 0 - 1	Lab	- Plant	Effluent	Org. 1.03	enic Carbon (To

Ed Bailey WTP

Bailey Previous Day Treatment Report 2/12/2018

Plant flow (RW)	5.002
Total Cost/MG (Chemicals & Energy)	183.631
Total Chemical Cost/MG	85.11
Avg Raw Turbidity	1.57
Avg Finished Turbidity	0.02
Total Plant Energy Cost	492.78

Juniper Pump Station	4.88014
Williams Creek Pump Station	4.84129
Bradley Pump Station	4.87964
Plant Influent Train A	5.00205
Plant Influent Train B	0
Northfield Zone	-1.45314
Highline Zone	6.10788
Total Backwash Flow	0.24903
Total Wash Water Recovery Flow	0.23525
Total EW Production Flow (Filt FID	5.10399

Energy vs Flow	
	KWH/MG
Juniper Pump Station	185.756
Williams Creek Pump Station	274.885
Bradley Pump Station	184.691
Treatment Plant	1375.53
Diesel	
Natural Gas	

	KWH	Cost
Juniper Pump Station	873.469	61.14
Williams Creek Pump Station	1282.88	89.8
Bradley Pump Station	871	60.97
PS Total Energy	3027.34	211.91
Treatment Plant	7039.77	492.78
SDS Total Energy	10057.1	704.69

Filter Performance					
	Total Ether	ALC: COMPANY	Ave Filter	Min Filter	May F

	Flow (MG)	AVG Filter Flow (MGD)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)
ilter 1	1.70961	1.71	0.02	0.024	0.026
ilter 2	0	0	0	0	0
ilter 3	1.71112	1.71	0.02	0.022	0.023
ilter 4	0	0	0	0	0
atox F	0.55111	0.55	0.01	0	0.019

			Config to the second	
Flash Mix Train A	Sulfuric Acid	0	0	0
	Coegulant Aid	0	0	0
	Phosphoric Acid			
	Sodium Hypochlorite	0	0	0
	Ferric Sulfate	1387.49	14	212.82
Flash Mix Train B	Sulfuric Acid	0	0	0
	Coegulant Aid	0	0	0
	Phosphoric Acid			
	Sodium Hypochlorite	0	0	0
	Ferric Sulfate	0	0	0
		-		
Floc Basin A	Flocculant Aid	3932.65	0.1	7.56
Floc Basin B	Flocculant Aid	0	0	0
Settled Water	Sodium Hydroxide	220.96	2.7	46.71
	Sodium Hypochlorite	0	0	0
Filter Influent	Sodium Hypochlorite	0	0	0
	Hydrogen Peroxide	0	0	0
	Phosphoric Acid	0	0	0
	Filter Aid	0	0	0
	Flocculant Aid	0	0	0
	Sodium Hydroxide	0	0	0
	Sodium BiSulfite	124.68	0.6	15.62
	100	446.62		20.22
	LOW	440.05		29.52
Ches CM-see	Sodium Humochlorite			0
Filter Effluent	Sodium Hypochlorite Sodium Hydroxide	0	0	0
Filter Effluent	Sodium Hypochlorite Sodium Hydroxide	0	0	0
Filter Effluent	Sodium Hypochlorite Sodium Hydroxide	0	0	0
Filter Effluent	Sodium Hypochlorite Sodium Hydroxide Sodium Hypochlorite	0 0 733.42	0	0 113.7
Filter Effluent	Sodium Hypochlorite Sodium Hydroxide Sodium Hypochlorite	0 0 733.42	0	0 0 113.7
Filter Effluent CCT Backwash	Sodium Hypochlorite Sodium Hydroxide Sodium Hypochlorite	0 0 733.42 0	0	0 0 113.71
Filter Effluent CCT Backwash	Sodium Hypochlorite Sodium Hypochlorite Sodium Hypochlorite Ferric Sulfate Filter Aid	0 0 733.42 0	0	0 0 113.71 0 0 0
Filter Effluent CCT Backwash	Sodium Hypochlorite Sodium Hydroxide Sodium Hypochlorite Ferric Sulfate Filter Aid Hydrogen Peroxide	0 0 733.42 0 0	0 0 1 0 0 0 0 0 0	0 0 113.71 0 0
Filter Effluent CCT Backwash	Sodium Hypochlorite Sodium Hypochlorite Sodium Hypochlorite Ferric Sulfate Filter Aid Hydrogen Peroxide Sodium Hypochlorite	0 0 733.42 0 0 0 0	0 0 1 0 0 0 0 0 0 0 0	0 0 113.71 0 0 0
Filter Effluent CCT Backwash	Sodium Hypochlorite Sodium Hypochlorite Sodium Hypochlorite Ferric Sulfate Filter Aid Hydrogen Peroxide Sodium Hypochlorite Sodium Hypochlorite Sodium Hypochlorite	0 0 733.42 0 0 0 0 0	0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 113.7 0 0 0 0 0
Filter Effluent CCT Backwash	Sodium Hypochlorite Sodium Hypochlorite Sodium Hypochlorite Ferric Sulfate Filter Aid Hydrogen Persode Sodium Hypochlorite Sodium Hypochlorite	0 0 733.42 0 0 0 0 0	0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 113.7 0 0 0 0 0
Filter Effluent CCT Backwash	Sodium Hypochlorite Sodium Hyploxide Sodium Hypochlorite Ferris Sulfate Filter Aid Hydrogen Peravide Sodium Hypochlorite Sodium Hydroxide	0 0 733.42 0 0 0 0 0	0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 113.71 0 0 0 0 0 0

Chemical Usage and Costs (Daily)

ar cost per MiG (chemicost/proditiow)		05.11	1
			Ł
v Month Avg Cost/Day		416.06	ł

Bailey Previous Day Filter

Bailey Daily Filter Summary Report

2/11/2018

Filter Statistics							
Filter		1	2	3	4	5	6
Total Filter Fl	ow	1.70961	0	1.71112	0	0.55111	1.13212
Total Hours C	Online	24	0	24	0	24	0
Total Hours C	Offline	0	24	0	24	0	24
Number of Ba	ackwashes	0	0	0	0	0	0
BackWash To	tal Flow	187014	186807	191954	187320	0	0
Avg Turbidity	(NTU)	0.02	0	0.02	0	0.01	0.03
Max Turbidity	y (NTU)	0.026	0	0.023	0	0.019	0.061
Min Turbidity	(NTU)	0.024	0	0.022	0	0	0
Avg Head Los	ss	7.4	0	8.9	0	16.1	0
Max Head Lo	ss	8.5	0	11.5	0	20.3	0
Min Head Los	55	6.1	0	6.6	0	12.8	0
Avg Valve Pos	sition	14.0404	0	10.3447	0	10.6667	10.7851
Avg Filter Rat	te	1.71	0	1.71	0	0.55	1.13
Avg Hours Ru	in						
Avg Minutes	Washed						
Avg Wash Vo	lume (kgal)						

Bailey Previous Day RAW Water Report for

2/12/2018

Weekly Source Water Flow (MG)				
	2/4/2018	2/11/2018		
Juniper Pump Station	33.67	33.74		
William Creek Pump Station	33.43	33.49		
Bradley Pump Station	33.75	33.79		
Plant Influent	35.024	35.018		

Daily Production (MG)			
2/5/2018	5.004		
2/6/2018	5.004		
2/7/2018	5.003		
2/8/2018	5.004		
2/9/2018	5.001		
2/10/2018	5		
2/11/2018	5.002		

Average Daily Production					
2/4/2017	through	2/11/2017	0		
2/4/2016	through	2/11/2016	0		

Total Water Production			
2/11/2015	through	2/11/2016	0
2/11/2016	through	2/11/2017	0
2/11/2017	through	2/11/2018	1790.77

Total Water Production To Date	

Maximum Water Production	Date	MG
Year to date Max Daily Production	1/7/2018 3:26:00 AN	15.01
Max Daily Production on Record	6/27/2017 3:27:00 AN	16.64

					Fi	iter BackWash	Details					
Date/Time at Start of BackWash	Filter	BackWash Mode	BackWash Reason	Total Hours Run at Start of BackWash	HeadLoss at Start of BackWash	Valve Pos. at Start of BackWash	Turbidity at Start of BackWash	Turbidity at End of BackWash	Total Minutes Washed	Total BackWash Flow	Total Rinse to Waste Flow	Filter To Waste Volume
2/9/2018 9:21:10.430008 AM	1	In BackWash	Time Online	0.67317	0.46136	0	0.0703	0.0277	43	187014	60192.5	0
1/29/2018 5:56:46.054001 AM	2	In BackWash	Time Online	527.494	0	0	0.03486	0.02968	66	186807	59653.3	0
2/7/2018 5:52:11.322006 AM	3	In BackWash	Time Online	359.412	0	0	0.04065	0.02718	80	191954	60079.2	0
2/1/2018 6:34:33.903 AM	4	In BackWash	Time Online	357.888	0.92281	0	0.04347	0.03202	71	187320	60528.2	0
2/1/2018 6:34:32.903 AM	5	Resting	Time Online	357.888	0	0	0.03454	0.03717	78	0	0	0
2/1/2018 6:34:32.903 AM	6	Filtering	Time Online	357.888	8.01512	10	0.0262	0.02613	82	0	0	0

Ad-Hoc Trending

- Web-based client
 - Users to analyze enterprise data
 - Empowering end-users
 - Increased ownership of the data and autonomy

PI Co

- Ability to access real-time data
 - Displays that meet business needs
 - Mobile accessibility
 - Device agnostic
 - Improves field decision
 - Reduces operational cost



Operational Intelligence for Wastewater Treatment Innovators





Ad Hoc Display 🖉

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JDP PLANT kW vs FLOW MAIN PAGE



