GOOD DATA MANAGEMENT – PRINCIPLES, RISK MITIGATION, GOING PAPERLESS

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HACH

NOVEMBER 2, 2021
NEW ENGLAND WEA

OVERVIEW

Good Data Management is critical for Water Quality programs from data collection to analysis to reporting from both a utility's reporting and business needs.

Key principles of good data management practices state that data collection must be comprehensive, complete, and reliable.

Our decisions rely on the data being Accurate, Legible, Contemporaneous, Original, and Attributable (ALCOA method).

These practices apply to both the wastewater / drinking labs, plant operations, and field operations.

HOW DO WE MANAGE ALL OF OUR DATA?

How do we as drinking water / wastewater professionals effectively collect all of our data and put it into a usable format so decisions can be made for daily operations, monthly reports, budgets, as well as for troubleshooting and optimization? Let's bring all of those data sources into a central, secure, & legally defensible platform and let's drive towards data driven decision!

Let's turn Water Quality Data into Information & Knowledge!!!!

SOURCES OF DATA

- Central Lab Data
- Operations Lab Data
- Commercial Lab Data
- Data from our Industries
- SCADA Data
- Field Data from our Samplers

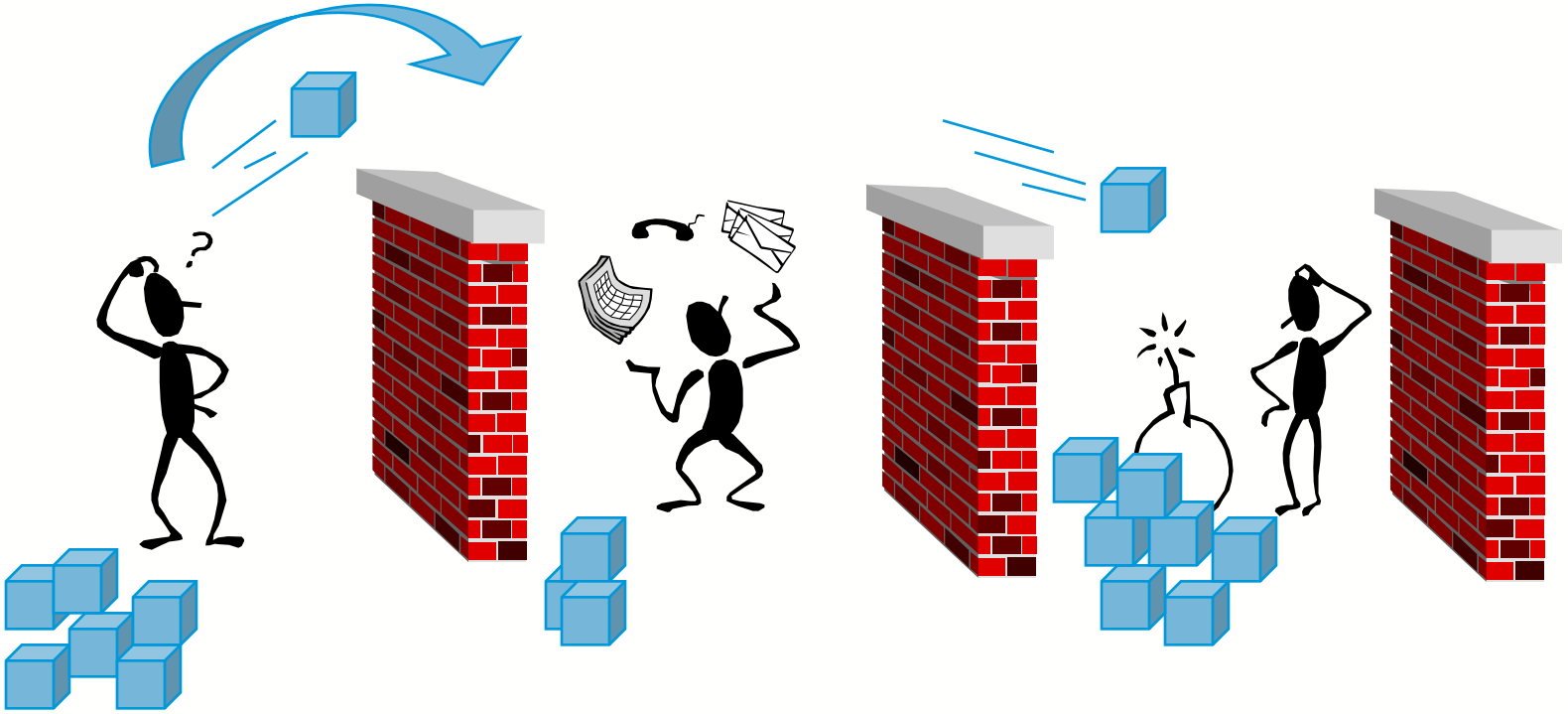
Everyone needs to understand where the data comes from and how it is produced. Understand sample locations, sample techniques, sample lines for process, analytical methods, etc. Everyone also needs to understand the flow of the data and how it is viewed by many. SOPs and Methods must be followed.

Bad Data In Means Bad Data Out! Bad data is a waste of time & leads to bad decisions!

Let’s turn good data into knowledge and make informed decisions!

TRADITIONAL "OVER THE WALL" BATCH PROCESSING

Let's break these walls down!!!



Field and
Lab Analysis / QC

Operations

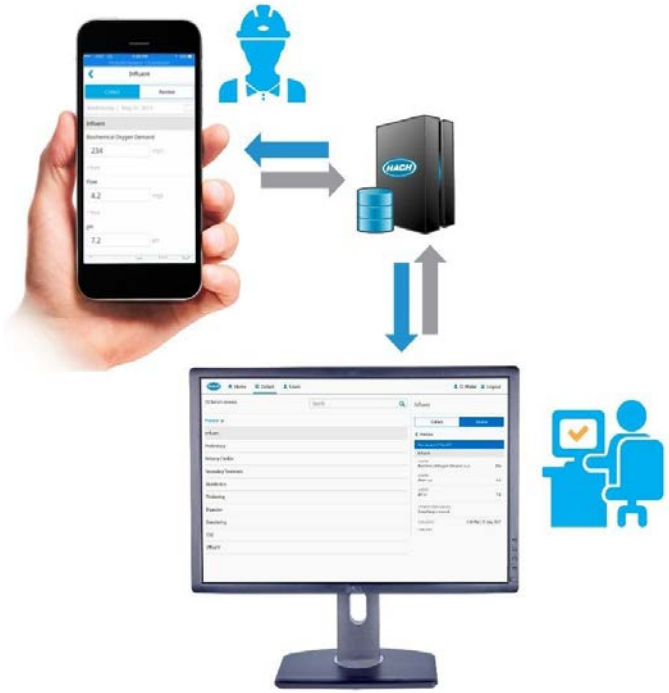
Process Engineering
Regulatory Compliance

INTEGRATED APPROACH

Not one software solution can do it all = depends on your business needs.

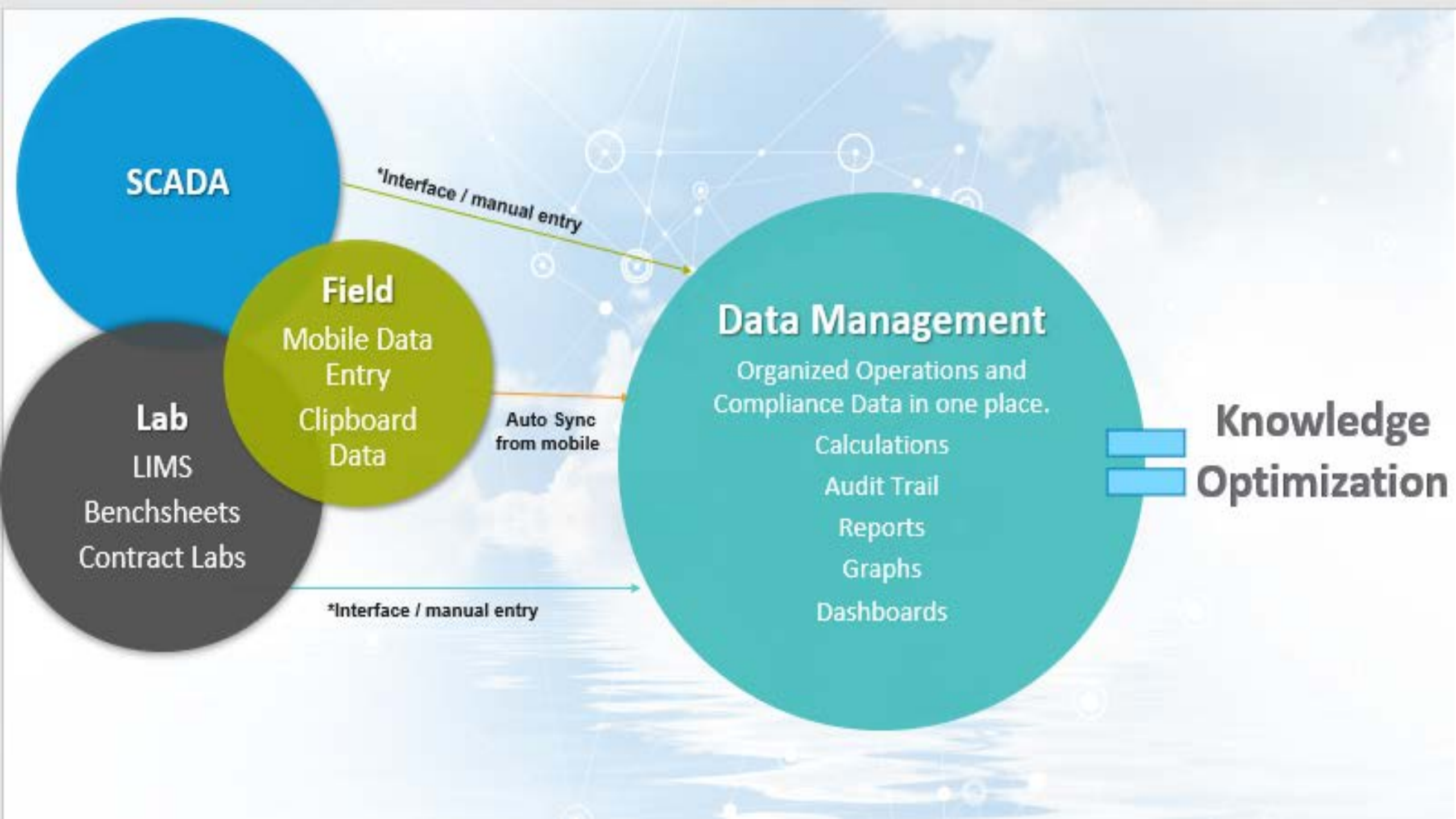
How do you integrate between your various solutions?

What does your integration schematic look?



Think about your solutions such as =

SCADA	LIMS
WQ Data Management	Mobile Data Collection
GIS	Power BI
CMMS / Assets	Billing
Utility Cloud	Industrial Pretreatment

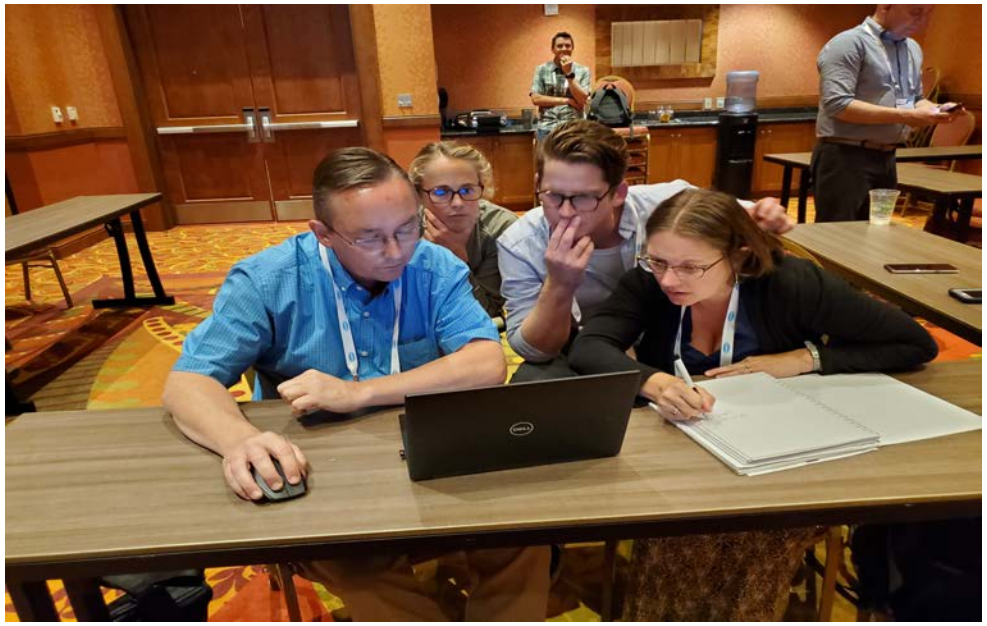

SCADA
*Interface / manual entry
Field
Mobile Data Entry
Clipboard Data
Auto Sync from mobile
Lab
LIMS
Benchsheets
Contract Labs
*Interface / manual entry
Data Management
Organized Operations and Compliance Data in one place.
Calculations
Audit Trail
Reports
Graphs
Dashboards
Knowledge
Optimization

PRINCIPLES OF GOOD DATA MANAGEMENT PRACTICE

The Standard for Building Good Data Management

Data Collection Must Be:

- Comprehensive
- Complete
- Reliable



PRINCIPLES OF GOOD DATA MANAGEMENT PRACTICE

What is ALCOA?

Decisions Rely on Data Being

- Accurate
- Legible
- Contemporaneous
- Original
- Attributable

World Health Organization (WHO) -
QAS/15.624 –
Paper addressing Data Management practices in Labs, Water, and Food & Drug environments.

PRINCIPLES OF GOOD DATA MANAGEMENT PRACTICE – FOR COMPUTERIZED SYSTEMS

- Designing and configuring computer systems and writing standard operating procedures (SOPs), as required, that enforce the saving of electronic data at the time of the activity and prior to proceeding to the next step of the sequence of events.

- Use of secure, time-stamped audit trails that independently record operator actions.

- Configuration settings that limit access to enhanced security rights, (such as the system administrator role that can be used to potentially turn off the audit trails or enable over-writing and deletion of data), only to persons independent of those responsible for the content of the electronic records.

PRINCIPLES OF GOOD DATA MANAGEMENT PRACTICE – FOR COMPUTERIZED SYSTEMS

- Configuration settings and SOPs, as required, to disable and prohibit the ability to overwrite data, including prohibiting overwriting of preliminary and intermediate processing of data.

- Strictly controlled configuration and use of data annotation tools in a manner that prevents data in display and prints from being obscured.

- Original = Source capture of data and all subsequent data required to fully reconstruct the conduct of the activity.

