



Observation and Evaluation of Pilot Testing of OVIVO RapidStorm Treatment System at King County

Volume 2: Appendices B–D

Prepared for



King County

September 2021



TETRA TECH

Parametrix

Prepared by



Observation and Evaluation of Pilot Testing of Ovivo RapidStorm Treatment System at King County

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Prepared by



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Parametrix

ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES



CITATION

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- B Pilot Run Packages
- C Photo Library
- D Bench and Jar Test Summary

Appendix B

Pilot Run Packages

Appendix B.1

Test Run Package 01

Run# 1

Run Description Confirm process performance at steady state.

Type	<input checked="" type="checkbox"/> process	<input type="checkbox"/> Performance
Influent water source	<input checked="" type="checkbox"/> PE	<input type="checkbox"/> Hydrant <input type="checkbox"/> Both
Flux rate	<input checked="" type="checkbox"/> Constant	<input type="checkbox"/> Varies

Wasting Rate	0
Air Scour	105 scfm
Backwash Frequency	15 min
Run Duration	24 Hrs
CIP	<input checked="" type="checkbox"/> Hypo <input checked="" type="checkbox"/> Caustic <input type="checkbox"/> Citric
Composite Sample Schedule	23 Samples, 1 hour apart, 200 mL each 4.6 L total volume

Date

List of Field Samples

Effluent grab

Tank probe readings

Temperature Conductivity

List of Westpoint Process Lab (WPPL) samples

Influent composite
- TSS/VSS, Alk, BOD, COD

Effluent composite -TSS/VSS, Alk, BOD

Influent grab
TSS/VSS
Fecal

Effluent grab
TSS/VSS
Chlorine demand
Fecal
Settleable solids

Tank grab TSS/VSS

List of Environmental Lab (KCEL) samples

Influent grab
TOC

Effluent composite TOC

OVIVO Pilot Setpoints Values to be set according to OVIVO's recommendations.

Run# 1

Date _____

Inlet System			Permeate			End of Event			Coagulant		
Screen Off Delay	2	min	Permeate Flow	206	gpm				Pump Start Inf Flow	1	gpm
Weir Gate Frequency	1800	min	Pump Start Level	116	in				Pump Start Level	0.1	in
Weir Gate Duration	30	sec	Pump Stop Level	5	in				Overflow Level	118	in
Blowers			Pump Stop Low Level	100	in				Coagulant Min Flow	0.5	gph
Scour Air Flow	105	scfm	Single Pump Flow	220	gpm				Coagulant Max Flow	10	gph
Blower Start Level	20	in	Backwash Frequency	15	min				Coag Fixed Flow	6.0	gph
Blower Stop Level	8	in	Backwash Flow	300	%				Coag TSS Ratio	0.40	
Lag Blower Start Level	65	%	Pre BW Relaxation	30	sec				Coag Al%	4.1	%
Lag Blower Start Delay	120	sec	Backwash Duration	60	sec				Coag SG	1.34	
Blower Fail Air Flow	4.5	scfm	Post BW Relax Duration	30	sec				Coag Flow Ratio	5	
Blower Fail Delay	140	sec	Perm Static Pressure	1.7	psi				Coag Fill Flow	4	gph
Low Air Flow Alarm	55	%	Turbidity Hi Alarm SP	10	NTU						
Low Air Flow Delay	45	sec	TMP Hi Alarm SP	8	psi						
Override Enabled			Backwash Start TMP	10	psi						
Max Hi TMP Cycles				1							
TMP Reset											
			Perm Tank Level Lo	20	in						
			Air Extractor Frequency	5	min						
			Air Extractor Duration	4	min						
Sodium Hypochlorite			Citric Acid			Caustic			Coagulant Dosing Mode Select		
CIP Permeate Flow	100	gpm	CIP Permeate Flow	100	gpm	CIP Permeate Flow	100	gpm	Fixed Flow		
Backwash Perm Flow	200	gpm	Backwash Perm Flow	200	gpm	Backwash Perm Flow	100	gpm	TSS		
Hypochlorite Flow	100	gph	Citric Flow	28	gph	Caustic Flow	50	gph	Perm Flow		
Pre CIP Relax Duration	30	sec	Pre CIP Relax Duration	30	sec	Pre CIP Relax Duration	30	sec			
Chem Flow Duration	10	min	Chem Flow Duration	10	min	Chem Flow Duration	10	min			
Soak Duration	30	min	Soak Duration	999	min	Soak Duration	30	min			
Rinse Duration	60	sec	Rinse Duration	60	sec	Rinse Duration	60	sec			
Final Relax Duration	60	sec	Final Relax Duration	60	sec	Final Relax Duration	60	sec			
Pre-Drain Disabled			Pre-Drain Disabled			Pre-Drain Disabled					

P1/2

Daily Field Notes

Run
Cond

1

Process and Performance Testing

Date	Time	Observation	Action Item
9/3	0725 hrs 8:22	Started pilot on PE inlet box pH = 7.1, membrane basin = 7.2	
	09:27 8:35 9:00 9:05	Noted foam (light white) in membrane tank started composite samplers (infl & ept) - both sampler reservoirs collected TOC (KCEL) collected E. coli (WPP-PL)	fitted with crushed ice
10:08		Increased the coag dose ratio 0.4 → 0.8 based on current fouling rate. Will monitor pH and adjust caustic addition to maintain pH > 6.5	
10:28		pH @ 6.6 - increased caustic addition from 4% → 8% (1.9 gph)	7% (3.9 gph)
10:33		pH @ 6.3 in inlet box so increased caustic to 10% (5 gph)	
	11:00	infl. pH = 6.83, 22.6°C	
12:01		reduced Caustic addition 10% → 4% (~2 gph) current pH = 7.2 (want to control @ around 6.5)	(0.9 gph)
13:47		reduced Caustic addition 4% → 2% (0.9 gph)	
16:36		Increased Caustic addition 2% → 4% (~2 gph) pH = 6.17	
16:40		Observation - reduction in foam (staying in membrane tank)	
19:10 hrs		Transferred caustic suction to new 55-gal drum and primed for 30 sec.	

P2/
2

Daily Field Notes

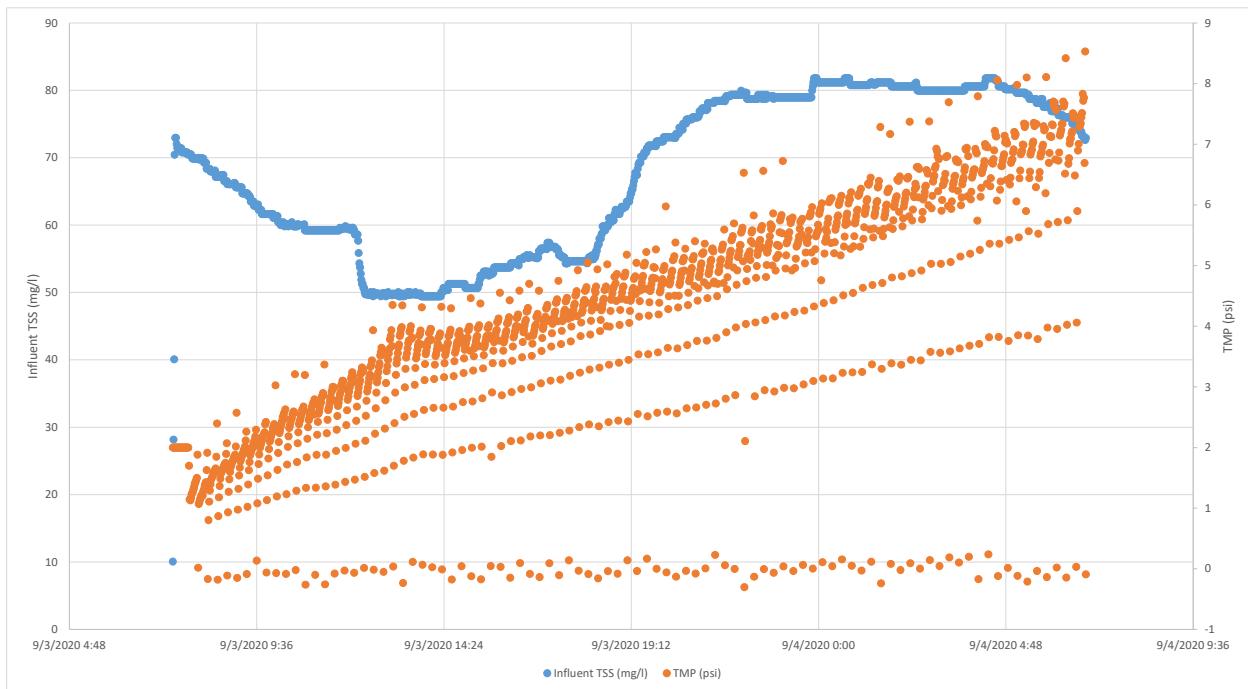
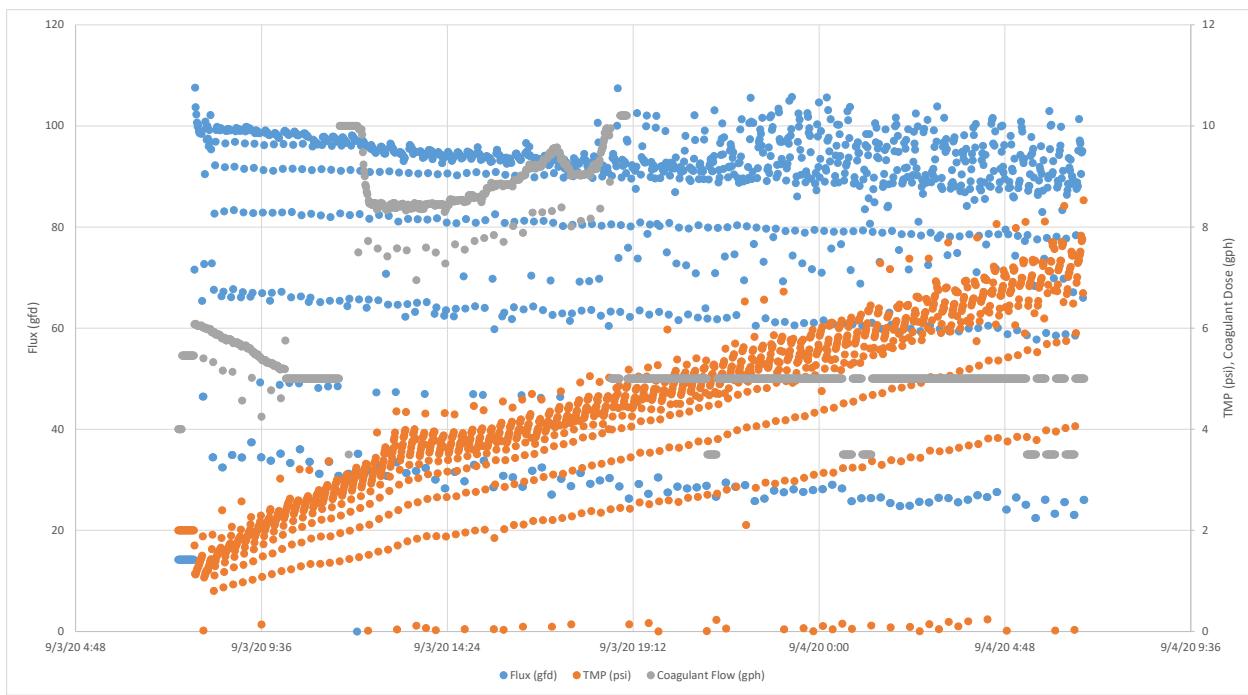
Run

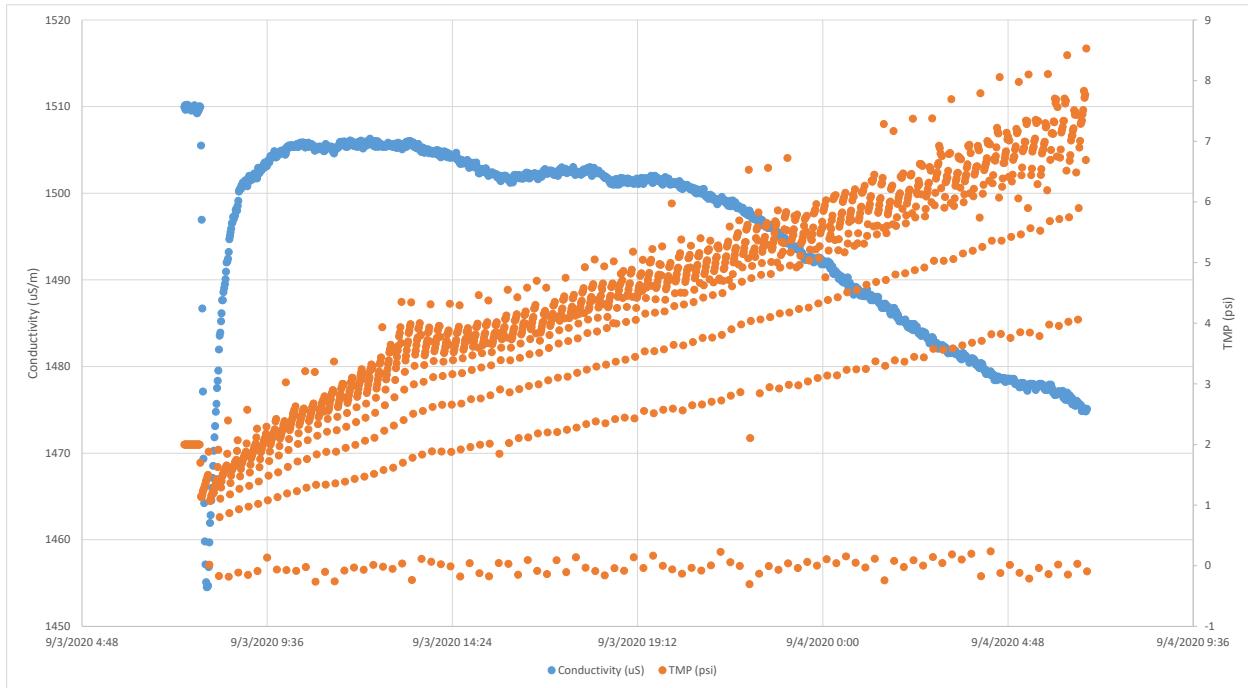
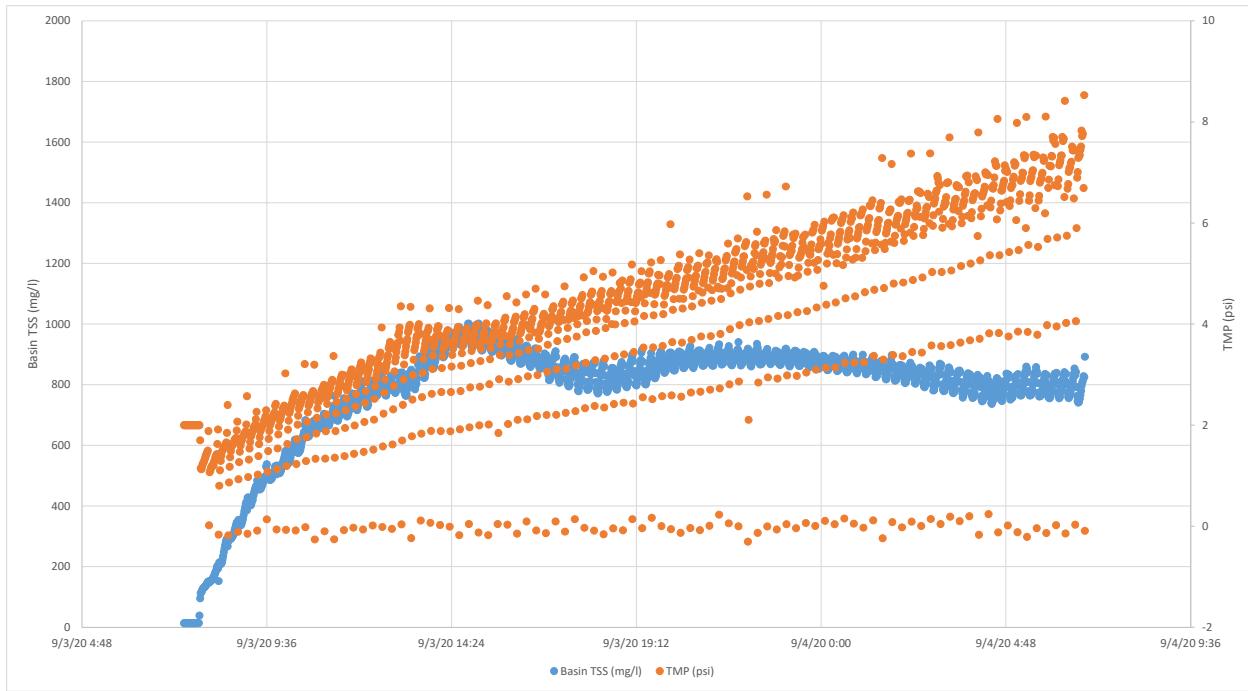
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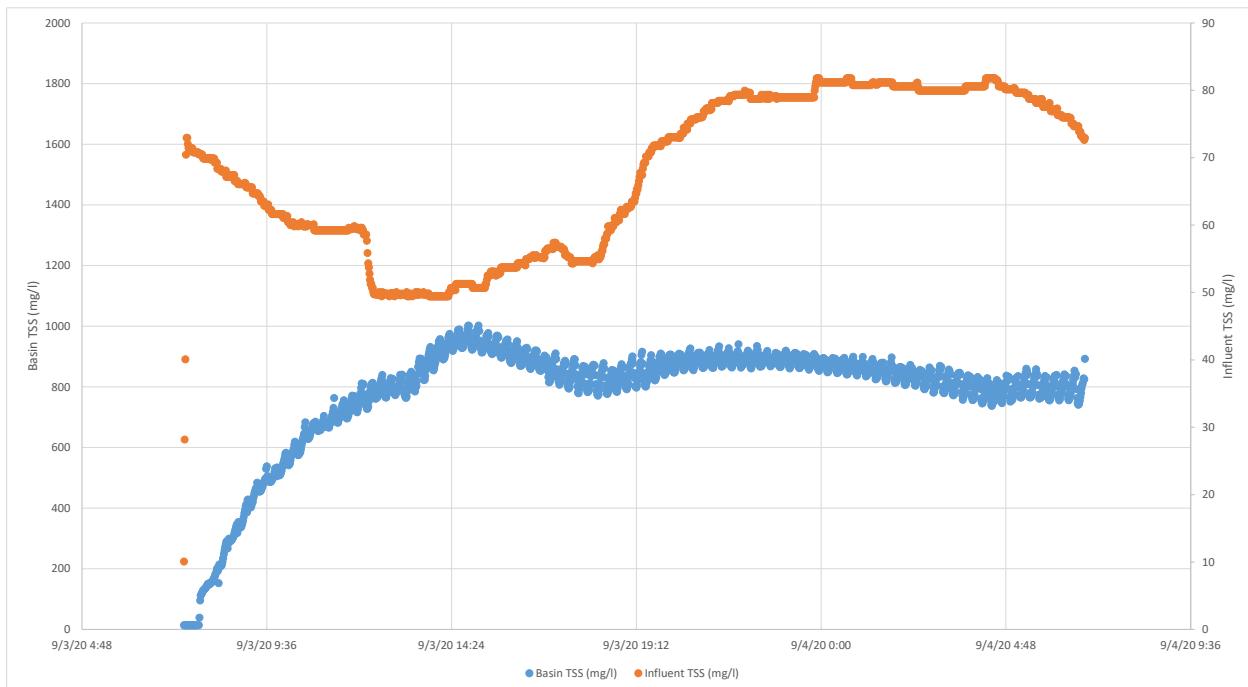
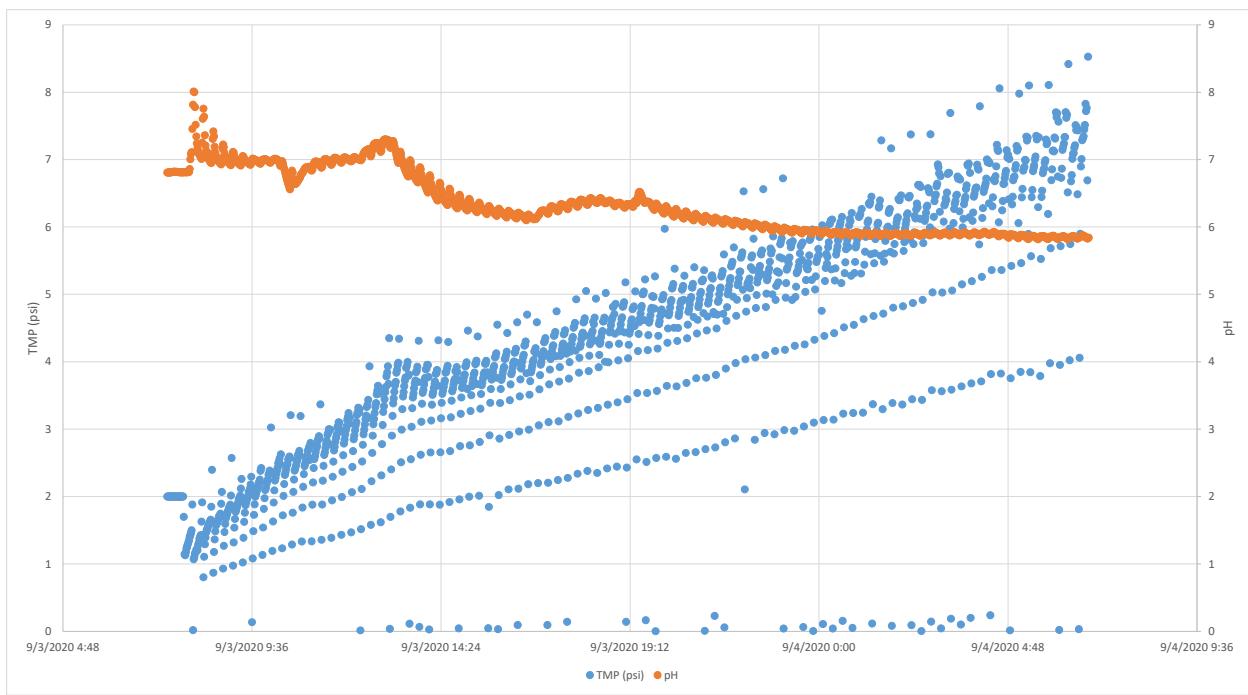
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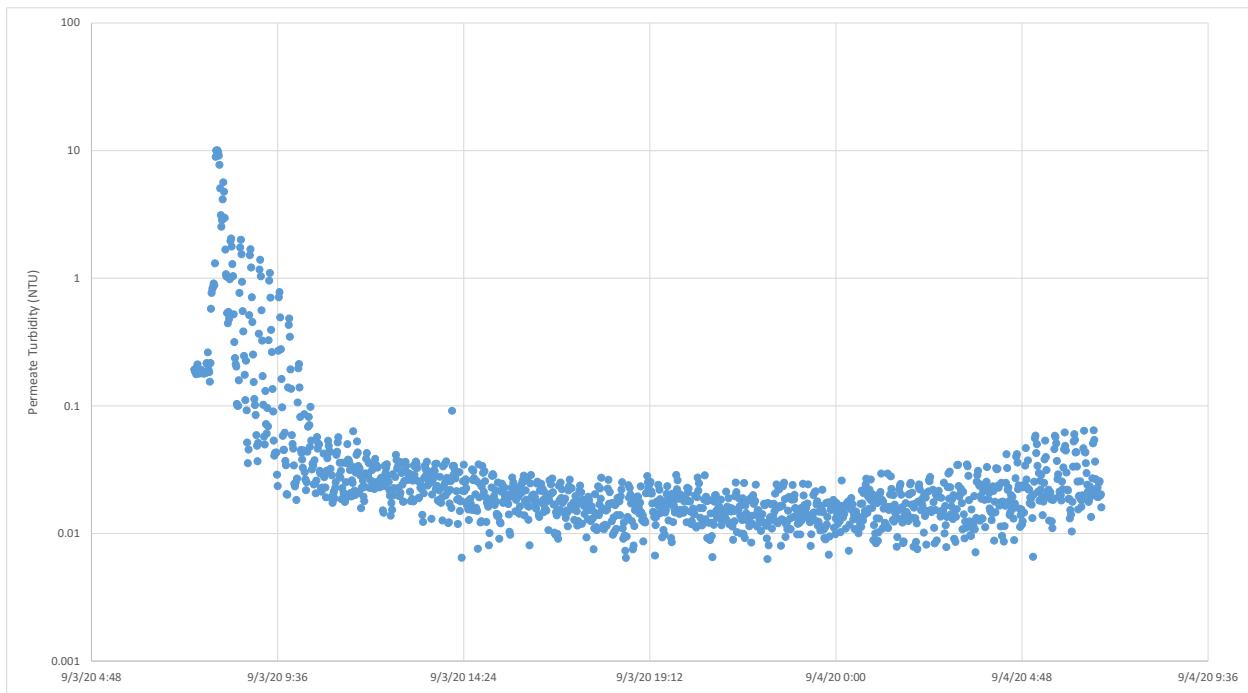
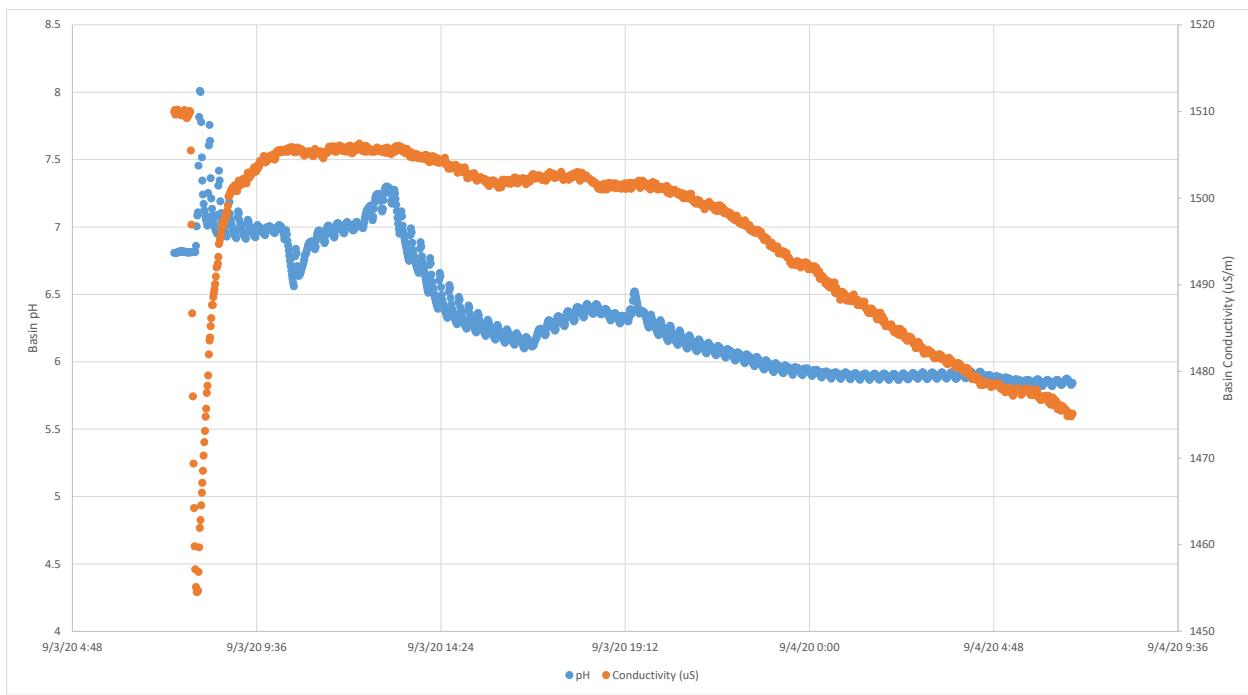
Process and Performance Testing

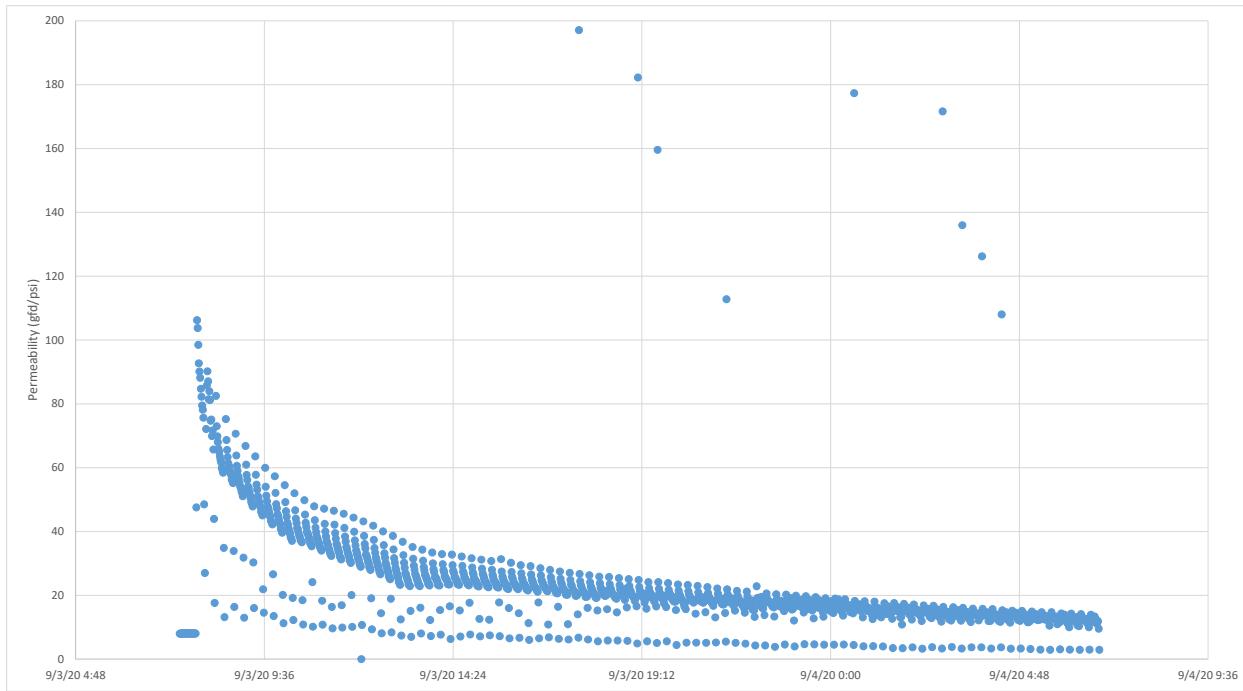
Date	Time	Observation	Action Item
9/4	0831	Setting up to secure pilot - noticed TMP @ 8.0 and pilot continues to run (need to check that TMP S/D setting)	
	0835	Revised CIP Soak period from 30 min → 999 min based on membrane TMP	
	0835	Noted minimal (normal) foam in membrane tank - approx 1 ft thick	
	0836	Troubleshooting high TMP alarming - numerous alarms in Alarm History	
	0852	HTI TMP - stopped filtration. Reset TMP pressed but pilot start on ran momentarily then S/D (TMP = 1.2 psi)	
	0855	Initiated End-of-Event CIP (hypochlorite) using setpts from run sheet. *Revised soak period from 30 min to 999 min	
	0900	Transported samples to process laboratory. The effluent composite sampler failed to operate correctly (only 100 ml sample)	











OVIVO PILOT TESTING

WO # C165282

Day		# of samples	Sample Frequency	Thu			
Sample Date	Unit			9/3/2020			
S1-G	Military Time (hours)			1105			
TSS	mg/L	1	1/run	23			
VSS	mg/L	1	1/run	19			
tCOD	mg/L			333			
sCOD	mg/L			143			
BOD	mg/L			156			
Alkalinity	mg/L			193			
Fecal Coliform Sample ID				#1	#2		
Fecal Coliform Sample Time				1105	9/4/2020 0710		
Fecal Coliform	MPN/100mL	2	2/run	9,200,000	7,800,000		
S1-C	Military Time (hours)						
TSS	mg/L	1	hourly	30			
VSS	mg/L	1	hourly	27			
Alkalinity	mg/L	1	hourly	198			
COD	mg/L	1	hourly	321			
BOD	mg/L	1	hourly	156			
S2-G	Military Time (hours)			1105			
TSS							
VSS							
Cl2 Demand	mg/L	1	1/run	2.83			
SS	ml/l	1	1/run	0			
Alkalinity	mg/L			131			
COD	mg/L			141			
sCOD	mg/L			137			
Fecal Coliform Sample ID				#1	#2	#3	#4
Fecal Coliform Sample Time				905	1110	1300	9/4/2020 0715
Fecal Coliform	MPN/100mL	4	4/run	24,000,000	0	0	0
S2-C	Military Time (hours)						
TSS	mg/L	1	hourly	0			
VSS	mg/L	1	hourly	0			
Alkalinity	mg/L	1	hourly	50			
UV Abs	cm ⁻¹	1	hourly	0.248			
BOD	mg/L	1	hourly	Not enough sample			
S3-G	Military Time (hours)			1105			
TSS	mg/L	1	1/run	1560			
VSS	mg/L	1	1/run	825			
Alkalinity	mg/L			225			
COD	mg/L	1	1/run	1735			
sCOD	mg/L	1	1/run	154			
S3-G, Flow Box	Military Time (hours)						
TSS	mg/L	1	1/run				
VSS	mg/L	1	1/run				
Alkalinity	mg/L						
COD	mg/L	1	1/run				
sCOD	mg/L	1	1/run				

Date 9/4/2020
Ovivo Run # Ovivo Dose Strategy Development
Conditions

Influent (S1) Sequential Sampler

Sample #		Grab Sample Time	Date Stamp	Sample ID	Laboratory Analysis					Comments
					tCOD	TSS	VSS	ALK	BOD	
1		7:30	9/3/2020	S1-1	311					
2		11:30	9/3/2020	S1-2	238					
3		13:30	9/3/2020	S1-3	244					
4		17:30	9/3/2020	S1-4	372					
5		22:30	9/3/2020	S1-5	379					
6		4:30	9/4/2020	S1-6	373					

Effluent (S2) Composite Sampler

Sample #	Start Time	End Time		Sample Lab ID	Laboratory Analysis					Comments
					tCOD	TSS	VSS	ALK	BOD	

Date	Location	Time	TOC (mg/L)
9/3/2020	Inf	9:00	46.3
		11:05	63.4
		12:55	56.1
		15:00	51.7
		19:00	63.2
		23:00	86.3
		3:00	89.8
		7:10	81.8
9/3/2020	Eff	11:10	37.3

Appendix B.2

Test Run Package 02

Run#

Run Description Confirm process performance with variable water quality

Type	<input checked="" type="checkbox"/> process	<input type="checkbox"/> Performance
Influent water source	<input checked="" type="checkbox"/> PE	
	<input checked="" type="checkbox"/> Hydrant	
	<input checked="" type="checkbox"/> Both	
Flux rate	<input checked="" type="checkbox"/> Constant	
	<input type="checkbox"/> Varies	

Wasting Rate	0
Air Scour	105 scfm
Backwash Frequency	15 min
Run Duration	12 Hrs
CIP	<input checked="" type="checkbox"/> Hypo <input checked="" type="checkbox"/> Caustic <input type="checkbox"/> Citric
Composite Sample Schedule	11 Samples, 1 hour apart, 400 mL each 4.4 L total volume

Date

Field
Eff
Turbidity
Probe reading
pH
Temperature
Conductivity

WPPLsamples
Influent composite
Effluent composite
-TSS/VSS, Alk, BOD
Influent grab
TSS/VSS
Fecal
Effluent grab
TSS/VSS
Chlorine demand
Fecal
Settleable solids
Tank grab
TSS/VSS

KCEL

Influent grab
TOC

Effluent composite
TOC

OVIVO Pilot Setpoints Values to be set according to OVIVO's recommendations.

Run# <u>2</u>		Date	FLOW OPTIMIZATION			CHEM DOSING		
System	ONLINE/OFFLINE		Permeate		End of Event	Coagulant		
Inlet System			Permeate Flow	206	gpm	Pump Start Inf Flow	1	gpm
Screen Off Delay	2	min	Pump Start Level	116	in	Pump Start Level	0.1	in
Weir Gate Frequency	1800	min	Pump Stop Level	5	in	Overflow Level	118	in
Weir Gate Duration	30	sec	Pump Stop Low Level	100	in	Coagulant Min Flow	0.5	gph
Blowers			Single Pump Flow	220	gpm	Coagulant Max Flow	20	gph
Scour Air Flow	105	scfm	Backwash Frequency	15	min	Coag Fixed Flow	6.0	gph
Blower Start Level	20	in	Backwash Flow	300	%	Coag TSS Ratio	0.40	
Blower Stop Level	8	in	Pre BW Relaxation	30	sec	Coag AI%	4.1	%
Lag Blower Start Level	65	%	Backwash Duration	60	sec	Coag SG	1.34	
Lag Blower Start Delay	120	sec	Post BW Relax Duration	30	sec	Coag Flow Ratio	5	
Blower Fail Air Flow	4.5	scfm	Perm Static Pressure	1.7	psi	Coag Fill Flow	8	gph
Blower Fail Delay	140	sec	Turbidity Hi Alarm SP	10	NTU			
Low Air Flow Alarm	55	%	TMP Hi Alarm SP	8	psi			
Low Air Flow Delay	45	sec	Backwash Start TMP	10	psi			
Override Enabled			Max Hi TMP Cycles	1				
TMP Reset								
Sodium Hypochlorite			Perm Tank Level Lo	20	in	Membrane Basin Drain Vlv		
CIP Permeate Flow	100	gpm	Air Extractor Frequency	5	min	WAS Vlv Open TSS	6,000	mg/l
Backwash Perm Flow	200	gpm	Air Extractor Duration	4	min	WAS Vlv Close Lvl	117	in
Hypochlorite Flow	100	gph			WAS Valve Duration	0	sec	
Pre CIP Relax Duration	30	sec	Citric Acid					
Chem Flow Duration	10	min	CIP Permeate Flow	100	gpm	CIP Permeate Flow	100	gpm
Soak Duration	999	min	Backwash Perm Flow	200	gpm	Backwash Perm Flow	100	gpm
Rinse Duration	60	sec	Citric Flow	28	gph	Caustic Flow	50	gph
Final Relax Duration	60	sec	Pre CIP Relax Duration	30	sec	Pre CIP Relax Duration	30	sec
			Chem Flow Duration	10	min	Chem Flow Duration	10	min
			Soak Duration	999	min	Soak Duration	999	min
			Rinse Duration	60	sec	Rinse Duration	60	sec
			Final Relax Duration	60	sec	Final Relax Duration	60	sec
Pre-Drain Disabled			Pre-Drain Disabled			Pre-Drain Disabled		

Daily Field Notes

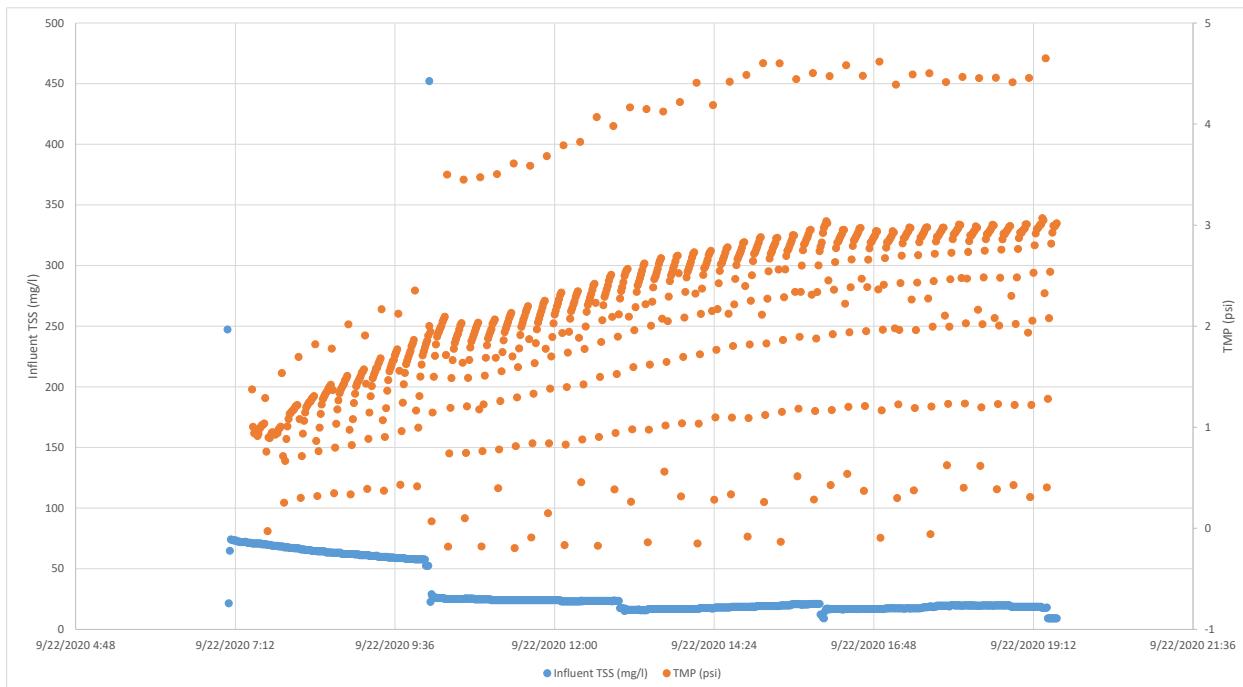
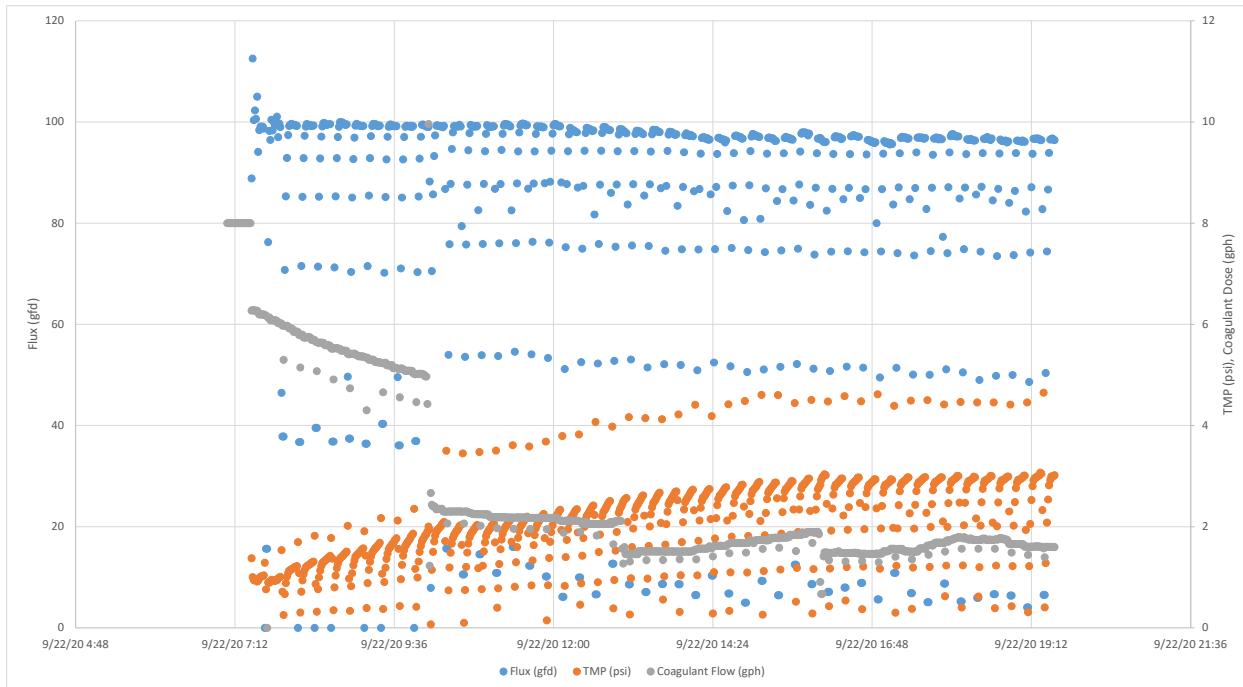
Run

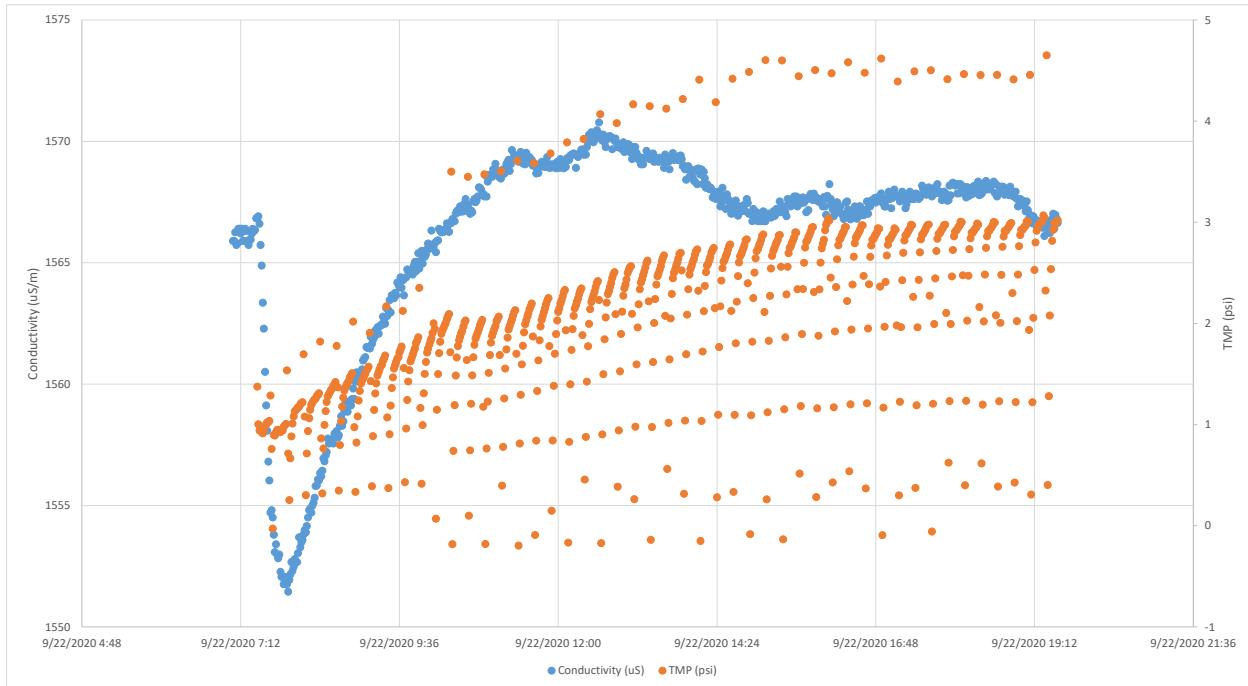
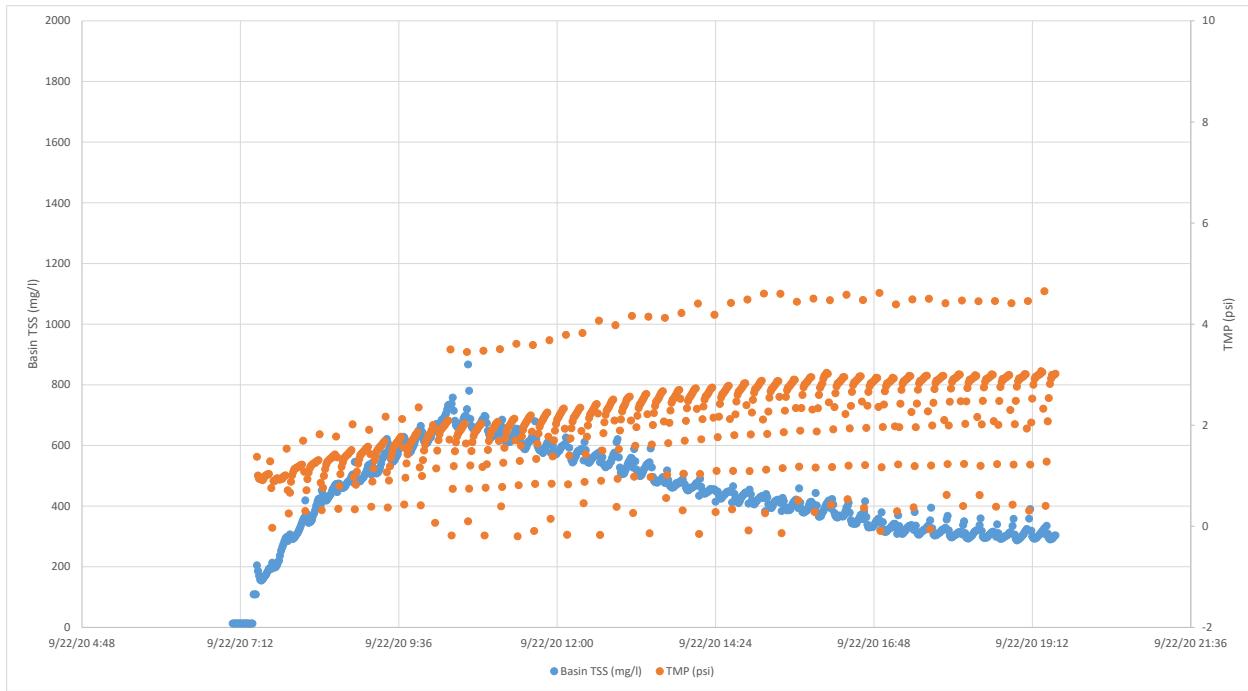
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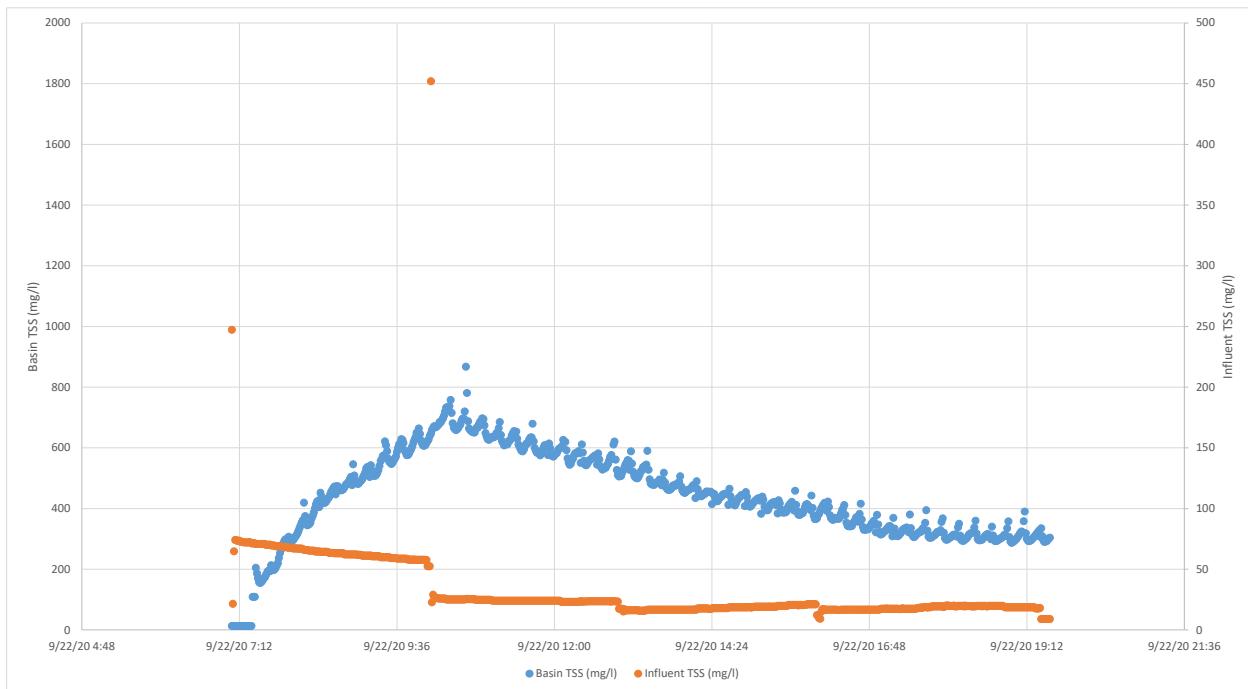
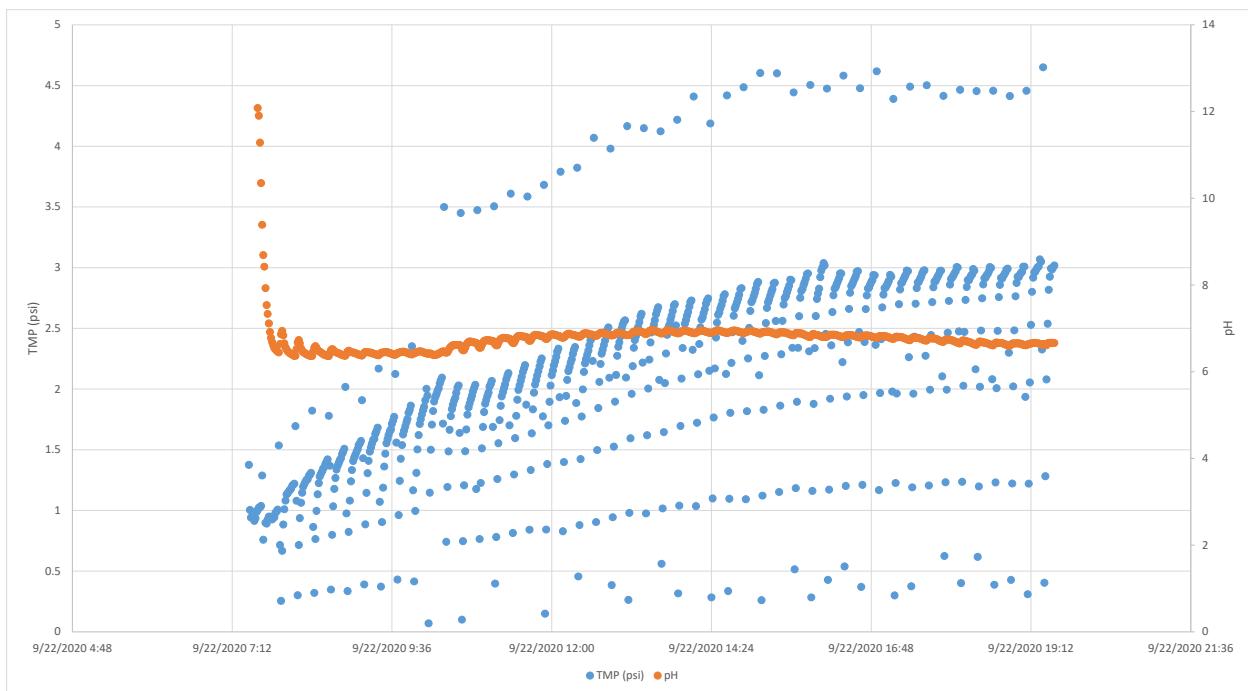
Cond

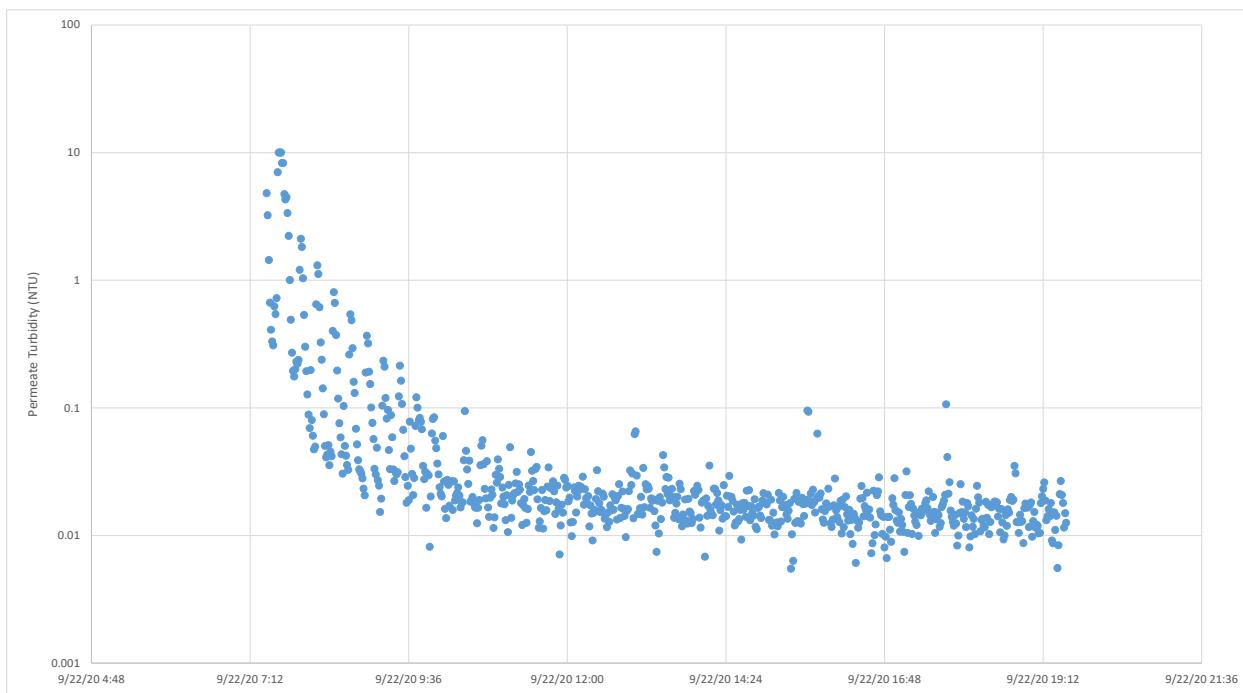
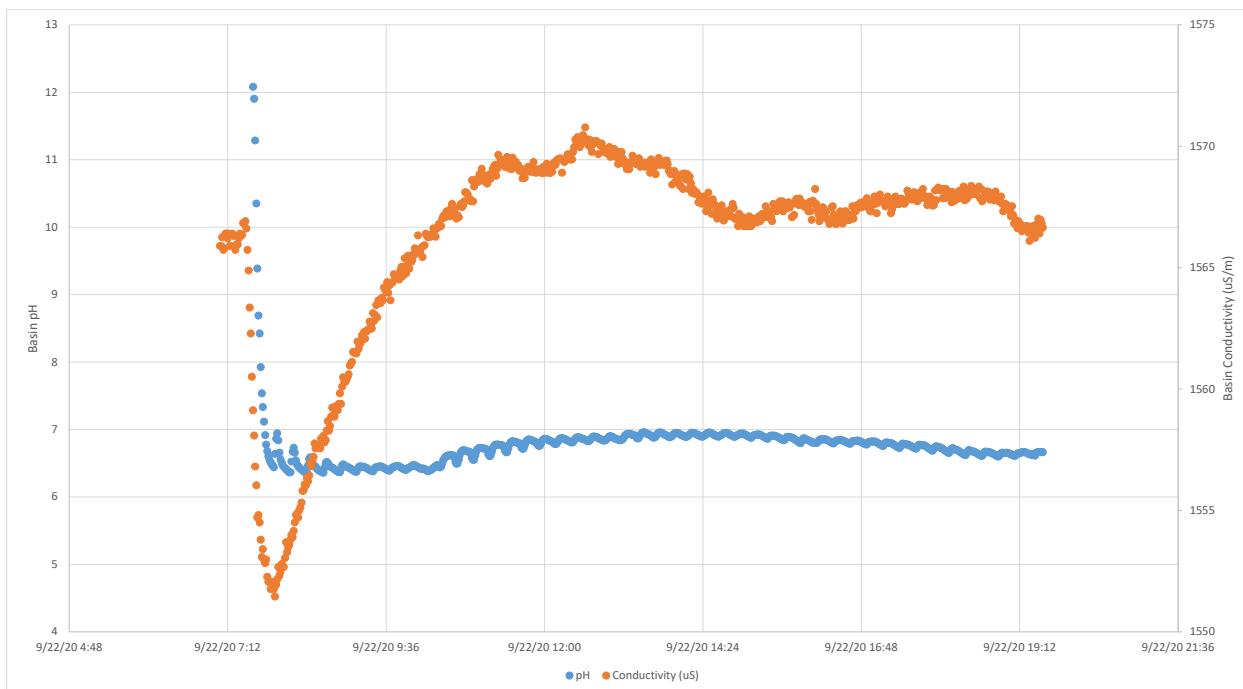
Process and Performance Testing

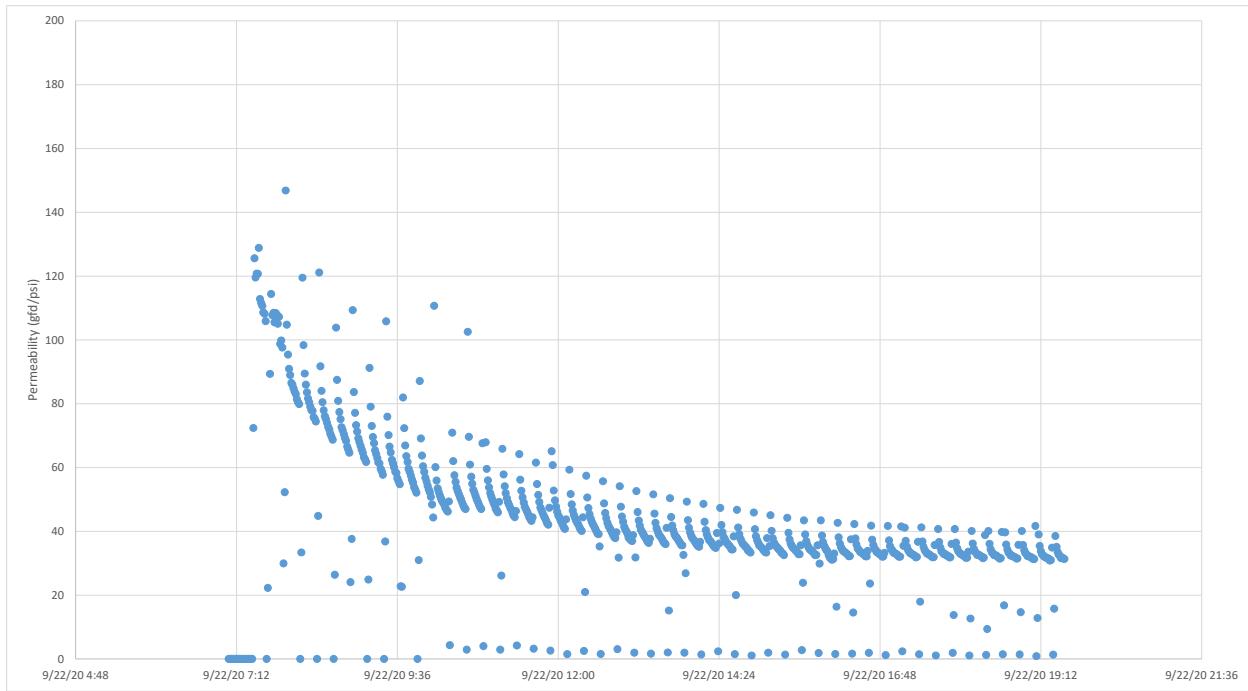
Date	Time	Observation	Action Item
9/22	0646	Open membrane tank drain (level at +1%)	
	0650	Closed membrane tank drain open permeate tank drain - start with empty tank	
	0700	Initial flow to pit (PE only)	
	0707	Closed permeate drain valve.	
	8:00	Started composite samplers - both -	
	8:30	collected int. found TOC	KCEL P72337-1
	9:50	Mixed lots of foam	
see below	10:30	Secure pit feed and initial EOC CIP (hypochlorite) Hydroant water	
	12:35	Handheld turbidimeter	
	10:30	Jiffy check pH = 7.4 T = 20 °C, conductivity = 932 µS	
	11:35	Membrane tank field check, pH = 7.93, T = 21 °C, conductivity = 1120 µS	
	11:40	EFE field check pH = 7.02, T = 20.8 °C conductivity = 1134 µS	
	12:55	handheld turb = 0.16 NTU, online reading = 0.011 NTU	
	13:25	rec. eff composite from 100 mL → 1000 mL	

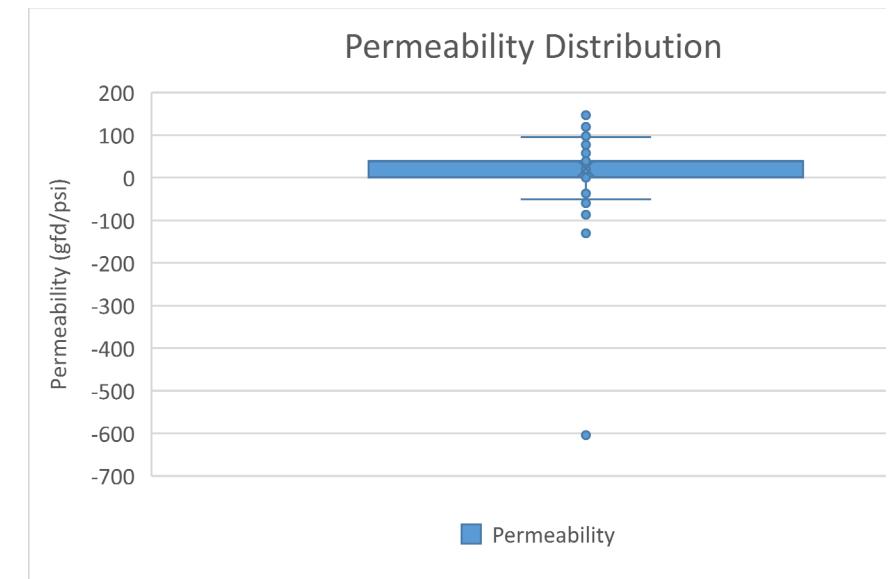
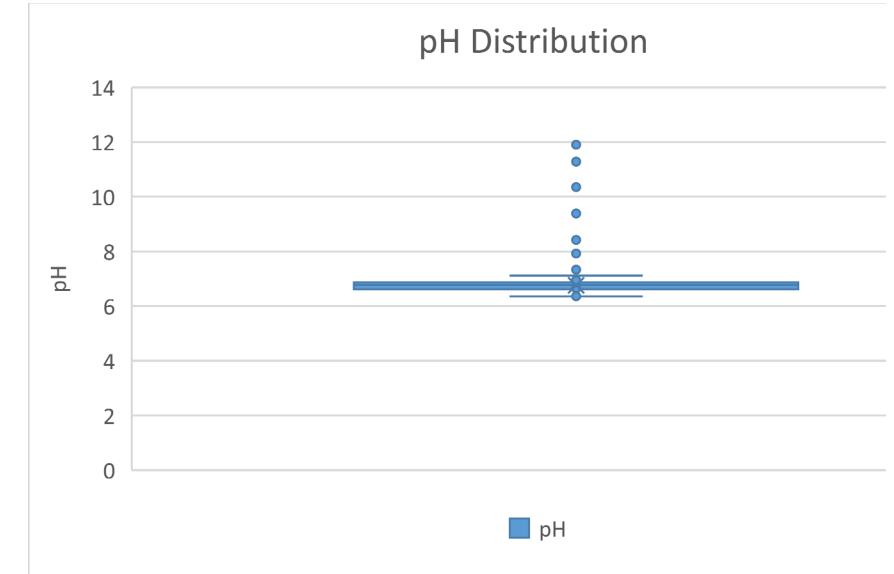
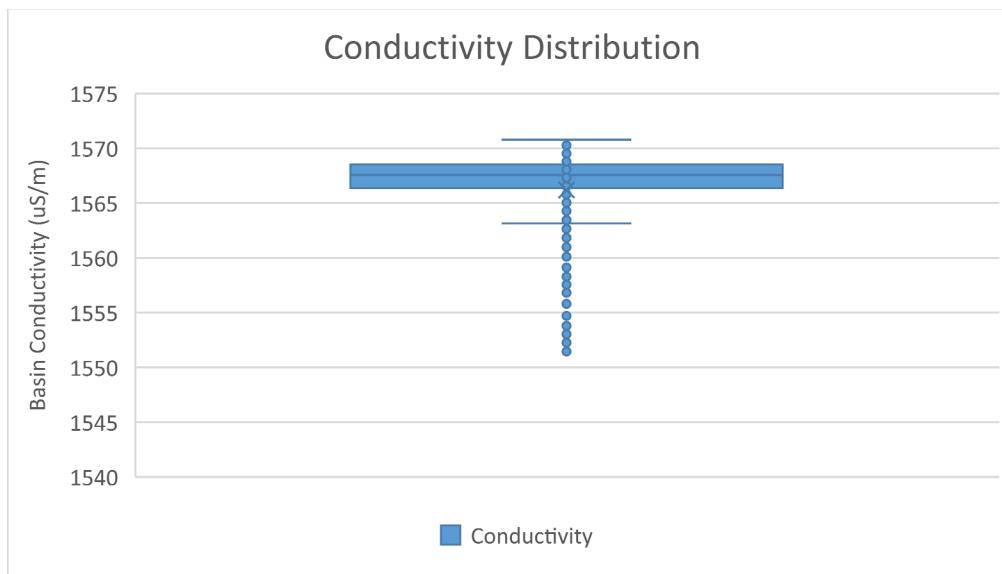
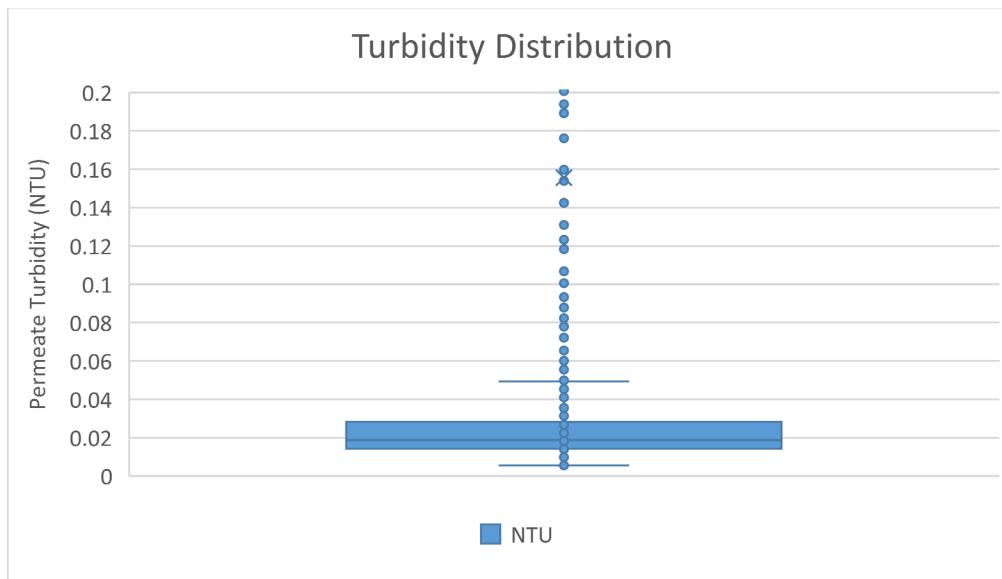
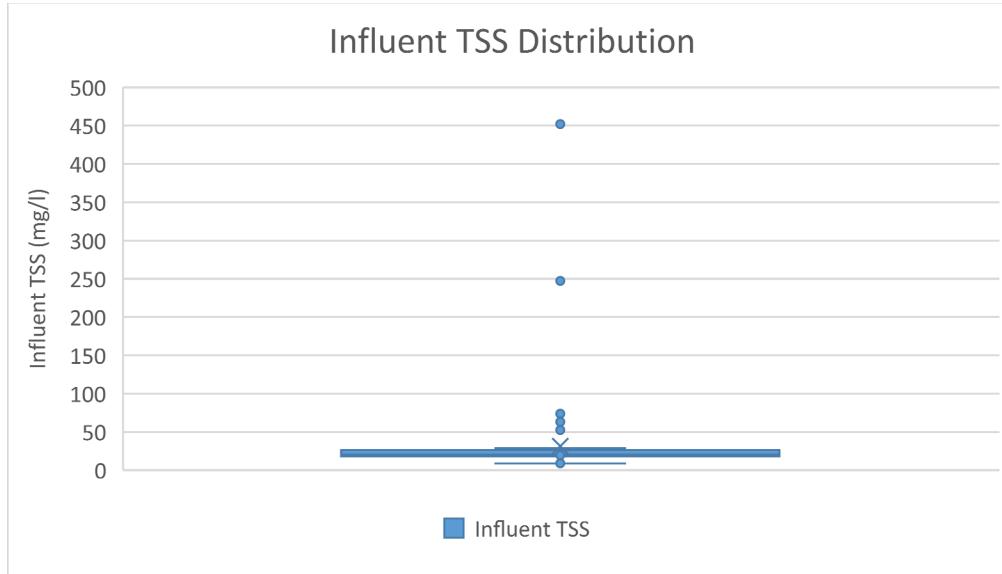
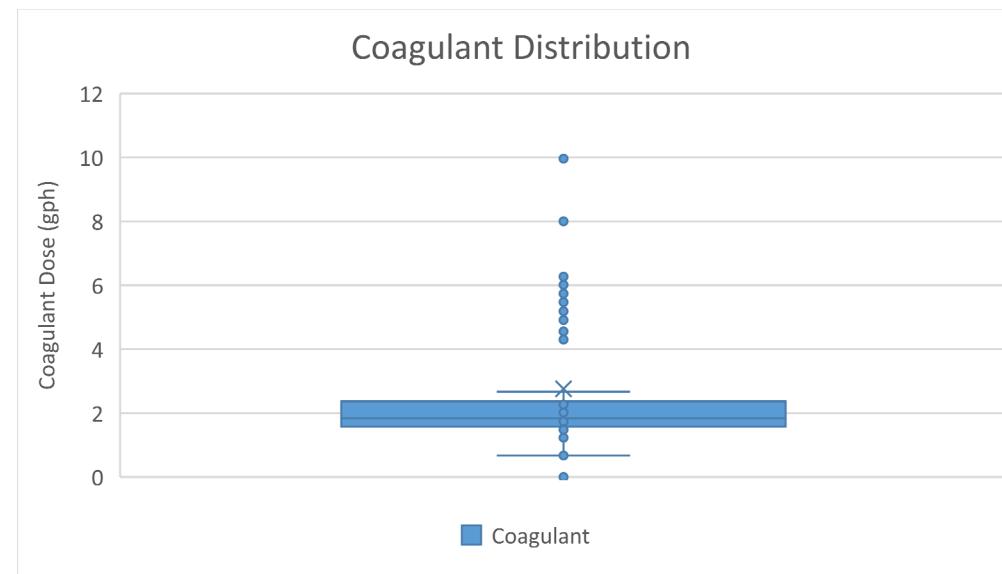
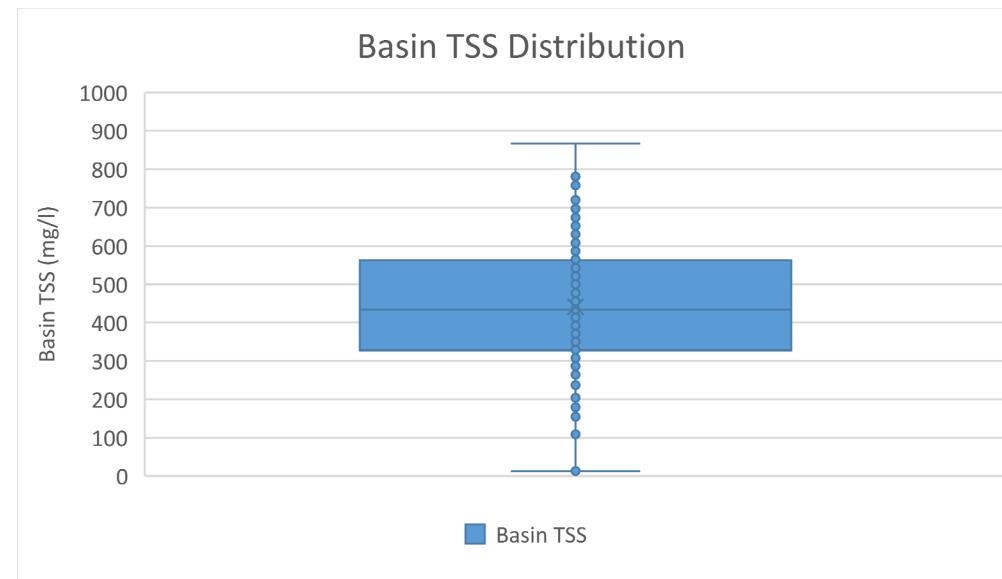
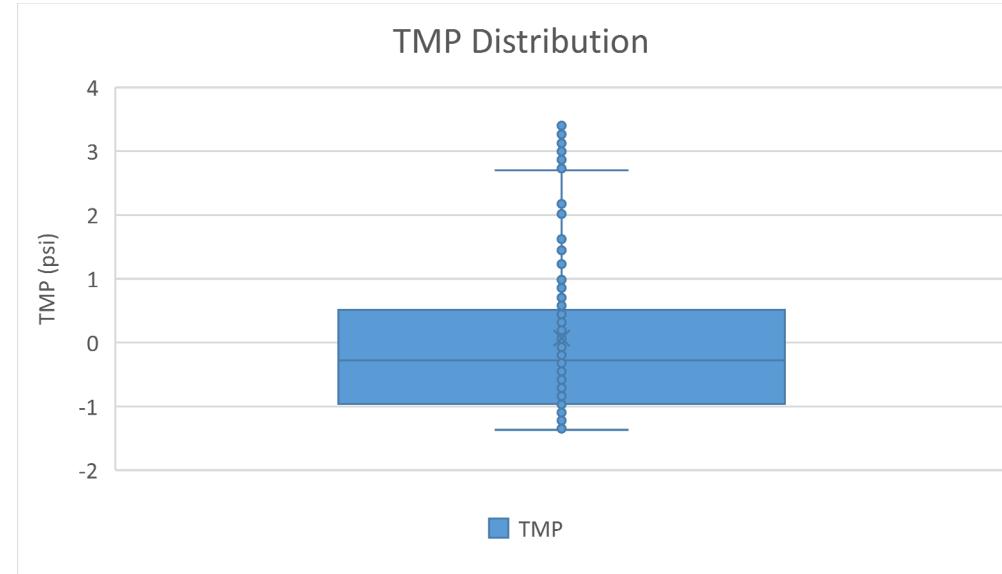












OVIVO PILOT TESTING

WO # C165282

Day		# of samples	Sample Frequency	Tue			
Sample Date	Unit			9/22/2020			
S1-G	Military Time (hours)						
TSS	mg/L	1	1/run	33			
VSS	mg/L	1	1/run	23			
tCOD	mg/L			104			
sCOD	mg/L			58			
BOD	mg/L			56			
Alkalinity	mg/L			105			
Fecal Coliform Sample ID				#1	#2		
Fecal Coliform Sample Time				9/22/2020 1030	9/22/2020 1330		
Fecal Coliform	MPN/100mL	2	2/run	2,300,000	2,300,000		
S1-C	Military Time (hours)						
TSS	mg/L	1	hourly	21			
VSS	mg/L	1	hourly	18			
Alkalinity	mg/L	1	hourly	107			
COD	mg/L	1	hourly	106			
BOD	mg/L	1	hourly	45			
S2-G	Military Time (hours)						
TSS							
VSS							
Cl2 Demand	mg/L	1	1/run	1.34			
SS	mg/L	1	1/run	<0.1			
Alkalinity	mg/L			63			
COD	mg/L			113			
sCOD	mg/L			60			
Fecal Coliform Sample ID				#1	#2	#3	#4
Fecal Coliform Sample Time				9/22/2020 0835	9/22/2020 1040	9/22/2020 1235	9/22/2020 1345
Fecal Coliform	MPN/100mL	4	4/run	0	0	0	0
S2-C	Military Time (hours)						
TSS	mg/L	1	hourly	1			
VSS	mg/L	1	hourly	1			
Alkalinity	mg/L	1	hourly	58			
UV Abs	cm ⁻¹	1	hourly	0.111			
BOD	mg/L	1	hourly	24			
S3-G	Military Time (hours)						
TSS	mg/L	1	1/run	1430			
VSS	mg/L	1	1/run	750			
Alkalinity	mg/L			142			
COD	mg/L	1	1/run	1358			
sCOD	mg/L	1	1/run	70			
S3-G, Flow Box	Military Time (hours)						
TSS	mg/L	1	1/run				
VSS	mg/L	1	1/run				
Alkalinity	mg/L						
COD	mg/L	1	1/run				
sCOD	mg/L	1	1/run				

Weekly Check of online instruments

Date/Time/Initials							
Turbidity online reading							
Turbidity lab reading							
pH online reading							
pH lab reading							
Temperature online reading							
Temperature lab reading							
Conductivity							
Hypo Strength %							

Bottle Kit	Volume
FE grab	2L
FE Fecal	4 125-ml sterile
FE cl2	1L amber bottle
FE comp	4L
Inf grab	2L
Inf Fecal	2 125-ml sterile
Inf comp	2L
TNK	500mL

S1-G
S1-C
S2-G
S2-C
S3-G

OVIVO Effluent Chlorine Demand

Date	Time	Chlorine con mg/L	Hold time min
9/22/2020	10:30	1.34	15

Date 9/22/2020
Ovivo Run # Ovivo Dose Strategy Development
Conditions

Influent (S1) Sequential Sampler

Sample #		Grab Sample Time	Date Stamp	Sample ID	Laboratory Analysis					Comments
					tCOD	TSS	VSS	ALK	BOD	
1		8:00-9:00	9/22/2020	#1		44				
2		11:00-12:00	9/22/2020	#2		17				
3		14:00-15:00	9/22/2020	#3		20				
4		17:00-18:00	9/22/2020	#4		8				

Effluent (S2) Composite Sampler

Sample #	Start Time	End Time		Sample Lab ID	Laboratory Analysis					Comments
					tCOD	TSS	VSS	ALK	BOD	

TOC**Run#2**

Date	Time	Location	TOC (mg/L)		Note
			Inf	Eff	
9/22/2020	8:30	Infl	52.1		
	10:30	Infl	20.7		
	10:40	Eff		14.9	
	12:30	Infl	21.5		
	13:30	Infl	15		<RDL of 20
	16:30	Infl	15.4		
	18:30	Infl	18		

Appendix B.3

Test Run Package 03

Type	<input type="checkbox"/> process	<input checked="" type="checkbox"/> Performance
Influent water source		<input checked="" type="checkbox"/> PE <input type="checkbox"/> Hydrant <input type="checkbox"/> Both
Flux rate		<input checked="" type="checkbox"/> Constant <input type="checkbox"/> Varies

Wasting Rate	0
Air Scour	105 scfm
Backwash Frequency	15 min
Run Duration	10 Hrs
CIP	<input checked="" type="checkbox"/> Hypo <input checked="" type="checkbox"/> Caustic <input type="checkbox"/> Citric
Composite Sample Schedule	10 Samples, 1 hour apart, 450 mL each 4.5 L total volume

Date

Event	Day	Time Hr	PE gpm	Hydrant gpm	Coag Dose Al:TSS ratio	Flux Rate gfd	Event/Action	Influent		Effluent		Membrane Tank		Comments
								Grab / Probe	Note	Grab / Probe	Note	Grab / Probe	Note	
0	1	6:00	200	-	0.4		Start Flow to pilot							
1		6:30				100	Start producing effluent							
2		7:00					Start Composite Samplers							
3		7:30					Influent Sample	Field: Full Set WPP: TP, TKN, NH4 KCEL: Full Set						Temperature
4		7:35					Tank Sample				KCEL: Full Set			Conductivity
5		7:40					Effluent Sample			Field: Full Set WPP: Fecal, TP, TKN, NH4 KCEL: Full Set				WPPLsamples
6		9:00					Effluent Sample			WPP: Fecal				Influent composite
7		10:00					Influent Sample	Field: Full Set WPP: Full Set KCEL: Full Set						Effluent composite
8		10:05					Tank Sample				Field: Full Set WPP: Full Set KCEL: Full Set			-TSS/VSS, Alk, BOD
9		10:10					Effluent Sample			Field: Full Set WPP: Full Set KCEL: Full Set				Influent grab
10		12:00					Influent Sample	Field: Full Set WPP: Fecal, TP, TKN, NH4 KCEL: Full Set						TSS/VSS
11		12:05					Tank Sample					KCEL: Full Set		Fecal
12		12:10					Effluent Sample			Field: Full Set WPP: Fecal, TP, TKN, NH4 KCEL: Full Set				Effluent grab
13		16:30					Stop producing effluent							TSS/VSS

Field	Eff
Turbidity	
Probe reading	
pH	
Temperature	
Conductivity	
WPPLsamples	
Influent composite	
Effluent composite	
-TSS/VSS, Alk, BOD	
Influent grab	
TSS/VSS	
Fecal	
Effluent grab	
TSS/VSS	
Chlorine demand	
Fecal	
Settleable solids	
Tank grab	
TSS/VSS	
KCEL	
Influent grab	
TOC	
Effluent composite	
TOC	

OVIVO Pilot Setpoints Values to be set according to OVIVO's recommendations.
Run# 3Date 10/1/2020

FLOW OPTIMIZATION				CHEM DOSING			
System	ONLINE/OFFLINE	Permeate	End of Event	Coagulant	Pump Start Inf Flow	0.5 gpm	
Inlet System				Pump Start Level	1	gpm	
Screen Off Delay	2	min		Pump Stop Level	0.1	in	
Weir Gate Frequency	1800	min		Overflow Level	118	in	
Weir Gate Duration	30	sec		Coagulant Min Flow	0.5	gph	
Blowers				Coagulant Max Flow	20	gph	
Scour Air Flow	105	scfm		Coag Fixed Flow	6.0	gph	
Blower Start Level	20	in		Coag TSS Ratio	0.40		
Blower Stop Level	8	in		Coag A%	4.1	%	
Lag Blower Start Level	65	%		Coag SG	1.34		
Lag Blower Start Delay	120	sec		Coag Flow Ratio	5		
Blower Fail Air Flow	4.5	scfm		Coag Fill Flow	8	gph	
Blower Fail Delay	140	sec					
Low Air Flow Alarm	55	%					
Low Air Flow Delay	45	sec					
Override Enabled							
TMP Reset				Coagulant Dosing Mode Select			
Sodium Hypochlorite					Fixed Flow		
CIP Permeate Flow	100	gpm			TSS		
Backwash Perm Flow	200	gpm			Perm Flow		
Hypochlorite Flow	100	gph					
Pre CIP Relax Duration	30	sec					
Chem Flow Duration	10	min					
Soak Duration	999	min					
Rinse Duration	60	sec					
Final Relax Duration	60	sec					
Citric Acid				Membrane Basin Drain Vlv			
CIP Permeate Flow	100	gpm			WAS Vlv Open TSS	6,000 mg/l	
Backwash Perm Flow	200	gpm			WAS Vlv Close Lvl	117 in	
Citric Flow	28	gph			WAS Valve Duration	0 sec	
Pre CIP Relax Duration	30	sec					
Chem Flow Duration	10	min					
Soak Duration	999	min					
Rinse Duration	60	sec					
Final Relax Duration	60	sec					
Caustic				CIP Permeate Flow			
					100	gpm	
					Backwash Perm Flow	100 gpm	
					Caustic Flow	50 gph	
					Pre CIP Relax Duration	30 sec	
					Chem Flow Duration	10 min	
					Soak Duration	999 min	
					Rinse Duration	60 sec	
					Final Relax Duration	60 sec	
Pre-Drain Disabled				Pre-Drain Disabled			
Pre-Drain Disabled				Pre-Drain Disabled			

Daily Field Notes

Run

2

Cond.