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JDP UV FILTER BUILDING kW vs FLOW



MAIN PAGE

7d

Reservoir Water Quality Display



Utilization Real-Time Data

Maintaining operational efficiency

- Proactively identify treatment plant zone of influence and system disruptions
- Optimize system control by decreasing water age
- Reduce treatment plant effluent chlorination usage

Lead to Improved operational efficiencies

- Accessibility to data
- Heightened internal and external customers service
- Sustain operational needs

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Stature 1 Strt: 10 Coloring: (1) Trace Cond INF Cond INF Trace Coloring: (1) WFLAS: 00.17, 853: 01.25 V.20 V.70 MS MAX UNITS VIII (NIS) VIIII (NIS) VIIIII (NIS) VIIIIII (NIS)				- V	vQs	SG .	sar	npie	e Si	τε	HISTORI	car	re	rna	S					Er	nd lime	*	6/18	/2014 15:56
SAMULTS ITE ID Total UNITS			Chlorin	e (ELE			Db /C				TEMP	-		Cond		-		HDC		Tota	e intervai	1y	ator Ou	- ality Inday
WILAG BULL RES. UZZ UZG UZG UZG UZG UZG UZG UZG UZG UZG	SAMPLE SITE ID	AVG	IMIN	MAX		AVG	PIT (F	ΜΔΧ Π				AVG	MIN	MAX	UNITS	AVG	MIN	MAX	UNITS			AVG		
WILE 803 CUM U.Z. U.Z. <thu.z.< th=""> <thu.z.< th=""> U.Z.</thu.z.<></thu.z.<>	WPLAB BOIA RES	0.25	0.25	0.7	U mg/L	7.92	7.60	8.10 5	0 13	.2 7.	0 19.0 degree C	105.0	96.0	114.0	umhos/cm	0.5	0.0	3.4	CFU/mL	0 0	0 CFU/mL	4.1	3.4	4.6 Index
WFLAS 5620 Store Dist Dis Dist Dist	WPLAB BO3 COM	0.22	0.22	0.7	/ mg/L	7.79	7.20	8.20 S	U 13	.5 7.	20.0 degree C	109.8	98.0	161.0	umhos/cm	3.1	0.4	22.0	CFU/mL	0 0	0 CFU/mL	3.8	2.9	4.6 Index
WPLAB SBC CS OSS 0.05	WPLAB BO4D SS	0.16	0.16	0.7	9 mg/L	7.54	7.10	8.10 S	U 11	.0 5.0	0 17.0 degree C	115.5	96.0	286.0	umhos/cm	0.4	0.0	4.2	CFU/mL	0 (0 CFU/mL	4.0	2.9	4.8 Index
WFLAS BODA RES 0.03 0.03 0.03 0.01	WPLAB B05C SS	0.35	0.35	0.5	7 mg/L	7.15	7.10	7.94 S	U 14	.0 11.	0 16.0 degree C	129.6	96.0	156.0	umhos/cm	26.7	0.4	27.0	CFU/mL	125 (0 131 CFU/mL	3.6	3.5	4.7 Index
WPLAS B107 S0 0.36 0.36 0.36 0.36 0.36 0.07	WPLAB_B06A_RES	0.28	0.28	0.6	3 mg/L	7.55	7.50	7.80 S	U 15	.2 13.	0 17.0 degree C	105.5	96.0	142.0	umhos/cm	0.1	0.0	1.6	CFU/mL	0 (0 CFU/mL	4.1	3.9	4.6 Index
WPLAS B11:A F 0.21 0.21 0.72 0.76 7.20 8.40 1.20 0.21 </td <td>WPLAB_B09C_SS</td> <td>0.36</td> <td>0.36</td> <td>0.3</td> <td>6 mg/L</td> <td>7.75</td> <td>7.10</td> <td>8.20 S</td> <td>U 9</td> <td>.4 4.</td> <td>0 14.0 degree C</td> <td>101.8</td> <td>95.0</td> <td>136.0</td> <td>umhos/cm</td> <td>3.8</td> <td>0.0</td> <td>18.0</td> <td>CFU/mL</td> <td>0 (</td> <td>0 CFU/mL</td> <td>4.3</td> <td>3.4</td> <td>4.9 Index</td>	WPLAB_B09C_SS	0.36	0.36	0.3	6 mg/L	7.75	7.10	8.20 S	U 9	.4 4.	0 14.0 degree C	101.8	95.0	136.0	umhos/cm	3.8	0.0	18.0	CFU/mL	0 (0 CFU/mL	4.3	3.4	4.9 Index
WPLAS B128 SS. O. 28 O. 28 O. 28 O. 27	WPLAB_B11A_FF	0.21	0.21	0.7	2 mg/L	7.76	7.20	8.40 S	0 11	.3 4.	0 21.0 degree C	107.0	94.0	123.0	umhos/cm	0.2	0.0	2.8	CFU/mL	0 (0 CFU/mL	4.2	3.4	4.8 Index
WPLAB State State <th< td=""><td>WPLAB_B12B_SS</td><td>0.28</td><td>0.28</td><td>0.7</td><td>0 mg/L</td><td>7.54</td><td>7.10</td><td>8.30 S</td><td>U 9</td><td>.5 4.0</td><td>0 20.0 degree C</td><td>102.3</td><td>93.0</td><td>129.0</td><td>umhos/cm</td><td>0.2</td><td>0.0</td><td>1.9</td><td>CFU/mL</td><td>0 (</td><td>0 CFU/mL</td><td>3.9</td><td>3.1</td><td>4.8 Index</td></th<>	WPLAB_B12B_SS	0.28	0.28	0.7	0 mg/L	7.54	7.10	8.30 S	U 9	.5 4.0	0 20.0 degree C	102.3	93.0	129.0	umhos/cm	0.2	0.0	1.9	CFU/mL	0 (0 CFU/mL	3.9	3.1	4.8 Index
WrLab Bits Init Dist Dist <thdist< th=""> Dist Dist <th< td=""><td>WPLAB_B14B_SS</td><td>0.31</td><td>0.31</td><td>0.7</td><td>6 mg/L</td><td>7.76</td><td>7.30</td><td>8.10 S</td><td>0 10</td><td>.2 4.</td><td>0 16.0 degree C</td><td>106.9</td><td>95.0</td><td>131.0</td><td>umhos/cm</td><td>1.0</td><td>0.0</td><td>25.0</td><td>CFU/mL</td><td>0 (</td><td>0 CFU/mL</td><td>3.0</td><td>1.8</td><td>4.3 Index</td></th<></thdist<>	WPLAB_B14B_SS	0.31	0.31	0.7	6 mg/L	7.76	7.30	8.10 S	0 10	.2 4.	0 16.0 degree C	106.9	95.0	131.0	umhos/cm	1.0	0.0	25.0	CFU/mL	0 (0 CFU/mL	3.0	1.8	4.3 Index
WHAB BJU 25 U-27 U-27 <thu-27< th=""> U-27 U-27 <t< td=""><td>WPLAB_B15_INK</td><td>0.34</td><td>0.34</td><td>1.2</td><td>U mg/L</td><td>7.52</td><td>7.20</td><td>8.00 5</td><td>0 10</td><td>.9 8.</td><td>0 14.0 degree C</td><td>122.2</td><td>100.0</td><td>200.0</td><td>umnos/cm</td><td>1.3</td><td>0.0</td><td>9.6</td><td>CFU/mL</td><td>0 (</td><td>0 CFU/mL</td><td>3.2</td><td>2.2</td><td>4.5 Index</td></t<></thu-27<>	WPLAB_B15_INK	0.34	0.34	1.2	U mg/L	7.52	7.20	8.00 5	0 10	.9 8.	0 14.0 degree C	122.2	100.0	200.0	umnos/cm	1.3	0.0	9.6	CFU/mL	0 (0 CFU/mL	3.2	2.2	4.5 Index
WPLAB BESP CVM 0.23 0.24 0.23 0.24	WPLAB_B17D_SS	0.29	0.29	0.7	/ mg/L	1.11	7.20	8.30 5		.9 4.	J 14.0 degree C	103.1	93.0	152.0	umnos/cm	3.3	0.0	44.0	CFU/mL	0 0	0 CFU/mL	3.9	2.8	4.8 Index