PRINCIPLES OF GOOD DATA MANAGEMENT PRACTICE – FOR COMPUTERIZED SYSTEMS

Attributable =

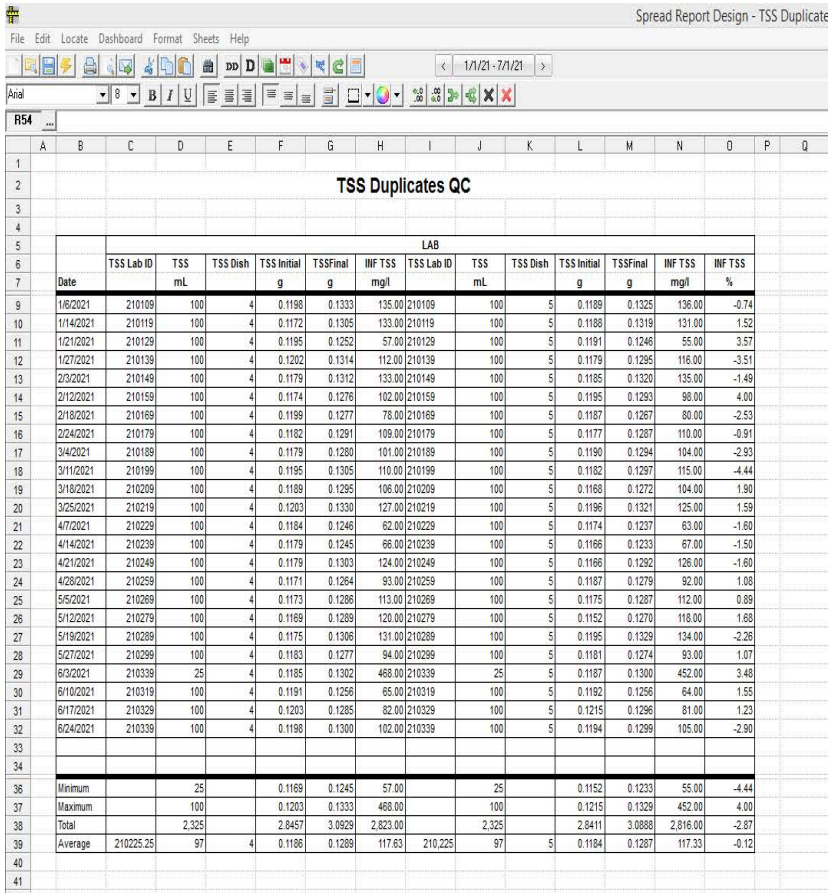
Data captured is uniquely identifiable to Person, Computer, Other Electronic Source.

Such as =

- Unique user logons that link the user to actions that create, modify or delete data; by ID, Time, and System
- Electronic signatures, (either biometric or non-biometric)
- Device Specific Source Recording – SCADA, Instrument, etc

O.H.I.O PRINCIPLE

ONLY HANDLE IT ONCE!!!!!!!!



Spread Report Design - TSS Duplicate

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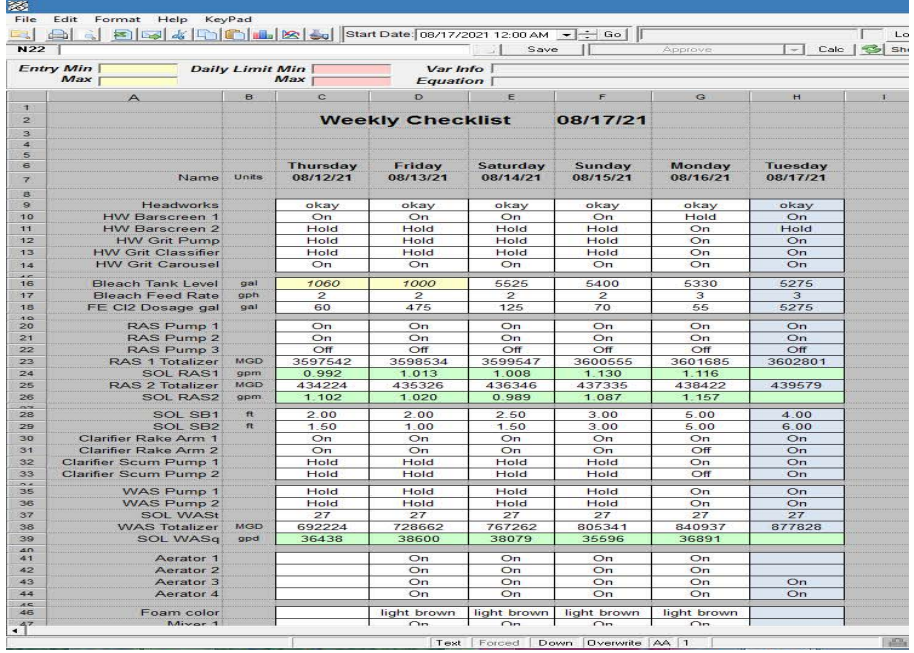
1/1/21 - 7/1/21

R54

TSS Duplicates QC

		LAB												
		TSS Lab ID	TSS	TSS Dish	TSS Initial	TSSFinal	INF TSS	TSS Lab ID	TSS	TSS Dish	TSS Initial	TSSFinal	INF TSS	INF TSS
	Date		mL		g	g	mg/l		mL		g	g	mg/l	%
9	1/6/2021	210109	100	4	0.1198	0.1333	135.00	210109	100	5	0.1189	0.1325	136.00	-0.74
10	1/14/2021	210119	100	4	0.1172	0.1305	133.00	210119	100	5	0.1188	0.1319	131.00	1.52
11	1/21/2021	210129	100	4	0.1195	0.1252	57.00	210129	100	5	0.1191	0.1246	55.00	3.57
12	1/27/2021	210139	100	4	0.1202	0.1314	112.00	210139	100	5	0.1179	0.1295	116.00	-3.51
13	2/3/2021	210149	100	4	0.1179	0.1312	133.00	210149	100	5	0.1185	0.1320	135.00	-1.49
14	2/12/2021	210159	100	4	0.1174	0.1276	102.00	210159	100	5	0.1195	0.1293	98.00	4.00
15	2/18/2021	210169	100	4	0.1199	0.1277	78.00	210169	100	5	0.1187	0.1267	80.00	-2.53
16	2/24/2021	210179	100	4	0.1182	0.1291	109.00	210179	100	5	0.1177	0.1287	110.00	-0.91
17	3/4/2021	210189	100	4	0.1179	0.1280	101.00	210189	100	5	0.1190	0.1294	104.00	-2.93
18	3/11/2021	210199	100	4	0.1195	0.1305	110.00	210199	100	5	0.1182	0.1297	115.00	-4.44
19	3/18/2021	210209	100	4	0.1189	0.1295	106.00	210209	100	5	0.1168	0.1272	104.00	1.90
20	3/25/2021	210219	100	4	0.1203	0.1330	127.00	210219	100	5	0.1196	0.1321	125.00	1.59
21	4/7/2021	210229	100	4	0.1184	0.1246	62.00	210229	100	5	0.1174	0.1237	63.00	-1.60
22	4/14/2021	210239	100	4	0.1179	0.1245	66.00	210239	100	5	0.1166	0.1233	67.00	-1.50
23	4/21/2021	210249	100	4	0.1179	0.1303	124.00	210249	100	5	0.1166	0.1292	126.00	-1.60
24	4/28/2021	210259	100	4	0.1171	0.1264	93.00	210259	100	5	0.1187	0.1279	92.00	1.08
25	5/5/2021	210269	100	4	0.1173	0.1286	113.00	210269	100	5	0.1175	0.1287	112.00	0.89
26	5/12/2021	210279	100	4	0.1169	0.1289	120.00	210279	100	5	0.1152	0.1270	118.00	1.68
27	5/19/2021	210289	100	4	0.1175	0.1306	131.00	210289	100	5	0.1195	0.1329	134.00	-2.26
28	5/27/2021	210299	100	4	0.1183	0.1277	94.00	210299	100	5	0.1181	0.1274	93.00	1.07
29	6/3/2021	210339	25	4	0.1185	0.1302	468.00	210339	25	5	0.1187	0.1300	452.00	3.48
30	6/10/2021	210319	100	4	0.1191	0.1256	65.00	210319	100	5	0.1192	0.1256	64.00	1.55
31	6/17/2021	210329	100	4	0.1203	0.1285	82.00	210329	100	5	0.1215	0.1296	81.00	1.23
32	6/24/2021	210339	100	4	0.1198	0.1300	102.00	210339	100	5	0.1194	0.1299	105.00	-2.90
33														
34														
36	Minimum		25		0.1169	0.1245	57.00		25		0.1152	0.1233	55.00	-4.44
37	Maximum		100		0.1203	0.1333	468.00		100		0.1215	0.1329	452.00	4.00
38	Total		2,325		2.8457	3.0929	2,823.00		2,325		2.8411	3.0888	2,816.00	-2.87
39	Average	210225.25	97	4	0.1186	0.1289	117.63	210,225	97	5	0.1184	0.1287	117.33	-0.12



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Start Date: 08/17/2021 12:00 AM Go

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Entry Min Max Daily Limit Min Max Var Info Equation

Weekly Checklist **08/17/21**

	Name	Units	Thursday 08/12/21	Friday 08/13/21	Saturday 08/14/21	Sunday 08/15/21	Monday 08/16/21	Tuesday 08/17/21
9	Headworks		okay	okay	okay	okay	okay	okay
10	HW Barscreen 1		On	On	On	On	Hold	On
11	HW Barscreen 2		Hold	Hold	Hold	Hold	On	Hold
12	HW Grit Pump		Hold	Hold	Hold	Hold	On	On
13	HW Grit Classifier		Hold	Hold	Hold	Hold	On	On
14	HW Grit Carousel		On	On	On	On	On	On
16	Bleach Tank Level	gal	1060	1000	5525	5400	5330	5275
17	Bleach Feed Rate	gph	2	2	2	2	3	3
18	FE Cl2 Dosage gal	gal	60	475	125	70	55	5275
20	RAS Pump 1		On	On	On	On	On	On
21	RAS Pump 2		On	On	On	On	On	On
22	RAS Pump 3		Off	Off	Off	Off	Off	Off
23	RAS 1 Totalizer	MGD	3597542	3598534	3599547	3600555	3601685	3602801
24	SOL RAS1	gpm	0.992	1.013	1.008	1.130	1.116	
25	RAS 2 Totalizer	MGD	434224	435326	436346	437335	438422	439579
26	SOL RAS2	gpm	1.102	1.020	0.989	1.087	1.157	
28	SOL SB1	ft	2.00	2.00	2.50	3.00	5.00	4.00
29	SOL SB2	ft	1.50	1.00	1.50	3.00	5.00	6.00
30	Clarifier Rake Arm 1		On	On	On	On	On	On
31	Clarifier Rake Arm 2		On	On	On	On	Off	On
32	Clarifier Scum Pump 1		Hold	Hold	Hold	Hold	On	On
33	Clarifier Scum Pump 2		Hold	Hold	Hold	Hold	Off	On
35	WAS Pump 1		Hold	Hold	Hold	Hold	On	On
36	WAS Pump 2		Hold	Hold	Hold	Hold	On	On
37	SOL WASt		27	27	27	27	27	27
38	WAS Totalizer	MGD	692224	728662	767262	805341	840937	877828
39	SOL WASq	gpd	36438	38600	38079	35596	36891	
41	Aerator 1			On	On	On	On	
42	Aerator 2			On	On	On	On	
43	Aerator 3			On	On	On	On	On
44	Aerator 4			On	On	On	On	On
46	Foam color			light brown	light brown	light brown	light brown	
47	Mixer 1			On	On	On	On	

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Monthly Log Page 9 **May 2016**
Appleton Wastewater Treatment Plant
Summary of Sludge Treatment

	Thickened Sludge								Receiving Station Flow	Water Treatment Residuals		
Date	WAS To DAF Flow	TWAS Flow	TWAS TS	TWAS	Polymer Useage					Wastewater Operational Flowmeter	TSS	Wastewater Operational Loadings
	avg/gpm	th-gals	%	dry tons	lbs	#/dry tons	($/lb)	($/dry ton)	th-gals	th-gals	mg/L	#/day
Var #	283	425	303	calc	401	403	402	Calc	423	354	350	367
1	351.0	46	3.7	7.1	647	122.6	0.100	12.26	16.6	0.315	11,650	30,627
2	335.0	44	3.6	6.4	3,063	656.6	0.100	65.66	54.8	0.301	12,350	31,012
3	344.0	44	3.8	7.0	1,612	306.7	0.100	30.67	37.7	0.303	14,900	37,592
4	328.0	43	3.7	6.6	1,386	277.2	0.100	27.72	46.6	0.306	16,800	42,905
5	334.0	46	3.5	6.7	2,659	639.2	0.100	63.92	46.2	0.312	13,600	35,384
6	309.0	38	3.5	5.5	521	141.3	0.100	14.13	32.4	0.411	12,200	41,822
7	334.0	38	3.6	5.7	468	112.0	0.100	11.20	26.5	0.327	14,950	40,774
8	346.0	37	3.7	5.7	319	75.2	0.100	7.52	15.0	0.277	15,150	35,032
9	327.0	35	3.8	5.6	997	227.1	0.100	22.71	46.4	0.300	13,350	33,401
10	317.0	37	3.6	5.5	1,562	413.3	0.100	41.33	38.2	0.376	13,300	41,663
11	327.0	38	3.5	5.5	1,580	340.8	0.100	34.08	41.7	0.300	13,400	33,560
12	304.0	37	3.7	5.6	1,657	481.9	0.100	48.19	45.6	0.268	13,500	32,416
13	326.0	37	3.5	5.4	378	89.7	0.100	8.97	41.5	0.268	14,400	32,137
14	320.0	38	3.5	5.6	0	0.0	0.100	0.00	24.2	0.242	15,500	31,342
15	320.0	37	3.5	5.5	264	66.0	0.100	6.60	24.7	0.243	14,250	28,860
16	198.0	26	3.4	3.7	133	49.6	0.100	4.96	32.1	0.265	15,850	35,029
17	309.0	42	3.2	5.6	341	84.6	0.100	8.46	65.7	0.312	11,400	29,623
18	321.0	45	3.3	6.1	193	46.9	0.100	4.69	48.1	0.303	14,900	37,684
19	329.0	42	3.3	5.8	302	69.3	0.100	6.93	37.3	0.308	14,950	38,343
20	322.0	36	3.7	5.5	311	79.8	0.100	7.98	32.3	0.307	15,700	40,142
21	347.0	37	3.6	5.9	638	179.3	0.100	17.93	28.4	0.302	16,400	41,316
22	356.0	40	3.6	6.0	294	69.2	0.100	6.92	14.5	0.282	15,100	36,818
23	325.0	35	3.5	5.1	313	88.9	0.100	8.89	45.4	0.333	14,900	41,320
24	344.0	39	3.4	5.5	302	81.1	0.100	8.11	37.6	0.348	16,150	46,811
25	331.0	38	3.4	5.5	302	69.3	0.100	6.93	41.2	0.507	11,650	49,215
26	325.0	38	3.7	5.8	294	65.7	0.100	6.57	37.3	0.444	11,550	42,806
27	325.0	41	3.4	6.9	312	57.1	0.100	5.71	50.7	0.262	16,500	35,999
28	297.0	42	3.5	6.2	286	68.2	0.100	6.82	34.5	0.203	17,650	29,913
29	325.0	41	3.3	5.6	302	64.9	0.100	6.49	19.8	0.213	17,750	31,458
30	327.0	42	3.3	5.8	302	71.5	0.100	7.15	44.9	0.220	20,200	37,059
31	350.0	46	3.3	6.4	311	62.6	0.100	6.26	37.3	0.237	17,000	33,638
Minimum	198.0	26.0	3.2	3.7	0	0.0	0.100	0.00	14.5	0.203	11,400	28,889.6
Maximum	356.0	46.0	3.8	7.1	3,063	656.6	0.100	65.66	65.7	0.507	20,200	49,215.4
Average	324.3	39.5	3.5	5.8	717	163.2	0.100	16.32	36.9	0.304	14,740	36,636.6
Total	10,052.0	1,225.0		179.8	22,236				1,145.2		456,950	1,135,731.1

ITEMS TO CONSIDER

Safety with Covid 19

Field Data Collection

Chain of Custody

Operators' Lab Data Entry

Lab Bench Sheets

Legally Defensible Data

Audit Trail

Results Comments

QA/QC

Electronic Logbooks for Operations

Electronic Notebooks for Lab

Records Retention Policy

Backups

System Architecture

RISK MITIGATION IN THIS COVID 19 WORLD

WHAT TOOLS ARE AVAILABLE TODAY & HOW IT HELPS MITIGATE RISK

- **Data Management – Manages ACCURATE data**
  - Capture field data remotely and digitally eliminating the need for paper logs and increasing accuracy of data
  - Easily manage ALL data from SCADA, field and lab in one location eliminating duplicity of data and increased accuracy
  - Easily perform calculations and trend and analyze data from ALL sources of data
  - Create standard forms and reports that once created are available at the touch of button or can be scheduled
  - Create event logs that can email alerts for upset conditions
  - Create customized dashboards allowing the view of critical data at all times

- **How does this help *MITIGATE RISK with less available FTE*?**
  - Is there any benefit in reducing the amount of time and FTE needed to collect and manage data?
  - Is there any benefit in having your data automatically in an electronic, usable format?
  - Is there any benefit to entering data ONLY ONCE and being able to generate desired reports at the touch of a button?
  - Is there any benefit in being able to run linear regressions at the touch of a button on ALL data (process, lab, field) to solve systemic process issues?