Process and Performance Testing

Date	Time	Location	pH	Temp C	Conductivit	TDS (ppm)
Oct1,2020	7:30	inf	7.12	18.4	1209	855
	7:35	tank	6.72	18.1	1275	906
	7:40	eff				
	10:00	inf	7.16	18.2	1011	731
	10:05	tank	7	18.4	1090	785
	10:10	eff	6.86	18.6	1049	745
	12:00	inf	7.11	19.5	871	616
	12:05	tank				
	12:10	eff	7.08	19.4	913	648

Sample Data

King County Environmental Lab Analytical Report

Project: 423650-100
 Locator: INF-SL
 Descrip: PILOT INFLUENT, IN
 Sample: L72439-1
 Matrix: LB INFLUENT
 ColDate: 10/1/20 7:00
 TimeSpan: 9.5
WET Weight Basis

Project: 423650-100
 Locator: INF-SL
 Descrip: PILOT INFLUENT, IN
 Sample: L72439-2
 Matrix: LB INFLUENT
 ColDate: 10/1/20 7:30
WET Weight Basis

Project: 423650-100
 Locator: INF-SL
 Descrip: PILOT INFLUENT, IN
 Sample: L72439-3
 Matrix: LB INFLUENT
 ColDate: 10/1/20 0:00
 TimeSpan:
WET Weight Basis

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
CV SM5310-B															
Total Organic Carbon	42		10	20	mg/L	61.3		10	20	mg/L					
MT EPA 200.8 (MOD)															
Antimony, Total, ICP-MS			0.38	<RDL	ug/L	0.3	1				0.35	<RDL	0.3	1	ug/L
Arsenic, Total, ICP-MS			1.78		ug/L	0.05	0.25				1.83		0.05	0.25	ug/L
Beryllium, Total, ICP-MS				<MDL	ug/L	0.1	0.5					<MDL	0.1	0.5	ug/L
Cadmium, Total, ICP-MS			0.12	<RDL	ug/L	0.05	0.25				0.086	<RDL	0.05	0.25	ug/L
Calcium, Total, ICP-MS			26900		ug/L	50	50				26400		50	50	ug/L
Chromium, Total, ICP-MS			1.06		ug/L	0.2	1				0.95	<RDL	0.2	1	ug/L
Copper, Total, ICP-MS			25.6		ug/L	0.2	2				24.9		0.2	2	ug/L
Lead, Total, ICP-MS			1.56		ug/L	0.1	0.5				1.76		0.1	0.5	ug/L
Magnesium, Total, ICP-MS			18800		ug/L	50	50				16300		50	50	ug/L
Nickel, Total, ICP-MS			3.37		ug/L	0.1	0.5				3.31		0.1	0.5	ug/L
Selenium, Total, ICP-MS			0.55	<RDL	ug/L	0.5	1				0.57	<RDL	0.5	1	ug/L
Silver, Total, ICP-MS			0.87		ug/L	0.04	0.2				0.075	<RDL	0.04	0.2	ug/L
Thallium, Total, ICP-MS				<MDL	ug/L	0.1	0.2					<MDL	0.1	0.2	ug/L
Zinc, Total, ICP-MS			59.3		ug/L	0.5	2.5				48.3		0.5	2.5	ug/L
MT EPA 200.8 (MOD) SM2340B															
Hardness, Calc			145		mg CaCO3/L	0.331	0.331				133		0.331	0.331	mg CaCO3/L
MT EPA 245.1															
Mercury, Total, CVAA			0.0235		ug/L	0.005	0.015				0.013	<RDL	0.005	0.015	ug/L
OR EPA 1664B															
Hem (oil, total)			23.9		mg/L	1.5	5.2				17.1		1.5	5.5	mg/L

King County Environmental Lab Analytical Report

Project:	423650-100	Project:	423650-100	Project:	423650-100										
Locator:	INF-SL	Locator:	EFF-SL	Locator:	EFF-SL										
Descrip:	PILOT INFLUENT, IN	Descrip:	PILOT MEMBRANE PER	Descrip:	PILOT MEMBRANE PER										
Sample:	L72439-4	Sample:	L72439-5	Sample:	L72439-6										
Matrix:	LB INFLUENT	Matrix:	LA OTHR WTR	Matrix:	LA OTHR WTR										
ColDate:	10/1/20 12:00	ColDate:	10/1/20 7:00	ColDate:	10/1/20 7:40										
TimeSpan:		TimeSpan:	9.5	TimeSpan:											
WET Weight Basis															
Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
CV SM5310-B															
Total Organic Carbon	45.3		10	20	mg/L	25.8		2	4	mg/L					
MT EPA 200.8 (MOD)															
Antimony, Total, ICP-MS	0.33	<RDL	0.3	1	ug/L						<MDL	0.3	1	ug/L	
Arsenic, Total, ICP-MS	1.9		0.05	0.25	ug/L						0.83	0.05	0.25	ug/L	
Beryllium, Total, ICP-MS		<MDL	0.1	0.5	ug/L						<MDL	0.1	0.5	ug/L	
Cadmium, Total, ICP-MS	0.095	<RDL	0.05	0.25	ug/L						<MDL	0.05	0.25	ug/L	
Calcium, Total, ICP-MS	23700		50	50	ug/L						26300	50	50	ug/L	
Chromium, Total, ICP-MS	1.03		0.2	1	ug/L						<MDL	0.2	1	ug/L	
Copper, Total, ICP-MS	23.5		0.2	2	ug/L						2.14	0.2	2	ug/L	
Lead, Total, ICP-MS	1.77		0.1	0.5	ug/L						0.16	<RDL	0.1	0.5	ug/L
Magnesium, Total, ICP-MS	14000		50	50	ug/L						19500	50	50	ug/L	
Nickel, Total, ICP-MS	2.94		0.1	0.5	ug/L						2.94	0.1	0.5	ug/L	
Selenium, Total, ICP-MS	0.51	<RDL	0.5	1	ug/L						<MDL	0.5	1	ug/L	
Silver, Total, ICP-MS	0.075	<RDL	0.04	0.2	ug/L						<MDL	0.04	0.2	ug/L	
Thallium, Total, ICP-MS		<MDL	0.1	0.2	ug/L						<MDL	0.1	0.2	ug/L	
Zinc, Total, ICP-MS	50.3		0.5	2.5	ug/L						22.3	0.5	2.5	ug/L	
MT EPA 200.8 (MOD)*SM2340B															
Hardness, Calc	117		0.331	0.331	mg CaCO3/L						146	0.331	0.331	mg CaCO3/L	
MT EPA 245.1															
Mercury, Total, CVAA	0.0279		0.005	0.015	ug/L						<MDL	0.005	0.015	ug/L	
OR EPA 1664B															
Hem (oil, total)	16.4		1.5	5.3	mg/L						1.6	<RDL	1.5	5.3	mg/L

King County Environmental Lab Analytical Report

Project: 423650-100 Locator: EFF-SL Descrip: PILOT MEMBRANE PER Sample: L72439-7 Matrix: LA OTHR WTR ColDate: 10/1/20 10:10 TimeSpan: WET Weight Basis	Project: 423650-100 Locator: EFF-SL Descrip: PILOT MEMBRANE PER Sample: L72439-8 Matrix: LA OTHR WTR ColDate: 10/1/20 12:10 TimeSpan: WET Weight Basis	Project: 423650-100 Locator: TNK-SL Descrip: IN-LINE SED FOR OV Sample: L72439-9 Matrix: LA OTHR WTR ColDate: 10/1/20 7:35 TimeSpan: WET Weight Basis												
Parameters CV SM5310-B	Value Qual MDL RDL Units	Value Qual MDL RDL Units	Value Qual MDL RDL Units											
Total Organic Carbon														
MT EPA 200.8 (MOD)														
Antimony, Total, ICP-MS	<MDL	0.3	1	ug/L	<MDL	0.3	1	ug/L	0.8	<RDL	0.3	1	ug/L	
Arsenic, Total, ICP-MS	0.85	0.05	0.25	ug/L	0.913	0.05	0.25	ug/L	5.79	0.05	0.25	ug/L		
Beryllium, Total, ICP-MS	<MDL	0.1	0.5	ug/L	<MDL	0.1	0.5	ug/L	1.31	0.1	0.5	ug/L		
Cadmium, Total, ICP-MS	<MDL	0.05	0.25	ug/L	<MDL	0.05	0.25	ug/L	0.586	0.05	0.25	ug/L		
Calcium, Total, ICP-MS	24900	50	50	ug/L	22900	50	50	ug/L	30000	50	50	ug/L		
Chromium, Total, ICP-MS	<MDL	0.2	1	ug/L	<MDL	0.2	1	ug/L	7.28	0.2	1	ug/L		
Copper, Total, ICP-MS	1.9	<RDL	0.2	2	ug/L	2.17	0.2	2	ug/L	119	0.2	2	ug/L	
Lead, Total, ICP-MS	0.13	<RDL	0.1	0.5	ug/L	0.13	<RDL	0.1	0.5	ug/L	7.79	0.1	0.5	ug/L
Magnesium, Total, ICP-MS	16400	50	50	ug/L	14300	50	50	ug/L	19600	50	50	ug/L		
Nickel, Total, ICP-MS	2.65	0.1	0.5	ug/L	2.49	0.1	0.5	ug/L	6.84	0.1	0.5	ug/L		
Selenium, Total, ICP-MS	<MDL	0.5	1	ug/L	<MDL	0.5	1	ug/L	1.21	0.5	1	ug/L		
Silver, Total, ICP-MS	<MDL	0.04	0.2	ug/L	<MDL	0.04	0.2	ug/L	0.458	0.04	0.2	ug/L		
Thallium, Total, ICP-MS	<MDL	0.1	0.2	ug/L	<MDL	0.1	0.2	ug/L	<MDL	0.1	0.2	ug/L		
Zinc, Total, ICP-MS	15.9	0.5	2.5	ug/L	14.6	0.5	2.5	ug/L	237	0.5	2.5	ug/L		
MT EPA 200.8 (MOD)*SM2340B														
Hardness, Calc	130	0.331	0.331	mg CaCO3/L	116	0.331	0.331	mg CaCO3/L	156	0.331	0.331	mg CaCO3/L		
MT EPA 245.1														
Mercury, Total, CVAA	<MDL	0.005	0.015	ug/L	<MDL	0.005	0.015	ug/L	0.104	0.005	0.015	ug/L		
OR EPA 1664B														
Hem (oil, total)	1.4	<RDL	1.4	5.1	mg/L	1.6	<RDL	1.5	5.3	mg/L				

King County Environmental Lab Analytical Report

Project:	423650-100	Project:	423650-100							
Locator:	TNK-SL	Locator:	TNK-SL							
Descrip:	IN-LINE SED FOR OV	Descrip:	IN-LINE SED FOR OV							
Sample:	L72439-10	Sample:	L72439-11							
Matrix:	LA OTHR WTR	Matrix:	LA OTHR WTR							
ColDate:	10/1/20 10:05	ColDate:	10/1/20 12:05							
TimeSpan:		TimeSpan:								
WET Weight Basis										
Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
CV SM5310-B										
Total Organic Carbon										
MT EPA 200.8 (MOD)										
Antimony, Total, ICP-MS	1.02		0.3	1	ug/L	1.12		0.3	1	ug/L
Arsenic, Total, ICP-MS	9.18		0.05	0.25	ug/L	12.5		0.05	0.25	ug/L
Beryllium, Total, ICP-MS	2		0.1	0.5	ug/L	2.57		0.1	0.5	ug/L
Cadmium, Total, ICP-MS	0.828		0.05	0.25	ug/L	1.06		0.05	0.25	ug/L
Calcium, Total, ICP-MS	33300		50	50	ug/L	35900		50	50	ug/L
Chromium, Total, ICP-MS	11.3		0.2	1	ug/L	14.7		0.2	1	ug/L
Copper, Total, ICP-MS	202		0.2	2	ug/L	268		0.2	2	ug/L
Lead, Total, ICP-MS	11.9		0.1	0.5	ug/L	15.7		0.1	0.5	ug/L
Magnesium, Total, ICP-MS	17800		50	50	ug/L	16400		50	50	ug/L
Nickel, Total, ICP-MS	9.05		0.1	0.5	ug/L	10.6		0.1	0.5	ug/L
Selenium, Total, ICP-MS	1.73		0.5	1	ug/L	2.01		0.5	1	ug/L
Silver, Total, ICP-MS	0.71		0.04	0.2	ug/L	0.947		0.04	0.2	ug/L
Thallium, Total, ICP-MS	<MDL		0.1	0.2	ug/L	<MDL		0.1	0.2	ug/L
Zinc, Total, ICP-MS	375		0.5	2.5	ug/L	493		0.5	2.5	ug/L
MT EPA 200.8 (MOD)*SM2340B										
Hardness, Calc	156		0.331	0.331	mg CaCO3/L	157		0.331	0.331	mg CaCO3/L
MT EPA 245.1										
Mercury, Total, CVAA	0.127		0.005	0.015	ug/L	0.146		0.005	0.015	ug/L
OR EPA 1664B										
Hem (oil, total)										

King County Environmental Lab Analytical MATRIX Report

Owner: SEEDPAK
Matrix Class: LIQUID
User select: WET Weight Basis

LOCATOR	PROJECT	SAMPLE	COLLECTED	Total Organic Carbon		Antimony, Total, ICP-MS		Arsenic, Total, ICP-MS		Beryllium, Total, ICP-MS		Cadmium, Total, ICP-MS		Calcium, Total, ICP-MS		Chromium, Total, ICP-MS		Copper, Total, ICP-MS		Lead, Total, ICP-MS		Magnesium, Total, ICP-MS		Nickel, Total, ICP-MS		Selenium, Total, ICP-MS	
				mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L		
INF-SL	423650-100	L72439-1	10/1/2020 7:00	42																							
INF-SL	423650-100	L72439-2	10/1/2020 7:30	61.3	0.38	1.78			0.12	26900	1.06	25.6	1.56	18800	3.37	0.55											
INF-SL	423650-100	L72439-3	10/1/2020 0:00			0.35	1.83		0.086	26400	0.95	24.9	1.76	16300	3.31	0.57											
INF-SL	423650-100	L72439-4	10/1/2020 12:00	45.3	0.33	1.9			0.095	23700	1.03	23.5	1.77	14000	2.94	0.51											
EFF-SL	423650-100	L72439-5	10/1/2020 7:00	25.8																							
EFF-SL	423650-100	L72439-6	10/1/2020 7:40				0.83			26300		2.14	0.16	19500	2.94												
EFF-SL	423650-100	L72439-7	10/1/2020 10:10				0.85			24900		1.9	0.13	16400	2.65												
EFF-SL	423650-100	L72439-8	10/1/2020 12:10				0.913			22900		2.17	0.13	14300	2.49												
TNK-SL	423650-100	L72439-9	10/1/2020 7:35			0.8	5.79	1.31	0.586	30000	7.28	119	7.79	19600	6.84	1.21											
TNK-SL	423650-100	L72439-10	10/1/2020 10:05			1.02	9.18	2	0.828	33300	11.3	202	11.9	17800	9.05	1.73											
TNK-SL	423650-100	L72439-11	10/1/2020 12:05			1.12	12.5	2.57	1.06	35900	14.7	268	15.7	16400	10.6	2.01											
* Not converted to dry weight basis																											
If a parameter/analyte appears twice in the column header, it implies that they were analyzed by two different method codes																											

King County Environmental Lab Analytical MATRIX Report

Owner: SEEDPAK
Matrix Class: LIQUID
User select: WET Weight Basis

LOCATOR	PROJECT	SAMPLE	COLLECTED	Silver, Total, ICP-MS	Thallium, Total, ICP-MS	Zinc, Total, ICP-MS	Hardness, Calc	Mercury, Total, CVAA	Hem (oil, total)
				ug/L	ug/L	ug/L	mg CaCO3/L	ug/L	mg/L
INF-SL	423650-100	L72439-1	10/1/2020 7:00						
INF-SL	423650-100	L72439-2	10/1/2020 7:30	0.87		59.3	145	0.0235	23.9
INF-SL	423650-100	L72439-3	10/1/2020 0:00	0.075		48.3	133	0.013	17.1
INF-SL	423650-100	L72439-4	10/1/2020 12:00	0.075		50.3	117	0.0279	16.4
EFF-SL	423650-100	L72439-5	10/1/2020 7:00						
EFF-SL	423650-100	L72439-6	10/1/2020 7:40			22.3	146		1.6
EFF-SL	423650-100	L72439-7	10/1/2020 10:10			15.9	130		1.4
EFF-SL	423650-100	L72439-8	10/1/2020 12:10			14.6	116		1.6
TNK-SL	423650-100	L72439-9	10/1/2020 7:35	0.458		237	156	0.104	
TNK-SL	423650-100	L72439-10	10/1/2020 10:05	0.71		375	156	0.127	
TNK-SL	423650-100	L72439-11	10/1/2020 12:05	0.947		493	157	0.146	
* Not converted to dry weight basis									
If a parameter/analyte appears twice in the column header, it implies that they were analyzed									

Quality Control Data

WG172432 Total Organic Carbon

Sample	Project	Project Description	List Type	Matrix	Collect Date	Prep Date	Anal Date	QC Association	Comments
L72439-1	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/1/2020 7:00	10/13/2020 17:10	10/13/2020 17:10		
L72439-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/1/2020 7:30	10/13/2020 17:16	10/13/2020 17:16		
L72439-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/1/2020 12:00	10/13/2020 17:23	10/13/2020 17:23		
L72439-5	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	OTHR WTR	10/1/2020 7:00	10/13/2020 19:00	10/13/2020 19:00		
L72440-1	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/8/2020 7:00	10/13/2020 15:48	10/13/2020 15:48		
L72440-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/8/2020 7:30	10/13/2020 15:56	10/13/2020 15:56		
L72440-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/8/2020 13:10	10/13/2020 16:29	10/13/2020 16:29		
L72440-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/8/2020 17:05	10/13/2020 16:58	10/13/2020 16:58		
L72440-5	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	OTHR WTR	10/8/2020 7:00	10/13/2020 18:53	10/13/2020 18:53		
L75600-3	421422-CHSW-E	SWD-CHSW E Cedar Hills Emergency	CVTOC	FRESH WTR	10/12/2020 11:30	10/13/2020 15:16	10/13/2020 15:16		
L75619-1	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/6/2020 8:30	10/13/2020 17:30	10/13/2020 17:30		
L75619-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/6/2020 11:00	10/13/2020 17:37	10/13/2020 17:37		
L75619-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/6/2020 14:00	10/13/2020 17:45	10/13/2020 17:45		
L75619-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/6/2020 10:30	10/13/2020 18:15	10/13/2020 18:15		
L75619-5	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/6/2020 20:00	10/13/2020 18:22	10/13/2020 18:22		
L75619-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/7/2020 0:00	10/13/2020 18:30	10/13/2020 18:30		
L75619-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/7/2020 4:00	10/13/2020 18:38	10/13/2020 18:38		
L75619-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/7/2020 7:00	10/13/2020 18:45	10/13/2020 18:45		
L75619-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	OTHR WTR	10/6/2020 8:00	10/13/2020 19:08	10/13/2020 19:08		
WG172432-1	MDLCK		CVTOC	BLANK WTR	10/13/2020 14:34	10/13/2020 14:34	10/13/2020 14:34		
WG172432-2	MB		CVTOC	BLANK WTR	10/13/2020 14:41	10/13/2020 14:41	10/13/2020 14:41	MB1 10/13/20	
WG172432-3	SB		CVTOC	BLANK WTR	10/13/2020 14:50	10/13/2020 14:50	10/13/2020 14:50	WG172432-2	
WG172432-4	LCS		CVTOC	BLANK WTR	10/13/2020 14:57	10/13/2020 14:57	10/13/2020 14:57	LEVEL1	
WG172432-5	LD		CVTOC	FRESH WTR	10/13/2020 15:24	10/13/2020 15:24	10/13/2020 15:24	L75600-3	
WG172432-6	MS		CVTOC	FRESH WTR	10/13/2020 15:31	10/13/2020 15:31	10/13/2020 15:31	L75600-3	
WG172432-7	LD		CVTOC	INFLUENT	10/13/2020 16:36	10/13/2020 16:36	10/13/2020 16:36	L72440-3	
WG172432-8	MS		CVTOC	INFLUENT	10/13/2020 16:44	10/13/2020 16:44	10/13/2020 16:44	L72440-3	
WG172432-9	LD		CVTOC	OTHR WTR	10/13/2020 19:16	10/13/2020 19:16	10/13/2020 19:16	L75619-10	
WG172432-10	MS		CVTOC	OTHR WTR	10/13/2020 19:23	10/13/2020 19:23	10/13/2020 19:23	L75619-10	

WG172432-1,-2,-3,-4,-5,-6,-7,-8,-9,-10

King County Environmental Laboratory Batch Report

OVIVO Pilot 01October2020

WG172403 Total Metals and Hardness by ICPMS

Sample	Project	Project Description	List Type	Matrix	Collect Date	Prep Date	Anal Date	QC Association	Comments
L72439-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	INFLUENT	10/1/2020 7:30	10/12/2020 12:00	10/31/2020 23:05		
L72439-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	INFLUENT	10/1/2020 7:30	10/12/2020 12:00	10/19/2020 11:17		
L72439-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	INFLUENT	10/1/2020 0:00	10/12/2020 12:00	10/31/2020 23:05		
L72439-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	INFLUENT	10/1/2020 0:00	10/12/2020 12:00	10/19/2020 11:20		
L72439-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	INFLUENT	10/1/2020 12:00	10/12/2020 12:00	10/31/2020 23:05		
L72439-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	INFLUENT	10/1/2020 12:00	10/12/2020 12:00	10/19/2020 11:23		
L72439-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/1/2020 7:40	10/12/2020 12:00	10/31/2020 23:05		
L72439-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/1/2020 7:40	10/12/2020 12:00	10/19/2020 11:27		
L72439-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/1/2020 10:10	10/12/2020 12:00	10/31/2020 23:05		
L72439-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/1/2020 10:10	10/12/2020 12:00	10/19/2020 11:30		
L72439-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/1/2020 12:10	10/12/2020 12:00	10/31/2020 23:05		
L72439-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/1/2020 12:10	10/12/2020 12:00	10/19/2020 11:33		
L72439-9	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/1/2020 7:35	10/12/2020 12:00	10/31/2020 23:05		
L72439-9	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/1/2020 7:35	10/12/2020 12:00	10/19/2020 11:49		
L72439-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/1/2020 10:05	10/12/2020 12:00	10/31/2020 23:05		
L72439-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/1/2020 10:05	10/12/2020 12:00	10/19/2020 11:54		
L72439-11	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/1/2020 12:05	10/12/2020 12:00	10/31/2020 23:05		
L72439-11	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/1/2020 12:05	10/12/2020 12:00	10/19/2020 11:57		
L72440-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	INFLUENT	10/8/2020 7:30	10/12/2020 12:00	10/31/2020 23:05		
L72440-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	INFLUENT	10/8/2020 7:30	10/12/2020 12:00	10/19/2020 12:00		
L72440-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	INFLUENT	10/8/2020 13:10	10/12/2020 12:00	10/31/2020 23:05		
L72440-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	INFLUENT	10/8/2020 13:10	10/12/2020 12:00	10/19/2020 12:03		
L72440-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	INFLUENT	10/8/2020 17:05	10/12/2020 12:00	10/31/2020 23:05		
L72440-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	INFLUENT	10/8/2020 17:05	10/12/2020 12:00	10/19/2020 12:06		
L72440-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/8/2020 7:40	10/12/2020 12:00	10/31/2020 23:05		
L72440-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/8/2020 7:40	10/12/2020 12:00	10/19/2020 12:10		
L72440-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/8/2020 13:20	10/12/2020 12:00	10/31/2020 23:05		
L72440-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/8/2020 13:20	10/12/2020 12:00	10/19/2020 12:13		
L72440-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/8/2020 17:15	10/12/2020 12:00	10/31/2020 23:05		
L72440-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/8/2020 17:15	10/12/2020 12:00	10/19/2020 12:29		
L72440-9	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/8/2020 7:35	10/12/2020 12:00	10/31/2020 23:05		
L72440-9	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/8/2020 7:35	10/12/2020 12:00	10/19/2020 12:32		
L72440-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/8/2020 13:15	10/12/2020 12:00	10/31/2020 23:05		
L72440-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/8/2020 13:15	10/12/2020 12:00	10/19/2020 12:36		
L72440-11	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/8/2020 17:10	10/12/2020 12:00	10/31/2020 23:05		
L72440-11	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/8/2020 17:10	10/12/2020 12:00	10/19/2020 12:39		
WG172403-1	MB		MTHARD-ICPMS	BLANK WTR	10/12/2020 12:00	10/31/2020 23:05		METHOD BLANK	
WG172403-1	MB		MTICPMS	BLANK WTR	10/12/2020 12:00	10/19/2020 11:10		METHOD BLANK	
WG172403-2	SB		MTHARD-ICPMS	BLANK WTR	10/12/2020 12:00	10/31/2020 23:05		WG172403-1 MS-20	
WG172403-2	SB		MTICPMS	BLANK WTR	10/12/2020 12:00	10/19/2020 11:14		WG172403-1 MS-20	
WG172403-3	MS		MTHARD-ICPMS	OTHR WTR	10/12/2020 12:00	10/31/2020 23:05		L72439-8 MS-20	
WG172403-3	MS		MTICPMS	OTHR WTR	10/12/2020 12:00	10/19/2020 11:36		L72439-8 MS-20	
WG172403-4	MSD		MTHARD-ICPMS	OTHR WTR	10/12/2020 12:00	10/31/2020 23:05		WG172403-3 L72439-8 MS-20	
WG172403-4	MSD		MTICPMS	OTHR WTR	10/12/2020 12:00	10/19/2020 11:40		WG172403-3 L72439-8 MS-20	
WG172403-5	MS		MTHARD-ICPMS	OTHR WTR	10/12/2020 12:00	10/31/2020 23:05		L72440-7 MS-20	
WG172403-5	MS		MTICPMS	OTHR WTR	10/12/2020 12:00	10/19/2020 12:16		L72440-7 MS-20	
WG172403-6	MSD		MTHARD-ICPMS	OTHR WTR	10/12/2020 12:00	10/31/2020 23:05		WG172403-5 L72440-7 MS-20	
WG172403-6	MSD		MTICPMS	OTHR WTR	10/12/2020 12:00	10/19/2020 12:19		WG172403-5 L72440-7 MS-20	

WG172403-1,-2,-3,-4,-5,-6

WG172567 Total Mercury

Sample	Project	Project Description	List Type	Matrix	Collect Date	Prep Date	Anal Date	QC Association	Comments
L72439-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	INFLUENT	10/1/2020 7:30	10/19/2020 11:00	10/20/2020 14:26		
L72439-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	INFLUENT	10/1/2020 0:00	10/19/2020 11:00	10/20/2020 14:30		
L72439-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	INFLUENT	10/1/2020 12:00	10/19/2020 11:00	10/20/2020 14:33		
L72439-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/1/2020 7:40	10/19/2020 11:00	10/20/2020 14:37		
L72439-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/1/2020 10:10	10/19/2020 11:00	10/20/2020 14:48		
L72439-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/1/2020 12:10	10/19/2020 11:00	10/20/2020 14:52		
L72439-9	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/1/2020 7:35	10/19/2020 11:00	10/20/2020 15:02		
L72439-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/1/2020 10:05	10/19/2020 11:00	10/20/2020 15:06		
L72439-11	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/1/2020 12:05	10/19/2020 11:00	10/20/2020 15:10		
L72440-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	INFLUENT	10/8/2020 7:30	10/19/2020 11:00	10/20/2020 15:13		
L72440-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	INFLUENT	10/8/2020 13:10	10/19/2020 11:00	10/20/2020 15:17		
L72440-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	INFLUENT	10/8/2020 17:05	10/19/2020 11:00	10/20/2020 15:21		
L72440-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/8/2020 7:40	10/19/2020 11:00	10/20/2020 15:24		
L72440-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/8/2020 13:20	10/19/2020 11:00	10/20/2020 15:28		
L72440-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/8/2020 17:15	10/19/2020 11:00	10/20/2020 15:39		
L72440-9	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/8/2020 7:35	10/19/2020 11:00	10/20/2020 15:50		
L72440-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/8/2020 13:15	10/19/2020 11:00	10/20/2020 15:53		
L72440-11	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/8/2020 17:10	10/19/2020 11:00	10/20/2020 15:57		
WG172567-1	MB		MTHG-LOW	BLANK WTR	10/19/2020 11:00	10/20/2020 14:19		MB	
WG172567-2	SB		MTHG-LOW	BLANK WTR	10/19/2020 11:00	10/20/2020 14:22		WG172567-1 HG-LLOW	
WG172567-3	MS		MTHG-LOW	OTHR WTR	10/19/2020 11:00	10/20/2020 14:41		L72439-6 HG-LLOW	
WG172567-4	MSD		MTHG-LOW	OTHR WTR	10/19/2020 11:00	10/20/2020 14:44		WG172567-3 L72439-6 HG-LLOW-MSD	
WG172567-5	MS		MTHG-LOW	OTHR WTR	10/19/2020 11:00	10/20/2020 15:43		L72440-8 HG-LLOW	
WG172567-6	MSD		MTHG-LOW	OTHR WTR	10/19/2020 11:00	10/20/2020 15:46		WG172567-5 L72440-8 HG-LLOW-MSD	
WG172567-7	MDLCK		MTHG-LOW	BLANK WTR	10/19/2020 11:00	10/20/2020 16:01		LOW	
WG172567-8	MDLCK		MTHG-LOW	BLANK WTR	10/19/2020 11:00	10/20/2020 16:04		LOW	

WG172274 HEM

Sample	Project	Project Description	List Type	Matrix	Collect Date	Prep Date	Anal Date	QC Association	Comments
L72439-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	INFILUENT	10/1/2020 7:30	10/6/2020 10:00	10/8/2020 13:10		
L72439-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	INFILUENT	10/1/2020 0:00	10/6/2020 10:00	10/8/2020 13:10		
L72439-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	INFILUENT	10/1/2020 12:00	10/6/2020 10:00	10/8/2020 13:10		
L72439-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	OTHR WTR	10/1/2020 7:40	10/6/2020 10:00	10/8/2020 13:10		
L72439-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	OTHR WTR	10/1/2020 10:10	10/6/2020 10:00	10/8/2020 13:10		
L72439-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	OTHR WTR	10/1/2020 12:10	10/6/2020 10:00	10/8/2020 13:10		
L75601-1	421166	IW Emergency Spills	ORHEM	SEWER WTR	9/26/2020 11:45	10/6/2020 10:00	10/8/2020 13:10		
L75633-1	421422-ENLS	SWD-ENLS Enumclaw Wastewater Permit	ORHEM	IVW WTR	10/6/2020 7:45	10/6/2020 10:00	10/8/2020 13:10		
WG172274-1	MB		ORHEM	BLANK WTR		10/6/2020 10:00	10/8/2020 13:10		MB201006
WG172274-2	LCS		ORHEM	BLANK WTR		10/6/2020 10:00	10/8/2020 13:10		WG172274-1
WG172274-3	LCSD		ORHEM	BLANK WTR		10/6/2020 10:00	10/8/2020 13:10		WG172274-2 WG172274-1

* End of L72439_56443_BATCH.xls

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Workgroup: WG172432 Total Organic Carbon

MB:WG172432-2 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Total Organic Carbon	0.5	1	mg/L	<MDL	

SB:WG172432-3 MB:WG172432-2 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Spike Blank, Method Blank)

Parameter	MDL	RDL	Units	MB Value	True Value	SB Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	0.5	1	mg/L	<MDL	5	5.22	104		80--120

LCS:WG172432-4 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Lab Control Sample)

Parameter	MDL	RDL	Units	True Value	LCS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	0.5	1	mg/L	8	8.1	101		85--115

LD:WG172432-5 L75600-3 Matrix: FRESH WTR Listtype:CVTOC Method:SM5310-B Project:421422-CHSW-E Pkey:STD

(Lab Duplicate)

Parameter	MDL	RDL	Units	SAMP Value	LD Value	RPD	Qual	Lab Limit
Total Organic Carbon	5	10	mg/L	33.4	35.8	7		0--20

MS:WG172432-6 L75600-3 Matrix: FRESH WTR Listtype:CVTOC Method:SM5310-B Project:421422-CHSW-E Pkey:STD

(Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	5	10	mg/L	33.4	50	85.3	104		75--125

LD:WG172432-7 L72440-3 Matrix: INFLUENT Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Lab Duplicate)

Parameter	MDL	RDL	Units	SAMP Value	LD Value	RPD	Qual	Lab Limit
Total Organic Carbon	10	20	mg/L	55.2	58.1	5		0--20

MS:WG172432-8 L72440-3 Matrix: INFLUENT Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	10	20	mg/L	55.2	100	162	106		75--125

LD:WG172432-9 L75619-10 Matrix: OTHR WTR Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Lab Duplicate)

Parameter	MDL	RDL	Units	SAMP Value	LD Value	RPD	Qual	Lab Limit
Total Organic Carbon	2	4	mg/L	31.5	31.7	0		0--20

MS:WG172432-10 L75619-10 Matrix: OTHR WTR Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	2	4	mg/L	31.5	20	52.1	103		75--125

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Workgroup: WG172403 Total Metals and Hardness by ICPMS

MB:WG172403-1 Matrix: BLANK WTR Listtype:MTHARD-ICPMS Method:EPA 200.8 (MOD)*SM2340B Project: Pkey:STD
(Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Hardness, Calc	0.331		0.331 mg CaCO ₃ /L		<MDL

MB:WG172403-1 Matrix: BLANK WTR Listtype:MTICPMS Method:EPA 200.8 (MOD) Project: Pkey:STD

Parameter	MDL	RDL	Units	MB Value	Qual
Beryllium, Total, ICP-MS	0.1	0.5	ug/L	<MDL	
Magnesium, Total, ICP-MS	50	50	ug/L	<MDL	
Calcium, Total, ICP-MS	50	50	ug/L	<MDL	
Chromium, Total, ICP-MS	0.2	1	ug/L	<MDL	
Nickel, Total, ICP-MS	0.1	0.5	ug/L	<MDL	
Copper, Total, ICP-MS	0.2	2	ug/L	<MDL	
Zinc, Total, ICP-MS	0.5	2.5	ug/L	<MDL	
Arsenic, Total, ICP-MS	0.05	0.25	ug/L	<MDL	
Selenium, Total, ICP-MS	0.5	1	ug/L	<MDL	
Silver, Total, ICP-MS	0.04	0.2	ug/L	<MDL	
Cadmium, Total, ICP-MS	0.05	0.25	ug/L	<MDL	
Antimony, Total, ICP-MS	0.3	1	ug/L	<MDL	
Thallium, Total, ICP-MS	0.1	0.2	ug/L	<MDL	
Lead, Total, ICP-MS	0.1	0.5	ug/L	<MDL	

SB:WG172403-2 MB:WG172403-1 Matrix: BLANK WTR Listtype:MTHARD-ICPMS Method:EPA 200.8 (MOD)*SM2340B Project: Pkey:STD

Parameter	MDL	RDL	Units	MB Value	True Value	SB Value	% Rec. Qual	Lab Limit
Hardness, Calc	0.331		0.331 mg CaCO ₃ /L	<MDL	33.1	33.2	100	85--115

SB:WG172403-2 MB:WG172403-1 Matrix: BLANK WTR Listtype:MTICPMS Method:EPA 200.8 (MOD) Project: Pkey:STD

Parameter	MDL	RDL	Units	MB Value	True Value	SB Value	% Rec. Qual	Lab Limit
Beryllium, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	20.1	101	85--115
Magnesium, Total, ICP-MS	50	50	ug/L	<MDL	5000	5120	102	85--115
Calcium, Total, ICP-MS	50	50	ug/L	<MDL	5000	4850	97	85--115
Chromium, Total, ICP-MS	0.2	1	ug/L	<MDL	20	21.5	108	85--115
Nickel, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	21.5	107	85--115
Copper, Total, ICP-MS	0.2	2	ug/L	<MDL	20	22.1	111	85--115
Zinc, Total, ICP-MS	0.5	2.5	ug/L	<MDL	20	21.9	110	85--115
Arsenic, Total, ICP-MS	0.05	0.25	ug/L	<MDL	20	20.4	102	85--115
Selenium, Total, ICP-MS	0.5	1	ug/L	<MDL	20	20.2	101	85--115
Silver, Total, ICP-MS	0.04	0.2	ug/L	<MDL	20	20	100	85--115
Cadmium, Total, ICP-MS	0.05	0.25	ug/L	<MDL	20	20	100	85--115
Antimony, Total, ICP-MS	0.3	1	ug/L	<MDL	20	20.5	102	85--115
Thallium, Total, ICP-MS	0.1	0.2	ug/L	<MDL	20	20.8	104	85--115
Lead, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	21.6	108	85--115

MSD:WG172403-4 MS:WG172403-3 L72439-8 Matrix: OTHR WTR Listtype:MTHARD-ICPMS Method:EPA 200.8 (MOD)*SM2340B Project:423650-100 Pkey:STD

(Matrix Spike Duplicate, Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec. Qual	Lab Limit	True Value	MSD Value	% Rec. Qual	RPD	Qual	Lab Limit
Hardness, Calc	0.331		0.331 mg CaCO ₃ /L	116	33.1	151	105	75--125	33.1	148	98	2		0--20

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MSD:WG172403-4 MS:WG172403-3 L72439-8 Matrix: OTHR WTR Listtype:MTICPMS Method:EPA 200.8 (MOD) Project:423650-100 Pkey:STD
(Matrix Spike Duplicate, Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit	True Value	MSD Value	% Rec.	Qual	RPD	Qual	Lab Limit
Beryllium, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	20.1	100		75--125	20	19.7	98		2		0--20
Magnesium, Total, ICP-MS	50	50	ug/L	14300	5000	19600	106		75--125	5000	19200	98		2		0--20
Calcium, Total, ICP-MS	50	50	ug/L	22900	5000	28000		4xRule	75--125	5000	27700		4xRule	1		0--20
Chromium, Total, ICP-MS	0.2	1	ug/L	<MDL	20	21	105		75--125	20	21.3	106		1		0--20
Nickel, Total, ICP-MS	0.1	0.5	ug/L	2.49	20	23.5	105		75--125	20	23.7	106		1		0--20
Copper, Total, ICP-MS	0.2	2	ug/L	2.17	20	23.1	105		75--125	20	23.7	107		2		0--20
Zinc, Total, ICP-MS	0.5	2.5	ug/L	14.6	20	35.4	104		75--125	20	36	107		2		0--20
Arsenic, Total, ICP-MS	0.05	0.25	ug/L	0.913	20	21.2	101		75--125	20	21.5	103		2		0--20
Selenium, Total, ICP-MS	0.5	1	ug/L	<MDL	20	20.5	102		75--125	20	20.8	104		1		0--20
Silver, Total, ICP-MS	0.04	0.2	ug/L	<MDL	20	19.4	97		75--125	20	19.6	98		1		0--20
Cadmium, Total, ICP-MS	0.05	0.25	ug/L	<MDL	20	19.8	99		75--125	20	20.2	101		2		0--20
Antimony, Total, ICP-MS	0.3	1	ug/L	<MDL	20	20.7	103		75--125	20	21.1	105		2		0--20
Thallium, Total, ICP-MS	0.1	0.2	ug/L	<MDL	20	20.3	101		75--125	20	20.5	102		1		0--20
Lead, Total, ICP-MS	0.1	0.5	ug/L	0.13	20	21.4	106		75--125	20	20.9	104		2		0--20

MSD:WG172403-6 MS:WG172403-5 L72440-7 Matrix: OTHR WTR Listtype:MTHARD-ICPMS Method:EPA 200.8 (MOD)*SM2340B Project:423650-100 Pkey:STD
(Matrix Spike Duplicate, Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit	True Value	MSD Value	% Rec.	Qual	RPD	Qual	Lab Limit
Hardness, Calc	0.331	0.331 mg CaCO ₃ /L		131	33.1	165	104		75--125	33.1	161	92		2		0--20

MSD:WG172403-6 MS:WG172403-5 L72440-7 Matrix: OTHR WTR Listtype:MTICPMS Method:EPA 200.8 (MOD) Project:423650-100 Pkey:STD
(Matrix Spike Duplicate, Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit	True Value	MSD Value	% Rec.	Qual	RPD	Qual	Lab Limit
Beryllium, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	20.4	102		75--125	20	19.9	100		3		0--20
Magnesium, Total, ICP-MS	50	50	ug/L	17300	5000	22500	103		75--125	5000	21700	88		4		0--20
Calcium, Total, ICP-MS	50	50	ug/L	23800	5000	28900		4xRule	75--125	5000	28800		4xRule	1		0--20
Chromium, Total, ICP-MS	0.2	1	ug/L	<MDL	20	21.3	107		75--125	20	20.7	104		3		0--20
Nickel, Total, ICP-MS	0.1	0.5	ug/L	2.43	20	23.4	105		75--125	20	23	103		2		0--20
Copper, Total, ICP-MS	0.2	2	ug/L	2.31	20	23.7	107		75--125	20	23	103		3		0--20
Zinc, Total, ICP-MS	0.5	2.5	ug/L	13.3	20	34.1	104		75--125	20	33.4	100		2		0--20
Arsenic, Total, ICP-MS	0.05	0.25	ug/L	0.961	20	21.6	103		75--125	20	21.1	101		2		0--20
Selenium, Total, ICP-MS	0.5	1	ug/L	<MDL	20	20.9	105		75--125	20	20.3	102		3		0--20
Silver, Total, ICP-MS	0.04	0.2	ug/L	<MDL	20	19.6	98		75--125	20	19	95		3		0--20
Cadmium, Total, ICP-MS	0.05	0.25	ug/L	<MDL	20	19.8	99		75--125	20	19.6	98		1		0--20
Antimony, Total, ICP-MS	0.3	1	ug/L	<MDL	20	21.5	108		75--125	20	20.8	104		3		0--20
Thallium, Total, ICP-MS	0.1	0.2	ug/L	<MDL	20	19.6	98		75--125	20	20.1	101		3		0--20
Lead, Total, ICP-MS	0.1	0.5	ug/L	0.11	20	20.1	100		75--125	20	20.6	102		2		0--20

King County Environmental Laboratory QC Report

OVIVO Pilot 01October2020

Workgroup: WG172567 Total Mercury

MB:WG172567-1 Matrix: BLANK WTR Listtype:MTHG-LOW Method:EPA 245.1 Project: Pkey:STD
(Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Mercury, Total, CVAA	0.005	0.015	ug/L	<MDL	

SB:WG172567-2 MB:WG172567-1 Matrix: BLANK WTR Listtype:MTHG-LOW Method:EPA 245.1 Project: Pkey:STD

(Spike Blank, Method Blank)

Parameter	MDL	RDL	Units	MB Value	True Value	SB Value	% Rec.	Qual	Lab Limit
Mercury, Total, CVAA	0.005	0.015	ug/L	<MDL	0.05	0.0497	99		85--115

MSD:WG172567-4 MS:WG172567-3 L72439-6 Matrix: OTHR WTR Listtype:MTHG-LOW Method:EPA 245.1 Project:423650-100 Pkey:STD

(Matrix Spike Duplicate, Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit	True Value	MSD Value	% Rec.	Qual	RPD	Qual	Lab Limit
Mercury, Total, CVAA	0.005	0.015	ug/L	<MDL	0.05	0.0465	93		75--125	0.05	0.0501	100		7		0--20

MSD:WG172567-6 MS:WG172567-5 L72440-8 Matrix: OTHR WTR Listtype:MTHG-LOW Method:EPA 245.1 Project:423650-100 Pkey:STD

(Matrix Spike Duplicate, Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit	True Value	MSD Value	% Rec.	Qual	RPD	Qual	Lab Limit
Mercury, Total, CVAA	0.005	0.015	ug/L	<MDL	0.05	0.0456	91		75--125	0.05	0.0453	91		1		0--20

King County Environmental Laboratory QC Report

OVIVO Pilot 01October2020

Workgroup: WG172274 HEM

MB:WG172274-1 Matrix: BLANK WTR Listtype:ORHEM Method:EPA 1664B Project: Pkey:STD
(Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Hem (oil, total)	1.4	5	mg/L	<MDL	

LCSD:WG172274-3 LCS:WG172274-2 Matrix: BLANK WTR Listtype:ORHEM Method:EPA 1664B Project: Pkey:STD
(Lab Control Sample Duplicate, Lab Control Sample)

Parameter	MDL	RDL	Units	True Value	LCS Value	% Rec.	Qual	Lab Limit	True Value	LCSD Value	% Rec.	Qual	RPD	Qual	Lab Limit
Hem (oil, total)	1.4	5	mg/L	40	38.2	96		78--114	40	38.8	97	2		0-18	

=====

4xRule indicates no MS/MSD recovery was calculated due to the 4x rule.

Sample Receipt and Chain of Custody Records

Login: P72499

OVIVO Pilot Unit Testing at WPT - PERFORMANCE Test Run

TC: _____

Project: 423650-100

CHAIN OF CUSTODY

LPM: Katherine Bourbonais

Relinquished by <i>Payogi Sankapanditaram</i>	Date 10/2/20	Time 9:35
Received by <i>KRB</i>	Date 10-2-20	Time 9:35
Sample Numbers [All]		

Sample Number	P72439-1	P72439-2	P72439-3
QC Link			
Locator	INF-SL	INF-SL	INF-SL
Short Loc Desc	INF-SL	INF-SL	INF-SL
Locator Desc	PILOT INFLUENT, INFLOW PIPE <i>Influent</i>	PILOT INFLUENT, INFLOW PIPE	PILOT INFLUENT, INFLOW PIPE
Site	WEST PT INPLANT	WEST PT INPLANT	WEST PT INPLANT
Comments	OVIVO pilot influent prior to coagulant addition - composite	OVIVO pilot influent prior to coagulant addition - grab #1	OVIVO pilot influent prior to coagulant addition - grab #2
Start Date/Time	10/1, 4:16:30	10/1, 7:30	10/2, 7:10:00 missed
End Date/Time	7:00-16:30		
Time Span	9.5hr		
Sample Depth			
AMP INFO			
SAMPLE CODE	Composite	Grab	Grab
Sample Matrix, Prod	3 LB TOC	3 LB TOC 6 LB CA-ICPMS 6 LB HG-CVAA-L 6 LB ICPMS-HARDNESS 6 LB MG-ICPMS 6 LB PP ICPMS 7 LB HEM	3 LB TOC — missed 6 LB CA-ICPMS 6 LB HG-CVAA-L 6 LB ICPMS-HARDNESS 6 LB MG-ICPMS 6 LB PP ICPMS 7 LB HEM

S. Plan: I-0910 11/11/2019
 Login #: _____
 Ver #: _____
 Ser #: _____
 Approved by: _____
 Moved by: _____

Login: P72439

OVIVO Pilot Unit Testing at WPT - PERFORMANCE Test Run

TC: _____

Project: 423650-100

LPM: Katherine Bourbonais

Sample Number	P72439-4	P72439-5	P72439-6
QC Link			
Locator	INF-SL	EFF-SL	EFF-SL
Short Loc Desc	INF-SL	EFF-SL	EFF-SL
Locator Desc	PILOT INFLUENT, INFLOW PIPE <i>Influent</i>	PILOT MEMBRANE PERMEATE <i>Effluent</i>	PILOT MEMBRANE PERMEATE
Site	WEST PT INPLANT	WEST PT INPLANT	WEST PT INPLANT
Comments	OVIVO pilot influent prior to coagulant addition - grab #3	OVIVO pilot permeate - composite	OVIVO pilot permeate - grab #1
Start Date/Time	10/1, 12:00	10/1, 16:30	10/1, 7:40
End Date/Time		7:00-16:30	
Time Span		9.5hr	
Sample Depth			
SAMP INFO			
SAMPLE CODE	Grab	Composite	Grab #1
	3 LB TOC 6 LB CA-ICPMS 6 LB HG-CVAA-L 6 LB ICPMS-HARDNESS 6 LB MG-ICPMS 6 LB PP ICPMS 7 LB HEM	3 LA TOC	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS 7 LA HEM

(2 / 4)

Login: P72439

OVIVO Pilot Unit Testing at WPt - PERFORMANCE Test Run

TC: _____

Project: 423650-100

LPM: Katherine Bourbonais

Sample Number	P72439-7	P72439-8	P72439-9
QC Link			
Locator	EFF-SL	EFF-SL	TNK-SL
Short Loc Desc	EFF-SL	EFF-SL	TNK-SL
Locator Desc	PILOT MEMBRANE PERMEATE <i>Effluent</i>	PILOT MEMBRANE PERMEATE	PILOT MEMBRANE TANK <i>Tank</i>
Site	WEST PT INPLANT	WEST PT INPLANT	WEST PT INPLANT
Comments	OVIVO pilot permeate - grab #2	OVIVO pilot permeate - grab #3	OVIVO pilot mixed water from feed side of tank - grab #1
Start Date/Time	10/1, 10:10	10/1, 12:10	10/1, 7:35
End Date/Time			
Time Span			
Sample Depth			
SAMP INFO			
SAMPLE CODE	Grab	Grab	Grab
Dept, Matrix, Prod	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS 7 LA HEM	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS 7 LA HEM	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS

TNK-SL

Login: P72439

OVIVO Pilot Unit Testing at WPt - PERFORMANCE Test Run

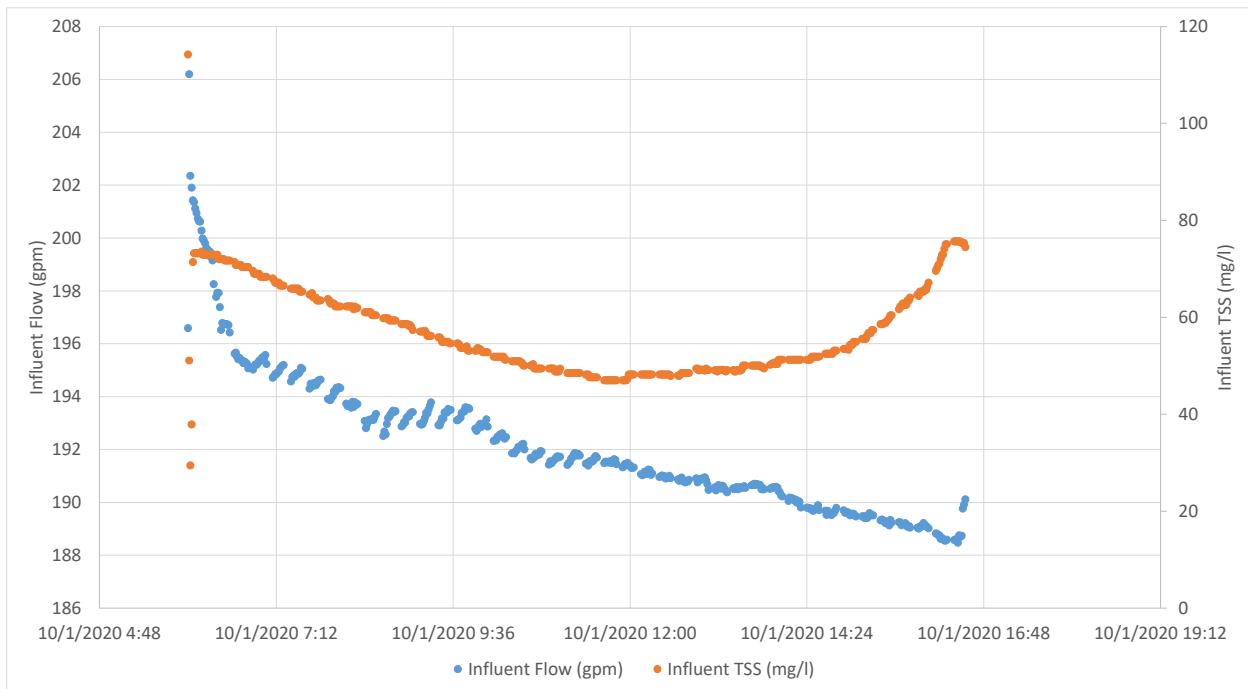
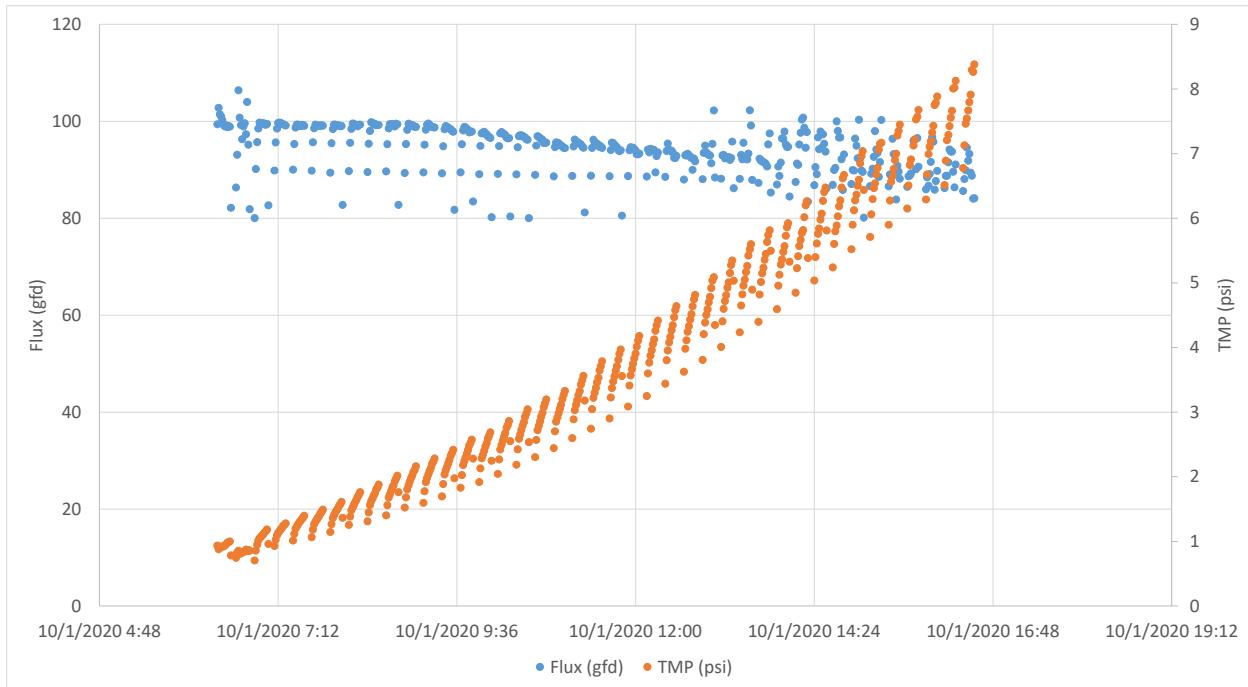
TC: _____

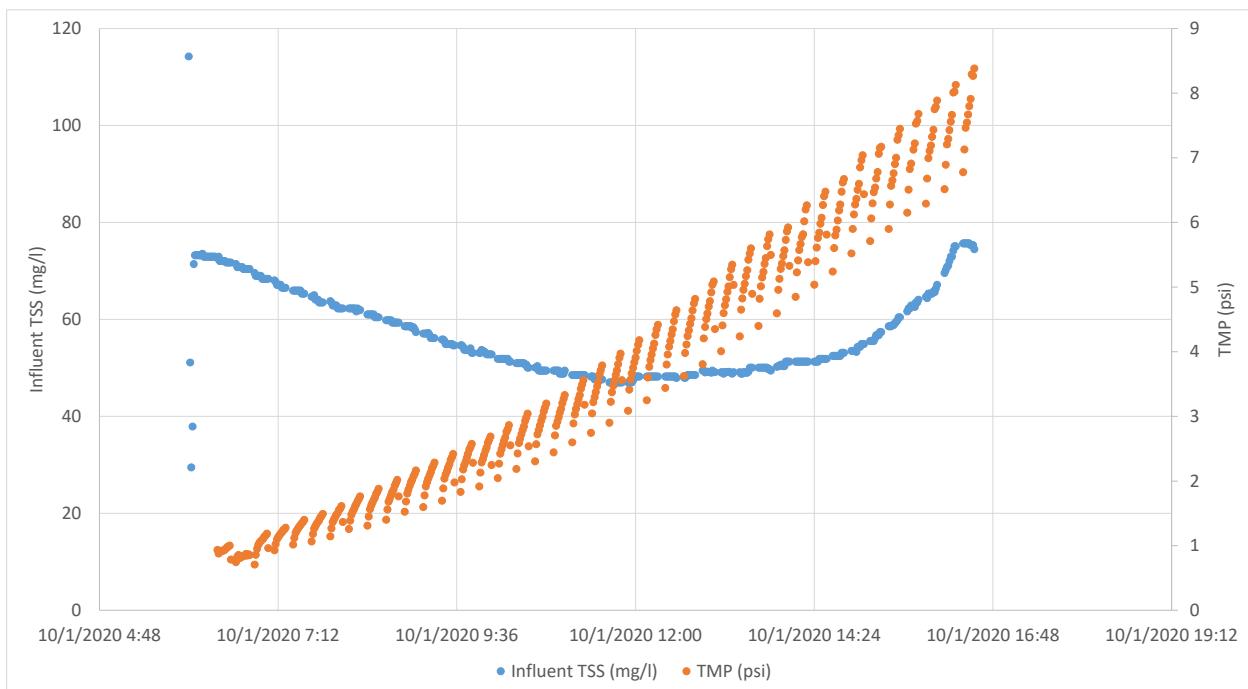
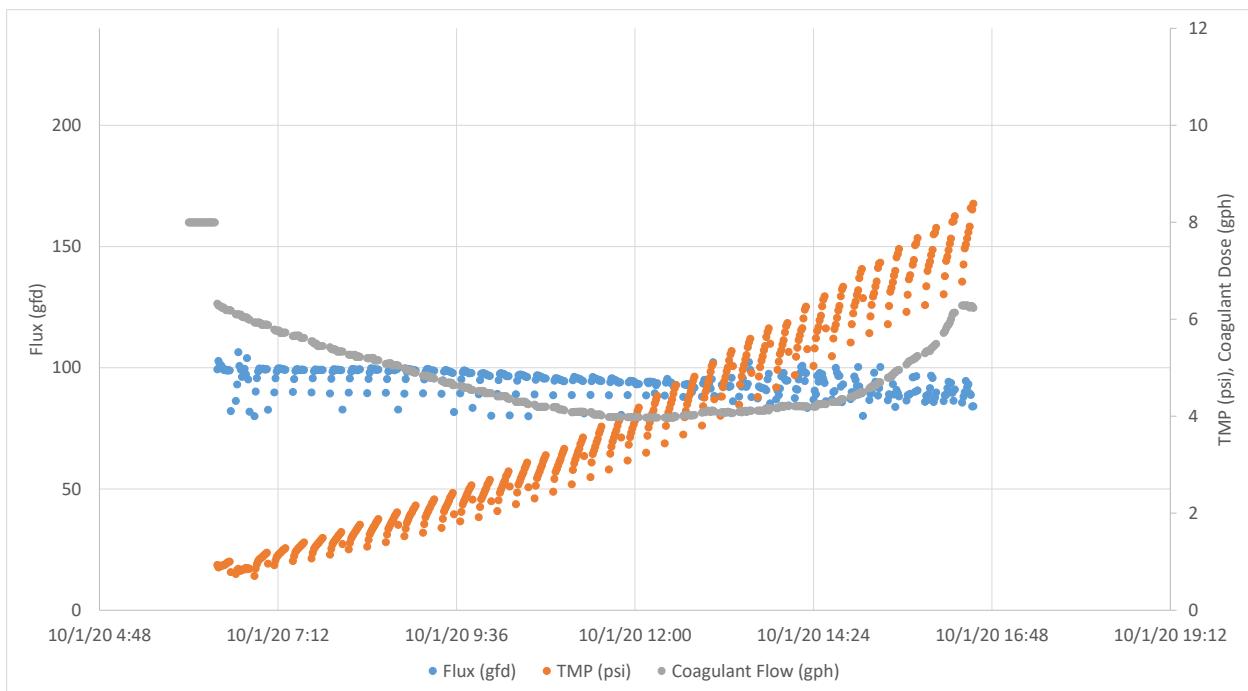
Project: 423650-100

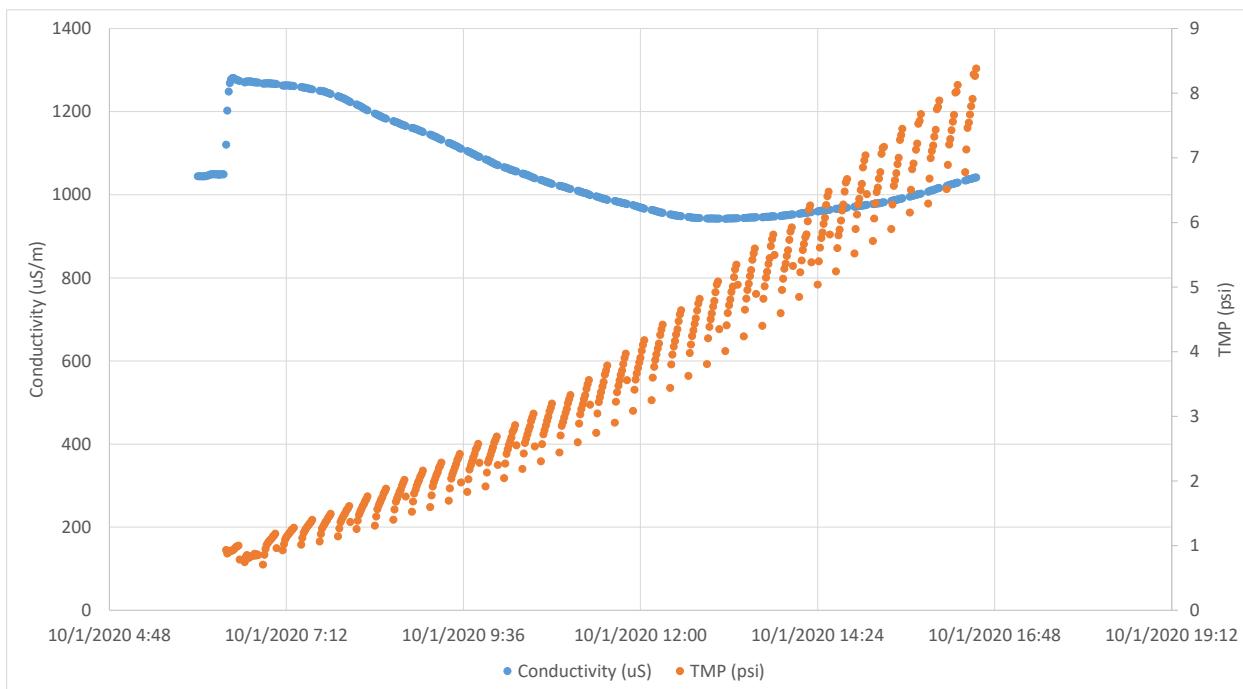
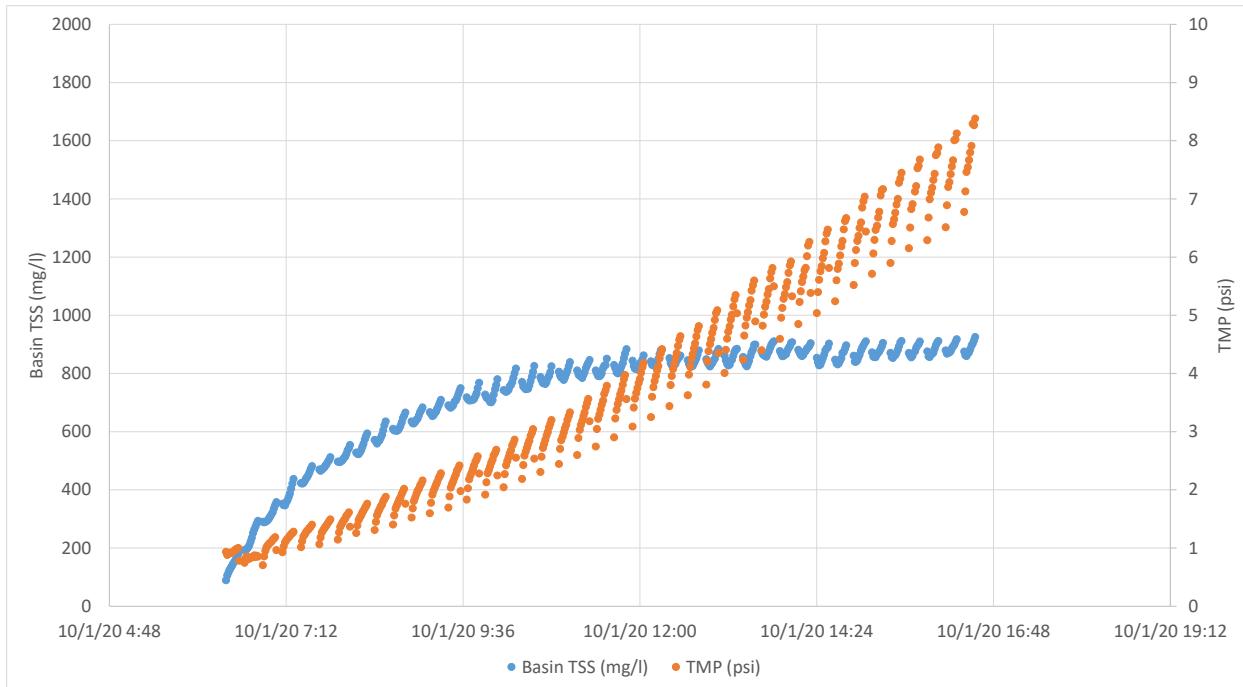
LPM: Katherine Bourbonais

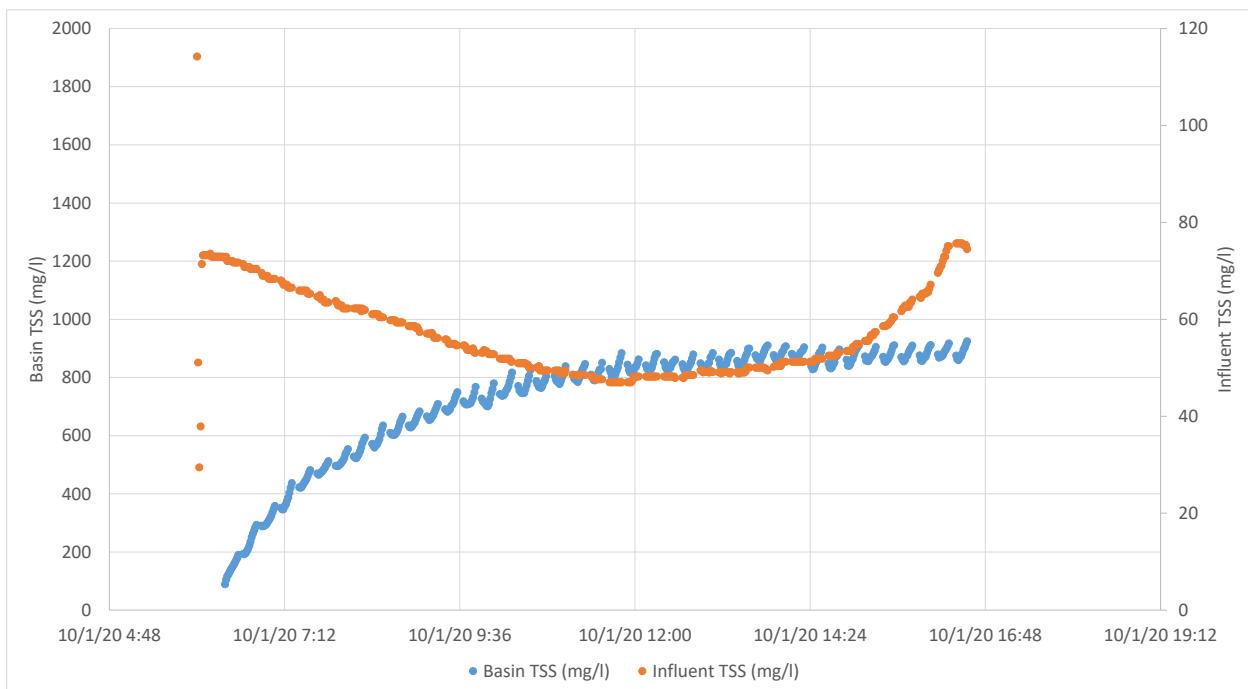
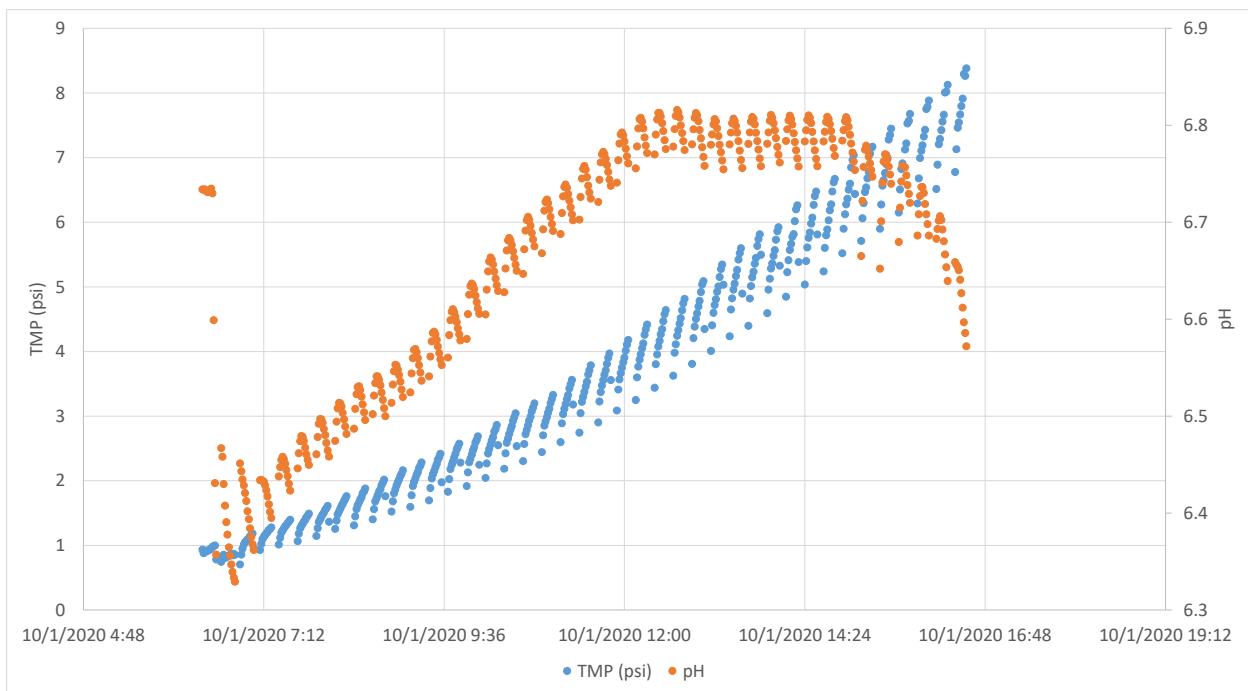
Sample Number	P72439-10	P72439-11	
QC Link			
Locator	TNK-SL	TNK-SL	
Short Loc Desc	TNK-SL	TNK-SL	
Locator Desc	PILOT MEMBRANE TANK <i>Tank</i> →	PILOT MEMBRANE TANK	
Site	WEST PT INPLANT	WEST PT INPLANT	
Comments	TNK-SL OVIVO pilot mixed water from feed side of tank - grab #2	OVIVO pilot mixed water from feed side of tank - grab #3	TNK-SL
Start Date/Time	10/1, 10:05	10/1, 12:05	
End Date/Time			
Time Span			
Sample Depth			
SAMP INFO			
SAMPLE CODE	Grab	Grab	
Dept, Matrix, Prod	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS	

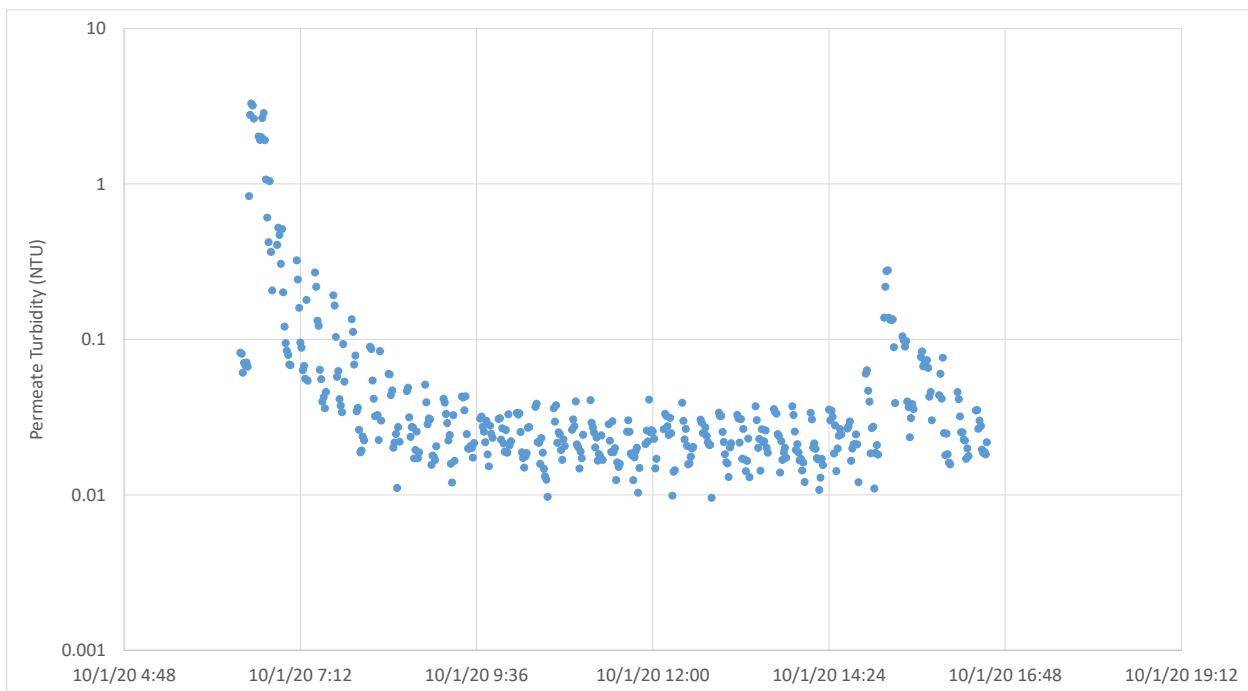
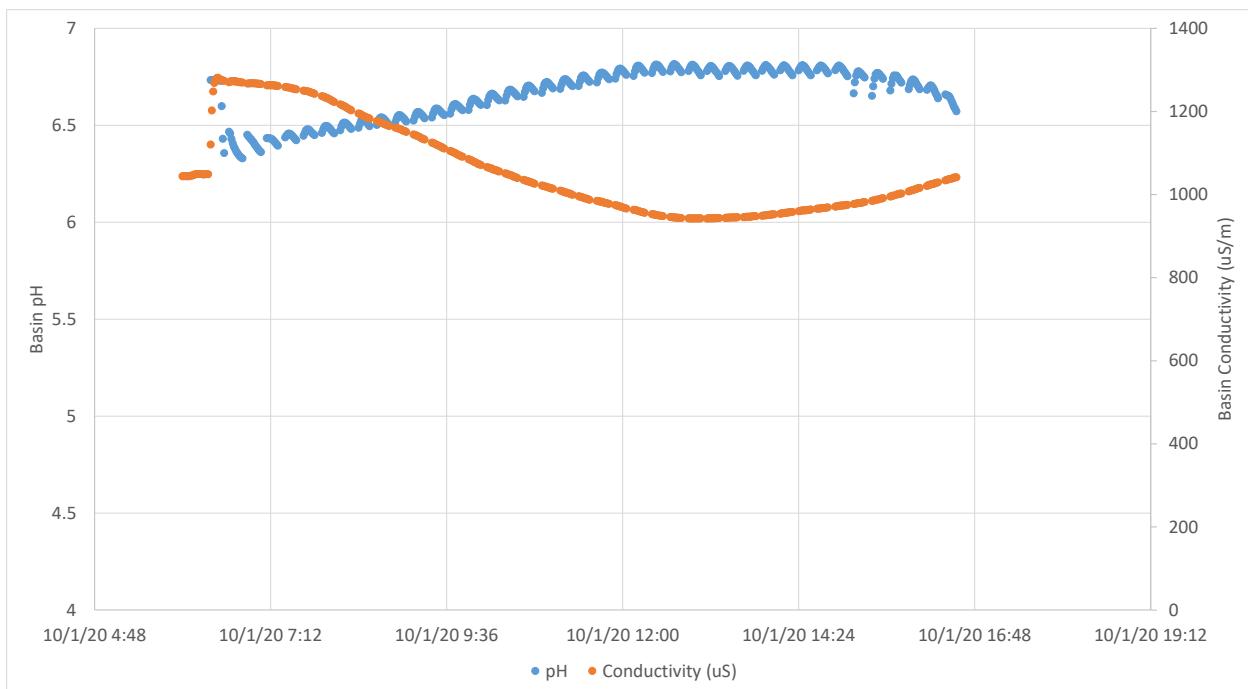
(4 / 4)

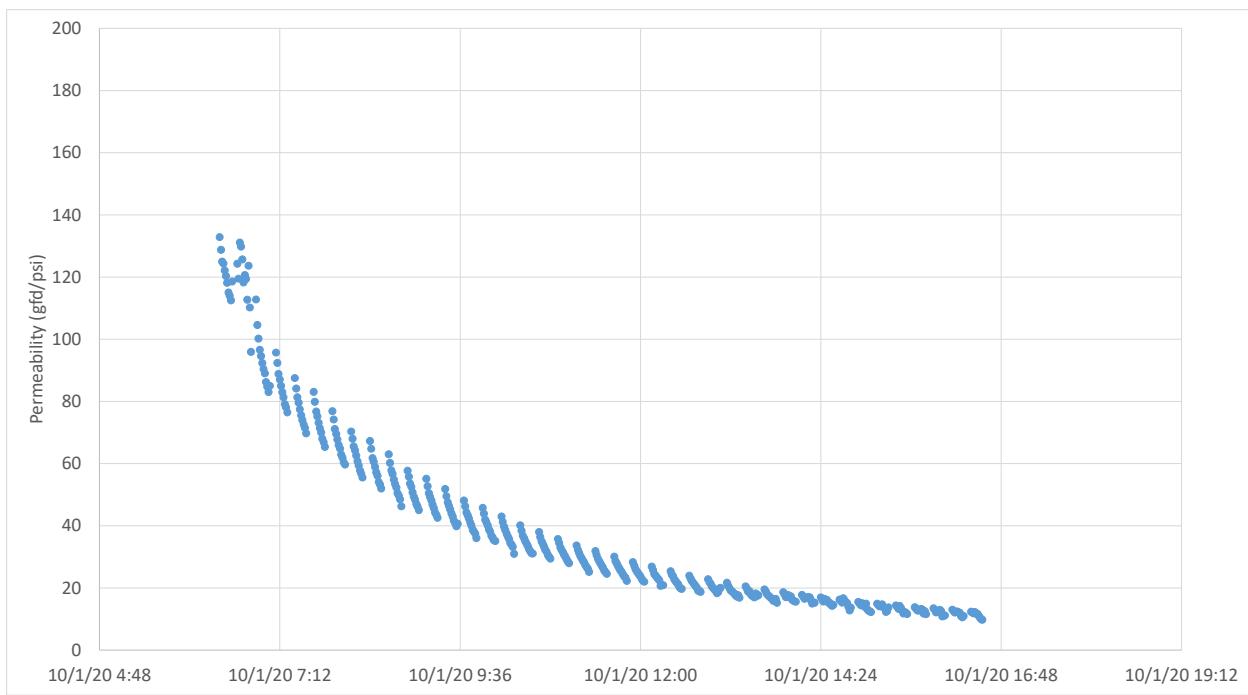


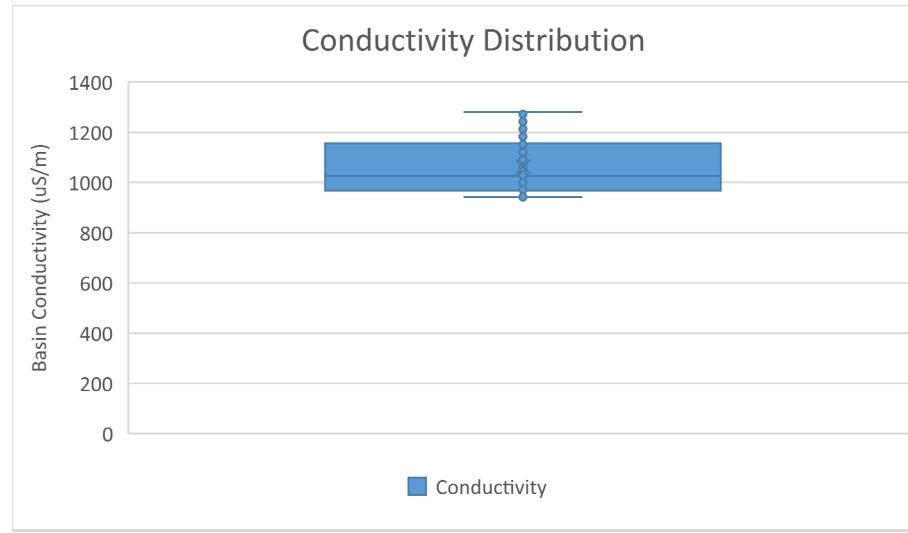
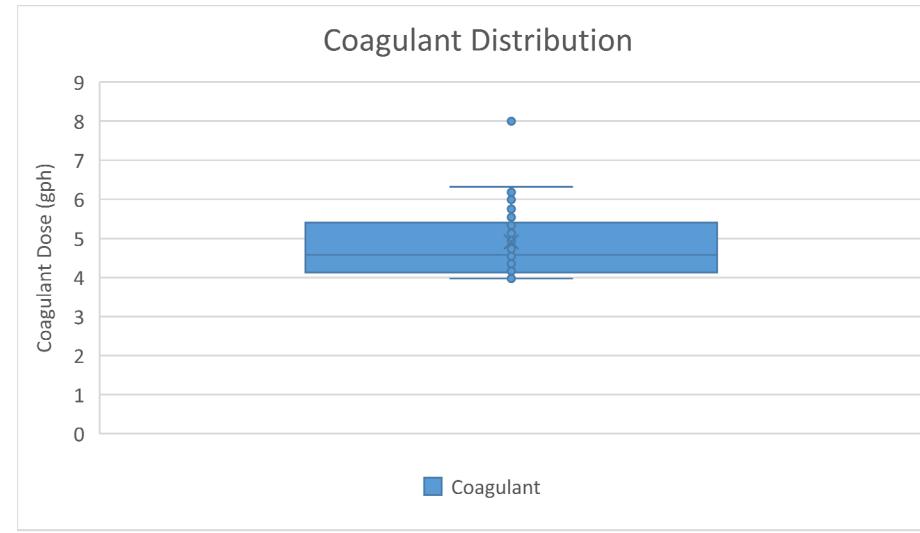
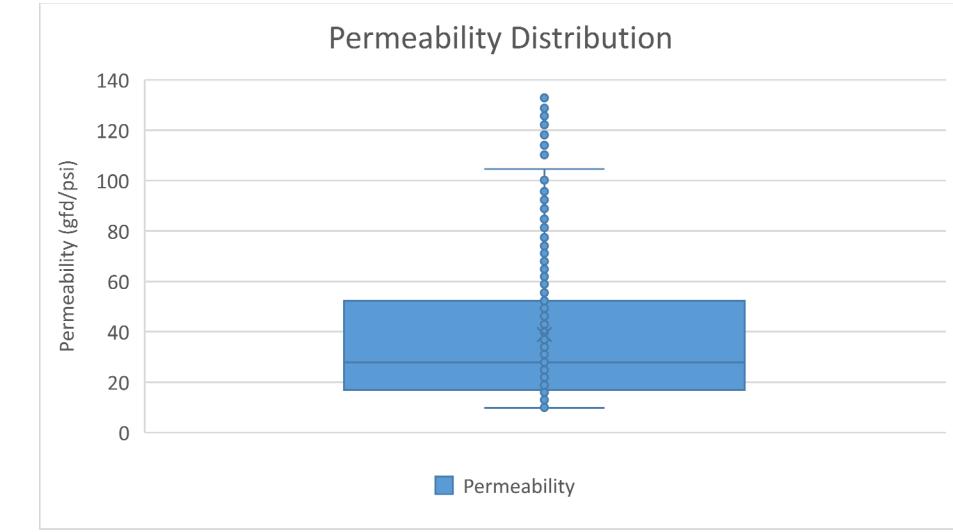
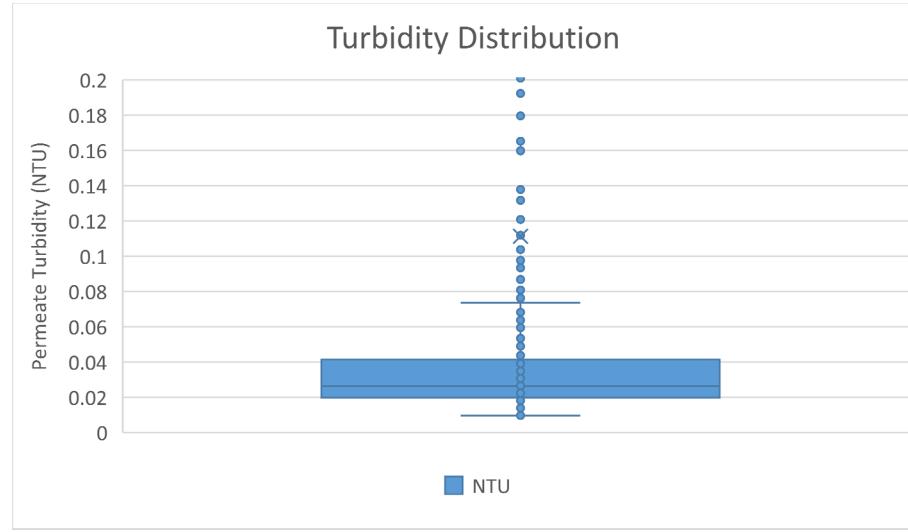
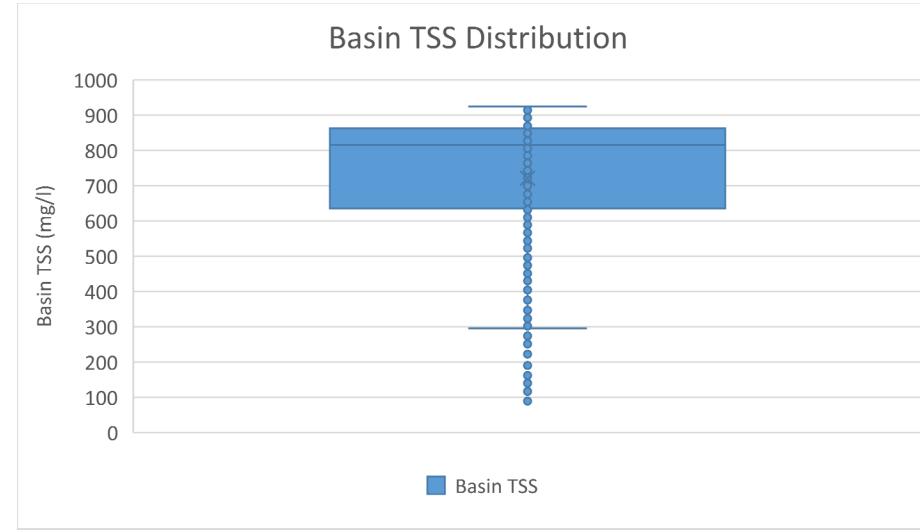
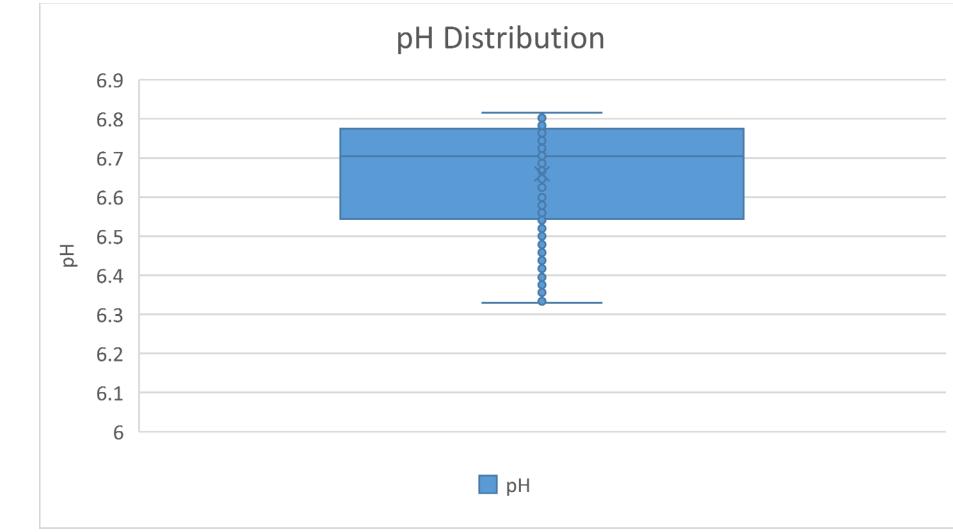
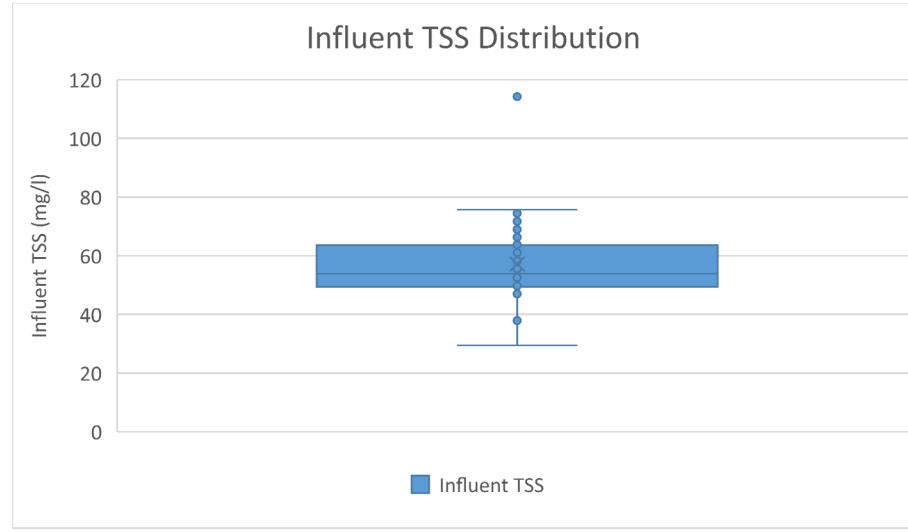
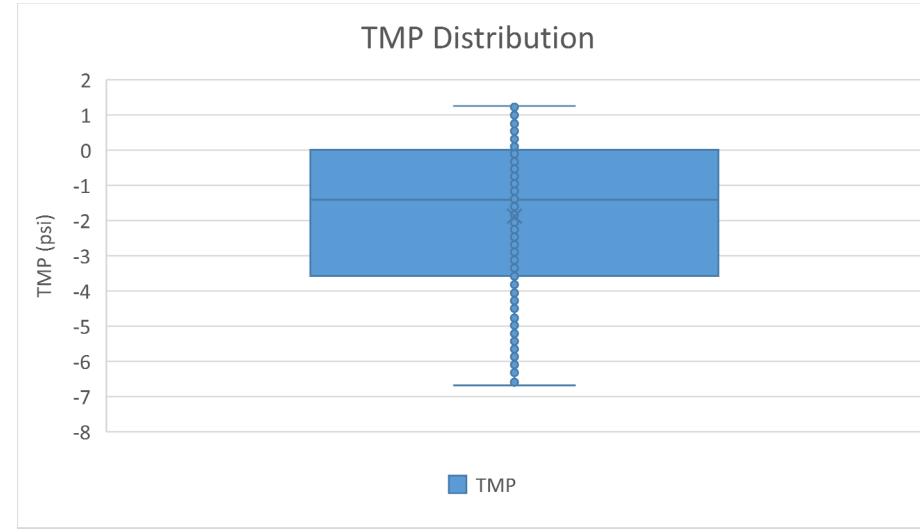












OVIVO PILOT TESTING

WO # C165282

Day	Unit	# of samples	Sample Frequency	Thu 10/1/2020				Sat			Sat			Sat		
S1-G																
TSS	mg/L	1	1/run		38											
VSS	mg/L	1	1/run		32											
Fecal Coliform Sample ID				#1	#2			#1	#2		#1	#2		#1	#2	
Fecal Coliform Sample Time				10/1/2020 1000	10/1/2020 1200											
Fecal Coliform	MPN/100mL	2	2/run	22000000	13000000											
Nutrient Sample ID				#1	#2	#3		#1	#2	#3	#1	#2	#3	#1	#2	#3
Nutrient Sample Time				10/1/20 0730	10/1/2020 1000	10/1/2020 1200										
TP	mg/L	3	3/run		4.17	3.76	3.99									
OPO4	mg/L	3	3/run		2.74	2.5	2.77									
TKN	mg/L	3	3/run		37.61	35.63	38.4									
NH3	mg/L	3	3/run		25.32	25.78	28.34									
NO3	mg/L	3	3/run		0	0	0									
NO2	mg/L	3	3/run		0	0	0									
S1-C																
TSS	mg/L	1	hourly		43											
VSS	mg/L	1	hourly		36											
Alkalinity	mg/L	1	hourly		193											
COD	mg/L	1	hourly		196											
S2-G																
Cl2 Demand	mg/L	1	1/run		1.04											
SS	mg/L	1	1/run		0											
Fecal Coliform Sample ID				#1	#2	#3	#4	#1	#2	#3	#4	#1	#2	#3	#4	
Fecal Coliform Sample Time				10/1/2020 0740	10/1/2020 not time	10/1/2020 1010	10/1/2020 1210									
Fecal Coliform	MPN/100mL	4	4/run		0	20	20	0								
Nutrient Sample ID				#1	#2	#3		#1	#2	#3	#1	#2	#3	#1	#2	#3
Nutrient Sample Time				10/1/2020 no time	10/1/2020 1010	10/1/2020 1210										
TP	mg/L	3	3/run		0.2	0.1	0.14									
OPO4	mg/L	3	3/run		0.01	0.01	0.02									
TKN	mg/L	3	3/run		31.64	30.92	31.64									
NH3	mg/L	3	3/run		26.52	26.26	27.99									
NO3 or filter for NOx	mg/L	3	3/run		0	0	0									
NO2 or filter for NOx	mg/L	3	3/run		0	0.017	0									
S2-C																
TSS	mg/L	1	hourly		2											
VSS	mg/L	1	hourly		1											
Alkalinity	mg/L	1	hourly		98											
UV Abs	cm ⁻¹	1	hourly		0.199											
BOD	mg/L	1	hourly		42											
S3-G																
TSS	mg/L	1	1/run		1550											
VSS	mg/L	1	1/run		870											

Week Check of online instruments

Date/Time/Initials															
Turbidity online reading															
Turbidity lab reading															
pH online reading															
pH lab reading															
Temperature online reading															
Temperature lab reading															
Conductivity															

Bottle Kit	Volume	S1-G	Influent Grab
FE grab	2L	S1-C	Influent Composite
FE Fecal	4 125-ml sterile	S2-G	Effluent Grab
FE Demand	3L amber bottle	S2-C	Effluent Composite
FE nutrients	3 each 2L	S3-G	TNK Grab
FE comp	4L		
Inf grab	2L		
Inf Fecal	2 125-ml sterile		
Inf comp	2L		
Inf nutrients	3 each 2L		
TNK	500mL		

Appendix B.4

Test Run Package 04

Run# 4
Run Description Confirm peak flux range from 100 to 200 gfd

Type	<input checked="" type="checkbox"/> process	<input type="checkbox"/> Performance
Influent water source	<input type="checkbox"/> PE <input type="checkbox"/> Hydrant <input checked="" type="checkbox"/> Both	
Flux rate	<input type="checkbox"/> Constant <input checked="" type="checkbox"/> Varies	

Wasting Rate	0	
Air Scour	105	scfm
Backwash Frequency	15	min
Run Duration	10	Hrs
CIP	<input checked="" type="checkbox"/> Hypo <input type="checkbox"/> Caustic	<input type="checkbox"/> Citric
Composite Sample Schedule	9 Samples, 1 hour apart, 500 mL each 4.5 L total volume	

Date 9/29/2020 *Exact PE and hydrant flow may need to be adjusted to achieve the desired flux.

*Exact PE and hydrant flow may need to be adjusted to achieve the desired flux.