WPLAB BSA COM O.22 O.23 O.24 O.24 <tho< td=""><td>WPLAB_BI8B_CUIVI</td><td>0.21</td><td>0.21</td><td>0.7</td><td>3 mg/L</td><td>7.08</td><td>7.20</td><td>8.20 5</td><td>0 14</td><td>.3 7.</td><td>J 22.0 degree C</td><td>104.7</td><td>92.0</td><td>100.0</td><td>umnos/cm</td><td>0.1</td><td>0.0</td><td>0.2</td><td>CFU/mL</td><td></td><td></td><td>4.2</td><td>3.5</td><td>4.8 Index</td></tho<>	WPLAB_BI8B_CUIVI	0.21	0.21	0.7	3 mg/L	7.08	7.20	8.20 5	0 14	.3 7.	J 22.0 degree C	104.7	92.0	100.0	umnos/cm	0.1	0.0	0.2	CFU/mL			4.2	3.5	4.8 Index
WPLAB B23A COM O 22 O 23 C 23 <thc 23<="" th=""> C 23 C 23 <thc< td=""><td>WPLAD_DIJA_INK</td><td>0.37</td><td>0.37</td><td>0.0</td><td></td><td>7.07</td><td>7.30</td><td>0.20 3</td><td></td><td>0 4.</td><td>20.0 Idegree C</td><td>101.1</td><td>94.0</td><td>110 0</td><td>lumbos/cm</td><td>0.2</td><td>0.0</td><td>12.0</td><td>CEU/mL</td><td></td><td></td><td>3.0</td><td>2.4</td><td>4.5 Index</td></thc<></thc>	WPLAD_DIJA_INK	0.37	0.37	0.0		7.07	7.30	0.20 3		0 4.	20.0 Idegree C	101.1	94.0	110 0	lumbos/cm	0.2	0.0	12.0	CEU/mL			3.0	2.4	4.5 Index
WPLAB B23A SC OTIN OTIN <tho< td=""><td>WPLAB B20A COM</td><td>0.25</td><td>0.25</td><td>0.7</td><td>5 mg/L</td><td>7.53</td><td>7.30</td><td>8.00 5</td><td></td><td>1 8</td><td>20.0 degree C</td><td>123.6</td><td>97.0</td><td>193.0</td><td>umbos/cm</td><td>30.6</td><td>0.1</td><td>120.0</td><td>CFU/mL</td><td></td><td></td><td>33</td><td>0.8</td><td>4.0 Index</td></tho<>	WPLAB B20A COM	0.25	0.25	0.7	5 mg/L	7.53	7.30	8.00 5		1 8	20.0 degree C	123.6	97.0	193.0	umbos/cm	30.6	0.1	120.0	CFU/mL			33	0.8	4.0 Index
WPLAB B23A COIL COIL <t< td=""><td>WPLAB B264 SS</td><td>0.18</td><td>0.18</td><td>0.7</td><td>5 mg/l</td><td>7.61</td><td>7.10</td><td>8.30 5</td><td></td><td>8 4</td><td>18.0 degree C</td><td>114.5</td><td>92.0</td><td>167.0</td><td>umhos/cm</td><td>1.4</td><td>0.0</td><td>6.2</td><td>CEU/mL</td><td>i i i</td><td>0 CEU/mL</td><td>3.7</td><td>2.8</td><td>4.8 Index</td></t<>	WPLAB B264 SS	0.18	0.18	0.7	5 mg/l	7.61	7.10	8.30 5		8 4	18.0 degree C	114.5	92.0	167.0	umhos/cm	1.4	0.0	6.2	CEU/mL	i i i	0 CEU/mL	3.7	2.8	4.8 Index
WPLAB B22 A C11 C12 C12 C12 C13 C14	WPLAB B27A SS	0.18	0.18	0.7	1 mg/L	7.78	7.30	8.20 S	0 11	.6 4.	0 19.0 degree C	108.1	97.0	135.0	umhos/cm	1.9	0.0	12.0	CFU/mL	ŏ č	0 0 CFU/mL	3.8	2.7	4.6 Index
WPLAB B23 COM 0.13 0.10 0.2 CPU/mt 3.3 2.3 4.1 1.06 0.0 0.2 CPU/mt 3.3 2.3 4.1 1.06 0.0	WPLAB B28A SS	0.15	0.15	0.7	2 mg/L	8.08	7.60	8.80 S	0 11	.9 5.0	0 20.0 degree C	105.2	93.0	143.2	umhos/cm	0.0	0.0	0.4	CFU/mL	0 0	0 O CFU/mL	3.6	2.3	4.6 Index
WPLAB B33A COM 0.14 0.14 0.14 0.03 0.22 CU/mL 0.35 2.8 4.21 desc WPLAB B33A S 0.30 0.32 m.27 0.10 0.30 0.52 m.21 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.57 0.30 0.52 m.50 0.50 0.50 0.57 0.50 0.50 0.57 0.50 0.50 0.57 0.50 0.50 0.57 0.50 0.50 0.50 0.57 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.57 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50 0.50	WPLAB B29 COM	0.13	0.13	0.8	7 mg/L	7.46	7.10	8.00 S	U 13	.0 6.0	0 20.0 degree C	136.5	97.0	227.1	umhos/cm	3.2	0.0	16.0	CFU/mL	0 (0 CFU/mL	3.3	2.5	4.1 Index
WPLAB B35A S5 0.30 0.30 0.32 mg/L 7.52 7.10 B.10 S0 GEV CFU/mL 0.0 0.0 CFU/mL 0.0 0.0 CFU/mL 3.3 3.1 4.4 Index WPLAB B35A S0 0.00 0.07 (mg/L 7.85 7.50 8.70 S0 S0 S0 0.00 CFU/mL 0.0 0.0 CFU/mL 0.0<	WPLAB B33A COM	0.14	0.14	0.8	0 mg/L	7.46	7.10	8.00 S	U 13	.2 7.	20.0 degree C	132.3	96.0	248.0	umhos/cm	0.1	0.0	3.2	CFU/mL	0 (0 CFU/mL	3.5	2.8	4.2 Index
WPLAB B3A S5 0.07 0	WPLAB_B35A_SS	0.30	0.30	0.9	2 mg/L	7.62	7.10	8.10 S	U 9	.4 4.0	0 16.0 degree C	125.0	92.0	168.0	umhos/cm	0.1	0.0	1.8	CFU/mL	0 (0 CFU/mL	3.9	3.1	4.4 Index
WPLAB B37_SS 0.10 0.10 0.07 mg/L 7.87 7.10 8.60 [SU 12.1 5.0 13.0 13.0 0.00 0.00 0.07 (P/L) 2.6 1.6 4.0 Index WPLAB B38_FF 0.08 0.08 0.04 mg/L 7.77 7.40 8.40 [SU 12.5 7.40 16.0 degree C 12.81 10.01 18.2.0 umbos/cm 0.0 <td>WPLAB_B36A_SS</td> <td>0.07</td> <td>0.07</td> <td>0.6</td> <td>2 mg/L</td> <td>8.25</td> <td>7.50</td> <td>8.70 S</td> <td>0 11</td> <td>.1 4.</td> <td>0 18.0 degree C</td> <td>113.9</td> <td>104.0</td> <td>149.3</td> <td>umhos/cm</td> <td>0.7</td> <td>0.0</td> <td>4.4</td> <td>CFU/mL</td> <td>0 (</td> <td>0 CFU/mL</td> <td>2.1</td> <td>0.7</td> <td>3.8 Index</td>	WPLAB_B36A_SS	0.07	0.07	0.6	2 mg/L	8.25	7.50	8.70 S	0 11	.1 4.	0 18.0 degree C	113.9	104.0	149.3	umhos/cm	0.7	0.0	4.4	CFU/mL	0 (0 CFU/mL	2.1	0.7	3.8 Index
WPLAB B38A_COM 0.06 0.06 0.07 mg/L 7.57 7.50 8.20 VI.26 7.00 1.00 degree C 124.5 100.0 182.0 Umbac/cm 0.0 0.05 C/FU/mL 3.2 4.3 Indegree C WPLAB B43-COM 0.13 0.13 0.05 mg/L 7.77 7.70 7.20 8.20 S0.00 0.05 0.6 C/FU/mL 3.4 2.7 4.3 Indegree C 128.5 98.0 165.3 umbac/cm 0.0 0.6 C/FU/mL 3.4 2.7 3.3 3.3 Indegree C 128.3 10.4 0.00 0.05 0.6 C/FU/mL 3.5 3.5 3.5 3.5 1.0 3.0 10.3 <	WPLAB_B37_SS	0.10	0.10	0.74	4 mg/L	7.87	7.10	8.60 S	U 12	.1 5.0	0 19.0 degree C	115.7	102.0	171.0	umhos/cm	0.2	0.0	0.6	CFU/mL	0 (0 CFU/mL	2.6	1.6	4.0 Index
WPLAB B39_FF 0.08 0.08 0.04 0.06 CFU/mL 0.0 0 0 0 CFU/mL 3.5 2.8 4.31 Indegree C 128.5 98.0 155.3 Umbas/cm 1.5 0.04 0.00 CFU/mL 0.0 0 0 CFU/mL 3.5 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 0.0	WPLAB_B38A_COM	0.06	0.06	0.7	0 mg/L	7.85	7.50	8.20 S	0 12	.6 7.	0 21.0 degree C	129.8	104.0	165.0	umhos/cm	0.6	0.0	9.8	CFU/mL	0 (0 CFU/mL	4.0	3.2	4.9 Index