What is the Risk? Which Would You Choose?

- No

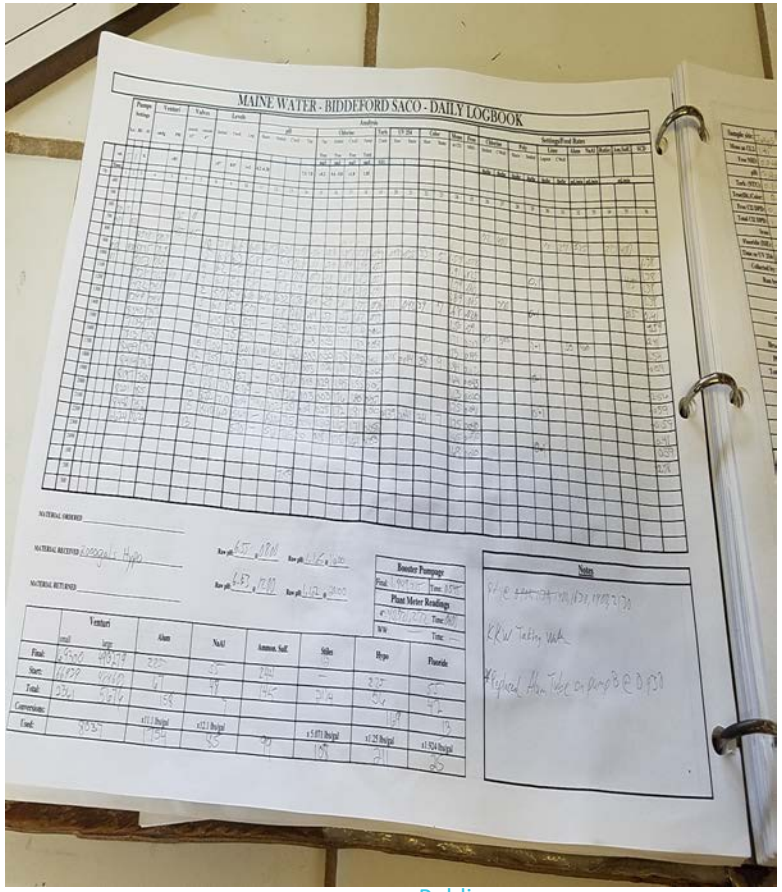
Post Aeration Data

Revised: 03/09/15: mmr

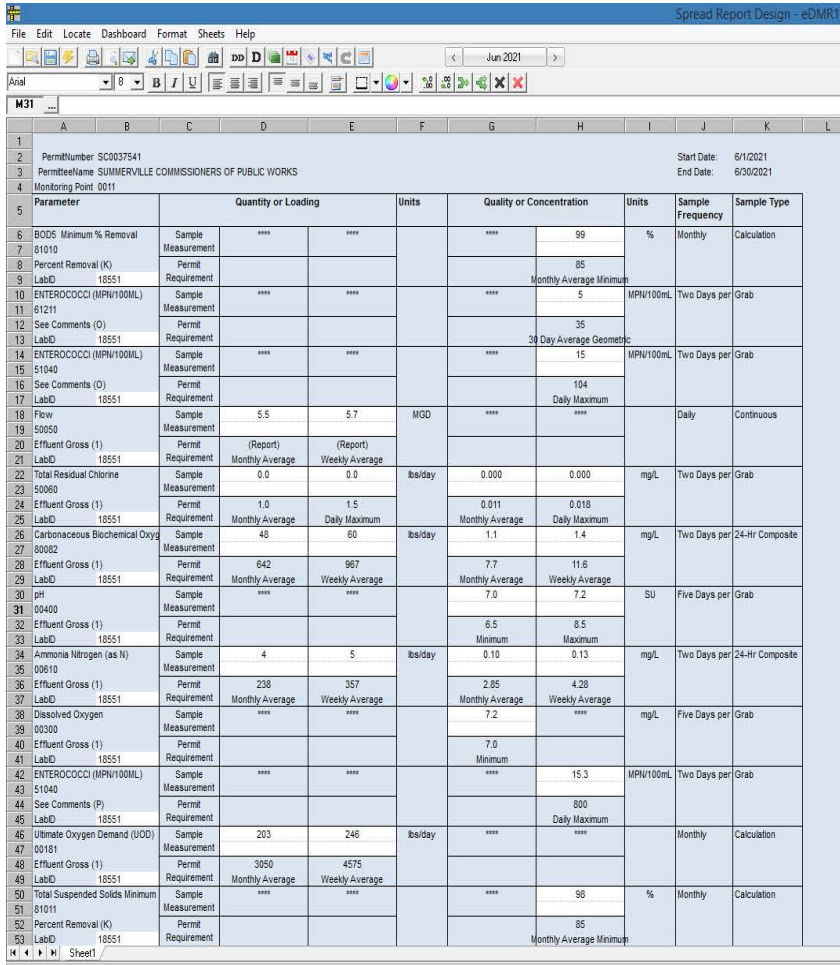
Month: June

Date	Time	Inst Flow	Tank #1	Tank #2	Bisulfite gpd	speed	stroke	pump #1	pump #2	Blower #1	Blower #2	Comments	Initial
1	0826	3.11	2306	2600	20	---	---	+	-	---	---		CG
2	0832	5.25	2280	2600	20	-	-	+	-	-	-		CG
3	0841	4.46	2960	2600	10	-	---	+	---	---	-		CG
4	0849	4.41	2750	2600	15	—	---	+	-	---	---		CG
5	0831	5.06	2235	2600	20	—	---	+	—	—	—	switched pumps	JW
6	0840	5.50	2315	2600	15	—	-	+	-	-	-		JW
7	0826	5.48	2200	2600	25	—	—	+	—	—	—		JW/AC
8	0831	7.63	2175	2600	20	—	-	+	-	-	-		JW
9	0826	6.17	2165	2600	25	-	-	+	-	-	-		JW
10	0810	4.75	2140	2600	20	—	-	+	-	-	-		JW
11	0819	4.78	2120	2600	10	-	-	+	-	-	-		JW
12	0857	5.99	2100	2600	20	-	-	-	+	-	-		CG
13	0810	5.66	2090	2600	20	—	-	-	+	—	-		CG
14	0817	5.83	2080	2600	15	-	-	-	+	-	-		CG
15	0823	5.67	2085	2600	20	—	-	-	+	—	-		CG
16	0822	4.96	2025	2600	20	—	-	-	+	-	-		CG
17	0744	3.62	2005	2600	15	—	-	-	+	—	—		CG
18	0919	5.09	1990	2600	25	-		-	+	-	-		CG
19	0805	5.33	1965		15	—	-	+	-	-	-		CG
20	0830	5.66	1950	2600	20	-	-	+	-	-	-		JW
21	0820	6.05	1930	2600	30	-	-	+	-	-	-		CG
22	0828	6.28	1900	2600	20	-	-	+	-	-	-		JW
23	0810	5.96	1880	2600	20	-	-	+	-	-	-		JW
24	0825	4.70	1840	2600	10	-	-	+	-	-	-		BS
25	0900	4.85	1830	2600	15	-	-	+	-	-	-		BS
26	0836	6.59	1835	2600	35	-	-	-	+	-	-		CG
27	0815	6.04	1800	2600	10	-	-	-	+	-	-		BS
28	0843	5.96	1790	2600	10	-	-	-	+	-	-		JG
29	0748	5.55	1780	2600	30	-	-	-	+	-	-		CG
30			1750	2600	15	-	-	-	+	-	-		CG
31													

- No



- Yes!



Spread Report Design - eDMR

File Edit Locate Dashboard Format Sheets Help

Jun 2021

Arial 8

M31

	A	B	C	D	E	F	G	H	I	J	K	L
1												
2	PermitNumber SC0037541									Start Date:	6/1/2021	
3	PermitteeName SUMMERVILLE COMMISSIONERS OF PUBLIC WORKS									End Date:	6/30/2021	
4	Monitoring Point 0011											
5	Parameter		Quantity or Loading			Units	Quality or Concentration		Units	Sample Frequency	Sample Type	
6	BOD5 Minimum % Removal	Sample Measurement	****	****			****	99	%	Monthly	Calculation	
7	81010											
8	Percent Removal (K)	Permit Requirement						85				
9	LabID 18551							Monthly Average Minimum				
10	ENTEROCOCCI (MPN/100ML)	Sample Measurement	****	****			****	5	MPN/100mL	Two Days per	Grab	
11	61211											
12	See Comments (O)	Permit Requirement						35				
13	LabID 18551							30 Day Average Geometric				
14	ENTEROCOCCI (MPN/100ML)	Sample Measurement	****	****			****	15	MPN/100mL	Two Days per	Grab	
15	51040											
16	See Comments (O)	Permit Requirement						104				
17	LabID 18551							Daily Maximum				
18	Flow	Sample Measurement	5.5	5.7	MGD		****	****		Daily	Continuous	
19	50050											
20	Effluent Gross (1)	Permit Requirement	(Report)	(Report)								
21	LabID 18551		Monthly Average	Weekly Average								
22	Total Residual Chlorine	Sample Measurement	0.0	0.0	lbs/day		0.000	0.000	mg/L	Two Days per	Grab	
23	50060											
24	Effluent Gross (1)	Permit Requirement	1.0	1.5			0.011	0.018				
25	LabID 18551		Monthly Average	Daily Maximum			Monthly Average	Daily Maximum				
26	Carbonaceous Biochemical Oxyg	Sample Measurement	48	60	lbs/day		1.1	1.4	mg/L	Two Days per	24-Hr Composite	
27	80082											
28	Effluent Gross (1)	Permit Requirement	642	967			7.7	11.6				
29	LabID 18551		Monthly Average	Weekly Average			Monthly Average	Weekly Average				
30	pH	Sample Measurement	****	****			7.0	7.2	SU	Five Days per	Grab	
31	00400											
32	Effluent Gross (1)	Permit Requirement					6.5	8.5				
33	LabID 18551						Minimum	Maximum				
34	Ammonia Nitrogen (as N)	Sample Measurement	4	5	lbs/day		0.10	0.13	mg/L	Two Days per	24-Hr Composite	
35	00610											
36	Effluent Gross (1)	Permit Requirement	238	357			2.85	4.28				
37	LabID 18551		Monthly Average	Weekly Average			Monthly Average	Weekly Average				
38	Dissolved Oxygen	Sample Measurement	****	****			7.2	****	mg/L	Five Days per	Grab	
39	00300											
40	Effluent Gross (1)	Permit Requirement					7.0					
41	LabID 18551						Minimum					
42	ENTEROCOCCI (MPN/100ML)	Sample Measurement	****	****			****	15.3	MPN/100mL	Two Days per	Grab	
43	51040											
44	See Comments (P)	Permit Requirement						800				
45	LabID 18551							Daily Maximum				
46	Ultimate Oxygen Demand (UOD)	Sample Measurement	203	246	lbs/day		****	****		Monthly	Calculation	
47	00181											
48	Effluent Gross (1)	Permit Requirement	3050	4575								
49	LabID 18551		Monthly Average	Weekly Average								
50	Total Suspended Solids Minimum	Sample Measurement	****	****			****	98	%	Monthly	Calculation	
51	81011											
52	Percent Removal (K)	Permit Requirement						85				
53	LabID 18551							Monthly Average Minimum				

Sheet1

FIELD SAMPLING SAFETY IS A BIG TOPIC OF DISCUSSION!

Data Management solutions offers risk mitigation to both Drinking Water and Wastewater Facilities.

A goal is to reduce health risk touch points to COVID-19.

Operators and Water Treaters may be exposed to higher risks when sharing clipboards (pen/paper) than compared to recording data on personal electronic devices.

CDC guidance suggests using alcohol-based wipes or sprays containing at least 70% alcohol to disinfect touch screens and to dry surfaces thoroughly.

Personal smart phone/tablets are easy to clean reducing exposure to threats such as Covid-19.

These solutions can help with reducing workflow risks, error reductions, enhancing data visibility and offering data backup.

SO LET’S GO PAPERLESS

WHAT DOES IT LOOK LIKE?

DATA ENTRY……..