Field
Eff
Turbidity
Probe reading
pH
Temperature
Conductivity

WPPLsamples
Influent composite
Effluent composite
-TSS/VSS, Alk, BOD
Influent grab
TSS/VSS
Fecal
Effluent grab
TSS/VSS
Chlorine demand
Fecal
Settleable solids
Tank grab
TSS/VSS

KCEL
Influent grab
TOC

Effluent composite
TOC

OVIVO Pilot Setpoints **Values to be set according to OVIVO's recommendations.**
Run# **4**Date **9/28/2020**

FLOW OPTIMIZATION				CHEM DOSING						
System	ONLINE/OFFLINE			Permeate		End of Event		Coagulant		
Inlet System				Permeate Flow	206	gpm		Pump Start Inf Flow	1	gpm
Screen Off Delay	2	min		Pump Start Level	116	in		Pump Start Level	0.1	in
Weir Gate Frequency	1800	min		Pump Stop Level	5	in		Overflow Level	118	in
Weir Gate Duration	30	sec		Pump Stop Low Level	100	in		Coagulant Min Flow	0.5	gph
Blowers				Single Pump Flow	220	gpm		Coagulant Max Flow	20	gph
Scour Air Flow	105	scfm		Backwash Frequency	15	min		Coag Fixed Flow	6.0	gph
Blower Start Level	20	in		Backwash Flow	300	%		Coag TSS Ratio	0.40	
Blower Stop Level	8	in		Pre BW Relaxation	30	sec		Coag A1%	4.1	%
Lag Blower Start Level	65	%		Backwash Duration	60	sec		Coag SG	1.34	
Lag Blower Start Delay	120	sec		Post BW Relax Duration	30	sec		Coag Flow Ratio	5	
Blower Fail Air Flow	4.5	scfm		Perm Static Pressure	1.7	psi		Coag Fill Flow	8	gph
Blower Fail Delay	140	sec		Turbidity Hi Alarm SP	10	NTU				
Low Air Flow Alarm	55	%		TMP Hi Alarm SP	8	psi				
Low Air Flow Delay	45	sec		Backwash Start TMP	10	psi				
Override Enabled				Max Hi TMP Cycles	1					
				TMP Reset						
				Perm Tank Level Lo	20	in				
				Air Extractor Frequency	5	min				
				Air Extractor Duration	4	min				
				Membrane Basin Drain Vlv						
				WAS Vlv Open TSS	6,000	mg/l				
				WAS Vlv Close Lvl	117	in				
				WAS Valve Duration	0	sec				
				Caustic						
				CIP Permeate Flow	100	gpm				
				Backwash Perm Flow	200	gpm				
				Citric Flow	28	gph				
				Pre CIP Relax Duration	30	sec				
				Chem Flow Duration	10	min				
				Soak Duration	999	min				
				Rinse Duration	60	sec				
				Final Relax Duration	60	sec				
				Pre-Drain Disabled						
				Pre-Drain Disabled						
				Pre-Drain Disabled						

King County Ovivo Pilot

Run # 4
Date 9/29/2020

See log sheet for notes

membrane
surface area per stack = 975 sf

Test Variable Test Variable

Influent flow = PE + hyd (gpm)	permeate flow setpt (gpm)	stacks in service (#)	surface area in service (sf)	instantaneous flux (GFD)	Test Plan Flux Goal (GFD)	Start Time	Stop Time
240	204	3	2,925	100	100		
	240	3	2,925	118	125	10:30	11:30
	203	2	1,950	150	150	11:30	12:30
	237	2	1,950	175	175	12:30	13:30
	136	1	975	201	200	13:30	15:30
	237	2	1,950	175	175	15:30	16:30
	203	2	1,950	150	150	16:30	17:30
	240	3	2,925	118	125	17:30	18:30
	204	3	2,925	100	100	18:30	19:30

9/19 TSS probe
Calibration

(8/27)

Daily Field Notes

Run
Cond

4

9/29

Process and Performance Testing



150
175
200
220

240

total

210

Date	Time	Observation	Action Item
9/29	0647 hrs	Opened permeate tank drain (stated @ ~10")	
	0648 hrs	Opened membrane tank drain to remove residual water (~0.5")	
	0701 hrs	PE feed to ON.	
	0743 hrs	Lots of white foam from membrane tank	
	0833	Adjusted flow setpt to 258 gpm with PE/hyd	
	0900	Manual wiper of infected TSS probe (TSS reading & n/a)	
	0905	Troubleshooting influent flow Adjusted flow from 150 - 200 gpm	100 GPD
	0906	Influent water back (on) - watching TSS probe	
	1030 hrs	Initiated revised flux testing based on removing stacks from service (see field sheet for details)	
	1032 hrs	Initiating scum of pilot (sample off).	
	1034 hrs	Sample turbidimetric valves closed / hyd primed	
	1034	Initiated EOE CIP ⁴ (hyd/canister)	

King County Ovivo Pilot

Run #

4

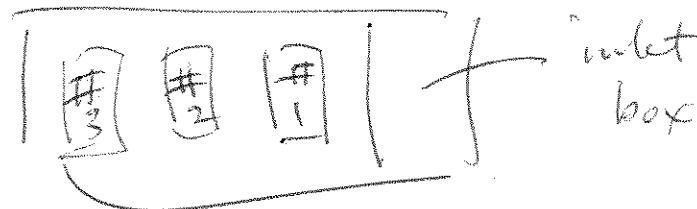
Date

9/29/2020

membrane
surface area per stack =

975 sf

Cassette configuration



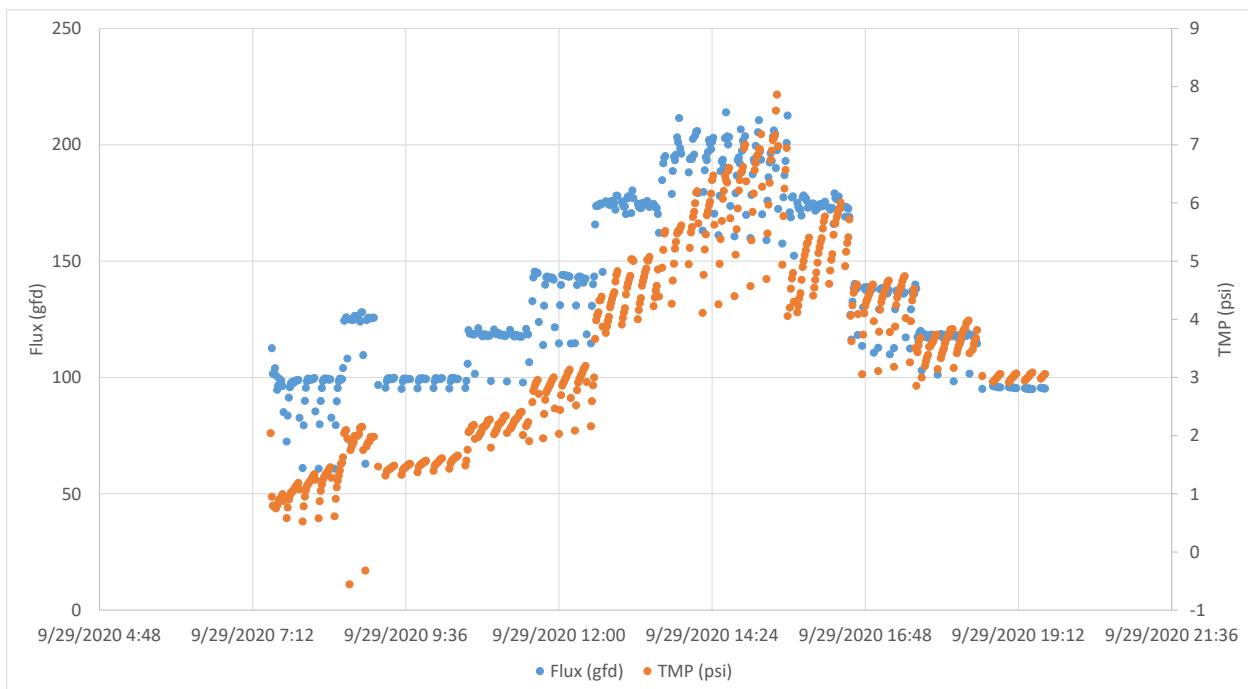
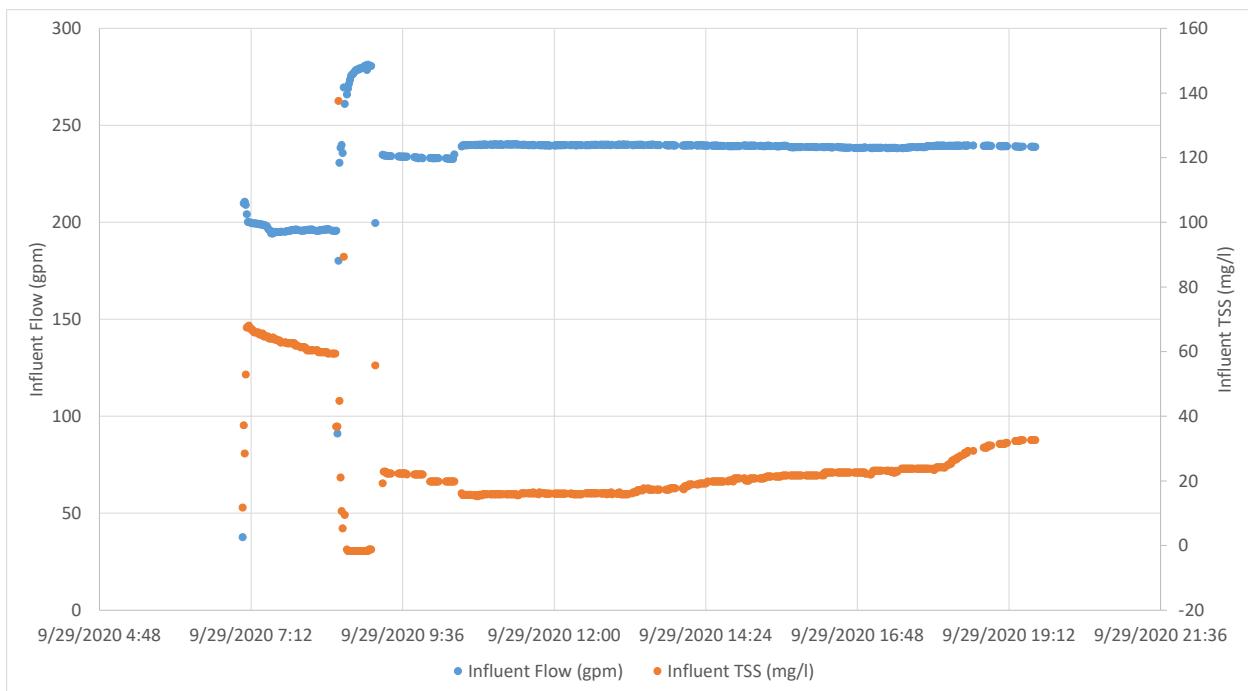
Influent flow = PE + hyd (gpm)	permeate flow setpt (gpm)	stacks in service (#)	surface area in service (sf)	instantaneous flux (GFD)	Test Plan Flux Goal (GFD)	Start Time	Stop Time
Cassette 3 valves out 240 Cassette 2 & 3 valves out	204	3	2,925	100	100	10:30	11:30
	240	3	2,925	118	125	11:30	12:30
	203	2	1,950	150	150	12:30	13:30
	237	2	1,950	175	175	12:30	13:30
	136	1	975	201	200	13:30	15:30
	237	2	1,950	175	175	15:30	16:30
	203	2	1,950	150	150	16:30	17:30
	240	3	2,925	118	125	17:30	18:30
	204	3	2,925	100	100	18:30	19:30

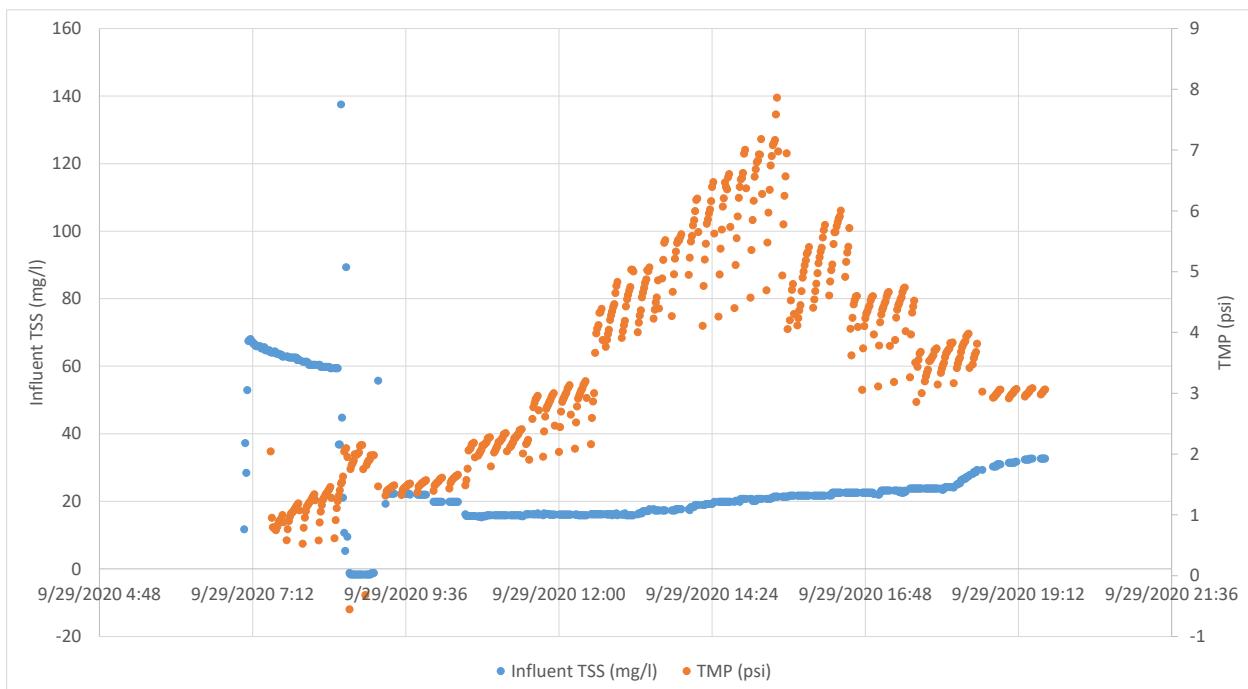
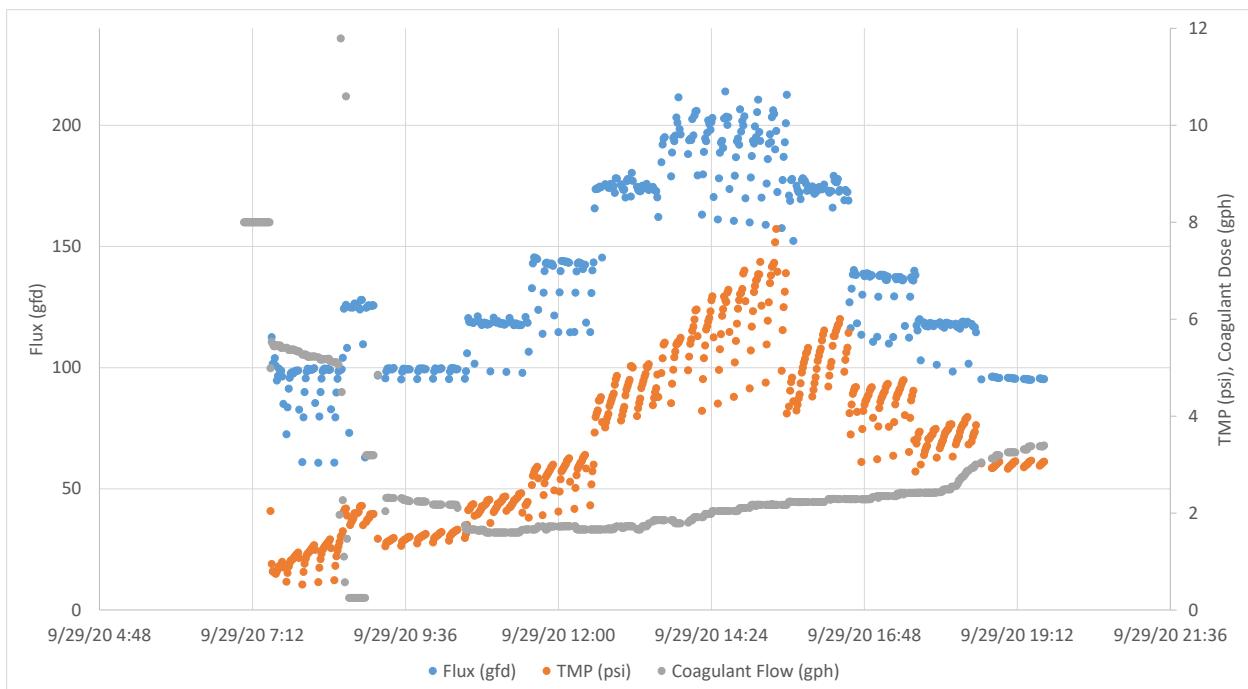


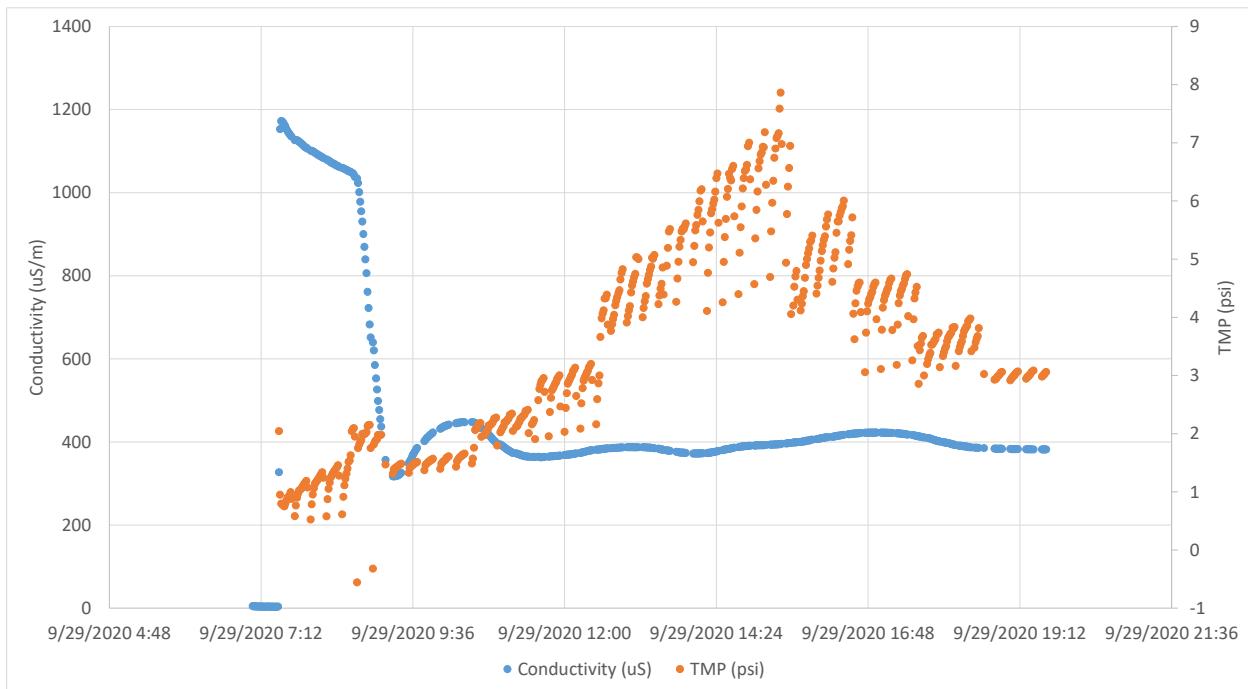
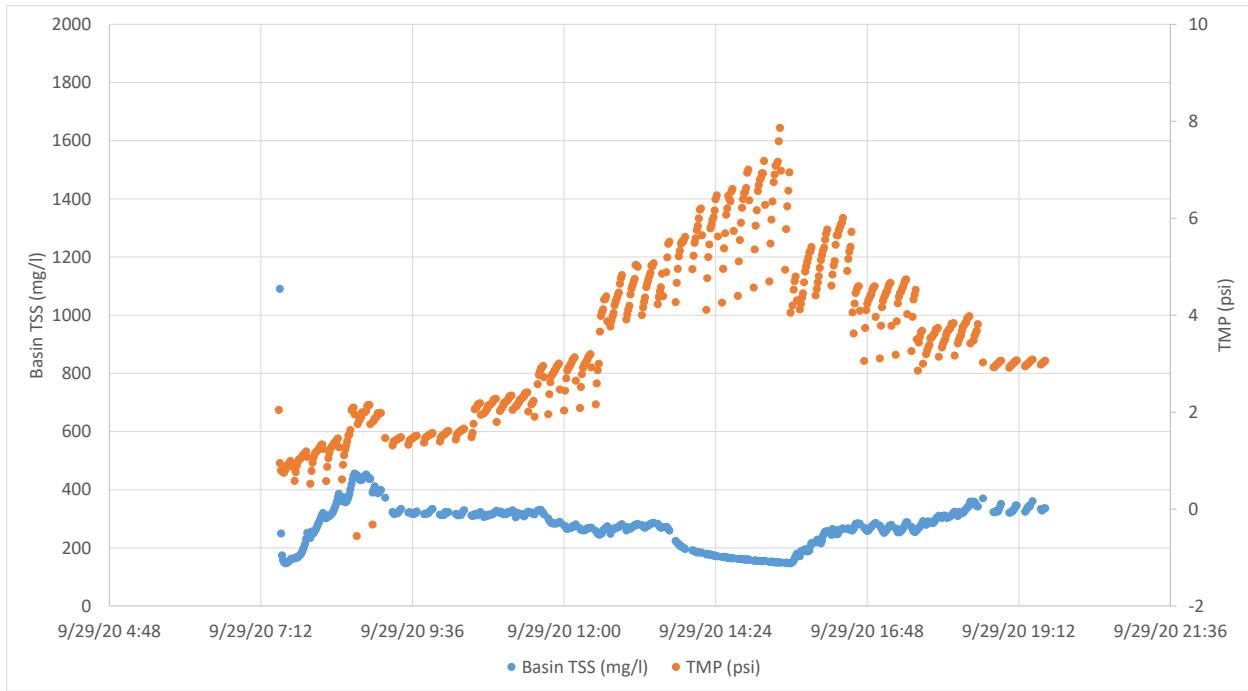
* need to also adjust * setpt for stacks online

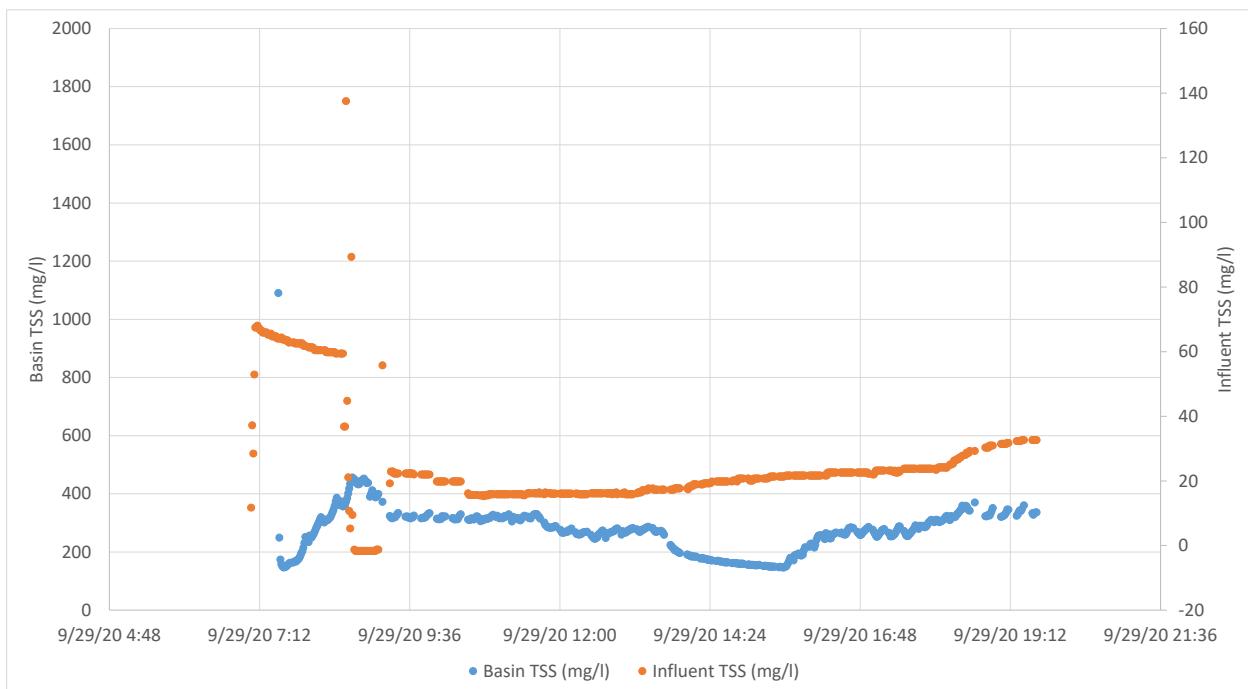
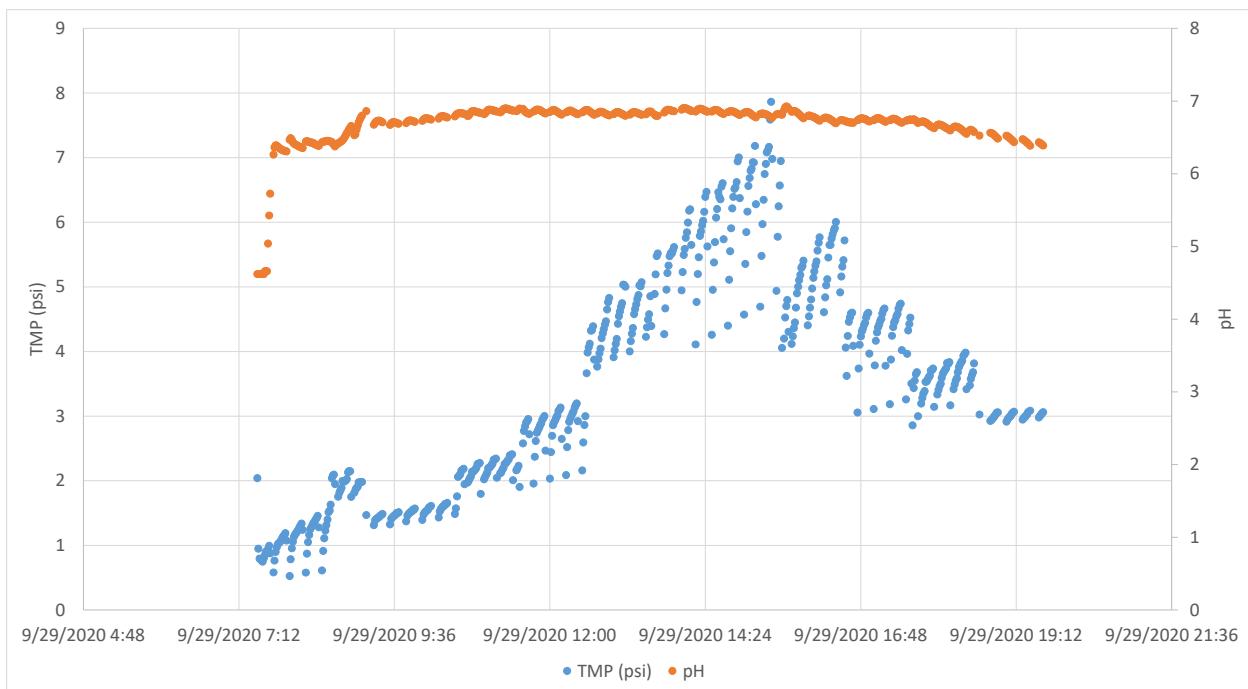
(Ovivo Setup)

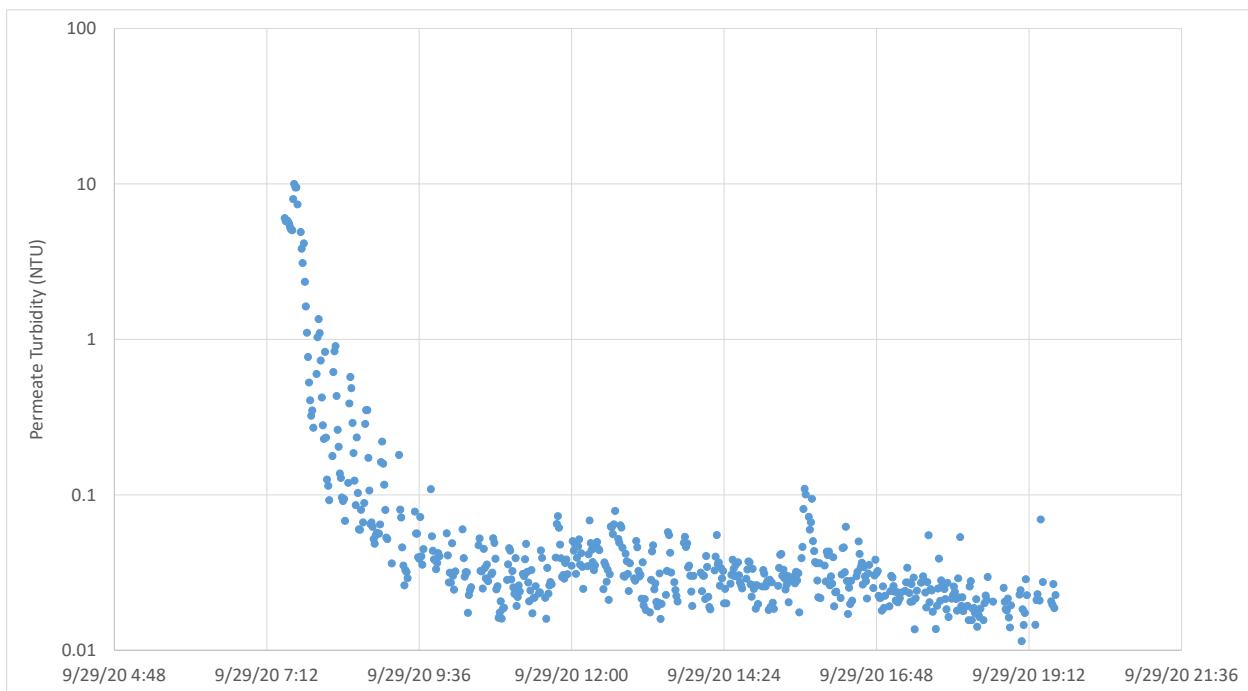
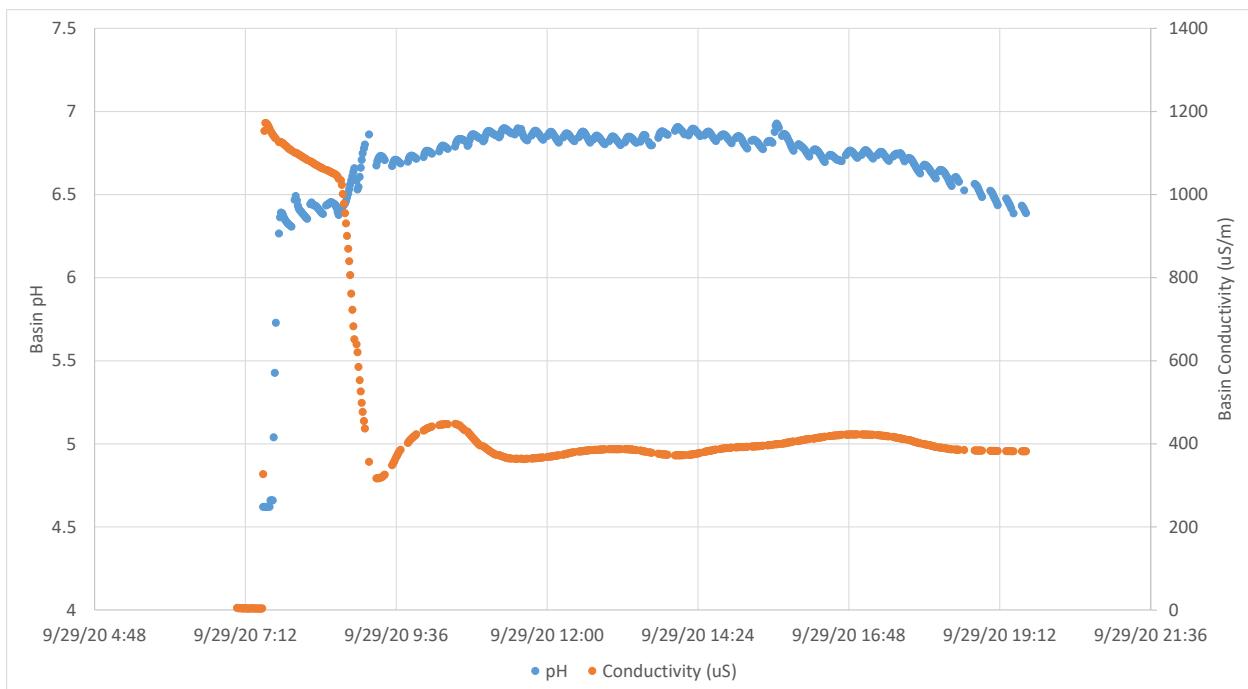
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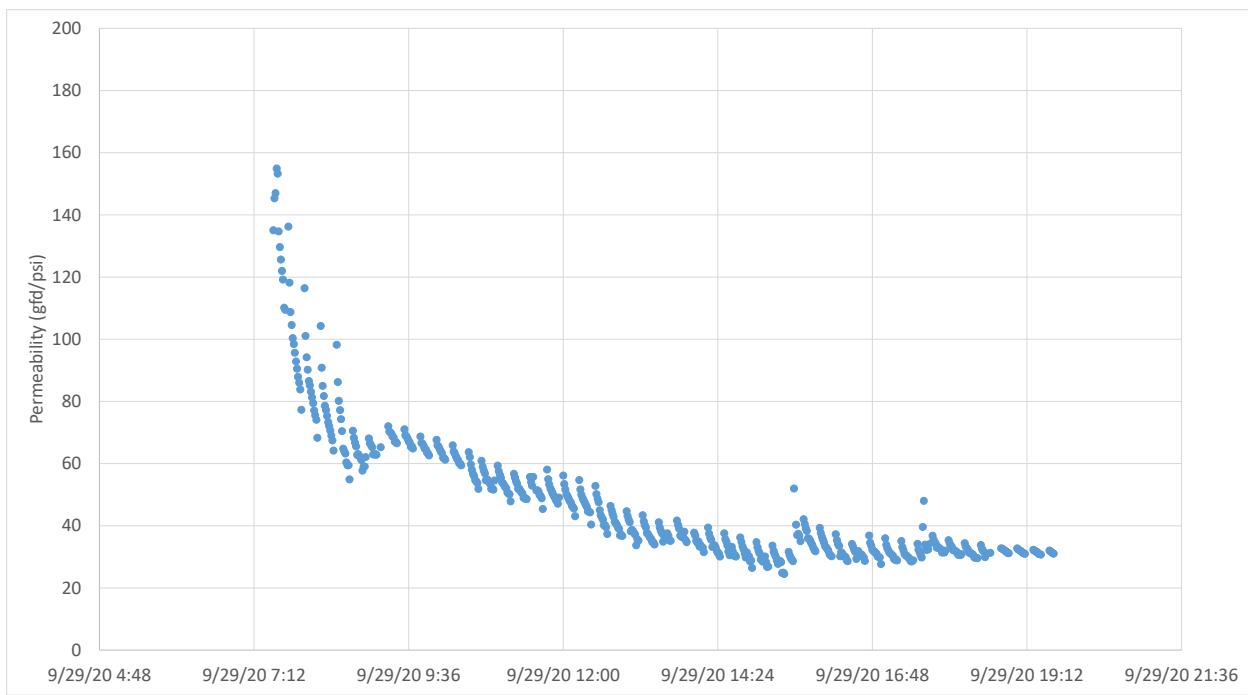


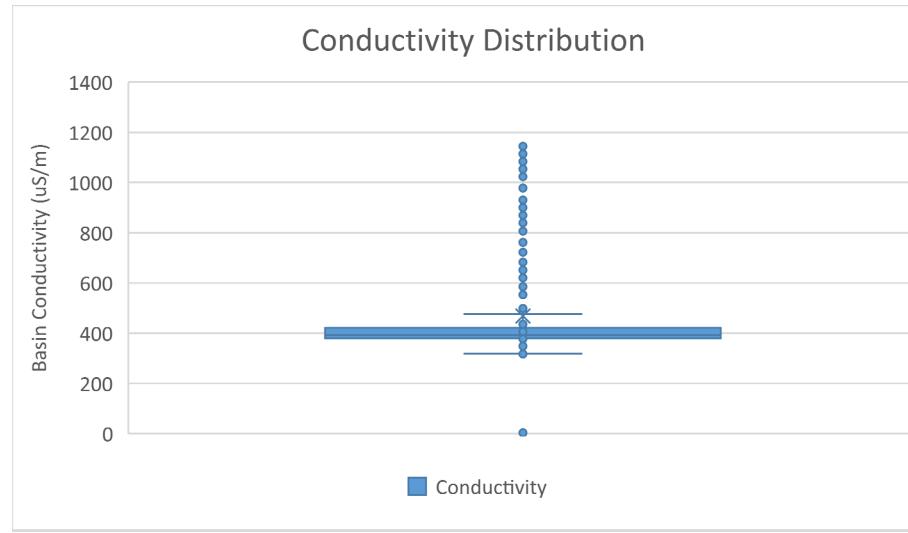
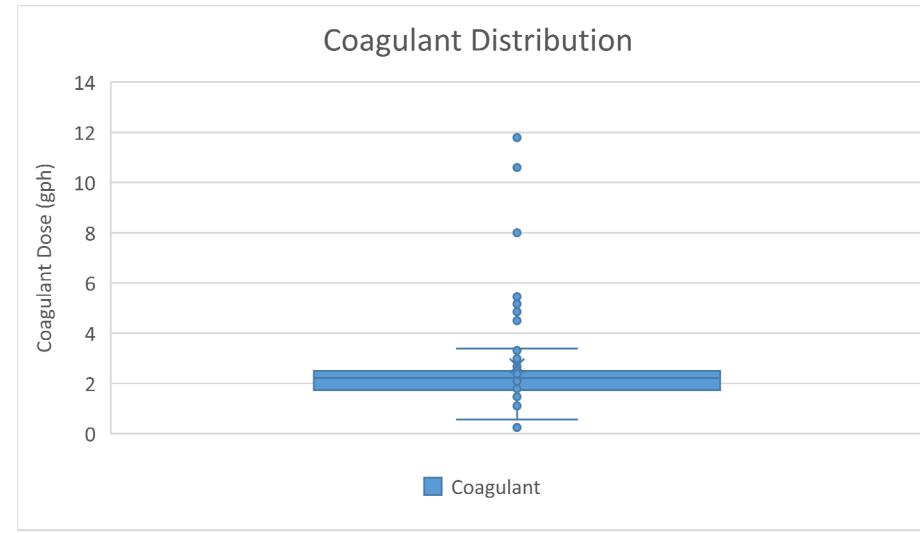
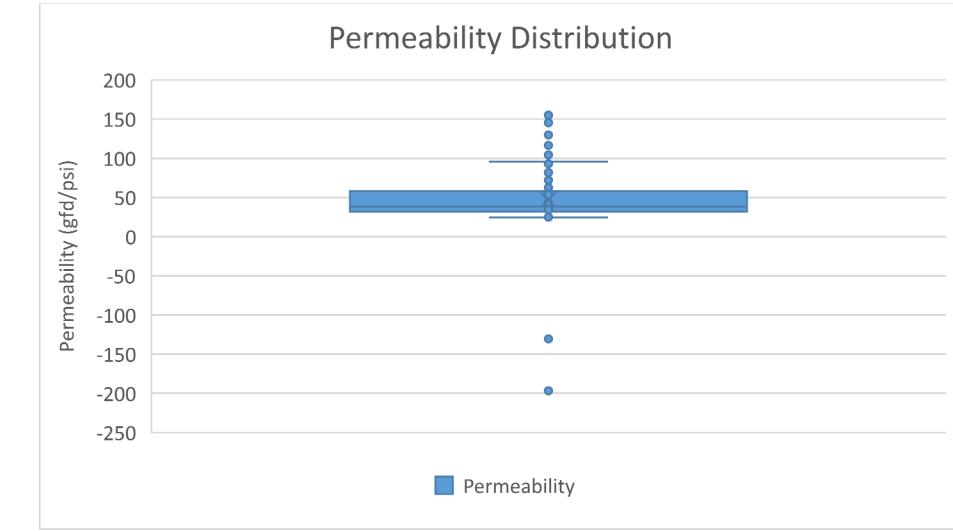
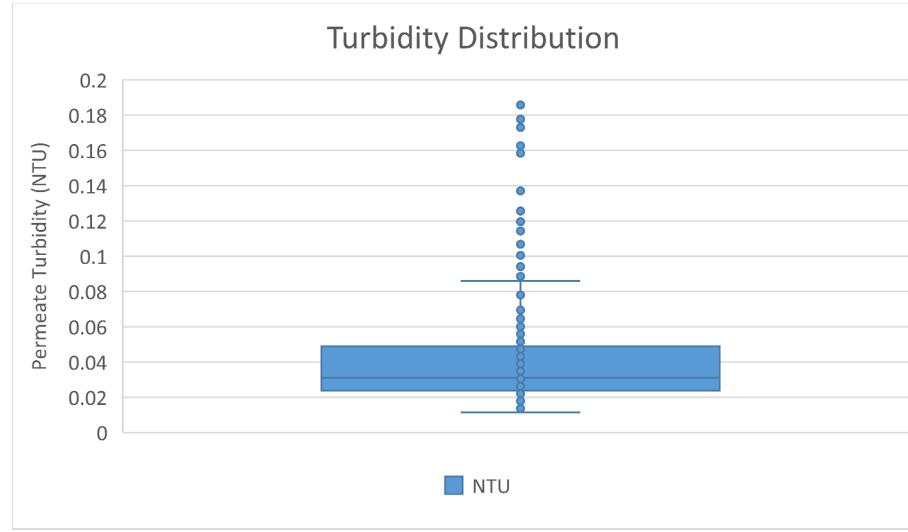
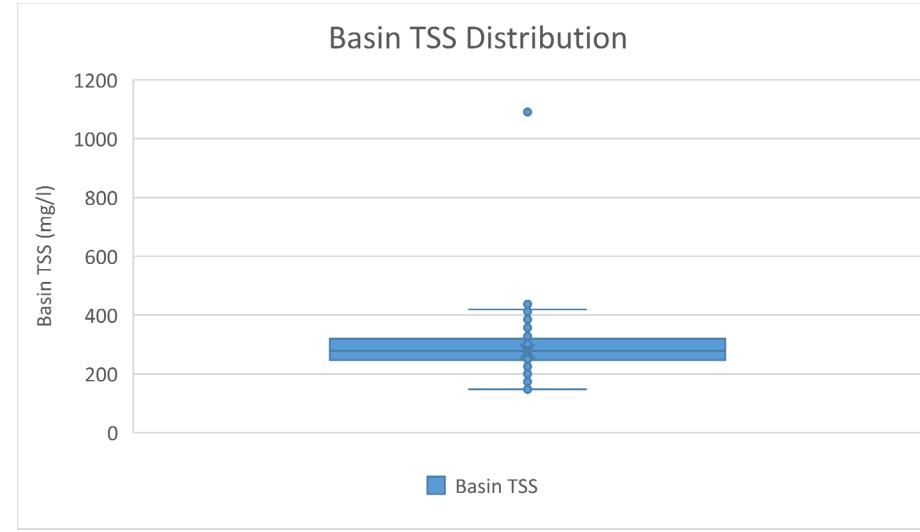
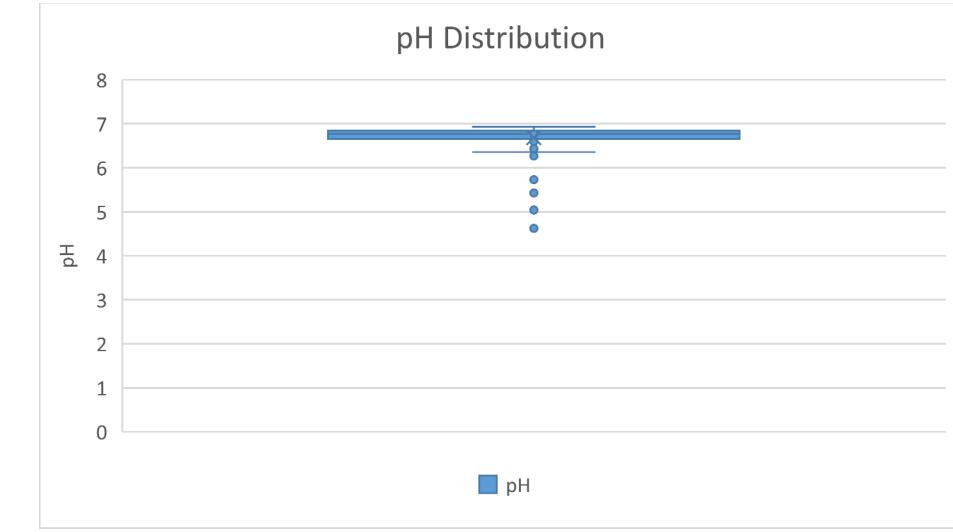
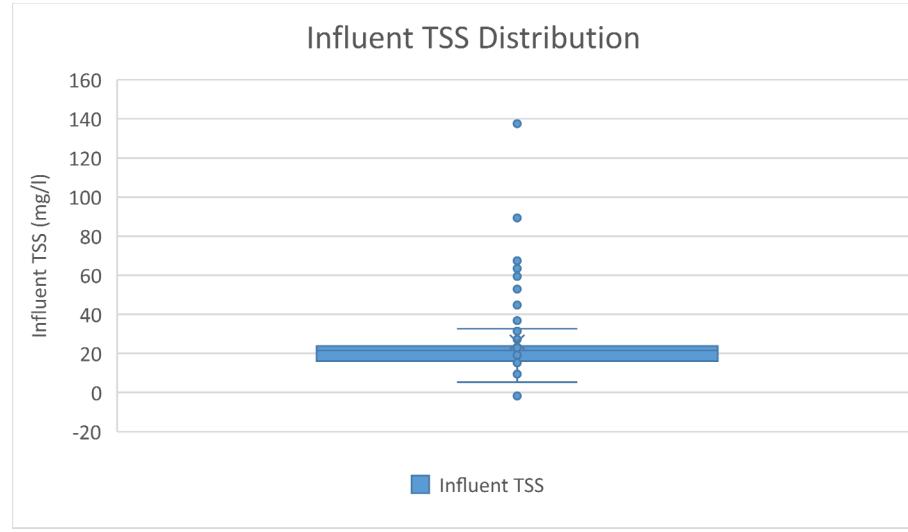
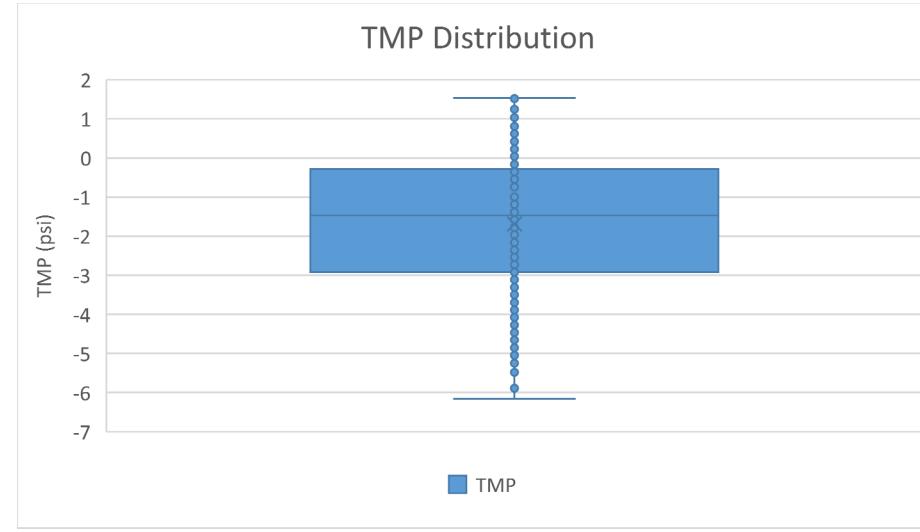












OVIVO PILOT TESTING

WO # C165282

Day	Sample Date	Unit	# of samples	Sample Frequency	Tue	Wed	Thu	Fri	Time	Mon	Wed	Mon	Thu	Thu	Tue	Thu	Tue	Tue	Tue	Sat	Sat	Sat	Sat						
					4/2/2019	4/24/2019	4/25/2019	4/26/2019		5/6/2019	7/29/2019	7/31/2019	8/5/2019	8/15/2019	9/12/2019	8/4/2020	8/4/2020	9/3/2020	9/22/2020	9/29/2020									
S1-G		Military Time (hours)																											
TSS	mg/L	1/run	204							68	43.1	57	43	44	27		1105												
VSS	mg/L	1/run	138						53		46	38	36			24	43	26											
ICOD	mg/L															23	21												
SCOD	mg/L															33	104												
BOD	mg/L															13	58	30											
Alkalinity	mg/L															143	156	38											
Fecal Caliform Sample ID					#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2							
Actual Sample Time																1105	9/4/2020 07150	9/21/2020 1038	9/22/2020 1330	9/29/2020 1400									
Fecal Caliform	MPN/100mL	20/run														9,200,000	7,800,000	1,300,000	1,300,000										
S1-C		Military Time (hours)																											
TSS	mg/L	1 hourly														30	21	25											
VSS	mg/L	1 hourly														27	18	21											
Alkalinity	mg/L	1 hourly														198	107	88											
COD	mg/L	1 hourly														32	106	98											
BOD	mg/L	1 hourly														155	45	36											
S2-G		Military Time (hours)																											
TSS										1013						1105													
SS									2																				
CD Demand	mg/L	1/run							1																				
SS	ml/L	1/run															2.65	1.34	0.7235										
Alkalinity	mg/L	1 hourly														50	<0.1	<0.1											
COD	mg/L															62	131	54											
ICOD	mg/L															80	141	27											
Fecal Caliform Sample ID					#1	#2	#3	#4	#1	#2	#3	#4	#1	#2	#3	#4	#1	#2	#3	#4	#1	#2	#3	#4					
Actual Sample Time																71	60	22											
Fecal Caliform	MPN/100mL	0/run														24,000,000	11,100,000	9/4/2020 07150	9/22/2020 0905	9/22/2020 1040	9/22/2020 1235	9/29/2020 0805	9/29/2020 1210	9/29/2020 1415	0ms				
S2-C		Military Time (hours)																											
TSS	mg/L	1 hourly														0	1	1											
VSS	mg/L	1 hourly														0	1	0											
Alkalinity	mg/L	1 hourly														50	58	50											
UV Abs	cm ⁻¹	1 hourly														0.248	0.111	0.0865											
BOD	mg/L	1 hourly														not enough sample	24	20											
S3-G		Military Time (hours)																											
TSS	mg/L	1/run	820	4260	4567	3510			Time: 1418 TSS Probe	4080	4355	474				1015													
VSS	mg/L	1/run	470	2000	2117	1770				2240	258					770	340	176	1560	1450	490								
Alkalinity	mg/L															98	434	825	750	290									
COD	mg/L	1/run														97	734	22	142	80									
ICOD	mg/L	1/run														88	170	135	165	100									
S3-G, Flow Box		Military Time (hours)																											
TSS	mg/L	1/run														1015													
VSS	mg/L	1/run														3370													
Alkalinity	mg/L															1500													
COD	mg/L															147													
ICOD	mg/L															2050													

run results are: COD 32.80, SCOD 140

Weekly Check of online instruments	
Date/Time/Initials	
Turbidity online reading	
Turbidity lab reading	
pH online reading	
pH lab reading	
Temperature online reading	
Temperature lab reading	
Conductivity	
Hypo Strength %	
Bottle Kit	Volume
FE grab	1L
FE Fecal	8 125-mL sterile
FE c2D	1L Amber bottle
FE comp	4L
Inf grab	2L
Inf Fecal	2 125-mL sterile
Inf comp	2L
TNK	500mL

S1-G
 Influent Grab
S2-G
 Effluent Grab
S3-G
 Effluent Composite
S3-G
 TNK Grab

OVIVO pilot TOC

Date	Time	Location	TOC (mg/L)
9/29/2020	8:05	Inf	57.7
	9:00	Inf	1.04
	11:00	Inf	14
	12:05	Inf	13
	14:00	Inf	15
	16:00	Inf	19
	18:00	Inf	19
	19:05	Inf	26.2
	19:10	Eff	12.3

Appendix B.5

Test Run Package 05

Run# 5 10/6/2020

Run Description Confirm process operation with variable flux and water quality

Type	<input checked="" type="checkbox"/> process	<input type="checkbox"/> Performance
Influent water source		<input checked="" type="checkbox"/> PE <input checked="" type="checkbox"/> Hydrant <input checked="" type="checkbox"/> Both
Flux rate		<input type="checkbox"/> Constant <input checked="" type="checkbox"/> Varies

Wasting Rate	0	
Air Scour	105	scfm
Backwash Frequency	15	min
Run Duration	24	Hrs
CIP	<input checked="" type="checkbox"/> Hypo	<input checked="" type="checkbox"/> Caustic
Composite Sample	24 Samples, 1 hour apart, 200 mL each	
	4.8 L total volume	

200 gpm
100 gfd
100
150

*For flux above 100 gfd, dilute PE with hydrant water so that the influent TSS is approximately half that of pure PE

Date

Event	Day	Time Hr	PE gpm	Hydrant gpm	Coag Dose Al:TSS ratio	Flux Rate gfd	Event/Action	Influent		Effluent		Membrane Tank		Comments
								Grab / Probe	Note	Grab / Probe	Note	Grab / Probe	Note	
0	1	7:00	100*	100*	0.4		Start Flow to pilot							
1		7:30				200	1 stack online Start producing effluent							
2		8:00					Start Composite Samplers							- noticed air in the tubing from permeate O21 --> turbidimeter
3		8:30					Influent Sample	KCEL: TOC	75619-1					
4		8:35					Effluent Sample			WPP: Fecal				
5		9:30				150	Change flux rate 2 stacks online							
6		10:30	200	0		100	Change flux All 3 stacks online							
7		11:00					Influent Sample	Field: Full Set WPP: Full Set KCEL: TOC	75619-2					
8		11:05					Tank Sample				Field: Full Set WPP: Full Set			
9		11:10					Effluent Sample			Field: Full Set WPP: Full Set				
10		12:30				75	Chance flux							
11		14:00					Influent Sample	KCEL: TOC	75619-3					
12		14:05					Effluent Sample			WPP: Fecal				
13		17:00					Influent Sample	KCEL: TOC	75619-4					
14		17:05					Effluent Sample							
15		17:30				50	Change flux rate							
16		20:00	22:00				Influent Sample	KCEL: TOC	75619-5					
17	2	0:00					Influent Sample	KCEL: TOC	75619-6					
18		4:00					Influent Sample	KCEL: TOC	75619-7					
19		7:00					Influent Sample	WPP: Fecal KCEL: TOC	75619-8					
20		7:30					Effluent Sample			WPP: Fecal				
							Stop producing effluent							

Field Eff
Turbidity
Probe reading
pH
Temperature
Conductivity

WPPLsamples
Influent composite
Effluent composite
-TSS/VSS, Alk, BOD
Influent grab
TSS/VSS
Fecal
Effluent grab
TSS/VSS
Chlorine demand
Fecal
Settleable solids
Tank grab
TSS/VSS

KCEL
Influent grab
TOC
Effluent composite
TOC

OVIVO Pilot Setpoints Values to be set according to OVIVO's recommendations.

Run# <u>2</u>		Date	FLOW OPTIMIZATION			CHEM DOSING		
System	ONLINE/OFFLINE		Permeate		End of Event	Coagulant		
Inlet System			Permeate Flow	206	gpm	Pump Start Inf Flow	1	gpm
Screen Off Delay	2	min	Pump Start Level	116	in	Pump Start Level	0.1	in
Weir Gate Frequency	1800	min	Pump Stop Level	5	in	Overflow Level	118	in
Weir Gate Duration	30	sec	Pump Stop Low Level	100	in	Coagulant Min Flow	0.5	gph
Blowers			Single Pump Flow	220	gpm	Coagulant Max Flow	20	gph
Scour Air Flow	105	scfm	Backwash Frequency	15	min	Coag Fixed Flow	6.0	gph
Blower Start Level	20	in	Backwash Flow	300	%	Coag TSS Ratio	0.40	
Blower Stop Level	8	in	Pre BW Relaxation	30	sec	Coag Al%	4.1	%
Lag Blower Start Level	65	%	Backwash Duration	60	sec	Coag SG	1.34	
Lag Blower Start Delay	120	sec	Post BW Relax Duration	30	sec	Coag Flow Ratio	5	
Blower Fail Air Flow	4.5	scfm	Perm Static Pressure	1.7	psi	Coag Fill Flow	8	gph
Blower Fail Delay	140	sec	Turbidity Hi Alarm SP	10	NTU			
Low Air Flow Alarm	55	%	TMP Hi Alarm SP	8	psi			
Low Air Flow Delay	45	sec	Backwash Start TMP	10	psi			
Override Enabled			Max Hi TMP Cycles	1				
TMP Reset								
Sodium Hypochlorite			Perm Tank Level Lo	20	in	Membrane Basin Drain Vlv		
CIP Permeate Flow	100	gpm	Air Extractor Frequency	5	min	WAS Vlv Open TSS	6,000	mg/l
Backwash Perm Flow	200	gpm	Air Extractor Duration	4	min	WAS Vlv Close Lvl	117	in
Hypochlorite Flow	100	gph			WAS Valve Duration	0	sec	
Pre CIP Relax Duration	30	sec	Citric Acid					
Chem Flow Duration	10	min	CIP Permeate Flow	100	gpm	Caustic		
Soak Duration	999	min	Backwash Perm Flow	200	gpm	CIP Permeate Flow	100	gpm
Rinse Duration	60	sec	Citric Flow	28	gph	Backwash Perm Flow	100	gpm
Final Relax Duration	60	sec	Pre CIP Relax Duration	30	sec	Caustic Flow	50	gph
			Chem Flow Duration	10	min	Pre CIP Relax Duration	30	sec
			Soak Duration	999	min	Chem Flow Duration	10	min
			Rinse Duration	60	sec	Soak Duration	999	min
			Final Relax Duration	60	sec	Rinse Duration	60	sec
						Final Relax Duration	60	sec
Pre-Drain Disabled			Pre-Drain Disabled			Pre-Drain Disabled		

King County Ovivo Pilot

Run #

5

Date

10/6/2020

membrane
surface area per stack =

975 sf

Test Variable Test Variable

Influent flow = PE + hyd	permeate flow setpt	stacks in service	surface area in service	instantaneous flux	Test Plan Flux Goal	Start Time	Stop Time
(gpm)	(gpm)	(#)	(sf)	(GFD)	(GFD)		
200	204	3	2,925	100	100	7:00	7:30
	136	1	975	201	200	7:30	9:30
	203	2	1,950	150	150	9:30	10:30
	204	3	2,925	100	100	10:30	12:30
	153	3	2,925	75	75	12:30	17:30
	102	3	2,925	50	50	17:30	7:30

Sample Data

King County Environmental Lab Analytical Report

Project: 423650-100
 Locator: INF-SL
 Descrip: PILOT INFLUENT, IN
 Sample: L75619-1
 Matrix: LB INFLUENT
 ColDate: 10/6/20 8:30
WET Weight Basis

Project: 423650-100
 Locator: INF-SL
 Descrip: PILOT INFLUENT, IN
 Sample: L75619-2
 Matrix: LB INFLUENT
 ColDate: 10/6/20 11:00
WET Weight Basis

Project: 423650-100
 Locator: INF-SL
 Descrip: PILOT INFLUENT, IN
 Sample: L75619-3
 Matrix: LB INFLUENT
 ColDate: 10/6/20 14:00
WET Weight Basis

Parameters CV SM5310-B	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
Total Organic Carbon	11	<RDL	10	20	mg/L	46.3		10	20	mg/L	49.4		10	20	mg/L

King County Environmental Lab Analytical Report

Project: 423650-100
Locator: INF-SL
Descrip: PILOT INFLUENT, IN
Sample: L75619-4
Matrix: LB INFLUENT
ColDate: 10/6/20 10:30
WET Weight Basis

Project: 423650-100
Locator: INF-SL
Descrip: PILOT INFLUENT, IN
Sample: L75619-5
Matrix: LB INFLUENT
ColDate: 10/6/20 20:00
WET Weight Basis

Project: 423650-100
Locator: INF-SL
Descrip: PILOT INFLUENT, IN
Sample: L75619-6
Matrix: LB INFLUENT
ColDate: 10/7/20 0:00
WET Weight Basis

Parameters CV SM5310-B	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
Total Organic Carbon	57.1		10	20	mg/L	73.7		10	20	mg/L	91.6		10	20	mg/L

King County Environmental Lab Analytical Report

Project: 423650-100
 Locator: INF-SL
 Descrip: PILOT INFLUENT, IN
 Sample: L75619-7
 Matrix: LB INFLUENT
 ColDate: 10/7/20 4:00
WET Weight Basis

Project: 423650-100
 Locator: INF-SL
 Descrip: PILOT INFLUENT, IN
 Sample: L75619-8
 Matrix: LB INFLUENT
 ColDate: 10/7/20 7:00
WET Weight Basis

Project: 423650-100
 Locator: EFF-SL
 Descrip: PILOT MEMBRANE PER
 Sample: L75619-10
 Matrix: LA OTHR WTR
 ColDate: 10/6/20 8:00
WET Weight Basis

Parameters CV SM5310-B	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
Total Organic Carbon	84.8		10	20	mg/L	70.4		10	20	mg/L	31.5		2	4	mg/L

Quality Control Data

King County Environmental Laboratory Batch Report

OVIVO Pilot 06October2020

WG172432 Total Organic Carbon

Sample	Project	Project Description	List Type	Matrix	Collect Date	Prep Date	Anal Date	QC Association	Comments
L72439-1	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/1/2020 7:00	10/13/2020 17:10	10/13/2020 17:10		
L72439-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/1/2020 7:30	10/13/2020 17:16	10/13/2020 17:16		
L72439-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/1/2020 12:00	10/13/2020 17:23	10/13/2020 17:23		
L72439-5	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	OTHR WTR	10/1/2020 7:00	10/13/2020 19:00	10/13/2020 19:00		
L72440-1	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/8/2020 7:00	10/13/2020 15:48	10/13/2020 15:48		
L72440-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/8/2020 7:30	10/13/2020 15:56	10/13/2020 15:56		
L72440-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/8/2020 13:10	10/13/2020 16:29	10/13/2020 16:29		
L72440-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/8/2020 17:05	10/13/2020 16:58	10/13/2020 16:58		
L72440-5	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	OTHR WTR	10/8/2020 7:00	10/13/2020 18:53	10/13/2020 18:53		
L75600-3	421422-CHSW-E	SWD-CHSW E Cedar Hills Emergency	CVTOC	FRESH WTR	10/12/2020 11:30	10/13/2020 15:16	10/13/2020 15:16		
L75619-1	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/6/2020 8:30	10/13/2020 17:30	10/13/2020 17:30		
L75619-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/6/2020 11:00	10/13/2020 17:37	10/13/2020 17:37		
L75619-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/6/2020 14:00	10/13/2020 17:45	10/13/2020 17:45		
L75619-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/6/2020 10:30	10/13/2020 18:15	10/13/2020 18:15		
L75619-5	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/6/2020 20:00	10/13/2020 18:22	10/13/2020 18:22		
L75619-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/7/2020 0:00	10/13/2020 18:30	10/13/2020 18:30		
L75619-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/7/2020 4:00	10/13/2020 18:38	10/13/2020 18:38		
L75619-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/7/2020 7:00	10/13/2020 18:45	10/13/2020 18:45		
L75619-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	OTHR WTR	10/6/2020 8:00	10/13/2020 19:08	10/13/2020 19:08		
WG172432-1	MDLCK		CVTOC	BLANK WTR		10/13/2020 14:34	10/13/2020 14:34		
WG172432-2	MB		CVTOC	BLANK WTR		10/13/2020 14:41	10/13/2020 14:41	MB1 10/13/20	
WG172432-3	SB		CVTOC	BLANK WTR		10/13/2020 14:50	10/13/2020 14:50	WG172432-2	
WG172432-4	LCS		CVTOC	BLANK WTR		10/13/2020 14:57	10/13/2020 14:57	LEVEL1	
WG172432-5	LD		CVTOC	FRESH WTR		10/13/2020 15:24	10/13/2020 15:24	L75600-3	
WG172432-6	MS		CVTOC	FRESH WTR		10/13/2020 15:31	10/13/2020 15:31	L75600-3	
WG172432-7	LD		CVTOC	INFLUENT		10/13/2020 16:36	10/13/2020 16:36	L72440-3	
WG172432-8	MS		CVTOC	INFLUENT		10/13/2020 16:44	10/13/2020 16:44	L72440-3	
WG172432-9	LD		CVTOC	OTHR WTR		10/13/2020 19:16	10/13/2020 19:16	L75619-10	
WG172432-10	MS		CVTOC	OTHR WTR		10/13/2020 19:23	10/13/2020 19:23	L75619-10	

* End of L75616_56461_BATCH.xls

King County Environmental Laboratory QC Report

OVIVO Pilot 06October2020

Workgroup: WG172432 Total Organic Carbon

MB:WG172432-2 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Total Organic Carbon	0.5	1	mg/L	<MDL	

SB:WG172432-3 MB:WG172432-2 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Spike Blank, Method Blank)

Parameter	MDL	RDL	Units	MB Value	True Value	SB Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	0.5	1	mg/L	<MDL	5	5.22	104		80-120

LCS:WG172432-4 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Lab Control Sample)

Parameter	MDL	RDL	Units	True Value	LCS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	0.5	1	mg/L	8	8.1	101		85-115

LD:WG172432-5 L75600-3 Matrix: FRESH WTR Listtype:CVTOC Method:SM5310-B Project:421422-CHSW-E Pkey:STD

(Lab Duplicate)

Parameter	MDL	RDL	Units	SAMP Value	LD Value	RPD	Qual	Lab Limit
Total Organic Carbon	5	10	mg/L	33.4	35.8	7		0-20

MS:WG172432-6 L75600-3 Matrix: FRESH WTR Listtype:CVTOC Method:SM5310-B Project:421422-CHSW-E Pkey:STD

(Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	5	10	mg/L	33.4	50	85.3	104		75-125

LD:WG172432-7 L72440-3 Matrix: INFLUENT Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Lab Duplicate)

Parameter	MDL	RDL	Units	SAMP Value	LD Value	RPD	Qual	Lab Limit
Total Organic Carbon	10	20	mg/L	55.2	58.1	5		0-20

MS:WG172432-8 L72440-3 Matrix: INFLUENT Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	10	20	mg/L	55.2	100	162	106		75-125

LD:WG172432-9 L75619-10 Matrix: OTHR WTR Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Lab Duplicate)

Parameter	MDL	RDL	Units	SAMP Value	LD Value	RPD	Qual	Lab Limit
Total Organic Carbon	2	4	mg/L	31.5	31.7	0		0-20

MS:WG172432-10 L75619-10 Matrix: OTHR WTR Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	2	4	mg/L	31.5	20	52.1	103		75-125

Sample Receipt and Chain of Custody Records

Login: P75619

OVIVO Pilot Process Testing

TC: _____

Project: 423650-100

CHAIN OF CUSTODY

LPM: Ellen Sisk

<i>Pardhi Suka Panpetharam</i>	Date 10/7/20	Time 10:20
<i>OK</i>	Date 10-7-20	Time 1020
Sample Numbers	[All]	

Sample Number	P75619-1	P75619-2	P75619-3
QC Link			
Locator	INF-SL	INF-SL	INF-SL
Short Loc Desc			
Locator Desc	PILOT INFLUENT, INFLOW PIPE	PILOT INFLUENT, INFLOW PIPE	PILOT INFLUENT, INFLOW PIPE
Site	WEST PT INPLANT	WEST PT INPLANT	WEST PT INPLANT
Comments	OVIVO pilot influent prior to coagulant addition - grab	OVIVO pilot influent prior to coagulant addition - grab	OVIVO pilot influent prior to coagulant addition - grab
Start Date/Time	10/6/20, 8:30	10/6/20, 11:00	10/6/20 14:00
End Date/Time			
Time Span			
Sample Depth			
SAMP INFO			
SAMPLE CODE			
Dept, Matrix, Prod	3 LB TOC	3 LB TOC	3 LB TOC

Login: P75619

OVIVO Pilot Process Testing

TC: _____

Project: 423650-100

LPM: Ellen Sisk

Sample Number	P75619-4	P75619-5	P75619-6
QC Link			
Locator	INF-SL	INF-SL	INF-SL
Short Loc Desc			
Locator Desc	PILOT INFLUENT, INFLOW PIPE	PILOT INFLUENT, INFLOW PIPE	PILOT INFLUENT, INFLOW PIPE
Site	WEST PT INPLANT	WEST PT INPLANT	WEST PT INPLANT
Comments	OVIVO pilot influent prior to coagulant addition - grab	OVIVO pilot influent prior to coagulant addition - grab	OVIVO pilot influent prior to coagulant addition - grab
Start Date/Time	10/6/20 16:30	10/6/20 20:00	10/7/20 0:00
End Date/Time			
Time Span			
Sample Depth			
SAMP INFO			
SAMPLE CODE			
Dept, Matrix, Prod	3 LB TOC	3 LB TOC	3 LB TOC

Login: P75619

OVIVO Pilot Process Testing

TC: _____

Project: 423650-100

LPM: Ellen Sisk

Sample Number	P75619-7	P75619-8	P75619-9
QC Link			
Locator	INF-SL	INF-SL	INF-SL
Short Loc Desc			
Locator Desc	PILOT INFLUENT, INFLOW PIPE	PILOT INFLUENT, INFLOW PIPE	PILOT INFLUENT, INFLOW PIPE
Site	WEST PT INPLANT	WEST PT INPLANT	WEST PT INPLANT
Comments	OVIVO pilot influent prior to coagulant addition - grab	OVIVO pilot influent prior to coagulant addition - grab	OVIVO pilot influent prior to coagulant addition - grab
Start Date/Time	10/7/20, A:00	10/7/20, 7:00	not grabbed
End Date/Time			
Time Span			
Sample Depth			
SAMP INFO			
SAMPLE CODE			
Dept, Matrix, Prod	3 LB TOC	3 LB TOC	3 LB TOC

Login: P75619

OVIVO Pilot Process Testing

TC: _____

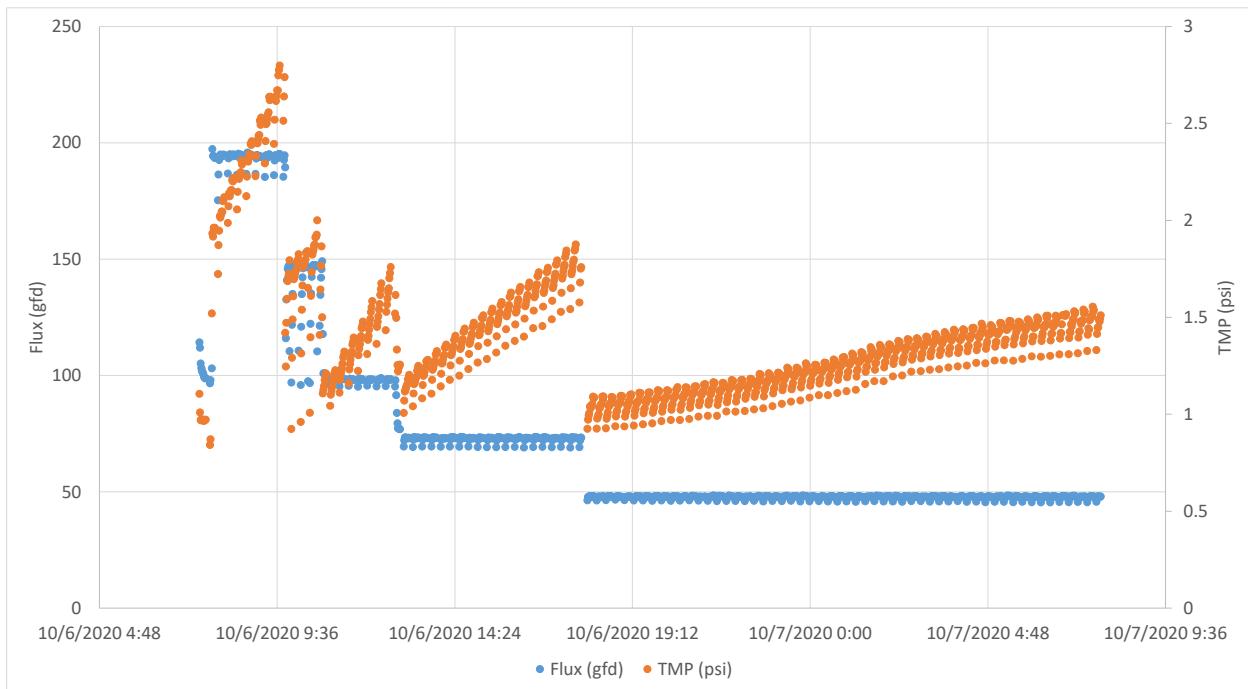
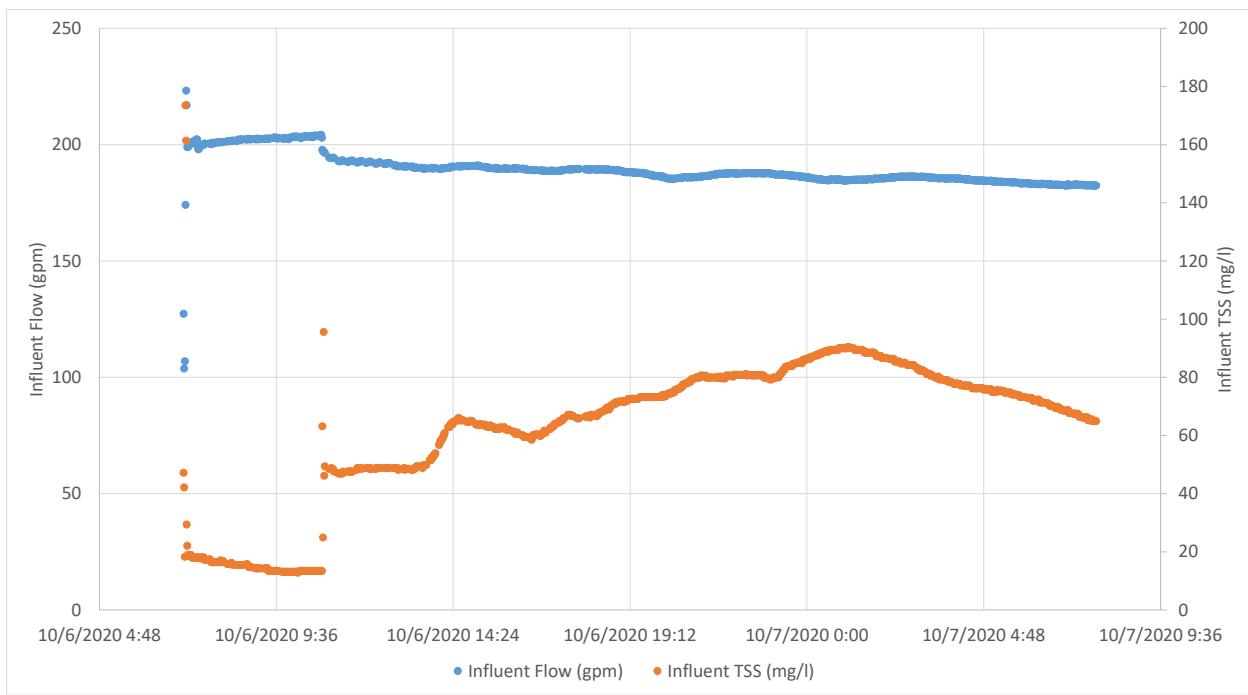
Project: 423650-100

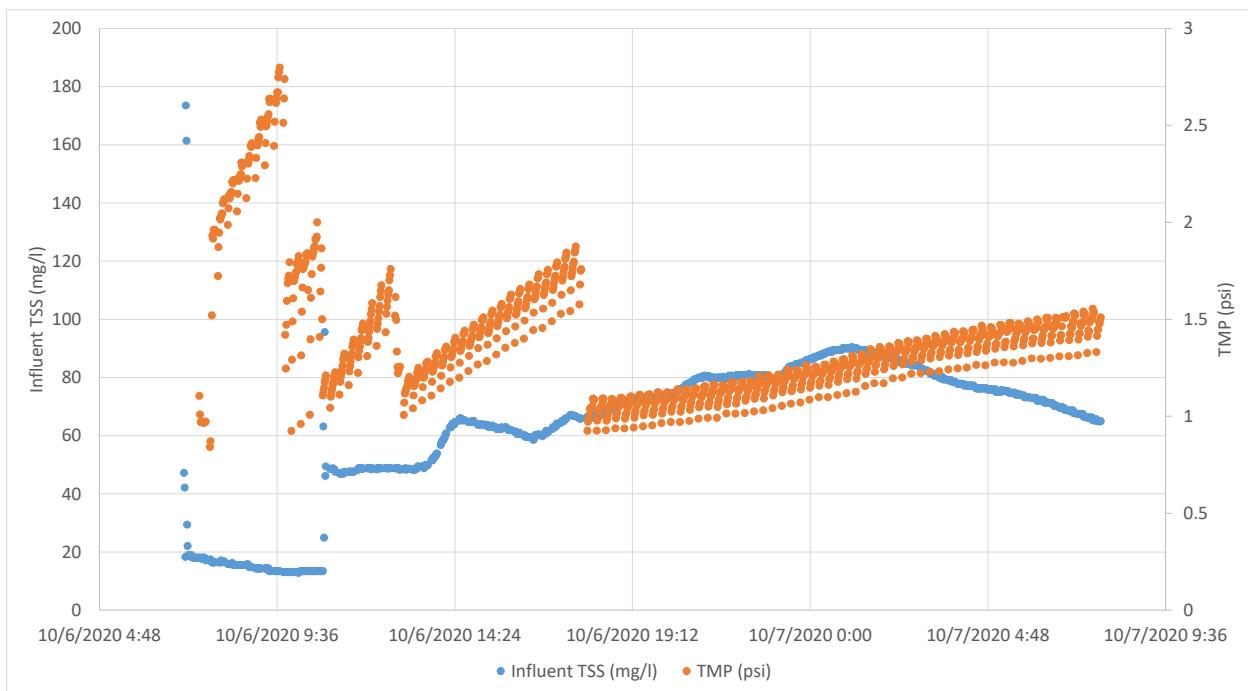
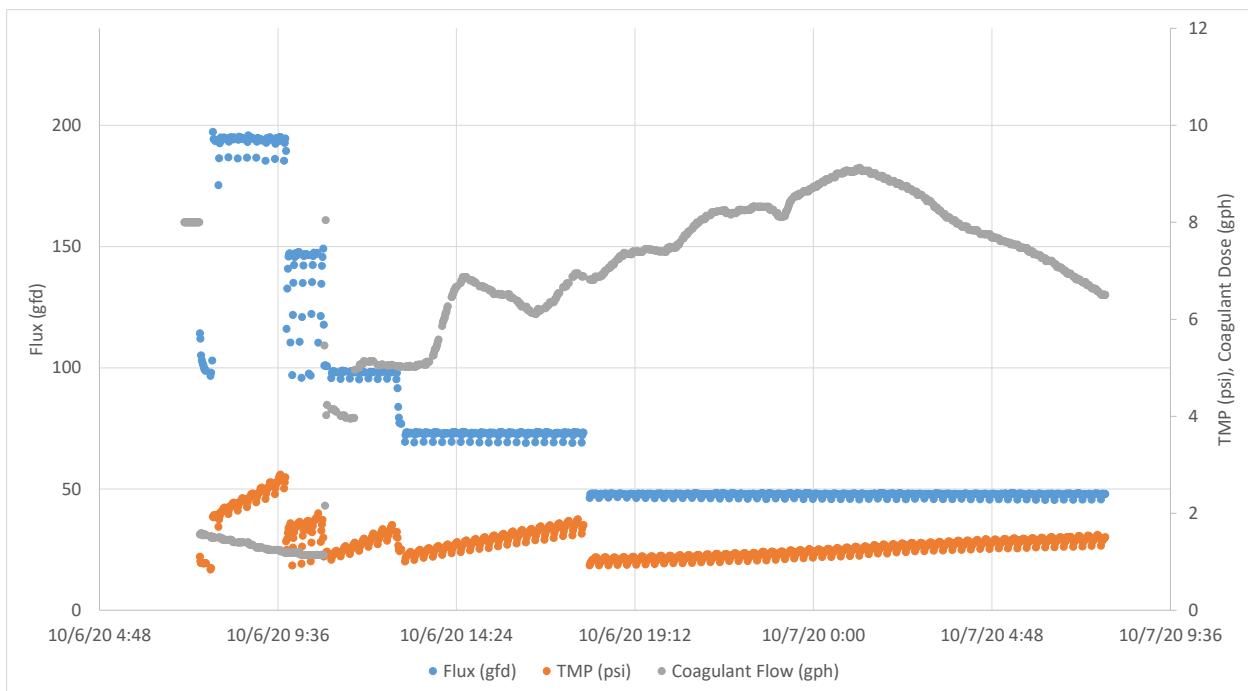
LPM: Ellen Sisk

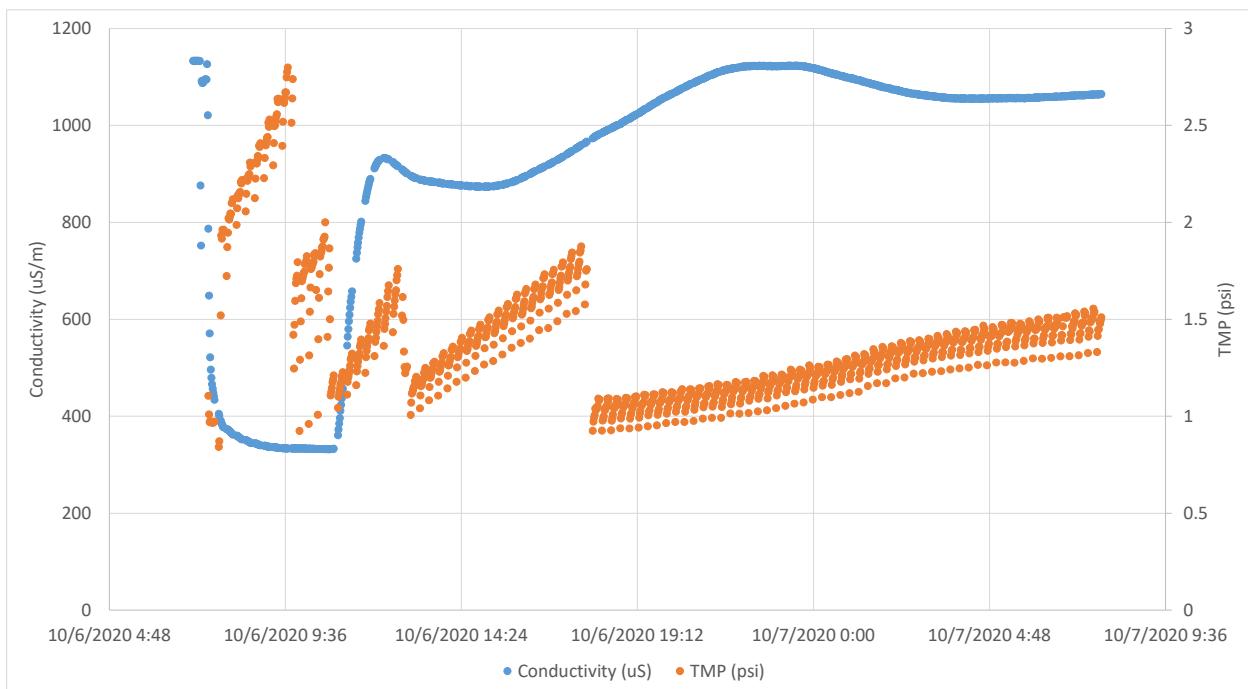
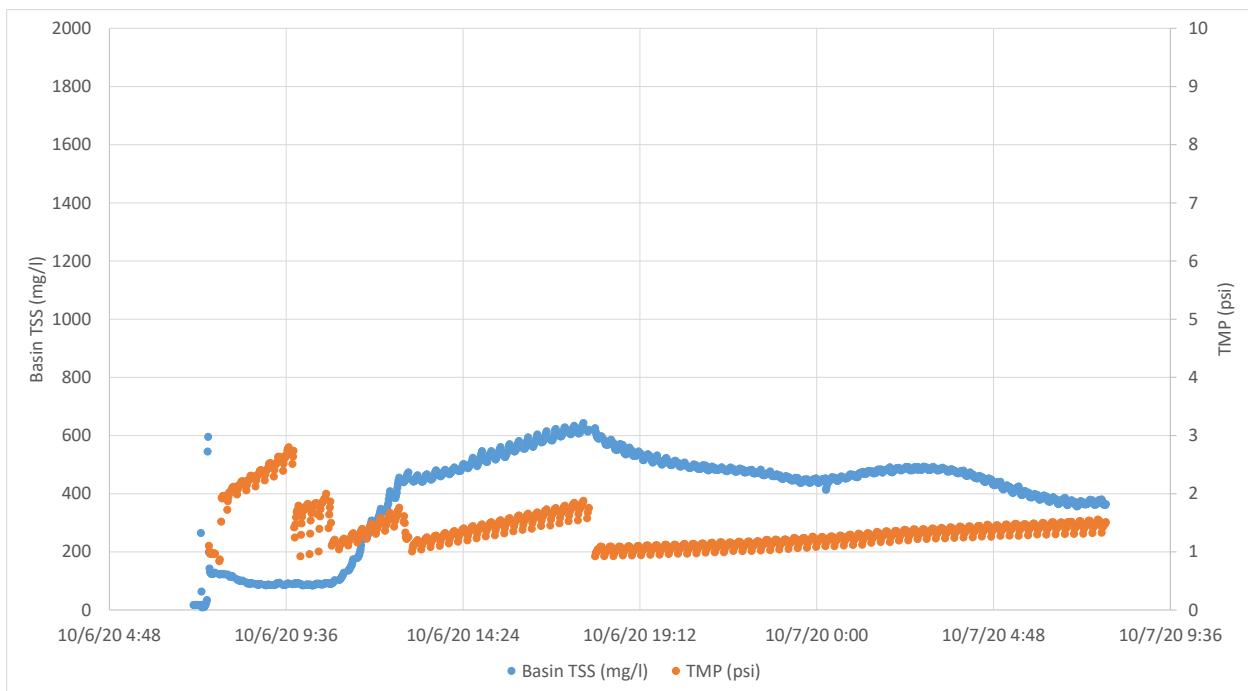
Sample Number	P75619-10		
QC Link			
Locator	EFF-SL		
Short Loc Desc			
Locator Desc	PILOT MEMBRANE PERMEATE		
Site	WEST PT INPLANT		
Comments	OVIVO pilot influent prior to coagulant addition - composite	OVIVO pilot membrane permeate-composite	
Start Date/Time	10/6/2020, 8:00		
End Date/Time	10/7/2020, 8:00		
Time Span	24 hrs.		
Sample Depth			
SAMP INFO			
SAMPLE CODE			
Dept, Matrix, Prod	3 LA TOC		

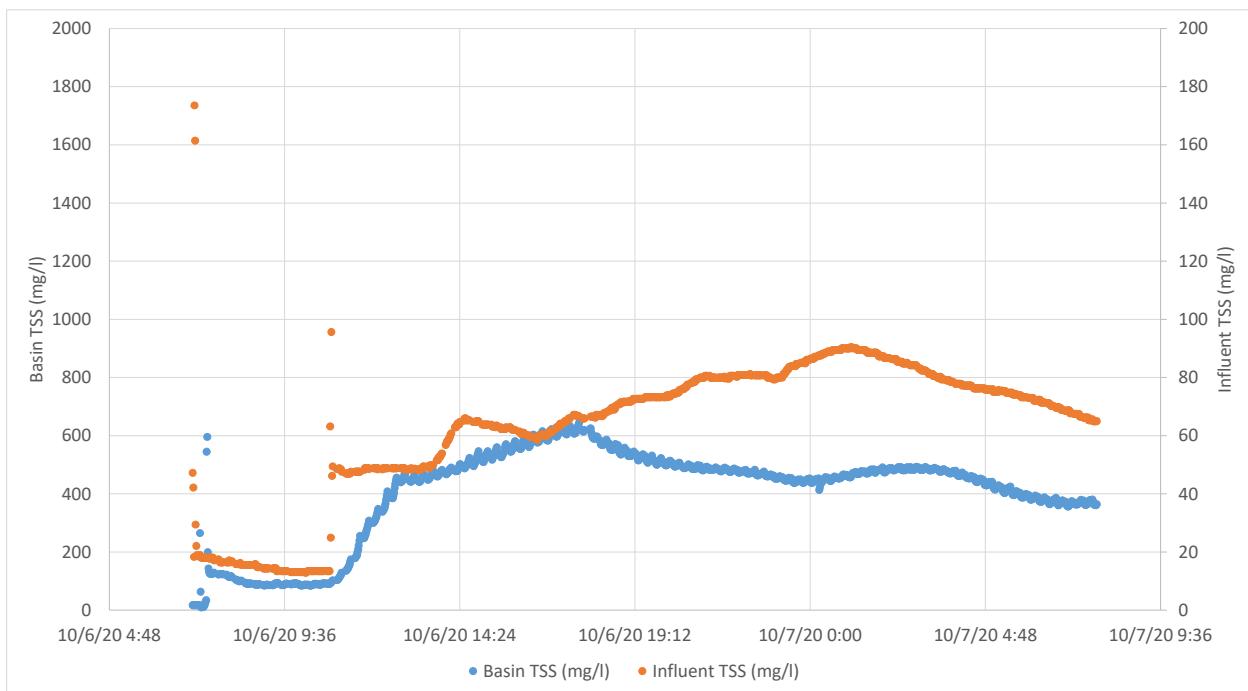
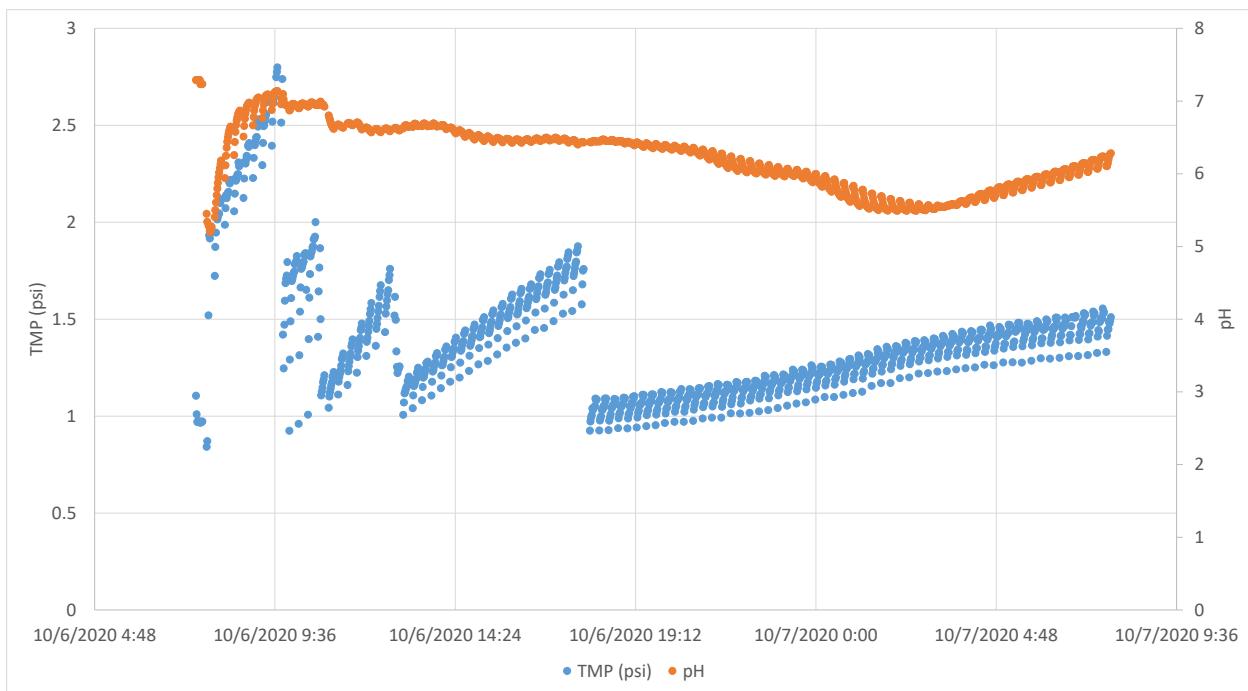
LIQUID SAMPLE RECEIPT RECORD

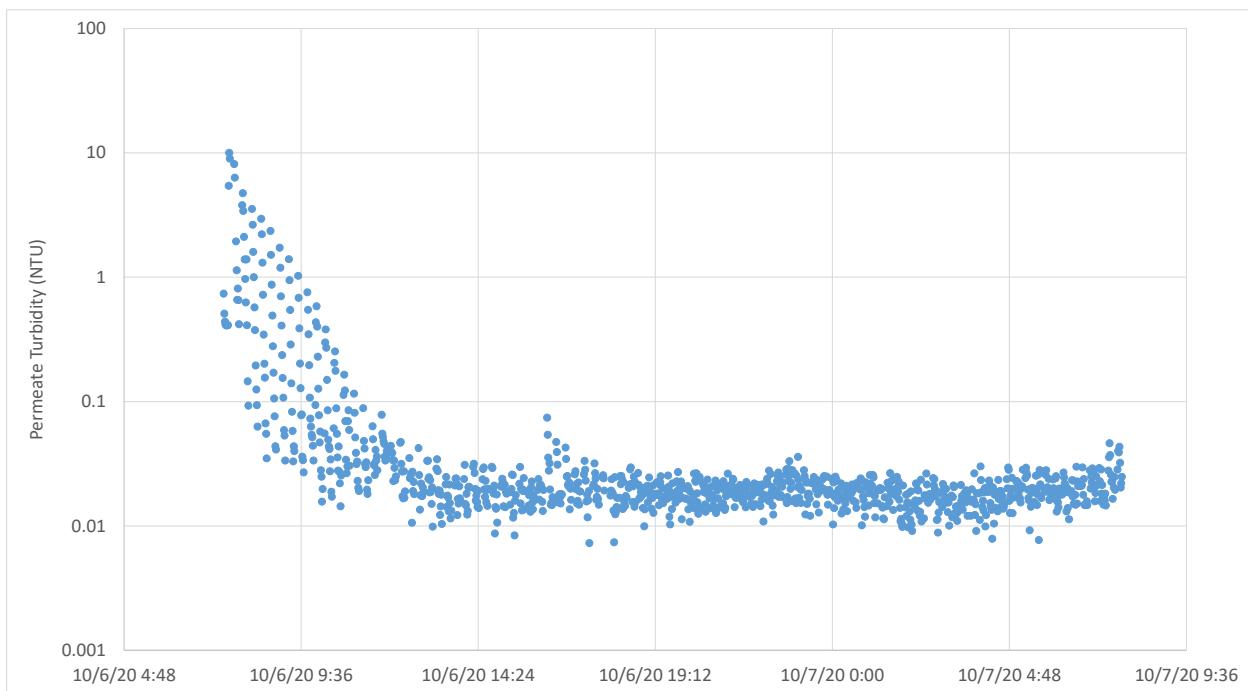
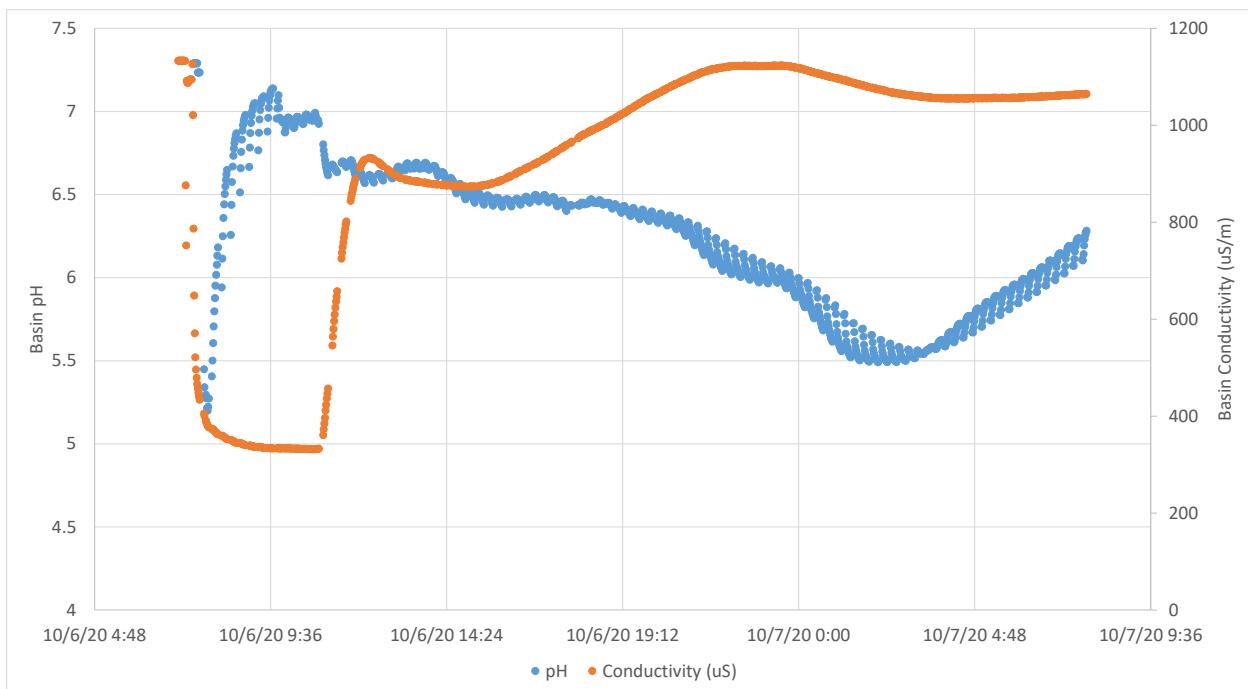
Login Number(s):	73619-11-8, Y1		Project No.:	42-3429-105		Sub-Contracting: <input checked="" type="checkbox"/> Y / <input type="checkbox"/> N	List Product(s):
Collect Date(s):	10-6-2010		Receive Date:	10-6-2010		Changes: <input checked="" type="checkbox"/> Y / <input type="checkbox"/> N	List Parameters:
SAMPLE RECEIVER CONDITIONS							
CONDITION	Acceptable?	Comment ID	CONDITION	Acceptable?	Comment ID	PRODUCT / Preservation	SM Action
Labels / Fieldsheets	<input checked="" type="checkbox"/> Y / <input type="checkbox"/> N		Volumes	<input checked="" type="checkbox"/> Y / <input type="checkbox"/> N		BNA / pH > 3 w/ H ₂ SO ₄ or NaOH	<input type="checkbox"/> field sheet for F+ PH
Container	<input checked="" type="checkbox"/> Y / <input type="checkbox"/> N	①	Holding Times	<input checked="" type="checkbox"/> Y / <input type="checkbox"/> N		CN / pH > 12 w/ NaOH within 15 min	<input type="checkbox"/> Check pH
Temperature (w/ ice)	<input checked="" type="checkbox"/> Y / <input type="checkbox"/> N	NA	Delivery Location	<input checked="" type="checkbox"/> Y / <input type="checkbox"/> N		NO23 ph < 2 w/ H ₂ SO ₄	<input type="checkbox"/> Check pH
BOTTLE COUNT AND DESERATION AND SAMPLE NUMBERS							
#	Cylindrical 40 mL Clear vial (VOA): 46 / 113 NO ₁ 1-8		Bottle Description: Sample Numbers			CRWV / TOTCR(V) / pH 9.3 - 7 w/ NaOH within 15 min	<input type="checkbox"/> field sheet for pH
5	60 mL clear glass (PHOTO):					ICP / HG-CVAA(M) / pH < 2 w/ HNO ₃	<input type="checkbox"/> Check pH
60 mL CWM HDPE:						O&G / HEM / PHEONOL / pH < 2 w/ H ₂ SO ₄	<input type="checkbox"/> Check documentation
125 mL AWM HDPE:						PHYTOPLANKTON / Lugsils	<input type="checkbox"/> Visually inspect
125 mL CNM HDPE:						TIN / GGD / pH < 2 w/ H ₂ SO ₄ within 15 min	<input type="checkbox"/> Check pH
125 mL CWM HDPE:						TOC / pH < 2 w/ H ₃ PO ₄ (NPIES only)	<input checked="" type="checkbox"/> Check pH
125 mL GANM:						TOTSULFIDE / pH > 9 w/ NaCl, ZnAc	<input type="checkbox"/> Check documentation
125 mL GANM:						WDO / FIXED	<input type="checkbox"/> Visually inspect
ROUTINE IMPRESERVATION CHECKLIST (Circle and/or check applicable selections)							
PRODUCT / Preservation	SM Action	Acceptable?	Corrective Action				
Chlorinated Pesticides / pH 6 - 9 w/ H ₂ SO ₄ or NaOH	<input type="checkbox"/> field sheet for F+ PH	<input checked="" type="checkbox"/> Y / <input type="checkbox"/> N	<input type="checkbox"/> Adjust pH				
HG-CVAA-L-Tetlon (T/D) / pH < 2 w/ ULTRA HCl	<input type="checkbox"/> Preserve & deliver	<input type="checkbox"/> NA	<input type="checkbox"/> NA				
ICP / HG-CVAA(M) / T / D / pH < 2 w/ ULTRA HNO ₃	<input type="checkbox"/> Preserve & deliver	<input type="checkbox"/> NA	<input type="checkbox"/> NA				
ICPMs / T / D / pH < 2 w/ ULTRA HNO ₃	<input type="checkbox"/> Preserve & deliver	<input type="checkbox"/> NA	<input type="checkbox"/> NA				
TOC / pH < 2 w/ H ₃ PO ₄	<input type="checkbox"/> Preserve & deliver	<input type="checkbox"/> NA	<input type="checkbox"/> NA				
Other:							
INTERFERENCE TEST CHECKLIST (Circle and/or check applicable selections)							
Product / Interference (SM Action)	Positive Test?	Treated	Corrective Action				
BNA / Chlorine (Check documentation)	<input type="checkbox"/> Y / <input type="checkbox"/> N	<input type="checkbox"/> not tested	<input type="checkbox"/> Deliver to ORG				
CN / Chlorine (Check documentation)	<input type="checkbox"/> Y / <input type="checkbox"/> N	<input type="checkbox"/> not tested	<input type="checkbox"/> Deliver to CONV				
CN / Sulfide (Check field sheet for DF)	<input type="checkbox"/> Y / <input type="checkbox"/> N	<input type="checkbox"/> not tested	<input type="checkbox"/> Deliver to CONV				
VOA / Chlorine (Check documentation)	<input type="checkbox"/> Y / <input type="checkbox"/> N	<input type="checkbox"/> not tested	<input type="checkbox"/> Deliver to ORG				
Other:							
HEADSPACE CHECK							
PRODUCT (SM Action)	Check For	Acceptable?	Corrective Action				
MICRO (Visually inspect)	Headspace (@ 1")	<input checked="" type="checkbox"/> Y / <input type="checkbox"/> N	<input type="checkbox"/> Notify MICRO				
TOTSULFIDE (Visually inspect)	Headspace (< 1")	<input type="checkbox"/> Y / <input type="checkbox"/> N	<input type="checkbox"/> Notify CONV				
VOA (Visually inspect)	Zero headspace	<input type="checkbox"/> Y / <input type="checkbox"/> N	<input type="checkbox"/> Notify ORGS				
WDO (Visually inspect)	Zero headspace	<input type="checkbox"/> Y / <input type="checkbox"/> N	<input type="checkbox"/> Notify CONV				
Other:							
FIELD FILTRATION CHECKLIST (Circle and/or check applicable selections)							
Product (SM Action)	Field Filtered	Field Blank	Corrective Action				
ORTHO (Check Field Sheet)	<input type="checkbox"/> Y (within 15 min y / n) / N	<input type="checkbox"/> Y / <input type="checkbox"/> N	<input type="checkbox"/> Deliver to CONV				
NO2 / NO23 / NH3 / SI (Documentation)	<input type="checkbox"/> Y (within 1 day y / n) / N	<input type="checkbox"/> Y / <input type="checkbox"/> N	<input type="checkbox"/> Deliver to CONV				
Dissolved Metals (Check Field Sheet)	<input type="checkbox"/> Y (within 15 min y / n) / N	<input type="checkbox"/> Y / <input type="checkbox"/> N	<input type="checkbox"/> Deliver to METALS				
DOC (Deliver / Notify Unit)	<input type="checkbox"/> Y (within 15 min or 1 day) / N	<input type="checkbox"/> Y / <input type="checkbox"/> N	<input type="checkbox"/> Deliver to CONV				
DCDP / CRIVI (Deliver / Notify Unit)	<input type="checkbox"/> Y (within 15 min y / n) / N	<input type="checkbox"/> Y / <input type="checkbox"/> N	<input type="checkbox"/> Deliver to CONV				
Other:							
COMMENTS / NOTIFICATIONS							
①-4 Wt. Certified							
CC: <input type="checkbox"/> AQUATOX, <input type="checkbox"/> CONV, <input type="checkbox"/> METALS, <input type="checkbox"/> MICRO, <input type="checkbox"/> ORG, <input type="checkbox"/>	1. Deliver dissolved Hg-CVAF samples to METALS for filtration. 2. Deliver double-bagged metals samples to METALS for preservation. 3. Do Not test pH for preserved BNA and TOTSULFIDE samples. 4. Deliver pH, WDO, and all MICRO samples ASAP to appropriate section for immediate processing. 5. Enter "Time Span" for composite samples during sample login. 6. Split all age sample into 60 mL clear glass if PHYTOQUAL is requested.						
NOTES							
SM Signature:	Signature						