WPLAB B43 COM 0.13 0.14 0.14 <th0< td=""><td>WPLAB_B39_FF</td><td>0.08</td><td>0.08</td><td>0.4</td><td>9 mg/L</td><td>7.97</td><td>7.40</td><td>8.40 S</td><td>U 9</td><td>.5 4.0</td><td>D 16.0 degree C</td><td>124.5</td><td>100.0</td><td>182.0</td><td>umhos/cm</td><td>0.0</td><td>0.0</td><td>0.6</td><td>CFU/mL</td><td>0 (</td><td>0 CFU/mL</td><td>3.5</td><td>2.8</td><td>4.3 Index</td></th0<>	WPLAB_B39_FF	0.08	0.08	0.4	9 mg/L	7.97	7.40	8.40 S	U 9	.5 4.0	D 16.0 degree C	124.5	100.0	182.0	umhos/cm	0.0	0.0	0.6	CFU/mL	0 (0 CFU/mL	3.5	2.8	4.3 Index
WPLAB B44 COM O.S5 O.S3 CU/UmL O.S3 D.S3 D.S3 D.S3 D.S3 D.S3 D.S3 D.S3 D.S3 <t< td=""><td>WPLAB_B40_COM</td><td>0.13</td><td>0.13</td><td>0.6</td><td>U mg/L</td><td>7.70</td><td>7.20</td><td>8.20 5</td><td>0 13</td><td>.6 7.</td><td>22.0 degree C</td><td>128.5</td><td>98.0</td><td>165.3</td><td>umnos/cm</td><td>1.9</td><td>0.0</td><td>40.0</td><td>CFU/mL</td><td>0.04 0</td><td>2 CFU/mL</td><td>3.4</td><td>2.7</td><td>4.1 Index</td></t<>	WPLAB_B40_COM	0.13	0.13	0.6	U mg/L	7.70	7.20	8.20 5	0 13	.6 7.	22.0 degree C	128.5	98.0	165.3	umnos/cm	1.9	0.0	40.0	CFU/mL	0.04 0	2 CFU/mL	3.4	2.7	4.1 Index
WPLAB_B49_RES 0.30 0.30 0.76 mg/L 7.40 8.10 30 107 4.30 148.00 logitere 112.2 93.0 146.00 lomins/cm 0.21 0.00 19.0 CFU/UML 0.00	WPLAB_B44_CON	0.08	0.08	0.2	5 mg/L	7.78	7.50	8.00 5		.0 18.	20.0 degree C	138.4	122.0	288.0	umnos/cm	0.5	0.0	0.8	CFU/mL			3.5	3.0	3.9 Index
WPLAB BS1 COM 0.11 0.03 0.03 0.13 0.12 0.03 0.03 0.13 0.03 0.03 0.14 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.02 0.03 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.04 0.03 0.02 0.04 0.03 0.02 0.04 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.03 0.02 0.02 0.03 0.02 0.03 0.02 0.02 0.02		0.50	0.30	0.7		7.60	7.40	0.10 3		5 5	18.0 degree C	122.5	104.0	140.0	umhos/cm	20	0.0	10.4	CEU/ml			4.1	3.5	2.0 Index
WPLAB BS3 DS5 O.12 O.31 O.31 <tho< td=""><td>WPLAB_B45_KES</td><td>0.03</td><td>0.03</td><td>0.0</td><td>3 mg/L</td><td>7.55</td><td>7.20</td><td>8.00 5</td><td></td><td>3 7</td><td>22.0 degree C</td><td>277.6</td><td>104.0</td><td>161.9</td><td>umhos/cm</td><td>2.5</td><td>0.0</td><td>98.0</td><td>CEU/mL</td><td></td><td></td><td>2.0</td><td>0.5</td><td>13 Index</td></tho<>	WPLAB_B45_KES	0.03	0.03	0.0	3 mg/L	7.55	7.20	8.00 5		3 7	22.0 degree C	277.6	104.0	161.9	umhos/cm	2.5	0.0	98.0	CEU/mL			2.0	0.5	13 Index
WPLAB BSSA_SS 0.14 0.14 0.16 0.17 0.18 7.30 8.20 SU 12.7 5.0 21.0 degree 14.3 0.00 30.0 CF//mL 0	WPLAB B53 PS	0.11	0.11	0.0		7.05	7 30	8 10 5	0 12	9 4	22.0 degree C	297.2	104.0	500.0	umhos/cm	17	0.2	16.0	CFU/mL	l õ õ	0 CEU/mL	40	3.2	4.3 Index
WPLAB_B55A_COM 0.11<	WPLAB B55A SS	0.14	0.14	0.6	7 mg/l	7.85	7.30	8.20 S	U 12	.7 5.	0 21.0 degree C	145.6	98.0	458.6	umhos/cm	4.3	0.0	30.0	CFU/ml	i o o	0 CFU/mL	3.4	2.3	4.5 Index
WPLAE_B57A_COM 0.23 0.23 0.23 0.23 0.23 0.23 0.23 0.23 0.23 0.23 0.23 0.23 0.23 0.23 0.23 0.23 0.23 0.00 0.00 0.010 <td>WPLAB B56A COM</td> <td>0.11</td> <td>0.11</td> <td>0.7</td> <td>7 mg/L</td> <td>7.90</td> <td>7.30</td> <td>8.20 S</td> <td>0 12</td> <td>.2 6.</td> <td>0 21.0 degree C</td> <td>104.6</td> <td>98.0</td> <td>111.0</td> <td>umhos/cm</td> <td>0.1</td> <td>0.0</td> <td>0.4</td> <td>CFU/mL</td> <td>0 0</td> <td>0 CFU/mL</td> <td>3.4</td> <td>2.0</td> <td>4.6 Index</td>	WPLAB B56A COM	0.11	0.11	0.7	7 mg/L	7.90	7.30	8.20 S	0 12	.2 6.	0 21.0 degree C	104.6	98.0	111.0	umhos/cm	0.1	0.0	0.4	CFU/mL	0 0	0 CFU/mL	3.4	2.0	4.6 Index
WPLAB_B608_SS 0.10 0.01 0.087/mg/L 7.53 7.10 8.90 [SU 12.3 4.0 23.0 degree C 174.7 102.0 451.8 umhos/cm 0.2 0.0 S2.0 CFU/mL 0 0 CFU/mL 3.3 1.9 4.1 Index WPLAB_B648_SS 0.20 0.20 0.76 mg/L 7.81 7.20 8.70 SU 10.4 10.9 30.1 121.0 umhos/cm 0.2 0.0 0.24 CFU/mL 0 0 CFU/mL 3.0 0.5 4.4 Index WPLAB_B684_SS 0.20 0.20 0.67 mg/L 7.81 7.20 8.70 SU 13.6 6.0 41.0 degree C 136.0 10.0 93.0 13.0 0.3 0.3 2.4 CFU/mL 0 0 CFU/mL 2.3 0.3 3.8 Index WPLAB_B69A_POE 0.36 0.36 1.00 mg/L 7.42 7.10 7.80 SU 10.8 7.0 13.0 10.0 4.1 Index 10.0 4.1 <td< td=""><td>WPLAB B57A COM</td><td>0.23</td><td>0.23</td><td>0.7</td><td>2 mg/L</td><td>7.68</td><td>7.20</td><td>8.30 S</td><td>U 13</td><td>.0 7.</td><td>0 19.0 degree C</td><td>106.9</td><td>96.0</td><td>178.3</td><td>umhos/cm</td><td>2.4</td><td>0.0</td><td>17.0</td><td>CFU/mL</td><td>0 0</td><td>0 CFU/mL</td><td>4.1</td><td>3.4</td><td>4.7 Index</td></td<>	WPLAB B57A COM	0.23	0.23	0.7	2 mg/L	7.68	7.20	8.30 S	U 13	.0 7.	0 19.0 degree C	106.9	96.0	178.3	umhos/cm	2.4	0.0	17.0	CFU/mL	0 0	0 CFU/mL	4.1	3.4	4.7 Index
WPLAB_B62_TNK 0.31 </td <td>WPLAB B60B SS</td> <td>0.10</td> <td>0.10</td> <td>0.8</td> <td>7 mg/L</td> <td>7.53</td> <td>7.10</td> <td>8.90 S</td> <td>U 12</td> <td>.3 4.0</td> <td>23.0 degree C</td> <td>174.7</td> <td>102.0</td> <td>461.8</td> <td>umhos/cm</td> <td>4.8</td> <td>0.0</td> <td>52.0</td> <td>CFU/mL</td> <td>0 (</td> <td>0 CFU/mL</td> <td>3.3</td> <td>1.9</td> <td>4.1 Index</td>	WPLAB B60B SS	0.10	0.10	0.8	7 mg/L	7.53	7.10	8.90 S	U 12	.3 4.0	23.0 degree C	174.7	102.0	461.8	umhos/cm	4.8	0.0	52.0	CFU/mL	0 (0 CFU/mL	3.3	1.9	4.1 Index