AUTOMATE MANUAL PROCESSES

- Replace manual with software-based data gathering and info reporting
  - Allows increased focus on “holistic” view
  - Improves productivity
  - Reduces errors
  - Maximizes new workforce skills
- On-line reporting in many states
- Spend less time gathering and more time analyzing
- Frees up time for value-added work
- Efficiently drives collaborative analysis and decisions across business, enterprise, or ecosystem

Empowers the utility to do more with less and simplifies the task of providing state and federal regulators with the reports they need

DATA ENTRY AND REVIEW

NPDES Review Form - Monthly Data Entry

File Edit Format

Jan 2009 | Monday, January 19, 2009 | Comments | Calc | Approve

Entry Min / Max | Daily Limit Min / Max | Var Info: 12 Influent BOD Load (lbs/day) | Equation: V1*V11*8.34

		Influent		Effluent		Influent		Effluent		
	Daily Com	11 - Influent BOD mg/L	12 - Influent BOD Load lbs/day	4011 - Effluent BOD mg/L	4012 - Effluent BOD Load lbs/day	41 - Influent TSS mg/L	42 - Influent TSS Load lbs/day	4041 - Effluent TSS mg/L	4042 - Effluent TSS Load lbs/day	4081 - Effluent pH SU
15 Thu		319	7423	19						
16 Fri		268	6705	16						
17 Sat		285	6275	24						
18 Sun		297	7183	16						
19 Mon		305	7199	11						
20 Tue		285	6608	18						
21 Wed		260	6635	17						
22 Thu		323	7489	14						
23 Fri		282	6844	17						
24 Sat		285	6822	19						
25 Sun		316	8275	25						
26 Mon										
27 Tue										
28 Wed										
29 Thu										

Audit Trail

4011 Effluent BOD (mg/L)

Current State of Datapoint

Datapoint Date: 1/8/2009 Value: 47 (47)

History of Actions

Date & Time	User	Action	Value	Approval Level
1/13/2009 3:50:24 PM	JAS	Data MODIFIED to	47 (47)	FINAL APPROVA
1/13/2009 9:36:00 AM	MGM	Data INSERTED	47 (47)	ENTERED

Restore Selected Value

Note : Only Super Users and Managers have priviledges to restore values from Audit Trail.

TSS Benchsheet (Custom Data Entry Form)

File Edit Format Help

Start Date: 1 / 8 /2009 Current Date: Thursday, January 08, 2009 Comment

C20 $C$16/$C$18*1000000 Save Approve Calc

TSS Benchsheet - Method SM 2540D

Analyst:	MGM		Oven Temperature In:	103.8
Sample Date:	01/08/09 - Thu		Oven Temperature Out:	104.2
Date/Time:	1/9/09 9:33AM			
	Inf TSS		PE TSS	RAS Conc
le & Tare	0.9755 g		0.9748 g	0.9748 g
Tare	0.9602 g		0.9671 g	0.9198 g
Solids	0.0153 g		0.0077 g	0.0550 g
e Volume	50.00 ml		50.00 ml	5.00 ml
ed Solids	306 mg/L		154 mg/L	11,000 mg/L

SUPER (2/24/2009 6:21:53 PM) ENTERED

None None None None Num Forced Down Overwrite AA 41 Influent TSS mg/L Day Param

BENCH SHEET

TSS Benchsheet - Method SM 2540D

Analyst:					Oven Temperature In:														
Sample Date:		04/21/19 - Sun			Oven Temperature Out:														
Analysis Date/Time:																			
		Inf TSS				PE TSS				RAS Conc				MLSS				Ef TSS	
Sample & Tare			g				g				g				g				g
Tare			g				g				g				g				g
Solids			g				g				g				g				g
Sample Volume			ml				ml				ml				ml				ml
Suspended Solids			mg/L				mg/L				mg/L				mg/L				mg/L

DATA LOG SHEET

Daily Entry For: Saturday, April 20, 2019

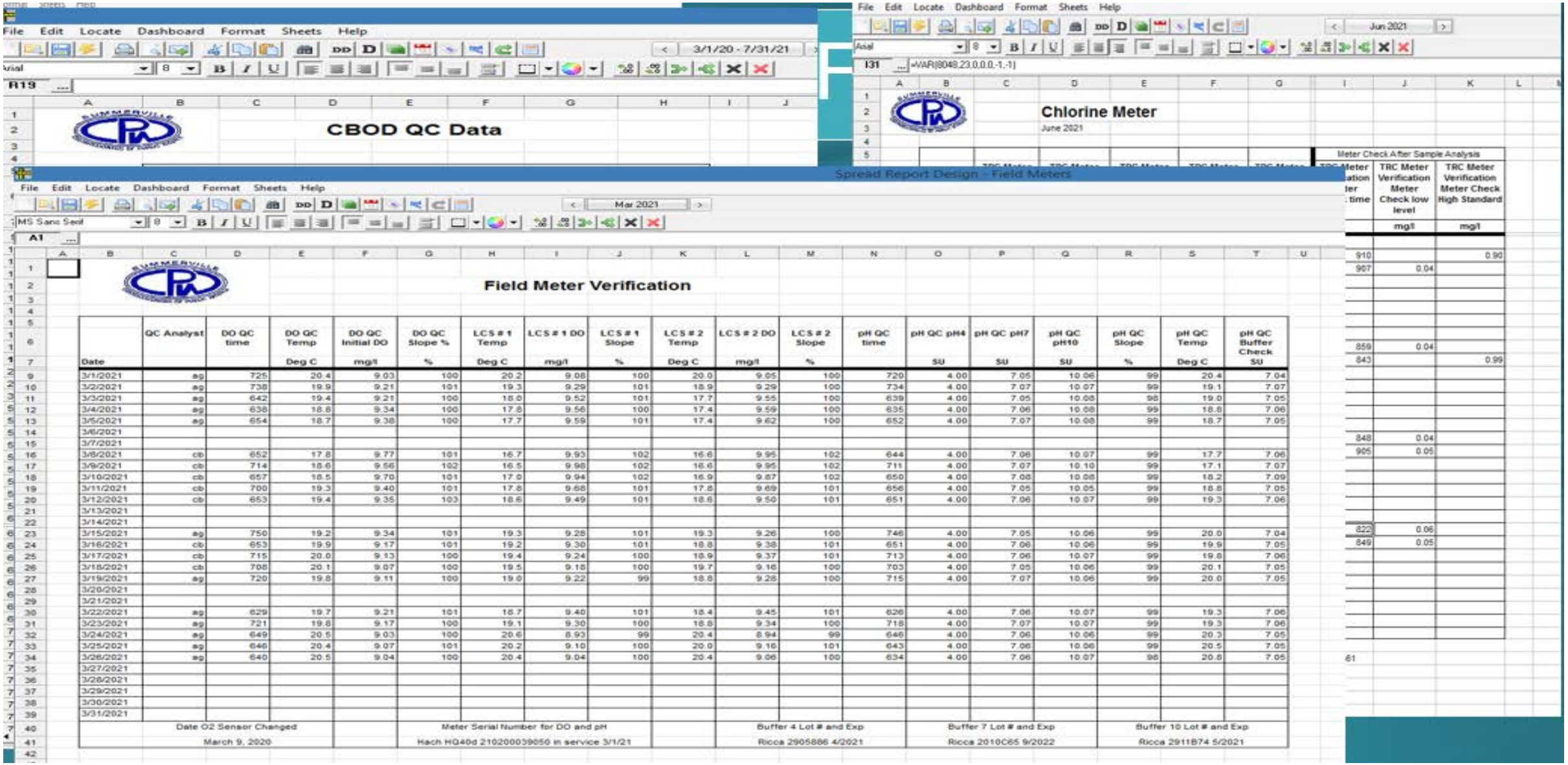
INFLUENT			
1	Inf Flow		MGD
11	Inf BOD		mg/L
12	Inf BOD Ld		lbs/day
41	Inf TSS		mg/L
42	Inf TSS Ld		lbs/day
81	Inf pH		SU
PRIMARY EFFLUENT			
611	PE BOD		mg/L
612	PE BOD LD		lbs/Day
613	PE TSS		mg/L
614	PE TSS LD		lbs/Day
SECONDARY TREATMENT			
1001	RAS Flow		MGD
1006	RAS Conc		mg/L
1011	WAS Flow		MGD
1021	MLSS		mg/L
1022	MLSS TMAS		lbs
1023	MLVSS		mg/L
1025	Vol Fraction		Fraction
1031	AerBasin DO		mg/L
1033	AerBasinTemp		Deg C
1035	Aer Energy		KWH/Day
1050	# Aer Bas		Number
1071	F/M Ratio		Ratio

EFFLUENT			
4001	Ef Flow		MGD
4011	Eff BOD		mg/L
4012	Ef BOD Ld		lbs/day
4013	Ef BOD WkAvg		mg/l
4016	BOD % Rem		%
4017	BOD GGA		mg/l
4018	Ef BOD Dup		mg/l
4019	Ef BOD Rge		mg/l
4041	Ef TSS		mg/L
4042	Ef TSS Ld		lbs/day
4046	TSS % Rem		%
4061	Ef Phos		mg/L
4062	Ef Phos Ld		lbs/day
4081	Ef pH		SU
4095	Ef D.O.		mg/L
4101	Ef NH3-N		mg/L
4102	Ef NH3-N Ld		lbs/day
4103	Ef NH3 Spk		mg/l
4104	Ef NH3%		%
4201	Ef Fecal		No/100ml
4206	Ef Cl Resid		mg/L
Misc			
901	Rainfall		Inch
941	Weather		Weather

DAILY DATA ENTRY – NOTE "ENTRY MIN & MAX" AND "DAILY LIMIT MIN & MAX"

Entry Min			Daily Limit Min			Var Info	4011 Effluent BOD (mg/L)							
Max	50		Max	> 40		Equation								
		Daily Com	1	4002	81	1021	1031	1033	4001	4081	4206	4011	1001	1011
			Influent Flow	Picture of Wildlife	Influent pH	MLSS	Aeration Basin	Aeration Basin	Effluent Flow	Effluent pH	Effluent Chlorine	Effluent BOD	RAS Flow	WAS Flow
			MGD	C	SU	mg/L	mg/L	Deg C	MGD	SU	mg/L	mg/L	MGD	MGD
	1 Fri		2.500		7.0	3700	2.90	16.0	2.615	7.0	0.86	13	1.7400	0.0110
	2 Sat		2.620		7.1	3500	3.90	17.0	2.531	7.1	0.66	15	1.7500	0.0190
	3 Sun		3.110		7.2	3600	3.10	15.0	2.895	7.2	0.85	10	1.7500	0.0150
	4 Mon		2.800		6.6	3640	4.10	16.0	2.712	6.6	0.70	17	1.7500	0.0180
	5 Tue		2.730		6.9	3765	2.90	17.0	2.646	6.9	0.74	13	2.0000	0.0140
	6 Wed		3.470		7.0	3622	4.90	18.0	3.384	7.0	0.47	25	2.0000	0.0100
	7 Thu		4.230		7.1	3434	2.10	17.0	4.160	7.1	0.75	42	2.0000	0.0120
	8 Fri		3.440		6.9	3770	4.00	16.0	4.490	6.9	0.86	47	2.0000	0.0150
	9 Sat		3.880		7.2	3020	3.10	17.0	3.830	7.2	0.80	33	2.0000	0.0170
	10 Sun		3.210		6.4	3117	4.20	16.0	3.120	6.4	0.44	27	2.0000	0.0120
	11 Mon		3.110		7.2	3505	2.50	18.0	3.010	7.2	0.96	43	1.7500	0.0130
	12 Tue		3.200		7.4	3655	3.20	17.0	3.100	7.4	0.65	37	1.7500	0.0100
	13 Wed		2.950		7.1	3745	2.10	15.0	2.852	7.1	0.88	30	1.7500	0.0180
	14 Thu		2.870		7.3	3701	3.60	16.0	2.771	7.3	0.59	25	1.7500	0.0180
	15 Fri		2.790		6.8	3857	5.00	18.0	2.690	6.8	0.51	19	1.7500	0.0090
Mar	16 Sat		3.000		6.9	3751	3.40	19.0	2.908	6.9	0.47	16	1.7500	0.0120
	17 Sun		2.640		7.2	3667	4.00	17.0	2.548	7.2	0.59	24	1.7500	0.0120
	18 Mon		2.900		6.3	3814	3.10	16.0	2.810	6.3	0.77	16	1.7500	0.0095
	19 Tue		2.830		7.2	3853	2.20	16.0	2.743	7.2	0.93	11	1.7500	0.0088
	20 Wed		2.780		7.3	3812	4.00	15.0	2.693	7.3	0.61	18	1.7500	0.0170
	21 Thu		3.060		7.1	3787	3.30	17.0	2.975	7.1	0.48	17	1.7500	0.0150
	22 Fri		2.780		7.0	3778	5.00	15.0	2.697	7.0	0.58	14	1.7500	0.0130
	23 Sat		2.910		6.9	3603	3.00	16.0	2.826	6.9	0.83	17	1.7500	0.0100
	24 Sun		2.870		6.9	3790	2.10	17.0	2.783	6.9	0.77	19	1.7500	0.0090
	25 Mon		3.140		6.6	3899	2.20	18.0	3.060	6.6	0.53	25	1.7500	0.0085
	26 Tue		3.240		7.1	3689	*1.80*	17.0	2.949	7.1	0.55	27	1.7500	0.0094
	27 Wed		3.020		7.2	3814	3.10	19.0	2.752	7.2	0.90	14	1.7500	0.0099
	28 Thu		2.690		7.1	3780	4.10	18.0	2.604	7.1	0.56	12	1.7500	0.0110
	29 Fri		3.300		7.7	3747	2.50	16.0	2.995	7.7	0.62	16	1.7500	0.0095
	30 Sat		2.780		7.2	3807	3.50	17.0	2.501	7.2	0.70	14	1.7500	0.0110
	31 Sun		2.630		7.0	3980	2.00	17.0	2.556	7.0	0.59	28	1.7500	0.0140
MINIMUM			2.500	-	6.3	3,020	1.80	15.0	2.501	6.3	0.44	10	1.7400	0.0085
MAXIMUM			4.230	-	7.7	3,980	5.00	19.0	4.490	7.7	0.96	47	2.0000	0.0190
AVERAGE			3.015	-	7.0	3,684	3.25	16.7	2.942	7.0	0.68	22	1.7981	0.0126
SUM			93.480	-	217.9	114,202	100.90	519.0	91.206	217.9	21.20	684	55.7400	0.3906
GEOMEAN			2.995	-	7.0	3,678	3.13	16.7	2.913	7.0	0.67	20	1.7955	0.0122