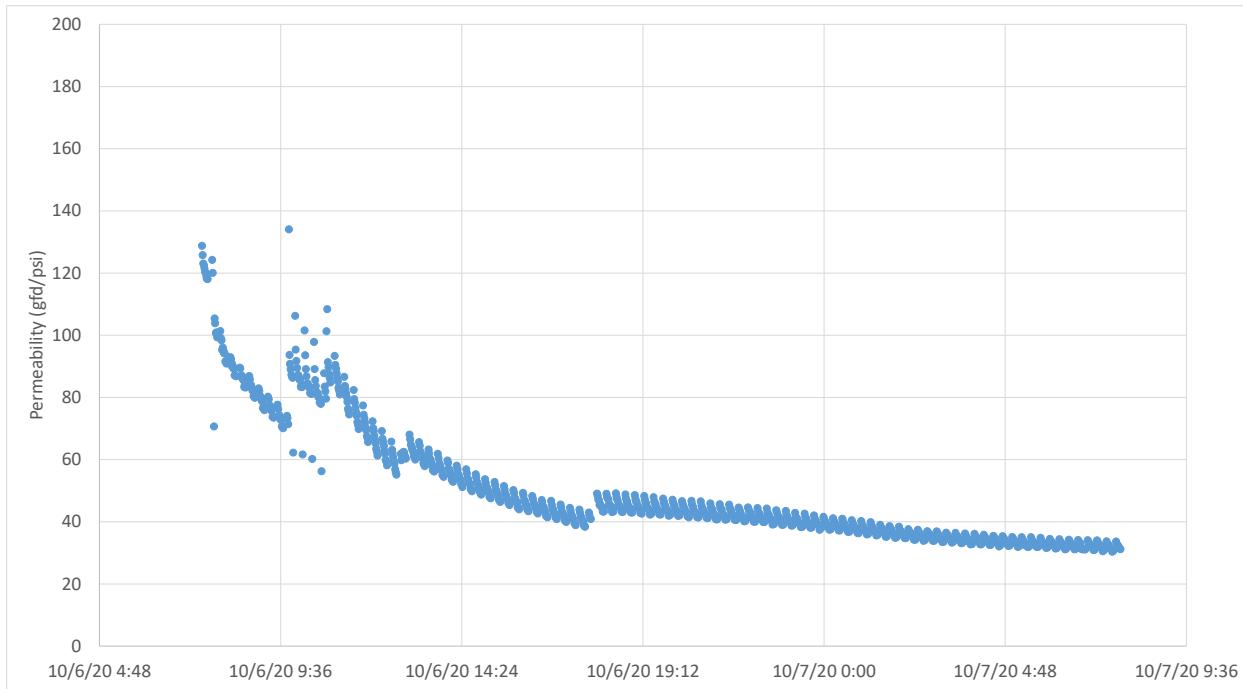


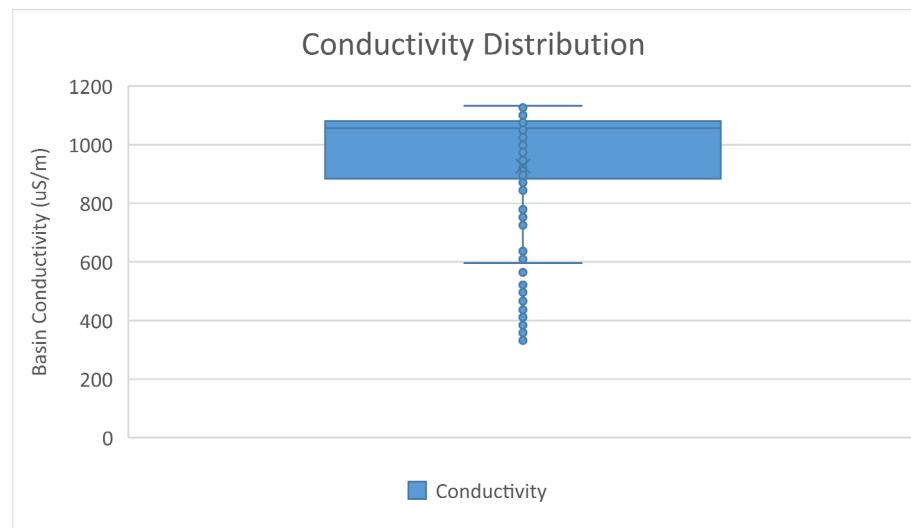
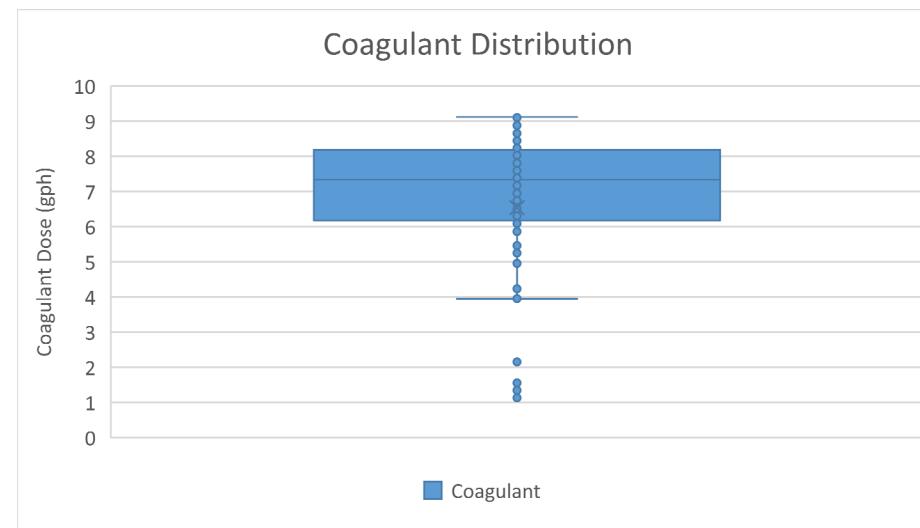
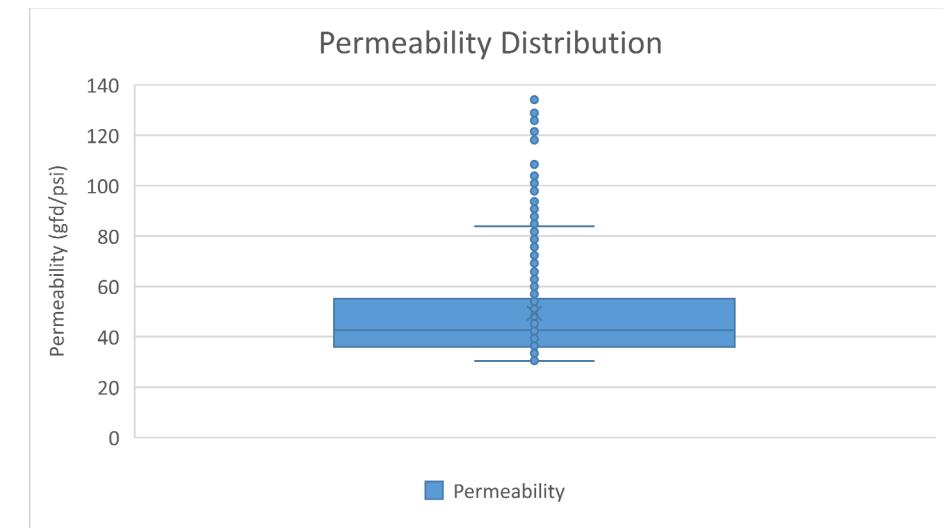
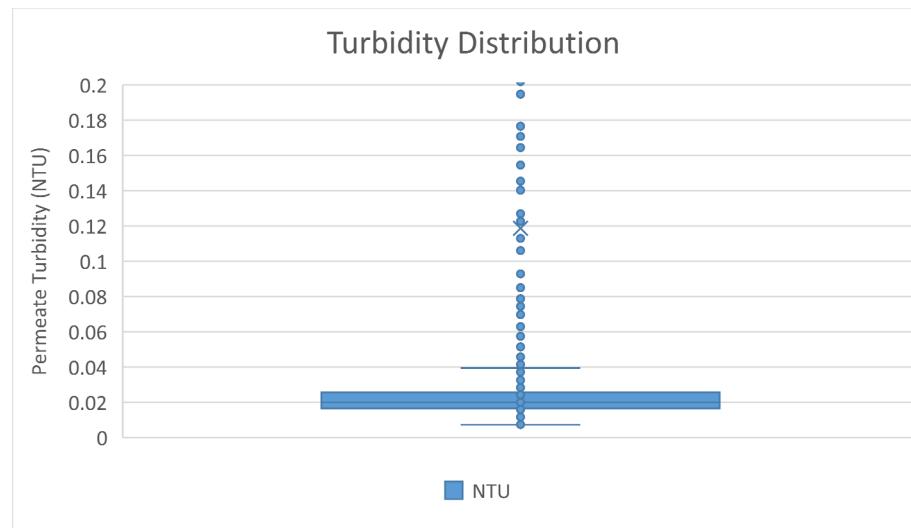
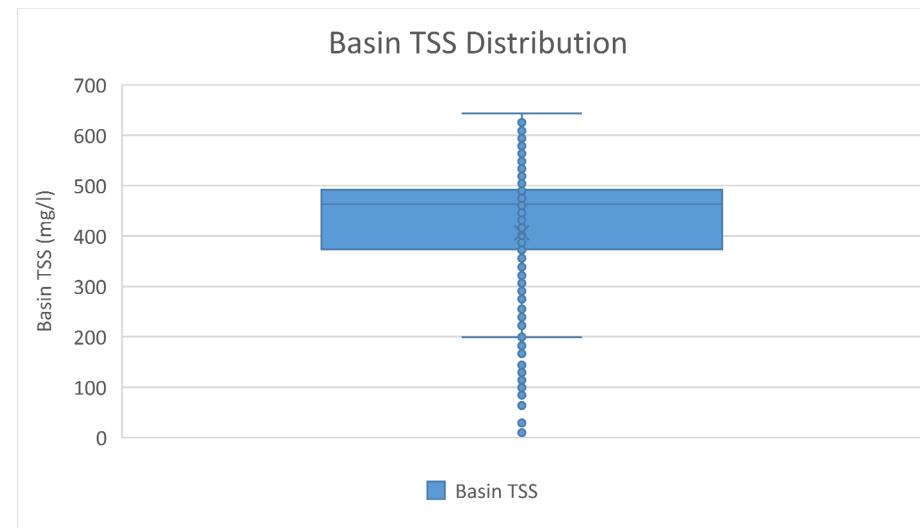
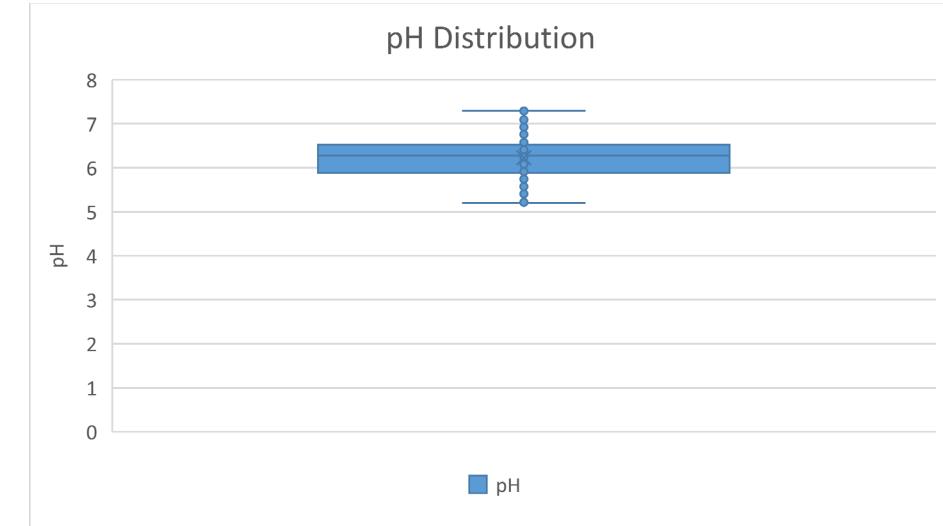
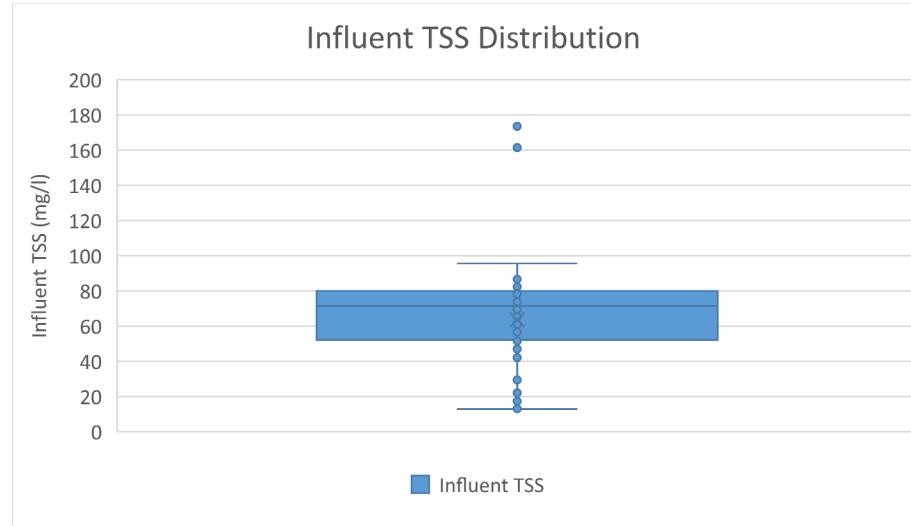
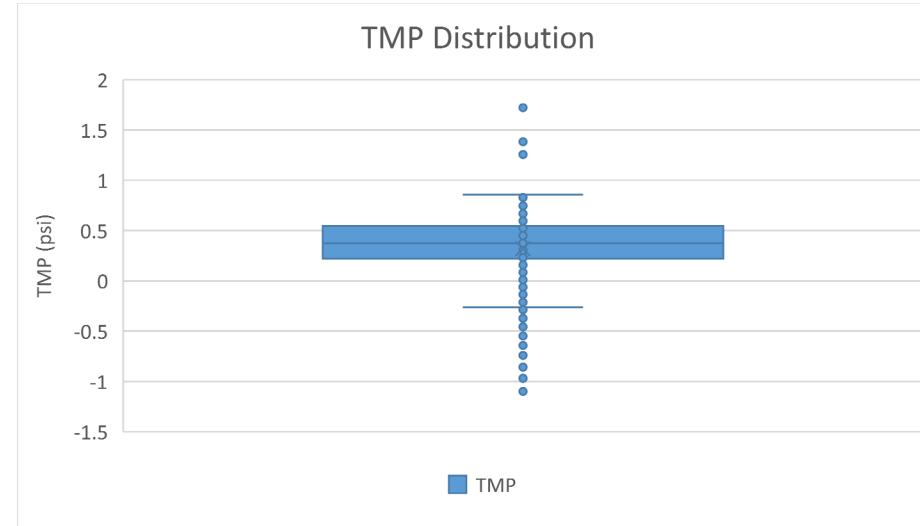












OVIVO PILOT TESTING

WO # C165282

Day	# of samples	Sample Frequency	Tue	Wed	Thu	Fri	Wed	Mon	Wed	Mon	Thu	Thu	Tue
Sample Date	Unit		4/2/2019	4/24/2019	4/25/2019	4/26/2019	5/8/2019	7/29/2019	7/31/2019	8/5/2019	8/15/2019	9/12/2019	8/4/2020
S1-G	Military Time (hours)												
TSS	mg/L	1/1/run	204										
VSS	mg/L	1/1/run	138										
tCOD	mg/L												
sCOD	mg/L												
BOD	mg/L												
Alkalinity	mg/L												
Fecal Coliform Sample ID			#1 #2		#1 #2		#1 #2		#1 #2		#1 #2		#1 #2
Fecal Coliform Sample Time													
Fecal Coliform	MPN/100mL	2/2/run											
S1-C	Military Time (hours)												
TSS	mg/L	1 hourly											
VSS	mg/L	1 hourly											
Alkalinity	mg/L	1 hourly											
COD	mg/L	1 hourly											
BOD	mg/L	1 hourly											
S2-G	Military Time (hours)												
TSS													
VSS													
Cl2 Demand	mg/L	1/1/run											
SS	ml/l	1/1/run											
Alkalinity	mg/L												
tCOD	mg/L												
sCOD	mg/L												
Fecal Coliform Sample ID			#1 #2 #3 #4		#1 #2 #3 #4		#1 #2 #3 #4		#1 #2 #3 #4		#1 #2 #3 #4		#1 #2 #3 #4
Fecal Coliform Sample Time													
Fecal Coliform	MPN/100mL	4/4/run											
S2-C	Military Time (hours)												
TSS	mg/L	1 hourly											
VSS	mg/L	1 hourly											
Alkalinity	mg/L	1 hourly											
UV Abs	cm ⁻¹	1 hourly											
BOD	mg/L	1 hourly											
S3-G	Military Time (hours)												
TSS	mg/L	1/1/run	820	4260	4567	3510	4080	4255	474	346	770		176
VSS	mg/L	1/1/run	470	2000	2117	1770	2240		258	226	434		98
Alkalinity	mg/L												
tCOD	mg/L	1/1/run											
sCOD	mg/L	1/1/run											
S3-G, Flow Box	Military Time (hours)												
TSS	mg/L	1/1/run											
VSS	mg/L	1/1/run											
Alkalinity	mg/L												
tCOD	mg/L	1/1/run											
sCOD	mg/L	1/1/run											

rerun results are: COD 3230, sCOD 140

Weekly Check of online instruments

Date/Time/Initials													
Turbidity online reading													
Turbidity lab reading													
pH online reading													
pH lab reading													
Temperature online reading													
Temperature lab reading													
Conductivity													
Hypo Strength %													

Bottle Kit	Volume
FE grab	2L
FE Fecal	4 125-ml sterile
FE cl2	1L amber bottle
FE comp	4L
Inf grab	2L
Inf Fecal	2 125-ml sterile
Inf comp	2L
TNK	500mL

S1-G	Influent Grab
S1-C	Influent Composite
S2-G	Effluent Grab
S2-C	Effluent Composite
S3-G	TNK Grab

	Thu 9/3/2020			Tue 9/22/2020			Thu 9/24/2020			Tue 9/29/2020			Tue 10/6/2020			Sat			Sat			Sat				
	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2		
1105			33				27			24			42													
23										21			35													
19			23							110			257													
333			104							41			117													
143			58							42			110													
156			56							83			187													
193			105				137																			
#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2			
1105	9/4/2020 0710			9/22/2020 1030	9/22/2020 1330			9/24/2020 0925	09/24/2020 1020			9/29/2020 1400				10/6/20 1100	10/7/20 0708									
9,200,000	7,800,000			2,300,000	2,300,000			1,400,000	4,900,000			1,300,000	ns			11,000,000	4,900,000									
30			21							33			25				40									
27			18							25			21				32									
198			107							128			88				178									
321			106							122			98				242									
156			45							41			36				106									
1105													1417													
2.65			1.34							0.1877			0.7255				0.865									
0			<0.1							<0.1			<0.1				0									
131			63							93			54				71									
141			113							28			27				54									
137			60							32			27				53									
#4	#1	#2	#3	#4	#1	#2	#3	#4	#1	#2	#3	#4	#1	#2	#3	#4	#1	#2	#3	#4	#1	#2	#3	#4		
905	1110	1300	9/4/2020 0715	9/22/2020 0835	9/22/2020 1040	9/22/2020 1235	9/22/2020 1345	9/24/2020 0820	09/24/2020 0925	09/24/2020 1020	ns	9/29/2020 0810	9/29/2020 1210	9/29/2020 1410		10/6/20 0835	10/6/20 1110	10/6/20 140	10/7/20 0706							
24,000,000	0	0	0	0	0	0	0	0	0	20	130		0	-45	0 ns	0	230	0	0							
0			1							2			1				3									
0			1							2			0				1									
50			58							75			50				52									
0.248			0.111							0.1215			0.0865				0.189									
Not enough sample			24							8			20				53									
1105																										
1560			1430							570			490				354									
825			750							310			290				202									
225			142							122			80				81									
1735			1358							516			463				420									
154			70							45			22				45									

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

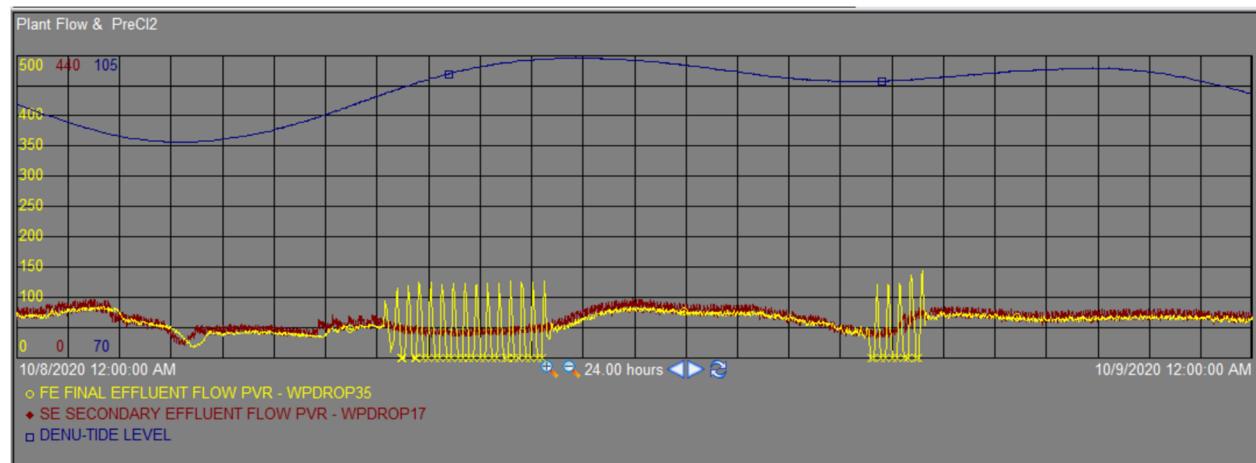
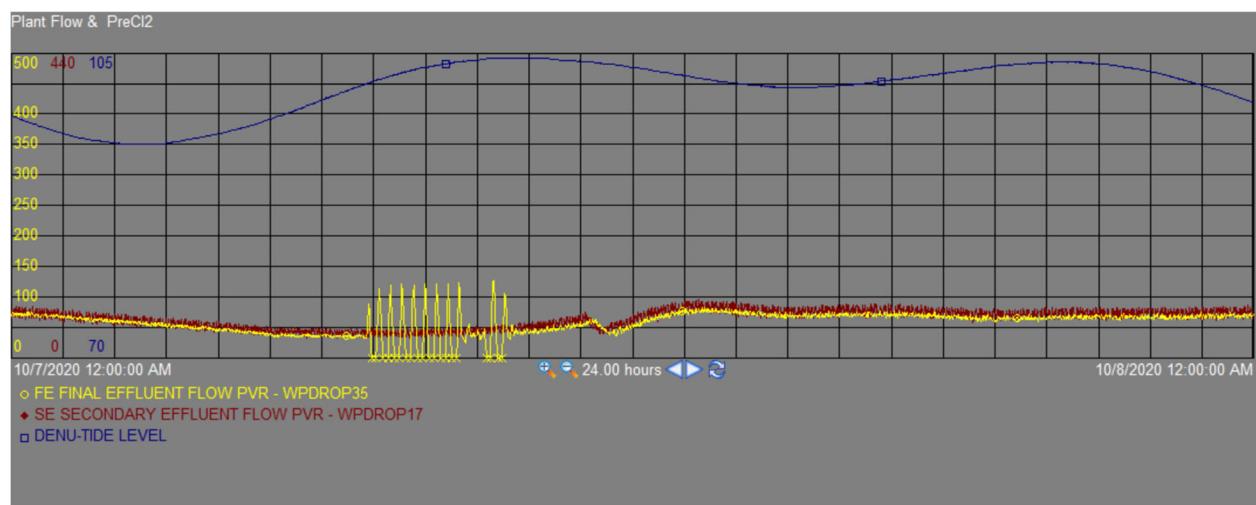
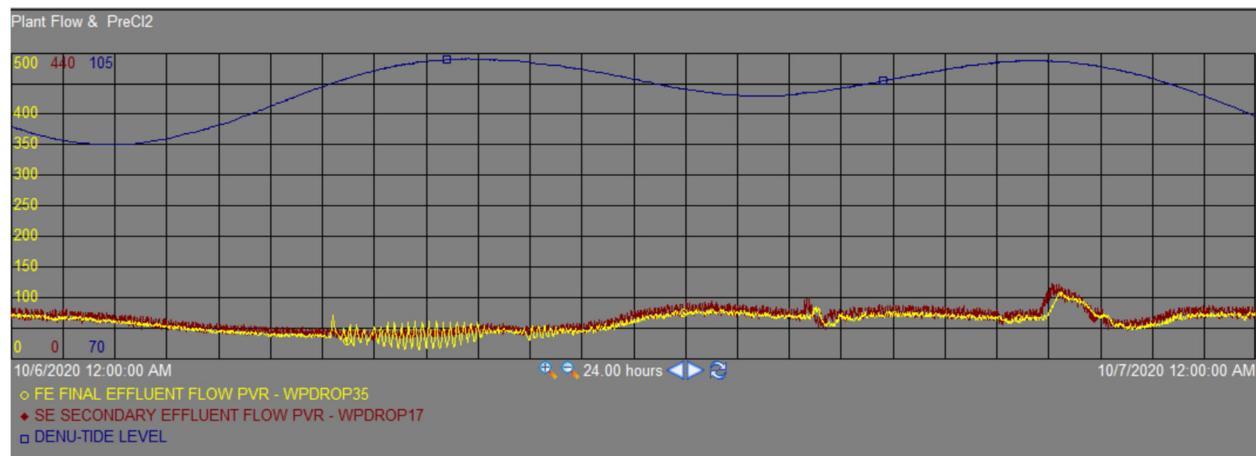
Field measurements

Run #5

Date 10/6/2020

Time	Location	pH	Temperature, C	Conductivity (uS)	TDS (ppm)
11:00	Inf	7.1	20.1	988	729
11:05	Tank	7.25	19.3	497	406
11:10	Permeate	6.88	19.3		503

Date	Time	Location	TOC (mg/L)
10/6/2020	8:30	Inf	11
	11:00	Inf	46.3
	14:00	Inf	49.4
	16:30	Inf	57.1
	20:00	Inf	73.7
10/7/2020	0:00	Inf	91.6
	4:00	Inf	84.8
	7:00	Inf	70.4
10/6/20-10/7/20	8:00-8:00	Eff	31.5 composite



Appendix B.6

Test Run Package 06

Run# 6 10/8/20

10/8/2020

Run Description Confirm performance with variable flux and water quality

200 gpm
100 gfd

Type	<input type="checkbox"/> process	<input checked="" type="checkbox"/> Performance
Influent water source		<input checked="" type="checkbox"/> PE <input checked="" type="checkbox"/> Hydrant <input checked="" type="checkbox"/> Both
Flux rate	<input type="checkbox"/>	Constant <input checked="" type="checkbox"/> Varies

Wasting Rate	0
Air Scour	105 scfm
Backwash Frequency	15 min
Run Duration	12 Hrs
CIP	<input checked="" type="checkbox"/> Hypo <input checked="" type="checkbox"/> Caustic <input type="checkbox"/> Citric
Composite Sample Schedule	12 Samples, 1 hour apart, 400 mL each 4.8 L total volume

*For flux above 100 gfd, dilute PE with hydrant water so that the influent TSS is approximately half that of pure PE

Date

Field
Eff
Turbidity
Probe reading
pH
Temperature
Conductivity

WPPIsamples
Influent composite
Effluent composite
-TSS/VSS, Alk, BOD
Influent grab
TSS/VSS
Fecal
Effluent grab
TSS/VSS
Chlorine demand
Fecal
Settleable solids
Tank grab
TSS/VSS

KCEL
Influent grab
TOC
Effluent composite
TOC

King County Ovivo Pilot

Run # **6**
Date **10/8/2020**

membrane
surface area per stack = **975 sf**

Test Variable	Test Variable	Calculated	Test Plan	Test Plan	Test Plan		
Influent flow = PE + hyd	permeate flow setpt	stacks in service	surface area in service	instantaneous flux	Flux Goal	Start Time	Stop Time
(gpm)	(gpm)	(#)	(sf)	(GFD)	(GFD)		
200 + 0	204	3	2,925	100	100	5:45	6:30
	102	3	2,925	50	50	6:30	13:30
	153	3	2,925	75	75	13:30	16:00
	204	3	2,925	100	100	16:00	17:00
100 + 100	203	2	1,950	150	150	17:00	17:30
	136	1	975	201	200	17:30	18:30

Notes:

Manually stop samplers at 1845 hrs.

Switch stacks online setting under Ovivo tab on HMI.

OVIVO Pilot Setpoints **Values to be set according to OVIVO's recommendations.**
Run# **6**Date **10/8/2020**

		FLOW OPTIMIZATION			CHEM DOSING					
System		ONLINE/OFFLINE		Permeate		End of Event		Coagulant		
Inlet System				Permeate Flow	206	gpm		Pump Start Inf Flow	1	gpm
Screen Off Delay	2	min		Pump Start Level	116	in		Pump Start Level	0.1	in
Weir Gate Frequency	1800	min		Pump Stop Level	5	in		Overflow Level	118	in
Weir Gate Duration	30	sec		Pump Stop Low Level	100	in		Coagulant Min Flow	0.5	gph
Blowers				Single Pump Flow	220	gpm		Coagulant Max Flow	20	gph
Scour Air Flow	105	scfm		Backwash Frequency	15	min		Coag Fixed Flow	6.0	gph
Blower Start Level	20	in		Backwash Flow	300	%		Coag TSS Ratio	0.40	
Blower Stop Level	8	in		Pre BW Relaxation	30	sec		Coag Al%	4.1	%
Lag Blower Start Level	65	%		Backwash Duration	60	sec		Coag SG	1.34	
Lag Blower Start Delay	120	sec		Post BW Relax Duration	30	sec		Coag Flow Ratio	5	
Blower Fail Air Flow	4.5	scfm		Perm Static Pressure	1.7	psi		Coag Fill Flow	8	gph
Blower Fail Delay	140	sec		Turbidity Hi Alarm SP	10	NTU		Coagulant Dosing Mode Select		
Low Air Flow Alarm	55	%		TMP Hi Alarm SP	8	psi		Fixed Flow		
Low Air Flow Delay	45	sec		Backwash Start TMP	10	psi		TSS		
Override Enabled				Max Hi TMP Cycles	1			Perm Flow		
Sodium Hypochlorite				TMP Reset				Membrane Basin Drain Vlv		
CIP Permeate Flow	100	gpm		Perm Tank Level Lo		20	in	WAS Vlv Open TSS	6,000	mg/l
Backwash Perm Flow	200	gpm		Air Extractor Frequency		5	min	WAS Vlv Close Lvl	117	in
Hypochlorite Flow	100	gph		Air Extractor Duration		4	min	WAS Valve Duration	0	sec
Pre CIP Relax Duration	30	sec		Citric Acid				Caustic		
Chem Flow Duration	10	min		CIP Permeate Flow	100	gpm		CIP Permeate Flow	100	gpm
Soak Duration	999	min		Backwash Perm Flow	200	gpm		Backwash Perm Flow	100	gpm
Rinse Duration	60	sec		Citric Flow	28	gph		Caustic Flow	50	gph
Final Relax Duration	60	sec		Pre CIP Relax Duration	30	sec		Pre CIP Relax Duration	30	sec
				Chem Flow Duration	10	min		Chem Flow Duration	10	min
				Soak Duration	999	min		Soak Duration	999	min
				Rinse Duration	60	sec		Rinse Duration	60	sec
				Final Relax Duration	60	sec		Final Relax Duration	60	sec
Pre-Drain Disabled			Pre-Drain Disabled			Pre-Drain Disabled				

Daily Field Notes

Run
Cond

6

Process and Performance Testing

10/3/2020

Date	Time	Observation	Action Item
10/3	0545	PE started to pilot	
	0610	pilot in filtration	
	0620	pilot to Standby - assume 200 gpm RSP > influent flow (membrane tank level)	= 190 gpm
		Reduced RSP to 204 gpm	
	0626	Switched PE to swap air in filter - pilot in Standby	
	0634	Started PE (new air in filter) and moved to 50 gpm	sept
	0645 ^(hrs)	Lifts of foam from membrane tank	
	1331	Adjusted permeate flow 102 > 13 and A1/R3 ratio 0.4 > 0.5 to 75	response to potential
	1620	Pilot to Standby due to influent < permeated flow Flow rates based on PE only	
	1622	Added bypass water to increase influent flow	previous
	1658	Adjust feed flow (hyd + PE)	
	1741	Hyd trip alarm and 51D	

King County Ovivo Pilot

Run #

6

Date

10/8/2020

membrane
surface area per stack = 975 sf

Influent flow = PE + hyd (gpm)	permeate flow setpt (gpm)	stacks in service (#)	surface area in service (sf)	Calculated instantaneous flux (GFD)	Flux Goal (GFD)	Test Plan	Test Plan	Test Plan
						Start Time	Stop Time	
200 + 0	204	3	2,925	100	100	5:45	6:30	✓
	102	3	2,925	50	50	0630	6:30	13:30
	153	3	2,925	75	75	1330	13:30	16:00
	204	3	2,925	100	100	16:00	17:00	✓
100 + 100	203	2	1,950	150	150	17:00	17:30	✓
	136	1	975	201	200	17:30	18:30	✓

Notes:

Manually stop samplers at 1845 hrs.

Switch stacks online setting under Ovivo tab on HMI.

Run # 6

SOP OVIVO PILOT

Date : 10/8/2020

STARTING PROCEDURE

1. Inform WTP Main Control and inquire if there is any issue that would preventing the operation.
- ~~2. Contact shift crew to arrange for after hour sampling.~~
3. Obtain operating parameters and sampling schedule from the test package.
- ~~4. If dilution water is required:~~
 - a. Contact Facility Service to charge the water hydrant.
 - b. Hydrant needs to be secured by 18:00 hrs.
- ~~5. Log in. User name= h, password = h.~~
- ~~6. Drain the pilot.~~
 - a. Drain membrane tank by opening the drain valve from control screen.
 - b. Drain permeate tank by opening the drain valve manually.
- ~~7. Check chemical tanks.~~
 - a. Caustic - transfer of metering pump suction.
 - b. Sodium Hypochlorite – transfer of metering pump suction. (16 gal per run)
 - c. Alum – transfer of totes.
 - d. Contact Facility Services for support moving chemicals.
- ~~8. Prime coagulant pump- only if switch to a new tank.~~
 - Press "Prim 60 sec"
- ~~9. Adjust caustic addition valve to RUN position.~~
- ~~10. Go to MAIN SCREEN and verify that all pumps, except for alkalinity, are in AUTO~~
- ~~11. Set operating parameters in the following screen.~~
 - a. Select FLOW OPTIMIZATION screen
 - b. Verify that system is offline
 - c. Set parameters according to the test plan.
- ~~12. Select chemical dosing strategy and set the parameters.~~
- ~~13. Select ALARM. There are certain erroneous alarms that needs to be acknowledged to reset.~~
- ~~14. Select FLOW OPTIMIZATION screen and put the system ONLINE.~~
- ~~15. Turn on PE at the panel by the primary bldg.~~
 - a. Turn the switch to HAND
 - b. Press START
 - c. Open the PE hand valve completely.
- ~~16. Monitor and confirm the increasing tank level.~~
 - a. Weir gate XVCS-101 is open, once the tank level is 0.1 in., this weir gate will close and the coagulant pump will start.
- ~~17. Once coagulant pump start, start caustic pump manually.~~
 - a. Select PMP-AK 101 (alkalinity addition pump)
 - b. Adjust the pump speed to the target flowrate. 4% = 1.9 gph.
 - c. Verify the flowrate on the pump local display.
- ~~18. Monitor and confirm:~~
 - a. Air blower starts once the tank is at 20 in.
 - b. Permeate pump starts at 116 in.

- e. Confirm that there are sufficient flow through sampling buckets.
- ~~19. Open the valve to effluent turbidimeter.~~
- ~~20. Setup auto sampler on influent and effluent.
 - Open valves to get flow through sampling buckets.~~
- ~~21. Allow the system to run for at least 1 full cycle to prior to data & sample collection. Refer to run guidance document on sampling starting time.~~
- ~~22. Start sample collection~~

SHUTDOWN & CIP PROCEDURE

- ~~1. Check the hypo and caustic levels. Each cleaning cycle require 12 gal.~~
- ~~2. Close sampling valves, turbidimeter valves.~~
- ~~3. Switch alkalinity pump from manual to auto.~~
- ~~4. Prime hypochlorite pump.~~
- ~~5. Switch caustic addition valve position from RUN to CIP position.~~
- ~~6. Go to CIP screen to check the CIP parameters. If CIP is initiated from this screen, the system will go back into filtration once the CIP is completed (as long as the feed pump is on).~~
- ~~7. Wait for pump priming to finish.~~
- ~~8. Got to Flow Optimization screen and select "End of cycle".
 - If the pilot stopped/standby due to high TMP, press TMP reset, and the CIP will start.~~
- ~~9. Verify that the hypochlorite pump & caustic pumps are on.~~
- ~~10. Turn the feed off at the PE panel
 - a. Press STOP
 - b. Turn the switch to OFF
 - c. Close the manual valve~~
- ~~11. Spray down the membrane tank to remove foam and scum.~~
- ~~12. Log out.~~

King County Ovivo Pilot

Run #

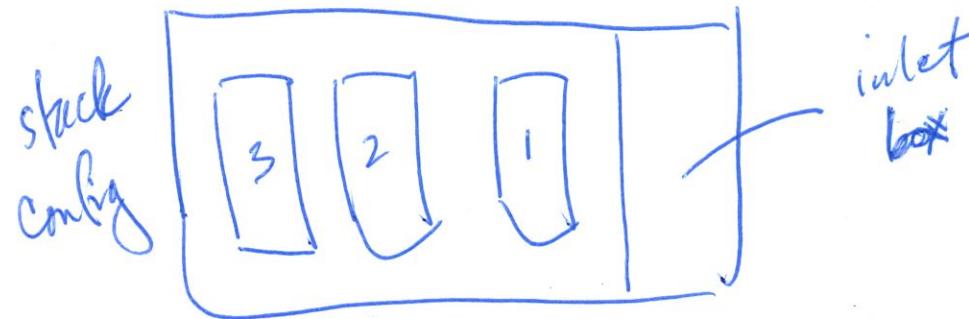
6

Date

10/8/2020

membrane
surface area per stack =

975 sf



Test Variable	Test Variable		Calculated	Test Plan	Test Plan	Test Plan	
Influent flow = PE + hyd	permeate flow setpt	stacks in service	surface area in service	instantaneous flux	Flux Goal	Start Time	Stop Time
(gpm)	(gpm)	(#)	(sf)	(GFD)	(GFD)		
200 + 0	204	3	2,925	100	100	5:45	6:30
	102	3	2,925	50	50	0635 hrs	13:30
	153	3	2,925	75	75	1331 hrs	16:00
	204	3	2,925	100	100	16:00	17:00
100 + 100	203	* 2	1,950	150	150	17:00	17:30
	136	* 1	975	201	200	17:30	18:30

Notes:

Manually stop samplers at 1845 hrs.

Switch stacks online setting under Ovivo tab on HMI.

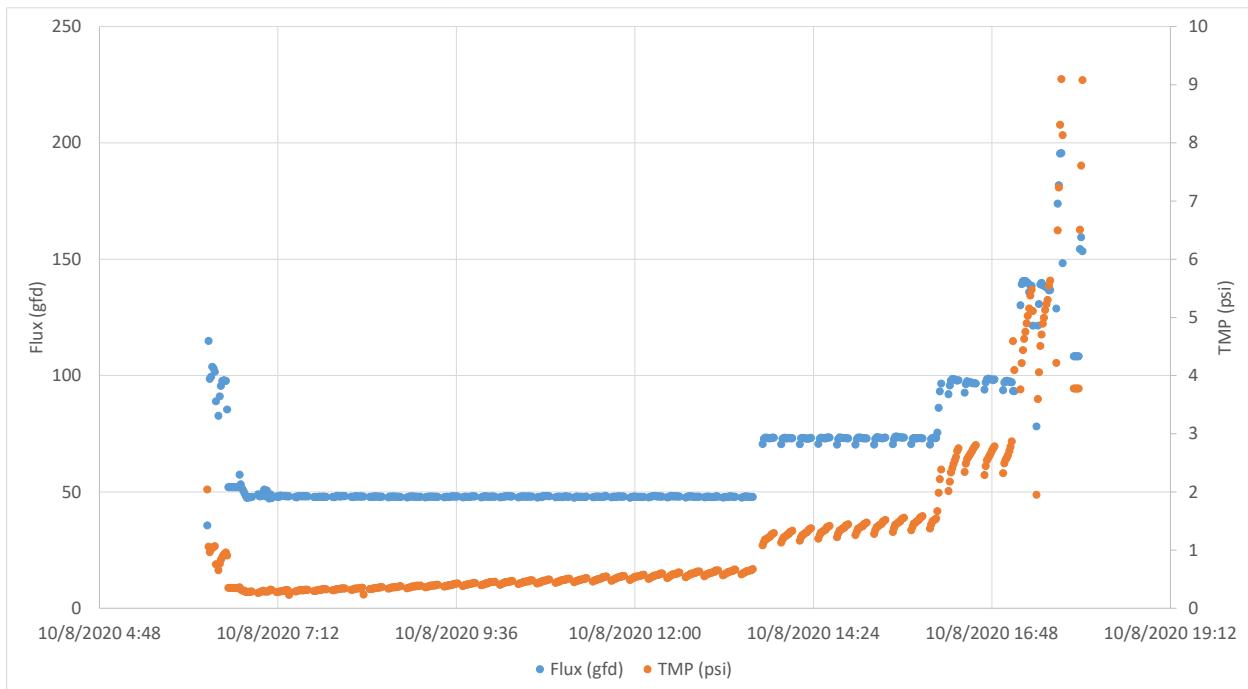
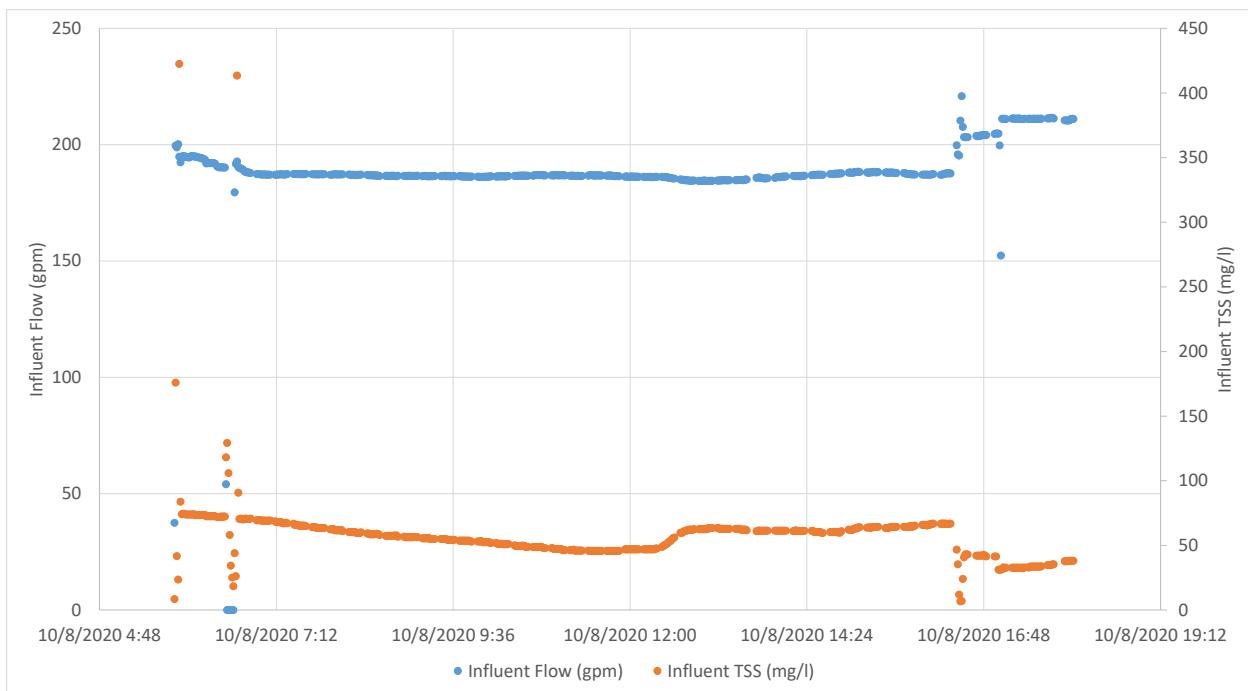
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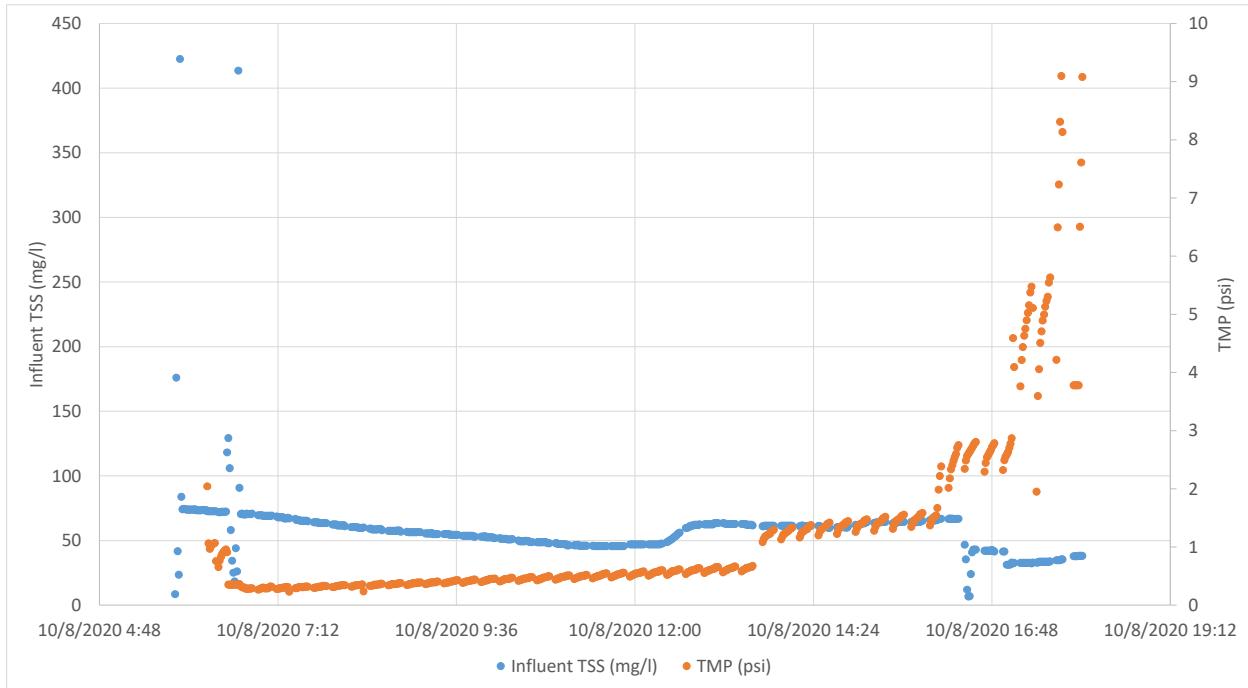
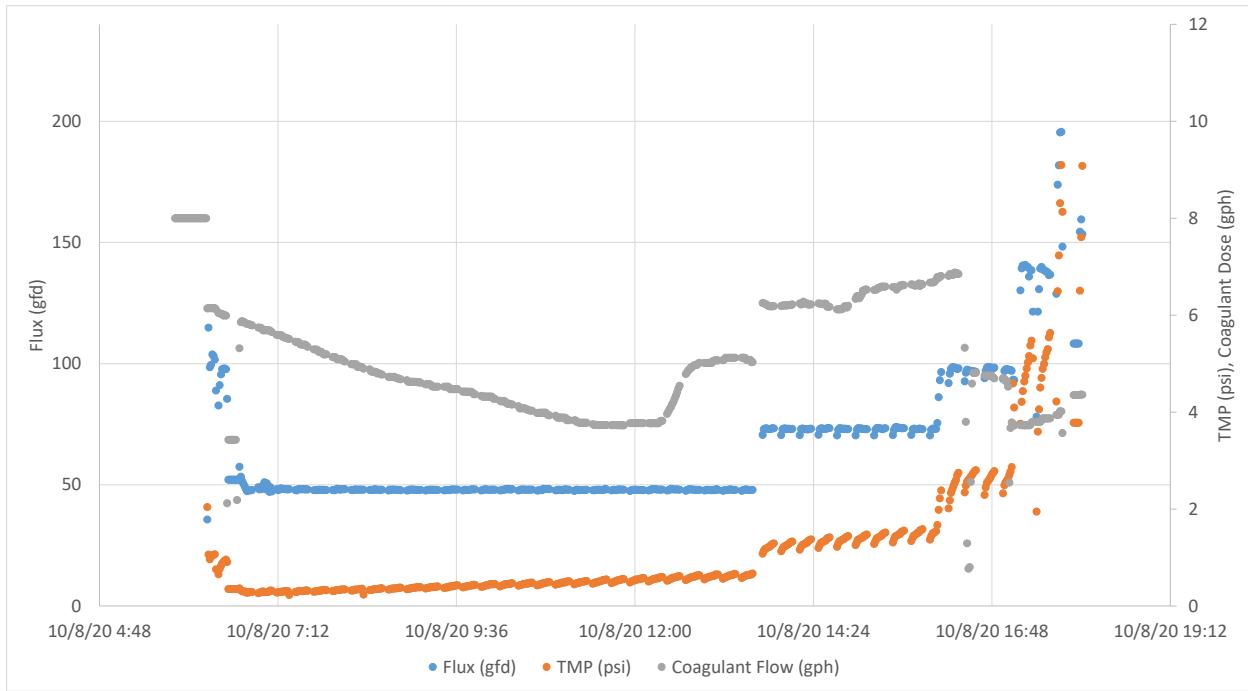
stacks 1 & 2 OFFLINE

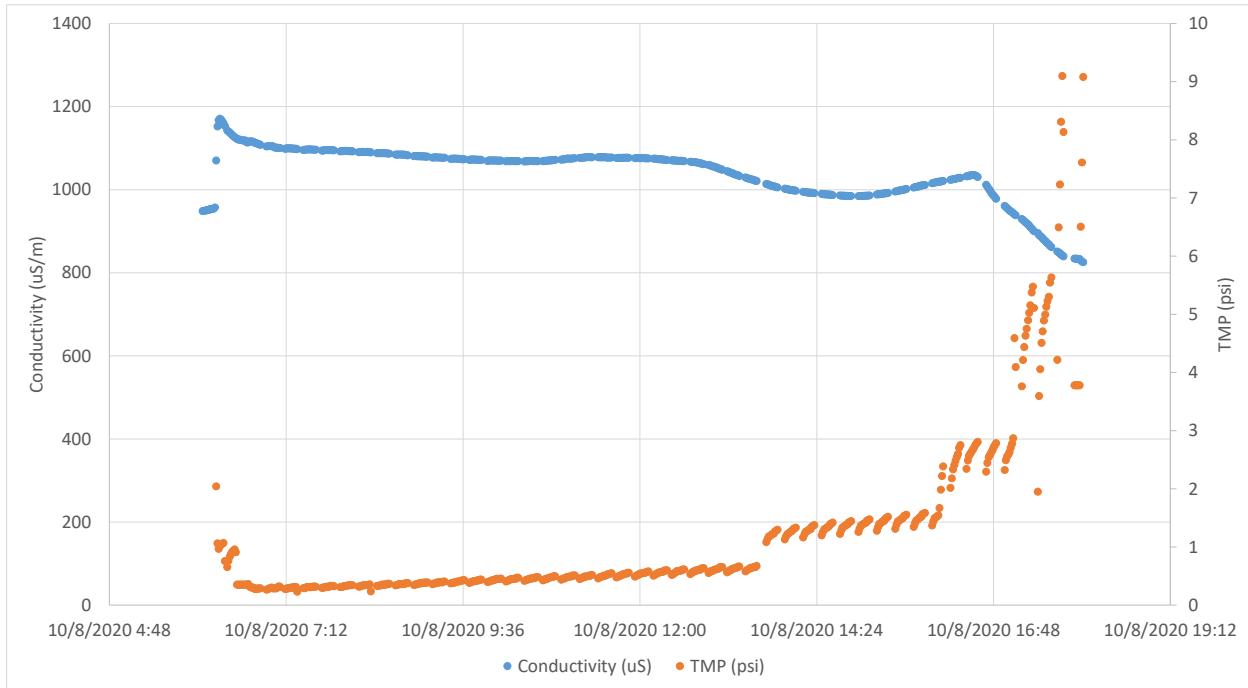
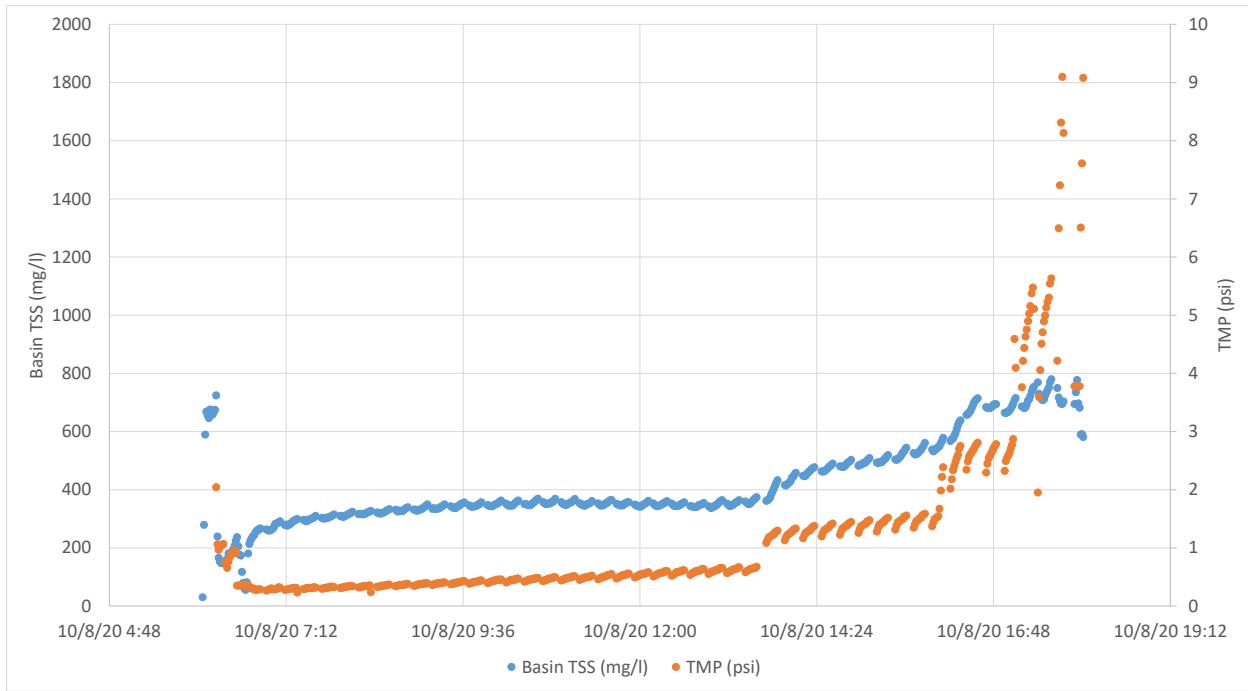
Added
10/9
JHL

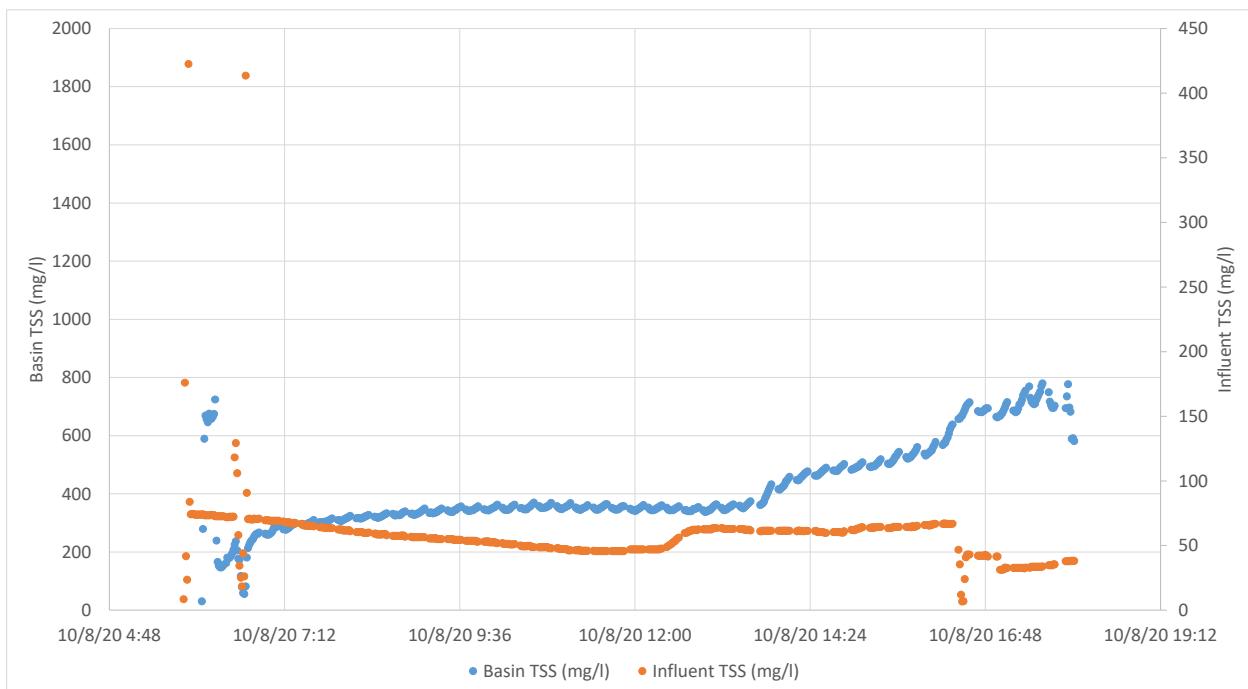
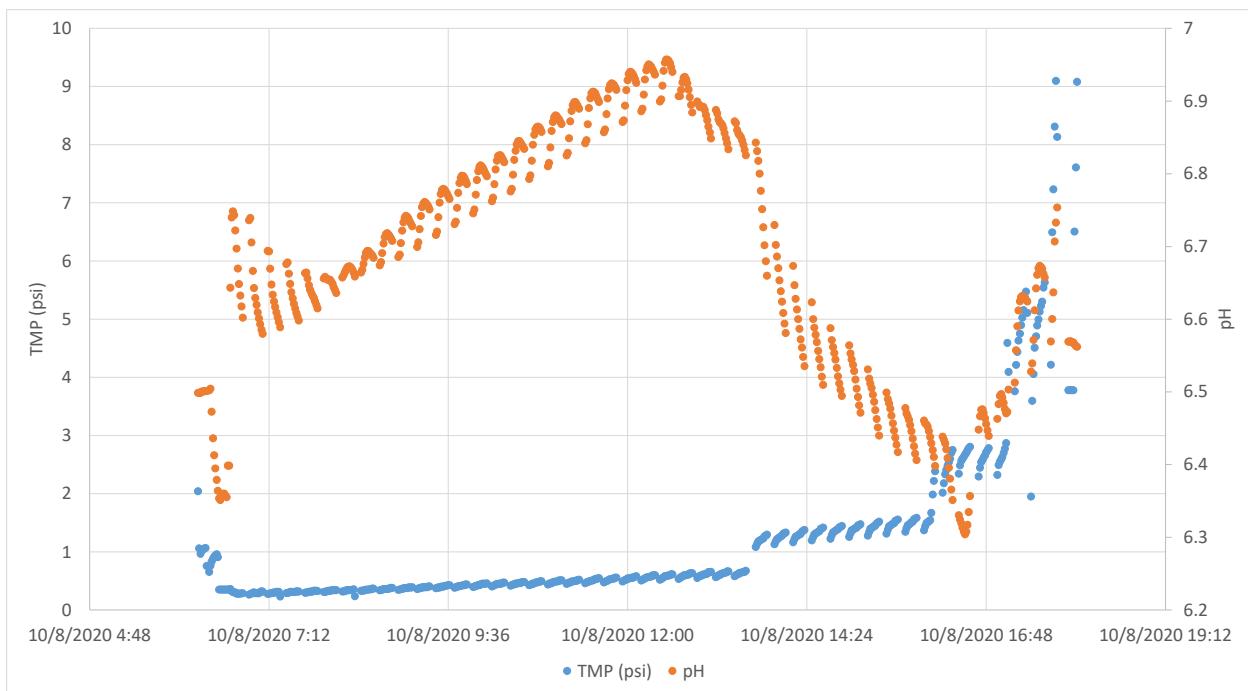
OVIVO Pilot Observations							
By: Mike Ollivant PE (Marcos Lopez PE onsite)							
Date: 10/08/2020							
		Influent	Permeate				Notes
Source Water	Time PM	GPM	GPM	NTU	TMP	GFD Flux	Dose
PE	2:46	187.8	148.2	0.018	1.4	73	6.2 75 gfd
PE	3:11	188	149.2	0.041	1.4	73.6	6.6
PE	3:25	187.9	149.9	0.032	1.4	73.9	6.6
PE	4:03		199	0.021	2.4		switch to 100 gfd - Pilot low level shut off - PE pump could not keep up with permeate flow
PE + Hydrant	4:24	212.5	197.1	0.02	2.6	97.1	0.7 Low TSS reduced hydrant flow
PE + Hydrant	5:09	211.3	191.5	0.084	4.6	138.1	3.7 ~50/50 PE to Hydrant, switch to 150 gfd, 2 stacks only.
PE + Hydrant	5:24	211.3	188.1	0.06	4.9	139.1	3.9
PE + Hydrant	5:32	211.3	185.4	0.05	5.7	136.7	3.9 End of 150 GFD Cycle
PE + Hydrant	5:41				10	202	200 gfd cycle shutdown after backwash cycle.
PE + Hydrant	5:54				6.8	159	Auto restart - no backwash cycle initiated
PE + Hydrant	5:56				9.2	175	
PE + Hydrant	5:57				9.9	210	
PE + Hydrant	5:58				10		Second shutdown.

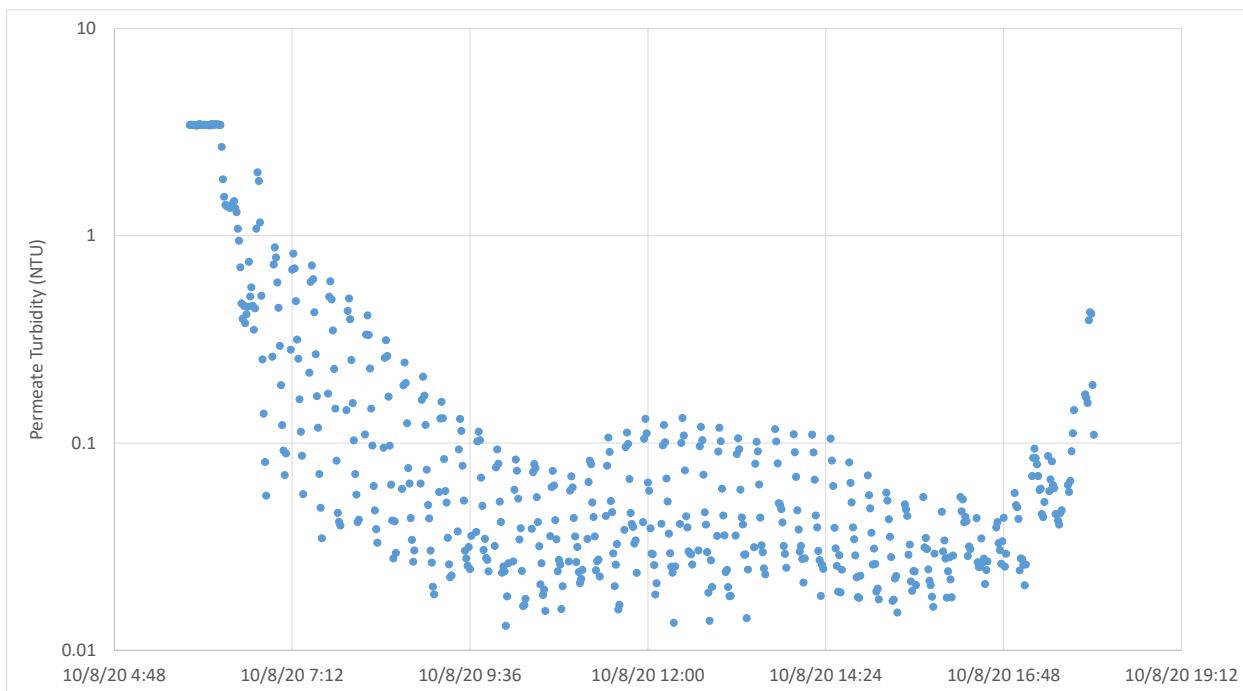
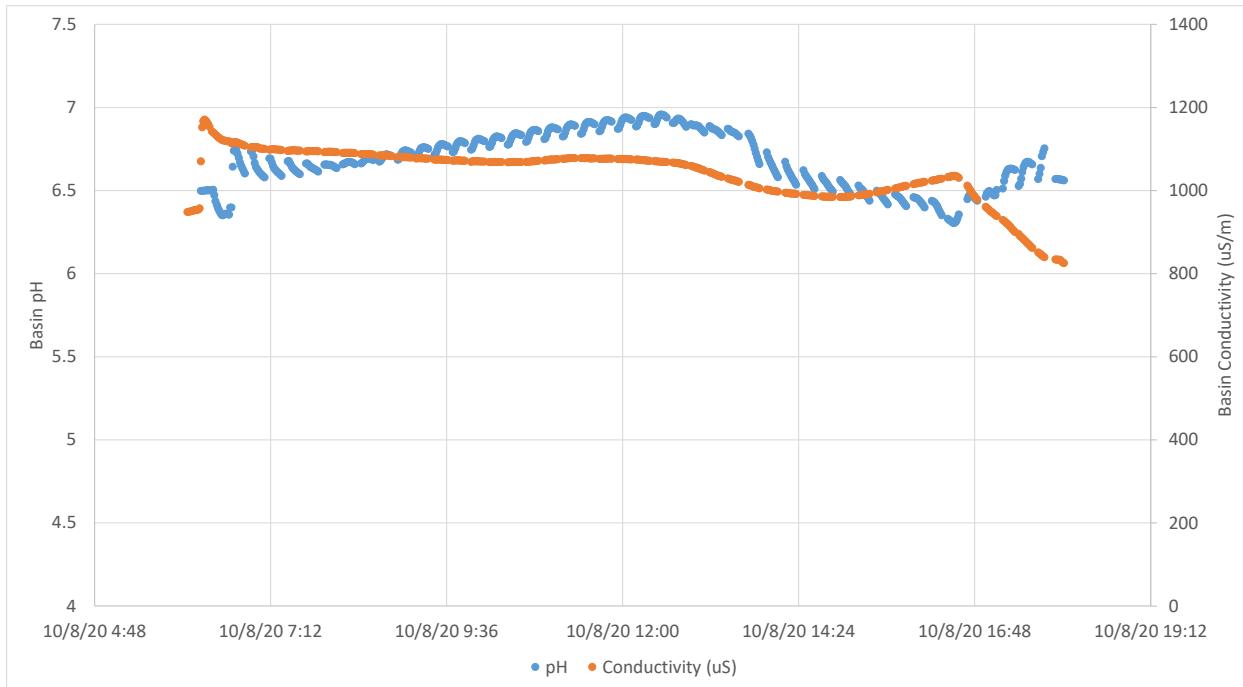
Status	Time	75 GFD		75 GFD		
		Countdown Timer Minutes	Flow - gpm	Time	Countdown Timer Minutes	Flow - gpm
Backwash	3:03 PM	2	148		2	148.9
		1.7	0		1.8	0
		1.5	Start		1.5	Start
		1	257		1	260
		0.5	360		0.5	361
		0.3	6		0.3	6
Permeate	0 - 13.00	0		0 - 13.00	0	
		12	106		12	108
		11	127		11	128
		10	139		10	139
		9	146		9	146
		8	149.2	3:26PM	8	149.5
		3	148.6			
100 GFD			150 GFD - 2 Stacks On			
Status	Time	Countdown Timer Minutes	Flow - gpm	Time	Countdown Timer Minutes	Flow - gpm
Backwash	4:23 PM	2	196		2	188
		1.7	0		1.7	0
		1.5	Start		1.5	Start
		1	264		1	263
		0.4	433		0.5	421
		0.2	6		0.2	6
Permeate	0 - 13.00	0		0 - 13.00	0	
		12	118		12	
		11	160		11	154
		10	179	5:22 PM	10	177
		9	192		9	188.9
		8	197.5		8	189.5

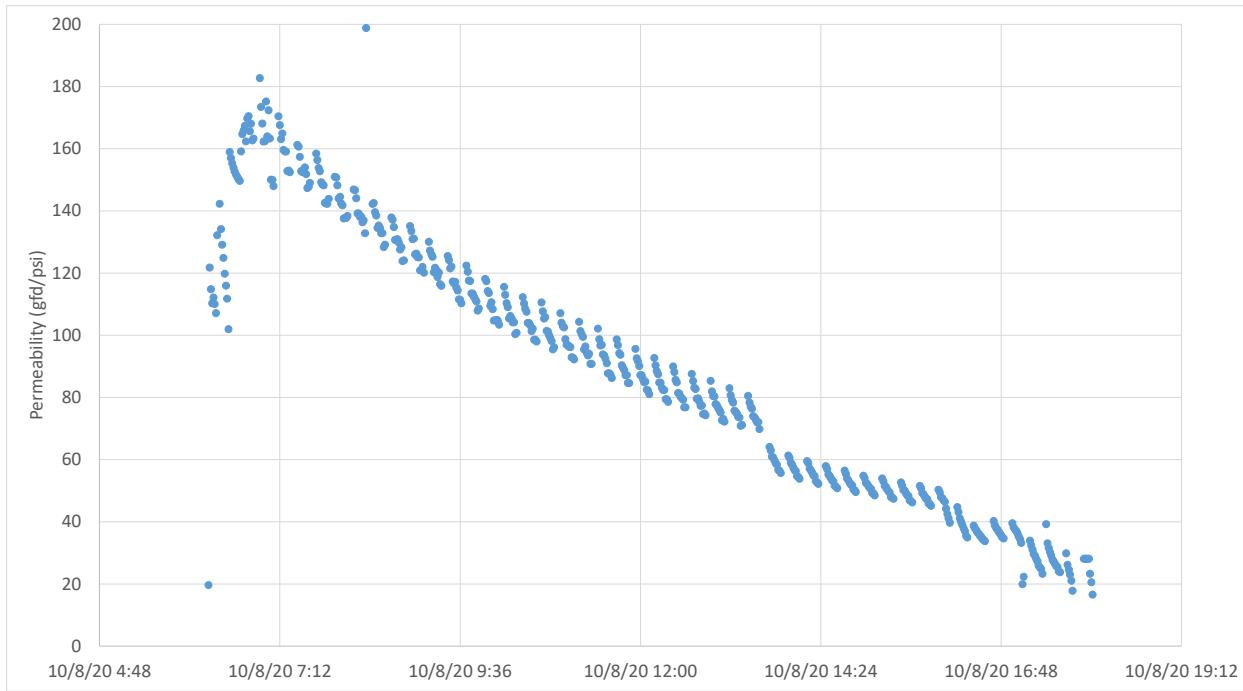


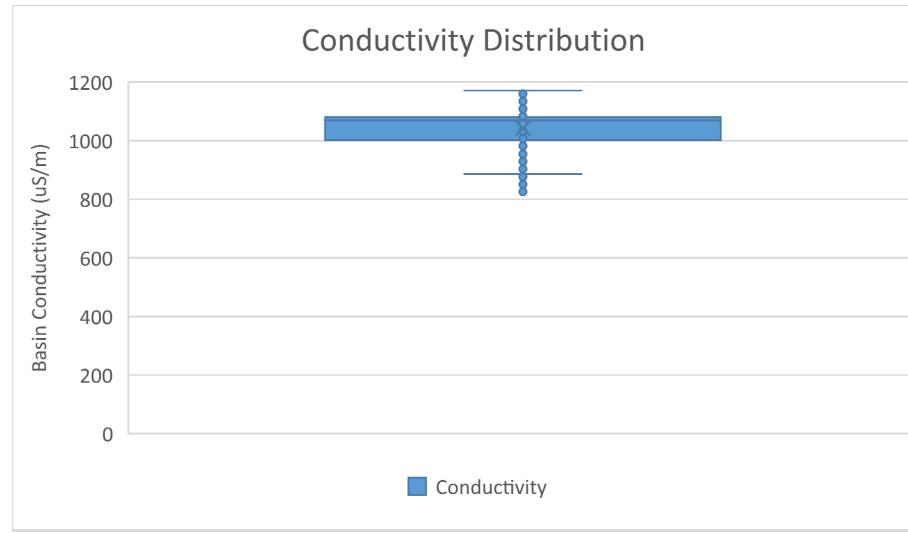
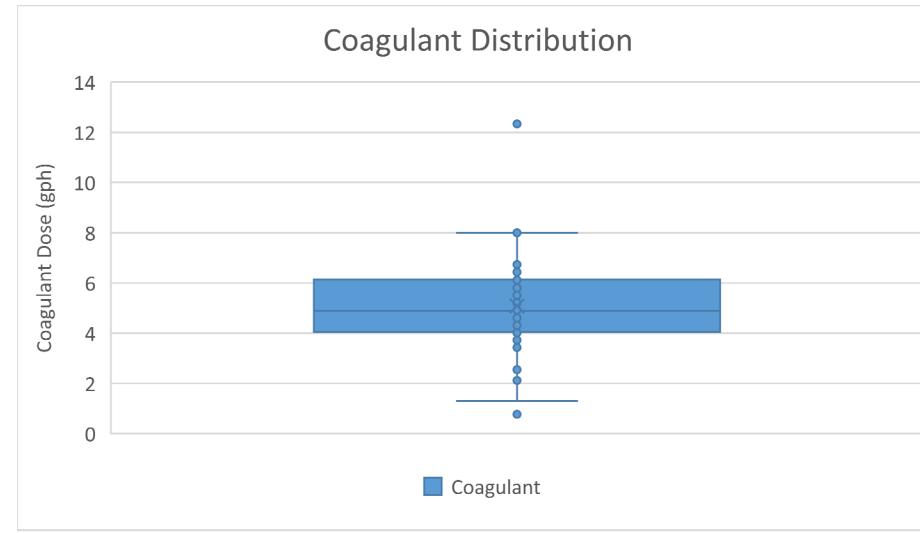
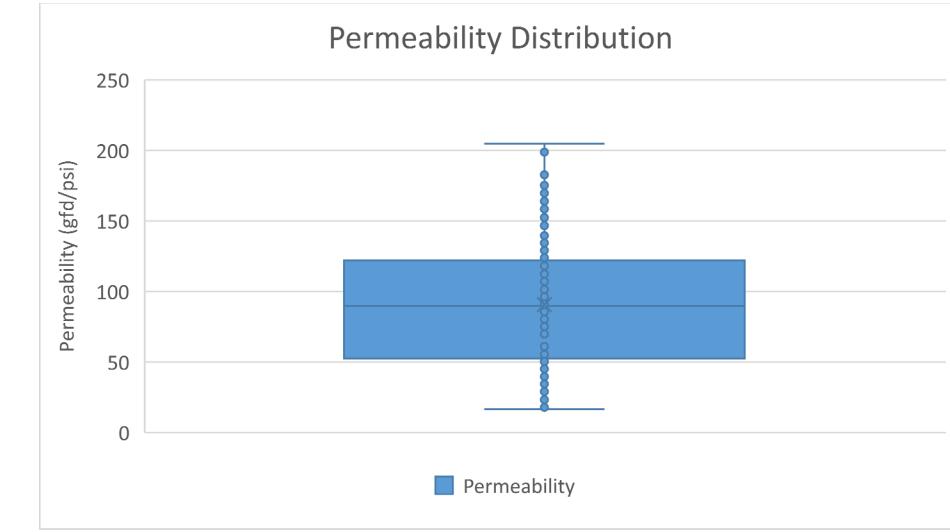
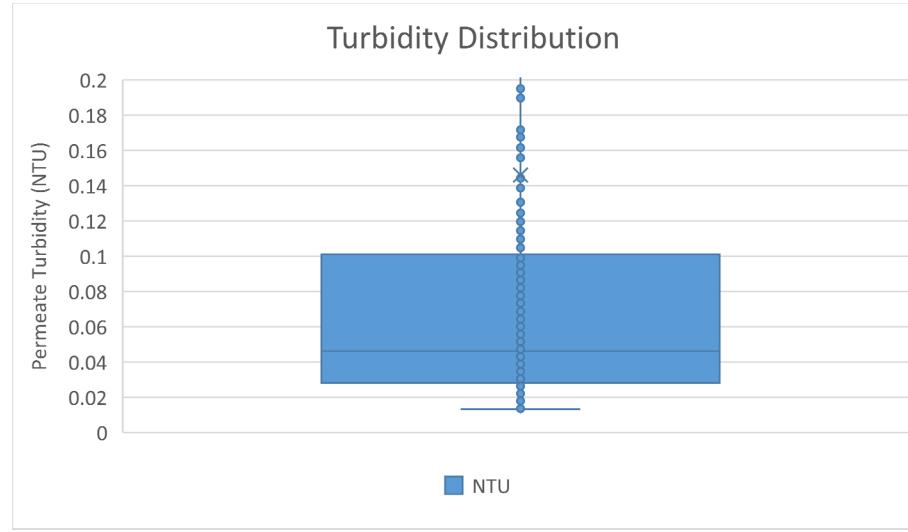
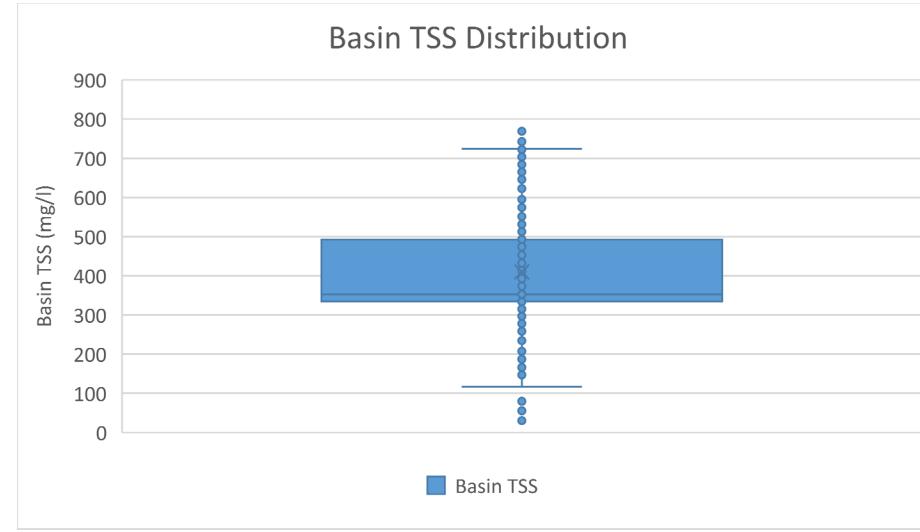
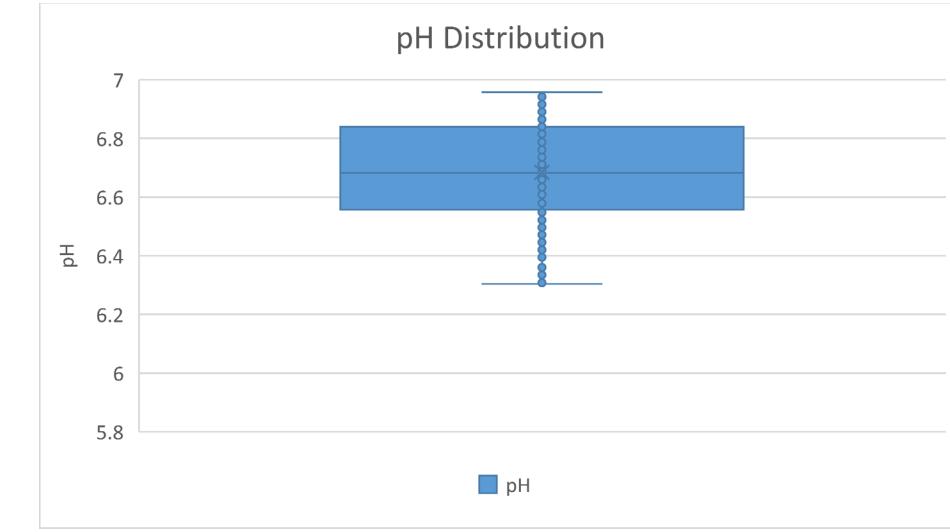
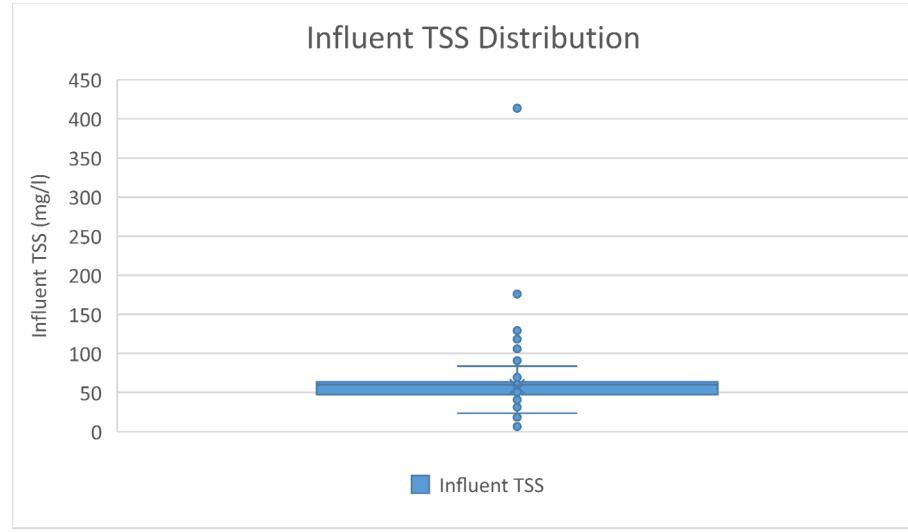
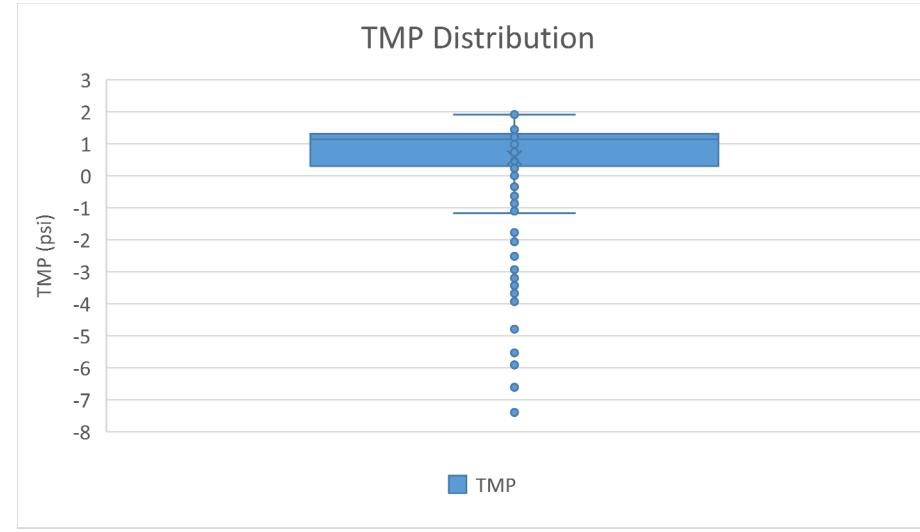












Sample Data

King County Environmental Lab Analytical Report

Project:	423650-100	Project:	423650-100	Project:	423650-100										
Locator:	INF-SL	Locator:	INF-SL	Locator:	INF-SL										
Descrip:	PILOT INFLUENT, IN	Descrip:	PILOT INFLUENT, IN	Descrip:	PILOT INFLUENT, IN										
Sample:	L72440-1	Sample:	L72440-2	Sample:	L72440-3										
Matrix:	LB INFLUENT	Matrix:	LB INFLUENT	Matrix:	LB INFLUENT										
ColDate:	10/8/20 7:00	ColDate:	10/8/20 7:30	ColDate:	10/8/20 13:10										
TimeSpan:	11.8	TimeSpan:		TimeSpan:											
TotalSolid:		TotalSolid:		TotalSolid:											
ClientLoc:		ClientLoc:		ClientLoc:											
SampDepth:		SampDepth:		SampDepth:											
WET Weight Basis			WET Weight Basis			WET Weight Basis									
Parameters CV SM5310-B	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
Total Organic Carbon	47.6		10	20	mg/L	65.7		10	20	mg/L	55.2		10	20	mg/L
MT EPA 200.8 (MOD)						0.4	<RDL	0.3	1	ug/L	0.4	<RDL	0.3	1	ug/L
Antimony, Total, ICP-MS						1.68		0.05	0.25	ug/L	2.38		0.05	0.25	ug/L
Arsenic, Total, ICP-MS						<MDL		0.1	0.5	ug/L	<MDL		0.1	0.5	ug/L
Beryllium, Total, ICP-MS						0.12	<RDL	0.05	0.25	ug/L	0.08	<RDL	0.05	0.25	ug/L
Cadmium, Total, ICP-MS						24500		50	50	ug/L	23500		50	50	ug/L
Calcium, Total, ICP-MS						0.95	<RDL	0.2	1	ug/L	1.11		0.2	1	ug/L
Chromium, Total, ICP-MS						30.3		0.2	2	ug/L	26.6		0.2	2	ug/L
Copper, Total, ICP-MS						1.58		0.1	0.5	ug/L	2.07		0.1	0.5	ug/L
Lead, Total, ICP-MS						16300		50	50	ug/L	14800		50	50	ug/L
Magnesium, Total, ICP-MS						2.94		0.1	0.5	ug/L	3.02		0.1	0.5	ug/L
Nickel, Total, ICP-MS						0.67	<RDL	0.5	1	ug/L	0.53	<RDL	0.5	1	ug/L
Selenium, Total, ICP-MS						0.17	<RDL	0.04	0.2	ug/L	0.12	<RDL	0.04	0.2	ug/L
Silver, Total, ICP-MS						<MDL		0.1	0.2	ug/L	<MDL		0.1	0.2	ug/L
Thallium, Total, ICP-MS						53.5		0.5	2.5	ug/L	63.1		0.5	2.5	ug/L
Zinc, Total, ICP-MS						128		0.331	0.331	mg CaCO3/L	120		0.331	0.331	mg CaCO3/L
MT EPA 200.8 (MOD)*SM2340B						0.0169		0.005	0.015	ug/L	0.0158		0.005	0.015	ug/L
MT EPA 245.1						23.1		1.5	5.4	mg/L	18.7		1.5	5.3	mg/L
Mercury, Total, CVAA															
OR EPA 1664B															
Hem (oil, total)															

King County Environmental Lab Analytical Report

Project:	423650-100	Project:	423650-100	Project:	423650-100										
Locator:	INF-SL	Locator:	EFF-SL	Locator:	EFF-SL										
Descrip:	PILOT INFLUENT, IN	Descrip:	PILOT MEMBRANE PER	Descrip:	PILOT MEMBRANE PER										
Sample:	L72440-4	Sample:	L72440-5	Sample:	L72440-6										
Matrix:	LB INFLUENT	Matrix:	LA OTHR WTR	Matrix:	LA OTHR WTR										
ColDate:	10/8/20 17:05	ColDate:	10/8/20 7:00	ColDate:	10/8/20 7:40										
TimeSpan:		TimeSpan:	11.8	TimeSpan:											
TotalSolid:		TotalSolid:		TotalSolid:											
ClientLoc:		ClientLoc:		ClientLoc:											
SampDepth:		SampDepth:		SampDepth:											
WET Weight Basis			WET Weight Basis												
Parameters															
CV SM5310-B	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
Total Organic Carbon	32.8		10	20	mg/L	31		2	4	mg/L					
MT EPA 200.8 (MOD)															
Antimony, Total, ICP-MS	<MDL		0.3	1	ug/L						<MDL		0.3	1	ug/L
Arsenic, Total, ICP-MS	1.43		0.05	0.25	ug/L						0.8		0.05	0.25	ug/L
Beryllium, Total, ICP-MS	<MDL		0.1	0.5	ug/L						<MDL		0.1	0.5	ug/L
Cadmium, Total, ICP-MS	<MDL		0.05	0.25	ug/L						<MDL		0.05	0.25	ug/L
Calcium, Total, ICP-MS	18600		50	50	ug/L						23700		50	50	ug/L
Chromium, Total, ICP-MS	0.69	<RDL	0.2	1	ug/L						<MDL		0.2	1	ug/L
Copper, Total, ICP-MS	16		0.2	2	ug/L						2.04		0.2	2	ug/L
Lead, Total, ICP-MS	1.16		0.1	0.5	ug/L						0.14	<RDL	0.1	0.5	ug/L
Magnesium, Total, ICP-MS	9450		50	50	ug/L						16500		50	50	ug/L
Nickel, Total, ICP-MS	1.7		0.1	0.5	ug/L						2.96		0.1	0.5	ug/L
Selenium, Total, ICP-MS	<MDL		0.5	1	ug/L						0.57	<RDL	0.5	1	ug/L
Silver, Total, ICP-MS	0.073	<RDL	0.04	0.2	ug/L						<MDL		0.04	0.2	ug/L
Thallium, Total, ICP-MS	<MDL		0.1	0.2	ug/L						<MDL		0.1	0.2	ug/L
Zinc, Total, ICP-MS	36.7		0.5	2.5	ug/L						13.7		0.5	2.5	ug/L
MT EPA 200.8 (MOD)*SM2340B															
Hardness, Calc	85.3		0.331	0.331	mg CaCO3/L						127		0.331	0.331	mg CaCO3/L
MT EPA 245.1															
Mercury, Total, CVAA	0.012	<RDL	0.005	0.015	ug/L						<MDL		0.005	0.015	ug/L
OR EPA 1664B															
Hem (oil, total)	10.2		1.4	5.1	mg/L						<MDL		1.4	5.1	mg/L

King County Environmental Lab Analytical Report

Project: 423650-100 Locator: EFF-SL Descrip: PILOT MEMBRANE PER Sample: L72440-7 Matrix: LA OTHR WTR ColDate: 10/8/20 13:20 TimeSpan: TotalSolid: ClientLoc: SampDepth: WET Weight Basis	Project: 423650-100 Locator: EFF-SL Descrip: PILOT MEMBRANE PER Sample: L72440-8 Matrix: LA OTHR WTR ColDate: 10/8/20 17:15 TimeSpan: TotalSolid: ClientLoc: SampDepth: WET Weight Basis	Project: 423650-100 Locator: TNK-SL Descrip: IN-LINE SED FOR OV Sample: L72440-9 Matrix: LA OTHR WTR ColDate: 10/8/20 7:35 TimeSpan: TotalSolid: ClientLoc: SampDepth: WET Weight Basis													
Parameters CV SM5310-B	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
Total Organic Carbon															
MT EPA 200.8 (MOD)															
Antimony, Total, ICP-MS	<MDL		0.3	1	ug/L	<MDL		0.3	1	ug/L	0.56	<RDL	0.3	1	ug/L
Arsenic, Total, ICP-MS	0.961		0.05	0.25	ug/L	0.826		0.05	0.25	ug/L	2.91		0.05	0.25	ug/L
Beryllium, Total, ICP-MS	<MDL		0.1	0.5	ug/L	<MDL		0.1	0.5	ug/L	0.726		0.1	0.5	ug/L
Cadmium, Total, ICP-MS	<MDL		0.05	0.25	ug/L	<MDL		0.05	0.25	ug/L	0.23	<RDL	0.05	0.25	ug/L
Calcium, Total, ICP-MS	23800		50	50	ug/L	19200		50	50	ug/L	26000		50	50	ug/L
Chromium, Total, ICP-MS	<MDL		0.2	1	ug/L	<MDL		0.2	1	ug/L	3.6		0.2	1	ug/L
Copper, Total, ICP-MS	2.31		0.2	2	ug/L	1.5	<RDL	0.2	2	ug/L	71.6		0.2	2	ug/L
Lead, Total, ICP-MS	0.11	<RDL	0.1	0.5	ug/L	<MDL		0.1	0.5	ug/L	3.88		0.1	0.5	ug/L
Magnesium, Total, ICP-MS	17300		50	50	ug/L	10700		50	50	ug/L	16200		50	50	ug/L
Nickel, Total, ICP-MS	2.43		0.1	0.5	ug/L	1.78		0.1	0.5	ug/L	4.78		0.1	0.5	ug/L
Selenium, Total, ICP-MS	<MDL		0.5	1	ug/L	<MDL		0.5	1	ug/L	0.89	<RDL	0.5	1	ug/L
Silver, Total, ICP-MS	<MDL		0.04	0.2	ug/L	<MDL		0.04	0.2	ug/L	0.559		0.04	0.2	ug/L
Thallium, Total, ICP-MS	<MDL		0.1	0.2	ug/L	<MDL		0.1	0.2	ug/L	<MDL		0.1	0.2	ug/L
Zinc, Total, ICP-MS	13.3		0.5	2.5	ug/L	10.6		0.5	2.5	ug/L	135		0.5	2.5	ug/L
MT EPA 200.8 (MOD)*SM2340B															
Hardness, Calc	131		0.331	0.331	mg CaCO3/L	92.2		0.331	0.331	mg CaCO3/L	132		0.331	0.331	mg CaCO3/L
MT EPA 245.1															
Mercury, Total, CVAA	0.0069	<RDL	0.005	0.015	ug/L	<MDL		0.005	0.015	ug/L	0.0464		0.005	0.015	ug/L
OR EPA 1664B															
Hem (oil, total)	<MDL		1.5	5.3	mg/L	<MDL		1.4	5.1	mg/L					

King County Environmental Lab Analytical Report

Project:	423650-100	Project:	423650-100							
Locator:	TNK-SL	Locator:	TNK-SL							
Descrip:	IN-LINE SED FOR OV	Descrip:	IN-LINE SED FOR OV							
Sample:	L72440-10	Sample:	L72440-11							
Matrix:	LA OTHR WTR	Matrix:	LA OTHR WTR							
ColDate:	10/8/20 13:15	ColDate:	10/8/20 17:10							
TimeSpan:		TimeSpan:								
TotalSolid:		TotalSolid:								
ClientLoc:		ClientLoc:								
SampDepth:		SampDepth:								
WET Weight Basis										
Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
CV SM5310-B										
Total Organic Carbon										
MT EPA 200.8 (MOD)										
Antimony, Total, ICP-MS	0.73	<RDL	0.3	1	ug/L	1.08		0.3	1	ug/L
Arsenic, Total, ICP-MS	5.57		0.05	0.25	ug/L	10.6		0.05	0.25	ug/L
Beryllium, Total, ICP-MS	1.07		0.1	0.5	ug/L	2.69		0.1	0.5	ug/L
Cadmium, Total, ICP-MS	0.357		0.05	0.25	ug/L	0.705		0.05	0.25	ug/L
Calcium, Total, ICP-MS	29100		50	50	ug/L	30300		50	50	ug/L
Chromium, Total, ICP-MS	5.87		0.2	1	ug/L	13.2		0.2	1	ug/L
Copper, Total, ICP-MS	108		0.2	2	ug/L	233		0.2	2	ug/L
Lead, Total, ICP-MS	6.94		0.1	0.5	ug/L	17.9		0.1	0.5	ug/L
Magnesium, Total, ICP-MS	17300		50	50	ug/L	13000		50	50	ug/L
Nickel, Total, ICP-MS	5.42		0.1	0.5	ug/L	9.75		0.1	0.5	ug/L
Selenium, Total, ICP-MS	1.06		0.5	1	ug/L	1.93		0.5	1	ug/L
Silver, Total, ICP-MS	0.597		0.04	0.2	ug/L	1.24		0.04	0.2	ug/L
Thallium, Total, ICP-MS		<MDL	0.1	0.2	ug/L		<MDL	0.1	0.2	ug/L
Zinc, Total, ICP-MS	221		0.5	2.5	ug/L	516		0.5	2.5	ug/L
MT EPA 200.8 (MOD)*SM2340B										
Hardness, Calc	144		0.331	0.331	mg CaCO3/L	129		0.331	0.331	mg CaCO3/L
MT EPA 245.1										
Mercury, Total, CVAA	0.0719		0.005	0.015	ug/L	0.123		0.005	0.015	ug/L
OR EPA 1664B										
Hem (oil, total)										

King County Environmental Lab Analytical MATRIX Report

Owner: SEEDPAK
Matrix Class: LIQUID
User select: WET Weight Basis

LOCATOR	PROJECT	SAMPLE	COLLECTED	Total Organic Carbon		Antimony, Total, ICP-MS		Arsenic, Total, ICP-MS		Beryllium, Total, ICP-MS		Cadmium, Total, ICP-MS		Calcium, Total, ICP-MS		Chromium, Total, ICP-MS		Copper, Total, ICP-MS		Lead, Total, ICP-MS		Magnesium, Total, ICP-MS		Nickel, Total, ICP-MS	
				mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L			
INF-SL	423650-100	L72440-1	10/8/2020 7:00	47.6																					
INF-SL	423650-100	L72440-2	10/8/2020 7:30	65.7	0.4	1.68			0.12	24500	0.95	30.3	1.58	16300	2.94										
INF-SL	423650-100	L72440-3	10/8/2020 13:10	55.2	0.4	2.38			0.08	23500	1.11	26.6	2.07	14800	3.02										
INF-SL	423650-100	L72440-4	10/8/2020 17:05	32.8		1.43				18600	0.69	16	1.16	9450	1.7										
EFF-SL	423650-100	L72440-5	10/8/2020 7:00	31																					
EFF-SL	423650-100	L72440-6	10/8/2020 7:40			0.8				23700		2.04	0.14	16500	2.96										
EFF-SL	423650-100	L72440-7	10/8/2020 13:20			0.961				23800		2.31	0.11	17300	2.43										
EFF-SL	423650-100	L72440-8	10/8/2020 17:15			0.826				19200		1.5		10700	1.78										
TNK-SL	423650-100	L72440-9	10/8/2020 7:35		0.56	2.91	0.726	0.23	26000	3.6	71.6	3.88	16200	4.78											
TNK-SL	423650-100	L72440-10	10/8/2020 13:15		0.73	5.57	1.07	0.357	29100	5.87	108	6.94	17300	5.42											
TNK-SL	423650-100	L72440-11	10/8/2020 17:10		1.08	10.6	2.69	0.705	30300	13.2	233	17.9	13000	9.75											

* Not converted to dry weight basis

If a parameter/analyte appears twice in the column header, it implies that they were analyzed by two different method codes

King County Environmental Lab Analytical MATRIX Report

Owner: SEEDPAK
Matrix Class: LIQUID
User select: WET Weight Basis

LOCATOR	PROJECT	SAMPLE	COLLECTED	Selenium, Total, ICP-MS		Silver, Total, ICP-MS		Thallium, Total, ICP-MS		Zinc, Total, ICP-MS		Hardness, Calc		Mercury, Total, CVAA		Hem (oil, total)	
				ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg CaCO3/L	ug/L	ug/L	ug/L	mg/L	ug/L	mg/L	
INF-SL	423650-100	L72440-1	10/8/2020 7:00														
INF-SL	423650-100	L72440-2	10/8/2020 7:30	0.67	0.17			53.5	128	0.0169	23.1						
INF-SL	423650-100	L72440-3	10/8/2020 13:10	0.53	0.12			63.1	120	0.0158	18.7						
INF-SL	423650-100	L72440-4	10/8/2020 17:05		0.073			36.7	85.3	0.012	10.2						
EFF-SL	423650-100	L72440-5	10/8/2020 7:00														
EFF-SL	423650-100	L72440-6	10/8/2020 7:40	0.57				13.7	127								
EFF-SL	423650-100	L72440-7	10/8/2020 13:20					13.3	131	0.0069							
EFF-SL	423650-100	L72440-8	10/8/2020 17:15					10.6	92.2								
TNK-SL	423650-100	L72440-9	10/8/2020 7:35	0.89	0.559			135	132	0.0464							
TNK-SL	423650-100	L72440-10	10/8/2020 13:15	1.06	0.597			221	144	0.0719							
TNK-SL	423650-100	L72440-11	10/8/2020 17:10	1.93	1.24			516	129	0.123							
* Not converted to dry weight basis																	
If a parameter/analyte appears twice in the column header, it implies that they were analyzed twice.																	