WPLAB_B64E_SS 0.20 0.20 0.76 mg/L 7.81 7.20 8.70 [SU 10.4 5.0 16.0 [degree C 101.9 93.0 121.0 [umhos/cm 0.3 0.0 2.4 [CFU/mL 0 0 0 [CFU/mL 3.0 0.5 4.4 [Index WPLAB_B68A_RES 0.04 0.04 0.02 mg/L 7.61 7.20 8.00 [SU 13.6 6.0 21.0 [degree C 136.0 106.0 491.0 [umhos/cm 0.8 0.0 3.2 [CFU/mL 0 0 0 [CFU/mL 4.2 3.5 4.4 [Index WPLAB_B63A_RES 0.20 0.20 0.72 [mg/L 7.82 7.0 8.10 [SU 13.6 0.01 135.0 [umhos/cm 0.1 0.0 2.4 [CFU/mL 0 0 0 [CFU/mL 4.2 3.5 4.7 [Index WPLAB_B70_COM 0.34 0.34 0.80 [mg/L 7.42 7.10 7.80 [SU 13.4 5.0 23.0 [degree C 104.1 93.0 11.1 0.0 2.0 [CFU/mL 0 0 0 [CFU/mL 3.0 1.6 4.4 [Index WPLAB_B72 CS 0.08 0.08 0.67	WPLAB_B62_TNK	0.31	0.31	0.8	4 mg/L	7.66	7.10	8.10 S	U 13	.0 5.0	0 22.0 degree C	443.1	290.0	503.0	umhos/cm	0.2	0.0	0.8	CFU/mL	0 (0 CFU/mL	3.6	3.0	4.1 Index
WPLAB_B6b_RES 0.04 0.04 0.02 mg/L 7.01 7.20 8.00 SU 13.6 6.0 21.0 degree C 136.0 106.0 491.0 lumnos/cm 0.8 0.0 3.2 CFU/mL 0 0 0 CFU/mL 2.3 0.3 3.8 Indes WPLAB_B68A_RES 0.20 0.20 0.72 mg/L 7.45 7.30 8.10 SU 12.7 7.0 19.0 degree C 104.3 95.0 136.0 lumnos/cm 0.3 0.0 5.4 CFU/mL 0 0 CFU/mL 4.2 3.5 4.7 Index WPLAB_B69A_POE 0.36 0.36 1.00 mg/L 7.42 7.10 7.80 SU 14.0 degree C 12.8 105.0 169.0 106.0 0.0 0.0 0.0 CFU/mL 0 0 CFU/mL 4.0 3.0 4.5 Index WPLAB_B7A_SS 0.08 0.67 mg/L 7.30 8.20 SU 13.4 9.0 20.0 degree C 107.17 102.0 141.0 unnos/cm 0.1 0.0 0.0 CFU/mL 3.5 4.4 16	WPLAB_B64B_SS	0.20	0.20	0.7	6 mg/L	7.81	7.20	8.70 S	U 10	.4 5.0	0 16.0 degree C	101.9	93.0	121.0	umhos/cm	0.3	0.0	2.4	CFU/mL	0 (0 CFU/mL	3.0	0.5	4.4 Index
WPLAB_B68A_RES 0.20 0.20 0.72 mg/L 7.85 7.30 8.10 12.1 7.00 19.0 degree C 104.3 95.0 136.0 umhos/cm 0.3 0.0 5.4 CFU/mL 0 0 0 CFU/mL 4.2 3.5 4.7 Index WPLAB_B69A_POE 0.36 1.00 mg/L 7.42 7.10 7.80 SU 13.4 0.00 5.0 15.0 umhos/cm 0.1 0.0 2.0 CFU/mL 0 0 CFU/mL 2.2 1.0 3.5 Index WPLAB_B70_C0M 0.34 0.34 0.30 mg/L 7.89 7.30 8.20 SU 13.4 5.0 23.0 degree C 14.0 14.0 umhos/cm 0.0 0.4 CFU/mL 0 0 CFU/mL 3.1 1.0 4.4 Index WPLAB_B73_RES 0.08 0.06 mg/L 7.42 7.40 8.10 13.4 5.0 23.0 degree C 111.7 10.0 14.0 umhos/cm 0.1 0.0 0.0 CFU/mL	WPLAB_B66_RES	0.04	0.04	0.6	2 mg/L	7.61	7.20	8.00 S	0 13	.6 6.	21.0 degree C	136.0	106.0	491.0	umhos/cm	0.8	0.0	3.2	CFU/mL	0 0	0 CFU/mL	2.3	0.3	3.8 Index
WPLAB B69A POE 0.36 0.36 1.00 mg/L 7.42 7.10 7.80 10 13.0 14.0 degree C 121.8 115.0 umhos/cm 0.1 0.0 0.0 C/C/U/mL 0 0 C/C/U/mL 2.2 1.0 3.5 Index WPLAB B70 COM 0.34 0.34 0.30 mg/L 7.89 7.30 8.20 SU 13.4 9.0 20.0 degree C 104.1 93.0 115.0 umhos/cm 0.0 0.0 CFU/mL 0 0 CFU/mL 4.0 3.0 4.4 Index WPLAB B71A SS 0.08 0.076 mg/L 8.33 7.30 9.00 SU 11.8 4.0 19.0 degree C 111.1 10.0 10.0 CFU/mL 0 0 CFU/mL 3.5 1.8 4.6 Index WPLAB B73 RES 0.24 0.27 mg/L 7.40 8.00 13.0 degree C 13.0 18.00 Index 10.0 CFU/mL 0	WPLAB_B68A_RES	0.20	0.20	0.7	2 mg/L	7.85	7.30	8.10 S	0 12	./ /.	0 19.0 degree C	104.3	95.0	136.0	umhos/cm	0.3	0.0	5.4	CFU/mL	0 (0 CFU/mL	4.2	3.5	4./ Index
WPLAB_B70_COM 0.34 0.34 0.30 mg/L 7.30 8.20 SU 13.4 9.0 20.0 degree C 104.1 93.0 115.0 µmhos/cm 0.0 0.0 0.4 CFU/mL 0 0 0 CFU/mL 4.0 3.0 4.5 [index WPLAB_B71A_SS 0.08 0.07 mg/L 7.72 7.40 8.10 SU 13.4 5.0 23.0 degree C 240.3 108.0 456.2 µmhos/cm 11.1 0.0 7.60 CFU/mL 0 0 0 CFU/mL 3.1 1.0 4.4 Index WPLAB_B72A_SS 0.08 0.76 mg/L 8.33 7.30 9.00 SU 11.8 4.0 20.0 degree C 111.7 10.0 14.10 µmhos/cm 0.1 0.0 0 0 CFU/mL 3.9 2.5 4.8 index WPLAB_B73_COM 0.15 0.15 0.91 mg/L 7.47 7.20 7.90 SU 15.3 7.0 21.0 degree C 13.9 13.0 11.0 18.0 11.0 0.0 0.4 10.5 5.8 CFU/mL 0 0 0 CFU/mL 3.5 2.4 4.6 Index	WPLAB_B69A_POE	0.36	0.36	1.0	0 mg/L	7.42	7.10	7.80 S	U 10	.8 7.	0 14.0 degree C	121.8	105.0	169.0	umhos/cm	0.1	0.0	2.0	CFU/mL	0 (0 CFU/mL	2.2	1.0	3.5 Index
WPLAB B71A SS 0.08 0.67 mg/L 7.72 7.40 8.10 SU 13.4 5.0 23.0 degree C 240.3 108.0 456.2 µmhos/cm 11.1 0.0 76.0 CFU/mL 0 0 0 CFU/mL 3.1 1.0 4.4 [index WPLAB B72A SS 0.08 0.67 mg/L 8.33 7.30 9.00 SU 11.8 4.0 20.0 degree C 107.3 98.0 150.0 µmhos/cm 0.4 0.0 0.4 CFU/mL 0 0 0 CFU/mL 3.3 2.5 4.8 index WPLAB B79 COM 0.15 0.51 0.51 0.91 mg/L 7.47 7.20 8.70 SU 11.3 4.0 13.0 degree C 100.4 181.0 µmhos/cm 0.1 0.0 0.4 CFU/mL 0 0 0 CFU/mL 3.5 2.4 4.6 index WPLAB B79 COM 0.15 0.51 mg/L 7.47 7.20 8.70 SU 13.3 0.0 133.0 µmhos/cm 0.4 0.0 5.8 CFU/mL 0 0 0 CFU/mL 3.5 2.4 4.6 index	WPLAB_B70_COM	0.34	0.34	0.8	0 mg/L	7.89	7.30	8.20 S	U 13	.4 9.	0 20.0 degree C	104.1	93.0	115.0	umhos/cm	0.0	0.0	0.4	CFU/mL	0 (0 0 CFU/mL	4.0	3.0	4.5 Index
WPLAB_B72A_SS 0.08 0.08 0.76 mg/L 8.33 7.30 9.00 SU 11.8 4.0 10.0 degree C 111.7 102.0 141.0 umnos/cm 0.4 0.0 0.0 CFU/mL 0 0 0 CFU/mL 3.5 1.8 4.6 lindesy WPLAB_B73_RES 0.24 0.24 0.67 mg/L 8.09 7.20 8.70 SU 11.8 4.0 19.0 degree C 107.3 98.0 150.0 umhos/cm 0.1 0.0 0.4 CFU/mL 1.0 0 0 0 CFU/mL 3.9 2.4 4.6 lindesy WPLAB_B80A_SS 0.29 0.29 0.88 mg/L 7.91 7.40 8.40 SU 7.9 4.0 13.0 degree C 100.8 93.0 133.0 umhos/cm 0.4 0.0 5.8 CFU/mL 0 0 0 CFU/mL 4.3 3.5 4.9 indesy WPLAB_B83A_PS 0.32 0.32 0.38 mg/L 7.40 8.30 SU 17.9 4.0 13.0 degree C 100.1 18.0 umhos/cm 0.4 0.0 5.8 CFU/mL 0 0 0 CFU/mL 3.5 4.9 indesy WPLAB_B85_RES 0.13 0	WPLAB_B71A_SS	0.08	0.08	0.6	/ mg/L	7.72	7.40	8.10 S	0 13	.4 5.	23.0 degree C	240.3	108.0	456.2	umhos/cm	11.1	0.0	76.0	CFU/mL	0 (0 CFU/mL	3.1	1.0	4.4 Index