QA/QC VERIFICATIONS – SUMMERVILLE CPW



CBOD QC Data

Chlorine Meter

June 2021

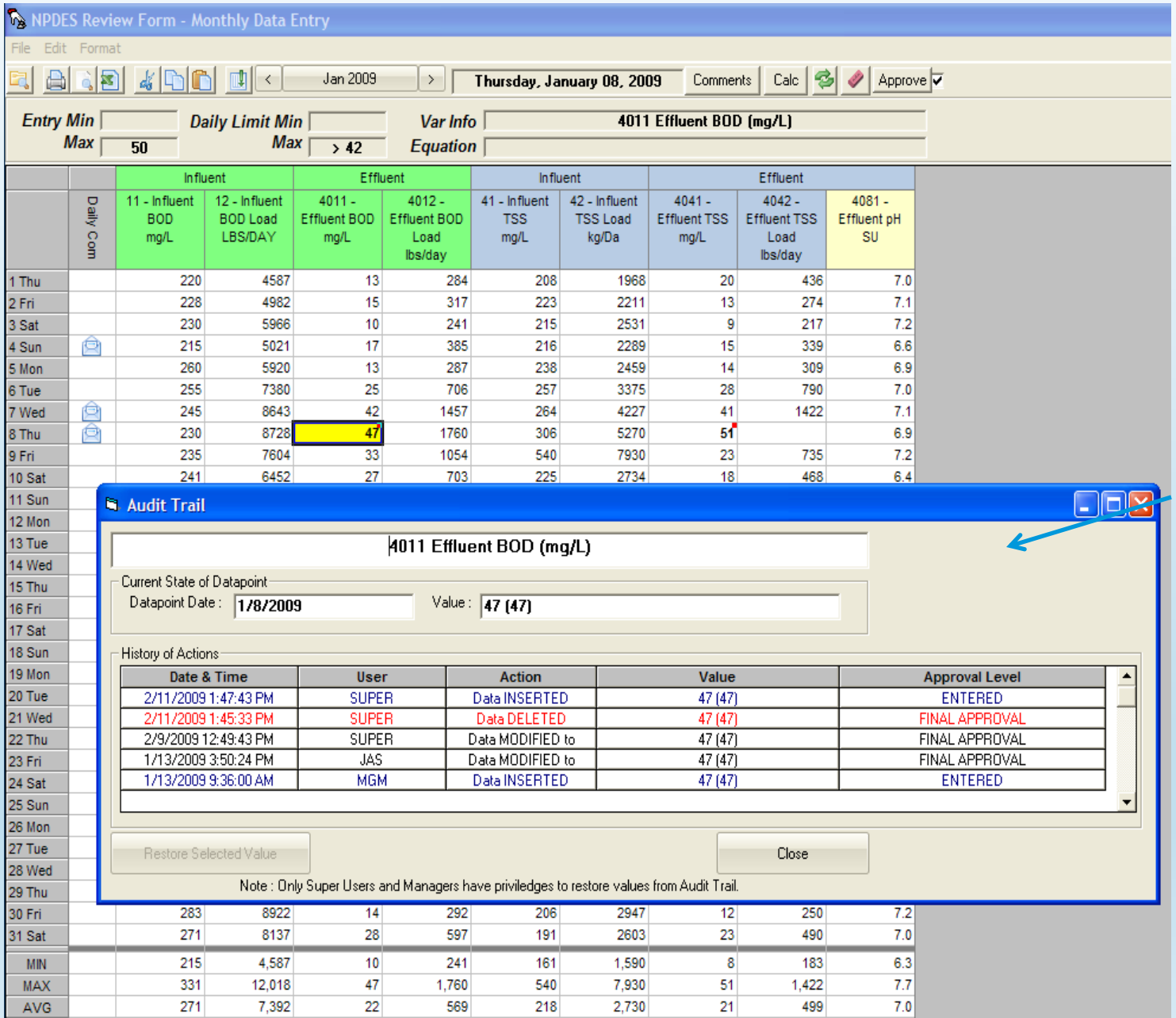
Field Meter Verification

Date	QC Analyst	DO QC time	DO QC Temp Deg C	DO QC Initial DO mg/l	DO QC Slope %	LCS # 1 Temp Deg C	LCS # 1 DO mg/l	LCS # 1 Slope %	LCS # 2 Temp Deg C	LCS # 2 DO mg/l	LCS # 2 Slope %	pH QC time	pH QC pH4 SU	pH QC pH7 SU	pH QC pH10 SU	pH QC Slope %	pH QC Temp Deg C	pH QC Buffer Check SU
3/1/2021	ag	725	20.4	9.03	100	20.2	9.08	100	20.0	9.05	100	729	4.00	7.05	10.06	99	20.4	7.04
3/2/2021	ag	736	19.9	9.21	101	19.3	9.29	101	18.9	9.29	100	734	4.00	7.07	10.07	99	19.1	7.07
3/3/2021	ag	642	19.4	9.21	100	18.0	9.52	101	17.7	9.55	100	639	4.00	7.05	10.08	98	19.0	7.05
3/4/2021	ag	638	18.8	9.34	100	17.8	9.56	100	17.4	9.59	100	635	4.00	7.06	10.08	99	18.8	7.06
3/5/2021	ag	654	18.7	9.38	100	17.7	9.59	101	17.4	9.62	100	652	4.00	7.07	10.08	99	18.7	7.05
3/6/2021																		
3/7/2021																		
3/8/2021	cb	652	17.8	9.77	101	16.7	9.93	102	16.6	9.95	102	644	4.00	7.06	10.07	99	17.7	7.06
3/9/2021	cb	714	18.6	9.56	102	16.5	9.98	102	16.6	9.95	102	711	4.00	7.07	10.10	99	17.1	7.07
3/10/2021	cb	657	18.5	9.70	101	17.0	9.94	102	16.9	9.87	102	650	4.00	7.08	10.08	99	18.2	7.09
3/11/2021	cb	700	19.3	9.40	101	17.8	9.68	101	17.8	9.69	101	656	4.00	7.05	10.05	99	18.8	7.05
3/12/2021	cb	653	19.4	9.35	103	18.6	9.49	101	18.6	9.50	101	651	4.00	7.06	10.07	99	19.3	7.06
3/13/2021																		
3/14/2021																		
3/15/2021	ag	750	19.2	9.34	101	19.3	9.28	101	19.3	9.26	100	746	4.00	7.05	10.06	99	20.0	7.04
3/16/2021	cb	653	19.9	9.17	101	19.2	9.30	101	18.8	9.38	101	651	4.00	7.06	10.06	99	19.9	7.05
3/17/2021	cb	715	20.0	9.13	100	19.4	9.24	100	18.9	9.37	101	713	4.00	7.06	10.07	99	19.8	7.06
3/18/2021	cb	708	20.1	9.07	100	19.5	9.18	100	19.7	9.16	100	703	4.00	7.05	10.06	99	20.1	7.05
3/19/2021	ag	720	19.8	9.11	100	19.0	9.22	99	18.8	9.28	100	715	4.00	7.07	10.06	99	20.0	7.05
3/20/2021																		
3/21/2021																		
3/22/2021	ag	629	19.7	9.21	101	18.7	9.40	101	18.4	9.45	101	626	4.00	7.06	10.07	99	19.3	7.06
3/23/2021	ag	721	19.8	9.17	100	19.1	9.30	100	18.8	9.34	100	718	4.00	7.07	10.07	99	19.3	7.06
3/24/2021	ag	649	20.5	9.03	100	20.6	8.93	99	20.4	8.94	99	646	4.00	7.06	10.06	99	20.3	7.05
3/25/2021	ag	646	20.4	9.07	101	20.2	9.10	100	20.0	9.16	101	643	4.00	7.06	10.06	99	20.5	7.05
3/26/2021	ag	640	20.5	9.04	100	20.4	9.04	100	20.4	9.06	100	634	4.00	7.06	10.07	98	20.8	7.05
3/27/2021																		
3/28/2021																		
3/29/2021																		
3/30/2021																		
3/31/2021																		

Meter Check After Sample Analysis		
	TRC Meter Verification Meter Check low level	TRC Meter Verification Meter Check High Standard
time	mg/l	mg/l
910		0.90
907	0.04	
859	0.04	
843		0.99
848	0.04	
905	0.05	
822	0.06	
849	0.05	

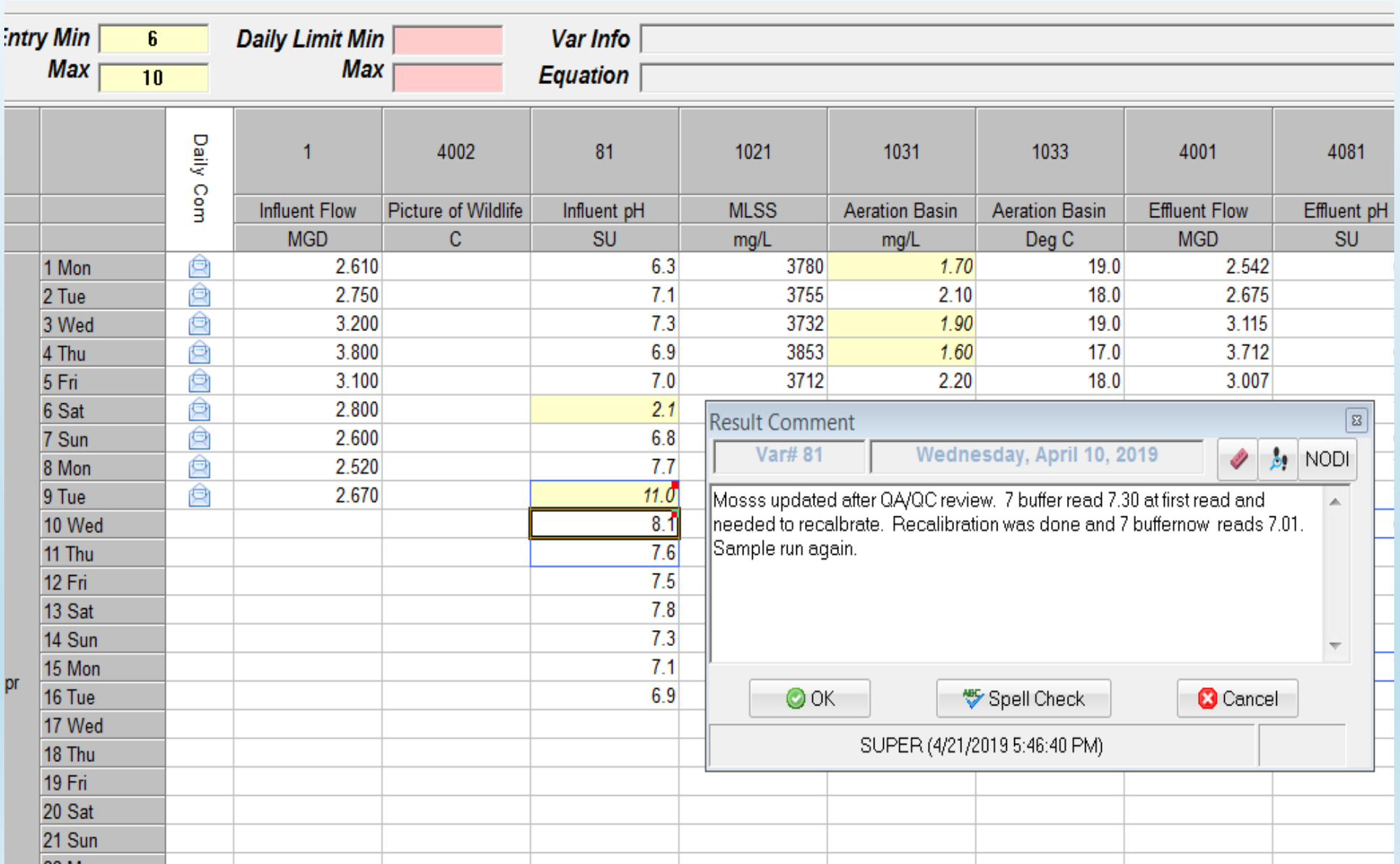
Date O2 Sensor Changed	Meter Serial Number for DO and pH	Buffer 4 Lot # and Exp	Buffer 7 Lot # and Exp	Buffer 10 Lot # and Exp
March 9, 2020	Hach HQ40d 210200039650 in service 3/1/21	Ricca 2905886 4/2021	Ricca 2010C65 9/2022	Ricca 2911B74 5/2021

Audit Trails



Audit trails show who touched the data

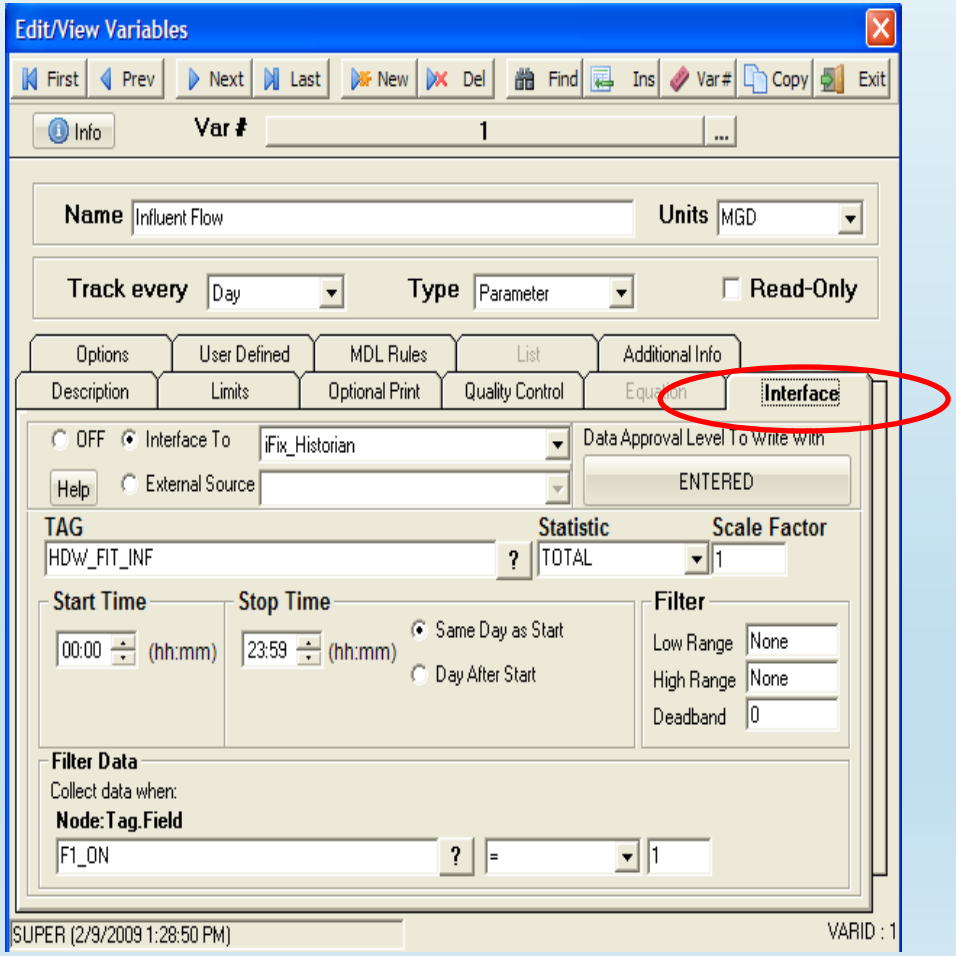
DOCUMENT RESULT COMMENTS



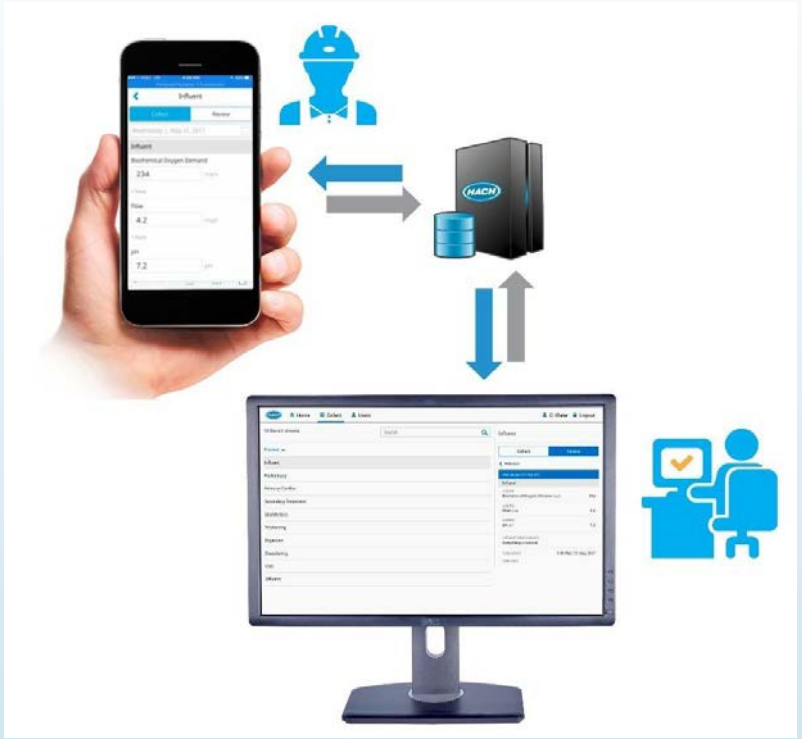
GATHER & ORGANIZE DATA FOR IMMEDIATE ACCESS & ANALYSIS FROM VARIOUS DATA SOURCES