Quality Control Data

WG172432 Total Organic Carbon

Sample	Project	Project Description	List Type	Matrix	Collect Date	Prep Date	Anal Date	QC Association	Comments
L72439-1	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/1/2020 7:00	10/13/2020 17:10	10/13/2020 17:10		
L72439-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/1/2020 7:30	10/13/2020 17:16	10/13/2020 17:16		
L72439-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/1/2020 12:00	10/13/2020 17:23	10/13/2020 17:23		
L72439-5	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	OTHR WTR	10/1/2020 7:00	10/13/2020 19:00	10/13/2020 19:00		
L72440-1	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/8/2020 7:00	10/13/2020 15:48	10/13/2020 15:48		
L72440-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/8/2020 7:30	10/13/2020 15:56	10/13/2020 15:56		
L72440-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/8/2020 13:10	10/13/2020 16:29	10/13/2020 16:29		
L72440-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/8/2020 17:05	10/13/2020 16:58	10/13/2020 16:58		
L72440-5	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	OTHR WTR	10/8/2020 7:00	10/13/2020 18:53	10/13/2020 18:53		
L75600-3	421422-CHSW-E	SWD-CHSW E Cedar Hills Emergency	CVTOC	FRESH WTR	10/12/2020 11:30	10/13/2020 15:16	10/13/2020 15:16		
L75619-1	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/6/2020 8:30	10/13/2020 17:30	10/13/2020 17:30		
L75619-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/6/2020 11:00	10/13/2020 17:37	10/13/2020 17:37		
L75619-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/6/2020 14:00	10/13/2020 17:45	10/13/2020 17:45		
L75619-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/6/2020 10:30	10/13/2020 18:15	10/13/2020 18:15		
L75619-5	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/6/2020 20:00	10/13/2020 18:22	10/13/2020 18:22		
L75619-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/7/2020 0:00	10/13/2020 18:30	10/13/2020 18:30		
L75619-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/7/2020 4:00	10/13/2020 18:38	10/13/2020 18:38		
L75619-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/7/2020 7:00	10/13/2020 18:45	10/13/2020 18:45		
L75619-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	OTHR WTR	10/6/2020 8:00	10/13/2020 19:08	10/13/2020 19:08		
WG172432-1	MDLCK		CVTOC	BLANK WTR	10/13/2020 14:34	10/13/2020 14:34	10/13/2020 14:34		LEVEL1
WG172432-2	MB		CVTOC	BLANK WTR	10/13/2020 14:41	10/13/2020 14:41	10/13/2020 14:41	MB1 10/13/20	
WG172432-3	SB		CVTOC	BLANK WTR	10/13/2020 14:50	10/13/2020 14:50	10/13/2020 14:50	WG172432-2	
WG172432-4	LCS		CVTOC	BLANK WTR	10/13/2020 14:57	10/13/2020 14:57	10/13/2020 14:57	LEVEL1	
WG172432-5	LD		CVTOC	FRESH WTR	10/13/2020 15:24	10/13/2020 15:24	10/13/2020 15:24	L75600-3	
WG172432-6	MS		CVTOC	FRESH WTR	10/13/2020 15:31	10/13/2020 15:31	10/13/2020 15:31	L75600-3	
WG172432-7	LD		CVTOC	INFLUENT	10/13/2020 16:36	10/13/2020 16:36	10/13/2020 16:36	L72440-3	
WG172432-8	MS		CVTOC	INFLUENT	10/13/2020 16:44	10/13/2020 16:44	10/13/2020 16:44	L72440-3	
WG172432-9	LD		CVTOC	OTHR WTR	10/13/2020 19:16	10/13/2020 19:16	10/13/2020 19:16	L75619-10	
WG172432-10	MS		CVTOC	OTHR WTR	10/13/2020 19:23	10/13/2020 19:23	10/13/2020 19:23	L75619-10	

WG172403 Total Metals and Hardness by ICPMS

Sample	Project	Project Description	List Type	Matrix	Collect Date	Prep Date	Anal Date	QC Association	Comments
L72439-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	INFLUENT	10/1/2020 7:30	10/12/2020 12:00	10/31/2020 23:05		
L72439-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	INFLUENT	10/1/2020 7:30	10/12/2020 12:00	10/19/2020 11:17		
L72439-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	INFLUENT	10/1/2020 0:00	10/12/2020 12:00	10/31/2020 23:05		
L72439-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	INFLUENT	10/1/2020 0:00	10/12/2020 12:00	10/19/2020 11:20		
L72439-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	INFLUENT	10/1/2020 12:00	10/12/2020 12:00	10/31/2020 23:05		
L72439-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	INFLUENT	10/1/2020 12:00	10/12/2020 12:00	10/19/2020 11:23		
L72439-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/1/2020 7:40	10/12/2020 12:00	10/31/2020 23:05		
L72439-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/1/2020 7:40	10/12/2020 12:00	10/19/2020 11:27		
L72439-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/1/2020 10:10	10/12/2020 12:00	10/31/2020 23:05		
L72439-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/1/2020 10:10	10/12/2020 12:00	10/19/2020 11:30		
L72439-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/1/2020 12:10	10/12/2020 12:00	10/31/2020 23:05		
L72439-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/1/2020 12:10	10/12/2020 12:00	10/19/2020 11:33		
L72439-9	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/1/2020 7:35	10/12/2020 12:00	10/31/2020 23:05		
L72439-9	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/1/2020 7:35	10/12/2020 12:00	10/19/2020 11:49		
L72439-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/1/2020 10:05	10/12/2020 12:00	10/31/2020 23:05		
L72439-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/1/2020 10:05	10/12/2020 12:00	10/19/2020 11:54		
L72439-11	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/1/2020 12:05	10/12/2020 12:00	10/31/2020 23:05		
L72439-11	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/1/2020 12:05	10/12/2020 12:00	10/19/2020 11:57		
L72440-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	INFLUENT	10/8/2020 7:30	10/12/2020 12:00	10/31/2020 23:05		
L72440-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	INFLUENT	10/8/2020 7:30	10/12/2020 12:00	10/19/2020 12:00		
L72440-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	INFLUENT	10/8/2020 13:10	10/12/2020 12:00	10/31/2020 23:05		
L72440-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	INFLUENT	10/8/2020 13:10	10/12/2020 12:00	10/19/2020 12:03		
L72440-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	INFLUENT	10/8/2020 17:05	10/12/2020 12:00	10/31/2020 23:05		
L72440-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	INFLUENT	10/8/2020 17:05	10/12/2020 12:00	10/19/2020 12:06		
L72440-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/8/2020 7:40	10/12/2020 12:00	10/31/2020 23:05		
L72440-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/8/2020 7:40	10/12/2020 12:00	10/19/2020 12:10		
L72440-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/8/2020 13:20	10/12/2020 12:00	10/31/2020 23:05		
L72440-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/8/2020 13:20	10/12/2020 12:00	10/19/2020 12:13		
L72440-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/8/2020 17:15	10/12/2020 12:00	10/31/2020 23:05		
L72440-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/8/2020 17:15	10/12/2020 12:00	10/19/2020 12:29		
L72440-9	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/8/2020 7:35	10/12/2020 12:00	10/31/2020 23:05		
L72440-9	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/8/2020 7:35	10/12/2020 12:00	10/19/2020 12:32		
L72440-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/8/2020 13:15	10/12/2020 12:00	10/31/2020 23:05		
L72440-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/8/2020 13:15	10/12/2020 12:00	10/19/2020 12:36		
L72440-11	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/8/2020 17:10	10/12/2020 12:00	10/31/2020 23:05		
L72440-11	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/8/2020 17:10	10/12/2020 12:00	10/19/2020 12:39		
WG172403-1	MB		MTHARD-ICPMS	BLANK WTR		10/12/2020 12:00	10/31/2020 23:05		METHOD BLANK
WG172403-1	MB		MTICPMS	BLANK WTR		10/12/2020 12:00	10/19/2020 11:10		METHOD BLANK
WG172403-2	SB		MTHARD-ICPMS	BLANK WTR		10/12/2020 12:00	10/31/2020 23:05		WG172403-1 MS-20
WG172403-2	SB		MTICPMS	BLANK WTR		10/12/2020 12:00	10/19/2020 11:14		WG172403-1 MS-20
WG172403-3	MS		MTHARD-ICPMS	OTHR WTR		10/12/2020 12:00	10/31/2020 23:05		L72439-8 MS-20
WG172403-3	MS		MTICPMS	OTHR WTR		10/12/2020 12:00	10/19/2020 11:36		L72439-8 MS-20
WG172403-4	MSD		MTHARD-ICPMS	OTHR WTR		10/12/2020 12:00	10/31/2020 23:05		WG172403-3 L72439-8 MS-20
WG172403-4	MSD		MTICPMS	OTHR WTR		10/12/2020 12:00	10/19/2020 11:40		WG172403-3 L72439-8 MS-20
WG172403-5	MS		MTHARD-ICPMS	OTHR WTR		10/12/2020 12:00	10/31/2020 23:05		L72440-7 MS-20
WG172403-5	MS		MTICPMS	OTHR WTR		10/12/2020 12:00	10/19/2020 12:16		L72440-7 MS-20
WG172403-6	MSD		MTHARD-ICPMS	OTHR WTR		10/12/2020 12:00	10/31/2020 23:05		WG172403-5 L72440-7 MS-20
WG172403-6	MSD		MTICPMS	OTHR WTR		10/12/2020 12:00	10/19/2020 12:19		WG172403-5 L72440-7 MS-20

WG172567 Total Mercury

Sample	Project	Project Description	List Type	Matrix	Collect Date	Prep Date	Anal Date	QC Association	Comments
L72439-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	INFLUENT	10/1/2020 7:30	10/19/2020 11:00	10/20/2020 14:26		
L72439-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	INFLUENT	10/1/2020 0:00	10/19/2020 11:00	10/20/2020 14:30		
L72439-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	INFLUENT	10/1/2020 12:00	10/19/2020 11:00	10/20/2020 14:33		
L72439-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/1/2020 7:40	10/19/2020 11:00	10/20/2020 14:37		
L72439-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/1/2020 10:10	10/19/2020 11:00	10/20/2020 14:48		
L72439-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/1/2020 12:10	10/19/2020 11:00	10/20/2020 14:52		
L72439-9	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/1/2020 7:35	10/19/2020 11:00	10/20/2020 15:02		
L72439-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/1/2020 10:05	10/19/2020 11:00	10/20/2020 15:06		
L72439-11	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/1/2020 12:05	10/19/2020 11:00	10/20/2020 15:10		
L72440-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	INFLUENT	10/8/2020 7:30	10/19/2020 11:00	10/20/2020 15:13		
L72440-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	INFLUENT	10/8/2020 13:10	10/19/2020 11:00	10/20/2020 15:17		
L72440-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	INFLUENT	10/8/2020 17:05	10/19/2020 11:00	10/20/2020 15:21		
L72440-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/8/2020 7:40	10/19/2020 11:00	10/20/2020 15:24		
L72440-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/8/2020 13:20	10/19/2020 11:00	10/20/2020 15:28		
L72440-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/8/2020 17:15	10/19/2020 11:00	10/20/2020 15:39		
L72440-9	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/8/2020 7:35	10/19/2020 11:00	10/20/2020 15:50		
L72440-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/8/2020 13:15	10/19/2020 11:00	10/20/2020 15:53		
L72440-11	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/8/2020 17:10	10/19/2020 11:00	10/20/2020 15:57		
WG172567-1	MB		MTHG-LOW	BLANK WTR	10/19/2020 11:00	10/20/2020 14:19		WG172567-1,-2,-3,-4,-5,-6,-7,-8	MB
WG172567-2	SB		MTHG-LOW	BLANK WTR	10/19/2020 11:00	10/20/2020 14:22		WG172567-1 HG-LLOW	
WG172567-3	MS		MTHG-LOW	OTHR WTR	10/19/2020 11:00	10/20/2020 14:41		L72439-6 HG-LLOW	
WG172567-4	MSD		MTHG-LOW	OTHR WTR	10/19/2020 11:00	10/20/2020 14:44		WG172567-3 L72439-6 HG-LLOW-MSD	
WG172567-5	MS		MTHG-LOW	OTHR WTR	10/19/2020 11:00	10/20/2020 15:43		L72440-8 HG-LLOW	
WG172567-6	MSD		MTHG-LOW	OTHR WTR	10/19/2020 11:00	10/20/2020 15:46		WG172567-5 L72440-8 HG-LLOW-MSD	
WG172567-7	MDLCK		MTHG-LOW	BLANK WTR	10/19/2020 11:00	10/20/2020 16:01		LOW	
WG172567-8	MDLCK		MTHG-LOW	BLANK WTR	10/19/2020 11:00	10/20/2020 16:04		LOW	

WG172380 HEM

Sample	Project	Project Description	List Type	Matrix	Collect Date	Prep Date	Anal Date	QC Association	Comments
L72440-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	INFLUENT	10/8/2020 7:30	10/12/2020 10:00	10/13/2020 12:30		
L72440-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	INFLUENT	10/8/2020 13:10	10/12/2020 10:00	10/13/2020 12:30		
L72440-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	INFLUENT	10/8/2020 17:05	10/12/2020 10:00	10/13/2020 12:30		
L72440-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	OTHR WTR	10/8/2020 7:40	10/12/2020 10:00	10/13/2020 12:30		
L72440-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	OTHR WTR	10/8/2020 13:20	10/12/2020 10:00	10/13/2020 12:30		
L72440-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	OTHR WTR	10/8/2020 17:15	10/12/2020 10:00	10/13/2020 12:30		
L74801-1	421164	IW FATS,OILS AND GREASE	ORHEM	IW WTR	10/7/2020 0:00	10/12/2020 10:00	10/13/2020 12:30		
L75600-3	421422-CHSW-E	SWD-CHSW E Cedar Hills Emergency	ORHEM	FRESH WTR	10/12/2020 11:30	10/12/2020 12:00	10/13/2020 12:30		
WG172380-1	MB		ORHEM	BLANK WTR		10/12/2020 10:00	10/13/2020 12:30		MB201012
WG172380-2	LCS		ORHEM	BLANK WTR		10/12/2020 10:00	10/13/2020 12:30		WG172380-1
WG172380-3	LCSD		ORHEM	BLANK WTR		10/12/2020 10:00	10/13/2020 12:30		WG172380-2 WG172380-1
WG172380-4	MS		ORHEM	FRESH WTR		10/12/2020 10:00	10/13/2020 12:30		L75600-3

* End of L72440_56471_BATCH.xls

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Workgroup: WG172432 Total Organic Carbon

MB:WG172432-2 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Total Organic Carbon	0.5	1	mg/L	<MDL	

SB:WG172432-3 MB:WG172432-2 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Spike Blank, Method Blank)

Parameter	MDL	RDL	Units	MB Value	True Value	SB Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	0.5	1	mg/L	<MDL	5	5.22	104		80-120

LCS:WG172432-4 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Lab Control Sample)

Parameter	MDL	RDL	Units	True Value	LCS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	0.5	1	mg/L	8	8.1	101		85-115

LD:WG172432-5 L75600-3 Matrix: FRESH WTR Listtype:CVTOC Method:SM5310-B Project:421422-CHSW-E Pkey:STD

(Lab Duplicate)

Parameter	MDL	RDL	Units	SAMP Value	LD Value	RPD	Qual	Lab Limit
Total Organic Carbon	5	10	mg/L	33.4	35.8	7		0-20

MS:WG172432-6 L75600-3 Matrix: FRESH WTR Listtype:CVTOC Method:SM5310-B Project:421422-CHSW-E Pkey:STD

(Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	5	10	mg/L	33.4	50	85.3	104		75-125

LD:WG172432-7 L72440-3 Matrix: INFLUENT Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Lab Duplicate)

Parameter	MDL	RDL	Units	SAMP Value	LD Value	RPD	Qual	Lab Limit
Total Organic Carbon	10	20	mg/L	55.2	58.1	5		0--20

MS:WG172432-8 L72440-3 Matrix: INFLUENT Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	10	20	mg/L	55.2	100	162	106		75-125

LD:WG172432-9 L75619-10 Matrix: OTHR WTR Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Lab Duplicate)

Parameter	MDL	RDL	Units	SAMP Value	LD Value	RPD	Qual	Lab Limit
Total Organic Carbon	2	4	mg/L	31.5	31.7	0		0--20

MS:WG172432-10 L75619-10 Matrix: OTHR WTR Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	2	4	mg/L	31.5	20	52.1	103		75-125

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Workgroup: WG172403 Total Metals and Hardness by ICPMS

MB:WG172403-1 Matrix: BLANK WTR Listtype:MTHARD-ICPMS Method:EPA 200.8 (MOD)*SM2340B Project: Pkey:STD
(Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Hardness, Calc	0.331	0.331	mg CaCO ₃ /L	<MDL	

MB:WG172403-1 Matrix: BLANK WTR Listtype:MTICPMS Method:EPA 200.8 (MOD) Project: Pkey:STD
(Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Beryllium, Total, ICP-MS	0.1	0.5	ug/L	<MDL	
Magnesium, Total, ICP-MS	50	50	ug/L	<MDL	
Calcium, Total, ICP-MS	50	50	ug/L	<MDL	
Chromium, Total, ICP-MS	0.2	1	ug/L	<MDL	
Nickel, Total, ICP-MS	0.1	0.5	ug/L	<MDL	
Copper, Total, ICP-MS	0.2	2	ug/L	<MDL	
Zinc, Total, ICP-MS	0.5	2.5	ug/L	<MDL	
Arsenic, Total, ICP-MS	0.05	0.25	ug/L	<MDL	
Selenium, Total, ICP-MS	0.5	1	ug/L	<MDL	
Silver, Total, ICP-MS	0.04	0.2	ug/L	<MDL	
Cadmium, Total, ICP-MS	0.05	0.25	ug/L	<MDL	
Antimony, Total, ICP-MS	0.3	1	ug/L	<MDL	
Thallium, Total, ICP-MS	0.1	0.2	ug/L	<MDL	
Lead, Total, ICP-MS	0.1	0.5	ug/L	<MDL	

SB:WG172403-2 MB:WG172403-1 Matrix: BLANK WTR Listtype:MTHARD-ICPMS Method:EPA 200.8 (MOD)*SM2340B Project: Pkey:STD

(Spike Blank, Method Blank)

Parameter	MDL	RDL	Units	MB Value	True Value	SB Value	% Rec. Qual	Lab Limit
Hardness, Calc	0.331	0.331	mg CaCO ₃ /L	<MDL	33.1	33.2	100	85-115

SB:WG172403-2 MB:WG172403-1 Matrix: BLANK WTR Listtype:MTICPMS Method:EPA 200.8 (MOD) Project: Pkey:STD

(Spike Blank, Method Blank)

Parameter	MDL	RDL	Units	MB Value	True Value	SB Value	% Rec. Qual	Lab Limit
Beryllium, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	20.1	101	85-115
Magnesium, Total, ICP-MS	50	50	ug/L	<MDL	5000	5120	102	85-115
Calcium, Total, ICP-MS	50	50	ug/L	<MDL	5000	4850	97	85-115
Chromium, Total, ICP-MS	0.2	1	ug/L	<MDL	20	21.5	108	85-115
Nickel, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	21.5	107	85-115
Copper, Total, ICP-MS	0.2	2	ug/L	<MDL	20	22.1	111	85-115
Zinc, Total, ICP-MS	0.5	2.5	ug/L	<MDL	20	21.9	110	85-115
Arsenic, Total, ICP-MS	0.05	0.25	ug/L	<MDL	20	20.4	102	85-115
Selenium, Total, ICP-MS	0.5	1	ug/L	<MDL	20	20.2	101	85-115
Silver, Total, ICP-MS	0.04	0.2	ug/L	<MDL	20	20	100	85-115
Cadmium, Total, ICP-MS	0.05	0.25	ug/L	<MDL	20	20	100	85-115
Antimony, Total, ICP-MS	0.3	1	ug/L	<MDL	20	20.5	102	85-115
Thallium, Total, ICP-MS	0.1	0.2	ug/L	<MDL	20	20.8	104	85-115
Lead, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	21.6	108	85-115

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MSD:WG172403-4 MS:WG172403-3 L72439-8 Matrix: OTHR WTR Listtype:MTHARD-ICPMS Method:EPA 200.8 (MOD)*SM2340B Project:423650-100 Pkey:STD
(Matrix Spike Duplicate, Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec. Qual	Lab Limit	True Value	MSD Value	% Rec. Qual	RPD	Qual	Lab Limit
Hardness, Calc	0.331	0.331 mg CaCO ₃ /L		116	33.1	151	105	75-125	33.1	148	98	2		0--20

MSD:WG172403-4 MS:WG172403-3 L72439-8 Matrix: OTHR WTR Listtype:MTICPMS Method:EPA 200.8 (MOD) Project:423650-100 Pkey:STD
(Matrix Spike Duplicate, Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec. Qual	Lab Limit	True Value	MSD Value	% Rec. Qual	RPD	Qual	Lab Limit
Beryllium, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	20.1	100	75-125	20	19.7	98	2		0--20
Magnesium, Total, ICP-MS	50	50	ug/L	14300	5000	19600	106	75-125	5000	19200	98	2		0--20
Calcium, Total, ICP-MS	50	50	ug/L	22900	5000	28000	4xRule	75-125	5000	27700	4xRule	1		0--20
Chromium, Total, ICP-MS	0.2	1	ug/L	<MDL	20	21	105	75-125	20	21.3	106	1		0--20
Nickel, Total, ICP-MS	0.1	0.5	ug/L	2.49	20	23.5	105	75-125	20	23.7	106	1		0--20
Copper, Total, ICP-MS	0.2	2	ug/L	2.17	20	23.1	105	75-125	20	23.7	107	2		0--20
Zinc, Total, ICP-MS	0.5	2.5	ug/L	14.6	20	35.4	104	75-125	20	36	107	2		0--20
Arsenic, Total, ICP-MS	0.05	0.25	ug/L	0.913	20	21.2	101	75-125	20	21.5	103	2		0--20
Selenium, Total, ICP-MS	0.5	1	ug/L	<MDL	20	20.5	102	75-125	20	20.8	104	1		0--20
Silver, Total, ICP-MS	0.04	0.2	ug/L	<MDL	20	19.4	97	75-125	20	19.6	98	1		0--20
Cadmium, Total, ICP-MS	0.05	0.25	ug/L	<MDL	20	19.8	99	75-125	20	20.2	101	2		0--20
Antimony, Total, ICP-MS	0.3	1	ug/L	<MDL	20	20.7	103	75-125	20	21.1	105	2		0--20
Thallium, Total, ICP-MS	0.1	0.2	ug/L	<MDL	20	20.3	101	75-125	20	20.5	102	1		0--20
Lead, Total, ICP-MS	0.1	0.5	ug/L	0.13	20	21.4	106	75-125	20	20.9	104	2		0--20

MSD:WG172403-6 MS:WG172403-5 L72440-7 Matrix: OTHR WTR Listtype:MTHARD-ICPMS Method:EPA 200.8 (MOD)*SM2340B Project:423650-100 Pkey:STD
(Matrix Spike Duplicate, Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec. Qual	Lab Limit	True Value	MSD Value	% Rec. Qual	RPD	Qual	Lab Limit
Hardness, Calc	0.331	0.331 mg CaCO ₃ /L		131	33.1	165	104	75-125	33.1	161	92	2		0--20

MSD:WG172403-6 MS:WG172403-5 L72440-7 Matrix: OTHR WTR Listtype:MTICPMS Method:EPA 200.8 (MOD) Project:423650-100 Pkey:STD
(Matrix Spike Duplicate, Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec. Qual	Lab Limit	True Value	MSD Value	% Rec. Qual	RPD	Qual	Lab Limit
Beryllium, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	20.4	102	75-125	20	19.9	100	3		0--20
Magnesium, Total, ICP-MS	50	50	ug/L	17300	5000	22500	103	75-125	5000	21700	88	4		0--20
Calcium, Total, ICP-MS	50	50	ug/L	23800	5000	28900	4xRule	75-125	5000	28800	4xRule	1		0--20
Chromium, Total, ICP-MS	0.2	1	ug/L	<MDL	20	21.3	107	75-125	20	20.7	104	3		0--20
Nickel, Total, ICP-MS	0.1	0.5	ug/L	2.43	20	23.4	105	75-125	20	23	103	2		0--20
Copper, Total, ICP-MS	0.2	2	ug/L	2.31	20	23.7	107	75-125	20	23	103	3		0--20
Zinc, Total, ICP-MS	0.5	2.5	ug/L	13.3	20	34.1	104	75-125	20	33.4	100	2		0--20
Arsenic, Total, ICP-MS	0.05	0.25	ug/L	0.961	20	21.6	103	75-125	20	21.1	101	2		0--20
Selenium, Total, ICP-MS	0.5	1	ug/L	<MDL	20	20.9	105	75-125	20	20.3	102	3		0--20
Silver, Total, ICP-MS	0.04	0.2	ug/L	<MDL	20	19.6	98	75-125	20	19	95	3		0--20
Cadmium, Total, ICP-MS	0.05	0.25	ug/L	<MDL	20	19.8	99	75-125	20	19.6	98	1		0--20
Antimony, Total, ICP-MS	0.3	1	ug/L	<MDL	20	21.5	108	75-125	20	20.8	104	3		0--20
Thallium, Total, ICP-MS	0.1	0.2	ug/L	<MDL	20	19.6	98	75-125	20	20.1	101	3		0--20
Lead, Total, ICP-MS	0.1	0.5	ug/L	0.11	20	20.1	100	75-125	20	20.6	102	2		0--20

King County Environmental Laboratory QC Report

OVIVO Pilot 08October2020

Workgroup: WG172567 Total Mercury

MB:WG172567-1 Matrix: BLANK WTR Listtype:MTHG-LOW Method:EPA 245.1 Project: Pkey:STD
(Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Mercury, Total, CVAA	0.005	0.015	ug/L	<MDL	

SB:WG172567-2 MB:WG172567-1 Matrix: BLANK WTR Listtype:MTHG-LOW Method:EPA 245.1 Project: Pkey:STD
(Spike Blank, Method Blank)

Parameter	MDL	RDL	Units	MB Value	True Value	SB Value	% Rec.	Qual	Lab Limit
Mercury, Total, CVAA	0.005	0.015	ug/L	<MDL	0.05	0.0497	99		85-115

MSD:WG172567-4 MS:WG172567-3 L72439-6 Matrix: OTHR WTR Listtype:MTHG-LOW Method:EPA 245.1 Project:423650-100 Pkey:STD
(Matrix Spike Duplicate, Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit	True Value	MSD Value	% Rec.	Qual	RPD	Qual	Lab Limit
Mercury, Total, CVAA	0.005	0.015	ug/L	<MDL	0.05	0.0465	93		75-125	0.05	0.0501	100		7		0--20

MSD:WG172567-6 MS:WG172567-5 L72440-8 Matrix: OTHR WTR Listtype:MTHG-LOW Method:EPA 245.1 Project:423650-100 Pkey:STD
(Matrix Spike Duplicate, Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit	True Value	MSD Value	% Rec.	Qual	RPD	Qual	Lab Limit
Mercury, Total, CVAA	0.005	0.015	ug/L	<MDL	0.05	0.0456	91		75-125	0.05	0.0453	91		1		0--20

King County Environmental Laboratory QC Report

OVIVO Pilot 08October2020

Workgroup: WG172380 HEM

MB:WG172380-1 Matrix: BLANK WTR Listtype:ORHEM Method:EPA 1664B Project: Pkey:STD

(Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Hem (oil, total)	1.4	5	mg/L	<MDL	

LCSD:WG172380-3 LCS:WG172380-2 Matrix: BLANK WTR Listtype:ORHEM Method:EPA 1664B Project: Pkey:STD

(Lab Control Sample Duplicate, Lab Control Sample)

Parameter	MDL	RDL	Units	True Value	LCS Value	% Rec.	Qual	Lab Limit	True Value	LCSD Value	% Rec.	Qual	RPD	Lab
Hem (oil, total)	1.4	5	mg/L	40	36.9	92		78-114	40	36.7	92	1		0--18

MS:WG172380-4 L75600-3 Matrix: FRESH WTR Listtype:ORHEM Method:EPA 1664B Project:421422-CHSW-E Pkey:STD

(Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit
Hem (oil, total)	1.6	5.7	mg/L	<MDL	93.5	69.2	74	*	78-114

=====

4xRule indicates no MS/MSD recovery was calculated due to the 4x rule.

Sample Receipt and Chain of Custody Records

MON. 10/7

Login: P72440

OVIVO Pilot Unit Testing at WF - PERFORMANCE Test Run

TC: _____

Project: 423650-100

CHAIN OF CUSTODY

LPM: Katherine Bourbonais

Relinquished by	Date	Time
	10-9-20	11:15
Received by	Date	Time
[All]		

Sample Number	P72440-1	P72440-2	P72440-3
QC Link			
Locator	INF-SL	INF-SL	INF-SL
Short Loc Desc	INF-SL	INF-SL	INF-SL
Locator Desc	PILOT INFLUENT, INFLOW PIPE 	PILOT INFLUENT, INFLOW PIPE	PILOT INFLUENT, INFLOW PIPE
Site	WEST PT INPLANT	WEST PT INPLANT	WEST PT INPLANT
Comments	OVIVO pilot influent prior to coagulant addition - composite	OVIVO pilot influent prior to coagulant addition - grab #1	OVIVO pilot influent prior to coagulant addition - grab #2
Start Date/Time	10/8, 7:00 - 18:50	10/8, 7:30	10/8, 13:10
End Date/Time	duration: 11:50 hrs		
Time Span			
Sample Depth			
SAMP INFO		+ were overfilled	
SAMPLE CODE	Composite	Grab	→
Ops, Medium, P. Type	3 LB TOC	3 LB TOC 6 LB CA-ICPMS 6 LB HG-CVAA-L 6 LB ICPMS-HARDNESS 6 LB MG-ICPMS 6 LB PP ICPMS 7 LB HEM	3 LB TOC 6 LB CA-ICPMS 6 LB HG-CVAA-L 6 LB ICPMS-HARDNESS 6 LB MG-ICPMS 6 LB PP ICPMS 7 LB HEM

S. Plan: T-ONVO Feb-5(28)19

Login #: 1 _____

W _____

Clerk #: _____

Approved by: _____

Mixed by: _____

Login: P72440

OVIVO Pilot Unit Testing at WPt - PERFORMANCE Test Run

TC: _____

Project: 423650-100

LPM: Katherine Bourbonais

Sample Number	P72440-4	P72440-5	P72440-6
QC Link			
Locator	INF-SL	EFF-SL	EFF-SL
Short Loc Desc	INF-SL	EFF-SL	EFF-SL
Locator Desc	PILOT INFLUENT, INFLOW PIPE <i>Influent</i>	PILOT MEMBRANE PERMEATE <i>Effluent</i>	PILOT MEMBRANE PERMEATE
Site	WEST PT INPLANT	WEST PT INPLANT	WEST PT INPLANT
Comments	OVIVO pilot influent prior to coagulant addition - grab #3	OVIVO pilot permeate - composite	OVIVO pilot permeate - grab #1
Start Date/Time	10/8, 17:05	10/8, 7:00 -18:50	10/8, 7:40
End Date/Time			
Time Span		duration 11:50 W	
Sample Depth			
SAMP INFO			
SAMPLE CODE	Grab	Composite	Grab
Dept, Matrix, Prod	3 LB TOC 6 LB CA-ICPMS 6 LB HG-CVAA-L 6 LB ICPMS-HARDNESS 6 LB MG-ICPMS 6 LB PP ICPMS 7 LB HEM	3 LA TOC	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS 7 LA HEM

(2 / 4)

Login: P72440

OVIVO Pilot Unit Testing at WPt - PERFORMANCE Test Run

TC: _____

Project: 423650-100

LPM: Katherine Bourbonais

Sample Number	P72440-7	P72440-8	P72440-9
QC Link			
Locator	EFF-SL	EFF-SL	TNK-SL
Short Loc Desc	EFF-SL	EFF-SL	TNK-SL
Locator Desc	PILOT MEMBRANE PERMEATE <i>Effluent</i>	PILOT MEMBRANE PERMEATE	PILOT MEMBRANE TANK <i>Tank</i>
Site	WEST PT INPLANT	WEST PT INPLANT	WEST PT INPLANT
Comments	OVIVO pilot permeate - grab #2	OVIVO pilot permeate - grab #3	OVIVO pilot mixed water from feed side of tank - grab #1
Start Date/Time	10/8, 13:20	10/8, 17:15	10/8, 7:35
End Date/Time			
Time Span			
Sample Depth			
SAMP INFO			
SAMPLE CODE	Grab		
Dept, Matrix, Prod	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS 7 LA HEM	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS 7 LA HEM	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS

(3 / 4)

Login: P72440

OVIVO Pilot Unit Testing at WPt - PERFORMANCE Test Run

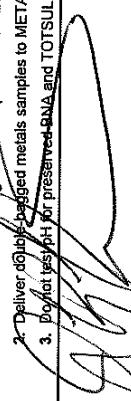
TC: _____

Project: 423650-100

LPM: Katherine Bourbonais

Sample Number	P72440-10	P72440-11	
QC Link			
Locator	TNK-SL	TNK-SL	
Short Loc Desc	TNK-SL	TNK-SL	
Locator Desc	PILOT MEMBRANE TANK <i>Tank</i> →	PILOT MEMBRANE TANK	
Site	WEST PT INPLANT	WEST PT INPLANT	
Comments	OVIVO pilot mixed water from feed side of tank - grab #2	OVIVO pilot mixed water from feed side of tank - grab #3	
Start Date/Time	10/8, 13:15	10/8, 17:10	
End Date/Time			
Time Span			
Sample Depth			
SAMP INFO			
SAMPLE CODE	Grab →		
Instrument, Prod	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS	

LIQUID SAMPLE RECEIPT RECORD

Login Numbers:	70390	Project No.:	423650-00	Sub-Contracting: Y / N	
Collect Dates:	10/20	Receive Date:	10-9-20	Changes: Y / N	
SAMPLE RECEIPT CONDITIONS					
CONDITION	Acceptable?	Comment ID	CONDITION	Acceptable?	Comment ID
Labels / FieldSheets	<input checked="" type="checkbox"/>	N	Volumes	<input checked="" type="checkbox"/>	N
Container	<input checked="" type="checkbox"/>	N	Holding Times	<input checked="" type="checkbox"/>	N
Temperature (w/ice)	<input checked="" type="checkbox"/>	N / NA	Delivery Location	<input checked="" type="checkbox"/>	N
BOTTLE COUNT (#) AND DESCRIPTION and SAMPLE NUMBERS					
#	4	Bottle Description: Sample Numbers			
40 mL clear vial (NOA):	<input checked="" type="checkbox"/>	W/H ₃ PO ₄ : -4			
60 mL clear glass (PHYTO):	<input checked="" type="checkbox"/>				
60 mL CWWM HDPE:	<input checked="" type="checkbox"/>				
125 mL AWWM HDPE:	<input checked="" type="checkbox"/>				
125 mL CNNM HDPE:	<input checked="" type="checkbox"/>				
125 mL CWWM HDPE:	<input checked="" type="checkbox"/>				
125 mL GANNM:	<input checked="" type="checkbox"/>				
125 mL GANNM w/H ₃ PO ₄ :	<input checked="" type="checkbox"/>	-5			
250 mL AWWM HDPE:	<input checked="" type="checkbox"/>				
250 mL CWWM HDPE:	<input checked="" type="checkbox"/>				
250 mL CWWM HDPE (MICRO):	<input checked="" type="checkbox"/>				
250 mL GANNM:	<input checked="" type="checkbox"/>				
250 mL GANNM W/H2SO ₄ :	<input checked="" type="checkbox"/>				
300 mL WDO (8 hour HT):	<input checked="" type="checkbox"/>				
500 mL AWWM HDPE:	<input checked="" type="checkbox"/>				
500 mL CWWM HDPE:	<input checked="" type="checkbox"/>				
500 mL CWWM PP (MICRO):	<input checked="" type="checkbox"/>				
500 mL HDPE (METALS):	<input checked="" type="checkbox"/>	246-11			
500 mL HDPE, double-bagged (METALS):	<input checked="" type="checkbox"/>				
500 mL Teflon (HT):	<input checked="" type="checkbox"/>	2-4,6-7			
500 mL Teflon, double-bagged (METALS):	<input checked="" type="checkbox"/>				
500 mL GANNM / GANNM:	<input checked="" type="checkbox"/>				
500 mL Polystyrene Filtration Units (METALS):	<input checked="" type="checkbox"/>				
1L AWWM HDPE:	<input checked="" type="checkbox"/>				
1L CWWM HDPE:	<input checked="" type="checkbox"/>				
1L CWWM PP (MICRO):	<input checked="" type="checkbox"/>				
1L GANNM:	<input checked="" type="checkbox"/>				
1L GCWIM:	<input checked="" type="checkbox"/>	2-4,6-7			
2L CWWM HDPE:	<input checked="" type="checkbox"/>				
Other:	<input checked="" type="checkbox"/>				
COMMENTS/NOTIFICATIONS					
CC: <input type="checkbox"/> AQUATOX, <input type="checkbox"/> CONV, <input type="checkbox"/> METALS, <input type="checkbox"/> MICRO, <input type="checkbox"/> ORG, <input type="checkbox"/>					
NOTES	1. Deliver dissolved Hg-CVAAsamples to METALS for filtration. 2. Deliver double-bagged metals samples to METALS for preservation. 3. Please yes /H for preserved-Pb and TOTSFIDE samples. 				
SM Signature:					

4. Deliver pH, WDO, and all MICRO samples ASAP to appropriate section for immediate processing.
5. Enter 'Time Span' for composite samples during sample login.
6. Split algae sample into 50 mL clear glass if PHYTOQUAL is requested.

Date / Time Completed:

JCT 09 20 11:20

Trace Organics Data Anomaly Form

Date(s) Occurred: *10/13/2020*

WG #(s): *WG172380*

All samples in WKGP(s) or Sample #(s): *L74801-1, L75600-3, WG172380-4*

Project #(s): *421164, 421422, 423650-100*

Matrix: Liquid Solid Air Tissue Calibration Other:

I. Analysis/Extraction

- | | | | |
|---|-----------------------------------|-----------------------------------|-------------------------------------|
| <input type="checkbox"/> BNA | <input type="checkbox"/> BNALL | <input type="checkbox"/> EDC | <input type="checkbox"/> EDC-LVI |
| <input type="checkbox"/> CLPESTPCB | <input type="checkbox"/> PEST | <input type="checkbox"/> PCB | <input type="checkbox"/> OPPEST |
| <input type="checkbox"/> VOA-GCMS | <input type="checkbox"/> NWTPH-GX | <input type="checkbox"/> NWTPH-DX | <input type="checkbox"/> NWTPH-HCID |
| <input type="checkbox"/> BUTYL TIN | <input type="checkbox"/> HERB | | |
| <input checked="" type="checkbox"/> Other: <i>EPA 1664B HEM</i> | | | |
| <input type="checkbox"/> Subcontracted: | | | |

II. Instrument

- | | |
|---------------------|---|
| GC/ICP/MS: | <input type="checkbox"/> P |
| GC/MS: | <input type="checkbox"/> A <input type="checkbox"/> J <input type="checkbox"/> K <input type="checkbox"/> L <input type="checkbox"/> M <input type="checkbox"/> N |
| GC ECD: | <input type="checkbox"/> F <input type="checkbox"/> B <input type="checkbox"/> C |
| GC FID: | <input type="checkbox"/> I <input type="checkbox"/> D <input type="checkbox"/> Q TCD/ECD |
| Extraction/Cleanup: | <input type="checkbox"/> PFE <input type="checkbox"/> GPC |
| | <input checked="" type="checkbox"/> Other: <i>EPA 1664B HEM</i> |

III. Type of Sample/Analytical Anomaly

- Values Outside of Control Limits:

- | | |
|---|--|
| 1 <input type="checkbox"/> Blank Contamination | 8 <input type="checkbox"/> Surrogate Spike Recoveries |
| 2 <input type="checkbox"/> LCS/LCSD Spike Recoveries | 9 <input type="checkbox"/> LCS/LCSD RPD |
| 3 <input checked="" type="checkbox"/> MS/MSD Spike Recoveries | 10 <input type="checkbox"/> MS/MSD RPD |
| 4 <input type="checkbox"/> LCS/SRM Recoveries | 11 <input type="checkbox"/> Sample/LD RPD |
| 5 <input type="checkbox"/> Initial Calibration | 12 <input type="checkbox"/> Continuing Calibration Checks |
| 6 <input type="checkbox"/> Performance Checks | 13 <input type="checkbox"/> Tuning Criteria |
| 7 <input type="checkbox"/> ISTD %Differences | 14 <input type="checkbox"/> Interferences in Sample Matrix |

15 Holding time exceeded by:

16 Insufficient sample amount.

17 Inappropriate storage, container or preservation.

18 Other

Anomaly Description:

3) *The HEM recovery of WG172380-4 (MS) was below the method specified recovery limit.*

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17) All three L74801-1 250 mL sample bottles submitted for analysis had a pH of 6 measured prior to extraction.

IV. Type of Project Anomaly

- SAP/Work Plan specified MDLs not met.
- SAP/Work Plan specified QC frequency or QC type not met.
- SAP/Work Plan specified methodology not used.
- Sample exceeds regulatory and/or hazardous waste limits.
- Sample data results are unusual or inconsistent with expected results.
- Other

Anomaly Description:

V. Corrective Action Taken

- | | |
|--|---|
| <input type="checkbox"/> Sample(s) re-analyzed | <input type="checkbox"/> Sample(s) re-prepared and re-analyzed |
| <input checked="" type="checkbox"/> Sample(s) reported "AS IS" | <input checked="" type="checkbox"/> Asterisk(s) applied to QC Report outlier(s) |
| <input type="checkbox"/> Sample(s) Diluted | |
| <input checked="" type="checkbox"/> Data qualified with the following flags: <i>JG, SH</i> | |
| <input type="checkbox"/> Other | |

Corrective Action Description:

3) An "" was applied to WG172380-4 on the QC summary report and a "JG" was applied to samples L75600-3 and WG172380-4.*

17) Prior to extraction, 6 mL of 1:1 H₂SO₄ was added to each bottle to lower the pH to < 2; an "SH" was applied to sample L77801-1

VI. Potential Effects on Data Quality (mandatory):

3) The low recovery in the MS suggests matrix interference as indicated by acceptable LCS/LCSD recoveries. Given the recovery is low, a low bias is suggested, and sample L75600-3 and WG172380-4 will be qualified accordingly.

17) Since the bias of non-preservation is unknown, the result was reported without further qualification.

	Signatures	Signature Dates
Reported By: Felix Zboralski		
Reviewer: Mike Doubrava		
Supervisor: Mike Doubrava		
QA Officer: <i>(For QA1 only)</i>		
cc: LPM: Erin McCabe		

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18616_WG172380_DAF

OVIVO Field measurement

Date	Time	Location	pH	Temp C	Cond, uS	TDS, ppm	Turb, NTU	UVT	UVA
8-Oct	7:30	Inf	6.79	18.5	971	689			
	7:40	Eff	6.53	18.4	979	693			
	13:10	Inf	6.83	19.1	805	567			
	13:15	Tank	6.9	19.1	803	633			
	13:20	Eff	6.72	19	912	642			
	13:40	Eff					0.17	62.3	0.208
	17:05	Inf	6.9	18.6	526	373			
	17:15	Eff	6.65	18.6	647	458	0.12		

OVIVO PILOT TESTING

WO # C165282

Day	# of samples	Sample Frequency	Thu				Sat			Sat		
Date	Unit		10/8/2020									
S1-G												
TSS	mg/L	1/run	53									
VSS	mg/L	1/run	46									
Fecal Coliform Sample ID			#1	#2				#1	#2		#1	#2
Fecal Coliform Sample Time			10/8/2020 0730	10/8/20 1310								
Fecal Coliform	MPN/100mL	2/run	13,000,000	3,300,000								
Nutrient Sample ID			#1	#2	#3			#1	#2	#3	#1	#2
Nutrient Sample Time			10/8/20 0730	10/8/20 1310	10/8/20 1705							
TP	mg/L	3/run	4.19	4.56	2.79							
OPO4	mg/L	3/run	2.94	3.45	1.77							
TKN	mg/L	3/run	37.81	40.75	23.28							
NH3	mg/L	3/run	27.84	31.83	18.2							
NO3	mg/L	3/run	0	0	0							
NO2	mg/L	3/run	0	0	0							
S1-C												
TSS	mg/L	1/hourly	36									
VSS	mg/L	1/hourly	30									
Alkalinity	mg/L	1/hourly	186									
COD	mg/L	1/hourly	236									
S2-G												
Cl2 Demand	mg/L	1/run	1.61									
SS	ml/l	1/run	0									
Fecal Coliform Sample ID			#1	#2	#3	#4	#1	#2	#3	#4	#1	#2
Fecal Coliform Sample Time			10/8/2020 0740	10/8/2020 0930	10/8/20 7	10/8/20 1320						
Fecal Coliform	MPN/100mL	4/run	0	0	18	110						
Nutrient Sample ID			#1	#2	#3		#1	#2	#3		#1	#2
Nutrient Sample Time			10/8/20 0740	10/8/20 1320	10/8/20 1715							
TP	mg/L	3/run	0	0	0	0						
OPO4	mg/L	3/run	0.05	0.06	0.02							
TKN	mg/L	3/run	31.93	30.5	23.91							
NH3	mg/L	3/run	29.65	27.5	22.05							
NO3 or filter for NOx	mg/L	3/run	0	0	0							
NO2 or filter for NOx	mg/L	3/run	0	0	0							
S2-C												
TSS	mg/L	1/hourly	1									
VSS	mg/L	1/hourly	0									
Alkalinity	mg/L	1/hourly	85									
UV Abs	cm⁻¹	1 hourly	0.1965									
BOD	mg/L	1/hourly	54									
S3-G												
TSS	mg/L	1/run	780									
VSS	mg/L	1/run	455									

Week Check of online instruments

Date/Time/Initials												
Turbidity online reading												
Turbidity lab reading												
pH online reading												
pH lab reading												
Temperature online reading												
Temperature lab reading												
Conductivity												

Bottle Kit	Volume	S1-G	Influent Grab
FE grab	2L	S1-C	Influent Composite
FE Fecal	4 125-ml sterile	S2-G	Effluent Grab
FE Demand	3L amber bottle	S2-C	Effluent Composite
FE nutrients	3 each 2L	S3-G	TNK Grab
FE comp	4L		
Inf grab	2L		
Inf Fecal	2 125-ml sterile		
Inf comp	2L		
Inf nutrients	3 each 2L		
TNK	500mL		

Appendix B.7

Test Run Package 07

Run# 7 #NAME? 9/24/2020

Run Description Confirm process recovery after loss of coagulant

Type	<input checked="" type="checkbox"/> process	<input type="checkbox"/> Performance
Influent water source	<input checked="" type="checkbox"/> PE <input type="checkbox"/> Hydrant <input type="checkbox"/> Both	
Flux rate	<input checked="" type="checkbox"/> Constant <input type="checkbox"/> Varies	

Wasting Rate		0	
Air Scour		105 scfm	
Backwash Frequency		15 min	
Run Duration		< 8 Hrs	
CIP	<input checked="" type="checkbox"/> Hypo	<input checked="" type="checkbox"/> Caustic	<input type="checkbox"/> Citric
Composite Sample Schedule	Because of short event, 4 samples taken as scheduled below. 1 L Each.		

*Because this is a short test run, composite samples will be collected in two large lots.

** The intent is to perform TOC samples every hour, and shortly before pilot shutdown. These should be extended or reduced depending on test duration

*** Influent Fecal and TOC, and Effluent Fecal samples should be taken when TMP reaches 7 psi, in order to get a sample shortly before shutdown.

Date

Field
Eff
Turbidity
Probe reading
pH
Temperature
Conductivity

WPPLsamples
Influent composite
Effluent composite
-TSS/VSS, Alk, BOD
Settleable solids
Tank grab
TSS/VSS

KCEL

Influent grab

TOC

Effluent composite

TOC

Run# _____

Run Description Confirm process recovery after loss of coagulant

Type	<input checked="" type="checkbox"/> process	<input type="checkbox"/> Performance
Influent water source	<input checked="" type="checkbox"/> PE	<input type="checkbox"/> Hydrant <input type="checkbox"/> Both
Flux rate	<input checked="" type="checkbox"/> Constant	<input type="checkbox"/> Varies

Wasting Rate	0
Air Scour	105 scfm
Backwash Frequency	15 min
Run Duration	< 8 Hrs
CIP	<input checked="" type="checkbox"/> Hypo <input checked="" type="checkbox"/> Caustic <input type="checkbox"/> Citric
Composite Sample Schedule	Because of short event, 4 samples taken as scheduled below. 1 L each.

*Because this is a short test run, composite samples will be collected in two large lots.

** The intent is to perform TOC samples every hour, and shortly before pilot shutdown. These should be extended or reduced depending on test duration

*** Influent Fecal and TOC, and Effluent Fecal samples should be taken when TMP reaches 7 psi, in order to get a sample shortly before shutdown.

Date

Field
Eff
Turbidity
Probe reading
pH
Temperature
Conductivity

WPPLsamples
Influent composite
Effluent composite
-TSS/VSS, Alk, BOD
Influent grab
TSS/VSS
Fecal
Effluent grab
TSS/VSS
Chlorine demand
Fecal
Settleable solids
Tank grab
TSS/VSS

KCEL

Influent grab

TOC

Effluent composite

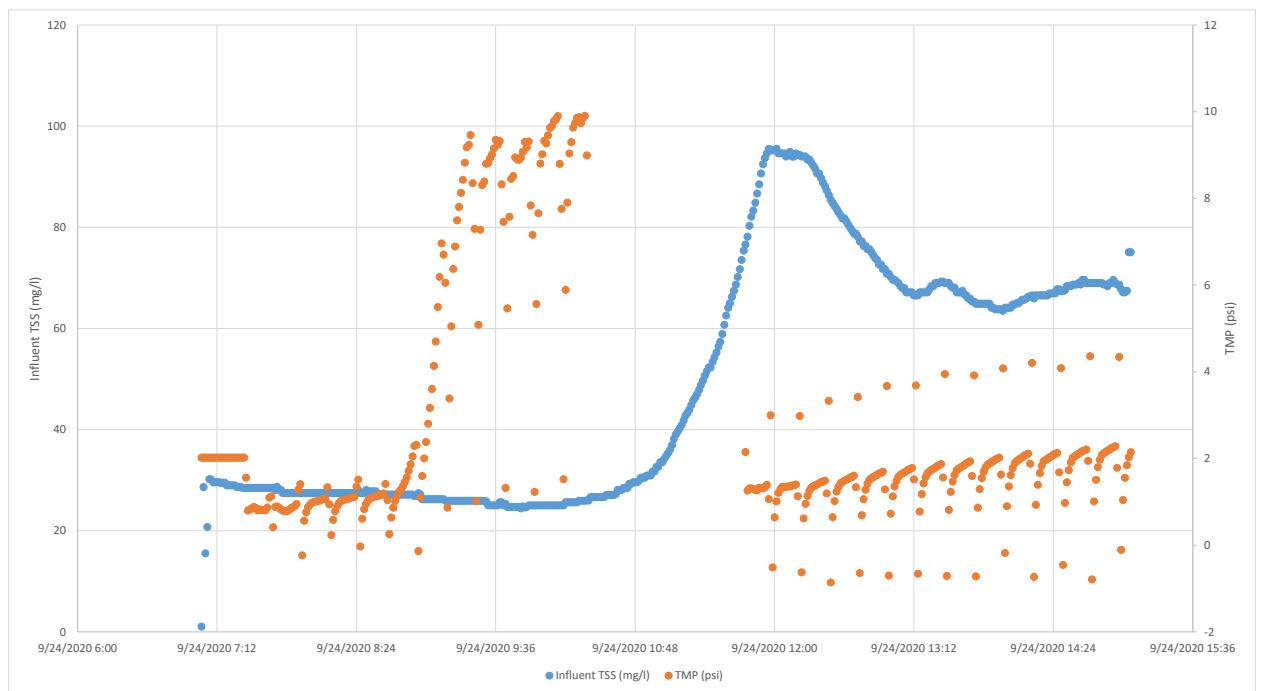
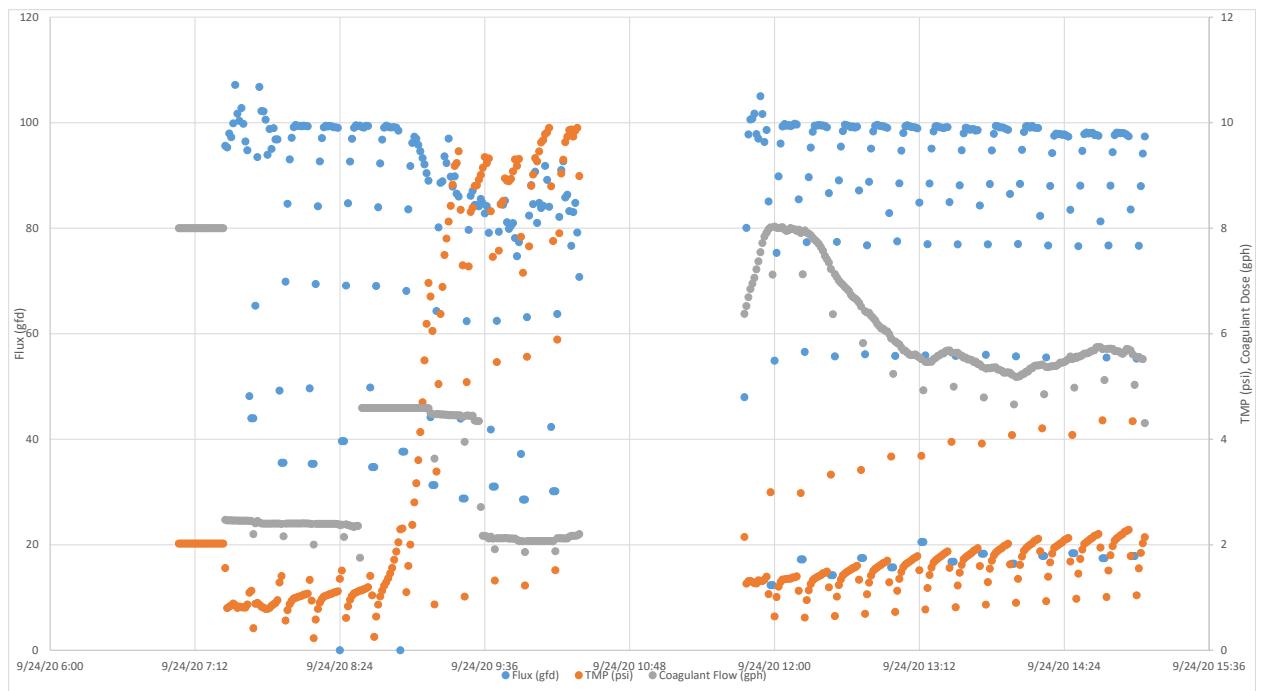
TOC

OVIVO Pilot Setpoints Values to be set according to OVIVO's recommendations.

Run# 7

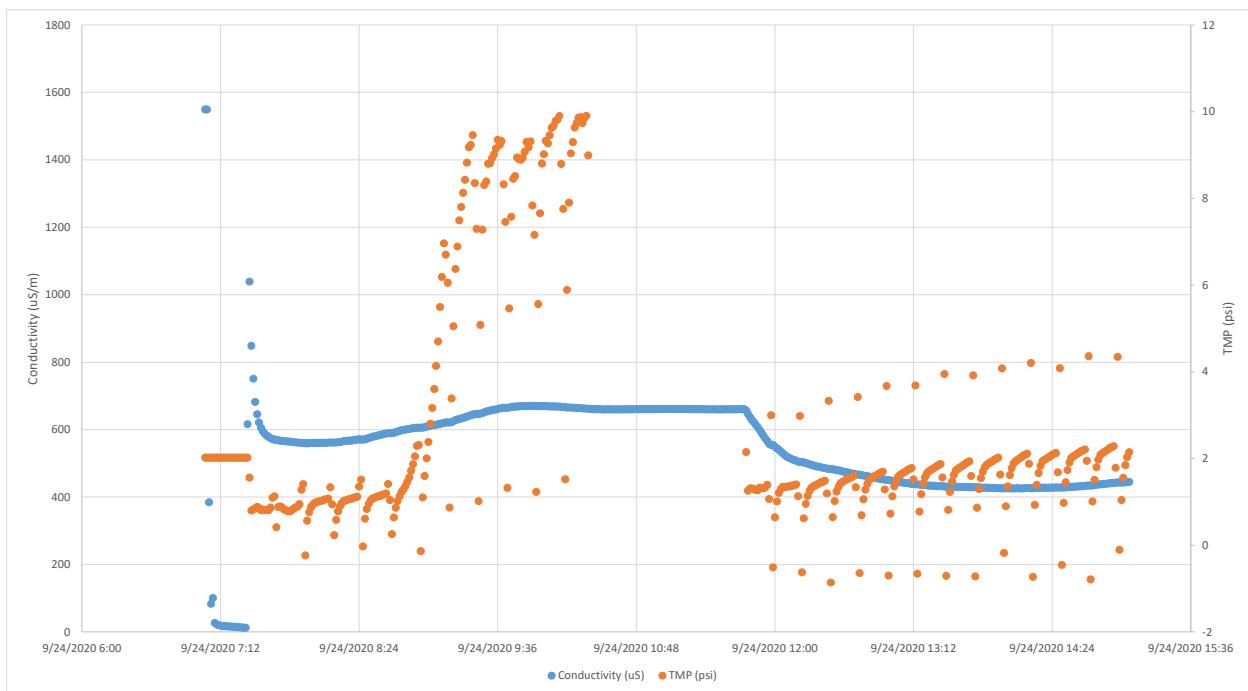
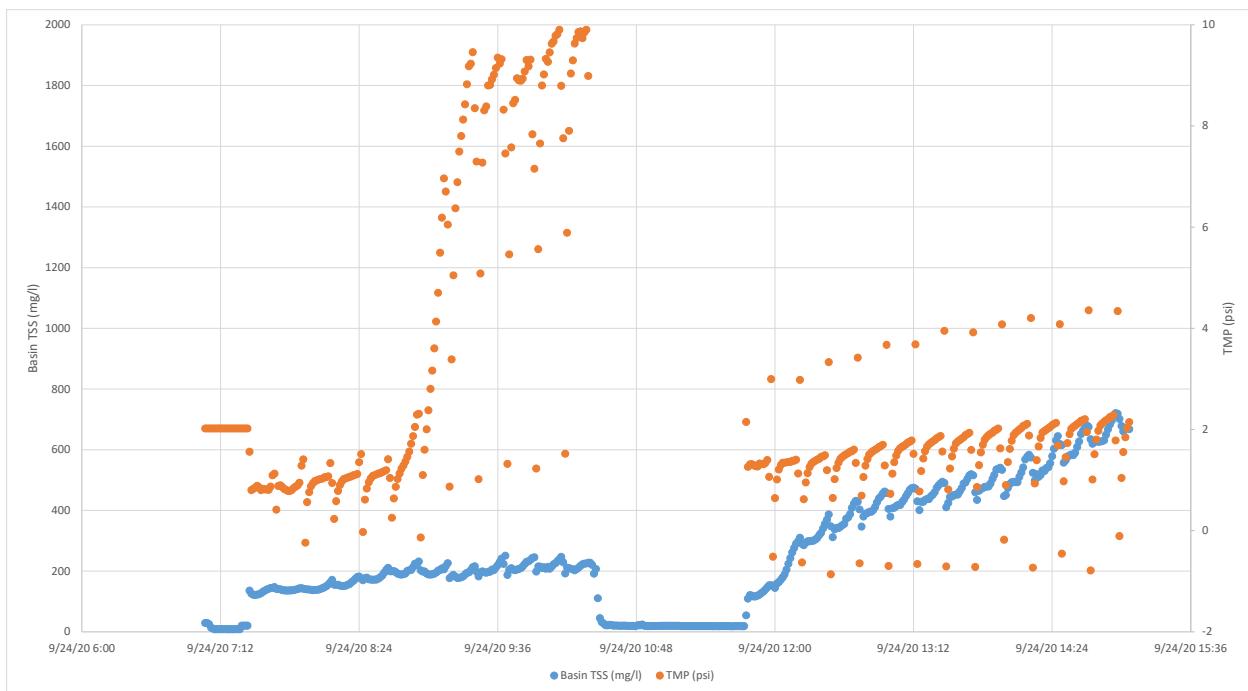
Date _____

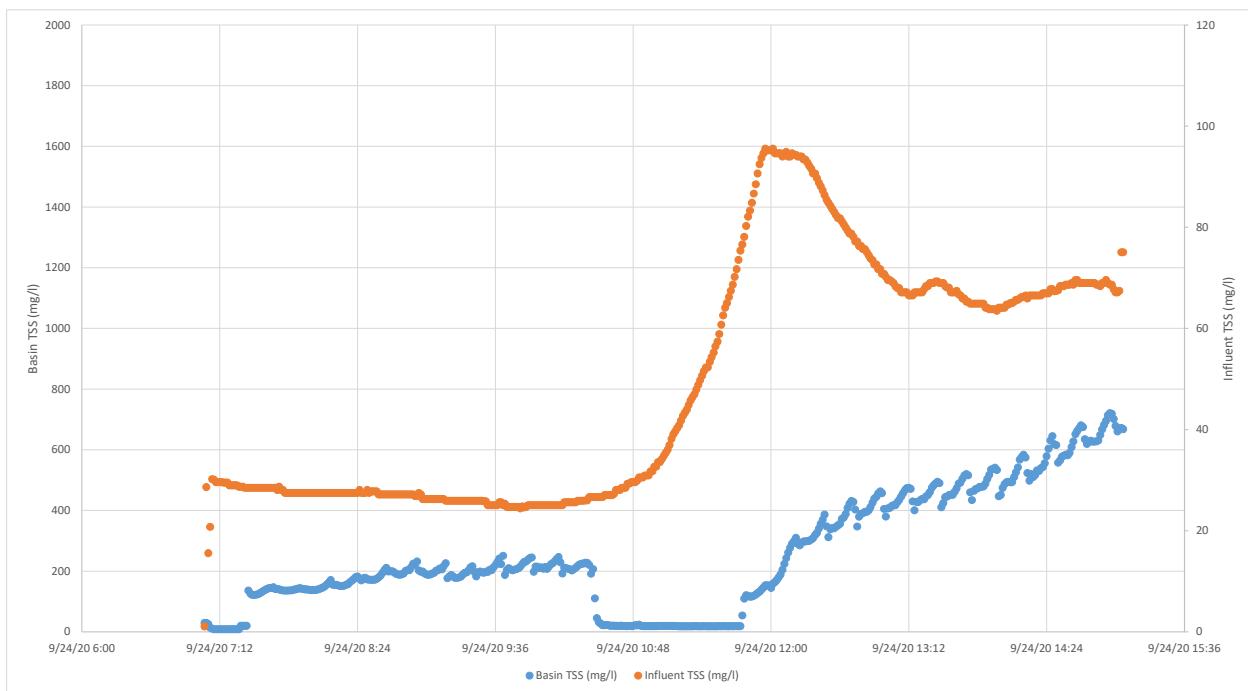
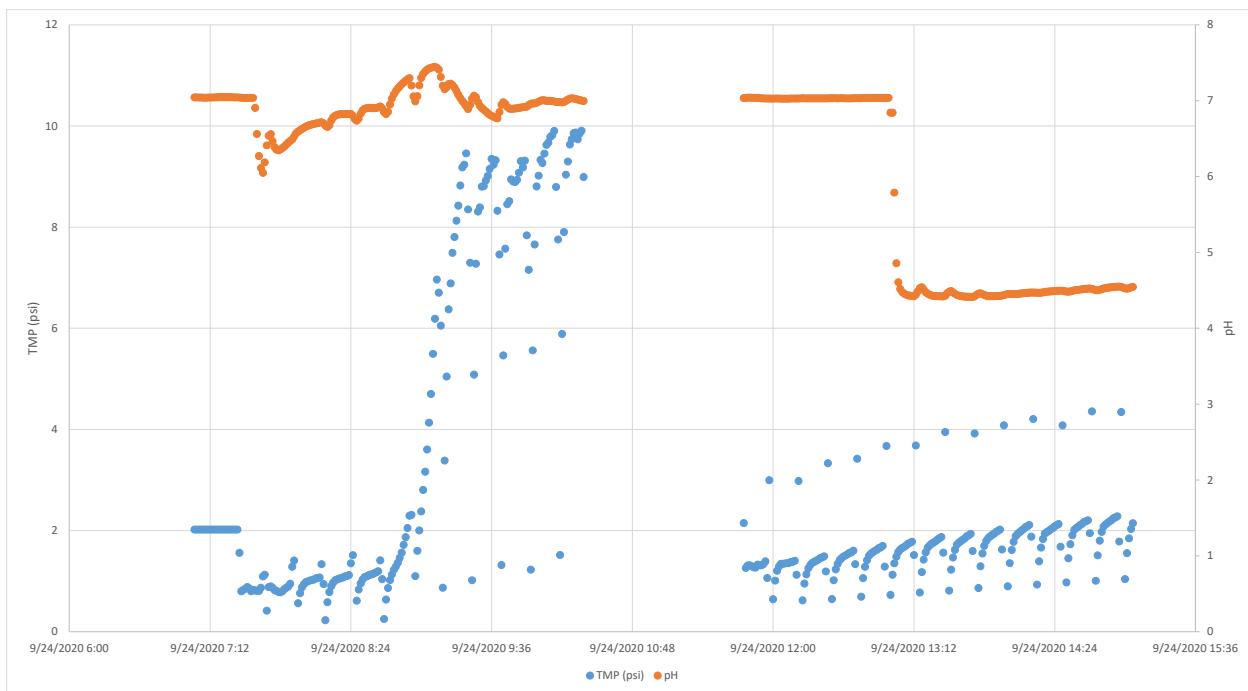
FLOW OPTIMIZATION				CHEM DOSING											
System		ONLINE/OFFLINE													
Inlet System															
Screen Off Delay	2	min	Permeate	Permeate Flow	206	gpm	Coagulant								
Weir Gate Frequency	1800	min	Pump Start Level	116	in	Pump Start Inf Flow	1	gpm							
Weir Gate Duration	30	sec	Pump Stop Level	5	in	Pump Start Level	0.1	in							
Blowers				Pump Stop Low Level	100	in	Overflow Level	118	in						
Scour Air Flow	105	scfm	Single Pump Flow	220	gpm	Coagulant Min Flow	0.5	gph							
Blower Start Level	20	in	Backwash Frequency	15	min	Coagulant Max Flow	20	gph							
Blower Stop Level	8	in	Backwash Flow	300	%	Coag Fixed Flow	6.0	gph							
Lag Blower Start Level	65	%	Pre BW Relaxation	30	sec	Coag TSS Ratio	0.40								
Lag Blower Start Delay	120	sec	Backwash Duration	60	sec	Coag AI%	4.1	%							
Blower Fail Air Flow	4.5	scfm	Post BW Relax Duration	30	sec	Coag SG	1.34								
Blower Fail Delay	140	sec	Perm Static Pressure	1.7	psi	Coag Flow Ratio	5								
Low Air Flow Alarm	55	%	Turbidity Hi Alarm SP	10	NTU	Coag Fill Flow	8	gph							
Low Air Flow Delay	45	sec	TMP Hi Alarm SP	8	psi	Coagulant Dosing Mode Select									
Override Enabled		TMP Reset		Backwash Start TMP	10	psi	Fixed Flow								
				Max Hi TMP Cycles	1		TSS								
Sodium Hypochlorite				Perm Tank Level Lo	20	in	Perm Flow								
CIP Permeate Flow	100	gpm	Air Extractor Frequency	5	min										
Backwash Perm Flow	200	gpm	Air Extractor Duration	4	min										
Hypochlorite Flow	100	gph	Membrane Basin Drain Vlv												
Pre CIP Relax Duration	30	sec													
Chem Flow Duration	10	min													
Soak Duration	30	min													
Rinse Duration	60	sec													
Final Relax Duration	60	sec													
CIP Permeate Flow				Citric Acid											
Backwash Perm Flow				CIP Permeate Flow	100	gpm	Caustic								
Hypochlorite Flow				Backwash Perm Flow	200	gpm									
Pre CIP Relax Duration				Citric Flow	28	gph									
Chem Flow Duration				Pre CIP Relax Duration	30	sec									
Soak Duration				Chem Flow Duration	10	min									
Rinse Duration				Soak Duration	999	min									
Final Relax Duration				Rinse Duration	60	sec									
Final Relax Duration				Final Relax Duration	60	sec									
Pre-Drain Disabled				Pre-Drain Disabled				Pre-Drain Disabled							



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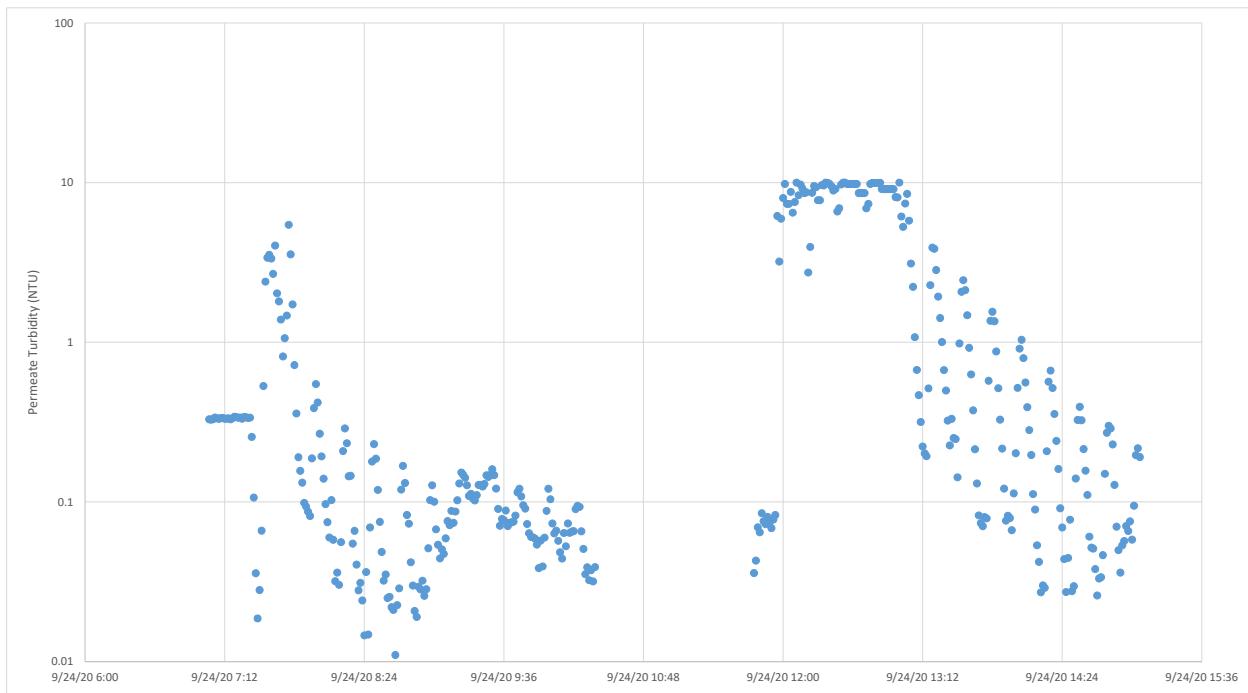
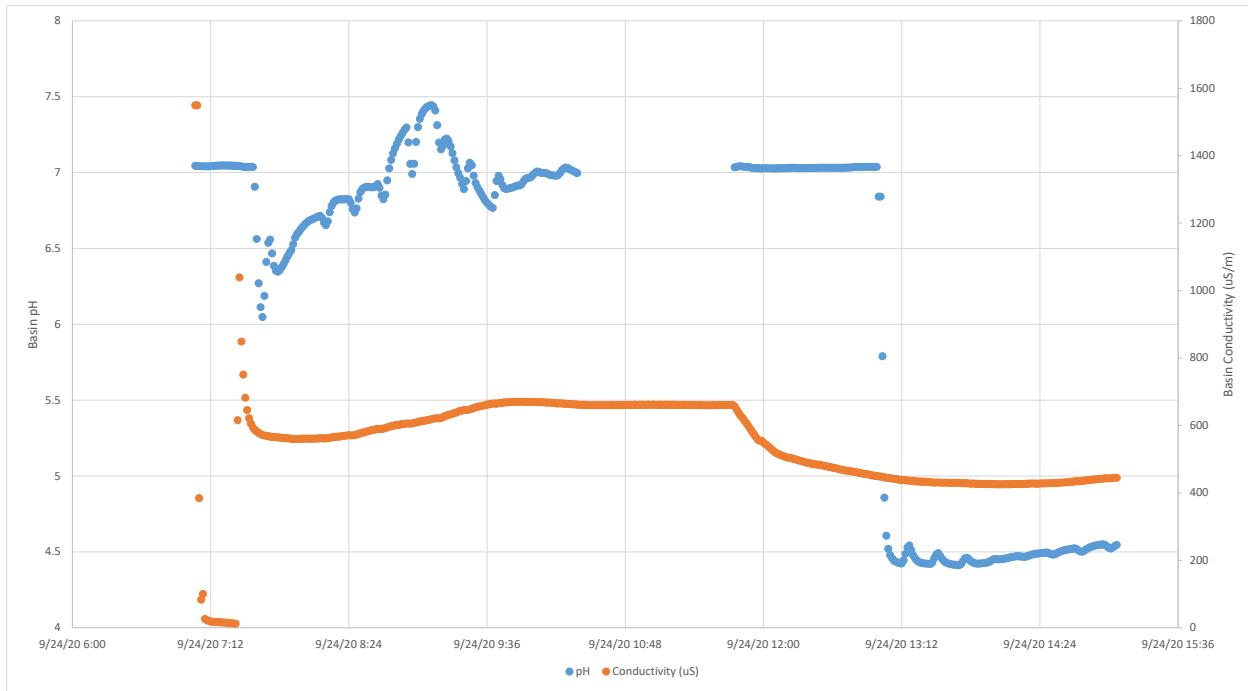
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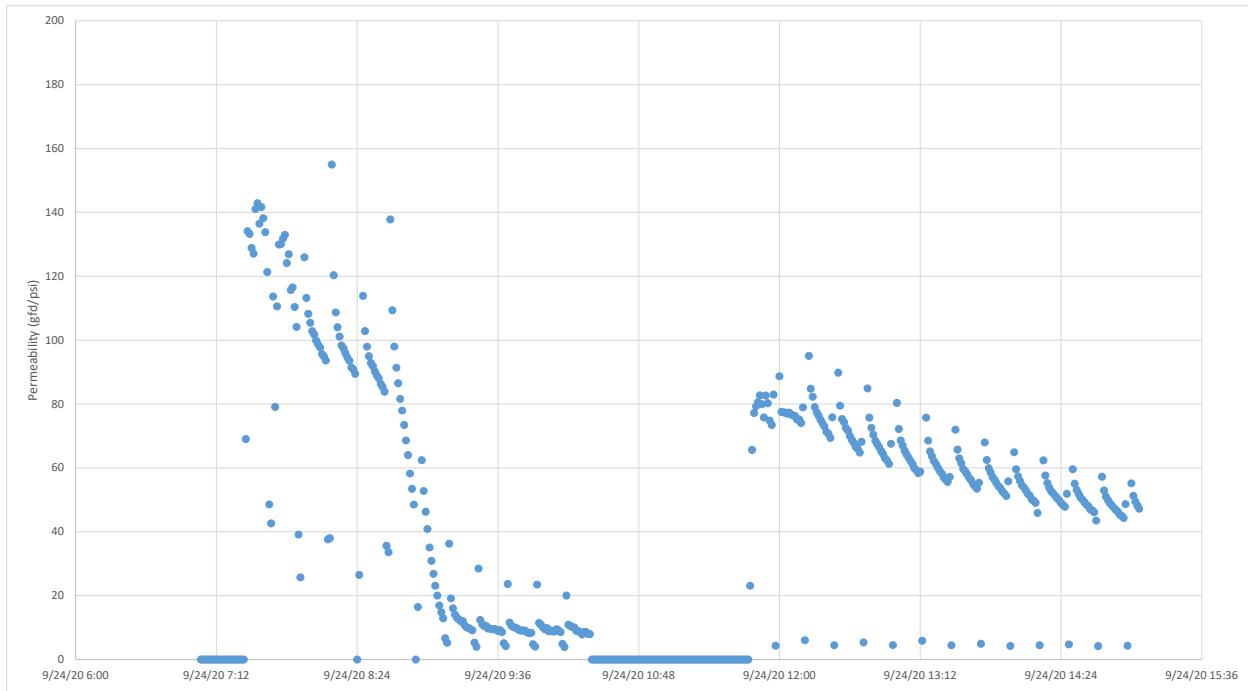
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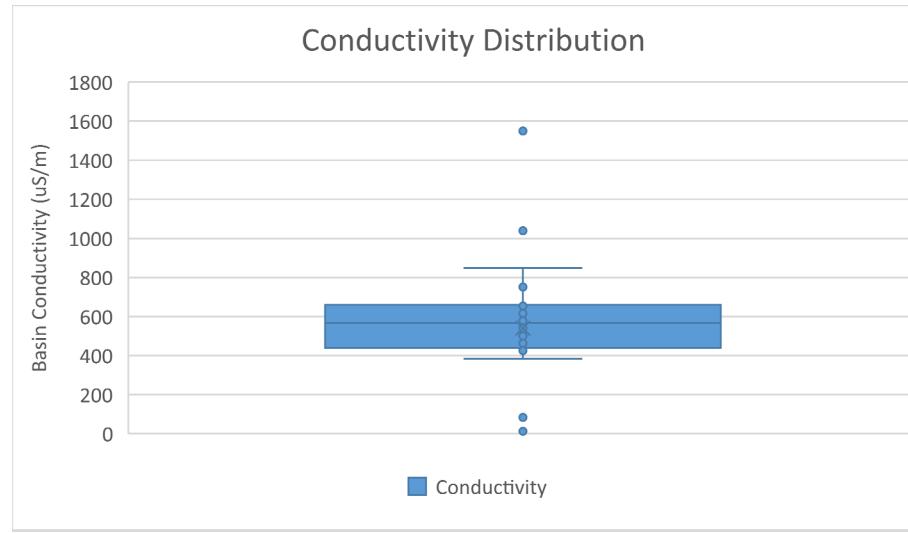
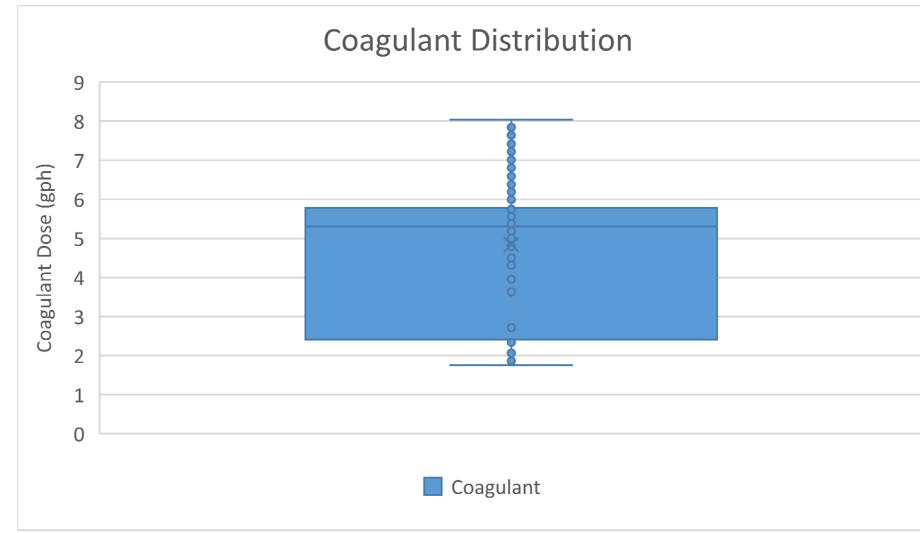
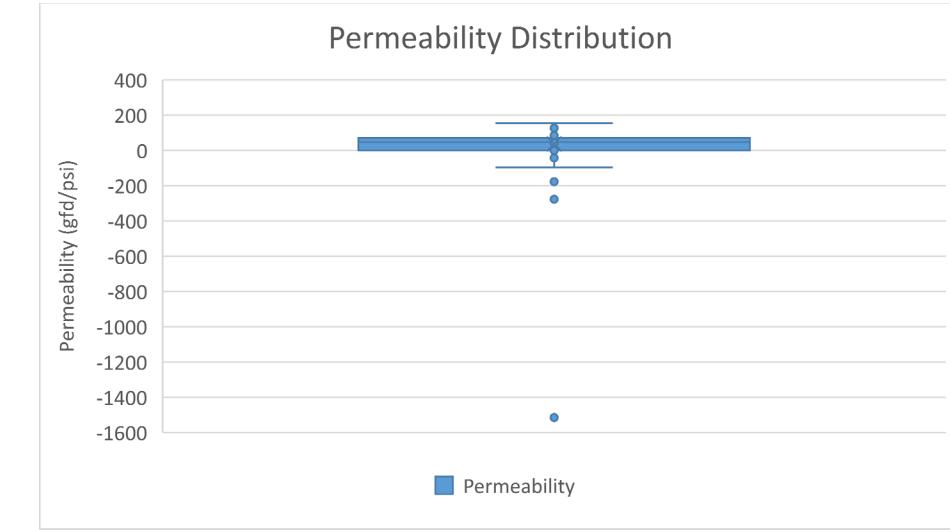
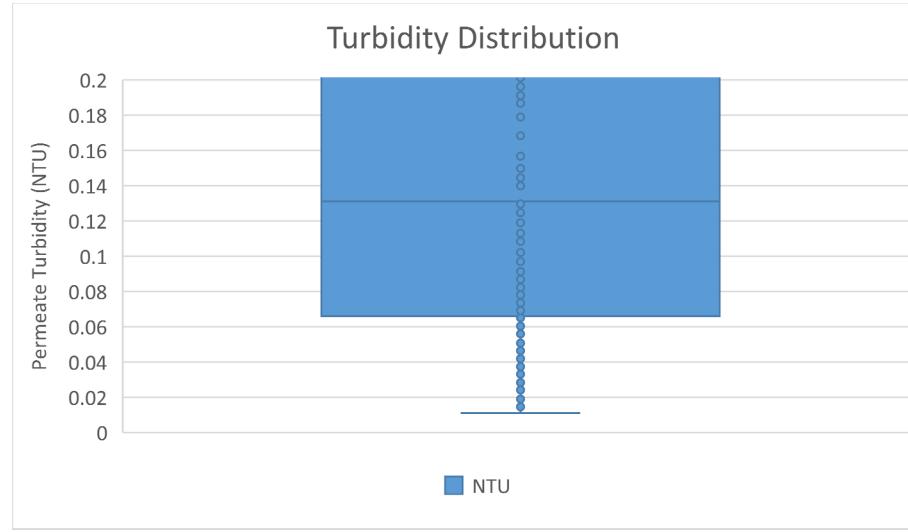
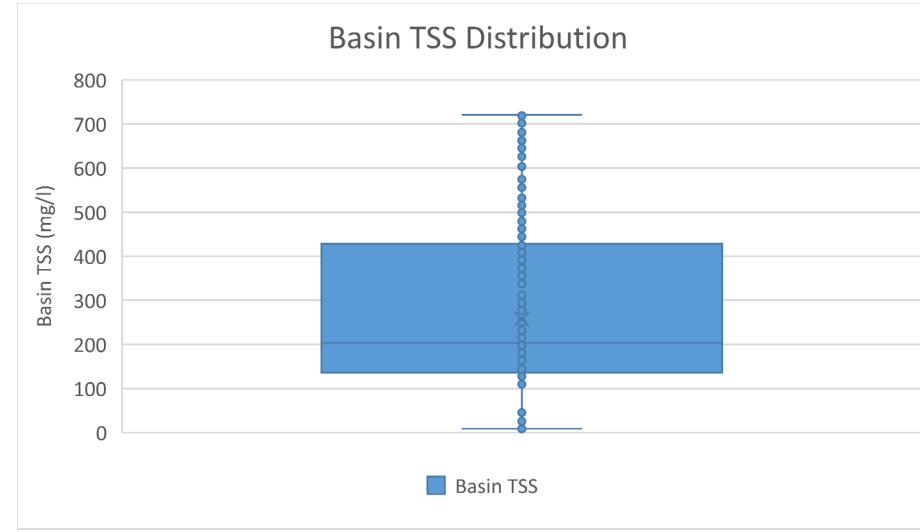
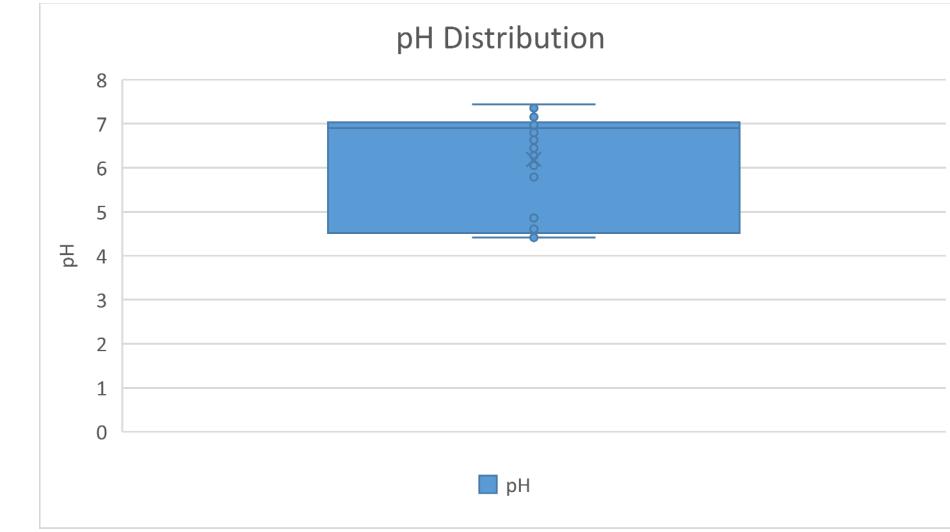
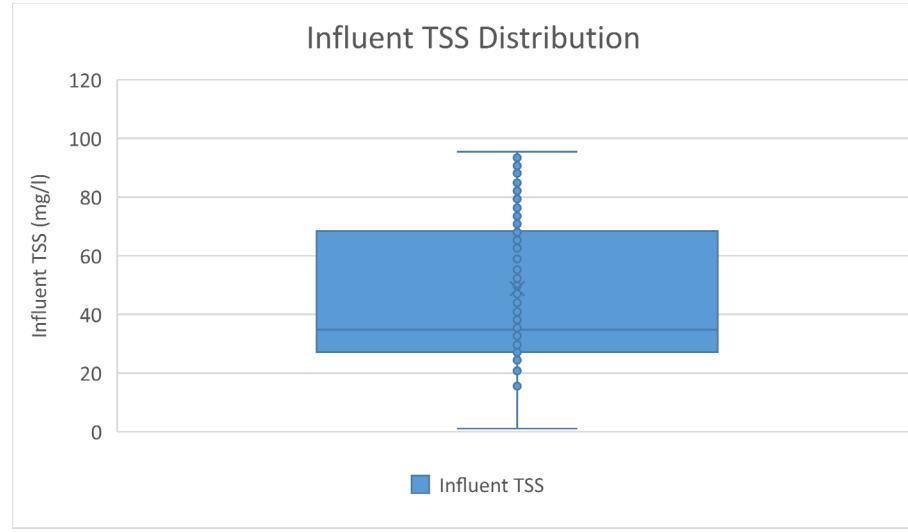
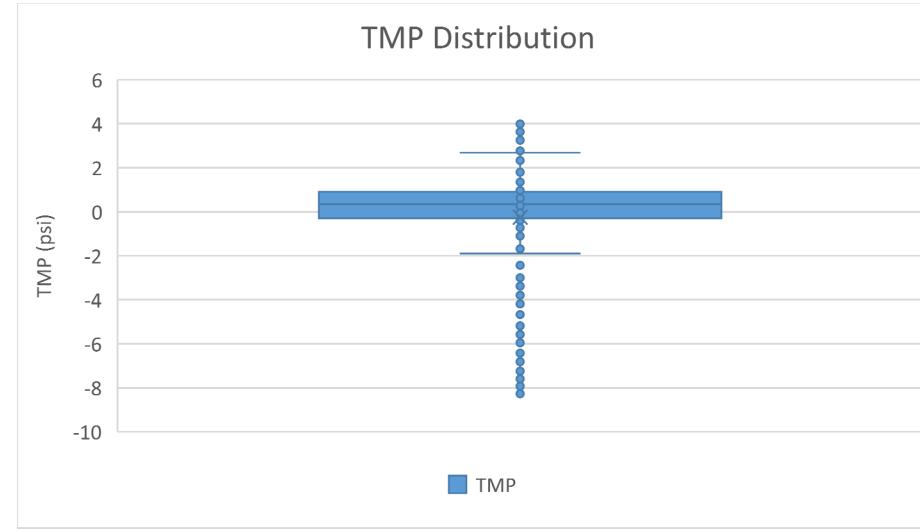
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OVIVO PILOT TESTING

WO # C165282

Day	Unit	# of samples	Sample Frequency	Tue	Wed	Thu	Fri	Wed	Mon	Wed	Mon	Thu	Thu	Tue	Thu	Sat	Sat	
Sample Date				4/2/2019	4/24/2019	4/25/2019	4/26/2019		5/8/2019		7/29/2019		8/5/2019	8/15/2019	9/12/2019	8/4/2020	9/24/2020	
S1-G	Military Time (hours)																	
pH	mg/L	1	1/run	200														
VSS	mg/L	1	1/run	138														
ECOD	mg/L																	
eCDD	mg/L																	
pOH	mg/L																	
Alkalinity	mg/L																	
Fecal Caliform Sample ID																		
Fecal Caliform Sample Time																		
Fecal Caliform	MPN/100mL	2	2/run															
S1-C	Military Time (hours)																	
TSS	mg/L		1	hourly														
VSS	mg/L		1	hourly														
Alkalinity	mg/L		1	hourly														
COD	mg/L		1	hourly														
eCDD	mg/L		1	hourly														
S2-G	Military Time (hours)																	
TSS																		
VSS																		
CO Demand	mg/L	1	1/run															
pH	mg/L	1	1/run															
Alkalinity	mg/L																	
COD	mg/L																	
eCDD	mg/L																	
Fecal Caliform Sample ID																		
Fecal Caliform Sample Time																		
Fecal Caliform	MPN/100mL	4	4/run															
S2-C	Military Time (hours)																	
TSS	mg/L		1	hourly														
VSS	mg/L		1	hourly														
Alkalinity	mg/L		1	hourly														
UV Abs.	cm ⁻¹		1	hourly														
COD	mg/L		1	hourly														
S3-G	Military Time (hours)																	
TSS	mg/L	1	1/run	820	4260	4567	3512	4040	4255	474	246	770	178	570				
VSS	mg/L	1	1/run	370	2000	2117	1770	2240	250	470	470	470	960	122				
Alkalinity	mg/L																	
COD	mg/L	1	1/run															
eCDD	mg/L	1	1/run															
S3-G, Flow Box	Military Time (hours)																	
TSS	mg/L		1	1/run														
VSS	mg/L		1	1/run														
Alkalinity	mg/L																	
COD	mg/L		1	1/run														
eCDD	mg/L		1	1/run														
Weekly Check of online instruments																		
Date/Time/Initials																		
Turbidity online reading																		
Chlorine online reading																		
pH online reading																		
pH lab reading																		
Temperature online reading																		
Temperature lab reading																		
Salinity online reading																		
Hypo Strength %																		
Bottle Kit	Volume																	
FT	L																	
FT Fecal	4.125-mL sterile																	
FT e12	1L amber bottle																	
FT comp	4L																	
inf	4L																	
inf Fecal	2.325-mL sterile																	
inf comp	2L																	
TKN	500mL																	

Time: 1418 TSS Probe Time: 1013
Time: 1418 TSS Probe Time: 178 570
Time: 1418 TSS Probe Time: 246 470
Time: 1418 TSS Probe Time: 250 470
Time: 1418 TSS Probe Time: 61 122
Time: 1418 TSS Probe Time: 734 516
Time: 1418 TSS Probe Time: 80 45

run results are: COD 3230, eCDD 140

Date	Time	TOC (mg/L)	
		Inf	Eff
9/24/2020	8:15	26.4	
	9:25	24.7	9:04
	10:23	21.7	

Appendix B.8

Test Run Package 08

Run# 8

Run Description Confirm process recovery after loss of air scour and backwash

Type	<input checked="" type="checkbox"/> process	<input type="checkbox"/> Performance
Influent water source	<input checked="" type="checkbox"/> PE	
	<input type="checkbox"/> Hydrant	
	<input type="checkbox"/> Both	

Wasting Rate		0
Air Scour		105** scfm
Backwash Frequency		15*** min
Run Duration		< 8 hrs
CIP	<input checked="" type="checkbox"/> Hypo	<input checked="" type="checkbox"/> Caustic
Flux rate	<input checked="" type="checkbox"/> Constant	<input type="checkbox"/> Chloric
	<input type="checkbox"/> Varies	
Composite Sample Schedule		Because of short event, 3 samples taken as scheduled below. 1.5 L each.