WPLAB_B72_RES 0.24 0.24 0.27 mg/L 8.09 7.20 8.09 S0 11.3 4.0 19.0 degree C 107.3 98.0 150.0 umnos/cm 0.1 0.0 0.4 CFU/mL 0 0 0 CFU/mL 3.9 2.5 4.4 161 Index WPLAB_B79_COM 0.15 0.15 0.51 mg/L 7.47 7.20 7.90 SU 15.3 7.01 21.0 degree C 135.9 102.0 183.0 lumhos/cm 0.4 0.0 5.8 CFU/mL 0 0 0 CFU/mL 4.3 3.5 4.9 Index WPLAB_B80A_SS 0.29 0.29 0.28 mg/L 7.47 7.40 8.00 SU 7.90 SU 11.30 degree C 121.2 (CFU/mL 0.4 0.0 5.8 CFU/mL 0 0 0 CFU/mL 4.3 3.5 4.9 Index WPLAB_B83A_PS 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.3 0.1 0.0 0 0 CFU/mL 2.7 1.1 4.4 Index WPLAB_B85_CDX <	WPLAB_B72A_SS	0.08	0.08	0.7	6 mg/L	8.33	7.30	9.00 S	0 11	.8 4.	20.0 degree C	111./	102.0	141.0	umhos/cm	0.4	0.0	2.6	CFU/mL	0 (0 CFU/mL	3.5	1.8	4.6 Index
WPLAB_B79_COM 0.15 0.16 0.17 0.16 0.17 0.17 1.1 4.4 Indegree 100.1 100.1 10.0 1.0.0 1.0.0 1.0.0 1.0.0 1.0.0 1.0.0 1.0.0 1.0.0 1.0.0 1.0.0 1.0.0 1.0.0 0.0	WPLAB_B73_RES	0.24	0.24	0.6	/ mg/L	8.09	7.20	8.70 5		.8 4.	J 19.0 degree C	107.3	98.0	150.0	umnos/cm	0.1	0.0	0.4	CFU/mL	1 22	0 CFU/mL	3.9	2.5	4.8 Index
WPLAB_B83A_PS 0.23 0.32 0.02 CPU/mL 0 0 0 CPU/mL 2.9 1.7 4.4 Index WPLAB_B85_COM 0.08 0.08 0.07 mg/L 7.57 7.20 8.20 SU 12.1 10.10 430.6 umhos/cm 8.6 0.0 12.0 CPU/mL 0 0 CPU/mL 3.0 2.1 4.1 Index 4.0 <td>WPLAB_B/9_CON</td> <td>0.15</td> <td>0.15</td> <td>0.9</td> <td>I mg/L</td> <td>7.47</td> <td>7.20</td> <td>7.90 5</td> <td></td> <td>.3 7.</td> <td>121.0 degree C</td> <td>135.9</td> <td>104.0</td> <td>181.0</td> <td>umnos/cm</td> <td>2.3</td> <td>0.2</td> <td>11.0</td> <td>CFU/mL</td> <td>1.22</td> <td>J 74 CFU/mL</td> <td>3.0</td> <td>2.4</td> <td>4.6 Index</td>	WPLAB_B/9_CON	0.15	0.15	0.9	I mg/L	7.47	7.20	7.90 5		.3 7.	121.0 degree C	135.9	104.0	181.0	umnos/cm	2.3	0.2	11.0	CFU/mL	1.22	J 74 CFU/mL	3.0	2.4	4.6 Index
WPLAB BSS RCS O.13 O.70 mg/L 7.87 7.40 8.30 SU 12.8 6.00 20.00 gene C 105.0 9.00 100 100 100 0.00 <	WPLAB BOOK 33	0.23	0.25	0.0	8 mg/L	7.01	7.40	7 90 9		0 8	15.0 degree C	121.2	102.0	189.0	umbos/cm	0.4	0.0	2.0	CEU/mL	0 0		27	11	4.5 Index
WPLAB B93A SS 0.28 0.28 0.28 0.28 0.28 0.28 0.28 0.28 0.28 0.28 0.28 0.21 4.11 Index WPLAB B91A SS 0.16 0.16 0.70 mg/L 7.57 7.20 8.20 SU 13.5 6.0 22.0 degree C 143.1 101.0 430.6 jumhos/cm 8.6 0.0 26.0 CFU/mL 0 0 CFU/mL 3.0 2.1 4.1 index WPLAB B91A SS 0.16 0.16 0.70 mg/L 7.80 7.00 8.20 SU 10.4 4.0 19.0 degree C 143.1 143.0 430.6 12.0 CFU/mL 0 0 CFU/mL 3.6 2.1 4.1 index 143.1 101.0 430.6 12.0 Umhos/cm 0.8 0.0 12.0 CFU/mL 0 0 CFU/mL 3.6 2.6 4.5 Index 143	WPLAB B85 RES	0.32	0.32	0.7	0 mg/L	7.40	7.40	8.30 \$	Ŭ 12	8 6	20.0 degree C	105.0	93.0	208.0	umhos/cm	0.2	0.0	1.0	CFU/m	0 0	0 0 CEU/mL	2.7	17	4.4 Index
WPLAB B91A SS 0.16 0.16 0.70 mg/L 7.80 7.00 8.20 SU 10.4 4.0 19.0 degree C 104.5 98.0 129.0 jumnos/cm 0.8 0.0 12.0 CFU/mL 0 0 0 CFU/mL 2.3 0.9 4.7 Index WPLAB B92 COM 0.16 0.71 mg/L 7.66 7.30 8.10 SU 13.8 4.0 23.0 degree C 209.3 102.0 453.8 jumnos/cm 0.3 0.0 2.2 CFU/mL 0 0 0 CFU/mL 3.6 2.6 4.5 index WPLAB B93A SS 0.28 0.78 mg/L 7.87 7.30 8.40 SU 10.5 0.0 0.1 0.0 0.8 CFU/mL 0 0 0 CFU/mL 4.0 2.8 1.48 index WPLAB B93A SS 0.28 0.28 0.78 mg/L 7.87 7.30 8.40 SU 10.5 0.1 0.0 0.8 CFU/mL 0 0 0 CFU/mL 4.0 2.8 das	WPLAB_B86_COM	0.08	0.08	0.7	2 mg/l	7.57	7.20	8.20 5	U 13	.5 6	22.0 degree C	145.1	101.0	430.6	umhos/cm	8.6	0.0	26.0	CFU/mL	0 0	0 0 CFU/mL	3.0	2.1	4.1 Index
WPLAB B92 COM 0.16 0.16 0.71 mg/L 7.66 7.30 8.10 SU 13.8 4.0 23.0 degree C 20.9 102.0 459.8 umhos/cm 0.3 0.0 2.2 CFU/mL 0 0 0 CFU/mL 3.6 2.6 4.5 Index WPLAB B93A SS 0.28 0.28 0.78 mg/L 7.87 7.30 8.40 SU 10.5 5.6 11.0 0.1 0.0 0.8 CFU/mL 0 0 0 CFU/mL 4.0 2.8 4.8 Index WPLAB B93A SS 0.28 0.28 0.78 mg/L 7.87 7.30 8.40 SU 10.5 5.6 11.0 0.1 0.0 0.8 CFU/mL 0 0 CFU/mL 4.0 2.8 4.8 Index WPLAB B94_SS 0.28 0.28 0.88 Index 0.1 0.0 0.4	WPLAB B91A SS	0.16	0.16	0.7	0 mg/l	7.80	7.00	8.20 5	U 10	4 4	0 19.0 degree C	104.5	98.0	129.0	umhos/cm	0.8	0.0	12.0	CFU/ml	0 0	0 0 CFU/ml	2.9	0.9	4.7 Index
WPLAB B93A SS 0.28 0.28 0.78 mg/L 7.87 7.30 8.40 SU 10 5 5 0 17 0 2 2 3 2 10 2 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	WPLAB B92 COM	0.16	0.16	0.7	1 mg/L	7.66	7.30	8.10 S	0 13	.8 4.	23.0 degree C	209.3	102.0	459.8	umhos/cm	0.3	0.0	2.2	CFU/mL	ŏ č	0 0 CFU/mL	3.6	2.6	4.5 Index
WPLAB_B94_SS 0.28 0.28 0.88 hours 7.95 7.30 8.70 SU 2.5 4.8 index	WPLAB B93A SS	0.28	0.28	0.7	8 mg/L	7.87	7.30	8.40 S	U 10	5 5.	0 17.0 degree C	102.9	96.0	110.0	umhos/cm	0.1	0.0	0.8	CFU/mL	0 0	0 0 CFU/mL	4.0	2.8	4.8 Index
	WPLAB B94 SS	0.28	0.28	0.8	8 hours	7.95	7.30	8.70 S	U	.9	1 LO degrae C	98.7	11.0	125.0	mhps/im	0.1	0.0	0.4	CFU/100	r o c	0 CFU/100	4.1	2.5	4.8 Index
WPLAB_BCR_FF 0.04 0.04 0.62 mg/L 7.57 7.10 8.30 SU 11 SI La table of 14.51 Jack 194.0 Link by Cin 0.1 0.0 0.4 CFU/mL 0 0 0 0 CFU/mL 2.5 0.2 4.2 Index	WPLAB_BCR_FF	0.04	0.04	0.6	2 mg/L	7.57	7.10	8.30 S	0 11	.5	J 2	129.5	1103.0	194.0	umhbs/cm	0.1	0.0	0.4	CFU/mL	0 (0 CFU/mL	2.5	0.2	4.2 Index