Automated Data Entry:

- SCADA Interface
- LIMS Interface
- Mobile Interface
- CSV Import Interface
- Third Party Software Interfaces
- Interface from Lab Instruments
- Data from Contract Labs

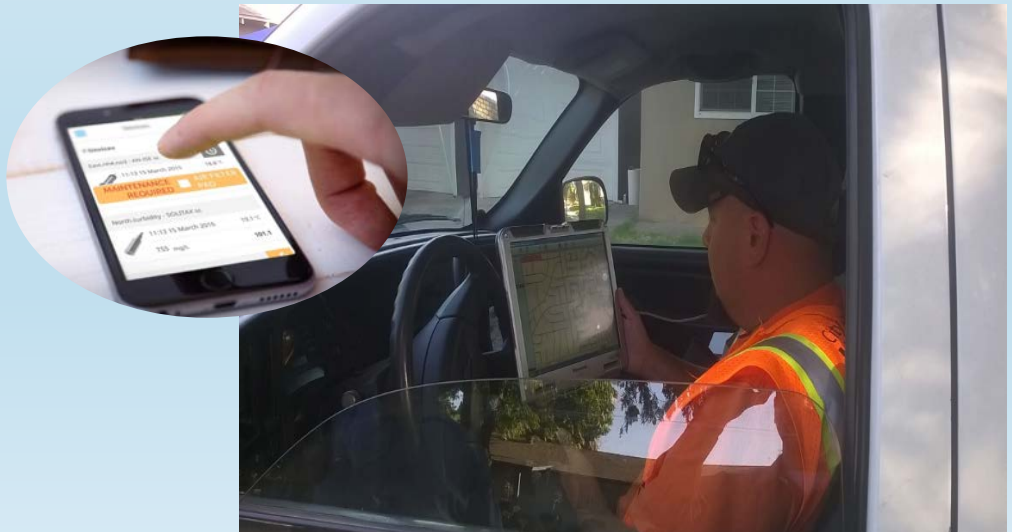


FIELD DATA COLLECTION



Mobile data collection solutions help you make informed decisions faster by reducing data errors at the source of collection and providing instant data availability.

- **Reduce data errors at the source of collection**
- **Make informed decisions with instant data availability**
- **Available anytime, anywhere**

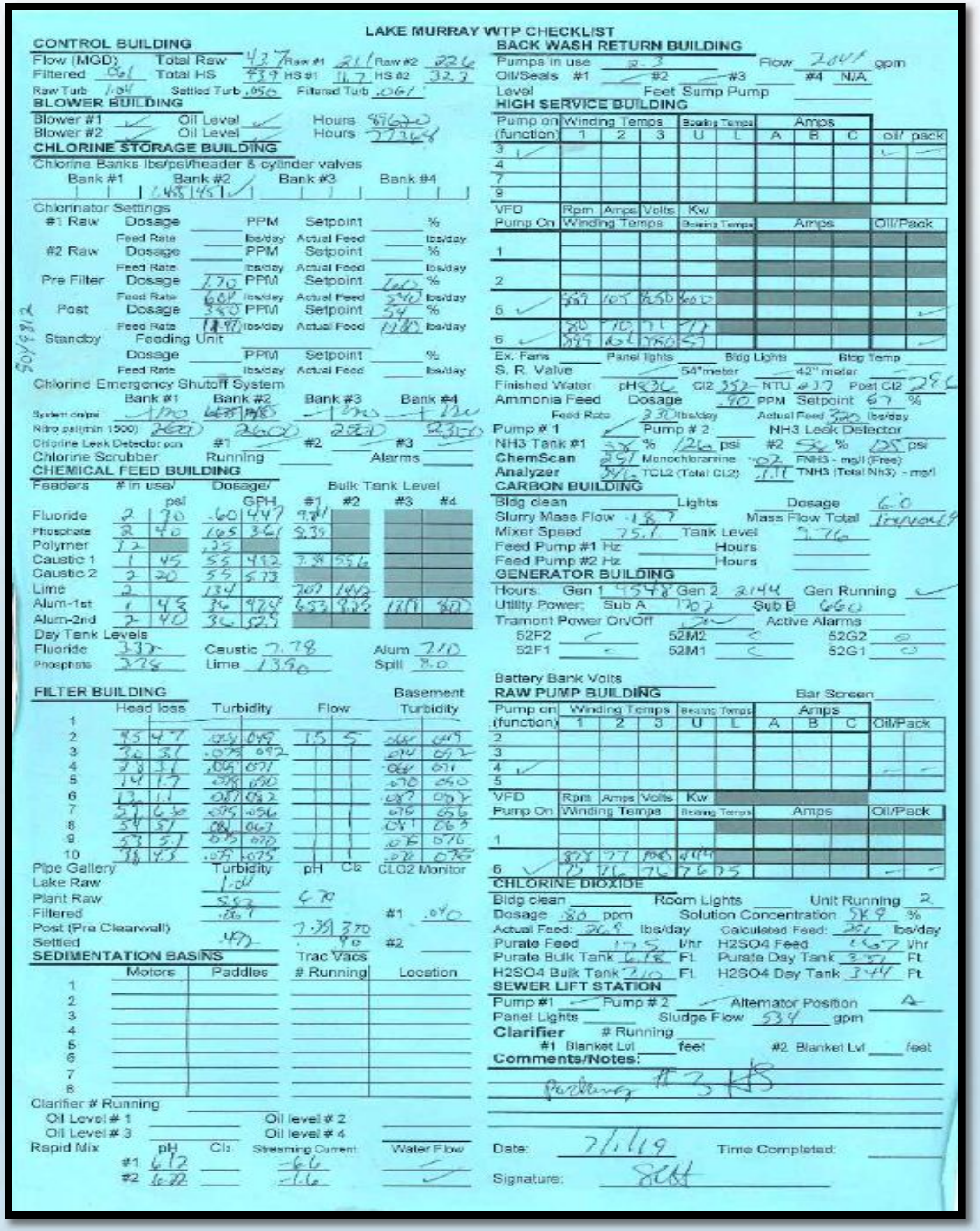


ENSURING ACCURATE AND MEANINGFUL DATA COLLECTION

City of Columbia Lake Murray WTP

Thank you to Adrian Martin.

Previous handwritten form!

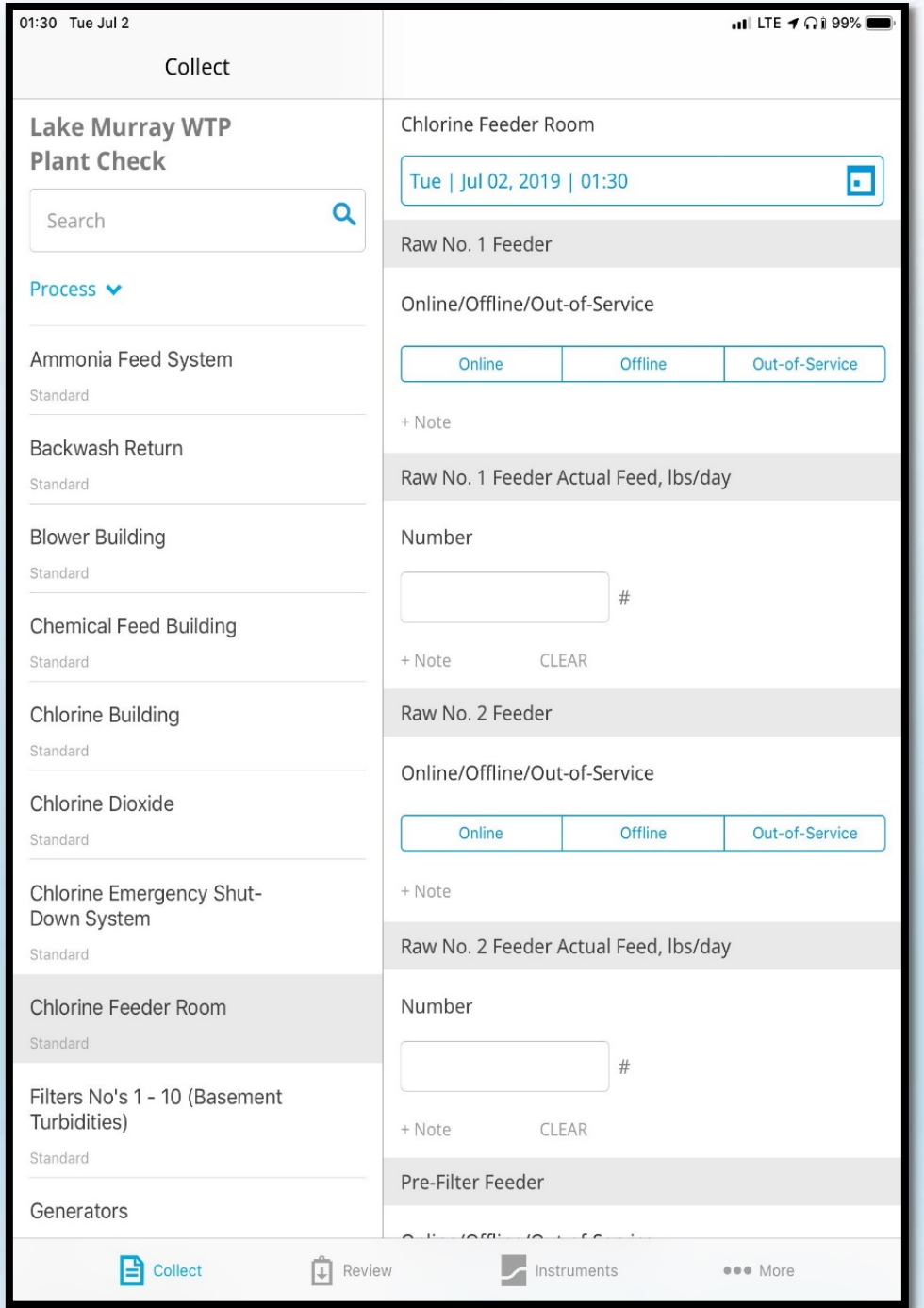


ENSURING ACCURATE AND MEANINGFUL DATA COLLECTION

City of Columbia Lake Murray WTP

Thank you to Adrian Martin.

Mobile Data Entry Form



WASTEWATER

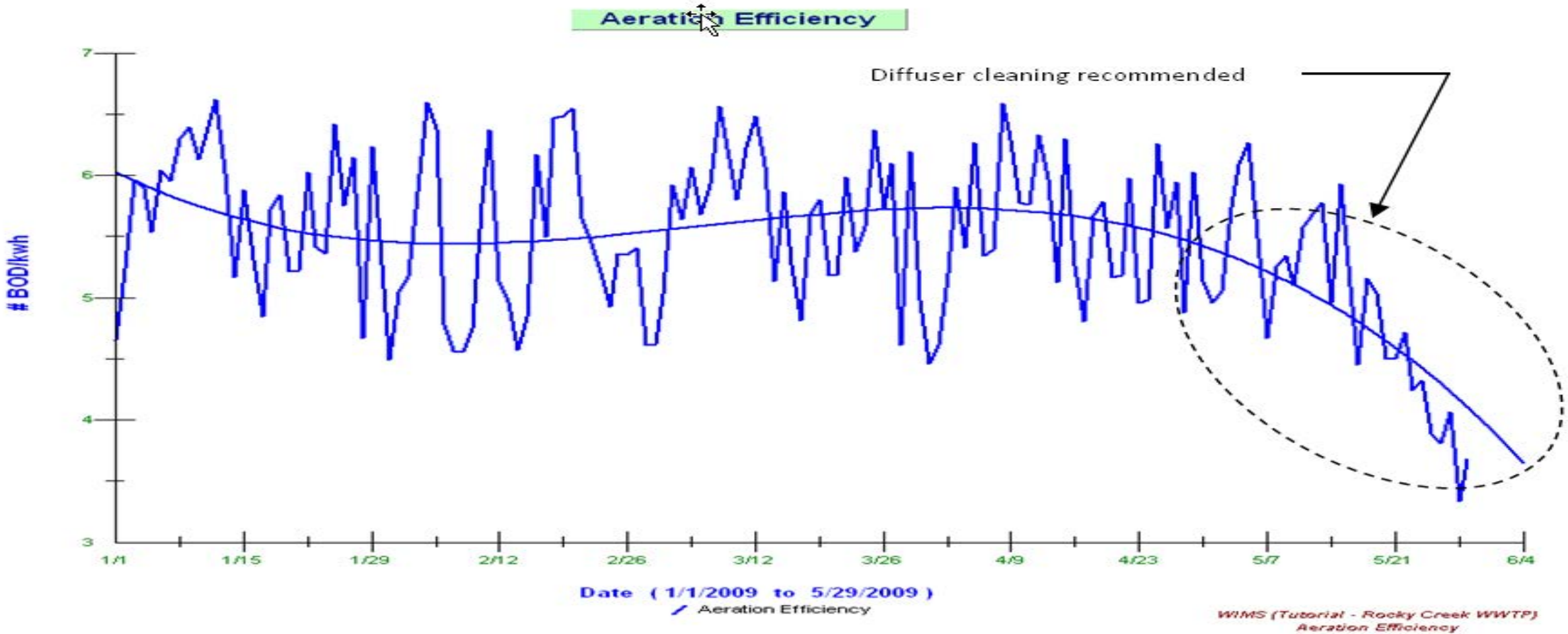
Let’s look at several case studies where Wastewater systems use their SCADA system data in conjunction with all sources of lab & field data thru Water Quality Data Management to review this data, optimize, troubleshoot, and plan at their Wastewater systems.

The goal of these plants is to turn data into knowledge, stay informed, and make data driven decisions.