*Because this is a short test run, composite samples will be collected in three large lots

** Air scour to be 105 scfm while operating, but 0 when off.

*** Backwash frequency to be 15 min when running, but when off the backwash should instead be replaced with just a relax period.

****Exact timing will vary depending on how fast TMP rises.

Date

Event	Day	Time	PE gpm	Hydrant gpm	Coag Dose AltSS ratio	Flux Rate gfd	Event/Action	Influent		Effluent		Membrane Tank		Comments
								Grab / Probe	Note	Grab / Probe	Note	Grab / Probe	Note	
0	1	7:00	200	—	0.6		Start Flow to pilot							
1		7:30				100	Start producing effluent							
2		8:00					Take 1st sample for composites*							Collect 1.5L influent and effluent samples
3		8:15					Influent Sample	KCEL: TOC	75620-1					
4		8:20					Effluent Sample			WPP: Fecal				
5		8:30					Turn off air scour							
6		10:30					Take 2nd sample for composites*							Collect 1.5L influent and effluent samples
7		10:35					Influent Sample	Field: Full Set WPP: Full Set KCEL: TOC	75620-2					
8		10:40					Tank Sample				Field: Full Set WPP: Full Set			
9		10:45					Effluent Sample							
10		10:50					Start 30 min CIP							
11		12:30					Restart filtration with normal air scour							
12		13:10					Influent Sample	KCEL: TOC	75620-3					
13		13:15					Effluent Sample			WPP: Fecal				
14		13:30					Stop backwash							
15		13:45					Composite							
16		13:55					Influent Sample	WPP: Fecal KCEL: TOC	75620-4					
17		14:00					Effluent Sample			WPP: Fecal				
18							When high TMP shutdown occurs or after 2 hrs.							
							Start 30 min CIP							
19		X					Restart filtration with standard backwash frequency							
20		X+20 min					Take 3rd sample for composites*							Collect 1.5L influent and effluent samples
21		17:05					Influent Sample	KCEL: TOC	75620-9					
22		17:15					Effluent Sample			WPP: Fecal				
23							Stop producing effluent. Perform normal procedure to prepare for next test.							

Field
Eff
Turbidity
Probe reading
pH
Temperature
Conductivity

WPPLsamples
Influent composite
Effluent composite
-TSS/VSS, Alk, BOD
Influent grab
TSS/VSS
Fecal
Effluent grab
TSS/VSS
Chlorine demand
Fecal
Settleable solids
Tank grab
TSS/VSS
KCEL
Influent grab
TOC
Effluent composite
TOC

OVIVO Pilot Setpoints **Values to be set according to OVIVO's recommendations.**
Run# **8**

Date _____

FLOW OPTIMIZATION				CHEM DOSING								
System		ONLINE/OFFLINE		Permeate		End of Event		Coagulant				
Inlet System				Permeate Flow	206	gpm		Pump Start Inf Flow	1	gpm		
Screen Off Delay	2	min		Pump Start Level	116	in		Pump Start Level	0.1	in		
Weir Gate Frequency	1800	min		Pump Stop Level	5	in		Overflow Level	118	in		
Weir Gate Duration	30	sec		Pump Stop Low Level	100	in		Coagulant Min Flow	0.5	gph		
Blowers				Single Pump Flow	220	gpm		Coagulant Max Flow	20	gph		
Scour Air Flow	105	scfm		Backwash Frequency	15	min		Coag Fixed Flow	6.0	gph		
Blower Start Level	20	in		Backwash Flow	300	%		Coag TSS Ratio	0.60			
Blower Stop Level	8	in		Pre BW Relaxation	30	sec		Coag Al%	4.1	%		
Lag Blower Start Level	65	%		Backwash Duration	60	sec		Coag SG	1.34			
Lag Blower Start Delay	120	sec		Post BW Relax Duration	30	sec		Coag Flow Ratio	5			
Blower Fail Air Flow	4.5	scfm		Perm Static Pressure	1.7	psi		Coag Fill Flow	8	gph		
Blower Fail Delay	140	sec		Turbidity Hi Alarm SP	10	NTU						
Low Air Flow Alarm	55	%		TMP Hi Alarm SP	8	psi						
Low Air Flow Delay	45	sec		Backwash Start TMP	10	psi						
Override Enabled		TMP Reset		Max Hi TMP Cycles	1							
				Perm Tank Level Lo	20	in						
				Air Extractor Frequency	5	min						
				Air Extractor Duration	4	min						
				Membrane Basin Drain Vlv				Coagulant Dosing Mode Select				
				WAS Vlv Open TSS	6,000	mg/l		Fixed Flow				
				WAS Vlv Close Lvl	117	in		TSS				
				WAS Valve Duration	0	sec		Perm Flow				
				Sodium Hypochlorite								
				CIP Permeate Flow	100	gpm						
				Backwash Perm Flow	200	gpm						
				Hypochlorite Flow	100	gph						
				Pre CIP Relax Duration	30	sec						
				Chem Flow Duration	10	min						
				Soak Duration	30	min						
				Rinse Duration	60	sec						
				Final Relax Duration	60	sec						
				Citric Acid								
				CIP Permeate Flow	100	gpm						
				Backwash Perm Flow	200	gpm						
				Citric Flow	28	gph						
				Pre CIP Relax Duration	30	sec						
				Chem Flow Duration	10	min						
				Soak Duration	999	min						
				Rinse Duration	60	sec						
				Final Relax Duration	60	sec						
				Caustic								
				CIP Permeate Flow	100	gpm						
				Backwash Perm Flow	100	gpm						
				Caustic Flow	50	gph						
				Pre CIP Relax Duration	30	sec						
				Chem Flow Duration	10	min						
				Soak Duration	30	min						
				Rinse Duration	60	sec						
				Final Relax Duration	60	sec						
				Pre-Drain Disabled								
				Pre-Drain Disabled								
				Pre-Drain Disabled								

P 1/2

Daily Field Notes

Run

8

10/13/2020

Cond

Process and Performance Testing

Date	Time	Observation	Action Item
10/13	0700	Started PE feed to plot	- heavy rain fall (West Point → 250 mm)
	0730 ^{hrs}	Opened influent and effluent sample & valves	
		minimal foam	turbidity
0737		Heavy Duty Ultra foam on membrane tank water surface	
0811		noticed bubble 187 < permeate flow 200 gpm, I float valve wide open	
0831		Scoured air scour blower (both from Auto → Manual)	
1044		Initiated CP (hypochlorite) and left air scour off	
1048		Closed effluent sample and turbidity valves - after them doing had started.	
1056		Returned both air scour blowers to Auto	
1132		Scoured PE feed pump to complete CP sequence.	
1148		Drawing membrane and permeate tanks prior to restart	
1205		Blocked foams and started PE feed	
1332 ^{hrs}		Scoured BWT by adjusting BW duration 60 → 10 see	
1334		Continued minimal foam on membrane tank surface.	
1533		Initiated CP(hypochlorite) and scoured PE feed pump	Test Run Package 08

Daily Field Notes

$$P^2/2$$

Run

X

Cond

Process and Performance Testing

Run #8

SOP OVIVO PILOT

Date : 10/13/2020

STARTING PROCEDURE

1. Inform WTP Main Control and inquire if there is any issue that would preventing the operation.
2. Contact shift crew to arrange for after hour sampling.
3. Obtain operating parameters and sampling schedule from the test package.
4. If dilution water is required:
 - a. Contact Facility Service to charge the water hydrant.
 - b. Hydrant needs to be secured by 18:00 hrs.
5. Log in. User name= h, password = h.
6. Drain the pilot.
 - a. Drain membrane tank by opening the drain valve from control screen.
 - b. Drain permeate tank by opening the drain valve manually.
7. Check chemical tanks.
 - a. Caustic - transfer of metering pump suction.
 - b. Sodium Hypochlorite – transfer of metering pump suction. (16 gal per run) *changed today*
 - c. Alum – transfer of totes.
 - d. Contact Facility Services for support moving chemicals.
8. Prime coagulant pump- only if switch to a new tank.
 - Press "Prim 60 sec"
9. Adjust caustic addition valve to RUN position.
10. Go to MAIN SCREEN and verify that all pumps, except for alkalinity, are in AUTO
11. Set operating parameters in the following screen.
 - a. Select FLOW OPTIMIZATION screen
 - b. Verify that system is offline *online*
 - c. Set parameters according to the test plan.
12. Select chemical dosing strategy and set the parameters.
13. Select ALARM. There are certain erroneous alarms that needs to be acknowledged to reset.
14. Select FLOW OPTIMIZATION screen and put the system ONLINE.
15. Turn on PE at the panel by the primary bldg.
 - a. Turn the switch to HAND
 - b. Press START
 - c. Open the PE hand valve completely.
16. Monitor and confirm the increasing tank level.
 - a. Weir gate XVCS-101 is open, once the tank level is 0.1 in., this weir gate will close and the coagulant pump will start.
17. Once coagulant pump start, start caustic pump manually.
 - a. Select PMP-AK 101 (alkalinity addition pump)
 - b. Adjust the pump speed to the target flowrate. 4% = 1.9 gph.
 - c. Verify the flowrate on the pump local display.
18. Monitor and confirm:
 - a. Air blower starts once the tank is at 20 in.
 - b. Permeate pump starts at 116 in.

- (1730 hrs)*
- c. Confirm that there are sufficient flow through sampling buckets.
 - 19. Open the valve to effluent turbidimeter.
 - 20. Setup auto sampler on influent and effluent.
 - Open valves to get flow through sampling buckets.
 - 21. Allow the system to run for at least 1 full cycle to prior to data & sample collection. Refer to run guidance document on sampling starting time.
 - 22. Start sample collection

SHUTDOWN & CIP PROCEDURE

- 1. Check the hypo and caustic levels. Each cleaning cycle require 12 gal.
- 2. Close sampling valves, turbidimeter valves.
- 3. Switch alkalinity pump from manual to auto.
- 4. Prime hypochlorite pump.
- 5. Switch caustic addition valve position from RUN to CIP position.
- 6. Go to CIP screen to check the CIP parameters. If CIP is initiated from this screen, the system will go back into filtration once the CIP is completed (as long as the feed pump is on).
- 7. Wait for pump priming to finish.
- 8. Got to Flow Optimization screen and select "End of cycle".
 - If the pilot stopped/standby due to high TMP, press TMP reset, and the CIP will start.
- 9. Verify that the hypochlorite pump & caustic pumps are on.
- 10. Turn the feed off at the PE panel
 - a. Press STOP
 - b. Turn the switch to OFF
 - c. Close the manual valve
- 11. Spray down the membrane tank to remove foam and scum.
- 12. Log out.

OVIVO Pilot Setpoints Values to be set according to OVIVO's recommendations.

Run# 8

Date

FLOW OPTIMIZATION						CHEM DOSING		
System			Permeate			End of Event		
Inlet System	ONLINE/OFFLINE		Permeate Flow	205	gpm			
Screen Off Delay	2	min	Pump Start Level	116	in			
Weir Gate Frequency	1800	min	Pump Stop Level	5	in			
Weir Gate Duration	30	sec	Pump Stop Low Level	100	in	End of Cycle	End Cycle	
Blowers			Single Pump Flow	220	gpm	Hypochlorite CIP	Enable	
Scour Air Flow	105	scfm	Backwash Frequency	15	min			
Blower Start Level	20	in	Backwash Flow	300	%	End of Cycle	Disable	
Blower Stop Level	8	in	Pre BW Relaxation	30	sec	Citric CIP		
Lag Blower Start Level	65	%	Backwash Duration	60	sec			
Lag Blower Start Delay	120	sec	Post BW Relax Duration	30	sec	End of Cycle	Enable	
Blower Fail Air Flow	4.5	scfm	Perm Static Pressure	1.7	psi	Hypo + Caustic CIP		
Blower Fail Delay	140	sec	Turbidity Hi Alarm SP	10	NTU			
Low Air Flow Alarm	55	%	TMP Hi Alarm SP	8	psi	End of Cycle	Disable	
Low Air Flow Delay	45	sec	Backwash Start TMP	10	psi	Caustic CIP		
Override Enabled			Max Hi TMP Cycles	1				
TMP Reset								
Sodium Hypochlorite			Perm Tank Level Lo	20	in	End of Event Drain Lvl	5	in
CIP Permeate Flow	100	gpm	Air Extractor Frequency	5	min	End of Event Dly	20	sec
Backwash Perm Flow	200	gpm	Air Extractor Duration	4	min			
Hypochlorite Flow	100	gph						
Pre CIP Relax Duration	30	sec	Citric Acid					
Chem Flow Duration	10	min	CIP Permeate Flow	100	gpm	Membrane Basin Drain Vlv		
Soak Duration	30	min	Backwash Perm Flow	200	gpm	WAS Vlv Open TSS	6,000	mg/l
Rinse Duration	60	sec	Citric Flow	28	gph	WAS Vlv Close Lvl	117	in
Final Relax Duration	60	sec	Pre CIP Relax Duration	30	sec	WAS Valve Duration	0	sec
			Chem Flow Duration	10	min			
			Soak Duration	999	min			
			Rinse Duration	60	sec			
			Final Relax Duration	60	sec			
Pre-Drain Disabled			Pre-Drain Disabled			Pre-Drain Disabled		

✓ *Bd*
7 10/13/2020

Bucher, Bob

From: Scott Weirich <SWeirich@parametrix.com>
Sent: Monday, October 12, 2020 3:10 PM
To: Mike Snodgrass; Sukapanpotharam, Pardi; Liang, HC
Cc: Mike Ollivant; Doug Berschauer; marcos.lopez; Bucher, Bob; Jacobson, Eron; De Arteaga, Pedro; Khare Ashwini
Subject: RE: Test RUn 8 and 9 packages uploaded

[EXTERNAL Email Notice] External communication is important to us. Be cautious of phishing attempts. Do not click or open suspicious links or attachments.

That makes sense to me.

Scott

From: Snodgrass Mike <Mike.Snodgrass@ovivowater.com>
Sent: Monday, October 12, 2020 3:00 PM
To: Scott Weirich <SWeirich@parametrix.com>; Sukapanpotharam, Pardi <Pardi.Sukapanpotharam@kingcounty.gov>; Liang, HC <hc.liang@trectech.com>
Cc: Mike Ollivant <MOllivant@parametrix.com>; Doug Berschauer <DBerschauer@parametrix.com>; marcos.lopez <marcos.lopez@trectech.com>; Bucher, Bob <Bob.Bucher@kingcounty.gov>; Jacobson, Eron <ejacobson@kingcounty.gov>; De Arteaga, Pedro <pedro.dearteaga@kingcounty.gov>; Khare Ashwini <Ashwini.Khare@ovivowater.com>
Subject: RE: Test RUn 8 and 9 packages uploaded

Scott,

Thanks for the response. Based on the data we have so far, I recommend a 50% increase in the dosing ratio to 0.6 AI/TSS would be appropriate.

Mike

From: Scott Weirich <SWeirich@parametrix.com>
Sent: Monday, October 12, 2020 2:33 PM
To: Snodgrass Mike <Mike.Snodgrass@ovivowater.com>; Sukapanpotharam, Pardi <Pardi.Sukapanpotharam@kingcounty.gov>; Liang, HC <hc.liang@trectech.com>
Cc: Mike Ollivant <MOllivant@parametrix.com>; Doug Berschauer <DBerschauer@parametrix.com>; marcos.lopez <marcos.lopez@trectech.com>; Bucher, Bob <Bob.Bucher@kingcounty.gov>; Jacobson, Eron <ejacobson@kingcounty.gov>; De Arteaga, Pedro <pedro.dearteaga@kingcounty.gov>; Khare Ashwini <Ashwini.Khare@ovivowater.com>
Subject: RE: Test RUn 8 and 9 packages uploaded

[EXTERNAL MAIL]

Mike and KC staff,

As we discussed on Friday, we think the coagulant dose should be adjusted to meet the conditions of the run. Given the high BOD:TSS ratio lately, I think that means it should start a bit higher than usual and/or be prepared to increase it soon if early indications are that it is insufficient. As you pointed out, we want to see a difference in the fouling rate between normal functioning and equipment failure.

For the air scour test, if the TMP is not rising rapidly I suggest letting it go for 2 hours without air scour. We can get a good estimate of TMP rise rate at that point. Then do a CIP and continue with the BW test.

For the BW test, I would do the same. Let it go for 2 hours before stopping it.

Scott

From: Snodgrass Mike <Mike.Snodgrass@ovivowater.com>

Sent: Monday, October 12, 2020 1:02 PM

To: Scott Weirich <SWeirich@parametrix.com>; Sukapanpotharam, Pardi <Pardi.Sukapanpotharam@kingcounty.gov>;

Liang, HC <hc.liang@trectech.com>

Cc: Mike Ollivant <MOllivant@parametrix.com>; Doug Berschauer <DBerschauer@parametrix.com>; marcos.lopez

<marcos.lopez@trectech.com>; Bucher, Bob <Bob.Bucher@kingcounty.gov>; Jacobson, Eron

<ejacobson@kingcounty.gov>; De Arteaga, Pedro <pedro.dearteaga@kingcounty.gov>; Khare Ashwini

<Ashwini.Khare@ovivowater.com>

Subject: RE: Test RUn 8 and 9 packages uploaded

Scott/Bob,

Couple of comments/questions:

- In light of the influent water quality data we have for the P&P testing, I think it makes sense to increase our baseline dosing ratio. The dosing ratio was derived from preliminary test data and designed to meet all anticipated Elliott West scenarios based on available data. Unfortunately, probably due to COVID and low plant flows, we are experiencing water quality changes that may not be a good representation of CSO flows. At the end of the day, the parameter of concern is BOD to TSS ratio since we are using a TSS based dosing strategy. In terms of BOD:TSS, the preliminary test phase could be considered a worst case scenario compared to EW since the ratios are much higher.
- Increasing baseline dosing ratio should also provide a more complete data set. While each individual test run has a different objective, there is enough overlap in terms of process conditions where we can compare the impact of a different dosing ratio. It will also help with tests 8 & 9 as it will allow us to clearly see impact of the air scour and/or backwash failure. If we are under-dosing, how do we tell if accelerated TMP is due to blower or BW pump failure, or an accumulation of organic fouling?
- For the air scour failure test, if the TMP is not accelerating is there another trigger for which we should execute the CIP? Do we just move on to the backwash failure test?
- Although I expect this to be less likely, what happens with the BW failure test if TMP climb is slow and it will take some time to reach terminal TMP?

I'm always happy to talk things through. I'll be in meetings until 2:30 pm today, but am free afterward if needed.



Mike Snodgrass

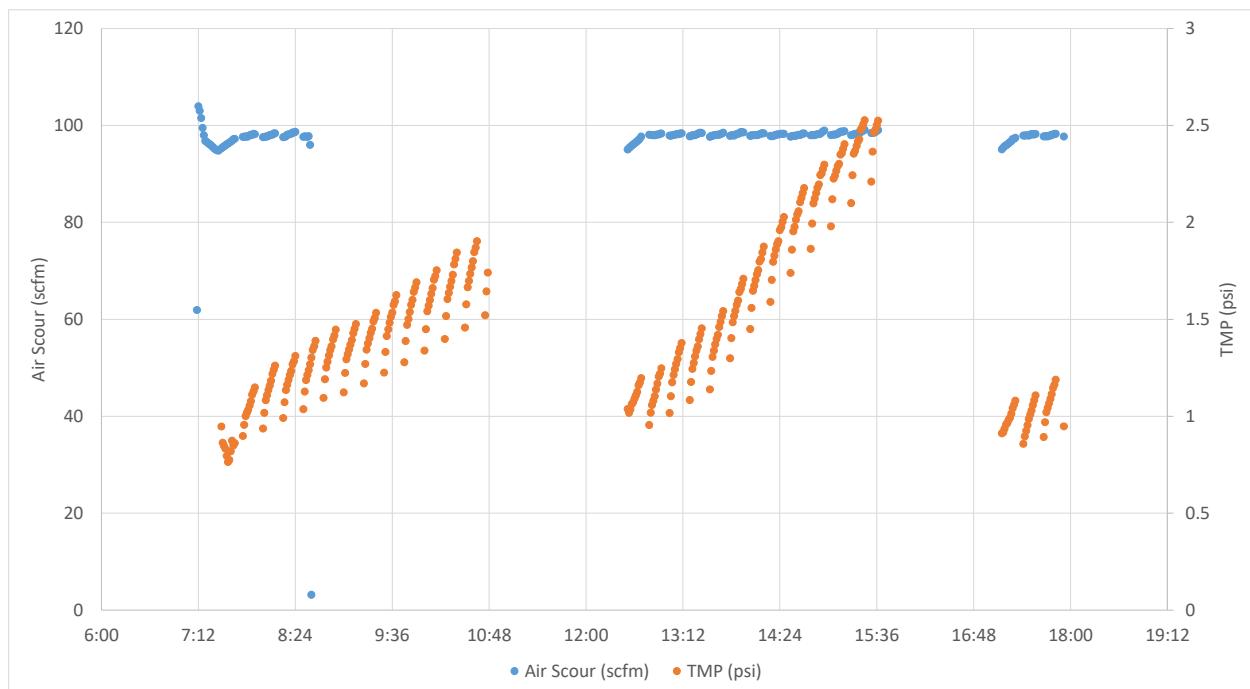
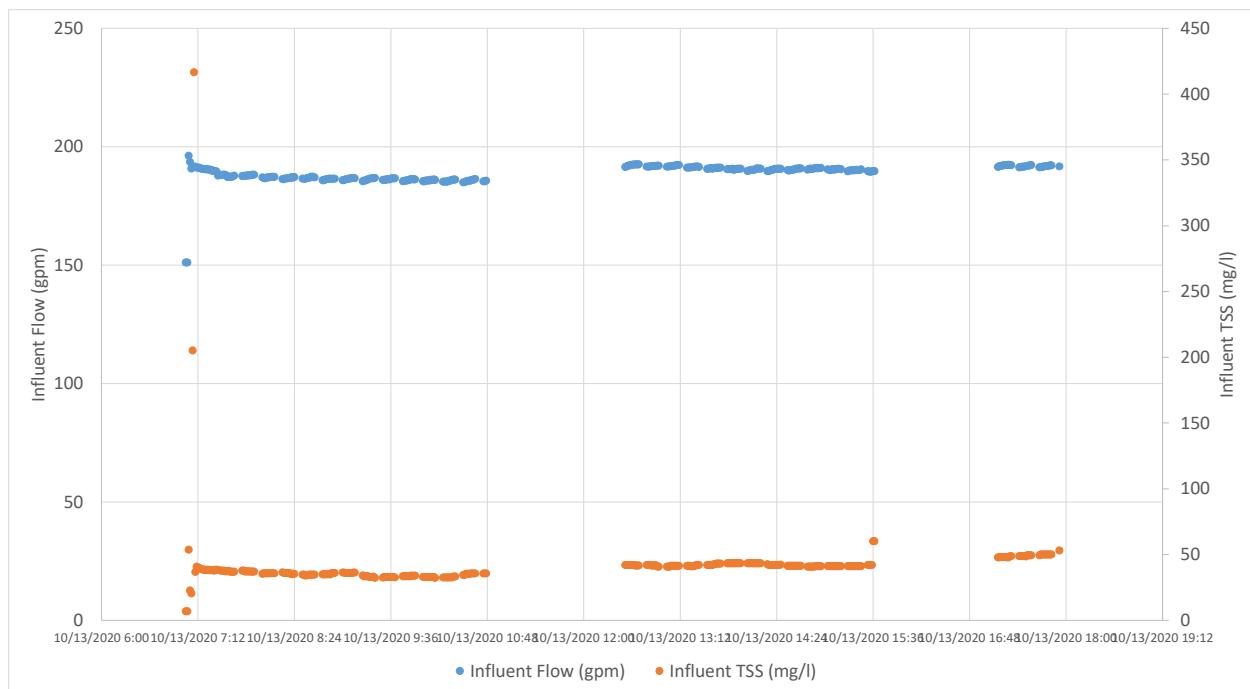
SiC Technology Leader, Municipal

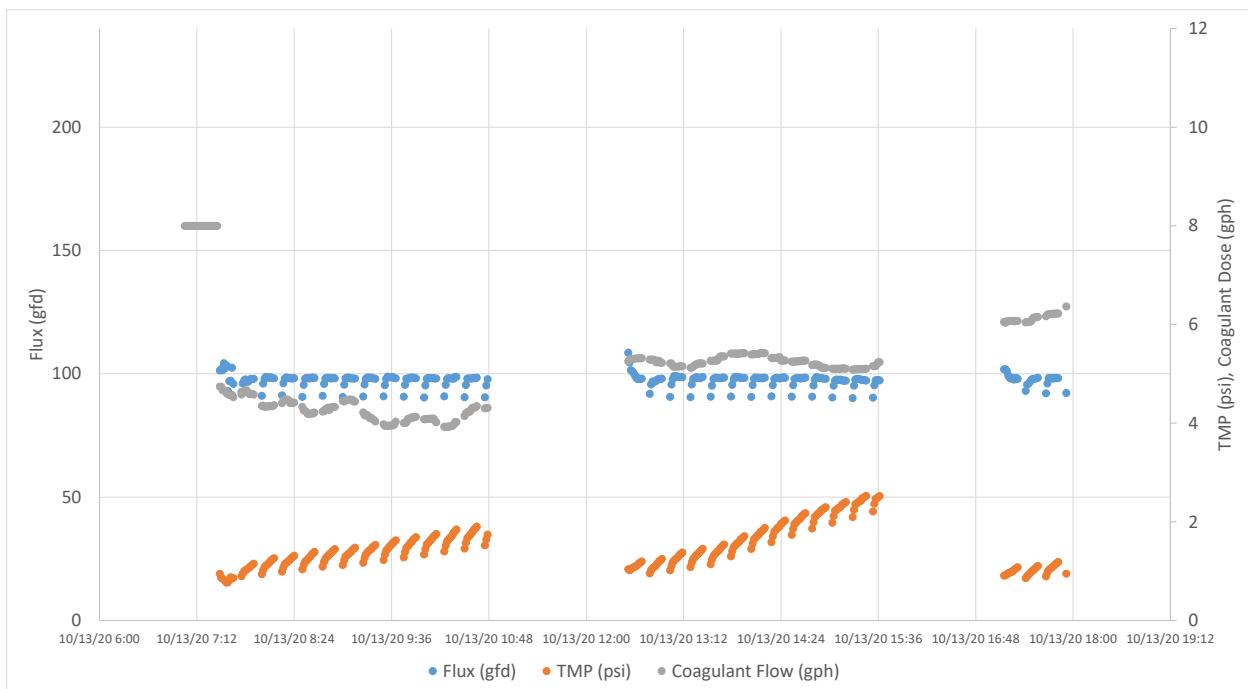
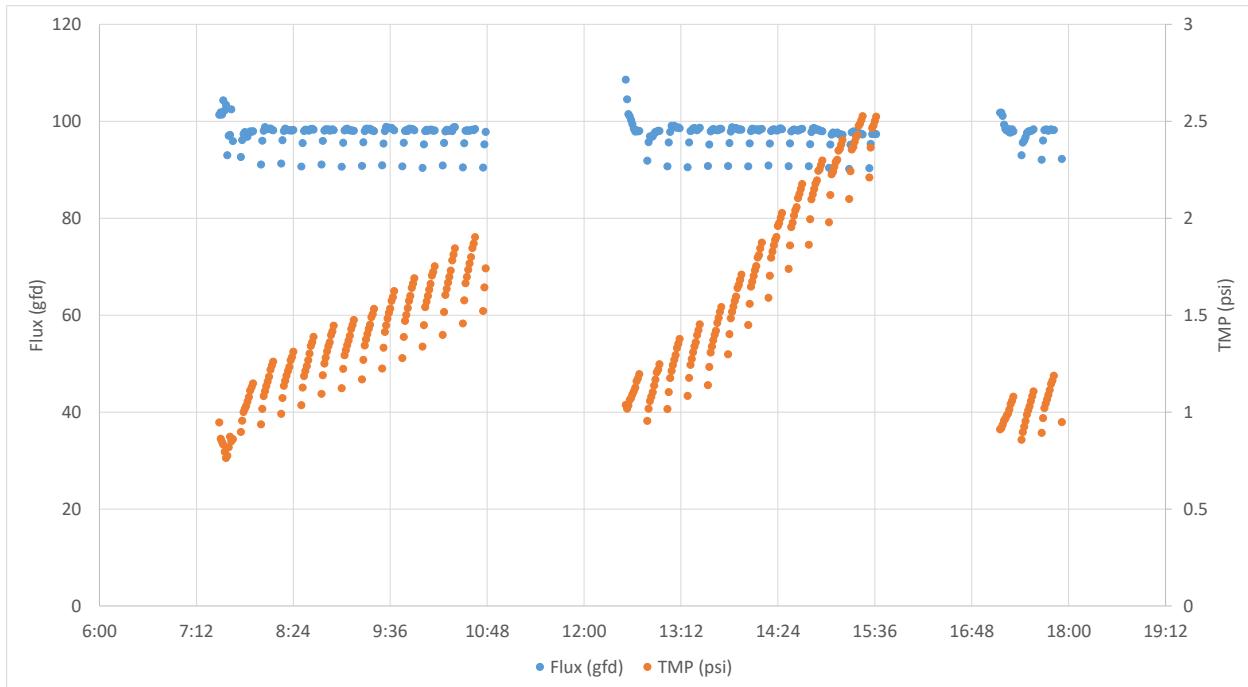
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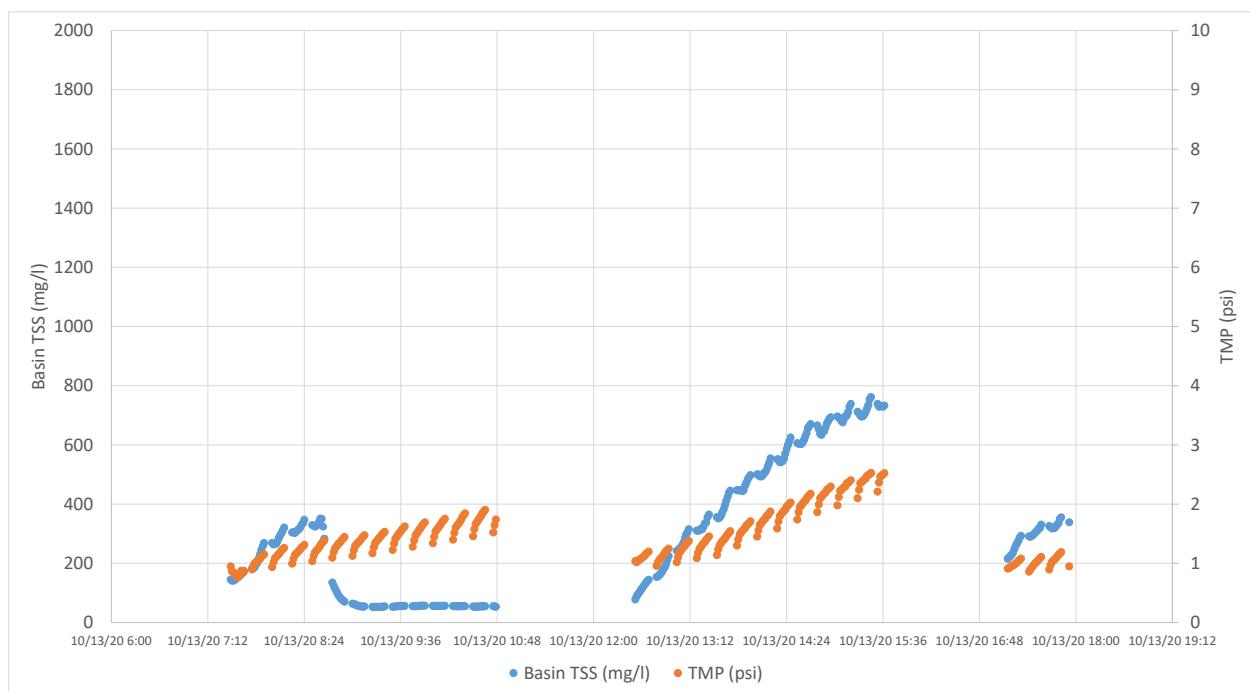
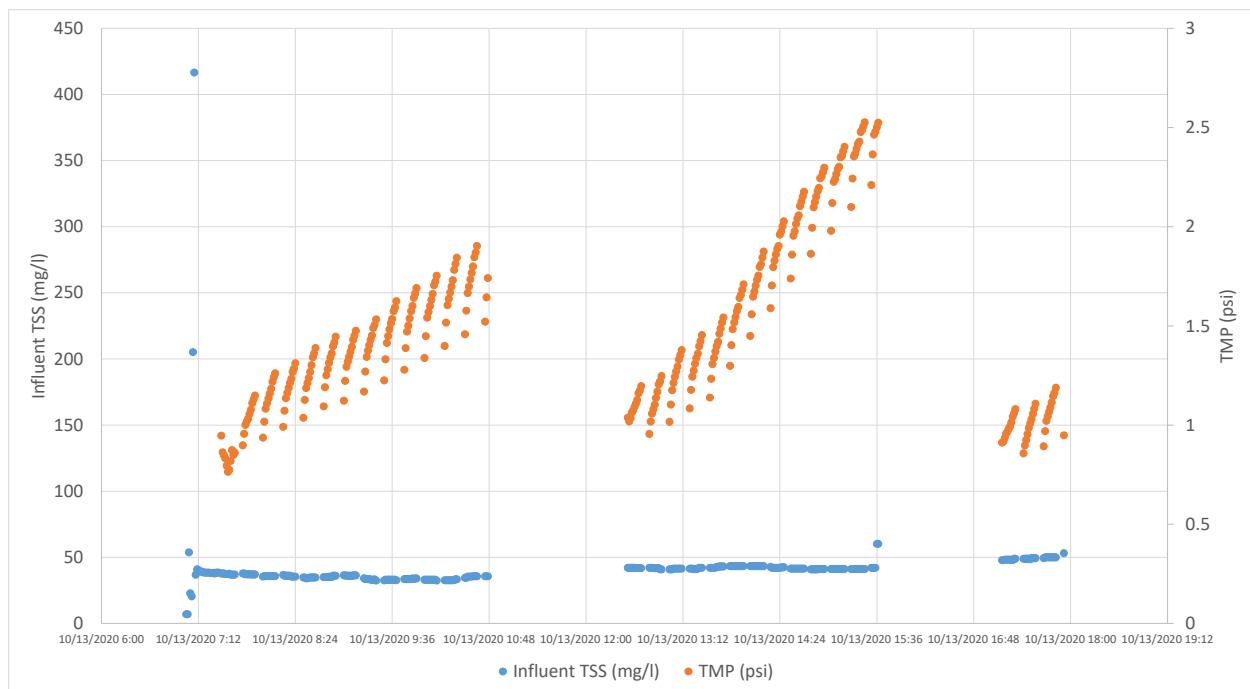
P: 805.705.1505 S: mike.snodgrass.ovivo

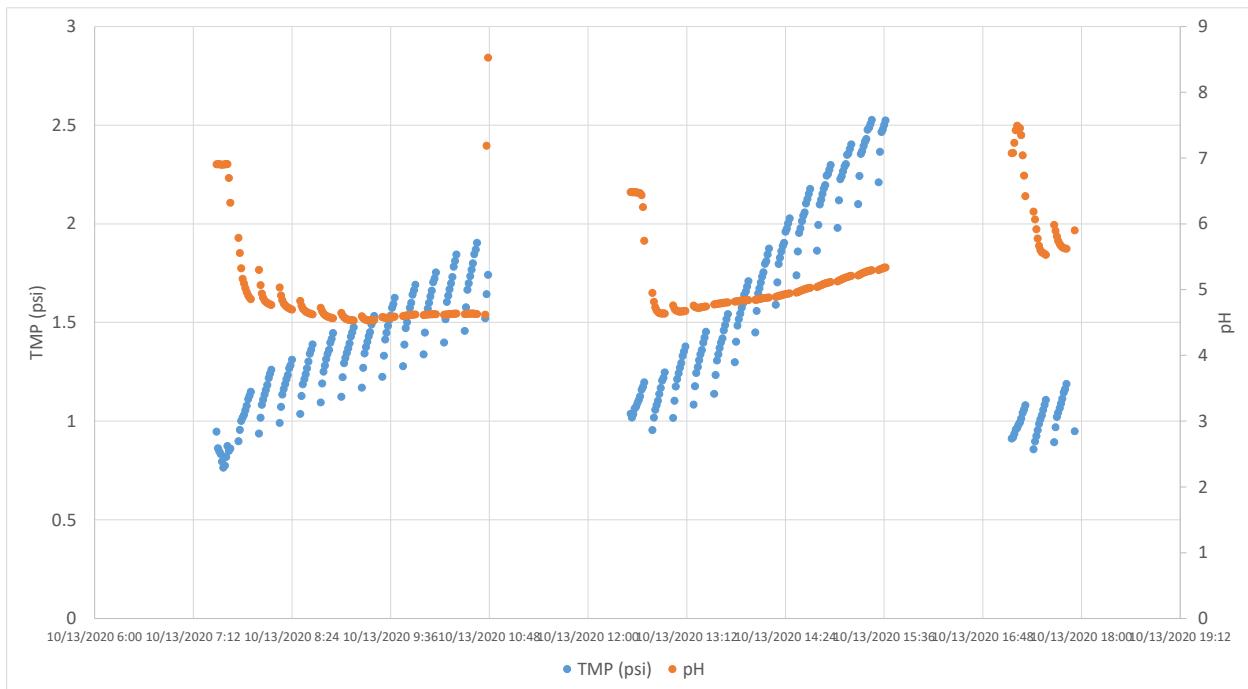
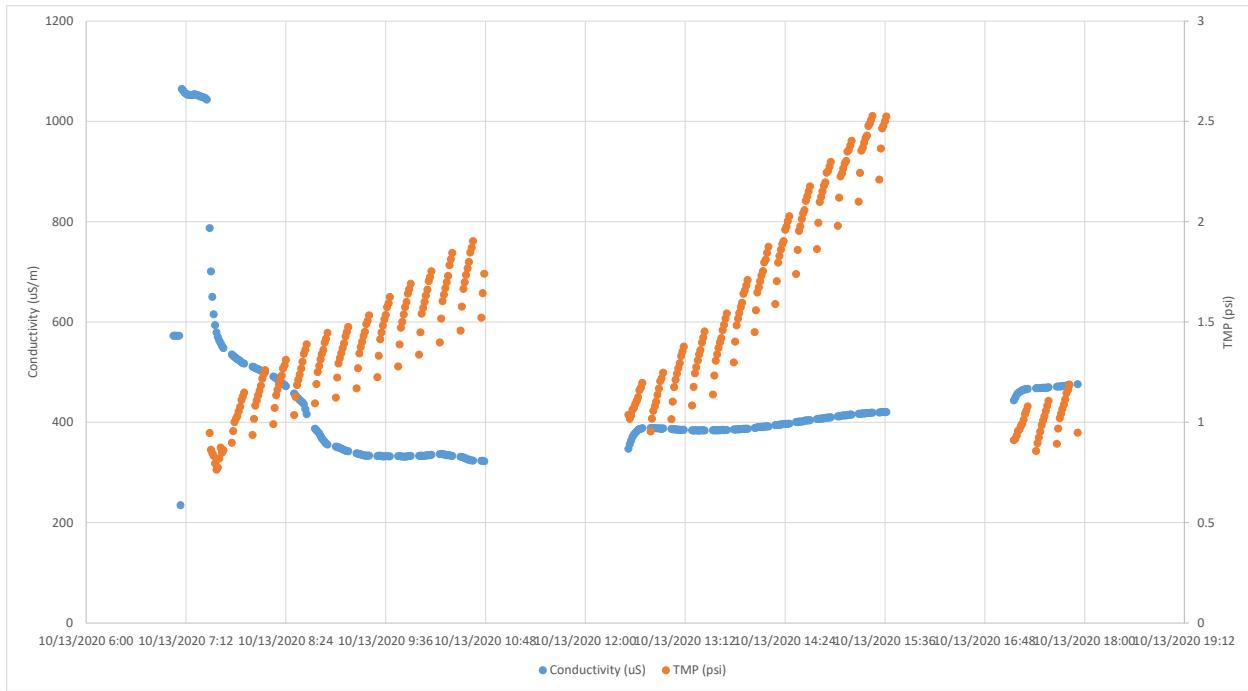
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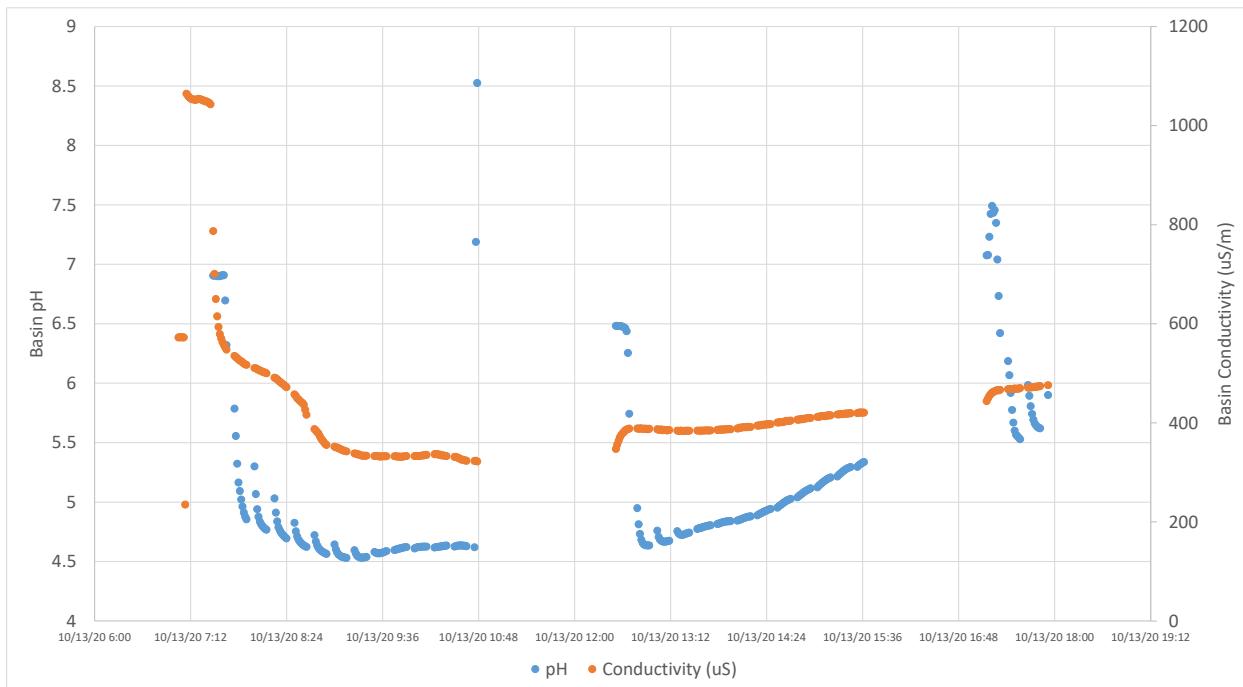
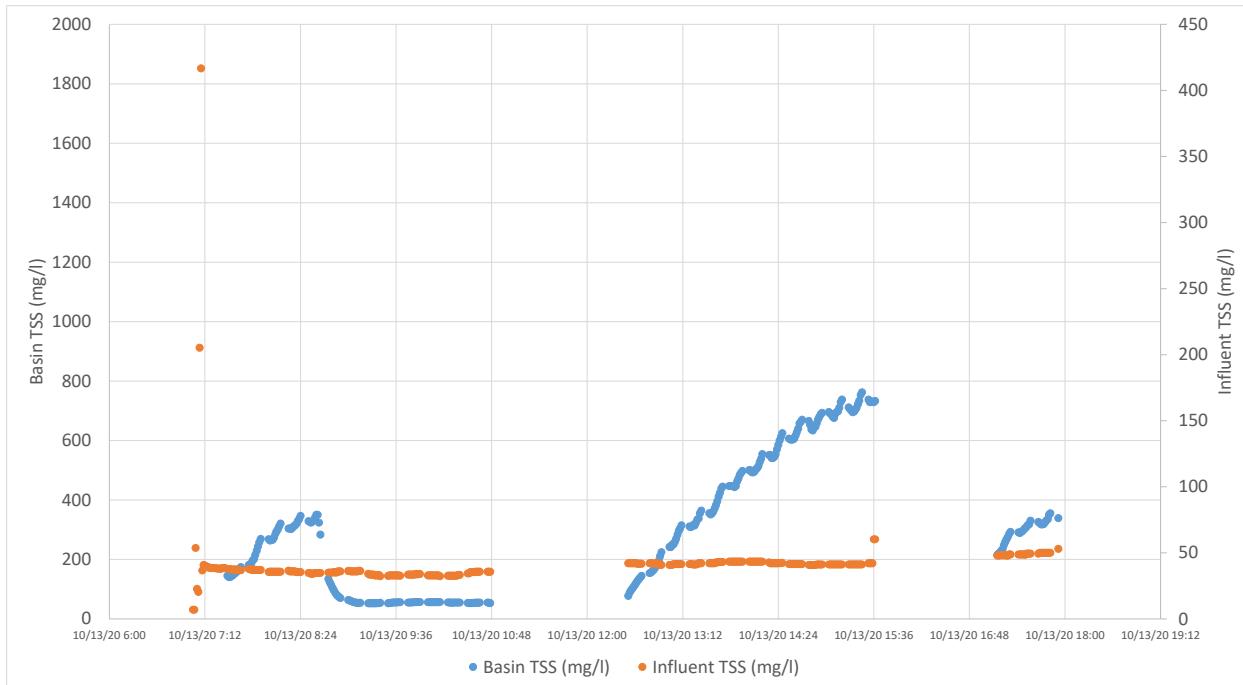
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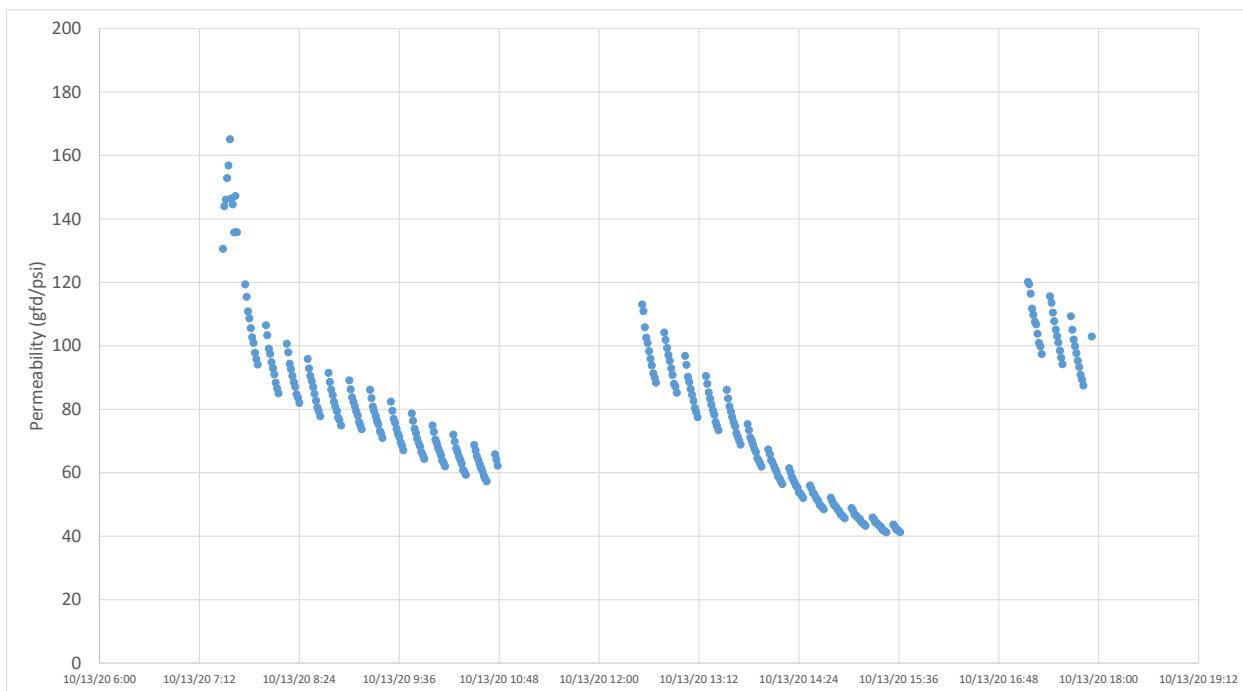
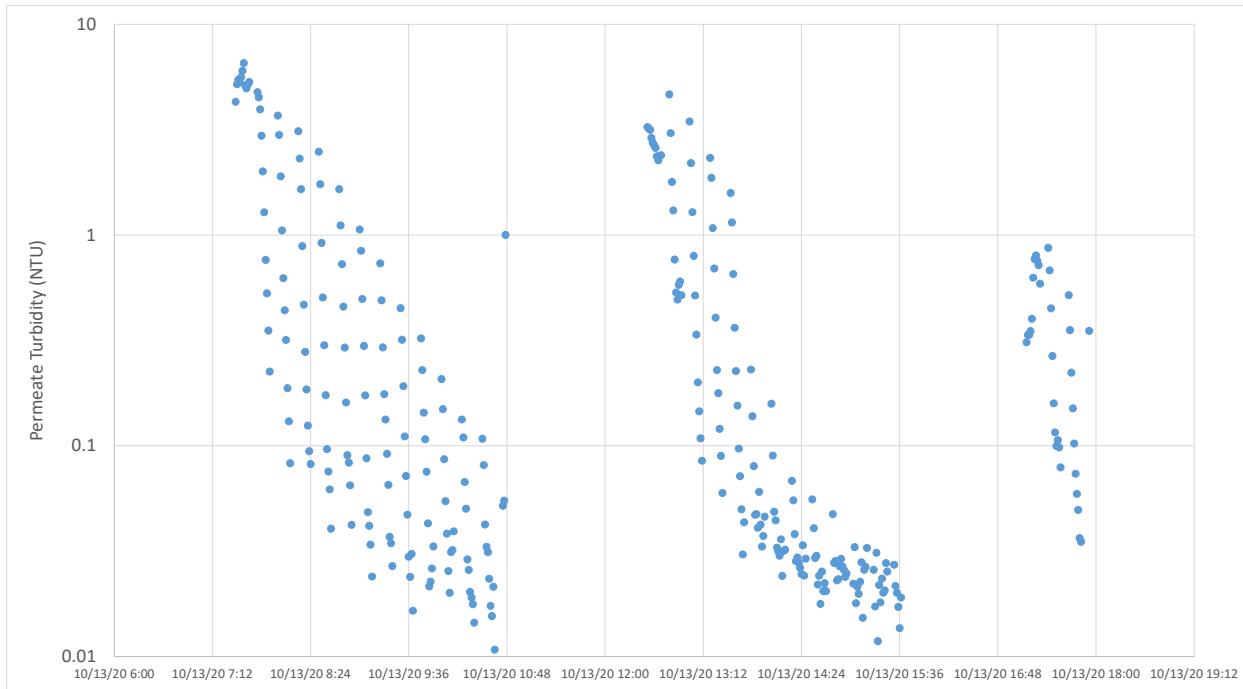


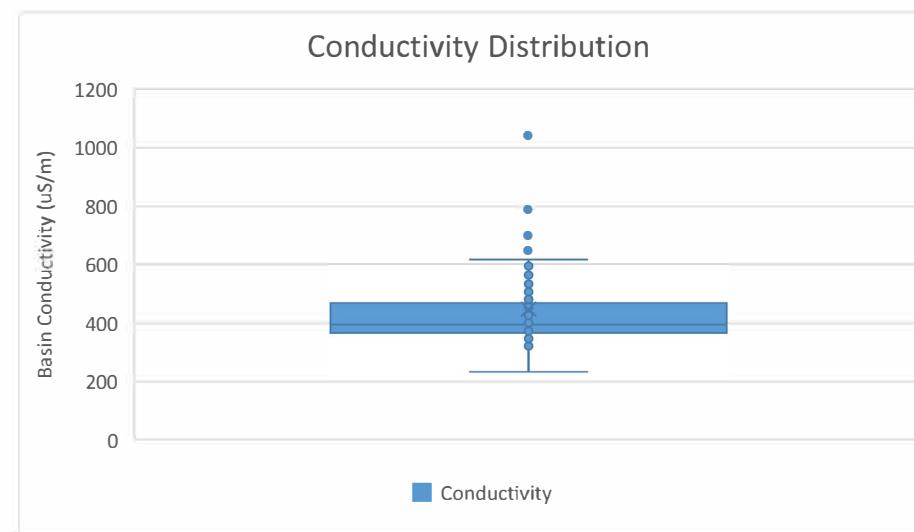
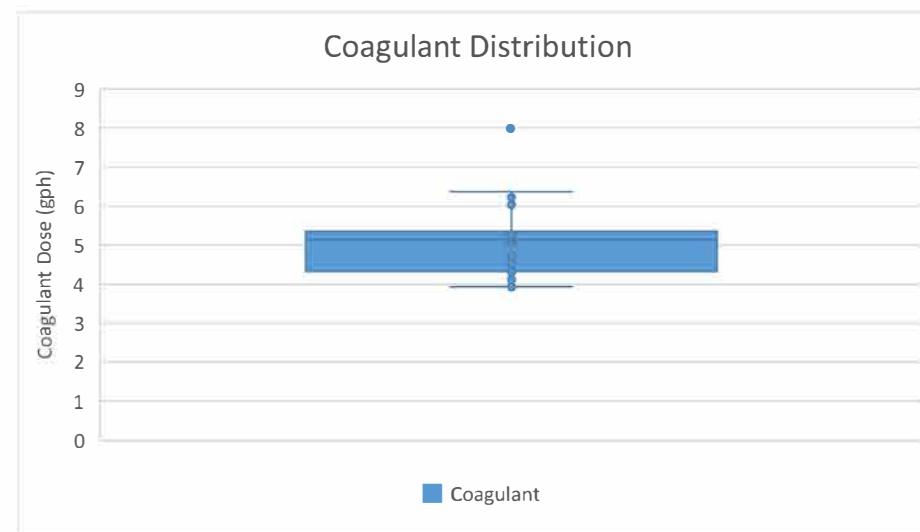
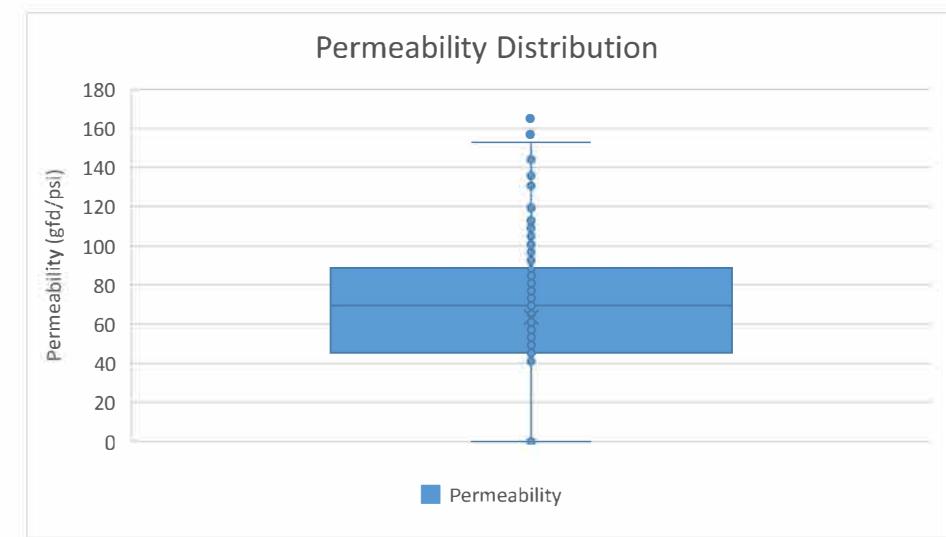
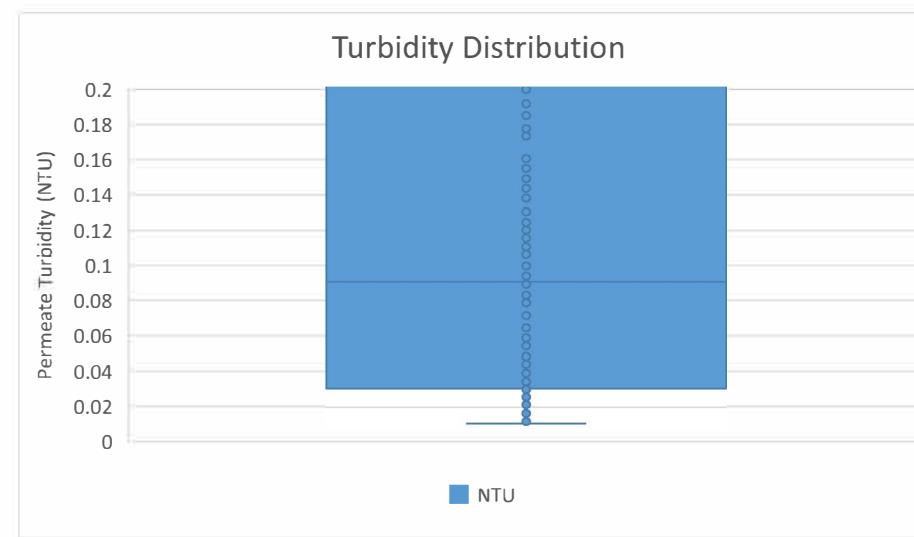
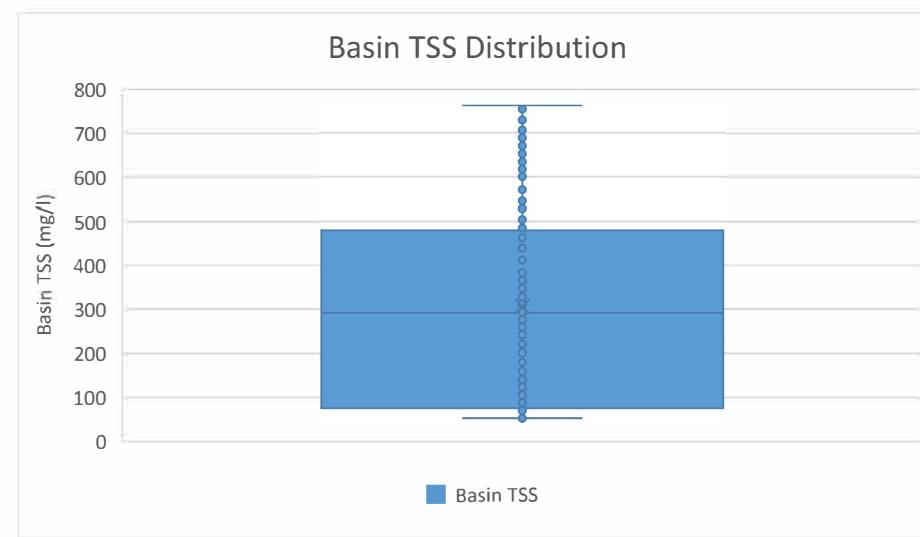
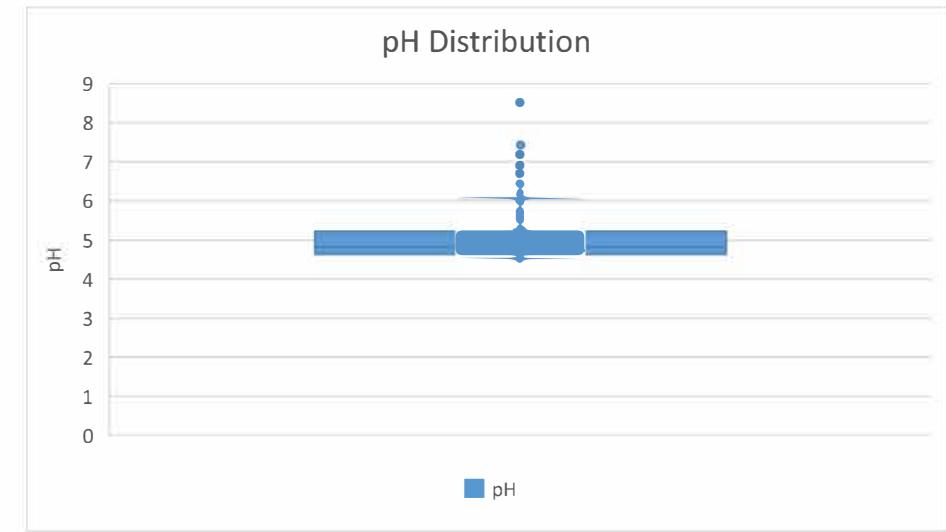
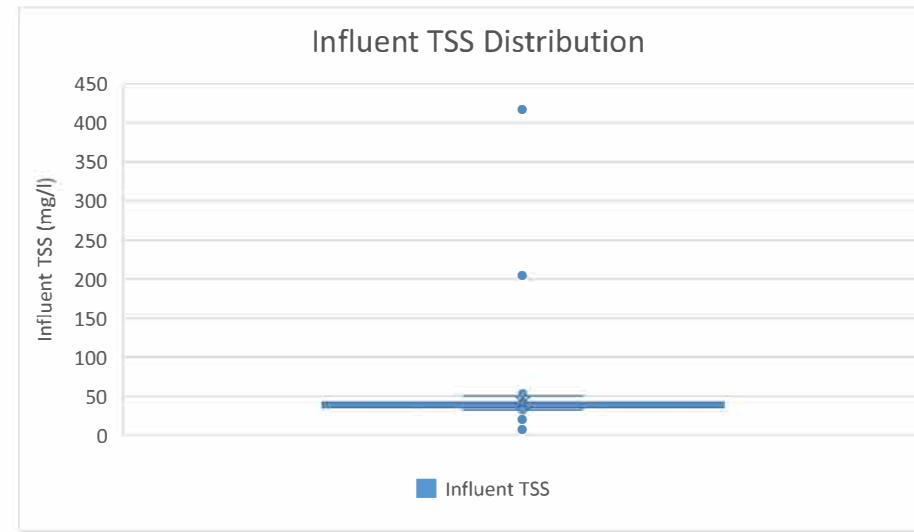
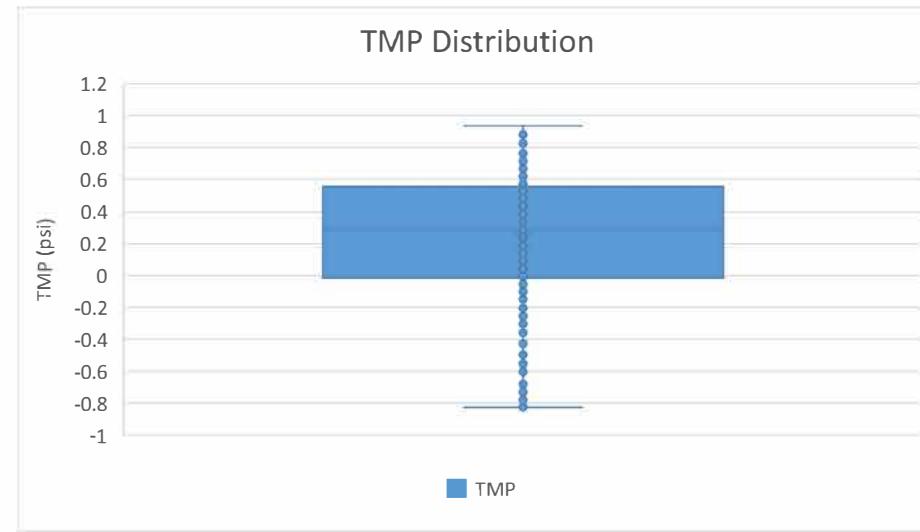












Run 8

10/13/2020

Date
10/13/2020

	Time	Location	pH	Temp,C	TDS, ppm	Cond
	10:35	Inf	6.62	15.4	161	202
	10:40	Tank	4.43	14.9	188	263
	10:45	Eff	4.47	14.9	199	281

OVIVO PILOT TESTING

WO # C165282

Day		# of samples	Sample Frequency	Tue			
Sample Date	Unit			10/13/2020			
S1-G	Military Time (hours)			1035			
TSS	mg/L	1	1/run	63			
VSS	mg/L	1	1/run	41			
tCOD	mg/L			106.5			
sCOD	mg/L			32			
BOD	mg/L			38			
Alkalinity	mg/L			60			
Fecal Coliform Sample ID				#1	#2		
Fecal Coliform Sample Time				1035 hrs	1458 hrs		
Fecal Coliform	MPN/100mL	2	2/run	460,000	3,300,000		
S1-C	Military Time (hours)						
TSS	mg/L	1	hourly	69			
VSS	mg/L	1	hourly	48			
Alkalinity	mg/L	1	hourly	82			
COD	mg/L	1	hourly	136			
BOD	mg/L	1	hourly	50			
S2-G	Military Time (hours)			1045			
TSS							
VSS							
Cl2 Demand	mg/L	1	1/run	0.789			
SS	mg/l	1	1/run	0			
Alkalinity	mg/L			3			
tCOD	mg/L			16			
sCOD	mg/L			18			
Fecal Coliform Sample ID				#1	#2	#3	#4
Fecal Coliform Sample Time				10/13 0820	1045 hrs	1315 hr	1400 hr
Fecal Coliform	MPN/100mL	4	4/run	0	0	0	0
S2-C	Military Time (hours)						
TSS	mg/L	1	hourly	1			
VSS	mg/L	1	hourly	1			
Alkalinity	mg/L	1	hourly	3			
UV Abs	cm ⁻¹	1	hourly	0.089			
BOD	mg/L	1	hourly	13			
S3-G	Military Time (hours)			1040			
TSS	mg/L	1	1/run	84			
VSS	mg/L	1	1/run	40			
Alkalinity	mg/L			4			
tCOD	mg/L	1	1/run	66.5			
sCOD	mg/L	1	1/run	22			
S3-G, Flow Box	Military Time (hours)						
TSS	mg/L	1	1/run				
VSS	mg/L	1	1/run				
Alkalinity	mg/L						
tCOD	mg/L	1	1/run				
sCOD	mg/L	1	1/run				

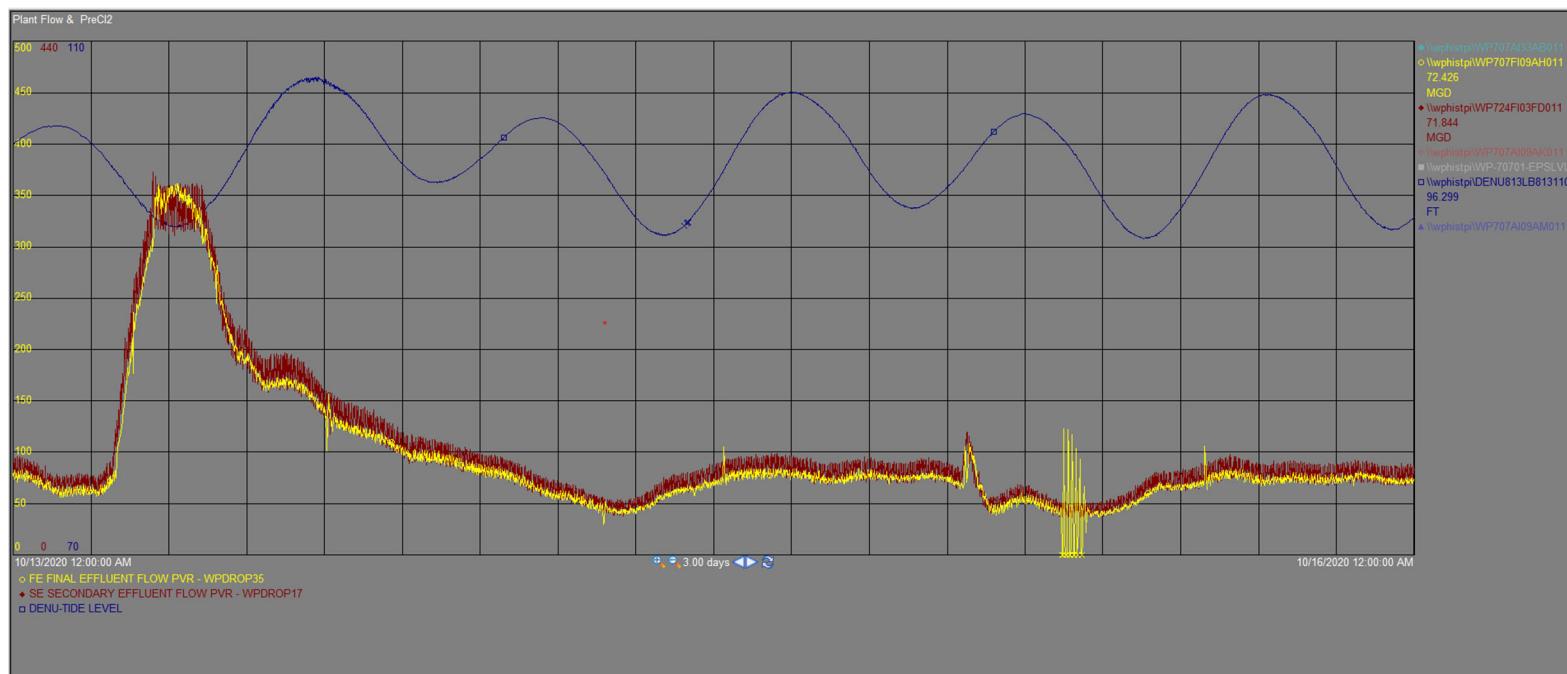
Weekly Check of online instruments

Date/Time/Initials							
Turbidity online reading							
Turbidity lab reading							
pH online reading							
pH lab reading							
Temperature online reading							
Temperature lab reading							
Conductivity							
Hypo Strength %							

Bottle Kit	Volume
FE grab	2L
FE Fecal	4 125-ml sterile
FE cl2	1L amber bottle
FE comp	4L
Inf grab	2L
Inf Fecal	2 125-ml sterile
Inf comp	2L
TNK	500mL

S1-G
S1-C
S2-G
S2-C
S3-G

Date	Time	Location	TOC (mg/L)
10/13/2020	8:15	Inf	14.3
	10:35	Inf	21.7
	13:01	Inf	29.7
	13:55	Inf	33.4
	17:05	Inf	44.5
	17:15	Eff	21.2



Sample Data

King County Environmental Lab Analytical Report

Project: 423650-100
 Locator: INF-SL
 Descrip: PILOT INFLUENT, IN
 Sample: L75620-1
 Matrix: LB INFLUENT
 ColDate: 10/13/20 8:15
WET Weight Basis

Project: 423650-100
 Locator: INF-SL
 Descrip: PILOT INFLUENT, IN
 Sample: L75620-2
 Matrix: LB INFLUENT
 ColDate: 10/13/20 10:35
WET Weight Basis

Project: 423650-100
 Locator: INF-SL
 Descrip: PILOT INFLUENT, IN
 Sample: L75620-3
 Matrix: LB INFLUENT
 ColDate: 10/13/20 13:10
WET Weight Basis

Parameters CV SM5310-B	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
Total Organic Carbon	14.3		2.5	5	mg/L	21.7		2.5	5	mg/L	29.7		2.5	5	mg/L

King County Environmental Lab Analytical Report

Project: 423650-100
 Locator: INF-SL
 Descrip: PILOT INFLUENT, IN
 Sample: L75620-4
 Matrix: LB INFLUENT
 ColDate: 10/13/20 13:55
WET Weight Basis

Project: 423650-100
 Locator: INF-SL
 Descrip: PILOT INFLUENT, IN
 Sample: L75620-9
 Matrix: LB INFLUENT
 ColDate: 10/13/20 17:05
WET Weight Basis

Project: 423650-100
 Locator: EFF-SL
 Descrip: PILOT MEMBRANE PER
 Sample: L75620-10
 Matrix: LA OTHR WTR
 ColDate: 10/13/20 17:15
WET Weight Basis

Parameters CV SM5310-B	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
Total Organic Carbon	33.4		2.5	5	mg/L	44.5		2.5	5	mg/L	21.2		2.5	5	mg/L

Quality Control Data

WG172726 Total Organic Carbon

Sample	Project	Project Description	List Type	Matrix	Collect Date	Prep Date	Anal Date	QC Association	Comments
L72347-1	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/20/2020 7:35	10/28/2020 0:33	10/28/2020 0:33		
L72347-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/20/2020 9:35	10/28/2020 0:41	10/28/2020 0:41		
L72347-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/20/2020 12:30	10/28/2020 0:49	10/28/2020 0:49		
L72347-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/20/2020 14:30	10/28/2020 0:57	10/28/2020 0:57		
L72347-5	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/20/2020 16:30	10/27/2020 21:57	10/27/2020 21:57		
L72347-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/20/2020 18:00	10/27/2020 21:49	10/27/2020 21:49		
L72347-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	OTHR WTR	10/20/2020 7:00	10/27/2020 19:43	10/27/2020 19:43		
L75598-3	421422-CFSW	SWD-CFSW Cedar Falls Surface Water Quarterly	CVTOC	FRESH WTR	10/26/2020 9:05	10/27/2020 18:42	10/27/2020 18:42		
L75620-1	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/13/2020 8:15	10/27/2020 21:42	10/27/2020 21:42		
L75620-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/13/2020 10:35	10/28/2020 1:05	10/28/2020 1:05		
L75620-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/13/2020 13:10	10/28/2020 1:15	10/28/2020 1:15		
L75620-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/13/2020 13:55	10/27/2020 22:45	10/27/2020 22:45		
L75620-9	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/13/2020 17:05	10/27/2020 22:52	10/27/2020 22:52		
L75620-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	OTHR WTR	10/13/2020 17:15	10/27/2020 20:44	10/27/2020 20:44		
L75631-4	421422-CHGW-OS	SWD-CHGW-OS Cedar Hills Groundwater Off-Site	CVTOC	GRND WTR	10/22/2020 8:57	10/27/2020 15:36	10/27/2020 15:36		
L75645-5	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	OTHR WTR	10/23/2020 9:20	10/27/2020 19:50	10/27/2020 19:50		
L75676-1	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/15/2020 8:30	10/27/2020 23:00	10/27/2020 23:00		
L75676-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/15/2020 11:30	10/27/2020 23:08	10/27/2020 23:08		
L75676-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/15/2020 14:00	10/27/2020 23:16	10/27/2020 23:16		
L75676-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/15/2020 16:30	10/27/2020 23:24	10/27/2020 23:24		
L75676-5	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/15/2020 20:00	10/27/2020 23:32	10/27/2020 23:32		
L75676-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/16/2020 0:30	10/27/2020 23:40	10/27/2020 23:40		
L75676-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/16/2020 4:00	10/27/2020 23:48	10/27/2020 23:48		
L75676-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFLUENT	10/16/2020 7:05	10/27/2020 23:57	10/27/2020 23:57		
L75676-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	OTHR WTR	10/15/2020 8:00	10/27/2020 20:52	10/27/2020 20:52		
L75685-5	421422-CHGW-APP3	SWD-CHGW-Appendix III GW Analyses	CVTOC	GRND WTR	10/22/2020 7:40	10/27/2020 15:43	10/27/2020 15:43		
L75691-1	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/22/2020 11:00	10/27/2020 15:50	10/27/2020 15:50		
L75691-3	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/22/2020 11:35	10/27/2020 16:53	10/27/2020 16:53		
L75691-4	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/22/2020 11:22	10/27/2020 16:59	10/27/2020 16:59		
L75691-5	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/22/2020 11:35	10/27/2020 16:46	10/27/2020 16:46		
L75691-6	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/23/2020 7:42	10/27/2020 17:12	10/27/2020 17:12		
L75691-7	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/23/2020 8:32	10/27/2020 17:23	10/27/2020 17:23		
L75691-8	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/26/2020 9:54	10/27/2020 17:52	10/27/2020 17:52		
L75691-9	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/23/2020 8:06	10/27/2020 17:32	10/27/2020 17:32		
L75691-10	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/23/2020 8:10	10/27/2020 17:38	10/27/2020 17:38		
L75691-11	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/23/2020 9:34	10/27/2020 17:45	10/27/2020 17:45		
L75692-1	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/26/2020 10:21	10/27/2020 17:59	10/27/2020 17:59		
L75692-3	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/26/2020 9:41	10/27/2020 18:49	10/27/2020 18:49		
L75692-4	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/26/2020 9:04	10/27/2020 19:00	10/27/2020 19:00		
WG172726-1	MDLCK		CVTOC	BLANK WTR	10/27/2020 14:51	10/27/2020 14:51			LEVEL1
WG172726-2	MB		CVTOC	BLANK WTR	10/27/2020 15:02	10/27/2020 15:02			MB1 10/27/20
WG172726-3	SB		CVTOC	BLANK WTR	10/27/2020 15:10	10/27/2020 15:10			WG172726-2
WG172726-4	LCS		CVTOC	BLANK WTR	10/27/2020 15:17	10/27/2020 15:17			LEVEL1
WG172726-5	LD		CVTOC	GRND WTR	10/27/2020 16:02	10/27/2020 16:02			L75691-1
WG172726-6	MS		CVTOC	GRND WTR	10/27/2020 16:10	10/27/2020 16:10			L75691-1
WG172726-7	LD		CVTOC	OTHR WTR	10/27/2020 19:58	10/27/2020 19:58			L75645-5
WG172726-8	MS		CVTOC	OTHR WTR	10/27/2020 20:06	10/27/2020 20:06			L75645-5
WG172726-9	MB		CVTOC	BLANK WTR	10/27/2020 21:06	10/27/2020 21:06			MB2 10/27/20
WG172726-10	SB		CVTOC	BLANK WTR	10/27/2020 21:16	10/27/2020 21:16			WG172726-9
WG172726-11	LCS		CVTOC	BLANK WTR	10/27/2020 21:23	10/27/2020 21:23			LEVEL1
WG172726-12	LD		CVTOC	INFLUENT	10/27/2020 22:05	10/27/2020 22:05			L72347-5
WG172726-13	MS		CVTOC	INFLUENT	10/27/2020 22:13	10/27/2020 22:13			L72347-5

WG172726-1,-2,-3,-4,-5,-6,-7,-8,-9,-10,-11,-12,-13

* End of L75620_56472_BATCH.xls

Workgroup: WG172726 Total Organic Carbon

MB:WG172726-2 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Method Blank)

Parameter MDL RDL Units MB Value Qual

Total Organic Carbon 0.5 1 mg/L <MDL

SB:WG172726-3 MB:WG172726-2 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Spike Blank, Method Blank)

Parameter MDL RDL Units MB Value True Value SB Value % Rec. Qual Lab Limit

Total Organic Carbon 0.5 1 mg/L <MDL 5 5.11 102 80-120

LCS:WG172726-4 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Lab Control Sample)

Parameter MDL RDL Units True Value LCS Value % Rec. Qual Lab Limit

Total Organic Carbon 0.5 1 mg/L 8 8.11 101 85-115

LD:WG172726-5 L75691-1 Matrix: GRND WTR Listtype:CVTOC Method:SM5310-B Project:421422-CFGW Pkey:STD

(Lab Duplicate)

Parameter MDL RDL Units SAMP Value LD Value RPD Qual Lab Limit

Total Organic Carbon 0.5 1 mg/L 1.11 1.28 14 0-20

MS:WG172726-6 L75691-1 Matrix: GRND WTR Listtype:CVTOC Method:SM5310-B Project:421422-CFGW Pkey:STD

(Matrix Spike)

Parameter MDL RDL Units SAMP Value True Value MS Value % Rec. Qual Lab Limit

Total Organic Carbon 0.5 1 mg/L 1.11 5 6.36 105 75-125

LD:WG172726-7 L75645-5 Matrix: OTHR WTR Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Lab Duplicate)

Parameter MDL RDL Units SAMP Value LD Value RPD Qual Lab Limit

Total Organic Carbon 2.5 5 mg/L 25.4 26.1 3 0-20

MS:WG172726-8 L75645-5 Matrix: OTHR WTR Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Matrix Spike)

Parameter MDL RDL Units SAMP Value True Value MS Value % Rec. Qual Lab Limit

Total Organic Carbon 2.5 5 mg/L 25.4 25 49.1 95 75-125

MB:WG172726-9 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Method Blank)

Parameter MDL RDL Units MB Value Qual

Total Organic Carbon 0.5 1 mg/L <MDL

SB:WG172726-10 MB:WG172726-9 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Spike Blank, Method Blank)

Parameter MDL RDL Units MB Value True Value SB Value % Rec. Qual Lab Limit

Total Organic Carbon 0.5 1 mg/L <MDL 5 5.02 100 80-120

LCS:WG172726-11 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Lab Control Sample)

Parameter MDL RDL Units True Value LCS Value % Rec. Qual Lab Limit

Total Organic Carbon 0.5 1 mg/L 8 7.73 97 85-115

LD:WG172726-12 L72347-5 Matrix: INFLUENT Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Lab Duplicate)

Parameter MDL RDL Units SAMP Value LD Value RPD Qual Lab Limit

Total Organic Carbon 2.5 5 mg/L 23.2 25.3 9 0-20

MS:WG172726-13 L72347-5 Matrix: INFLUENT Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Matrix Spike)

Parameter MDL RDL Units SAMP Value True Value MS Value % Rec. Qual Lab Limit

Total Organic Carbon 2.5 5 mg/L 23.2 25 45.7 90 75-125

Sample Receipt and Chain of Custody Records

Login: P75620

OVIVO Pilot Process Testing

TC: _____

Project: 423650-100

CHAIN OF CUSTODY

LPM: Ellen Sisk

Relinquished by <i>Jacqui Sykora-Pawlak</i>	Date Oct 14, 2020	Time 10/15
Received by <i>JR</i>	Date 10-14-20	Time 10/15
Sample Numbers		[All]

Sample Number	P75620-1	P75620-2	P75620-3
QC Link			
Locator	INF-SL	INF-SL	INF-SL
Short Loc Desc			
Locator Desc	PILOT INFLUENT, INFLOW PIPE	PILOT INFLUENT, INFLOW PIPE	PILOT INFLUENT, INFLOW PIPE
Site	WEST PT INPLANT	WEST PT INPLANT	WEST PT INPLANT
Comments	OVIVO pilot Influent prior to coagulant addition - grab	OVIVO pilot influent prior to coagulant addition - grab	OVIVO pilot influent prior to coagulant addition - grab
Start Date/Time	8/13/20 / 8:15	8/13/20, 10:35	8/13/20, 13:50
End Date/Time	10	10	10
Time Span			
Sample Depth			
SAMP INFO			
SAMPLE CODE			
Dept, Matrix, Prod	3 LB TOC	3 LB TOC	3 LB TOC

(1 / 4)

Login: P75620

OVIVO Pilot Process Testing

TC: _____

Project: 423650-100

LPM: Ellen Sisk

Sample Number	P75620-4	P75620-5	P75620-6
QC Link			
Locator	INF-SL	INF-SL	INF-SL
Short Loc Desc			
Locator Desc	PILOT INFLUENT, INFLOW PIPE	PILOT INFLUENT, INFLOW PIPE	PILOT INFLUENT, INFLOW PIPE
Site	WEST PT INPLANT	WEST PT INPLANT	WEST PT INPLANT
Comments	OVIVO pilot influent prior to coagulant addition - grab	OVIVO pilot influent prior to coagulant addition - grab	OVIVO pilot influent prior to coagulant addition - grab
Start Date/Time	10/13/20, 13:55		
End Date/Time			
Time Span			
Sample Depth			
SAMP INFO			
SAMPLE CODE			
Dept, Matrix, Prod	3 LB TOC	3 LB TOC	3 LB TOC

(2 / 4)

Login: P75620

OVIVO Pilot Process Testing

TC: _____

Project: 423650-100

LPM: Ellen Sisk

Sample Number	P75620-7	P75620-8	P75620-9
QC Link			
Locator	INF-SL	INF-SL	INF-SL
Short Loc Desc			
Locator Desc	PILOT INFLUENT, INFLOW PIPE	PILOT INFLUENT, INFLOW PIPE	PILOT INFLUENT, INFLOW PIPE
Site	WEST PT INPLANT	WEST PT INPLANT	WEST PT INPLANT
Comments	OVIVO pilot influent prior to coagulant addition - grab	OVIVO pilot influent prior to coagulant addition - grab	OVIVO pilot influent prior to coagulant addition - grab
Start Date/Time			10/13 , 17:05
End Date/Time			
Time Span			
Sample Depth			
SAMP INFO			
SAMPLE CODE			
Dept, Matrix, Prod	3 LB TOC	3 LB TOC	3 LB TOC

Login: P75620

OVIVO Pilot Process Testing

TC: _____

Project: 423650-100

LPM: Ellen Sisk

Sample Number	P75620-10		
QC Link			
Locator	EFF-SL		
Short Loc Desc			
Locator Desc	PILOT MEMBRANE PERMEATE		
Site	WEST PT INPLANT		
Comments	OVIVO pilot influent prior to coagulant addition - composite	OVIVO pilot membrane permeate - composite	
Start Date/Time	10/13 14:15		
End Date/Time			
Time Span			
Sample Depth			
SAMP INFO			
SAMPLE CODE			
Dept, Matrix, Prod	3 LA TOC		

(4 / 4)

LIQUID SAMPLE RECEIPT RECORD

Login Number(s): <u>75620-1149,10</u>		Project No.: <u>423650-100</u>	Sub-Contracting: <u>Y / N</u>	List Product(s):					
Collect Date(s): <u>10-13-20</u>		Receive Date: <u>10-13-20</u>	Changes: <u>Y / N</u>	List Parameter(s):					
SAMPLE RECEIPT CONDITIONS						FIELD PRESERVATION CHECKLIST (Circle and/or check applicable selections)			
CONDITION	Acceptable?	Comment ID	CONDITION	Acceptable?	Comment ID	PRODUCT / Preservation	SM Action	Acceptable?	Corrective Action
Labels / Fieldsheets	<input checked="" type="checkbox"/> Y / N		Volumes	<input checked="" type="checkbox"/> Y / N		BNA / pH 6 - 9 w/ H ₂ SO ₄ or NaOH	✓ field sheet for F. pH	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Notify ORG
Container	<input checked="" type="checkbox"/> Y / N	(1)	Holding Times	<input checked="" type="checkbox"/> Y / N		CN / pH > 12 w/ NaOH within 15 min	<input type="checkbox"/> Check pH	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Deliver to CONV
Temperature (w/Ice)	<input checked="" type="checkbox"/> Y / N / NA		Delivery Location	<input checked="" type="checkbox"/> Y / N		NO23 pH < 2 w/ H ₂ SO ₄	<input type="checkbox"/> Check pH	<input checked="" type="checkbox"/> Y / N / NA	<input type="checkbox"/> Preserve by SM
BOTTLE COUNT (#) AND DESCRIPTION AND SAMPLE NUMBERS						CR(VI) / TOTCR(VI) / pH 9.3 - 9.7 w/ NaOH w/in 15 min	✓ field sheet for pH	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Deliver to CONV
#	Bottle Description: Sample Numbers					ICP / HG-CVAA-M / pH < 2 w/ HNO ₃	<input type="checkbox"/> Check pH	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Preserve By SM
5	40 mL clear vial (VOA): W/H ₂ SO ₄ : 1-4, 9					O&G / HEM / PHENOL / pH < 2 w/ H ₂ SO ₄	Check documentation	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Preserve by SM
						PHYTOPLANKTON / Lugols	Visually inspect	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Deliver to MICRO
						TKN / COD / pH < 2 w/ H ₂ SO ₄ within 15 min	<input type="checkbox"/> Check pH	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Preserve By SM
						TOC / pH < 2 w/ H ₃ PO ₄ (NPOES only)	<input checked="" type="checkbox"/> Check pH	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Preserve By SM
						TOTSULFIDE / pH > 9 w/ NaOH, ZnAc	Check documentation	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Deliver to CONV
						WOO / FIXEO	Visually inspect	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Deliver to CONV
						Other:			
ROUTINE SM PRESERVATION CHECKLIST (Circle and/or check applicable selections)									
PRODUCT / Preservation	SM Action	Acceptable?	Corrective Action						
Chlorinated Pesticides / pH 5 - 9 w/ H ₂ SO ₄ or NaOH	✓ field sheet for F. pH	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Adjust pH						
HG-CVAA-L-Teflon (T / D) / pH < 2 w/ ULTRA HCl	<input type="checkbox"/> Preserve & deliver	<input checked="" type="checkbox"/> NA	<input type="checkbox"/> NA						
ICP / HG-CVAA-M (T / D) / pH < 2 w/ ULTRA HNO ₃	<input type="checkbox"/> Preserve & deliver	<input checked="" type="checkbox"/> NA	<input type="checkbox"/> NA						
ICPMs (T / D) / pH < 2 w/ ULTRA HNO ₃	<input type="checkbox"/> Preserve & deliver	<input checked="" type="checkbox"/> NA	<input type="checkbox"/> NA						
TOC / pH < 2 w/ H ₃ PO ₄	<input type="checkbox"/> Preserve & deliver	<input checked="" type="checkbox"/> NA	<input type="checkbox"/> NA						
Other:									
INTERFERENCE TEST (Circle and/or check applicable selections)									
Product / Interference (SM Action)	Positive Test?	Treated	Corrective Action						
BNA / Chlorine (Check documentation)	<input checked="" type="checkbox"/> Y / N / not tested	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Deliver to ORG						
CN / Chlorine (Check documentation)	<input checked="" type="checkbox"/> Y / N / not tested	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Deliver to CONV						
CN / Sulfide (Check field sheet for OF)	<input checked="" type="checkbox"/> Y / N / not tested	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Deliver to CONV						
VOA / Chlorine (Check documentation)	<input checked="" type="checkbox"/> Y / N / not tested	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Deliver to ORG						
Other:									
HEADSPACE CHECK									
PRODUCT (SM Action)	Check For	Acceptable?	Corrective Action						
MICRO (Visually inspect)	Headspace (@ 1")	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Notify MICRO						
TOTSULFIDE (Visually inspect)	Headspace (< 1")	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Notify CONV						
VOA (Visually Inspect)	Zero headspace	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Notify ORG						
WDO (Visually inspect)	Zero headspace	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Notify CONV						
Other:									
FIELD FILTRATION CHECKLIST (Circle and/or check applicable selections)									
Product (SM Action)	Field Filtered	Field Blank	Corrective Action						
ORTHOP (Check FieldSheet)	Y (within 15 min y / n) / N	<input checked="" type="checkbox"/> Y / N	<input type="checkbox"/> Deliver to CONV						
NO2 / NO3 / NO23 / NH3 / Si (Documentation)	Y (within 1 day y / n) / N	<input checked="" type="checkbox"/> Y / N / NA	<input type="checkbox"/> Deliver to CONV						
Dissolved Metals (Check Field Sheet)	Y (within 15 min y / n) / N	<input checked="" type="checkbox"/> Y / N / NA	<input type="checkbox"/> Deliver to METALS						
OOC (Deliver / Notify Unit)	Y (within 15 min or 1 day) / N	<input checked="" type="checkbox"/> Y / N / NA	<input type="checkbox"/> Deliver to CONV						
DCOD / CR(VI) (Deliver / Notify Unit)	Y (within 15 min y / n) / N	<input checked="" type="checkbox"/> Y / N / NA	<input type="checkbox"/> Deliver to CONV						
Other:									

CC: AQUATOX, CONV, METALS, MICRO, ORG,

- NOTES**
- 1. Deliver dissolved Hg-CVAF samples to METALS for filtration.
 - 2. Deliver double-bagged metals samples to METALS for preservation.
 - 3. Do not test pH for preserved BNA and TOTSULFIDE samples.
 - 4. Deliver pH, WDO, and all MICRO samples ASAP to appropriate section for immediate processing.
 - 5. Enter "Time Span" for composite samples during sample login.
 - 6. Split algae sample into 60 mL clear glass if PHYTOQUAL is requested.