Providing Real-Time Value for Water Quality







Treatment Source Trace Dynamic Mapping

- Centralized data source
 Leverage Data Sources
 Visualization Data
 System awareness
 - •Event Analysis
 - Understand
 - Predict
 - Mitigate
 - •Operational Efficiency
- Creates Training opportunities



Providing Real-time Value for Water Treatment and Water Distribution



Providing Value to Raw Water Monitoring & FERC for Rampart Dam

Ra

npart Reservoir Dam Surveillance	Area 1-1 OW Series	Area 2-1 P Series	A	rea 1-1 N	1ain D	am O	riginal	Well F	Piezom	neters	- Man	ual Re	ads	
	Rampart Pool Level; 8982 ft	Rampart Pool Level; 8982 ft	ampart Dam Janual Cur Vat 01-0.ct-14 (1 Jampart Dam Jactronis Read Cur	8500 362.39	c)W-1	C)W-4	0	W-6	0	W-7	Rampar	t Pool Level
IN Real There	Well Well Level Acuoli Level	Well Well Level Action Level	Val: 02-0ct-14 33	5030 161.94	8	951.4	8	906.4	88	324.4	88	24.4		
	OW 1 8915 ft 8951 ft	P-1 8959 ft 8951 ft	MPTS .501LI ResLvI .AV	Threshold Level	8	946.4	8	878.4	88	313.4	88	13.4		
	OW (8864 # 8906 #	P-14 8940 ft 8951 ft	r and second second	Top of the Casing	90	17.42	8	913.4	886	62.33	88	51.64		
	OW-5 8775 th 8824 th	P-15 8982 Manual 0 ft		Elevation:		Wate	-	Water		Water		Water Elemention		A STATE Reviewed
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	OW.7 8799 ft 8824 ft	P 16 8901 Marual 0 ft	start Time: 01-Jun-13		PIEZOLOV	V-1 Peter	T.PEZO.O	W-4 at Peizo	PIEZO.OW	/6 at Peico	PIEZO.OW	7 at Peizo	RESERVO	IR Elevation
	Area 1.2 OW Series	P-26 8806 Manual 0 ft	conditioner stranger		05/15/2013	102.53 891	193 07/15/2013	46.45 8866.9	6 07/15/2013	87.45 8774.8	46 07/15/2013	62.22 8799.4	06/02/2013	173.75 8996.88
	Alea 1-2 UN Jelles	1-0000 in			08/15/2013 09/15/2013	101.65 891 103.46 891	577 08/15/2013 196 09/15/2013	47.95 8865.4 40.00 8865.3	5 08/15/2013 7 09/15/2013	87.43 8774.5 87.43 8774.5	0 08/15/2013 0 09/15/2013	62.20 8799.4 62.08 8799.5	H 06/08/2013 6 06/04/2013	173.66 8996.83 173.60 8996.77
	Well Well Level Action Level	Area 2-2 P Series			10/15/2013 11/15/2013	105.65 891 106.02 891	40 11/15/2013	48.69 8864.7	1 10/15/2013	\$7.43 \$774.5 \$7.45 \$774.5	0 20/15/2013	62.51 \$799.1 62.65 \$798.1	3 06/06/2013	173.67 8996.84 173.00 8996.97
	OW-8 8847 # 8911 #	Well Well Level Action Level			12/15/2013	105.83 891	59 12/15/2013	49.02 0064.1	6 12/15/2013	67,47 6774.0	6 12/15/2013	62.65 8796.1	06/07/2013	173.90 8997.10
A starting of the starting of	OW.9 8899 ft 8911 ft	P-13 8947ft 0ft			05/15/2014	105.58 891	1.44 05/15/2014	40.76 8864.0	4 05/15/2014	87.45 8774.2	65 05/15/2014 16 05/15/2014	62.55 8799.5	3 06/09/2013	173.95 8997.12 173.93 8997.10
	OW-10 8819 H 8886 H	P.2 8960 ft 0 ft				#VALU	ei Ei	#VALUE		#VALUE #VALUE		#VALUE #VALUE	06/10/2013 06/11/2013	173.89 8997.06 173.78 8996.95
	OW.15 8774 ft 8793 ft	P.25 8881 # 0.#				eVAL	ei -	WALLE		IVALUE		#VALUE	05/12/2013	173.57 8996.74
	OW-16 8921 ft 8925 ft	D 26 8997 Manual 0.4											06/14/2013	173.49 8996.66
	OW-17 8872 N 8925 N	D 28 Malastras Mar. At Dur.											06/15/2013 06/16/2013	173.41 8996.56 173.40 8996.57
	(W.19 8903 ft 8912 ft	P-20 NO IISU, 10 New. V IL USIS											06/17/2013	173.35 8996.52 173.41 8996.53
		F-0 0000 V N					Ramna	rt Reservoir	Level					
	Area 1-3 OW Series	Area 2.3 P Series	9010				Kumpu	it neser ton	Level					ч
	Well Well Level Action Level		9000											
		Well Well Level Action Level	巻 8980											
	UW-20 8868 ft 8912 ft	P-17 8973Manual 0.0	8960 8950											Port
	OW-21 8853 ft 8852 ft	P_4 8959 ft 8970 ft	₩ 8940 8930											
	OW-22 8922 ft 8925 ft		8920		.3 .3		.3 .3	.3 .3	3 1	4. 4.	4. 4.	· · · · · · · · · · · · · · · · · · ·	4. 4.	
in the second second second	OW-23 8889 ft 8925 ft	Area 2-4 P Series	6101/201-116/201-1101/20	116/201-131/201-015/201-	130/201-014/201	2129/201-01A/201-	1291201-1131201-1	18/201-213/201-2/28	201-12/201-12/12	201-11/201-2/26/29	213/201-2/28/20	N12/201-N27/201	112/201-12/1201	
at part of the second second	OW 24 8899 ft 8912 ft		00, 00, 01,	o, o, o _o , o	v. 6v. 6	p. 4. 4	· · · ·	Sh Sh	02. 02	04 04	03, 03,	2m, 0m, 0	p. 65.	
	OW-25 8877 ft 8912 ft	Well Well Level Action Level												
	OW-26 8773 ft 8/93 ft	P 5 8964 ft 8970 ft			RAM	PART RESE	RVOIR SEE	P WEIR DAT	A GRAPH	- MANUAL	READS			
	Area 1.4 OW Series	Area 2 5 D Carico	0.80											
	Alea 14 OW Selles	Hied 2-01 Selles	0.70											
	Well Well Level Action Level	Well Well Level Action Level	0.50											
The second s	OW-30 8835 ft 8904 ft	P.6 8970 ft 8970 ft			. /								6	
	CWU:31 8872 ft 8903 ft	P.7 0957 ft 0970 ft	£ 0.50	~		W_								SW-1
	OW.32 8819 m 8869 m		E 0.40	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		- tr		~~						SW-2
	OW.33 8809 ft 8845 ft	Area 2-6 P Series	۳ _{0.30}	Ml~~~		~~~	h_m		لمستعهد	~~~~	~17			—— 5W-3
	OW-34 8792 ft 8800 ft					<u>~</u>	<u> </u>		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	A		<u> </u>	~~~~	5W-4
	OW-35 8795 N 8804 N	Well Well Level Action Level	0.20						~~~				~~~~	
		P.8 8954 ft 8970 ft	0.10	-~h/\		~								
	-		0.00											
	Area 3 CP Series		101/2012	16/2013 131/2013 15/2013	2012013 1412013	29/2013 14/2013	29/2012 13/2012	8/2013 13/2013 -8/	013 12/2014 27/20	014 11/2014 26/20	14 13/2014	12/2014 27/2014	13/2014 28/2014	
	Well Well Level Action Level	Seep Weirs	0610 0612 0710	511. 021,5 081 8. 08	1, 03/2, Q	PI. 101, 10	1" 121" 121	212 22/1	on, one	021, 0211	031 031 0	n' only of	1, 02/1,	

Operational Intelligence for Wastewater Lift Stations Situational Awareness meets Operations

	🚜 Wastewater	Lift Sta	tions					
Lift Station			Lead Pump	Pump Start		Wet well Level		
port Business Park L.S	. 0 GPM	07	0	1 STOP 2 STOP	-000	4.95536 ft	Start Stop	6 ft 4 ft
Valley L.S.	0 GPM	0	1	1 STOP	IUIT	2.57975 ft	Start	2.8 ft
n Ridge L.S	0 GPM	<u>_</u>	1	1 STOP		3.66911 ft	Start Stop	4ft 28ft
Squirrel L.S	0 GPM	0	2	1STOP		4.78442 ft	Start Stop	5.5 ft 3.5 ft
Hills L.S.	0 GPM	of	1	1STOP		3.73207 ft	Start	4.5 ft
ne L.S.	0 GPM	Ø	1	1 STOP		2.7735 ft	Start	4.5 ft
to L.S	0 GPM	<u>_</u>	2	1STOP		3.58364 ft	Start	4.1 ft
an L.S	0 GPM	0	1	1 STOP		3.33333 ft	Start	3.5 ft
anitell L.S.	0 GPM	0	1	1STOP		2.69231 ft	Start	3 ft
L Ranch L.S.	0 GPM	0	1	1 STOP		2.98474 ft	Start	3 ft 2 ft
ettle Creek L.S.	1180.39 GPM	7	Lead 2 Lag 3	1 STOP 2 RUN 3 STOP 4 STOP		5.31364 ft	Start Stop	5.2 ft 4.2 ft
liddle Tributary L.S.	0 GPM	6	2	1 STOP 2 STOP	Шľ.	4.78251 ft	Start Stop	5.5 ft 3 ft
liddle Monument L.S.	0 GPM	of	2	1 STOP 2 STOP		5.08013 ft	Start	5.5 ft
ando Lift Station L.S.	273.29 GPM		2	1 STOP 2 RUN		4.00053 ft	Start Stop	4.5 ft
eregrine L.S.	245.301 GPM		2	1STOP 2 RUN		4.24603 ft	Start	4.5 ft
P1 P2 and Creek L.S. P3 P4	0.020 83 0.008 8352.58 GPM 0.136 0.230	7	Lead 3 Lag 4	1 STOP 2 STOP 3 RUN 4 RUN	`Tr'	A 13.9658 ft B 14.0585 ft	Start Stop Start Stop	14 ft 8.2 ft 15 ft 13 ft
mith Creek L.S.	0 GPM	07	2	2STOP 1STOP		3.52885 ft	Start Stop	3.6 ft 2.2 ft
tratton Meadows L.S.	534.824 GPM	7	2	1STOP 2 RUN	ii hi	3.98016 ft	Start Stop	5.75 3.25
	0 GPM	100		1 STOP	HILITER	9 98924 ft	Start	10 ft