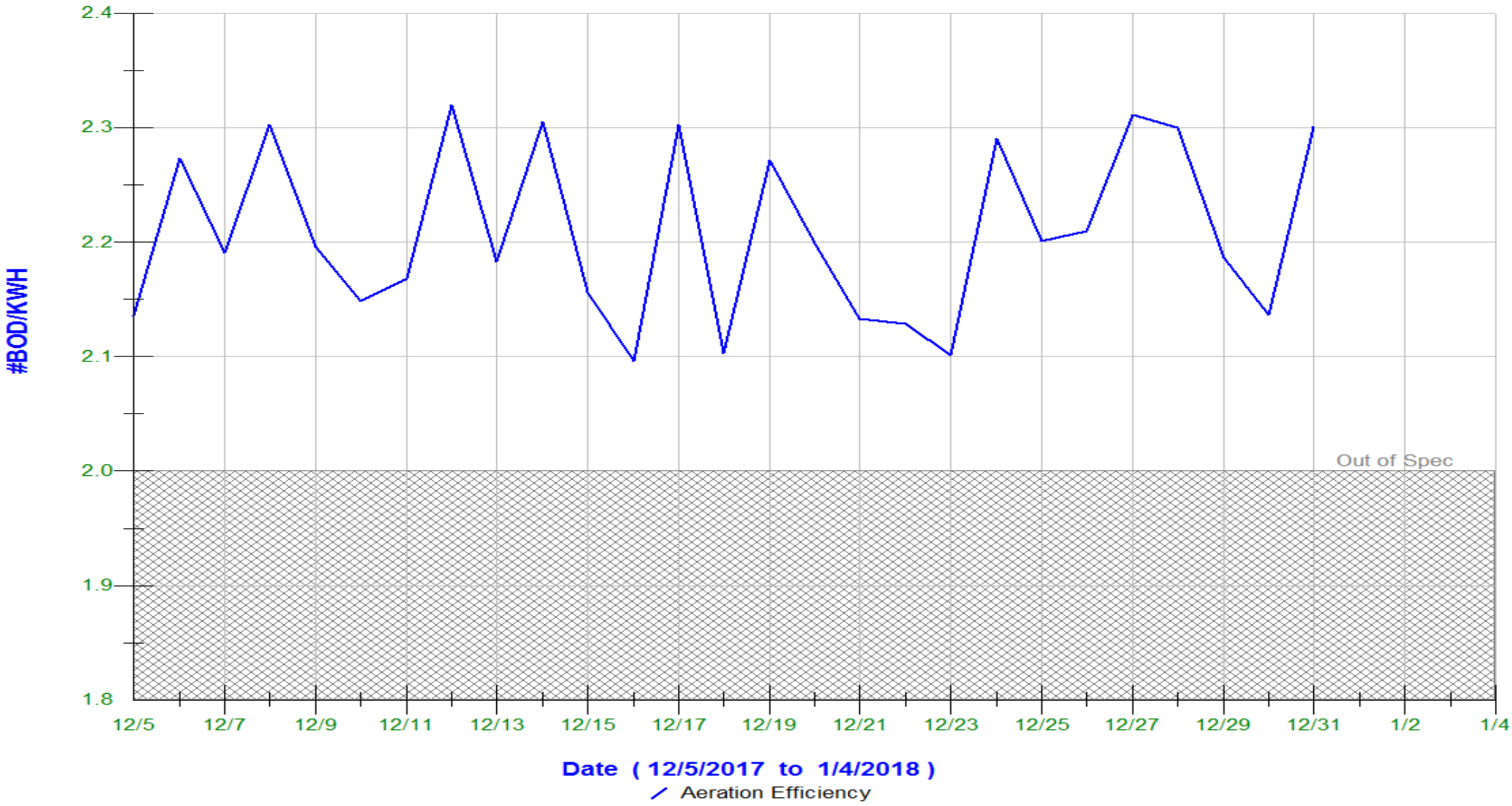
Ask yourself…….What are your Key Performance Indicators?

IMPROVING AERATION EFFICIENCY

Oxygen transfer efficiency is a function of bubble size. The smaller the bubble, the higher the efficiency. Ceramic or membrane diffusers will foul in time, causing the bubble size to increase. To minimize energy used and reduce downtime, it is important to determine when diffusers need to be cleaned. You can use info to determine cleaning cycle by benchmarking pounds of BOD removed per KW of electricity used.



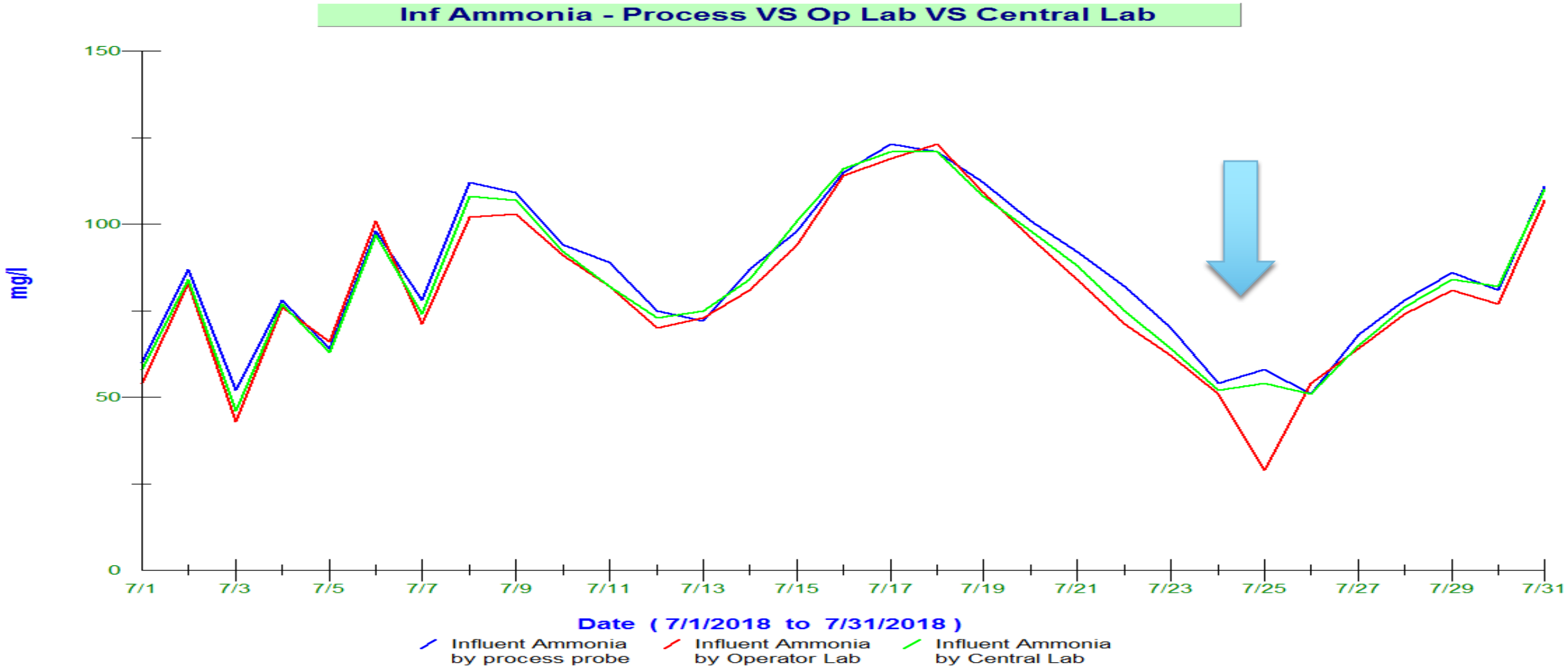
Aeration Efficiency - #BOD vs KWH

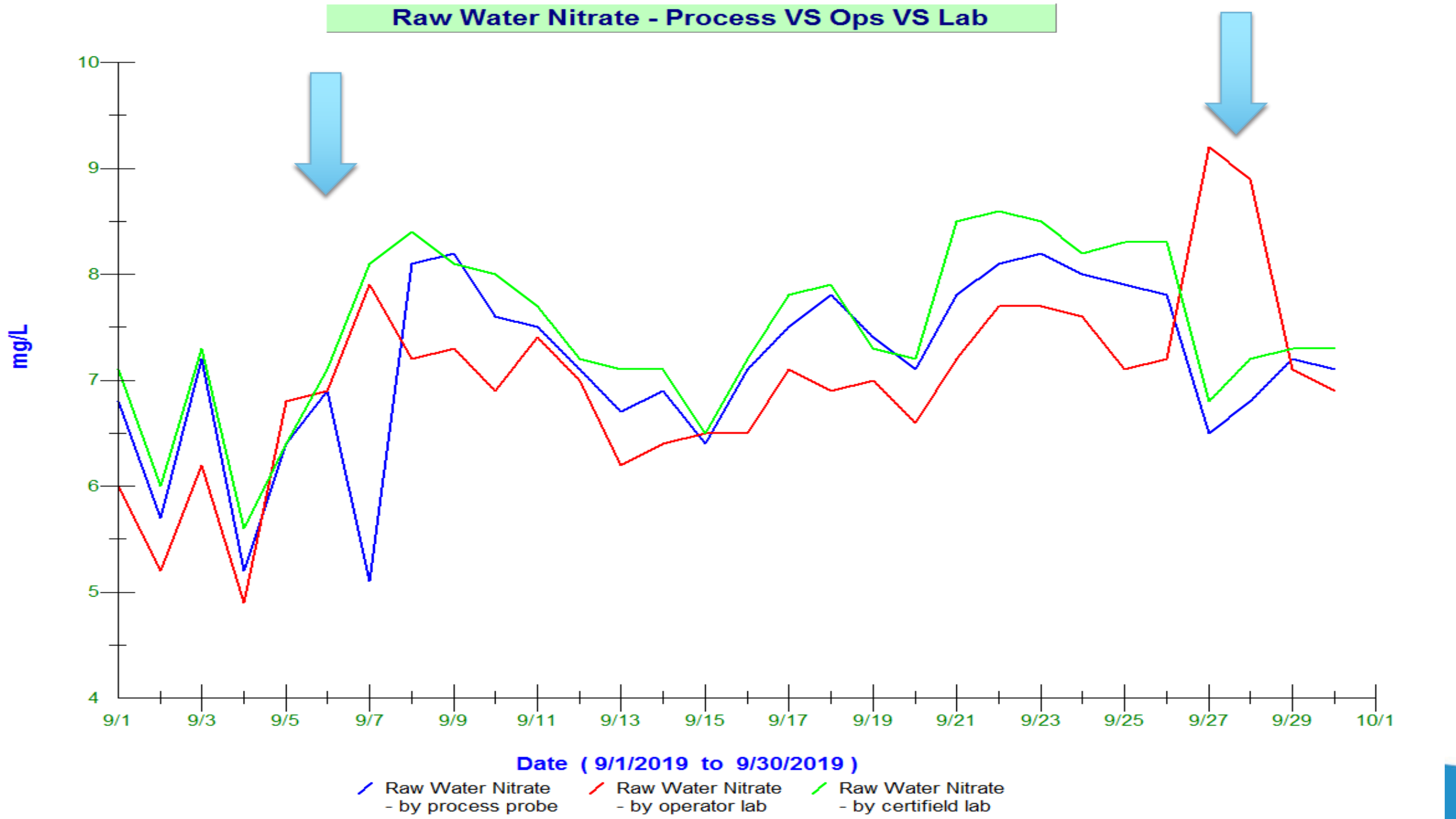


PROCESS CONTROL VERSUS COMPLIANCE

Let’s trend the data from various sources!

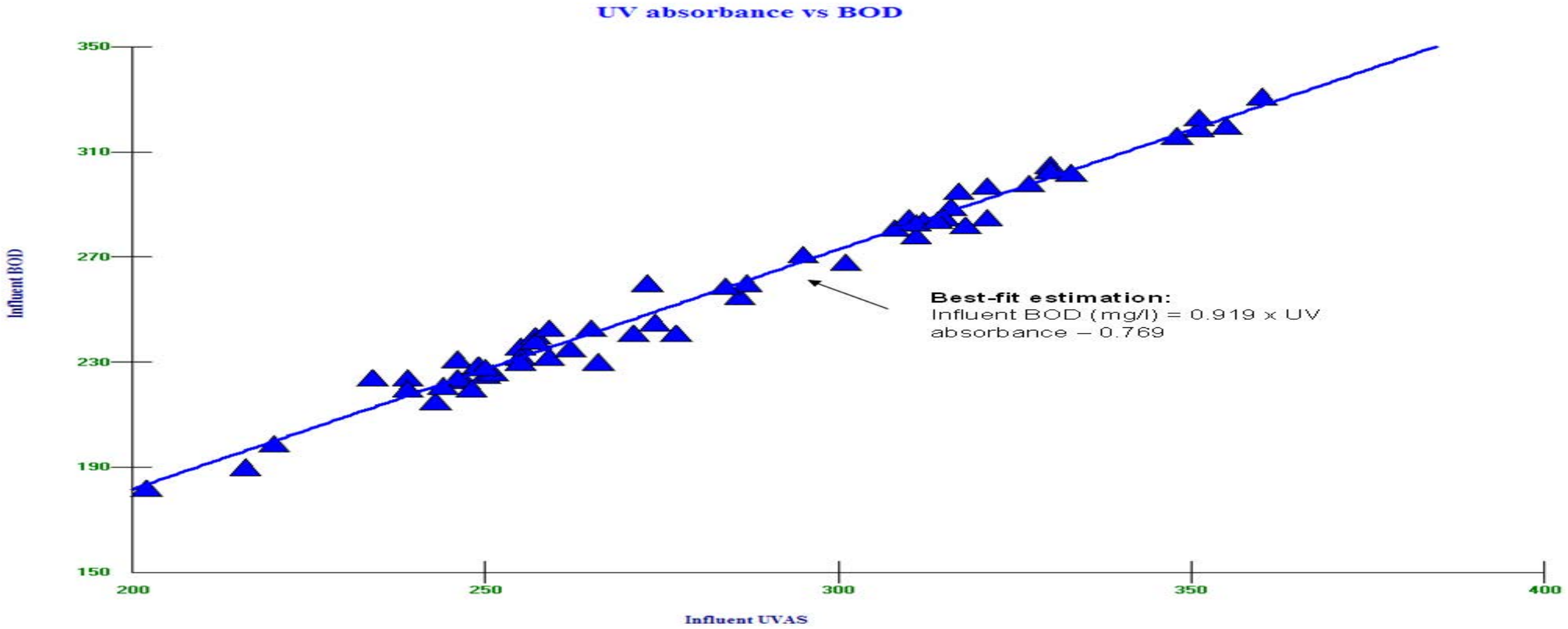
Good lab technique are critical for all sources!