DATE 10-13-2020

SM Signature:

Appendix C

Appendix B.9

Test Run Package 09

Run# 9

Run Description Confirm performance with variable flux and water quality

Type	<input checked="" type="checkbox"/> process	<input type="checkbox"/> Performance
Influent water source	<input checked="" type="checkbox"/> PE	
	<input checked="" type="checkbox"/> Hydrant	
	<input checked="" type="checkbox"/> Both	

Flux rate	<input type="checkbox"/> Constant	<input checked="" type="checkbox"/> Varies
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Wasting Rate	0
Air Scour	105 scfm
Backwash Frequency	15 min
Run Duration	24 Hrs
CIP	<input checked="" type="checkbox"/> Hypo <input type="checkbox"/> Caustic <input type="checkbox"/> Citric
Composite Sample Schedule	24 Samples, 1 hour apart, 200 mL each 4.8 L total volume

*Until after the peak flux, dilute PE with hydrant water so that the influent TSS is approximately half that of pure PE

Date

Event	Day	Time Hr	PE gpm	Hydrant gpm	Coag Dose Al:TSS ratio	Flux Rate gfd	Event/Action	Influent		Effluent		Membrane Tank		Comments
								Grab / Probe	Note	Grab / Probe	Note	Grab / Probe	Note	
0		7:00	100*	100*	0.6		Start Flow to pilot							
1		7:30				50	Start producing effluent							
2		8:00					Start Composite Samplers							
3		8:30					Influent Sample	KCEL: TOC						
4		8:35					Effluent Sample			WPP: Fecal				
5		11:30					Influent Sample	Field: Full Set WPP: Full Set KCEL: TOC						
6		11:35					Tank Sample					Field: Full Set WPP: Full Set		
7		11:40					Effluent Sample			Field: Full Set WPP: Full Set				
8		14:00					Influent Sample	KCEL: TOC						
9		14:05					Effluent Sample			WPP: Fecal				
10		14:30				75	Change flux rate							
11		16:30					Influent Sample	KCEL: TOC						
13		17:00				100	Change flux rate							
14		18:00				150	Take 1 stack offline Change flux							
18		18:30				200	Take additional stack offline Change flux							
19		20:00					Influent Sample	KCEL: TOC						
20		20:30				150	Return 1 stack to operation Change flux							
21		21:00	200	0		100	All stacks in operation Change flux, stop dilution							
22		22:00				75	Change flux							
23	2	0:00					Influent Sample	KCEL: TOC						
24		0:30				50	Change flux							
25		4:00					Influent Sample	KCEL: TOC						
26		7:00					Influent Sample	WPP: Fecal KCEL: TOC						
27		7:05					Effluent Sample			WPP: Fecal				
28		7:30					Stop producing effluent							

200 gpm
100 gfd100
150

Field
Eff
Turbidity
Probe reading
pH
Temperature
Conductivity

WPPLsamples
Influent composite
Effluent composite
-TSS/VSS, Alk, BOD
Influent grab
TSS/VSS
Fecal
Effluent grab
TSS/VSS
Chlorine demand
Fecal
Settleable solids
Tank grab
TSS/VSS

KCEL
Influent grab
TOC
Effluent composite
TOC

C

u k h

OVIVO Pilot Setpoints Values to be set according to OVIVO's recommendations.

Run# <u>9</u>		Date	FLOW OPTIMIZATION						CHEM DOSING					
System		ONLINE/OFFLINE	Permeate						End of Event					
Inlet System			Permeate Flow	206	gpm				End Cycle					Coagulant
Screen Off Delay		2 min	Pump Start Level	116	in				End of Cycle					Pump Start Inf Flow
Weir Gate Frequency		1800 min	Pump Stop Level	5	in				Hypochlorite CIP					Pump Start Level
Weir Gate Duration		30 sec	Pump Stop Low Level	100	in				End of Cycle					Overflow Level
Blowers			Single Pump Flow	220	gpm				Citric CIP					Coagulant Min Flow
Scour Air Flow		105 scfm	Backwash Frequency	15	min				End of Cycle					Coagulant Max Flow
Blower Start Level		20 in	Backwash Flow	300	%				Hypo + Caustic CIP					Coag Fixed Flow
Blower Stop Level		8 in	Pre BW Relaxation	30	sec				End of Cycle					Coag TSS Ratio
Lag Blower Start Level		65 %	Backwash Duration	60	sec				Caustic CIP					Coag Al%
Lag Blower Start Delay		120 sec	Post BW Relax Duration	30	sec				End of Event Drain Lvl	5 in				Coag SG
Blower Fail Air Flow		4.5 scfm	Perm Static Pressure	1.7	psi				End of Event Dly	20 sec				Coag Flow Ratio
Blower Fail Delay		140 sec	Turbidity Hi Alarm SP	10	NTU									Coag Fill Flow
Low Air Flow Alarm		55 %	TMP Hi Alarm SP	8	psi									
Low Air Flow Delay		45 sec	Backwash Start TMP	10	psi									
Override Enabled			Max Hi TMP Cycles	1										
TMP Reset														
			Perm Tank Level Lo	20	in									Coagulant Dosing Mode Select
			Air Extractor Frequency	5	min									Fixed Flow
			Air Extractor Duration	4	min									TSS
Membrane Basin Drain Vlv														Perm Flow
			WAS Vlv Open TSS	6,000	mg/l									
			WAS Vlv Close Lvl	117	in									
			WAS Valve Duration	0	sec									
Sodium Hypochlorite			Citric Acid						Caustic					
CIP Permeate Flow		100 gpm	CIP Permeate Flow	100	gpm				CIP Permeate Flow	100	gpm			
Backwash Perm Flow		200 gpm	Backwash Perm Flow	200	gpm				Backwash Perm Flow	100	gpm			
Hypochlorite Flow		100 gph	Citric Flow	28	gph				Caustic Flow	50	gph			
Pre CIP Relax Duration		30 sec	Pre CIP Relax Duration	30	sec				Pre CIP Relax Duration	30	sec			
Chem Flow Duration		10 min	Chem Flow Duration	10	min				Chem Flow Duration	10	min			
Soak Duration		999 min	Soak Duration	999	min				Soak Duration	999	min			
Rinse Duration		60 sec	Rinse Duration	60	sec				Rinse Duration	60	sec			
Final Relax Duration		60 sec	Final Relax Duration	60	sec				Final Relax Duration	60	sec			
Pre-Drain Disabled							Pre-Drain Disabled							Pre-Drain Disabled

King County Ovivo Pilot

Run # **9**
Date **10/15/2020**

membrane
surface area per stack = **975 sf**

Influent flow = PE + hyd (gpm)	Test Variables			Calculated		Test Plan	
	permeate flow setpt (gpm)	stacks in service (#)	surface area in service (sf)	instantaneous flux (GFD)	Flux Goal (GFD)	Start Time	Stop Time
100 + 100	102	3	2,925	50	50	7:00	14:30
	153	3	2,925	75	75	14:30	17:00
	204	3	2,925	100	100	17:00	18:00
	203	2	1,950	150	150	18:00	18:30
	204	1	975	301	200	18:30	20:30
	203	2	1,950	150	150	20:30	21:00
200 + 0	204	3	2,925	100	100	21:00	22:00
	153	3	2,925	75	75	22:00	0:30
	102	3	2,925	50	50	0:30	7:30

Notes:

Switch stacks online setting under Ovivo tab on HMI.

Daily Field Notes

Run

9

Cond

Process and Performance Testing

Date	Time	Observation	Action Item
whs	0705	Started hydrant water to pilot (setting @ 100 gpm)	
	0709	3 manual wipers of influent TSS probe (want to observe TSS in hyd water < 10 mg/l) *	
	0713	PE feed pump started and valve 100% open resulting in tidal flow to pilot ~ 220 gpm	need to check
	0731	Adjust permeate flow setpt 206 → 102 gpm (± 6%)	TSS probe cal
	11:30	foaming on top, but less than other tests.	
	16:30	foaming in the membrane tank, not but not overflowing.	
	21:00	Water down minimal foam (still running dilution water) Steaming shortly	
	21:02	Scoured hydrant water	
	21:30 -	- some surface foaming, no dense foam but only ~ half way to top of tank	
	21:34 -	stopped the pilot, initiated CJP	

OVIVO Pilot Setpoints Values to be set according to OVIVO's recommendations.

Run#

Date

FLOW OPTIMIZATION

FLOW OPTIMIZATION							CHEM DOSING				
System	ONLINE/OFFLINE		Permeate	206	gpm	End of Event	Coagulant	Pump Start Inf Flow	1	gpm	
Inlet System			Pump Start Level	116	in		Pump Start Level	0.1	in		
Screen Off Delay	2	min	Pump Stop Level	5	in		Overflow Level	118	in		
Weir Gate Frequency	1800	min	Pump Stop Low Level	100	in	End of Cycle	Coagulant Min Flow	0.5	gph		
Weir Gate Duration	30	sec	Single Pump Flow	220	gpm	Hypochlorite CIP	Coagulant Max Flow	20	gph		
Blowers			Backwash Frequency	15	min		Coag Fixed Flow	6.0	gph		
Scour Air Flow	105	scfm	Backwash Flow	300	%	End of Cycle	Coag TSS Ratio	0.40			
Blower Start Level	20	in	Pre BW Relaxation	30	sec	Citric CIP	Coag Al%	4.1	%		
Blower Stop Level	8	in	Backwash Duration	60	sec		Coag SG	1.34			
Lag Blower Start Level	65	%	Post BW Relax Duration	30	sec	End of Cycle	Coag Flow Ratio	5			
Lag Blower Start Delay	120	sec	Perm Static Pressure	1.7	psi	Hypo + Caustic CIP	Coag Fill Flow	8	gph		
Blower Fail Air Flow	4.5	scfm	Turbidity Hi Alarm SP	10	NTU		Coagulant Dosing Mode Select				
Blower Fail Delay	140	sec	TMP Hi Alarm SP	8	psi	End of Cycle	Fixed Flow				
Low Air Flow Alarm	55	%	Backwash Start TMP	10	psi	Caustic CIP	TSS				
Low Air Flow Delay	45	sec	Max Hi TMP Cycles	1			Perm Flow				
Override Enabled											
Sodium Hypochlorite			TMP Reset								
CIP Permeate Flow	100	gpm	Perm Tank Level Lo		20	in	End of Event Drain Lvl	5	in		
Backwash Perm Flow	200	gpm	Air Extractor Frequency		5	min	End of Event Dly	20	sec		
Hypochlorite Flow	100	gph	Air Extractor Duration		4	min					
Pre CIP Relax Duration	30	sec					Membrane Basin Drain Vlv				
Chem Flow Duration	10	min					WAS Vlv Open TSS	6,000	mg/l		
Soak Duration	999	min					WAS Vlv Close Lvl	117	in		
Rinse Duration	60	sec					WAS Valve Duration	0	sec		
Final Relax Duration	60	sec									
Pre-Drain Disabled											
Pre-Drain Disabled											
Pre-Drain Disabled											

Appendix C

5

Test Run Package 09

Run #9
10/15/2020

SOP OVIVO PILOT

STARTING PROCEDURE

1. Inform WTP Main Control and inquire if there is any issue that would preventing the operation.
2. Contact shift crew to arrange for after hour sampling.
3. Obtain operating parameters and sampling schedule from the test package.
4. If dilution water is required:
 - a. Contact Facility Service to charge the water hydrant.
 - b. Hydrant needs to be secured by 18:00 hrs.
5. Log in. User name = h, password = h. *2100*
6. Drain the pilot.
 - a. Drain membrane tank by opening the drain valve from control screen.
 - b. Drain permeate tank by opening the drain valve manually.
7. Check chemical tanks.
 - a. Caustic - transfer of metering pump suction.
 - b. Sodium Hypochlorite – transfer of metering pump suction. (16 gal per run)
 - c. Alum – transfer of totes.
 - d. Contact Facility Services for support moving chemicals.
8. Prime coagulant pump- only if switch to a new tank.
 - Press "Prim 60 sec"
9. Adjust caustic addition valve to RUN position.
10. Go to MAIN SCREEN and verify that all pumps, except for alkalinity, are in AUTO
11. Set operating parameters in the following screen.
 - a. Select FLOW OPTIMIZATION screen
 - b. Verify that system is ~~offline~~*online*
 - c. Set parameters according to the test plan.
12. Select chemical dosing strategy and set the parameters.
13. Select ALARM. There are certain erroneous alarms that needs to be acknowledged to reset.
14. Select FLOW OPTIMIZATION screen and put the system ONLINE.
15. Turn on PE at the panel by the primary bldg.
 - a. Turn the switch to HAND
 - b. Press START
 - c. Open the PE hand valve completely.
16. Monitor and confirm the increasing tank level.
 - a. Weir gate XVCS-101 is open, once the tank level is 0.1 in., this weir gate will close and the coagulant pump will start.
17. Once coagulant pump start, start caustic pump manually.
 - a. Select PMP-AK 101 (alkalinity addition pump)
 - b. Adjust the pump speed to the target flowrate. 4% = 1.9 gph.
 - c. Verify the flowrate on the pump local display.
18. Monitor and confirm:
 - a. Air blower starts once the tank is at 20 in.
 - b. Permeate pump starts at 116 in.

Setting up with hydrant dilution water per test package.

- c. Confirm that there are sufficient flow through sampling buckets.
19. Open the valve to effluent turbidimeter.
20. Setup auto sampler on influent and effluent.
- Open valves to get flow through sampling buckets.
21. Allow the system to run for at least 1 full cycle to prior to data & sample collection. Refer to run guidance document on sampling starting time.
22. Start sample collection

SHUTDOWN & CIP PROCEDURE

- 10/16 ✓ 1. Check the hypo and caustic levels. Each cleaning cycle require 12 gal.
- ✓ 2. Close sampling valves, turbidimeter valves.
- ✓ 3. Switch alkalinity pump from manual to auto.
- ✓ 4. Prime hypochlorite pump.
- ✓ 5. Switch caustic addition valve position from RUN to CIP position.
- ✓ 6. Go to CIP screen to check the CIP parameters. If CIP is initiated from this screen, the system will go back into filtration once the CIP is completed (as long as the feed pump is on).
- ✓ 7. Wait for pump priming to finish.
- ✓ 8. Got to Flow Optimization screen and select "End of cycle".
 - If the pilot stopped/standby due to high TMP, press TMP reset, and the CIP will start.
- ✓ 9. Verify that the hypochlorite pump & caustic pumps are on.
- ✓ 10. Turn the feed off at the PE panel
 - a. Press STOP
 - b. Turn the switch to OFF
 - c. Close the manual valve
11. Spray down the membrane tank to remove foam and scum.
12. Log out.

King County Ovivo Pilot

Run #

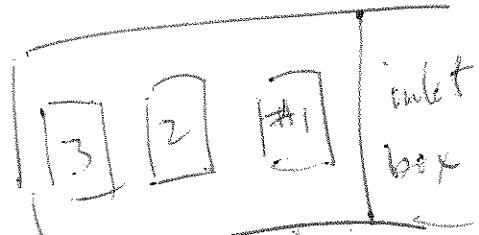
9

Date

10/15/2020

membrane
surface area per stack =

975 sf



Stack config

07:51 ✓

Influent flow = PE + hyd (gpm)	Test Variables		Calculated		Test Plan		
	permeate flow setpt (gpm)	stacks in service (#)	surface area in service (sf)	instantaneous flux (GFD)	Flux Goal (GFD)	Start Time	Stop Time
100 + 100	102	3	2,925	50	50	7:00	14:30
	153	3	2,925	75	75	14:30	13:30
	204	3	2,925	100	100	17:00	18:00
	203	2	1,950	150	150	18:00	18:30
	136	1	975	201	200	18:30	20:30
	203	2	1,950	150	150	20:30	21:00
200 + 0 203 hrs	204	3	2,925	100	100	21:00	22:00
	153	3	2,925	75	75	22:00	0:30
	102	3	2,925	50	50	0:30	7:30

Notes:

Switch stacks online setting under Ovivo tab on HMI.



17:00
stack #1 offline
stacks 1 & 2 online
stack 1 offline

OVIVO PILOT
Process and Performance Test # 9
10/15/2020

Overnight Procedure

(At 22:00 hours) Decrease Permeate Flow Setting per the following steps.

1. Log in to HMI - User name = h, password = h
2. Go to FLOW OPTIMIZATION screen
3. Adjust Permeate Flow setting from 204 to 153 gpm.

(At 00:30 hours) Decrease Permeate Flow Setting per the following steps.

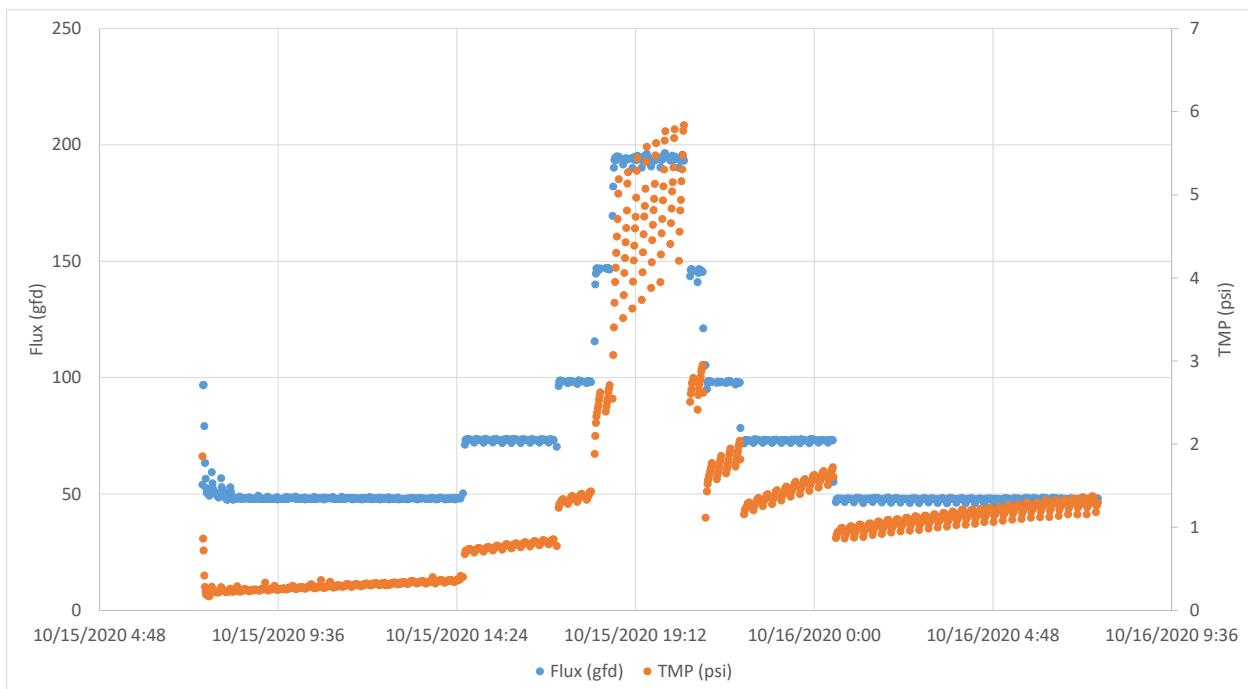
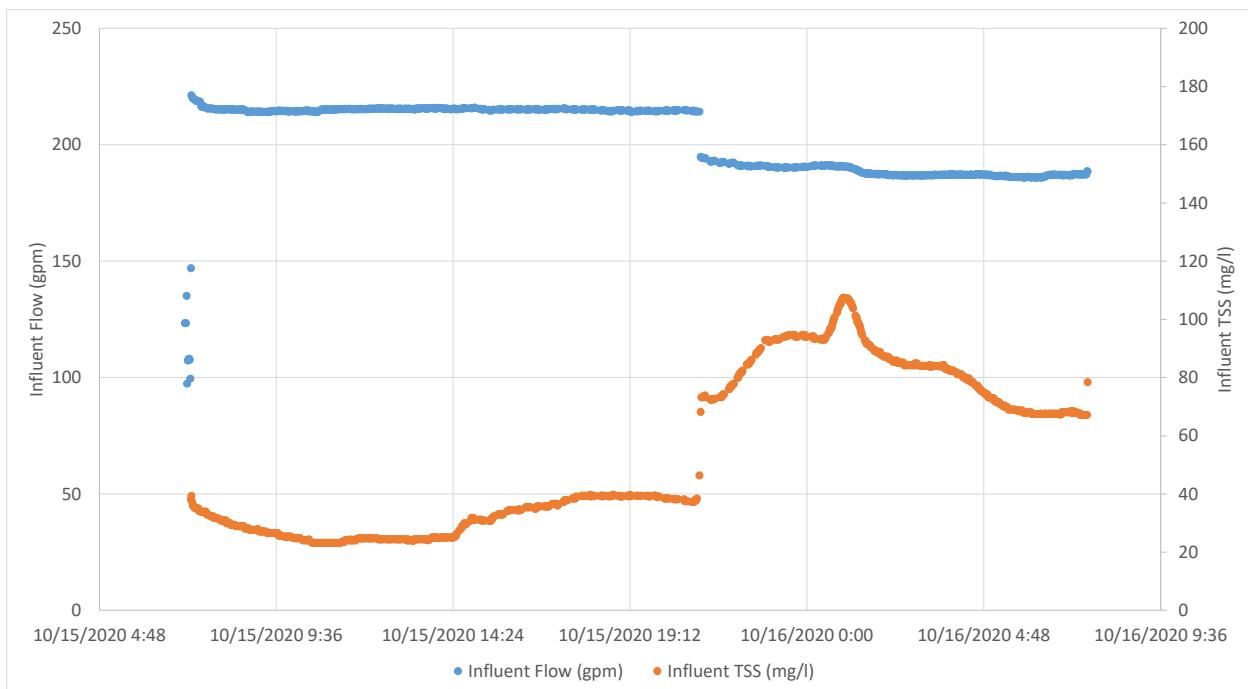
4. Log in to HMI - User name = h, password = h
5. Go to FLOW OPTIMIZATION screen
6. Adjust Permeate Flow setting from 153 to 102 gpm.

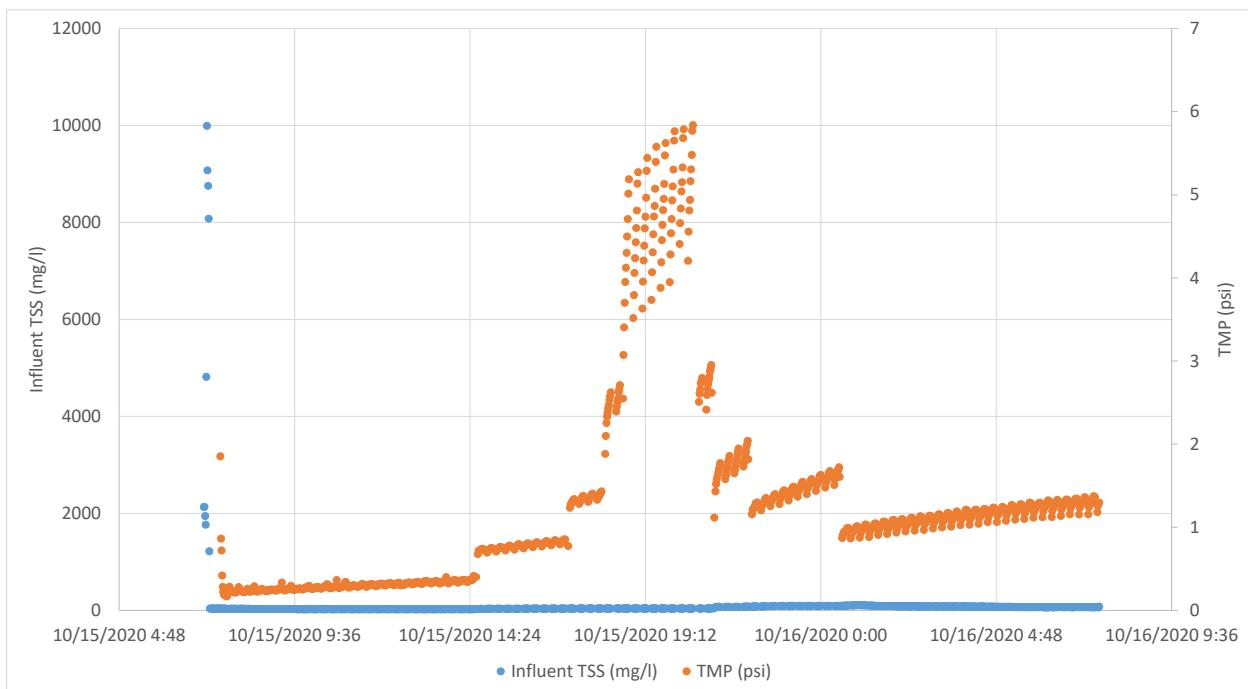
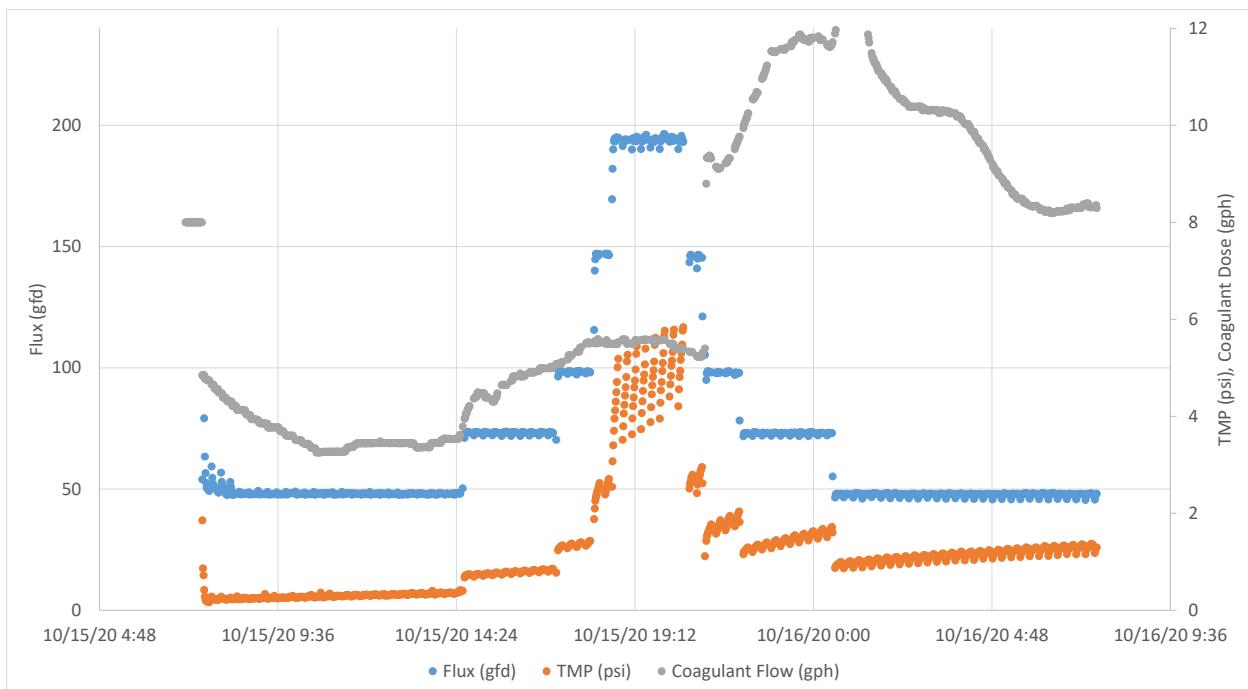
(At 00:30 hours) Collect TOC sample from influent stilling well (sample vial -6) and store in effluent sampler refrigerator.

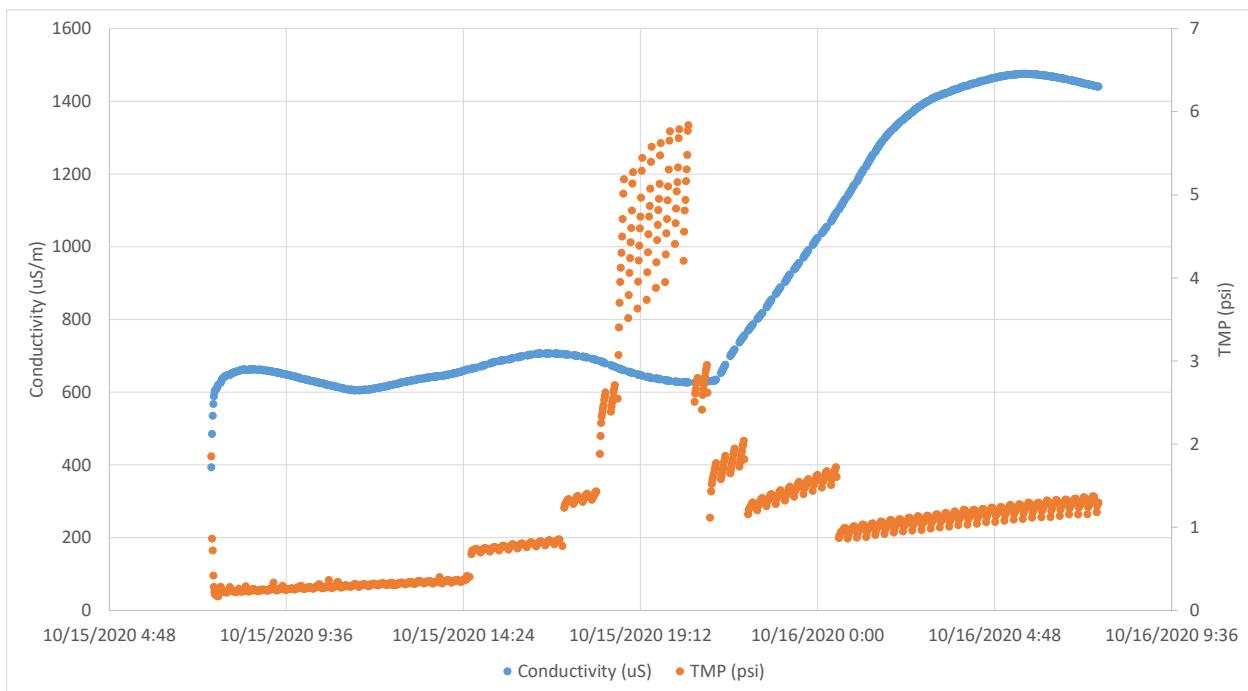
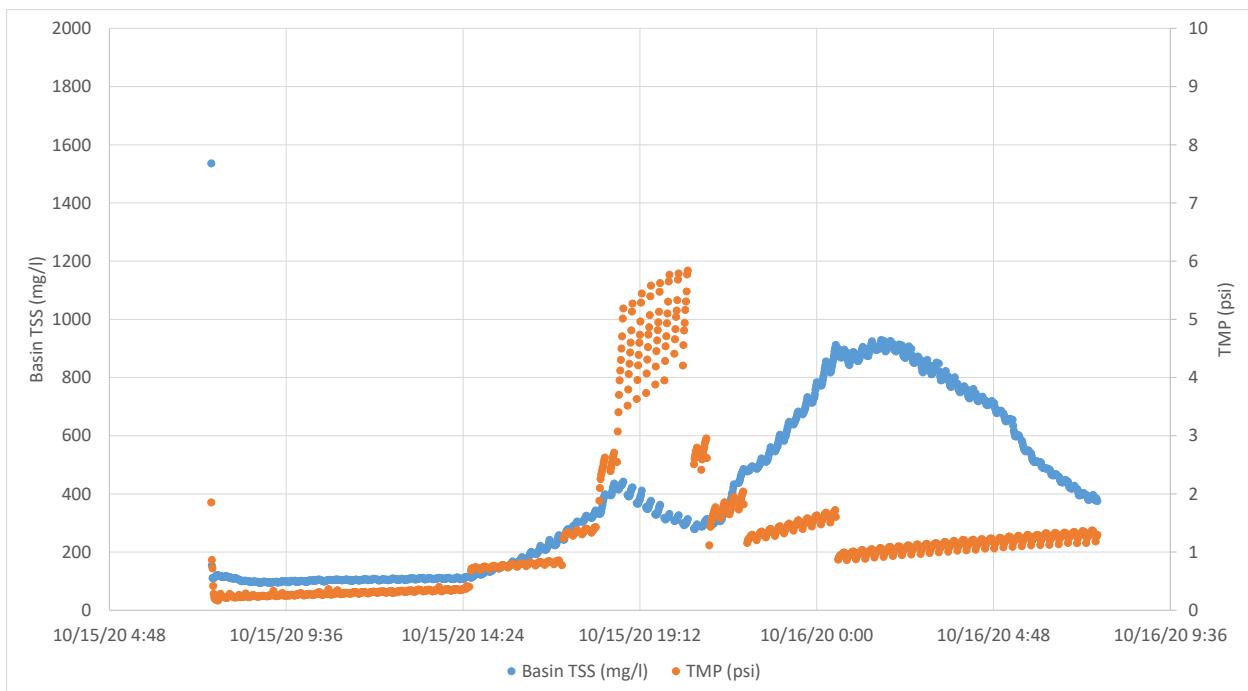
(At 04:00 hours) Collect TOC sample from influent stilling well (sample vial -7) and store in effluent sampler refrigerator.

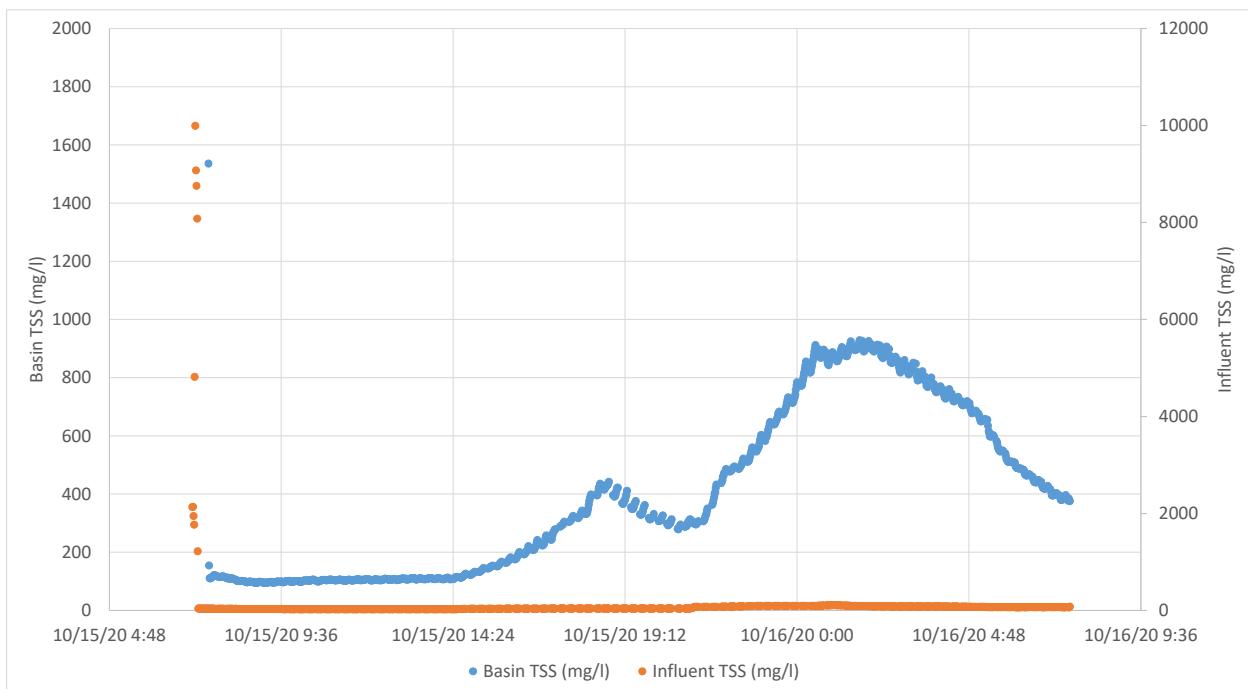
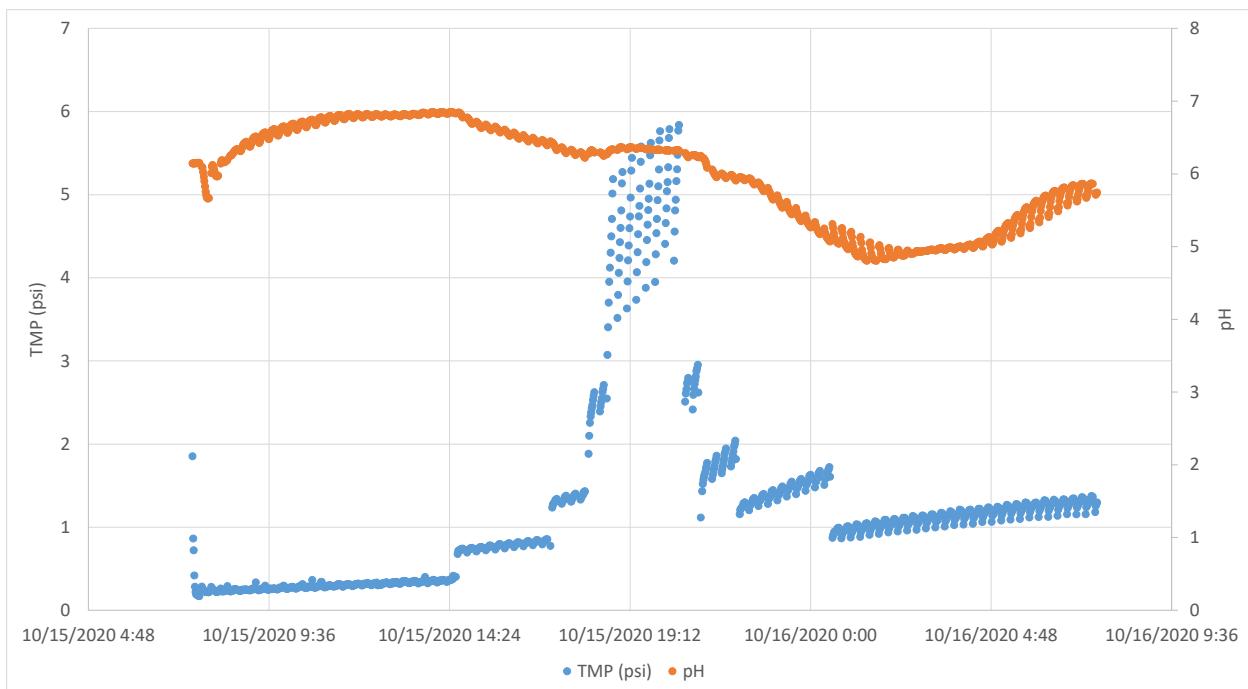
Field Notes:

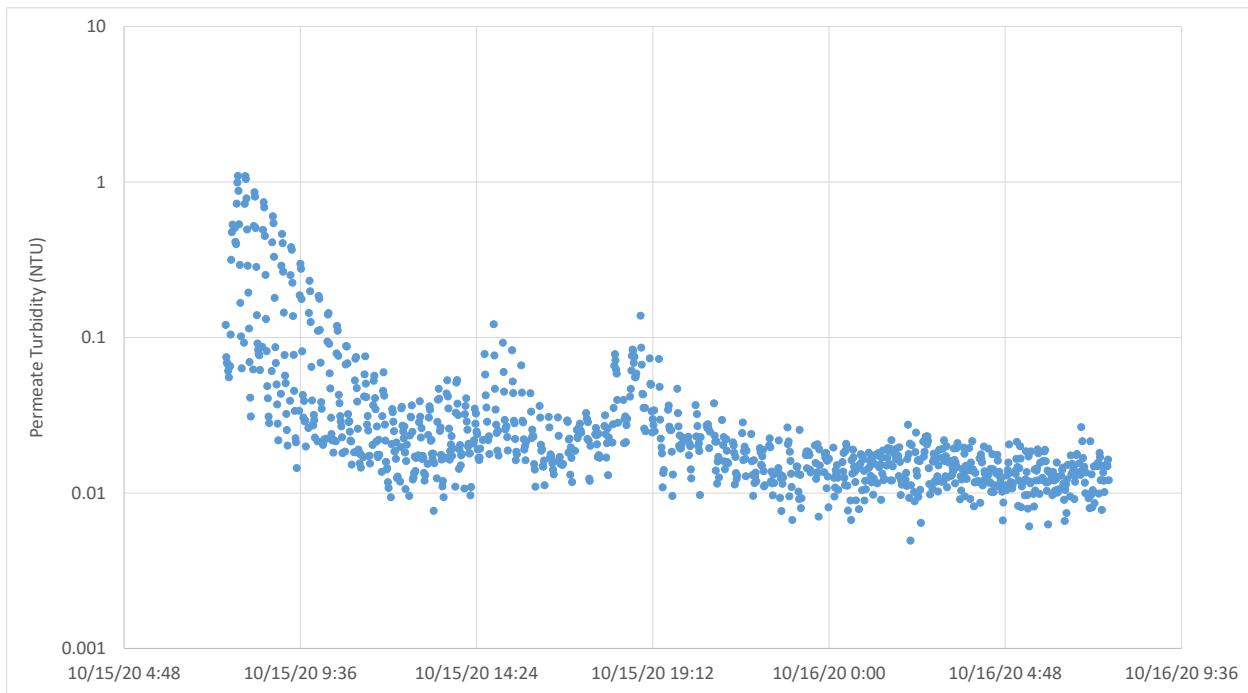
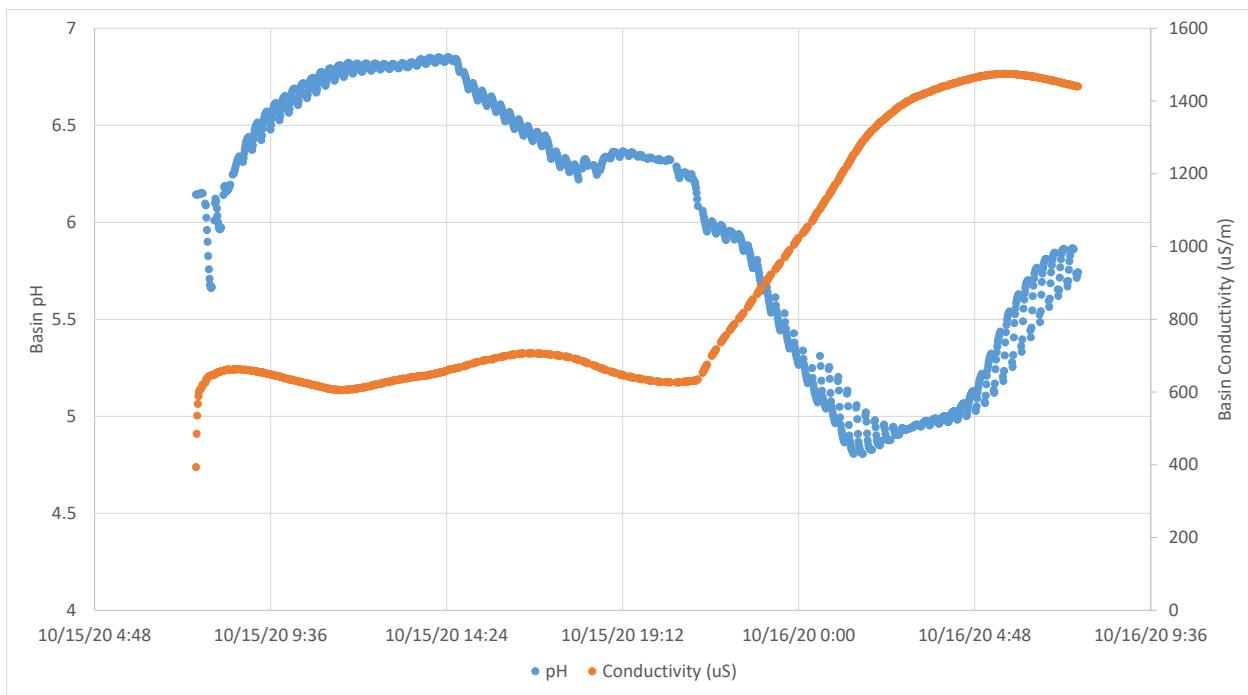
Bucher work cell (206) 255-4485

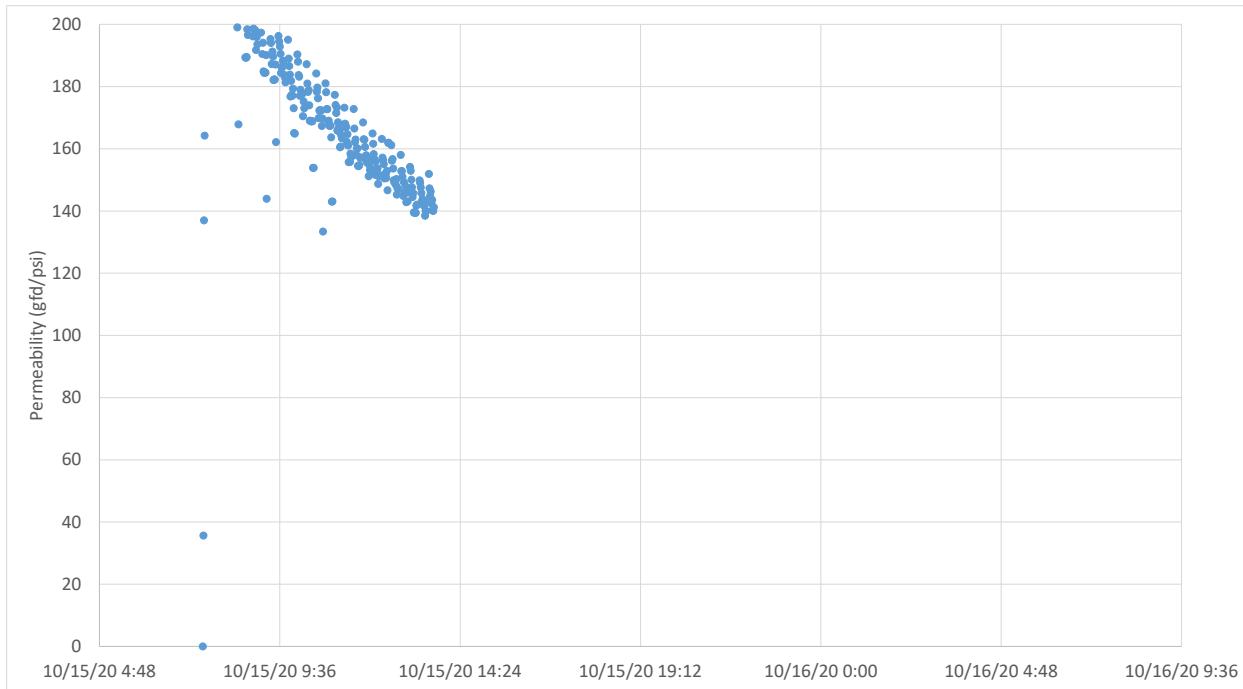


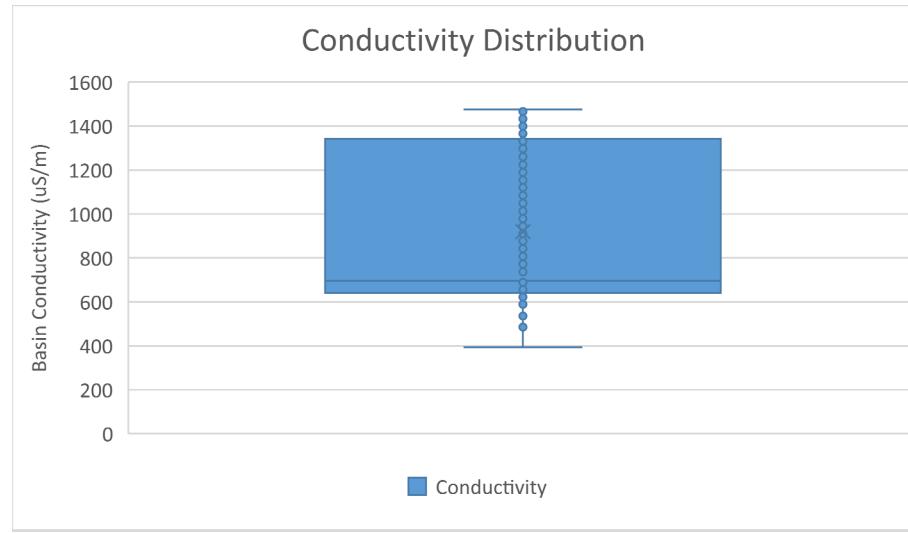
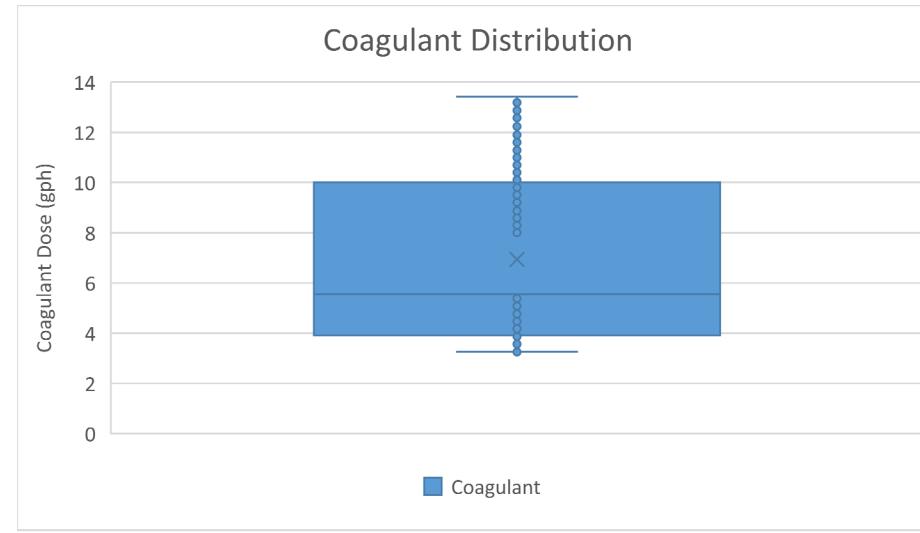
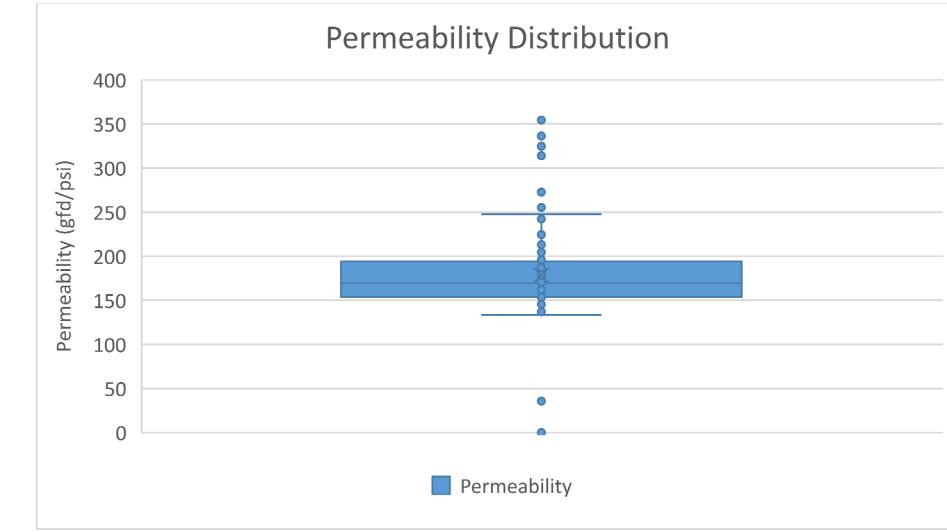
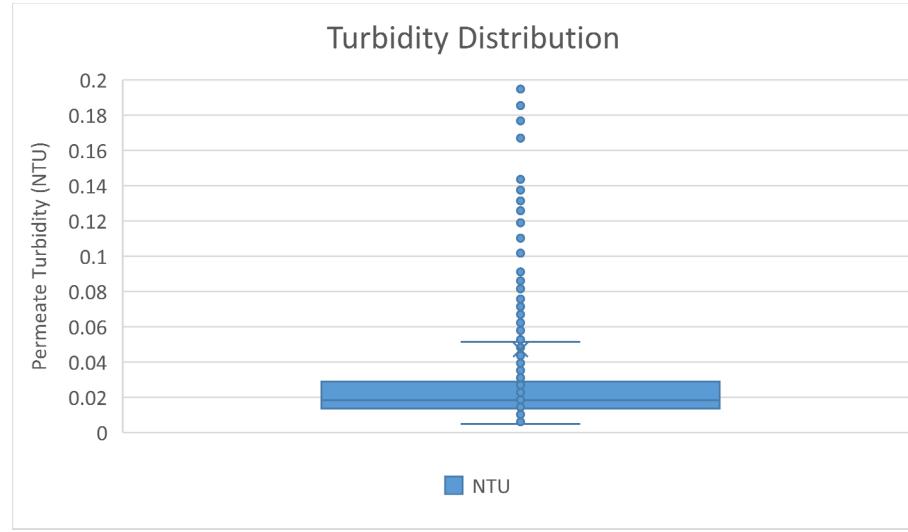
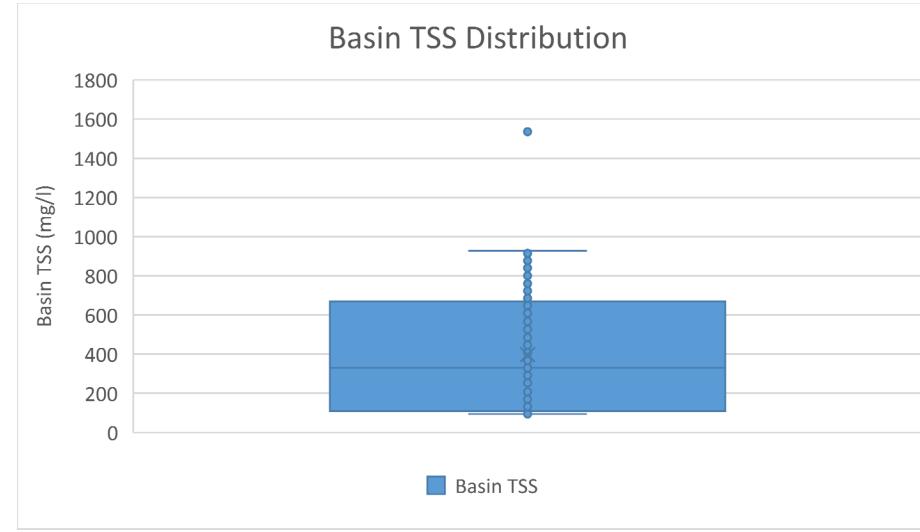
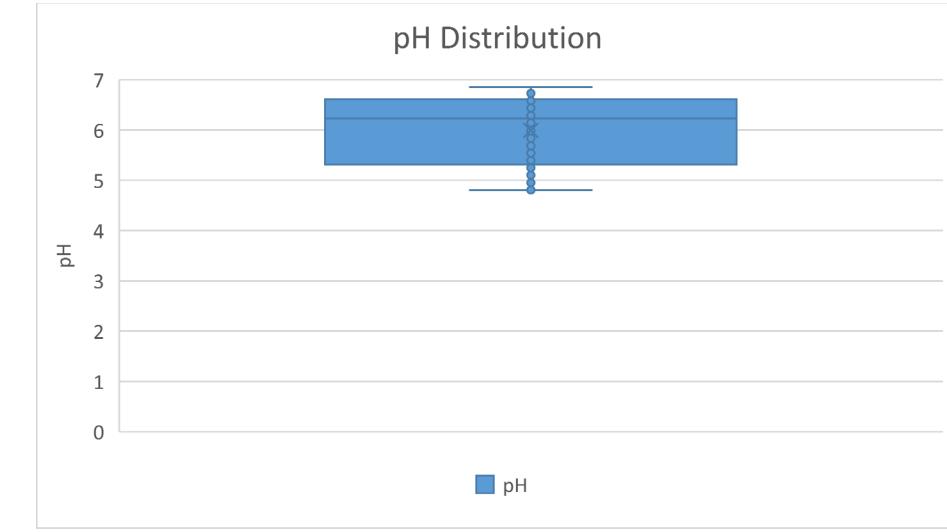
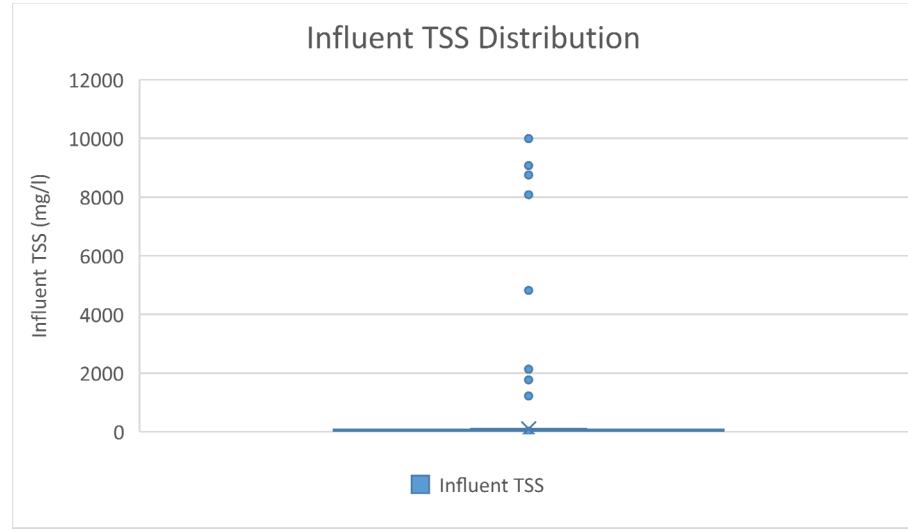
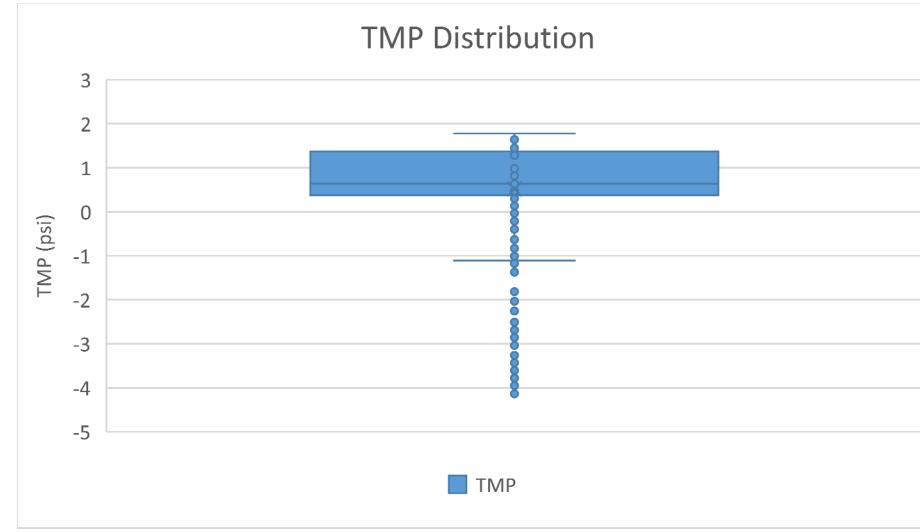












Field Measurements

Date	Time	Locations	pH	Temp, C	Cond, uS	TDS, ppm	UVT (%)	UVA
10/15/2020	11:30	Inf	7.3	19.8	702	497		
	11:35	Tank	7.1	20.6	538	382		
	11:40	Eff	7	18.3	543	385		
	11:55	Eff					82.1	0.085
	14:00	Inf					47.6	321
		Eff					81	0.091

OVIVO PILOT TESTING

WO # C165282

Day		# of samples	Sample Frequency	Thu				Sat			
Sample Date	Unit			10/15/2020							
S1-G	Military Time (hours)			1130							
TSS	mg/L	1	1/run	21							
VSS	mg/L	1	1/run	19							
tCOD	mg/L			105							
sCOD	mg/L			44							
BOD	mg/L			15							
Alkalinity	mg/L			117							
Fecal Coliform Sample ID				#1	#2			#1	#2		
Fecal Coliform Sample Time				1130	10-16 0700						
Fecal Coliform	MPN/100mL	2	2/run	2,200,000	4,900,000						
S1-C	Military Time (hours)										
TSS	mg/L	1	hourly	36							
VSS	mg/L	1	hourly	28							
Alkalinity	mg/L	1	hourly	155							
COD	mg/L	1	hourly	202							
BOD	mg/L	1	hourly	92							
S2-G	Military Time (hours)			1140							
TSS											
VSS											
Cl2 Demand	mg/L	1	1/run	0.622							
SS	ml/l	1	1/run	0							
Alkalinity	mg/L			53							
tCOD	mg/L			32							
sCOD	mg/L			30							
Fecal Coliform Sample ID				#1	#2	#3	#4	#1	#2	#3	#4
Fecal Coliform Sample Time				10/15 0830	1140	1405	10-16 0705				
Fecal Coliform	MPN/100mL	4	4/run	0	0	0	0	0	0		
S2-C	Military Time (hours)										
TSS	mg/L	1	hourly	3							
VSS	mg/L	1	hourly	1							
Alkalinity	mg/L	1	hourly	33							
UV Abs	cm ⁻¹		1 hourly	0.15							
BOD	mg/L	1	hourly	58							
S3-G	Military Time (hours)			1135							
TSS	mg/L	1	1/run	261							
VSS	mg/L	1	1/run	138							
Alkalinity	mg/L			73							
tCOD	mg/L	1	1/run	258							
sCOD	mg/L	1	1/run	27							
S3-G, Flow Box	Military Time (hours)										
TSS	mg/L	1	1/run								
VSS	mg/L	1	1/run								
Alkalinity	mg/L										
tCOD	mg/L		1/run								
sCOD	mg/L		1/run								

Weekly Check of online instruments

Date/Time/Initials											
Turbidity online reading											
Turbidity lab reading											
pH online reading											
pH lab reading											
Temperature online reading											
Temperature lab reading											
Conductivity											
Hypo Strength %											

Bottle Kit	Volume
FE grab	2L
FE Fecal	4 125-ml sterile
FE cl2	1L amber bottle
FE comp	4L
Inf grab	2L
Inf Fecal	2 125-ml sterile
Inf comp	2L
TNK	500mL

S1-G
S1-C
S2-G
S2-C
S3-G

Date	Time	Location	TOC (mg/L)
15-Oct-20	8:30	Inf	31.2
	11:30	Inf	26.3
	14:00	Inf	25.9
	16:30	Inf	37.5
	20:00	Inf	47
16-Oct-20	0:30	Inf	95.4
	4:00	Inf	84.5
	7:05	Inf	66.6
	composite	Eff	30.5

Appendix B.10

Test Run Package 10

Run# 10
Run Description Performance test with variable flux

2123

Type	<input type="checkbox"/> process	<input checked="" type="checkbox"/> Performance
Influent water source		<input checked="" type="checkbox"/> PE <input checked="" type="checkbox"/> Hydrant <input checked="" type="checkbox"/> Both
Flux rate		<input type="checkbox"/> Constant <input checked="" type="checkbox"/> Varies

Wasting Rate	0
Air Scour	105 scfm
Backwash Frequency	15 min
Run Duration	24 Hrs
CIP	<input type="checkbox"/> Hypo <input checked="" type="checkbox"/> Caustic <input type="checkbox"/> Citric
Composite Sample Schedule	24 Samples, 1 hour apart, 200 mL each 4.8 L total volume

*Time of fecal samples can be adjusted to fit the labs schedule, accounting for the 6+2 hour holding limit.

Date

Event	Day	Time Hr	PE gpm	Hydrant gpm	Coag Dose Al:TSS ratio	Flux Rate gfd	Event/Action	Influent		Effluent		Membrane Tank		Comments	Field
								Grab / Probe	Note	Grab / Probe	Note	Grab / Probe	Note		
0	1	7:30	100	100	0.6		Start Flow to pilot								Turbidity
1		8:00				150	2 stacks online Start producing effluent								Probe reading
2		8:30					Start Composite Samplers								pH
3		9:00				50	Change flux rate 3 stacks online								Temperature
4		9:30					Influent Sample	Field: Full Set WPP: TP, TKN, NH4 KCEL: Full Set							Conductivity
5		9:35					Tank Sample								WPPLsamples
6		9:40					Effluent Sample	Field: Full Set WPP: Fecal, TP, TKN, NH4 KCEL: Full Set							Influent composite
7		10:00				75	Change flux rate								Effluent composite
8		11:00					Effluent Sample		WPP: Fecal						-TSS/VSS, Alk, BOD
9		13:00				100	Change flux								Influent grab
10		13:30					Influent Sample	Field: Full Set WPP: Full Set KCEL: Full Set							TSS/VSS
11		13:35					Tank Sample								Fecal
12		13:40					Effluent Sample		Field: Full Set WPP: Full Set KCEL: Full Set						Effluent grab
13		14:00				50	Change flux								TSS/VSS
14		16:00				200	1 stack online Change flux								Chlorine demand
15		17:00	200	0		100	3 stacks online Change flux Change dilution								Fecal
16		18:00				75	Change flux rate								Settleable solids
17		20:00				50	Change flux								Tank grab
18	2	7:00	100	100		200	1 stack online Change flux Change dilution								TSS/VSS
19		8:00	200	0		50	3 stacks online Change flux Change dilution								KCEL
20		8:30					Influent Sample	Field: Full Set WPP: Fecal, TP, TKN, NH4 KCEL: Full Set						Influent grab	
21		8:35					Tank Sample								TOC
22		8:40					Effluent Sample	Field: Full Set WPP: Fecal, TP, TKN, NH4 KCEL: Full Set						Effluent composite	
23		9:00					Stop producing effluent								TOC

OVIVO Pilot Setpoints Values to be set according to OVIVO's recommendations.

Run# **10**

Date **10/22/2020**

FLOW OPTIMIZATION				CHEM DOSING							
System		ONLINE/OFFLINE									
Inlet System											
Screen Off Delay		2 min									
Weir Gate Frequency		1800 min									
Weir Gate Duration		30 sec									
Blowers											
Scour Air Flow		105 scfm									
Blower Start Level		20 in									
Blower Stop Level		8 in									
Lag Blower Start Level		65 %									
Lag Blower Start Delay		120 sec									
Blower Fail Air Flow		4.5 scfm									
Blower Fail Delay		140 sec									
Low Air Flow Alarm		55 %									
Low Air Flow Delay		45 sec									
Override Enabled											
Permeate				End of Event							
Permeate Flow		206 gpm		End Cycle							
Pump Start Level		116 in		End of Cycle		Enable					
Pump Stop Level		5 in		Hypochlorite CIP		Disable					
Pump Stop Low Level		100 in		Citric CIP		Enable					
Single Pump Flow		220 gpm		Hypo + Caustic CIP		Disable					
Backwash Frequency		15 min		Caustic CIP							
Backwash Flow		300 %		End of Cycle Drain Lvl		End of Event Drain Lvl					
Pre BW Relaxation		30 sec		End of Event Dly		5 in					
Backwash Duration		60 sec				20 sec					
Post BW Relax Duration		30 sec		Membrane Basin Drain Vlv							
Perm Static Pressure		1.7 psi		WAS Vlv Open TSS		6,000 mg/l					
Turbidity Hi Alarm SP		10 NTU		WAS Vlv Close Lvl		117 in					
TMP Hi Alarm SP		8 psi		WAS Valve Duration		0 sec					
Backwash Start TMP		10 psi		Caustic							
Max Hi TMP Cycles		1		CIP Permeate Flow		100 gpm					
TMP Reset				Backwash Perm Flow		100 gpm					
Perm Tank Level Lo		20 in		Caustic Flow		50 gph					
Air Extractor Frequency		5 min		Pre CIP Relax Duration		30 sec					
Air Extractor Duration		4 min		Chem Flow Duration		10 min					
				Soak Duration		999 min					
				Rinse Duration		60 sec					
				Final Relax Duration		60 sec					
Pre-Drain Disabled											
Pre-Drain Disabled											
Pre-Drain Disabled											

Daily Field Notes

P 1/2

Run

10

Cond

Process and Performance Testing

Refurbish

Date	Time	Observation	Action Item
07/22	0710	Opened inlet box valve to drain for hydrant water flow setting (and flush of box)	
	0713	Cleaned membrane TSS (and probe sample box (residual solids settled))	
	0717	Started PE feed pump	
	0720 hrs	Need to check influent TSS probe calibration (hydrant water with TSS $\text{fl}^{-1} = 10 \text{ mg/l}$)	
	0740 hrs	Opened sample valves (and turbimeter)	
	0753 hrs	1st flux change 100 \rightarrow 150 gfd	
	0830 hrs	2nd flux Δ 150 \rightarrow 50 gfd	
	10:00 hrs	changed flux from 50 gfd \rightarrow 75 gfd, permeate flow = 153 gpm	
	12:53 hrs	changed flux from 75 gfd \rightarrow 100 gfd, permeate flow = 204 gpm	
	14:00	changed flux from 100 gfd \rightarrow 50 gfd permeate flow = 102 gpm	
	1708 hrs	Scoured hydrant water.	
	1940 hrs	Reduced flux for overnight run (75 - 50 gfd)	

Daily Field Notes

Run

Cond

10

Process and Performance Testing

10/22 - 10/23

P2/2

Date	Time	Observation	Action Item
10/23	0717	Introducing hydrant water	
	0720	Flux change 50 → 200 gfd	
0733 hrs		Note for log - pilot shutdown test night between ~11 pm → 1 am due to unannounced plant hydraulics training by shift crew. Not a bad test for pilot shutdown simulating short-term idle. Only potential impact is of first 1 sample collected in composite is not from operating system.	
0831		Final adjustment Flux 200 → 50 gfd (secured hydrant water)	
10/23 hrs		Pilot Secure (long CIP soak)	

King County Ovivo Pilot

Run #

10

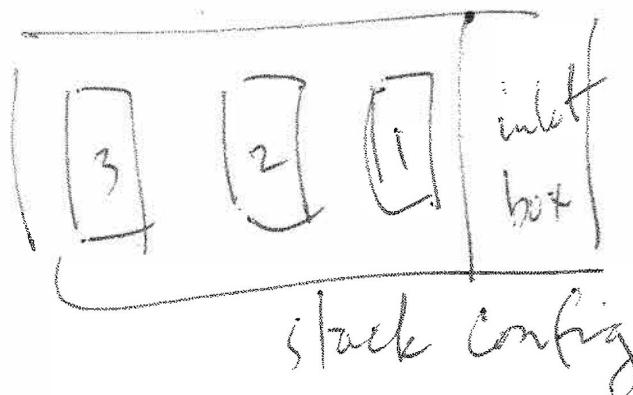
Date

10/22/2020

10/23/2020

membrane
surface area per stack =

975 sf



Influent flow = PE + hyd (gpm)	Test Variables		Calculated		Test Plan		
	permeate flow setpt (gpm)	stacks in service (#)	surface area in service (sf)	instantaneous flux (GFD)	Flux Goal (GFD)	Start Time	Stop Time
100 + 100	204	3	2,925	100	100	7:15	7:45
	203	2 *	1,950	150	150	7:45	8:45
	102	3	2,925	50	50	8:45	10:00
	153	3	2,925	75	75	10:00	13:00
	204	3	2,925	100	100	13:00	14:00
	102	3	2,925	50	50	14:00	16:00
	136	1 *	975	201	200	16:00	17:00
200 + 0	204	3	2,925	100	100	17:00	18:00
	153	3	2,925	75	75	18:00	20:00
	102	3	2,925	50	50	20:00	7:00
100 + 100	136	1 *	975	201	200	7:00	8:00
200 + 0	102	3	2,925	50	50	8:00	9:00

Notes:

Switch "stacks online" setting under Ovivo tab on HMI.

Follow High TMP S/D with 30-min CIP

* stack #1 005

** stacks 1 & 2 005

OVIVO Pilot Setpoints Values to be set according to OVIVO's recommendations.

Run# 10

Date 10/22/2020

✓ 10/22/2000
10/23/2000
10/23/2000

Run #10

SOP OVIVO PILOT

10/22/2020 - 10/23/2020

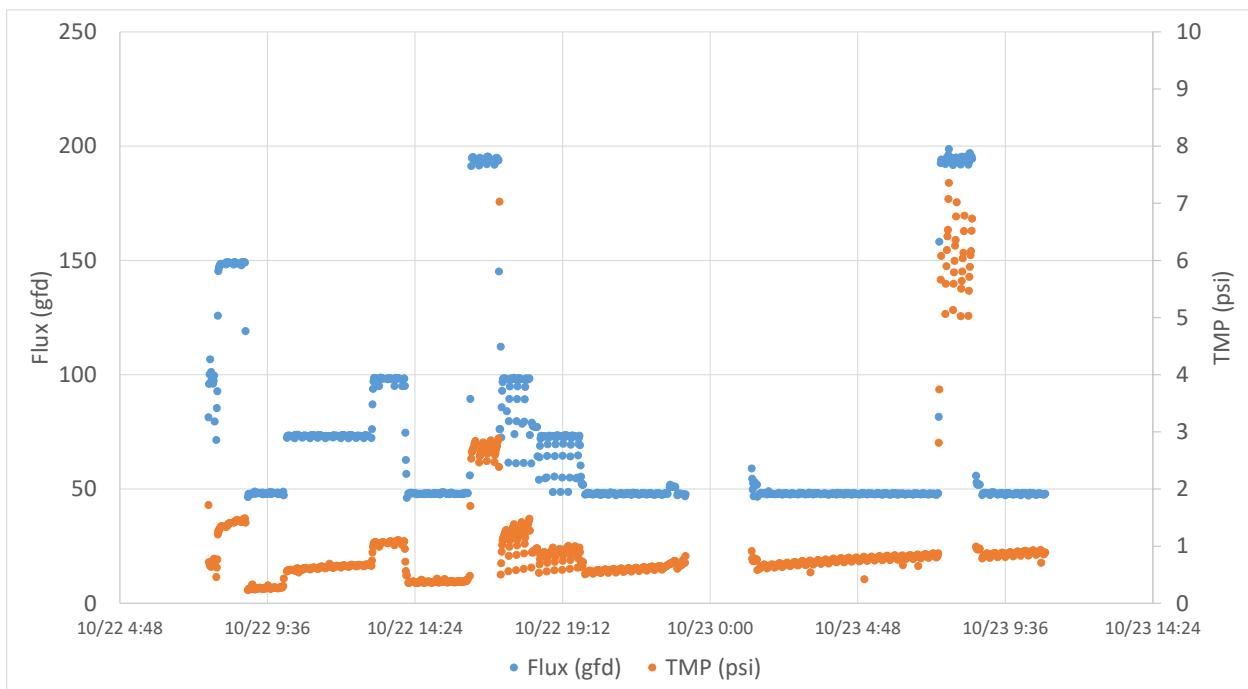
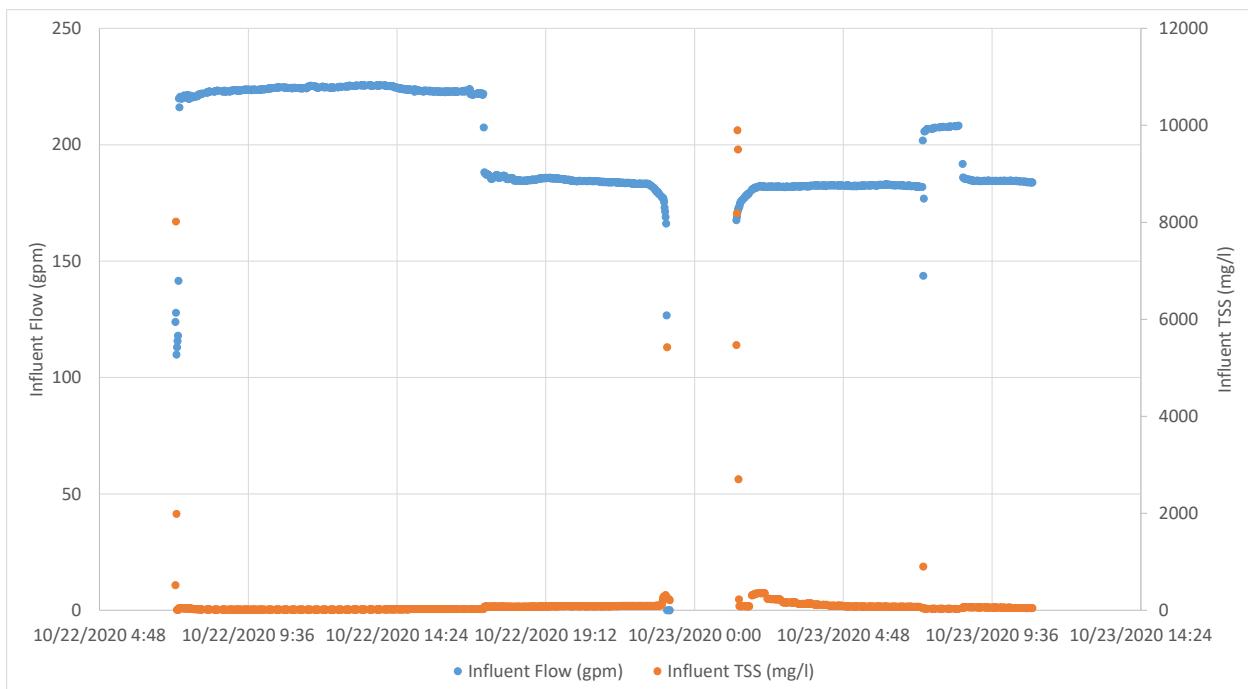
STARTING PROCEDURE

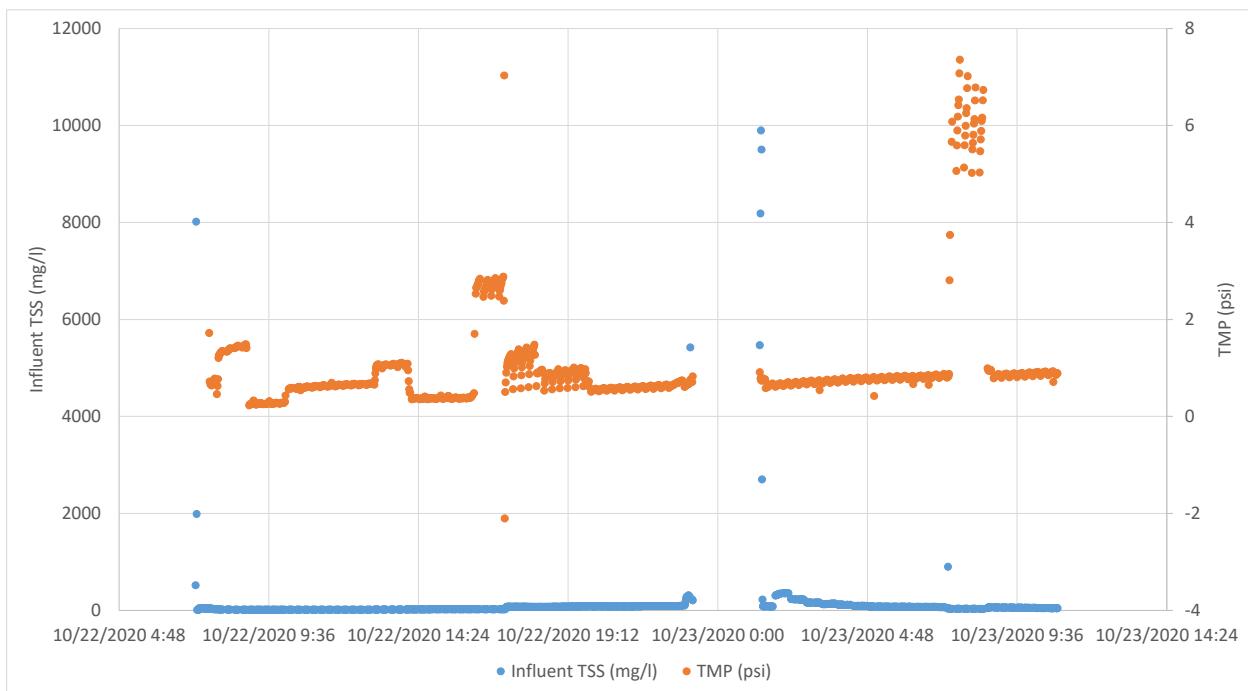
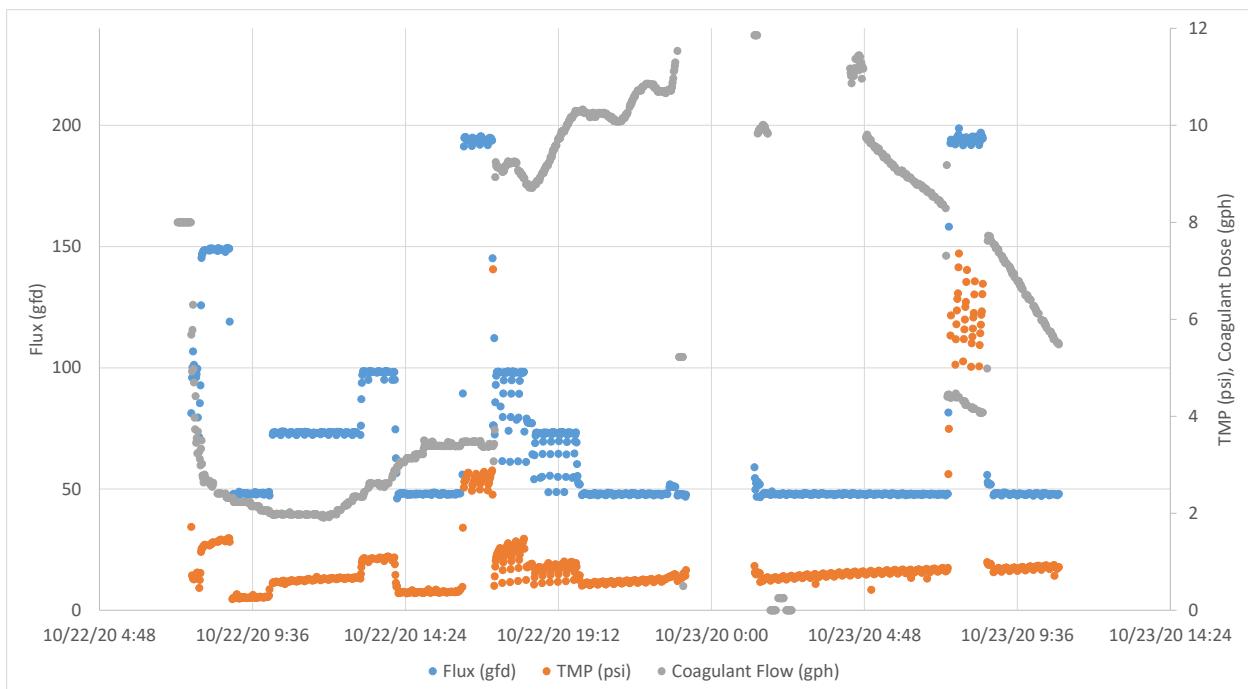
1. Inform WTP Main Control and inquire if there is any issue that would preventing the operation.
2. Contact shift crew to arrange for after hour sampling.
3. Obtain operating parameters and sampling schedule from the test package.
4. If dilution water is required:
 - a. Contact Facility Service to charge the water hydrant.
 - b. Hydrant needs to be secured by 18:00 hrs.
5. Log in. User name= h, password = h.
6. Drain the pilot.
 - a. Drain membrane tank by opening the drain valve from control screen.
 - b. Drain permeate tank by opening the drain valve manually.
7. Check chemical tanks.
 - a. Caustic - transfer of metering pump suction.
 - b. Sodium Hypochlorite – transfer of metering pump suction. (16 gal per run)
 - c. Alum – transfer of totes.
 - d. Contact Facility Services for support
8. Prime coagulant pump- only if switch to a new tank.
 - Press "Prim 60 sec"
9. Adjust caustic addition valve to RUN position.
10. Go to MAIN SCREEN and verify that all pumps, except for alkalinity, are in AUTO
11. Set operating parameters in the following screen.
 - a. Select FLOW OPTIMIZATION screen
 - b. Verify that system is offline ~~online~~
 - c. Set parameters according to the test plan.
12. Select chemical dosing strategy and set the parameters.
13. Select ALARM. There are certain erroneous alarms that needs to be acknowledged to reset.
14. Select FLOW OPTIMIZATION screen and put the system ONLINE.
15. Turn on PE at the panel by the primary bldg.
 - a. Turn the switch to HAND
 - b. Press START
 - c. Open the PE hand valve completely.
16. Monitor and confirm the increasing tank level.
 - a. Weir gate XVCS-101 is open, once the tank level is 0.1 in., this weir gate will close and the coagulant pump will start.
17. Once coagulant pump start, start caustic pump manually.
 - a. Select PMP-AK 101 (alkalinity addition pump)
 - b. Adjust the pump speed to the target flowrate. 4% = 1.9 gph.
 - c. Verify the flowrate on the pump local display.
18. Monitor and confirm:
 - a. Air blower starts once the tank is at 20 in.
 - b. Permeate pump starts at 116 in.

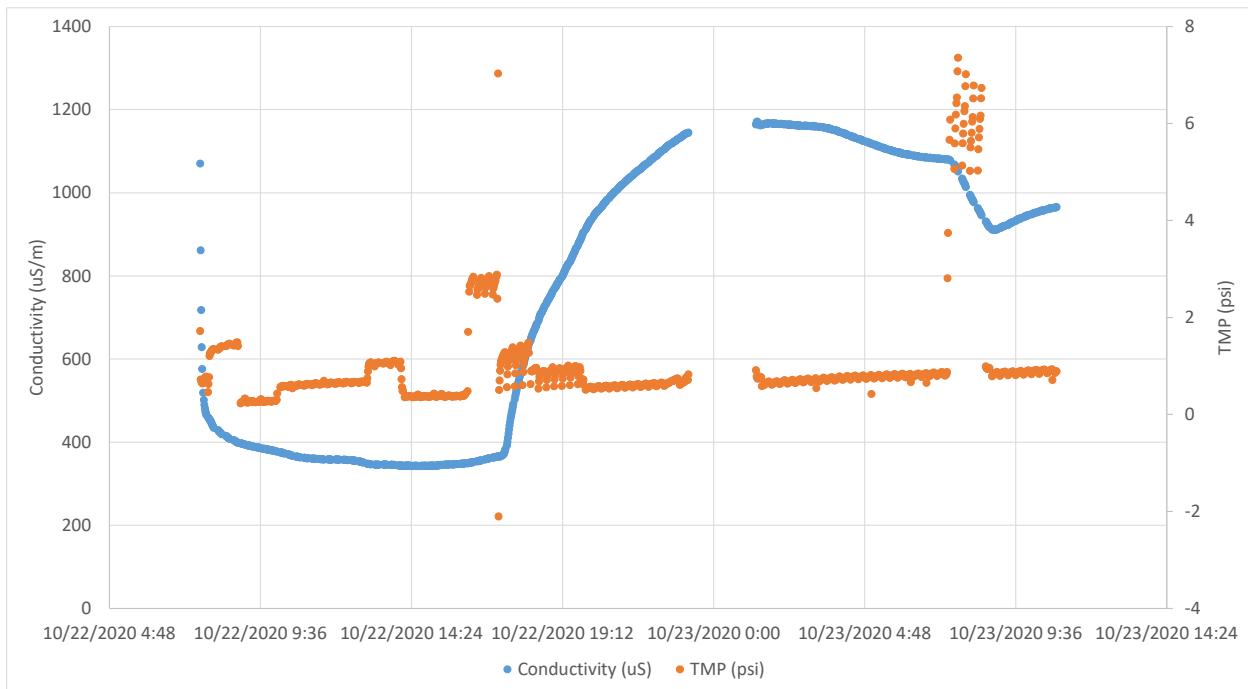
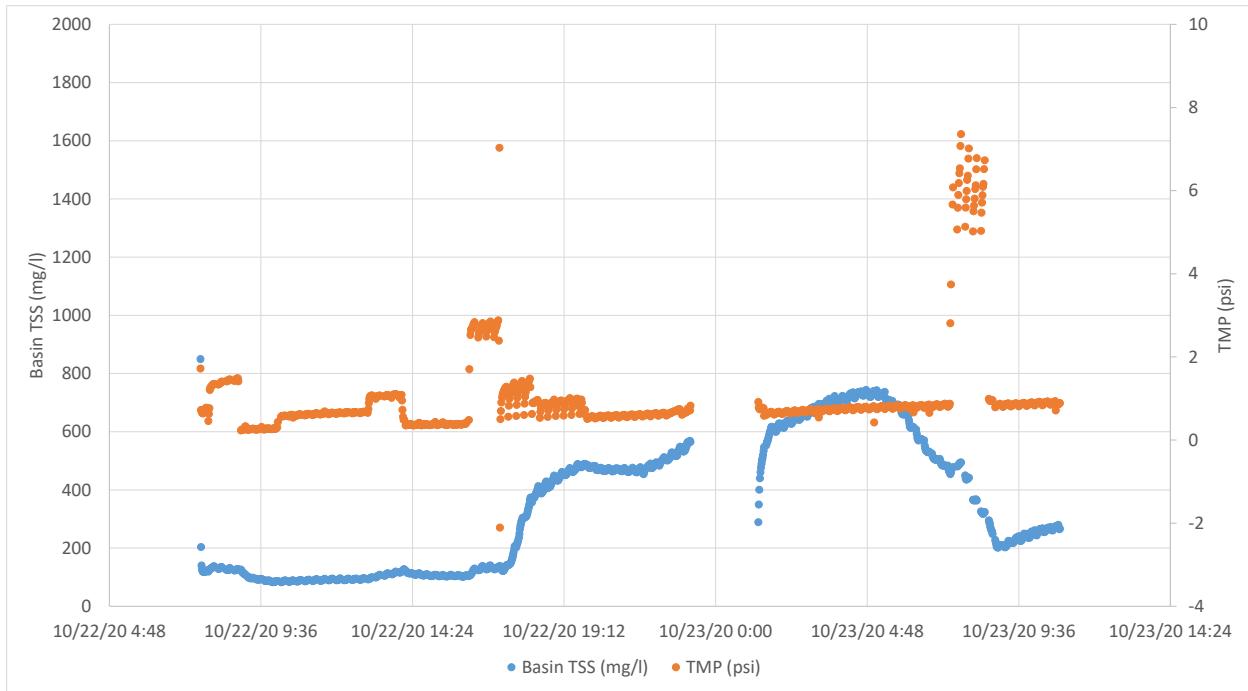
- 0750 hrs*
- c. Confirm that there are sufficient flow through sampling buckets.
 - 19. Open the valve to effluent turbidimeter.
 - 20. Setup auto sampler on influent and effluent.
 - Open valves to get flow through sampling buckets.
 - 21. Allow the system to run for at least 1 full cycle to prior to data & sample collection. Refer to run guidance document on sampling starting time.
 - 22. Start sample collection

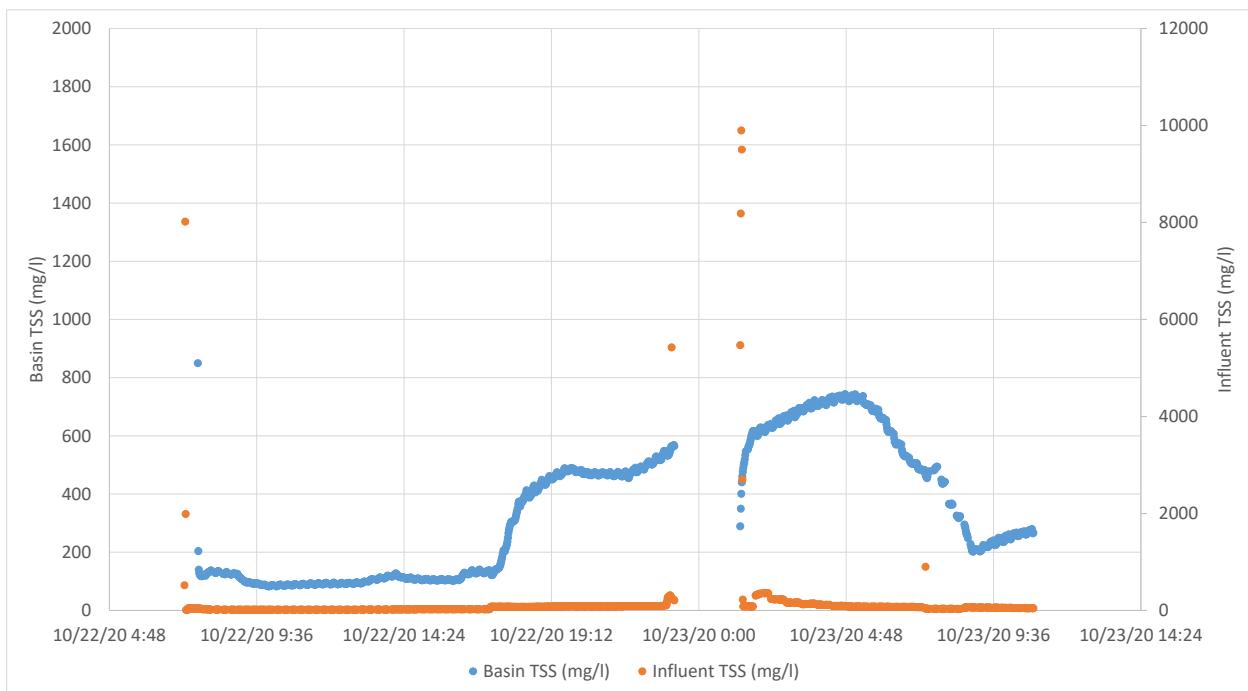
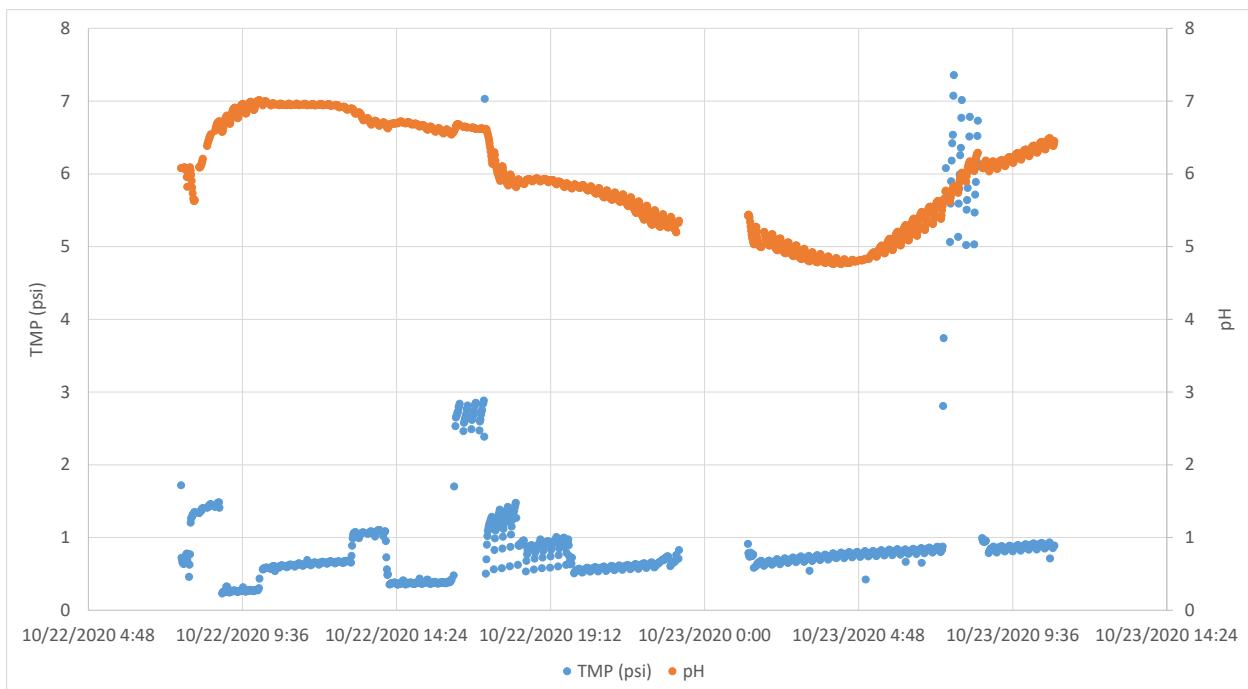
SHUTDOWN & CIP PROCEDURE

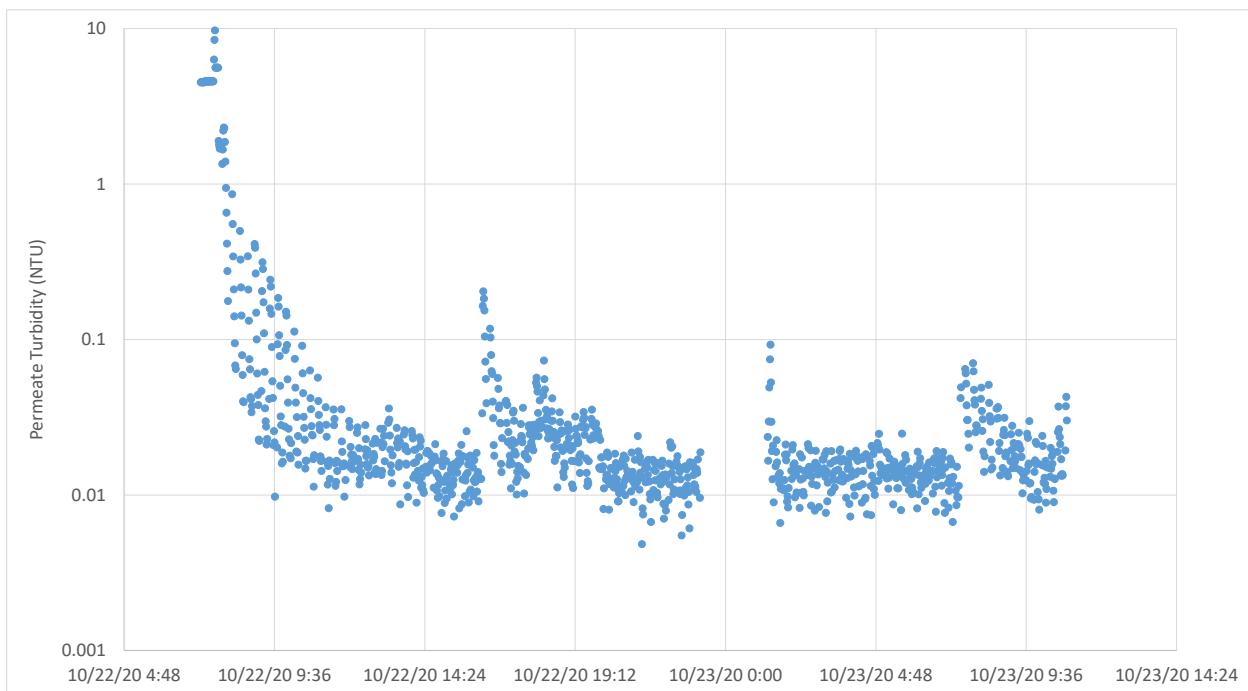
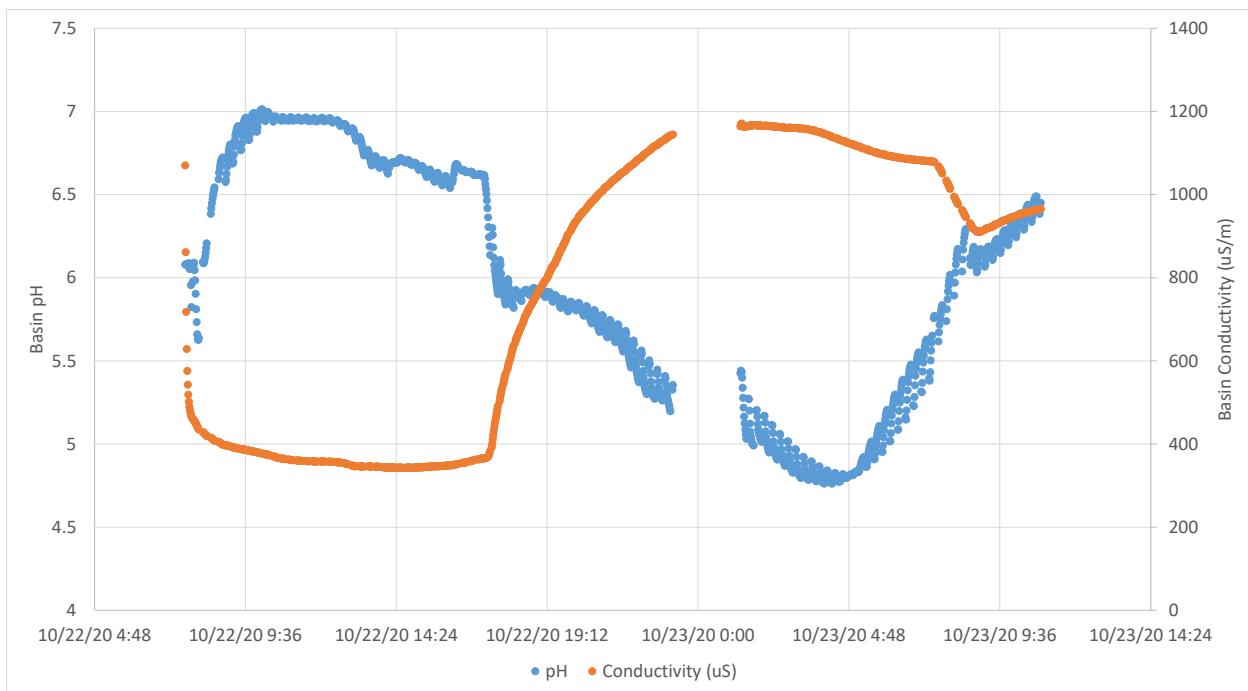
- 1. Check the hypo and caustic levels. Each cleaning cycle require 12 gal.
- 2. Close sampling valves, turbidimeter valves.
- 3. Switch alkalinity pump from manual to auto.
- 4. Prime hypochlorite pump. *30 sec*
- 5. Switch caustic addition valve position from RUN to CIP position.
- 6. Go to CIP screen to check the CIP parameters. If CIP is initiated from this screen, the system will go back into filtration once the CIP is completed (as long as the feed pump is on).
- 7. Wait for pump priming to finish.
- 8. Go to Flow Optimization screen and select "End of cycle".
 - If the pilot stopped/standby due to high TMP, press TMP reset, and the CIP will start.
- 9. Verify that the hypochlorite pump & caustic pumps are on.
- 10. Turn the feed off at the PE panel
 - a. Press STOP
 - b. Turn the switch to OFF
 - c. Close the manual valve
- 11. Spray down the membrane tank to remove foam and scum.
- 12. Log out.