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 Image: State of the s

Providing Value to Waste Water Lift Stations

1							-		
Chapel Hills L.S.	0 GPM	Ø	1	1 STOP 2 STOP		3.88164 ft	Start Stop	4.5 ft 2.6 ft	
Cheyenne L.S.	0 GPM	Ø	2	1 STOP 2 STOP		3.29674 ft	Start Stop	4.5 ft 2.5 ft	
Coronado L.S	0 GPM	Q	1	1 STOP 2 STOP		3.91331 ft	Start Stop	4.1 ft 2.2 ft	21
Drennan L.S	0 GPM	6	1	1 STOP 2 STOP		2.50343 ft	Start Stop	3.5 ft 2.5 ft	11
Janitell L.S.	0 GPM	Ø	1	1 STOP 2 STOP		2.7579 ft	Start Stop	3 ft 2 ft	25 110
JL Ranch L.S.	0 GPM	Ø	1	1 STOP 2 STOP		2.08059 ft	Start Stop	3 ft 2 ft	5
Kettle Creek L.S.	0 GPM	Ø	Lead 4 Lag 2	1 STOP 2 STOP 3 STOP 4 STOP		4.5467 ft	Start Stop	5.2 ft 4.2 ft	
Middle Tributary L.S.	0 GPM	6	2	1 STOP 2 STOP	anim.	4.27007 ft	Start Stop	5.5 ft 3 ft	
Middle Monument L.S.	0 GPM	Ø	1	1 STOP 2 STOP		5.14461 ft	Start Stop	5.5 ft 3.5 ft	V
Pando Lift Station L.S.	0 GPM	Ø	1	1 STOP 2 STOP		2.37473 ft	Start Stop	4.5 ft 2.5 ft	1076 2013
Peregrine L.S.	0 GPM	Q	2	1 STOP 2 STOP		3.92666 ft	Start Stop	4.5 ft 3 ft	1
P1 0.362 P2 0.007 P3 0.005 P4 0.076	8487.05 GPM	<u>Ø</u> "	Lead 4 Lag 1	1 RUN 2 STOP 3 STOP 4 RUN		A 14.2344 ft B 14.3091 ft	Start Stop Start Stop	14 ft 12.5 ft 15 ft 13 ft	
Smith Creek L.S.	0 GPM	Ø	1	2 STOP 1 STOP		2.17491 ft	Start Stop	3.6 ft 2.2 ft	33
Stratton Meadows L.S.	587.225 GPM	Ø	2	1 STOP 2 RUN	<u>ulut</u>	4.12048 ft	Start Stop	5.75 ft 3.25 ft	Ser
Talon Hill L.S.	0 GPM		1	1 STOP 2 STOP		3.61157 ft	Start Stop	10 ft 6 ft	

1290+	9 a	-		G	inarato Los Rex Anm ha	i pervente	é a new Low Flow metho	zionenett Nezage (HTML)
Netap Repair Repairs R	E Notesteal San Assert	er Ug ser Ug ten Ensi Ug ten Lörete Ug	i≩ To titerupo √ Done ∳ Coste New 013001	 Not Batter-	Raige Mark Collegetor Palige Lonato	P Tolos UP	al Hind Jacobs Jacobs Jacobs Jacobs Jacobs	Q Jon Jan
fon nok In kom Dr	swarg ette Örz nde Cav Rev Alem han generated a m	en Los Fion notificati	n ogt.					
					2		2.2.13	

Location Constado Lift Station Address 1590 W. Filmore St. FID 15 GOG31 How Tagname CORO2 MOFI Flow AV rtettie State Flow's less than 34% of total flow Man Flow: 150 Lead Pump: 2 Pemp 1 Status: STOP Penn 2 States: RUN Flow At time of Alarm: 13 7596972320557 board for Lift Stations ers/2631.it-Station-Deshboard-With-Tren

Perearine

Big Valley

LOW FLOW AT ARM WILL ACTIVE WHEN FLOW IS LESS THAN SLOPA



Providing Value to Wastewater Treatment

Bradley Pump Station SKF Vibration

	Description	Value	Units
	PMP-1100-Vib - Bradley PS Pump 1 Vibration Motor Top X-Axis Vibration	0.0013428	in/s²
	PMP-1100-Vib - Bradley PS Pump 1 Vibration Motor Top Y-Axis Vibration	0.0018006	in/s²
J	PMP-1100-Vib - Bradley PS Pump 1 Vibration Motor Top Z-Axis Vibration	0.0018006	in/s²
	PMP-1100-Vib - Bradley PS Pump 1 Vibration Motor Bottom X-Axis Vibration	0.0013428	in/s²
	PMP-1100-Vib - Bradley PS Pump 1 Vibration Motor Bottom Y-Axis Vibration	0.0018006	in/s²
	PMP-1100-Vib - Bradley PS Pump 1 Vibration Tachometer	0	RPM
	PMP-1100 - Bradley PS Pump 1 Running	Not Running	
	Description v	/alue	Units
	Description V PMP-1300-Vib - Bradley PS Pump 3 Vibration Tachometer	/alue O	Units RPM
	Description V PMP-1300-Vib - Bradley PS Pump 3 Vibration Tachometer PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Top Z-Axis Vibration	/alue 0 0.0022279	Units RPM in/s ²
)	Description ▼ Y PMP-1300-Vib - Bradley PS Pump 3 Vibration Tachometer PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Top Z-Axis Vibration PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Top Y-Axis Vibration PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Top Y-Axis Vibration	/alue 0 0.0022279 0.0018008	Units RPM in/s ² in/s ²
	Description ▼ ▼ PMP-1300-Vib - Bradley PS Pump 3 Vibration Tachometer P PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Top Z-Axis Vibration P PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Top Y-Axis Vibration P PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Top X-Axis Vibration P	/alue 0 0.0022279 0.0018006 0.0022584	Units RPM in/s ² in/s ²
	Description ▼ ▼ PMP-1300-Vib - Bradley PS Pump 3 Vibration Tachometer ■ PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Top Z-Axis Vibration ■ PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Top Y-Axis Vibration ■ PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Top X-Axis Vibration ■ PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Top X-Axis Vibration ■ PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Top X-Axis Vibration ■	/alue 0 0.0022279 0.0018005 0.0022584 0.0013428	Units RPM in/s ² in/s ² in/s ²
	Description ▼ ▼ PMP-1300-Vib - Bradley PS Pump 3 Vibration Tachometer P PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Top Z-Axis Vibration P PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Top Y-Axis Vibration P PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Top X-Axis Vibration P PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Top X-Axis Vibration P PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Bottom Y-Axis Vibration P PMP-1300-Vib - Bradley PS Pump 3 Vibration Motor Bottom X-Axis Vibration P	Value 0 0.0022279 0.0018008 0.0022584 0.0013428 0.0013428	Units RPM in/s ² in/s ² in/s ² in/s ²

Williams Creek Juniper Pump

Description	Value	Units	
PMP-1400-Vib - Bradley PS Pump 4 Vibration Motor Top X-Axis Vibration	0.00088504	in/s²	
PMP-1400-Vib - Bradley PS Pump 4 Vibration Motor Top Y-Axis Vibration	0.00088504	in/s²	
PMP-1400-Vib - Bradley PS Pump 4 Vibration Motor Top Z-Axis Vibration	0.00088504	in/s²	\cup
PMP-1400-Vib - Bradley PS Pump 4 Vibration Motor Bottom X-Axis Vibration	0.00088504	in/s²	
PMP-1400-Vib - Bradley PS Pump 4 Vibration Motor Bottom Y-Axis Vibration	0.00088504	in/s²	
PMP-1400-Vib - Bradley PS Pump 4 Vibration Tachometer	0	RPM	
PMP-1400 - Bradley PS Pump 4 Running	Not Running		



PI To Monitor PI





PI Manual Logger & SKF Microlog Inspector





Wireless Enabled Windows Tablet PC

Operator Driven Reliability

Improve Maintenance Management and Reliability Great for Inspection Programs

Compare Manual Data with Real-Time DCS/SCADA Data (online data)

Use manually collected data with automatically collected PI System data for comprehensive analysis and a complete operational picture.

Consistency in Data Collection

Task Instructions

Route can include task instructions for data collection. Can attach PDF's, JPEG's and Hyperlinks

Barcodes & RFID

Use Barcodes and RFID to guide the user through Data Collection points and prompts for appropriate data.

Data Validation During Data Entry

Performs automatic data validation and supports limit checks including High, HiHi, LoLo and Delta.

Conditional Data Entry

Conditional expressions can be used to specify if an item is due for collection.

Lower Cost Data Collection

These Systems do not require customized software programming. Both System are fully configurable. This is an inexpensive way to gather Manual Data for performance comparisons.

Requires Plant/User Ownership

In Order for your Operator Driven Reliability Program to be successful the Plants and Users must OWN their program and be committed to its success.

Future - WIFI

-Depending on appropriate placement of Access Points These systems are WIFI Capable

Putting the Data to Work!



What does the Data Mean?



Just Ask The PI Team...



Drake Rebuild



Providing Value to Transmission System Operations



Sharing Mobility & Lessons Learned across the organization













The Value We Gained...

- Lead to Convergence with IT and OT
- Transformation of business processes and utilization of KPI's
- Eliminate the need for assistance from other operating areas
- Identify System disruptions
- Improved decision quality
- Disaster Recovery and Event Analysis
- Quick access to critical data with the ability to visualize data in real-time

Leveraging data has truly revolutionize our company dynamics and our impact on decision making with the use of Real-Time Operational data

Transformed Operations from a static and reactionary to everyone can be a **SOLUTION** based team

Water Quality

Financial Gains Realized

Significant O&M Reductions Realized

- 29% Reduction in resource allocation for online Instrumentation Inspections
- 30% Reduction in Vehicle Usage Annually
- 58% Reduction in Overtime

Saving has helped with reallocation of O&M dollars

- To expand our Water Quality Instrumentation Program
 - Pre PI System utilization we had only 6 operating WQ systems
 - Compared to 18 now

COLLABORATION, TEAMWORK AND INFRASTRUCTURE



What is in our Future?

- Depending on Budget & resources PI for Water Treatment – Reporting & Analytics
- Pilot Integrations with AMI
- System Capability Forecasting
- Energy Optimization for CSU's Assets
- PI Event Frames
- I To Maximo
- PI to GIS
- PI & SKF for SDS
- Drake Scrubbers

How to Contact the PI Team

Call 8Help put in a case
Case Self Service
Call After hours
Call the PI Team





So What is Pi?

• Pi is Power to the People!

 It's the infrastructure and the integrations that connects people with the information from Control Rooms & SCADA and other data sources about CSU Operations to make critical operational decisions.