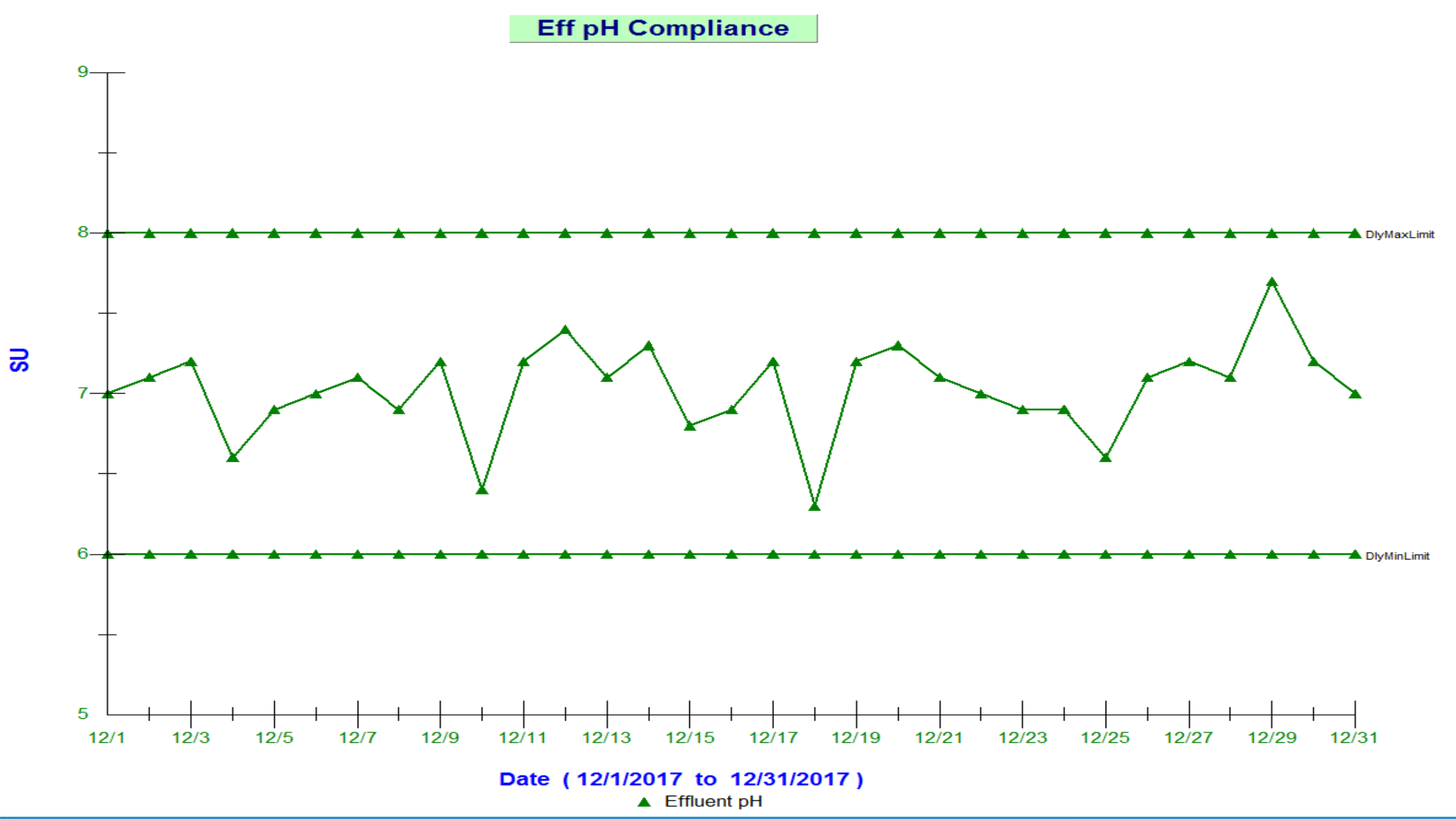



Raw Water Nitrate - Process VS Ops VS Lab
mg/L
10
9
8
7
6
5
4
9/1
9/3
9/5
9/7
9/9
9/11
9/13
9/15
9/17
9/19
9/21
9/23
9/25
9/27
9/29
10/1
Date (9/1/2019 to 9/30/2019)
Raw Water Nitrate - by process probe
Raw Water Nitrate - by operator lab
Raw Water Nitrate - by certifield lab

REAL-TIME ESTIMATION OF BOD

The time-lag in obtaining BOD results, a 5-day lab test, make it challenging for plant operations to adjust treatment processes to adverse levels of BOD. By using powerful statistical tools built into the software, a site-specific correlation between on-line UV absorbance against lab BOD measurements was obtained. The client can now estimate BOD in real-time, allowing for the optimization for treatment processes and avoid potential violations.



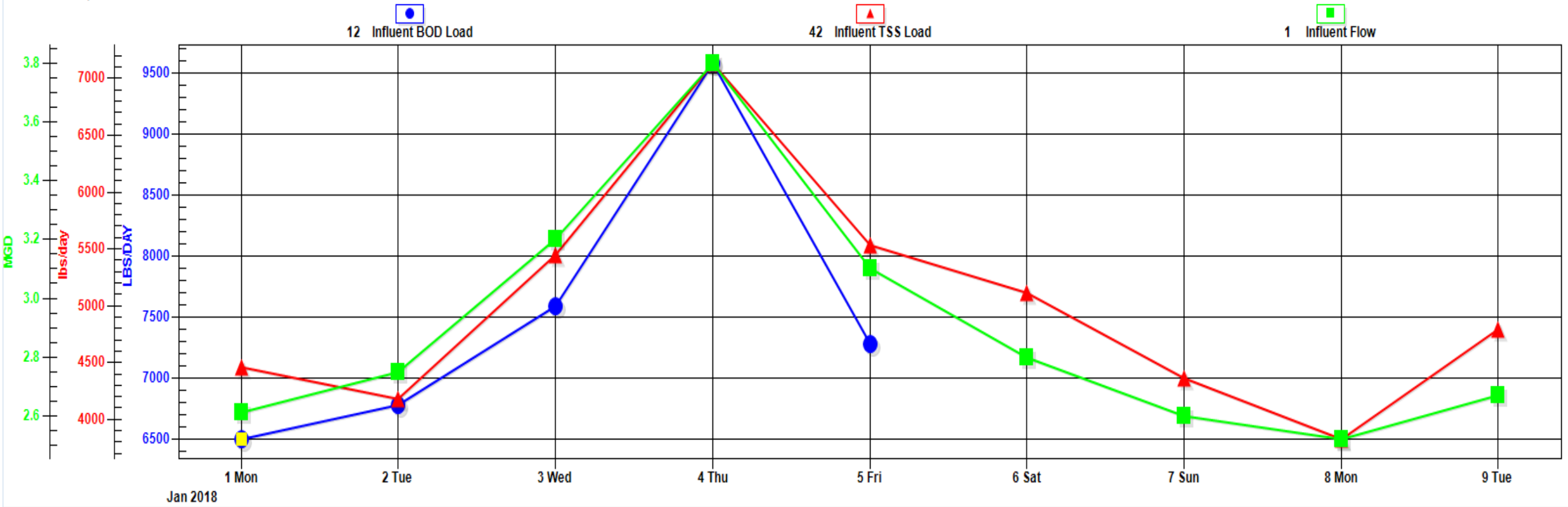

Eff pH Compliance
9
8
7
6
5
SU
DlyMaxLimit
DlyMinLimit
12/1
12/3
12/5
12/7
12/9
12/11
12/13
12/15
12/17
12/19
12/21
12/23
12/25
12/27
12/29
12/31
Date (12/1/2017 to 12/31/2017)
Effluent pH

Multiple Variable Analysis Graph - Var Analysis Graph - Influent loadings

Open | Save | Save As | ‹ Jan 2018 › | Custom | Print | Export | Undo Zoom

1/1/2018 0:00, 6494.463

1/1/2018 - 1/9/2018



... Add | ⇧ | ⇩ | Dim All | Hide All | Remove All

	Variable		Style				12 Influent BOD Load	42 Influent TSS Load	1 Influent Flow	J	K	L
1	12 Influent BOD Load	●	Points+Medium Line	Dim	Hide	Del		0.95998	0.98001			
2	42 Influent TSS Load	▲	Points+Medium Line	Dim	Hide	Del	0.95998		0.95929			
3	1 Influent Flow	■	Points+Medium Line	Dim	Hide	Del	0.98001	0.95929				
4		▼	Points+Medium Line	Dim	Hide	Del						
5		◆	Points+Medium Line	Dim	Hide	Del						

Columbia Water

Drinking Water • Wastewater • Stormwater

Welcome, SMHICKMAN

Regulatory

Laboratory

Operations

Instrumentation

Key Performance Indicators

11/27/2018 thru 12/04/2018	Previous Day	Weekly Avg.	Data Ranges: Normal	Warning	Danger
Influent Flow, MGD	52.85	47.96	35.00 - 60.00	> 60.00	>80.00
T1 SC NH3, mg/L	10.97	9.47	0.00 - 16.74	16.75 - 20	>20.00
T1 SC NO2, mg/L	0.15	0.20	0.0 - 2.5	2.51 - 3.5	> 3.5
T1 Eff TRC, mg/L	1.14	1.09	0.71-1.19	>1.2	<0.7
T2 SC NH3, mg/L	0.09		0.00 - 16.74	16.75 - 20	>20.00
T2 SC NO2, mg/L	0.17	0.82	0.0 - 2.5	2.51 - 3.5	> 3.5
T2 Eff TRC, mg/L	**1.33**	**1.48**	0.71-1.19	>1.2	<0.7
Effluent Flow, MGD	45.80	42.56	25 - 60	< 25	> 60
Eff TRC, mg/L	0.03	0.02	0.00 - 0.09	0.10 - 0.17	> 0.17
Solids Removed, lbs		57,976	> 50,000	< 50,000	< 25,000
Centrifuge Feed % Solids	3.57	3.46	2.50 - 4.50	> 4.50	< 2.50
Centrate % Solids	0.09	**0.14**	0.00 - 0.10	0.11 - 0.20	> 0.20

Budgetary

Lift Stations

IPP

The Wastewater Department collects wastewater from approx. 63,000 approved connections along ~1,000 miles of pipe line both inside the City limits and in portions of both Richland and Lexington Counties. The sewage is treated at the City's Metropolitan Wastewater Treatment Plant. The plant is a biological oxidation extended aeration sewage treatment facility that has a rated capacity of 60 MGD and treats an average of 35 MGD. The wastewater system consists of two major components- the Metro WWTP and the wastewater collection system of piping networks and pump stations. The City maintains more than 50 pump stations and 30,000 manholes.

CITY of COLUMBIA, S.C.
JUSTITIA VIRTUTUM REGINA

We Are Columbia

Operations Dashboard

The Metropolitan Wastewater Treatment Plant for the City of Columbia was originally constructed in 1970 and it has been through three major expansions since the original construction project. After the completion of the 1996 plant expansion the plant capacity was increased to an average design flow rate of 60 mgd. During this construction project the Metro Wastewater Treatment Plant was divided into two treatment trains referred to as Train No. 1 and Train No. 2.

Preliminary Treatment

Digestion

Log Books

Shift Change

Treatment Train No. 1

Treatment Train No. 2

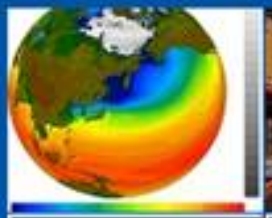
Dewatering

Daily Inspection Entry Form

Disinfection

Gauges

Reports/Graphs



Climate Data

Storage Room

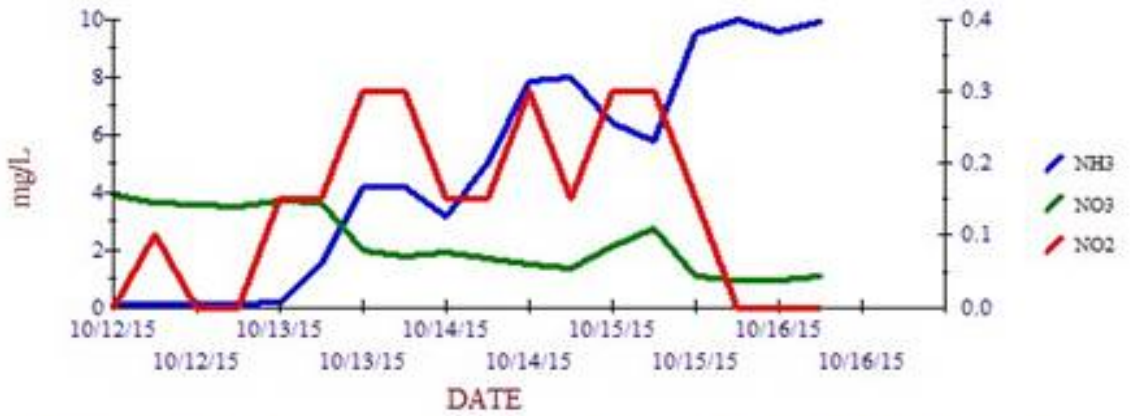
Serious accidents and errors are disproportionately related to shift changes, according to the National Aeronautics and Space Administration. Even if errors at a wastewater treatment plant won't necessarily result in fatalities, miscommunication during shift changes can have a significant impact on the treatment efficiency of the facility. Plant managers and staff must actively prepare for shift changes; planning and structuring the information exchange to ensure all critical details are communicated.

Train 1 Secondary Treatment

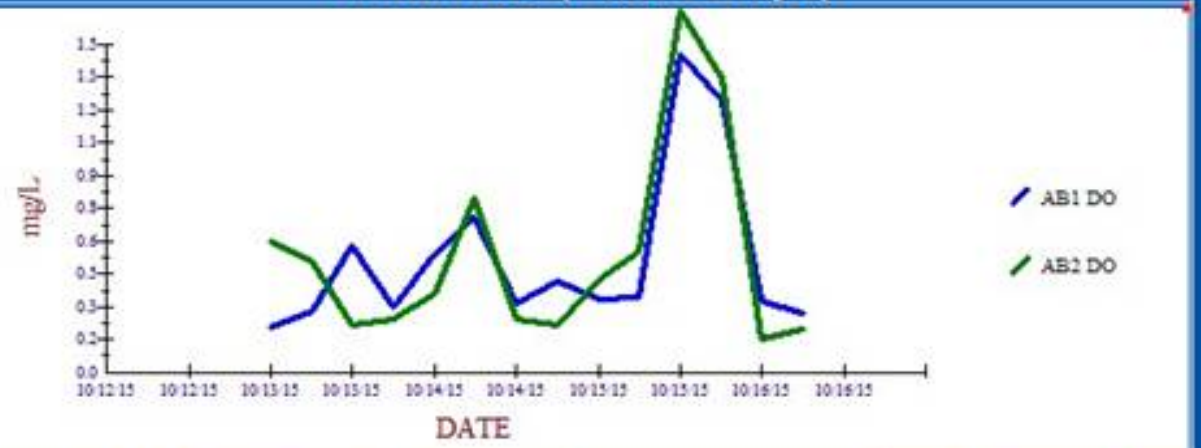
Train 1 WAS Rate	Train 1 MLSS AVG. (Previous Day)	Train 1 MLSS AVG. (Today)	Train 1 Aerators	
			AB1 (South)	AB2 (North)
	2,313			

T1 NH3	T1 NO3	T1 NO2	AB1 ZONE 1	AB1 ZONE 2	AB1 ZONE 3	AB2 ZONE 1	AB2 ZONE 2	AB2 ZONE 3

Train 1 Nitrification (Past 5 Days)



Train 1 DO (Past 5 Days)



Expand

T1 AB1 Alkalinity

T1 AB2 Alkalinity

Expand

← Back Page

Next Page →

SUMMARY

Good Data Management is critical for Water Quality programs from data collection to analysis to reporting from both a utility's reporting and business needs.

Is all of your data in an easy to use format so that it is easily accessible?

Let's turn data into knowledge!

Be informed so you can make data driven decisions!

Thank You

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HACH®

Be Right™