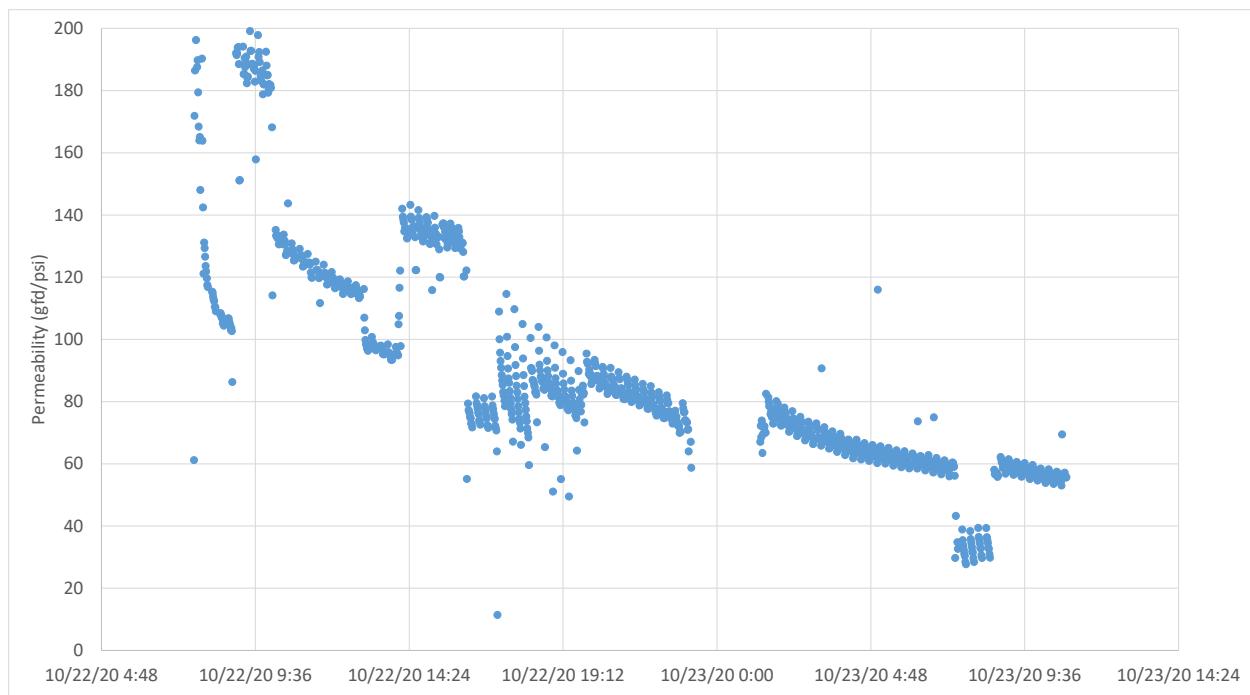


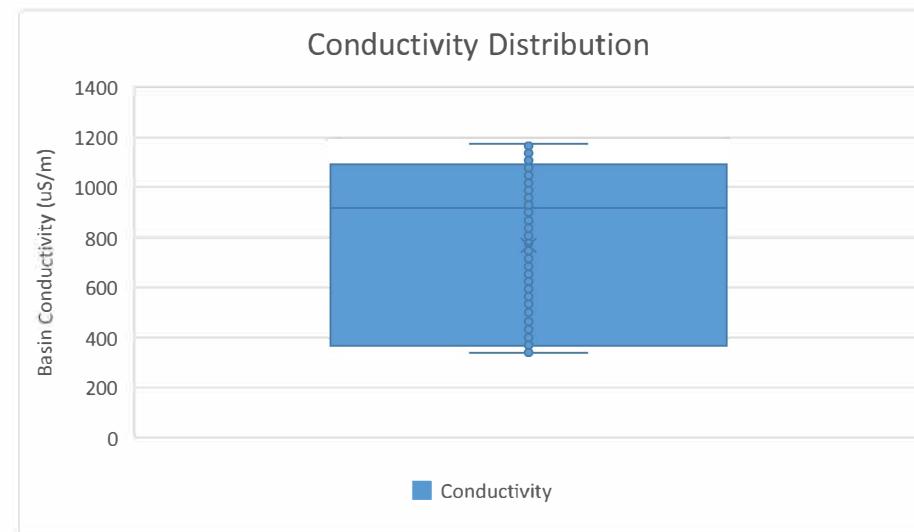
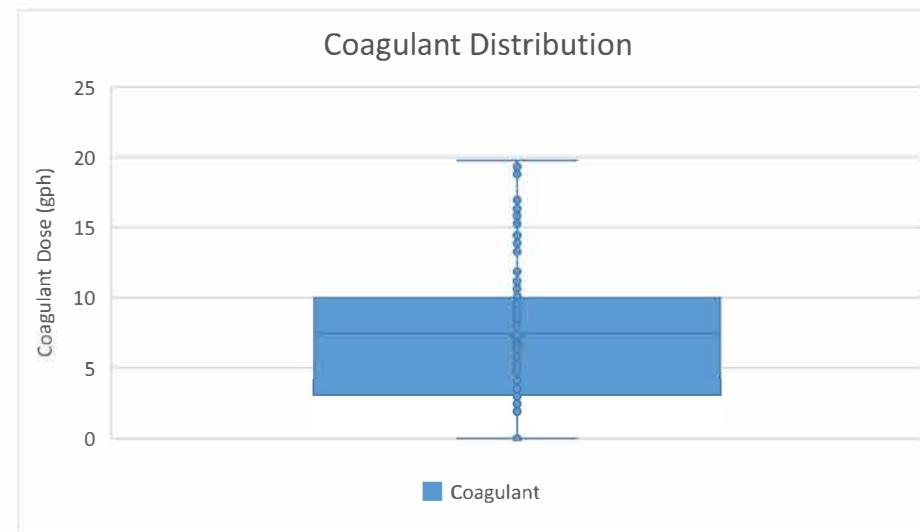
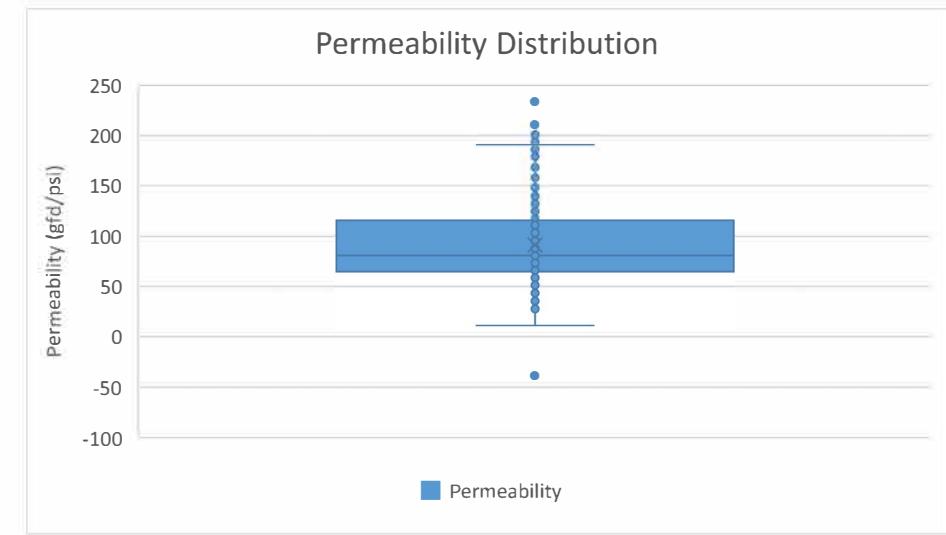
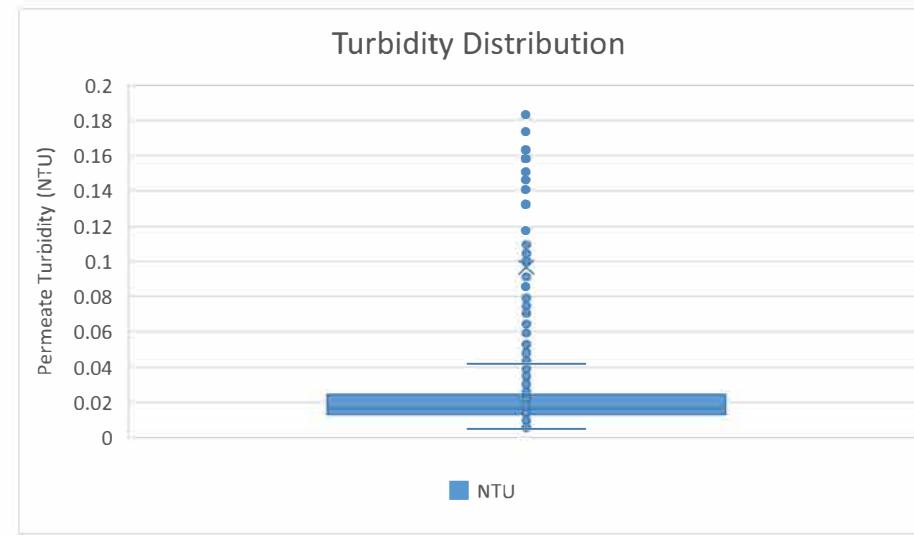
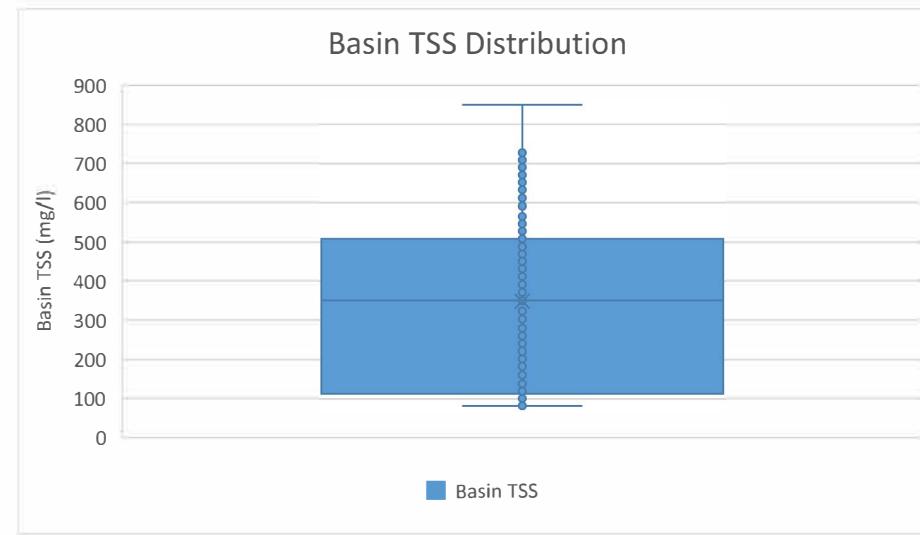
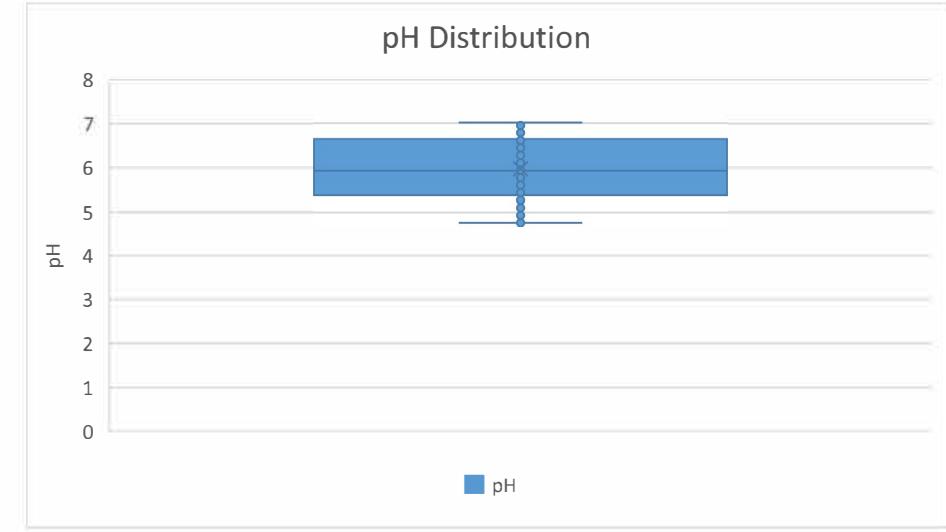
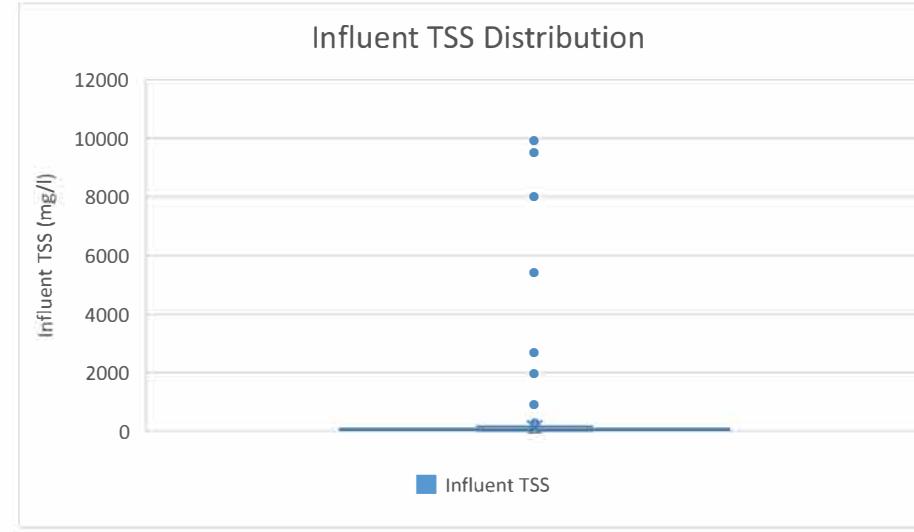
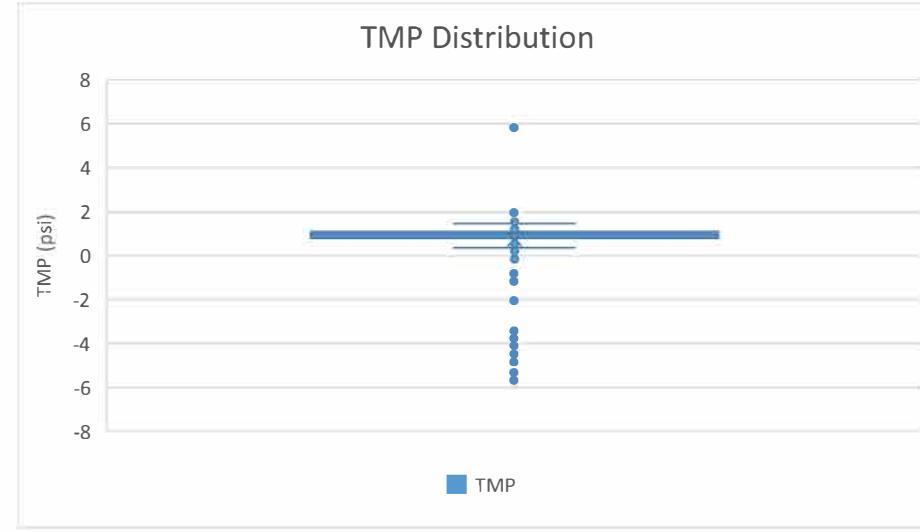












OVIVO PILOT TESTING

WO # C165282

Day		# of samples	Sample Frequency	Thu			Fri			Sat			Sat		
Date	Unit			10/22/2020			10/23/2020								
S1-G															
TSS	mg/L	1	1/run		12										
VSS	mg/L	1	1/run		14										
Fecal Coliform Sample ID				#1	#2			#1	#2		#1	#2		#1	#2
Fecal Coliform Sample Time				1330	10/23 0900										
Fecal Coliform	MPN/100mL	2	2/run	350,000	11,000,000										
Nutrient Sample ID				#1	#2	#3		#1	#2	#3	#1	#2	#3	#1	#2
Nutrient Sample Time				930	1330	10/23 0900									
TP	mg/L	3	3/run	1.51	1.36	4.02									
OPO4	mg/L	3	3/run	1.16	1	2.5									
TKN	mg/L	3	3/run	11.75	10.53	32.99									
NH3	mg/L	3	3/run	10.09	8.35	23.68									
NO3	mg/L	3	3/run	0.13	0.152	0.2205									
NO2	mg/L	3	3/run	0.009	0.102	0.011									
BOD	mg/L														
S1-C															
TSS	mg/L	1	hourly		53										
VSS	mg/L	1	hourly		46										
Alkalinity	mg/L	1	hourly		140										
BOD	mg/L	1			90										
COD	mg/L	1	hourly		224										
S2-G															
Cl2 Demand	mg/L	1	1/run		0.7892										
SS	ml/l	1	1/run		0										
Fecal Coliform Sample ID				#1	#2	#3	#4	#1	#2	#3	#4	#1	#2	#3	#4
Fecal Coliform Sample Time				940	1100	1340	10/23 0920								
Fecal Coliform	MPN/100mL	4	4/run	20	0	0	0								
Nutrient Sample ID				#1	#2	#3		#1	#2	#3		#1	#2	#3	
Nutrient Sample Time				940	1340	10/23 920									
TP	mg/L	3	3/run	0.04	0.02	0.04									
OPO4	mg/L	3	3/run	0.03	0.01	0.02									
TKN	mg/L	3	3/run	10.68	9.15	23.19									
NH3	mg/L	3	3/run	10.02	8.55	21.02									
NO3 or filter for NOx	mg/L	3	3/run	0.10375	0.143	0.10225									
NO2 or filter for NOx	mg/L	3	3/run	0.01	0.1215	0.00775									
BOD	mg/L				30										
S2-C															
TSS	mg/L	1	hourly		0										
VSS	mg/L	1	hourly		0										
Alkalinity	mg/L	1	hourly		26										
UV Abs	cm ⁻¹	1	hourly		0.158										
BOD	mg/L	1	hourly		43										
S3-G															
TSS	mg/L	1	1/run		382										
VSS	mg/L	1	1/run		200										
BOD	mg/L	1	1/run				125								

Week Check of online instruments

Date/Time/Initials															
Turbidity online reading															
Turbidity lab reading															
pH online reading															
pH lab reading															
Temperature online reading															
Temperature lab reading															
Conductivity															

Bottle Kit	Volume	S1-G	Influent Grab
FE grab	2L	S1-C	Influent Composite
FE Fecal	4 125-ml sterile	S2-G	Effluent Grab
FE Demand	3L amber bottle	S2-C	Effluent Composite
FE nutrients	3 each 2L	S3-G	TNK Grab
FE comp	4L		
Inf grab	2L		
Inf Fecal	2 125-ml sterile		
Inf comp	2L		
Inf nutrients	3 each 2L		
TNK	500mL		

Run# 10
Run Description Performance test with variable flux

Type	<input type="checkbox"/> process	<input checked="" type="checkbox"/> Performance
Influent water source		<input checked="" type="checkbox"/> PE <input checked="" type="checkbox"/> Hydrant <input checked="" type="checkbox"/> Both
Flux rate	<input type="checkbox"/> Constant	<input checked="" type="checkbox"/> Varies

*Time of fecal samples can be adjusted to fit the labs schedule, accounting for the 6+2 hour holding limit.

Wasting Rate	0
Air Scour	105 scfm
Backwash Frequency	15 min
Run Duration	24 Hrs
CIP	<input checked="" type="checkbox"/> Hypo <input type="checkbox"/> Caustic <input type="checkbox"/> Citric
Composite Sample Schedule	24 Samples, 1 hour apart, 200 mL each 4.8 L total volume

2123

INF → WPP + KCEL (#1)
(S1C)

EFF → WPP + KCEL (#5)
(S2C)

Date

Event	Day	Time Hr	PE gpm	Hydrant gpm	Coag Dose Al:TSS ratio	Flux Rate gfd	Event/Action	Influent		Effluent		Membrane Tank		Comments
								Grab / Probe	Note	Grab / Probe	Note	Grab / Probe	Note	
0	1	7:30	100	100	0.6		Start Flow to pilot							
1		8:00				150	2 stacks online Start producing effluent							
2		8:30					Start Composite Samplers <i>Adlet A</i>							
3		9:00				50	Change flux rate (3 stacks online)							
4		9:30					Influent Sample	Field: Full Set WPP: TP, TKN, NH4 KCEL: Full Set	Nutrient #1 UV _A = 0.176 UV _T = 66.5					
5		9:35					Tank Sample							
6		9:40					Effluent Sample							
7		10:00				75 ✓	Change flux rate							
8		11:00					✓ Effluent Sample							
9		13:00				100 ✓	Change flux							
10		13:30					Influent Sample	Field: Full Set WPP: Full Set KCEL: Full Set	Nutrient + S2G, Fecal, chlorine added -3 UV _T = 63.3, UV _A = 0.198					
11		13:35					Tank Sample							
12		13:40				50 ✓	Effluent Sample							
13		14:00					Change flux							
14		16:00				200	1 stack online Change flux							
15		17:00	200	0		100	3 stacks online Change flux							
16		18:00				75	Change flux rate							
17		20:00				50	Change flux							
18	2	7:20	100	100		200	1 stack online Change flux Change dilution							
19		8:30	200	0		50	3 stacks online Change flux Change dilution	Field: Full Set WPP: Fecal, TP, TKN, NH4 KCEL: Full Set	Nutrient + Fecal + SIG-BOD x2					
20		9:00	200	0			Influent Sample							
21		9:10					Tank Sample							
22		9:20					Effluent Sample							
23		9:30					Stop producing effluent							

Field
Eff
Turbidity
Probe reading
pH
Temperature
Conductivity
WPPLsamples
Influent composite
Effluent composite
-TSS/VSS, Alk, BOD
Influent grab
TSS/VSS
Fecal
Effluent grab
TSS/VSS
Chlorine demand
Fecal
Settleable solids
Tank grab
TSS/VSS
KCEL
Influent grab
TOC
Effluent composite
TOC

Sample Data

King County Environmental Lab Analytical Report

Project: 423650-100
 Locator: INF-SL
 Descrip: PILOT INFLUENT, IN
 Sample: L75645-1
 Matrix: LB INFLUENT
 ColDate: 10/23/20 9:00
WET Weight Basis

Project: 423650-100
 Locator: INF-SL
 Descrip: PILOT INFLUENT, IN
 Sample: L75645-2
 Matrix: LB INFLUENT
 ColDate: 10/22/20 9:30
WET Weight Basis

Project: 423650-100
 Locator: INF-SL
 Descrip: PILOT INFLUENT, IN
 Sample: L75645-3
 Matrix: LB INFLUENT
 ColDate: 10/22/20 13:30
WET Weight Basis

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units		
CV SM5310-B																	
Total Organic Carbon	54.7		2.5	5	mg/L	15.4		2.5	5	mg/L	16.3		2.5	5	mg/L		
MT EPA 200.8 (MOD)																	
Antimony, Total, ICP-MS						<MDL		0.3	1	ug/L			<MDL	0.3	1	ug/L	
Arsenic, Total, ICP-MS						1.1		0.05	0.25	ug/L			1.12	0.05	0.25	ug/L	
Beryllium, Total, ICP-MS						<MDL		0.1	0.5	ug/L			<MDL	0.1	0.5	ug/L	
Cadmium, Total, ICP-MS						<MDL		0.05	0.25	ug/L			<MDL	0.05	0.25	ug/L	
Calcium, Total, ICP-MS						14100		50	50	ug/L			13900	50	50	ug/L	
Chromium, Total, ICP-MS						0.54	<RDL	0.2	1	ug/L			0.68	<RDL	0.2	1	ug/L
Copper, Total, ICP-MS						10.5		0.2	2	ug/L			8.09	0.2	2	ug/L	
Lead, Total, ICP-MS						0.651		0.1	0.5	ug/L			0.695	0.1	0.5	ug/L	
Magnesium, Total, ICP-MS						5720		50	50	ug/L			5490	50	50	ug/L	
Nickel, Total, ICP-MS						0.935		0.1	0.5	ug/L			0.968	0.1	0.5	ug/L	
Selenium, Total, ICP-MS						<MDL		0.5	1	ug/L			<MDL	0.5	1	ug/L	
Silver, Total, ICP-MS						<MDL		0.04	0.2	ug/L			<MDL	0.04	0.2	ug/L	
Thallium, Total, ICP-MS						<MDL		0.1	0.2	ug/L			<MDL	0.1	0.2	ug/L	
Zinc, Total, ICP-MS						19.5		0.5	2.5	ug/L			20	0.5	2.5	ug/L	
MT EPA 200.8 (MOD)*SM2340B																	
Hardness, Calc						58.7		0.331	0.331	mg CaCO3/L			57.4	0.331	0.331	mg CaCO3/L	
MT EPA 245.1																	
Mercury, Total, CVAA						0.0063	<RDL	0.005	0.015	ug/L			<MDL	0.005	0.015	ug/L	
OR EPA 1664B																	
Hem (oil, total)						5	<RDL	1.4	5.1	mg/L			5	<RDL	1.4	5.1	mg/L

King County Environmental Lab Analytical Report

Project: 423650-100
 Locator: INF-SL
 Descrip: PILOT INFLUENT, IN
 Sample: L75645-4
 Matrix: LB INFLUENT
 ColDate: 10/23/20 9:00
WET Weight Basis

Project: 423650-100
 Locator: EFF-SL
 Descrip: PILOT MEMBRANE PER
 Sample: L75645-5
 Matrix: LA OTHR WTR
 ColDate: 10/23/20 9:20
WET Weight Basis

Project: 423650-100
 Locator: EFF-SL
 Descrip: PILOT MEMBRANE PER
 Sample: L75645-6
 Matrix: LA OTHR WTR
 ColDate: 10/22/20 9:40
WET Weight Basis

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
CV SM5310-B															
Total Organic Carbon	70.8		2.5	5	mg/L	25.4		2.5	5	mg/L					
MT EPA 200.8 (MOD)															
Antimony, Total, ICP-MS	0.36	<RDL	0.3	1	ug/L						<MDL	0.3	1	ug/L	
Arsenic, Total, ICP-MS	1.63		0.05	0.25	ug/L						0.438		0.05	0.25	ug/L
Beryllium, Total, ICP-MS		<MDL	0.1	0.5	ug/L						<MDL	0.1	0.5	ug/L	
Cadmium, Total, ICP-MS	0.075	<RDL	0.05	0.25	ug/L						<MDL	0.05	0.25	ug/L	
Calcium, Total, ICP-MS	25400		50	50	ug/L						14100		50	50	ug/L
Chromium, Total, ICP-MS	0.94	<RDL	0.2	1	ug/L						<MDL	0.2	1	ug/L	
Copper, Total, ICP-MS	20.5		0.2	2	ug/L						1.4	<RDL	0.2	2	ug/L
Lead, Total, ICP-MS	1.12		0.1	0.5	ug/L						<MDL	0.1	0.5	ug/L	
Magnesium, Total, ICP-MS	17700		50	50	ug/L						5760		50	50	ug/L
Nickel, Total, ICP-MS	2.91		0.1	0.5	ug/L						0.855		0.1	0.5	ug/L
Selenium, Total, ICP-MS	0.68	<RDL	0.5	1	ug/L						<MDL	0.5	1	ug/L	
Silver, Total, ICP-MS	0.1	<RDL	0.04	0.2	ug/L						<MDL	0.04	0.2	ug/L	
Thallium, Total, ICP-MS		<MDL	0.1	0.2	ug/L						<MDL	0.1	0.2	ug/L	
Zinc, Total, ICP-MS	45.6		0.5	2.5	ug/L						5.37		0.5	2.5	ug/L
MT EPA 200.8 (MOD)*SM2340B															
Hardness, Calc	136		0.331	0.331	mg CaCO3/L						58.9		0.331	0.331	mg CaCO3/L
MT EPA 245.1															
Mercury, Total, CVAA	0.0659		0.005	0.015	ug/L						<MDL	0.005	0.015	ug/L	
OR EPA 1664B															
Hem (oil, total)	20.1		1.6	5.6	mg/L						<MDL	1.5	5.2	mg/L	

King County Environmental Lab Analytical Report

Project:	423650-100	Project:	423650-100	Project:	423650-100										
Locator:	EFF-SL	Locator:	EFF-SL	Locator:	TNK-SL										
Descrip:	PILOT MEMBRANE PER	Descrip:	PILOT MEMBRANE PER	Descrip:	IN-LINE SED FOR OV										
Sample:	L75645-7	Sample:	L75645-8	Sample:	L75645-9										
Matrix:	LA OTHR WTR	Matrix:	LA OTHR WTR	Matrix:	LA OTHR WTR										
ColDate:	10/22/20 13:40	ColDate:	10/23/20 9:20	ColDate:	10/22/20 9:35										
WET Weight Basis															
Parameters CV SM5310-B	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
Total Organic Carbon															
MT EPA 200.8 (MOD)															
Antimony, Total, ICP-MS	<MDL		0.3	1	ug/L	<MDL		0.3	1	ug/L	0.3	<RDL	0.3	1	ug/L
Arsenic, Total, ICP-MS	0.439		0.05	0.25	ug/L	0.644		0.05	0.25	ug/L	2.76		0.05	0.25	ug/L
Beryllium, Total, ICP-MS	<MDL		0.1	0.5	ug/L	<MDL		0.1	0.5	ug/L	0.38	<RDL	0.1	0.5	ug/L
Cadmium, Total, ICP-MS	<MDL		0.05	0.25	ug/L	<MDL		0.05	0.25	ug/L	0.082	<RDL	0.05	0.25	ug/L
Calcium, Total, ICP-MS	13800		50	50	ug/L	21500		50	50	ug/L	15300		50	50	ug/L
Chromium, Total, ICP-MS	<MDL		0.2	1	ug/L	<MDL		0.2	1	ug/L	2.48		0.2	1	ug/L
Copper, Total, ICP-MS	0.91	<RDL	0.2	2	ug/L	1.7	<RDL	0.2	2	ug/L	26.6		0.2	2	ug/L
Lead, Total, ICP-MS	<MDL		0.1	0.5	ug/L	0.13	<RDL	0.1	0.5	ug/L	2.03		0.1	0.5	ug/L
Magnesium, Total, ICP-MS	5260		50	50	ug/L	13500		50	50	ug/L	5580		50	50	ug/L
Nickel, Total, ICP-MS	0.846		0.1	0.5	ug/L	2.35		0.1	0.5	ug/L	1.64		0.1	0.5	ug/L
Selenium, Total, ICP-MS	<MDL		0.5	1	ug/L	<MDL		0.5	1	ug/L	<MDL		0.5	1	ug/L
Silver, Total, ICP-MS	<MDL		0.04	0.2	ug/L	<MDL		0.04	0.2	ug/L	0.12	<RDL	0.04	0.2	ug/L
Thallium, Total, ICP-MS	<MDL		0.1	0.2	ug/L	<MDL		0.1	0.2	ug/L	<MDL		0.1	0.2	ug/L
Zinc, Total, ICP-MS	6.47		0.5	2.5	ug/L	16.2		0.5	2.5	ug/L	51.4		0.5	2.5	ug/L
MT EPA 200.8 (MOD)*SM2340B															
Hardness, Calc	56		0.331	0.331	mg CaCO3/L	109		0.331	0.331	mg CaCO3/L	61.1		0.331	0.331	mg CaCO3/L
MT EPA 245.1															
Mercury, Total, CVAA	<MDL		0.005	0.015	ug/L	<MDL		0.005	0.015	ug/L	0.0179		0.005	0.015	ug/L
OR EPA 1664B															
Hem (oil, total)	<MDL		1.5	5.3	mg/L	<MDL		1.5	5.2	mg/L					

King County Environmental Lab Analytical Report

Project: 423650-100
 Locator: TNK-SL
 Descrip: IN-LINE SED FOR OV
 Sample: L75645-10
 Matrix: LA OTHR WTR
 ColDate: 10/22/20 13:35
WET Weight Basis

Project: 423650-100
 Locator: TNK-SL
 Descrip: IN-LINE SED FOR OV
 Sample: L75645-11
 Matrix: LA OTHR WTR
 ColDate: 10/23/20 9:10
WET Weight Basis

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
CV SM5310-B										
Total Organic Carbon										
MT EPA 200.8 (MOD)										
Antimony, Total, ICP-MS	0.33	<RDL	0.3	1	ug/L	0.45	<RDL	0.3	1	ug/L
Arsenic, Total, ICP-MS	5.08		0.05	0.25	ug/L	2.86		0.05	0.25	ug/L
Beryllium, Total, ICP-MS	0.563		0.1	0.5	ug/L	0.63		0.1	0.5	ug/L
Cadmium, Total, ICP-MS	0.16	<RDL	0.05	0.25	ug/L	0.17	<RDL	0.05	0.25	ug/L
Calcium, Total, ICP-MS	15400		50	50	ug/L	22300		50	50	ug/L
Chromium, Total, ICP-MS	4.39		0.2	1	ug/L	3.28		0.2	1	ug/L
Copper, Total, ICP-MS	44.5		0.2	2	ug/L	44		0.2	2	ug/L
Lead, Total, ICP-MS	3.66		0.1	0.5	ug/L	2.93		0.1	0.5	ug/L
Magnesium, Total, ICP-MS	5490		50	50	ug/L	13200		50	50	ug/L
Nickel, Total, ICP-MS	2.21		0.1	0.5	ug/L	3.49		0.1	0.5	ug/L
Selenium, Total, ICP-MS		<MDL	0.5	1	ug/L	0.65	<RDL	0.5	1	ug/L
Silver, Total, ICP-MS	0.19	<RDL	0.04	0.2	ug/L	0.19	<RDL	0.04	0.2	ug/L
Thallium, Total, ICP-MS		<MDL	0.1	0.2	ug/L		<MDL	0.1	0.2	ug/L
Zinc, Total, ICP-MS	81.8		0.5	2.5	ug/L	85		0.5	2.5	ug/L
MT EPA 200.8 (MOD)*SM2340B										
Hardness, Calc	61.1		0.331	0.331	mg CaCO3/L	110		0.331	0.331	mg CaCO3/L
MT EPA 245.1										
Mercury, Total, CVAA	0.0296		0.005	0.015	ug/L	0.0394		0.005	0.015	ug/L
OR EPA 1664B										
Hem (oil, total)										

King County Environmental Lab Analytical MATRIX Report

Owner: SEEDPAK
Matrix Class: LIQUID
User select: WET Weight Basis

LOCATOR	PROJECT	SAMPLE	COLLECTED	Total Organic Carbon		Antimony, Total, ICP-MS		Arsenic, Total, ICP-MS		Beryllium, Total, ICP-MS		Cadmium, Total, ICP-MS		Chromium, Total, ICP-MS		Copper, Total, ICP-MS		Lead, Total, ICP-MS		Magnesium, Total, ICP-MS		Nickel, Total, ICP-MS	
				mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	
INF-SL	423650-100	L75645-1	10/23/2020 9:00	54.7																			
INF-SL	423650-100	L75645-2	10/22/2020 9:30	15.4				1.1															
INF-SL	423650-100	L75645-3	10/22/2020 13:30	16.3				1.12															
INF-SL	423650-100	L75645-4	10/23/2020 9:00	70.8	0.36	1.63			0.075														
EFF-SL	423650-100	L75645-5	10/23/2020 9:20	25.4																			
EFF-SL	423650-100	L75645-6	10/22/2020 9:40				0.438																
EFF-SL	423650-100	L75645-7	10/22/2020 13:40				0.439																
EFF-SL	423650-100	L75645-8	10/23/2020 9:20				0.644																
TNK-SL	423650-100	L75645-9	10/22/2020 9:35		0.3	2.76	0.38	0.082															
TNK-SL	423650-100	L75645-10	10/22/2020 13:35		0.33	5.08	0.563	0.16															
TNK-SL	423650-100	L75645-11	10/23/2020 9:10		0.45	2.86	0.63	0.17															
* Not converted to dry weight basis																							
If a parameter/analyte appears twice in the column header, it implies that they were analyzed by two different method codes																							

King County Environmental Lab Analytical MATRIX Report

Owner: SEEDPAK
Matrix Class: LIQUID
User select: WET Weight Basis

LOCATOR	PROJECT	SAMPLE	COLLECTED	Selenium, Total, ICP-MS		Silver, Total, ICP-MS		Thallium, Total, ICP-MS		Zinc, Total, ICP-MS		Hardness, Calc		Mercury, Total, CVAA		Hem (oil, total)	
				ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg CaCO ₃ /L	ug/L	ug/L	mg/L	ug/L	ug/L	mg/L	
INF-SL	423650-100	L75645-1	10/23/2020 9:00														
INF-SL	423650-100	L75645-2	10/22/2020 9:30							19.5	58.7	0.0063		5			
INF-SL	423650-100	L75645-3	10/22/2020 13:30							20	57.4			5			
INF-SL	423650-100	L75645-4	10/23/2020 9:00	0.68	0.1			45.6	136	0.0659		20.1					
EFF-SL	423650-100	L75645-5	10/23/2020 9:20														
EFF-SL	423650-100	L75645-6	10/22/2020 9:40							5.37	58.9						
EFF-SL	423650-100	L75645-7	10/22/2020 13:40							6.47	56						
EFF-SL	423650-100	L75645-8	10/23/2020 9:20							16.2	109						
TNK-SL	423650-100	L75645-9	10/22/2020 9:35		0.12					51.4	61.1	0.0179					
TNK-SL	423650-100	L75645-10	10/22/2020 13:35		0.19					81.8	61.1	0.0296					
TNK-SL	423650-100	L75645-11	10/23/2020 9:10	0.65	0.19					85	110	0.0394					
* Not converted to dry weight basis																	
If a parameter/analyte appears twice in the column header, it implies that they were analyzed																	

Quality Control Data

WG172726 Total Organic Carbon

Sample	Project	Project Description	List Type	Matrix	Collect Date	Prep Date	Anal Date	QC Association	Comments
L72347-1	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/20/2020 7:35	10/28/2020 0:33	10/28/2020 0:33		
L72347-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/20/2020 9:35	10/28/2020 0:41	10/28/2020 0:41		
L72347-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/20/2020 12:30	10/28/2020 0:49	10/28/2020 0:49		
L72347-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/20/2020 14:30	10/28/2020 0:57	10/28/2020 0:57		
L72347-5	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/20/2020 16:30	10/27/2020 21:57	10/27/2020 21:57		
L72347-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/20/2020 18:00	10/27/2020 21:49	10/27/2020 21:49		
L72347-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	OTHR WTR	10/20/2020 7:00	10/27/2020 19:43	10/27/2020 19:43		
L75598-3	421422-CFSW	SWD-CFSW Cedar Falls Surface Water Quarterly	CVTOC	FRESH WTR	10/26/2020 9:05	10/27/2020 18:42	10/27/2020 18:42		
L75620-1	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/13/2020 8:15	10/27/2020 21:42	10/27/2020 21:42		
L75620-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/13/2020 10:35	10/28/2020 1:05	10/28/2020 1:05		
L75620-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/13/2020 13:10	10/28/2020 1:15	10/28/2020 1:15		
L75620-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/13/2020 13:55	10/27/2020 22:45	10/27/2020 22:45		
L75620-9	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/13/2020 17:05	10/27/2020 22:52	10/27/2020 22:52		
L75620-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	OTHR WTR	10/13/2020 17:15	10/27/2020 20:44	10/27/2020 20:44		
L75631-4	421422-CHGW-OS	SWD-CHGW-OS Cedar Hills Groundwater Off-Site	CVTOC	GRND WTR	10/22/2020 8:57	10/27/2020 15:36	10/27/2020 15:36		
L75645-5	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	OTHR WTR	10/23/2020 9:20	10/27/2020 19:50	10/27/2020 19:50		
L75676-1	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/15/2020 8:30	10/27/2020 23:00	10/27/2020 23:00		
L75676-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/15/2020 11:30	10/27/2020 23:08	10/27/2020 23:08		
L75676-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/15/2020 14:00	10/27/2020 23:16	10/27/2020 23:16		
L75676-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/15/2020 16:30	10/27/2020 23:24	10/27/2020 23:24		
L75676-5	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/15/2020 20:00	10/27/2020 23:32	10/27/2020 23:32		
L75676-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/16/2020 0:30	10/27/2020 23:40	10/27/2020 23:40		
L75676-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/16/2020 4:00	10/27/2020 23:48	10/27/2020 23:48		
L75676-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/16/2020 7:05	10/27/2020 23:57	10/27/2020 23:57		
L75676-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	OTHR WTR	10/15/2020 8:00	10/27/2020 20:52	10/27/2020 20:52		
L75685-5	421422-CHGW-APP3	SWD-CHGW-Appendix III GW Analyses	CVTOC	GRND WTR	10/22/2020 7:40	10/27/2020 15:43	10/27/2020 15:43		
L75691-1	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/22/2020 11:00	10/27/2020 15:50	10/27/2020 15:50		
L75691-3	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/22/2020 11:35	10/27/2020 16:53	10/27/2020 16:53		
L75691-4	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/22/2020 11:22	10/27/2020 16:59	10/27/2020 16:59		
L75691-5	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/22/2020 11:35	10/27/2020 16:46	10/27/2020 16:46		
L75691-6	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/23/2020 7:42	10/27/2020 17:12	10/27/2020 17:12		
L75691-7	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/23/2020 8:32	10/27/2020 17:23	10/27/2020 17:23		
L75691-8	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/26/2020 9:54	10/27/2020 17:52	10/27/2020 17:52		
L75691-9	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/23/2020 8:06	10/27/2020 17:32	10/27/2020 17:32		
L75691-10	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/23/2020 8:10	10/27/2020 17:38	10/27/2020 17:38		
L75691-11	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/23/2020 9:34	10/27/2020 17:45	10/27/2020 17:45		
L75692-1	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/26/2020 10:21	10/27/2020 17:59	10/27/2020 17:59		
L75692-3	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/26/2020 9:41	10/27/2020 18:49	10/27/2020 18:49		
L75692-4	421422-CFGW	SWD-CFGW Cedar Falls Groundwater Quarterly	CVTOC	GRND WTR	10/26/2020 9:04	10/27/2020 19:00	10/27/2020 19:00		
WG172726-1	MDLCK		CVTOC	BLANK WTR	10/27/2020 14:51	10/27/2020 14:51	10/27/2020 14:51	LEVEL1	
WG172726-2	MB		CVTOC	BLANK WTR	10/27/2020 15:02	10/27/2020 15:02	10/27/2020 15:02	MB1 10/27/20	
WG172726-3	SB		CVTOC	BLANK WTR	10/27/2020 15:10	10/27/2020 15:10	10/27/2020 15:10	WG172726-2	
WG172726-4	LCS		CVTOC	BLANK WTR	10/27/2020 15:17	10/27/2020 15:17	10/27/2020 15:17	LEVEL1	
WG172726-5	LD		CVTOC	GRND WTR	10/27/2020 16:02	10/27/2020 16:02	10/27/2020 16:02	L75691-1	
WG172726-6	MS		CVTOC	GRND WTR	10/27/2020 16:10	10/27/2020 16:10	10/27/2020 16:10	L75691-1	
WG172726-7	LD		CVTOC	OTHR WTR	10/27/2020 19:58	10/27/2020 19:58	10/27/2020 19:58	L75645-5	
WG172726-8	MS		CVTOC	OTHR WTR	10/27/2020 20:06	10/27/2020 20:06	10/27/2020 20:06	L75645-5	
WG172726-9	MB		CVTOC	BLANK WTR	10/27/2020 21:06	10/27/2020 21:06	10/27/2020 21:06	MB2 10/27/20	
WG172726-10	SB		CVTOC	BLANK WTR	10/27/2020 21:16	10/27/2020 21:16	10/27/2020 21:16	WG172726-9	
WG172726-11	LCS		CVTOC	BLANK WTR	10/27/2020 21:23	10/27/2020 21:23	10/27/2020 21:23	LEVEL1	
WG172726-12	LD		CVTOC	INFILUENT	10/27/2020 22:05	10/27/2020 22:05	10/27/2020 22:05	L72347-5	
WG172726-13	MS		CVTOC	INFILUENT	10/27/2020 22:13	10/27/2020 22:13	10/27/2020 22:13	L72347-5	

WG172726-1,-2,-3,-4,-5,-6,-7,-8,-9,-10,-11,-12,-13

WG172939 Total Organic Carbon

Sample	Project	Project Description	List Type	Matrix	Collect Date	Prep Date	Anal Date	QC Association	Comments
L75598-1	421422-CFSW	SWD-CFSW Cedar Falls Surface Water Quarterly	CVTOC	FRESH WTR	10/26/2020 8:30	11/5/2020 22:52	11/5/2020 22:52		
L75645-1	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/23/2020 9:00	11/5/2020 13:54	11/5/2020 13:54		
L75645-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/22/2020 9:30	11/5/2020 14:00	11/5/2020 14:00		
L75645-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/22/2020 13:30	11/5/2020 14:08	11/5/2020 14:08		
L75645-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	10/23/2020 9:00	11/5/2020 14:15	11/5/2020 14:15		
L75725-1	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	11/3/2020 8:30	11/5/2020 12:57	11/5/2020 12:57		
L75725-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	11/3/2020 10:00	11/5/2020 13:04	11/5/2020 13:04		
L75725-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	11/3/2020 11:45	11/5/2020 13:12	11/5/2020 13:12		
L75725-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	CVTOC	INFILUENT	11/3/2020 13:50	11/5/2020 13:42	11/5/2020 13:42		
WG172939-1	MDLCK		CVTOC	BLANK WTR	11/5/2020 11:28	11/5/2020 11:28	11/5/2020 11:28		
WG172939-2	MB		CVTOC	BLANK WTR	11/5/2020 11:35	11/5/2020 11:35	11/5/2020 11:35		
WG172939-3	SB		CVTOC	BLANK WTR	11/5/2020 11:41	11/5/2020 11:41	11/5/2020 11:41		
WG172939-4	LCS		CVTOC	BLANK WTR	11/5/2020 11:49	11/5/2020 11:49	11/5/2020 11:49		
WG172939-5	LD		CVTOC	FRESH WTR	11/5/2020 23:05	11/5/2020 23:05	11/5/2020 23:05		
WG172939-6	MS		CVTOC	FRESH WTR	11/5/2020 23:13	11/5/2020 23:13	11/5/2020 23:13		
WG172939-7	LD		CVTOC	INFILUENT	11/5/2020 13:20	11/5/2020 13:20	11/5/2020 13:20		
WG172939-8	MS		CVTOC	INFILUENT	11/5/2020 13:27	11/5/2020 13:27	11/5/2020 13:27		
QC Association								WG172939-1,-2,-3,-4,-7,-8,-5,-6	
Comments								LEVEL1 MB1 11/5/20 WG172939-2 LEVEL1 L75598-1 L75598-1 L75725-3 L75725-3	

WG172699 Total Mercury

Sample	Project	Project Description	List Type	Matrix	Collect Date	Prep Date	Anal Date	QC Association	Comments
L75645-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	INFLUENT	10/22/2020 9:30	10/26/2020 15:00	10/29/2020 13:02		
L75645-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	INFLUENT	10/22/2020 13:30	10/26/2020 15:00	10/29/2020 13:05		
L75645-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	INFLUENT	10/23/2020 9:00	10/26/2020 15:00	10/29/2020 13:09		
L75645-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/22/2020 9:40	10/26/2020 15:00	10/29/2020 13:12		
L75645-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/22/2020 13:40	10/26/2020 15:00	10/29/2020 13:23		
L75645-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/23/2020 9:20	10/26/2020 15:00	10/29/2020 13:27		
L75645-9	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/22/2020 9:35	10/26/2020 15:00	10/29/2020 13:38		
L75645-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/22/2020 13:35	10/26/2020 15:00	10/29/2020 13:42		
L75645-11	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHG-LOW	OTHR WTR	10/23/2020 9:10	10/26/2020 15:00	10/29/2020 13:45		
WG172699-1	MB		MTHG-LOW	BLANK WTR		10/26/2020 15:00	10/29/2020 12:54		
WG172699-2	SB		MTHG-LOW	BLANK WTR		10/26/2020 15:00	10/29/2020 12:58		
WG172699-3	MS		MTHG-LOW	OTHR WTR		10/26/2020 15:00	10/29/2020 13:16		
WG172699-4	MSD		MTHG-LOW	OTHR WTR		10/26/2020 15:00	10/29/2020 13:20		
WG172699-5	MDLCK		MTHG-LOW	BLANK WTR		10/26/2020 15:00	10/29/2020 13:49		
WG172699-6	MDLCK		MTHG-LOW	BLANK WTR		10/26/2020 15:00	10/29/2020 13:53		

WG172822 Total Metals and Hardness by ICPMS

Sample	Project	Project Description	List Type	Matrix	Collect Date	Prep Date	Anal Date	QC Association	Comments
L75645-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/22/2020 9:40	11/3/2020 7:30	11/9/2020 16:50		
L75645-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/22/2020 9:40	11/3/2020 7:30	11/4/2020 12:01		
L75645-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/22/2020 13:40	11/3/2020 7:30	11/9/2020 16:50		
L75645-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/22/2020 13:40	11/3/2020 7:30	11/4/2020 12:54		
L75645-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/23/2020 9:20	11/3/2020 7:30	11/9/2020 16:50		
L75645-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/23/2020 9:20	11/3/2020 7:30	11/4/2020 12:14		
L75645-9	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/22/2020 9:35	11/3/2020 7:30	11/9/2020 16:50		
L75645-9	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/22/2020 9:35	11/3/2020 7:30	11/4/2020 12:18		
L75645-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/22/2020 13:35	11/3/2020 7:30	11/9/2020 16:50		
L75645-10	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/22/2020 13:35	11/3/2020 7:30	11/4/2020 12:21		
L75645-11	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	OTHR WTR	10/23/2020 9:10	11/3/2020 7:30	11/9/2020 16:50		
L75645-11	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	OTHR WTR	10/23/2020 9:10	11/3/2020 7:30	11/4/2020 12:24		
L75666-1	421937	Brightwater Operations	MTHARD-ICPMS	INFLUENT	10/28/2020 6:59	11/3/2020 7:30	11/9/2020 16:50		
L75666-1	421937	Brightwater Operations	MTICPMS	INFLUENT	10/28/2020 6:59	11/3/2020 7:30	11/4/2020 12:27		
L75666-3	421937	Brightwater Operations	MTHARD-ICPMS	EFFLUENT	10/28/2020 7:46	11/3/2020 7:30	11/9/2020 16:50		
L75666-3	421937	Brightwater Operations	MTICPMS	EFFLUENT	10/28/2020 7:46	11/3/2020 7:30	11/4/2020 12:31		
L75754-1	421937	Brightwater Operations	MTICPMS	STORM WTR	10/12/2020 11:00	11/3/2020 7:30	11/4/2020 12:41		
L75754-2	421937	Brightwater Operations	MTICPMS	STORM WTR	10/12/2020 11:00	11/3/2020 7:30	11/4/2020 12:50		
WG172822-1	MB		MTHARD-ICPMS	BLANK WTR	11/3/2020 7:30	11/9/2020 16:50			
WG172822-1	MB		MTICPMS	BLANK WTR	11/3/2020 7:30	11/4/2020 11:31			
WG172822-2	SB		MTHARD-ICPMS	BLANK WTR	11/3/2020 7:30	11/9/2020 16:50			
WG172822-2	SB		MTICPMS	BLANK WTR	11/3/2020 7:30	11/4/2020 11:35			
WG172822-5	MS		MTHARD-ICPMS	EFFLUENT	11/3/2020 7:30	11/9/2020 16:50			
WG172822-5	MS		MTICPMS	EFFLUENT	11/3/2020 7:30	11/4/2020 12:34			
WG172822-6	MSD		MTHARD-ICPMS	EFFLUENT	11/3/2020 7:30	11/9/2020 16:50			
WG172822-6	MSD		MTICPMS	EFFLUENT	11/3/2020 7:30	11/4/2020 12:37			

WG172822-1,-2,-5,-6

METHOD BLANK
 METHOD BLANK
 WG172822-1 MS-20
 WG172822-1 MS-20
 L75666-3 MS-20
 L75666-3 MS-20
 WG172822-5 L75666-3 MS-20
 WG172822-5 L75666-3 MS-20

WG172972 Total Metals and Hardness by ICPMS

Sample	Project	Project Description	List Type	Matrix	Collect Date	Prep Date	Anal Date	QC Association	Comments
L75607-1	421195-260	Ravensdale Monthly GW	MTICPMS	GRND WTR	11/4/2020 9:00	11/10/2020 9:40	11/12/2020 8:50		
L75645-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	INFLUENT	10/22/2020 9:30	11/10/2020 9:40	11/12/2020 12:33		
L75645-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	INFLUENT	10/22/2020 9:30	11/10/2020 9:40	11/12/2020 8:54		
L75645-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	INFLUENT	10/22/2020 13:30	11/10/2020 9:40	11/12/2020 12:33		
L75645-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	INFLUENT	10/22/2020 13:30	11/10/2020 9:40	11/12/2020 8:58		
L75645-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTHARD-ICPMS	INFLUENT	10/23/2020 9:00	11/10/2020 9:40	11/12/2020 12:33		
L75645-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	MTICPMS	INFLUENT	10/23/2020 9:00	11/10/2020 9:40	11/12/2020 9:01		
WG172972-1	MB		MTICPMS	BLANK WTR	11/10/2020 9:40	11/12/2020 9:40	11/12/2020 12:33	WG172972-1,-2,-3,-4	METHOD BLANK
WG172972-1	MB		MTICPMS	BLANK WTR	11/10/2020 9:40	11/12/2020 9:43			METHOD BLANK
WG172972-2	SB		MTHARD-ICPMS	BLANK WTR	11/10/2020 9:40	11/12/2020 12:33			WG172972-1 MS-20
WG172972-2	SB		MTICPMS	BLANK WTR	11/10/2020 9:40	11/12/2020 8:47			WG172972-1 MS-20
WG172972-3	MS		MTHARD-ICPMS	INFLUENT	11/10/2020 9:40	11/12/2020 12:33			L75645-4 MS-20
WG172972-3	MS		MTICPMS	INFLUENT	11/10/2020 9:40	11/12/2020 9:05			L75645-4 MS-20
WG172972-4	MSD		MTHARD-ICPMS	INFLUENT	11/10/2020 9:40	11/12/2020 12:33			WG172972-3 L75645-4 MS-20
WG172972-4	MSD		MTICPMS	INFLUENT	11/10/2020 9:40	11/12/2020 9:08			WG172972-3 L75645-4 MS-20

WG172811 HEM

Sample	Project	Project Description	List Type	Matrix	Collect Date	Prep Date	Anal Date	QC Association	Comments
L75645-2	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	INFILUENT	10/22/2020 9:30	11/2/2020 10:00	11/3/2020 17:45		
L75645-3	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	INFILUENT	10/22/2020 13:30	11/2/2020 10:00	11/3/2020 17:45		
L75645-4	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	INFILUENT	10/23/2020 9:00	11/2/2020 10:00	11/3/2020 17:45		
L75645-6	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	OTHR WTR	10/22/2020 9:40	11/2/2020 10:00	11/3/2020 17:45		
L75645-7	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	OTHR WTR	10/22/2020 13:40	11/2/2020 10:00	11/3/2020 17:45		
L75645-8	423650-100	WTC OVIVO Technology Pilot - Elliott West CSO	ORHEM	OTHR WTR	10/23/2020 9:20	11/2/2020 10:00	11/3/2020 17:45		
L75666-2	421937	Brightwater Operations	ORHEM	INFILUENT	10/28/2020 6:55	11/2/2020 10:00	11/3/2020 17:45		
L75666-4	421937	Brightwater Operations	ORHEM	EFFLUENT	10/28/2020 7:40	11/2/2020 10:00	11/3/2020 17:45	WG172811-1,-2,-3,-4,-5,-6,-7	
WG172811-1	MB		ORHEM	BLANK WTR	11/2/2020 10:00	11/3/2020 17:45			MB201102
WG172811-2	LCS		ORHEM	BLANK WTR	11/2/2020 10:00	11/3/2020 17:45			WG172811-1
WG172811-3	LCSD		ORHEM	BLANK WTR	11/2/2020 10:00	11/3/2020 17:45			WG172811-2 WG172811-1
WG172811-4	MS		ORHEM	OTHR WTR	11/2/2020 10:00	11/3/2020 17:45			L75645-7
WG172811-5	MDLCK		ORHEM	BLANK WTR	11/2/2020 10:00	11/3/2020 17:45			20 MG TOTAL HEM
WG172811-6	MDLCK		ORHEM	BLANK WTR	11/2/2020 10:00	11/3/2020 17:45			20 MG TOTAL HEM
WG172811-7	MDLCK		ORHEM	BLANK WTR	11/2/2020 10:00	11/3/2020 17:45			20 MG TOTAL HEM

* End of L75645_56492_BATCH.xls

King County Environmental Laboratory QC Report

OVIVO Pilot 22October2020

Workgroup: WG172726 Total Organic Carbon

MB:WG172726-2 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD
(Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Total Organic Carbon	0.5	1	mg/L	<MDL	

SB:WG172726-3 MB:WG172726-2 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Spike Blank, Method Blank)

Parameter	MDL	RDL	Units	MB Value	True Value	SB Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	0.5	1	mg/L	<MDL	5	5.11	102		80-120

LCS:WG172726-4 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Lab Control Sample)

Parameter	MDL	RDL	Units	True Value	LCS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	0.5	1	mg/L	8	8.11	101		85-115

LD:WG172726-5 L75691-1 Matrix: GRND WTR Listtype:CVTOC Method:SM5310-B Project:421422-CFGW Pkey:STD

(Lab Duplicate)

Parameter	MDL	RDL	Units	SAMP Value	LD Value	RPD	Qual	Lab Limit
Total Organic Carbon	0.5	1	mg/L	1.11	1.28	14		0-20

MS:WG172726-6 L75691-1 Matrix: GRND WTR Listtype:CVTOC Method:SM5310-B Project:421422-CFGW Pkey:STD

(Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	0.5	1	mg/L	1.11	5	6.36	105		75-125

LD:WG172726-7 L75645-5 Matrix: OTHR WTR Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Lab Duplicate)

Parameter	MDL	RDL	Units	SAMP Value	LD Value	RPD	Qual	Lab Limit
Total Organic Carbon	2.5	5	mg/L	25.4	26.1	3		0-20

MS:WG172726-8 L75645-5 Matrix: OTHR WTR Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	2.5	5	mg/L	25.4	25	49.1	95		75-125

MB:WG172726-9 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Total Organic Carbon	0.5	1	mg/L	<MDL	

SB:WG172726-10 MB:WG172726-9 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Spike Blank, Method Blank)

Parameter	MDL	RDL	Units	MB Value	True Value	SB Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	0.5	1	mg/L	<MDL	5	5.02	100		80-120

LCS:WG172726-11 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Lab Control Sample)

Parameter	MDL	RDL	Units	True Value	LCS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	0.5	1	mg/L	8	7.73	97		85-115

LD:WG172726-12 L72347-5 Matrix: INFLUENT Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Lab Duplicate)

Parameter	MDL	RDL	Units	SAMP Value	LD Value	RPD	Qual	Lab Limit
Total Organic Carbon	2.5	5	mg/L	23.2	25.3	9		0-20

MS:WG172726-13 L72347-5 Matrix: INFLUENT Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	2.5	5	mg/L	23.2	25	45.7	90		75-125

Workgroup: WG172939 Total Organic Carbon

MB:WG172939-2 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD
(Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Total Organic Carbon	0.5	1	mg/L	<MDL	

SB:WG172939-3 MB:WG172939-2 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Spike Blank, Method Blank)

Parameter	MDL	RDL	Units	MB Value	True Value	SB Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	0.5	1	mg/L	<MDL	10	10.8	108		80-120

LCS:WG172939-4 Matrix: BLANK WTR Listtype:CVTOC Method:SM5310-B Project: Pkey:STD

(Lab Control Sample)

Parameter	MDL	RDL	Units	True Value	LCS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	0.5	1	mg/L	8	8.39	105		85-115

LD:WG172939-5 L75598-1 Matrix: FRESH WTR Listtype:CVTOC Method:SM5310-B Project:421422-CFSW Pkey:STD

(Lab Duplicate)

Parameter	MDL	RDL	Units	SAMP Value	LD Value	RPD	Qual	Lab Limit
Total Organic Carbon	10	20	mg/L	17	16		0-20	

MS:WG172939-6 L75598-1 Matrix: FRESH WTR Listtype:CVTOC Method:SM5310-B Project:421422-CFSW Pkey:STD

(Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	10	20	mg/L	17	200	222	103		75-125

LD:WG172939-7 L75725-3 Matrix: INFLUENT Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Lab Duplicate)

Parameter	MDL	RDL	Units	SAMP Value	LD Value	RPD	Qual	Lab Limit
Total Organic Carbon	2.5	5	mg/L	16.6	17.6	6	0-20	

MS:WG172939-8 L75725-3 Matrix: INFLUENT Listtype:CVTOC Method:SM5310-B Project:423650-100 Pkey:STD

(Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit
Total Organic Carbon	2.5	5	mg/L	16.6	50	70.7	108		75-125

Workgroup: WG172699 Total Mercury

MB:WG172699-1 Matrix: BLANK WTR Listtype:MTHG-LOW Method:EPA 245.1 Project: Pkey:STD

(Method Blank)

Parameter

Mercury, Total, CVAA

	MDL	RDL	Units	MB Value	Qual
	0.005	0.015	ug/L	<MDL	

SB:WG172699-2 MB:WG172699-1 Matrix: BLANK WTR Listtype:MTHG-LOW Method:EPA 245.1 Project: Pkey:STD

(Spike Blank, Method Blank)

Parameter

Mercury, Total, CVAA

	MDL	RDL	Units	MB Value	True Value	SB Value	% Rec.	Qual	Lab Limit
	0.005	0.015	ug/L	<MDL	0.05	0.0469	94		85-115

MSD:WG172699-4 MS:WG172699-3 L75645-6 Matrix: OTHR WTR Listtype:MTHG-LOW Method:EPA 245.1 Project:423650-100 Pkey:STD

(Matrix Spike Duplicate, Matrix Spike)

Parameter

Mercury, Total, CVAA

	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit	True Value	MSD Value	% Rec.	Qual	RPD	Qual	Lab Limit
	0.005	0.015	ug/L	<MDL	0.05	0.0464	93		75-125	0.05	0.0472	94	2		0--20	

Workgroup: WG172822 Total Metals and Hardness by ICPMS

MB:WG172822-1 Matrix: BLANK WTR Listtype:MTHARD-ICPMS Method:EPA 200.8 (MOD)*SM2340B Project: Pkey:STD
 (Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Hardness, Calc	0.331	0.331	mg CaCO ₃ /L	<MDL	

MB:WG172822-1 Matrix: BLANK WTR Listtype:MTICPMS Method:EPA 200.8 (MOD) Project: Pkey:STD

(Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Beryllium, Total, ICP-MS	0.1	0.5	ug/L	<MDL	
Sodium, Total, ICP-MS	100	100	ug/L	<MDL	
Magnesium, Total, ICP-MS	50	50	ug/L	<MDL	
Potassium, Total, ICP-MS	100	500	ug/L	<MDL	
Calcium, Total, ICP-MS	50	50	ug/L	<MDL	
Chromium, Total, ICP-MS	0.2	1	ug/L	<MDL	
Iron, Total, ICP-MS	10	50	ug/L	<MDL	
Nickel, Total, ICP-MS	0.1	0.5	ug/L	<MDL	
Copper, Total, ICP-MS	0.2	2	ug/L	<MDL	
Zinc, Total, ICP-MS	0.5	2.5	ug/L	<MDL	
Arsenic, Total, ICP-MS	0.05	0.25	ug/L	<MDL	
Selenium, Total, ICP-MS	0.5	1	ug/L	<MDL	
Silver, Total, ICP-MS	0.04	0.2	ug/L	<MDL	
Cadmium, Total, ICP-MS	0.05	0.25	ug/L	<MDL	
Antimony, Total, ICP-MS	0.3	1	ug/L	<MDL	
Barium, Total, ICP-MS	0.5	0.5	ug/L	<MDL	
Thallium, Total, ICP-MS	0.1	0.2	ug/L	<MDL	
Lead, Total, ICP-MS	0.1	0.5	ug/L	<MDL	

SB:WG172822-2 MB:WG172822-1 Matrix: BLANK WTR Listtype:MTHARD-ICPMS Method:EPA 200.8 (MOD)*SM2340B Project: Pkey:STD

(Spike Blank, Method Blank)

Parameter	MDL	RDL	Units	MB Value	True Value	SB Value	% Rec.	Qual	Lab Limit
Hardness, Calc	0.331	0.331	mg CaCO ₃ /L	<MDL	33.1	33	100		85-115

SB:WG172822-2 MB:WG172822-1 Matrix: BLANK WTR Listtype:MTICPMS Method:EPA 200.8 (MOD) Project: Pkey:STD

(Spike Blank, Method Blank)

Parameter	MDL	RDL	Units	MB Value	True Value	SB Value	% Rec.	Qual	Lab Limit
Beryllium, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	19.7	98		85-115
Sodium, Total, ICP-MS	100	100	ug/L	<MDL	5000	4960	99		85-115
Magnesium, Total, ICP-MS	50	50	ug/L	<MDL	5000	5080	102		85-115
Potassium, Total, ICP-MS	100	500	ug/L	<MDL	5000	5020	100		85-115
Calcium, Total, ICP-MS	50	50	ug/L	<MDL	5000	4850	97		85-115
Chromium, Total, ICP-MS	0.2	1	ug/L	<MDL	20	20.8	104		85-115
Iron, Total, ICP-MS	10	50	ug/L	<MDL	5000	5030	101		85-115
Nickel, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	21.2	106		85-115
Copper, Total, ICP-MS	0.2	2	ug/L	<MDL	20	20.9	104		85-115
Zinc, Total, ICP-MS	0.5	2.5	ug/L	<MDL	20	20.5	102		85-115
Arsenic, Total, ICP-MS	0.05	0.25	ug/L	<MDL	20	20	100		85-115
Selenium, Total, ICP-MS	0.5	1	ug/L	<MDL	20	19.7	98		85-115
Silver, Total, ICP-MS	0.04	0.2	ug/L	<MDL	20	18.9	94		85-115
Cadmium, Total, ICP-MS	0.05	0.25	ug/L	<MDL	20	19.3	96		85-115
Antimony, Total, ICP-MS	0.3	1	ug/L	<MDL	20	19.5	97		85-115
Barium, Total, ICP-MS	0.5	0.5	ug/L	<MDL	20	20.5	102		85-115
Thallium, Total, ICP-MS	0.1	0.2	ug/L	<MDL	20	19.6	98		85-115
Lead, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	19.8	99		85-115

MSD:WG172822-6 MS:WG172822-5 L75666-3 Matrix: EFFLUENT Listtype:MTIHARD-ICPMS Method:EPA 200.8 (MOD)*SM2340B Project:421937 Pkey:STD

(Matrix Spike Duplicate, Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit	True Value	MSD Value	% Rec.	Qual	RPD	Qual	Lab Limit
Hardness, Calc	0.331	0.331	mg CaCO ₃ /L	229	33.1	270	4xRule		75-125	33.1	270	4xRule	0	0	0-20	

MSD:WG172822-6 MS:WG172822-5 L75666-3 Matrix: EFFLUENT Listtype:MTICPMS Method:EPA 200.8 (MOD) Project:421937 Pkey:STD

(Matrix Spike Duplicate, Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit	True Value	MSD Value	% Rec.	Qual	RPD	Qual	Lab Limit
Beryllium, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	19.8	99		75-125	20	20.1	101	2		0-20	
Sodium, Total, ICP-MS	100	100	ug/L	56100	5000	60800	4xRule		75-125	5000	62300	4xRule	2		0-20	
Magnesium, Total, ICP-MS	50	50	ug/L	46100	5000	53200	4xRule		75-125	5000	52900	4xRule	1		0-20	
Potassium, Total, ICP-MS	100	500	ug/L	18400	5000	23600	105		75-125	5000	23800	110	1		0-20	
Calcium, Total, ICP-MS	50	50	ug/L	15800	5000	20400	92		75-125	5000	21100	106	3		0-20	
Chromium, Total, ICP-MS	0.2	1	ug/L	0.44	20	21.2	104		75-125	20	21	103	1		0-20	
Iron, Total, ICP-MS	10	50	ug/L	76.4	5000	5090	100		75-125	5000	4920	97	3		0-20	
Nickel, Total, ICP-MS	0.1	0.5	ug/L	1.57	20	21.6	100		75-125	20	22.3	103	3		0-20	
Copper, Total, ICP-MS	0.2	2	ug/L	8.86	20	28.4	98		75-125	20	29	101	2		0-20	
Zinc, Total, ICP-MS	0.5	2.5	ug/L	42.5	20	61.1	93		75-125	20	62	97	1		0-20	
Arsenic, Total, ICP-MS	0.05	0.25	ug/L	1.02	20	21	100		75-125	20	21.3	101	1		0-20	
Selenium, Total, ICP-MS	0.5	1	ug/L	<MDL	20	20	100		75-125	20	20.3	101	2		0-20	
Silver, Total, ICP-MS	0.04	0.2	ug/L	<MDL	20	18.9	94		75-125	20	18.5	92	2		0-20	
Cadmium, Total, ICP-MS	0.05	0.25	ug/L	<MDL	20	19.2	96		75-125	20	19.1	95	1		0-20	
Antimony, Total, ICP-MS	0.3	1	ug/L	<MDL	20	19.7	99		75-125	20	19.5	98	1		0-20	
Barium, Total, ICP-MS	0.5	0.5	ug/L	4.65	20	25.1	102		75-125	20	24.8	101	2		0-20	
Thallium, Total, ICP-MS	0.1	0.2	ug/L	<MDL	20	18.9	95		75-125	20	18.9	95	0		0-20	
Lead, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	19.5	97		75-125	20	19.6	98	1		0-20	

King County Environmental Laboratory QC Report

OVIVO Pilot 22October2020

Workgroup: WG172972 Total Metals and Hardness by ICPMS

MB:WG172972-1 Matrix: BLANK WTR Listtype:MTHARD-ICPMS Method:EPA 200.8 (MOD)*SM2340B Project: Pkey:STD
(Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Hardness, Calc	0.331	0.331	mg CaCO ₃ /L	<MDL	

MB:WG172972-1 Matrix: BLANK WTR Listtype:MTICPMS Method:EPA 200.8 (MOD) Project: Pkey:STD

(Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Beryllium, Total, ICP-MS	0.1	0.5	ug/L	<MDL	
Magnesium, Total, ICP-MS	50	50	ug/L	<MDL	
Calcium, Total, ICP-MS	50	50	ug/L	<MDL	
Chromium, Total, ICP-MS	0.2	1	ug/L	<MDL	
Nickel, Total, ICP-MS	0.1	0.5	ug/L	<MDL	
Copper, Total, ICP-MS	0.2	2	ug/L	<MDL	
Zinc, Total, ICP-MS	0.5	2.5	ug/L	<MDL	
Arsenic, Total, ICP-MS	0.05	0.25	ug/L	<MDL	
Selenium, Total, ICP-MS	0.5	1	ug/L	<MDL	
Silver, Total, ICP-MS	0.04	0.2	ug/L	<MDL	
Cadmium, Total, ICP-MS	0.05	0.25	ug/L	<MDL	
Antimony, Total, ICP-MS	0.3	1	ug/L	<MDL	
Thallium, Total, ICP-MS	0.1	0.2	ug/L	<MDL	
Lead, Total, ICP-MS	0.1	0.5	ug/L	<MDL	

SB:WG172972-2 MB:WG172972-1 Matrix: BLANK WTR Listtype:MTHARD-ICPMS Method:EPA 200.8 (MOD)*SM2340B Project: Pkey:STD

(Spike Blank, Method Blank)

Parameter	MDL	RDL	Units	MB Value	True Value	SB Value	% Rec.	Qual	Lab Limit
Hardness, Calc	0.331	0.331	mg CaCO ₃ /L	<MDL	33.1	33.8	102		85-115

SB:WG172972-2 MB:WG172972-1 Matrix: BLANK WTR Listtype:MTICPMS Method:EPA 200.8 (MOD) Project: Pkey:STD

(Spike Blank, Method Blank)

Parameter	MDL	RDL	Units	MB Value	True Value	SB Value	% Rec.	Qual	Lab Limit
Beryllium, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	19.1	96		85-115
Magnesium, Total, ICP-MS	50	50	ug/L	<MDL	5000	5350	107		85-115
Calcium, Total, ICP-MS	50	50	ug/L	<MDL	5000	4710	94		85-115
Chromium, Total, ICP-MS	0.2	1	ug/L	<MDL	20	19.7	98		85-115
Nickel, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	21	105		85-115
Copper, Total, ICP-MS	0.2	2	ug/L	<MDL	20	20.4	102		85-115
Zinc, Total, ICP-MS	0.5	2.5	ug/L	<MDL	20	21.2	106		85-115
Arsenic, Total, ICP-MS	0.05	0.25	ug/L	<MDL	20	20.1	101		85-115
Selenium, Total, ICP-MS	0.5	1	ug/L	<MDL	20	19	95		85-115
Silver, Total, ICP-MS	0.04	0.2	ug/L	<MDL	20	19.5	98		85-115
Cadmium, Total, ICP-MS	0.05	0.25	ug/L	<MDL	20	19.5	97		85-115
Antimony, Total, ICP-MS	0.3	1	ug/L	<MDL	20	20	100		85-115
Thallium, Total, ICP-MS	0.1	0.2	ug/L	<MDL	20	19.6	98		85-115
Lead, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	20.3	102		85-115

MSD:WG172972-4 MS:WG172972-3 L75645-4 Matrix: INFLUENT Listtype:MTHARD-ICPMS Method:EPA 200.8 (MOD)*SM2340B Project:423650-100 Pkey:STD

(Matrix Spike Duplicate, Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit	True Value	MSD Value	% Rec.	Qual	RPD	Lab Limit
Hardness, Calc	0.331	0.331	mg CaCO ₃ /L	136	33.1	164	4xRule		75-125	33.1	167	4xRule	2	0-20	

MSD:WG172972-4 MS:WG172972-3 L75645-4 Matrix: INFLUENT Listtype:MTICPMS Method:EPA 200.8 (MOD) Project:423650-100 Pkey:STD

(Matrix Spike Duplicate, Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit	True Value	MSD Value	% Rec.	Qual	RPD	Qual	Lab Limit
Beryllium, Total, ICP-MS	0.1	0.5	ug/L	<MDL	20	19	95		75-125	20	20.9	105	10	0-20		
Magnesium, Total, ICP-MS	50	50	ug/L	17700	5000	22300	92		75-125	5000	22700	101	2	0-20		
Calcium, Total, ICP-MS	50	50	ug/L	25400	5000	29100	4xRule		75-125	5000	29400	4xRule	1	0-20		
Chromium, Total, ICP-MS	0.2	1	ug/L	0.94	20	20.6	98		75-125	20	20.5	98	1	0-20		
Nickel, Total, ICP-MS	0.1	0.5	ug/L	2.91	20	23.4	102		75-125	20	23	101	2	0-20		
Copper, Total, ICP-MS	0.2	2	ug/L	20.5	20	39.8	97		75-125	20	39.3	94	1	0-20		
Zinc, Total, ICP-MS	0.5	2.5	ug/L	45.6	20	66.2	103		75-125	20	65.5	99	1	0-20		
Arsenic, Total, ICP-MS	0.05	0.25	ug/L	1.63	20	21.3	98		75-125	20	22.2	103	4	0-20		
Selenium, Total, ICP-MS	0.5	1	ug/L	0.68	20	19.9	96		75-125	20	20.7	100	4	0-20		
Silver, Total, ICP-MS	0.04	0.2	ug/L	0.1	20	17.3	86		75-125	20	17.9	89	4	0-20		
Cadmium, Total, ICP-MS	0.05	0.25	ug/L	0.075	20	19.1	95		75-125	20	19.7	98	3	0-20		
Antimony, Total, ICP-MS	0.3	1	ug/L	0.36	20	20.2	99		75-125	20	20.9	103	4	0-20		
Thallium, Total, ICP-MS	0.1	0.2	ug/L	<MDL	20	17	85		75-125	20	18.2	91	6	0-20		
Lead, Total, ICP-MS	0.1	0.5	ug/L	1.12	20	19.6	92		75-125	20	20.5	97	4	0-20		

Workgroup: WG172811 HEM

MB:WG172811-1 Matrix: BLANK WTR Listtype:ORHEM Method:EPA 1664B Project: Pkey:STD
 (Method Blank)

Parameter	MDL	RDL	Units	MB Value	Qual
Hem (oil, total)	1.4	5	mg/L	<MDL	

LCSD:WG172811-3 LCS:WG172811-2 Matrix: BLANK WTR Listtype:ORHEM Method:EPA 1664B Project: Pkey:STD
 (Lab Control Sample Duplicate, Lab Control Sample)

Parameter	MDL	RDL	Units	True Value	LCS Value	% Rec.	Qual	Lab Limit	True Value	LCSD Value	% Rec.	Qual	RPD	Lab
Hem (oil, total)	1.4	5	mg/L	40	38.1	95		78-114	40	38.6	97	1		0-18

MS:WG172811-4 L75645-7 Matrix: OTHR WTR Listtype:ORHEM Method:EPA 1664B Project:423650-100 Pkey:STD
 (Matrix Spike)

Parameter	MDL	RDL	Units	SAMP Value	True Value	MS Value	% Rec.	Qual	Lab Limit
Hem (oil, total)	1.5	5.3	mg/L	<MDL	88.3	83	94		78-114

=====

4xRule indicates no MS/MSD recovery was calculated due to the 4x rule.

Sample Receipt and Chain of Custody Records

Login: P75645

OVIVO Pilot Unit Testing at WPT

TC: _____

Project: 423650-100

CHAIN OF CUSTODY

LPM: Ellen Sisk

Relinquished by <i>Bob Bucher</i>	Date 10/23/2020	Time 1045 hrs
Received by <i>DSW</i>	Date 10/23/20	Time 1045
Sample Numbers [All]		

Sample Number	P75645-1	P75645-2	P75645-3
QC Link			
Locator	INF-SL	INF-SL	INF-SL
Short Loc Desc			
Locator Desc	PILOT INFLUENT, INFLOW PIPE	PILOT INFLUENT, INFLOW PIPE	PILOT INFLUENT, INFLOW PIPE
Site	WEST PT INPLANT	WEST PT INPLANT	WEST PT INPLANT
Comments	OVIVO pilot influent prior to coagulant addition - composite Grab	OVIVO pilot influent prior to coagulant addition - grab	OVIVO pilot influent prior to coagulant addition - grab
Start Date/Time	10/23/2020 0900 hrs	10/22/2020 0930 hrs	10/22/2020 1330 hrs
End Date/Time	—	—	—
Time Span	grab	grab	grab
Sample Depth	from overflow bucket	overflow bucket	overflow bucket
SAMP INFO	B. Bucher		
SAMPLE CODE	E. Smothers		
Dept, Matrix, Prod	3 LB TOC	3 LB TOC 6 LB CA-ICPMS 6 LB HG-CVAA-L 6 LB ICPMS-HARDNESS 6 LB MG-ICPMS 6 LB PP ICPMS 7 LB HEM	3 LB TOC 6 LB CA-ICPMS 6 LB HG-CVAA-L 6 LB ICPMS-HARDNESS 6 LB MG-ICPMS 6 LB PP ICPMS 7 LB HEM

(1 / 4)

Login: P75645

OVIVO Pilot Unit Testing at WPt

TC: _____

Project: 423650-100

LPM: Ellen Sisk

Sample Number	P75645-4	P75645-5	P75645-6
QC Link			
Locator	INF-SL	EFF-SL	EFF-SL
Short Loc Desc			
Locator Desc	PILOT INFLUENT, INFLOW PIPE	PILOT MEMBRANE PERMEATE	PILOT MEMBRANE PERMEATE
Site	WEST PT INPLANT	WEST PT INPLANT	WEST PT INPLANT
Comments	OVIVO pilot influent prior to coagulant addition - grab	OVIVO pilot permeate samples Grab	OVIVO pilot permeate - grab
Start Date/Time	10/23/2020 0920 hrs	10/23/2020 0920 hrs	10/22/2020 0940 hrs
End Date/Time	—	—	—
Time Span	grab	grab	grab
Sample Depth	Sample overflow bucket	sample overflow bucket	overflow bucket
SAMP INFO	B Brubaker E Smithers	B Brubaker E Smithers	
SAMPLE CODE			
Dept, Matrix, Prod	3 LB TOC 6 LB CA-ICPMS 6 LB HG-CVAA-L 6 LB ICPMS-HARDNESS 6 LB MG-ICPMS 6 LB PP ICPMS 7 LB HEM	3 LA TOC	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS 7 LA HEM

Login: P76645

OVIVO Pilot Unit Testing at WPt

TC: _____

Project: 423650-100

LPM: Ellen Sisk

Sample Number	P76645-7	P76645-8	P75645-9
QC Link			
Locator	EFF-SL	EFF-SL	TNK-SL
Short Loc Desc			
Locator Desc	PILOT MEMBRANE PERMEATE	PILOT MEMBRANE PERMEATE	IN-LINE SED FOR OVIVO PROJECT
Site	WEST PT INPLANT	WEST PT INPLANT	WEST PT INPLANT
Comments	OVIVO pilot permeate - grab	OVIVO pilot permeate - grab	OVIVO pilot mixed water from feed side of tank - grab
Start Date/Time	10/22/2020 13:40 hrs	10/23/2020 09:20 hrs	10/22/2020 09:35 hrs
End Date/Time	—	—	—
Time Span	grab	grab	grab
Sample Depth	overflow bucket	from overflow bucket tank sample from top	
SAMP INFO		B. Bueler E. Smithers	
SAMPLE CODE			
Dept, Matrix, Prod	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS 7 LA HEM	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS 7 LA HEM	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS

(3 / 4)

Login: P75645

OVIVO Pilot Unit Testing at WPt

TC: _____

Project: 423650-100

LPM: Ellen Sisk

Sample Number	P75645-10	P75645-11	
QC Link			
Locator	TNK-SL	TNK-SL	
Short Loc Desc			
Locator Desc	IN-LINE SED FOR OVIVO PROJECT	IN-LINE SED FOR OVIVO PROJECT	
Site	WEST PT INPLANT	WEST PT INPLANT	
Comments	OVIVO pilot mixed water from feed side of tank - grab	OVIVO pilot mixed water from feed side of tank - grab	
Start Date/Time	10/22/2020 1335 hrs	10/23/2020 0910 hrs	
End Date/Time			
Time Span	grab	grab	
Sample Depth	tank sample from top	tank sample from top	
SAMP INFO		B. Buckner E. Smithers	
SAMPLE CODE			
Dept, Matrix, Prod	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS	6 LA CA-ICPMS 6 LA HG-CVAA-L 6 LA ICPMS-HARDNESS 6 LA MG-ICPMS 6 LA PP ICPMS	

(4 / 4)

LIQUID SAMPLE RECEIPT RECORD

Login Number(s): <u>75645</u>		Project No.: <u>423650 - 100</u>		Sub-Contracting: <u>Y / N</u>	List Product(s):					
Collect Date(s): <u>10/22/20 - 10/23/20</u>		Receive Date: <u>10/23/20</u>		Changes: <u>Y / N</u>	List Parameter(s):					
SAMPLE RECEIPT CONDITIONS				FIELD PRESERVATION CHECKLIST (Circle and/or check applicable selections)						
CONDITION	Acceptable?	Comment ID	CONDITION	Acceptable?	Comment ID	PRODUCT / Preservation	SM Action	Acceptable?	Corrective Action	
Labels / Fieldsheets	<input checked="" type="checkbox"/>	N	Volumes	<input checked="" type="checkbox"/>	N	BNA / pH 6 - 9 w/ H ₂ SO ₄ or NaOH	✓ field sheet for F. pH	<input checked="" type="checkbox"/>	<input type="checkbox"/> Notify ORG	
Container	<input checked="" type="checkbox"/>	N	Holding Times	<input checked="" type="checkbox"/>	N	CN / pH > 12 w/ NaOH within 15 min	<input type="checkbox"/> Check pH	<input checked="" type="checkbox"/>	<input type="checkbox"/> Deliver to CONV	
Temperature (w/ ice)	<input checked="" type="checkbox"/>	N / NA	Delivery Location	<input checked="" type="checkbox"/>	N	NO23 pH < 2 w/ H ₂ SO ₄	<input type="checkbox"/> Check pH	<input checked="" type="checkbox"/>	<input type="checkbox"/> Preserve by SM	
BOTTLE COUNT (#) AND DESCRIPTION and SAMPLE NUMBERS				CR(VI) / TOTCR(VI) / pH 9.3 - 9.7 w/ NaOH w/in 15 min				✓ field sheet for pH	<input checked="" type="checkbox"/>	<input type="checkbox"/> Deliver to CONV
#	Bottle Description: Sample Numbers			ICP / HG-CVAA-M / pH < 2 w/ HNO ₃	<input type="checkbox"/> Check pH	<input checked="" type="checkbox"/>	<input type="checkbox"/> Preserve By SM			
4	40 mL clear vial (VOA): <u>W/H3PO4 : 1-4</u>			O&G / HEM / PHENOL / pH < 2 w/ H ₂ SO ₄	<input type="checkbox"/> Check documentation	<input checked="" type="checkbox"/>	<input type="checkbox"/> Preserve by SM			
	60 mL clear glass (PHYTO):			PHYTOPLANKTON / Lugols	<input type="checkbox"/> Visually Inspect	<input checked="" type="checkbox"/>	<input type="checkbox"/> Deliver to MICRO			
	60 mL CWM HDPE:			TKN / COD pH < 2 w/ H ₂ SO ₄ within 15 min	<input type="checkbox"/> Check pH	<input checked="" type="checkbox"/>	<input type="checkbox"/> Preserve By SM			
	125 mL AVM HDPE:			TOC / pH < 2 w/ H ₃ PO ₄ (NPDES only)	<input checked="" type="checkbox"/> Check pH	<input checked="" type="checkbox"/>	<input type="checkbox"/> Preserve By SM			
	125 mL CNM HDPE:			TOTSULFIDE / pH > 9 w/ NaOH, ZnAc	<input type="checkbox"/> Check documentation	<input checked="" type="checkbox"/>	<input type="checkbox"/> Deliver to CONV			
	125 mL CWM HDPE:			WDO / FIXED	<input type="checkbox"/> Visually Inspect	<input checked="" type="checkbox"/>	<input type="checkbox"/> Deliver to CONV			
	125 mL GANM:			Other:						
	125 mL GANM w/H ₃ PO ₄ : <u>5</u>			ROUTINE SM PRESERVATION CHECKLIST (Circle and/or check applicable selections)						
				PRODUCT / Preservation	SM Action	Acceptable?	Corrective Action			
				Chlorinated Pesticides / pH 5 - 9 w/ H ₂ SO ₄ or NaOH	✓ field sheet for F. pH	<input checked="" type="checkbox"/>	<input type="checkbox"/> Adjust pH			
				HG-CVAA-L-Teflon (T / D) / pH < 2 w/ ULTRA HCl	<input checked="" type="checkbox"/> Preserve & deliver	NA	NA			
				ICP / HG-CVAA-M (T / D) / pH < 2 w/ ULTRA HNO ₃	<input type="checkbox"/> Preserve & deliver	NA	NA			
				ICPMS (T / D) / pH < 2 w/ ULTRA HNO ₃	<input checked="" type="checkbox"/> Preserve & deliver	NA	NA			
				TOC / pH < 2 w/ H ₃ PO ₄	<input type="checkbox"/> Preserve & deliver	NA	NA			
				Other:						
				INTERFERENCE TEST (Circle and/or check applicable selections)						
				Product / Interference (SM Action)	Positive Test?	Treated	Corrective Action			
				BNA / Chlorine (Check documentation)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Deliver to ORG			
				CN / Chlorine (Check documentation)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Deliver to CONV			
9	500 mL HDPE (METALS): <u>2,3,4,6-11</u>			CN / Sulfide (Check field sheet for DF)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Deliver to CONV			
9	500 mL HDPE, double-bagged (METALS):			VOA / Chlorine (Check documentation)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Deliver to ORG			
	500 mL Teflon (Hg): <u>2-4,6-11</u>			Other:						
	500 mL Teflon, double-bagged (METALS):			HEADSPACE CHECK						
	500 mL GANM / GAWM:			PRODUCT (SM Action)	Check For	Acceptable?	Corrective Action			
	500 mL Polystyrene Filtration Units (METALS):			MICRO (Visually inspect)	Headspace (@ 1")	<input checked="" type="checkbox"/>	<input type="checkbox"/> Notify MICRO			
	1L AWM HDPE:			TOTSULFIDE (Visually inspect)	Headspace (< 1")	<input checked="" type="checkbox"/>	<input type="checkbox"/> Notify CONV			
	1L CWM HDPE:			VOA (Visually inspect)	Zero headspace	<input checked="" type="checkbox"/>	<input type="checkbox"/> Notify ORG			
	1L CWM PP (MICRO):			WDO (Visually inspect)	Zero headspace	<input checked="" type="checkbox"/>	<input type="checkbox"/> Notify CONV			
	1L GANM:			Other:						
	1L GCWM:			FIELD FILTRATION CHECKLIST (Circle and/or check applicable selections)						
12	1L GAWM w/ H ₂ SO ₄ : <u>2,3,4,6,7,8 (2x ea)</u>			Product (SM Action)	Field Filtered	Field Blank	Corrective Action			
	2L CWM HDPE:			ORTHO-P (Check Field Sheet)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Deliver to CONV			
	Other:			NO2 / NO3 / NO23 / NH3 / SI (Documentation)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Deliver to CONV			
				Dissolved Metals (Check Field Sheet)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Deliver to METALS			
				DOC (Deliver / Notify Unit)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Deliver to CONV			
				DCOD / CR(VI) (Deliver / Notify Unit)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Deliver to CONV			
				Other:						

CC: AQUATOX, CONV, METALS, MICRO, ORG,

- NOTES**
- 1. Deliver dissolved HgCVAF samples to METALS for filtration.
 - 2. Deliver double-bagged metals samples to METALS for preservation.
 - 3. Do not test pH for preserved BNA and TOTSULFIDE samples.
 - 4. Deliver pH, WDO, and all MICRO samples ASAP to appropriate section for immediate processing.
 - 5. Enter "Time Span" for composite samples during sample login.
 - 6. Split algae sample into 60 mL clear glass if PHYTOQUAL is requested.

SM Signature: 
Appendix C

Date / Time Completed:

OCT 23 '20 11:46

Test Run Package 10

Appendix B.11

Test Run Package 11

Run# 11

Run Description Confirm process recovery during a multiple storm event

Type	<input checked="" type="checkbox"/> process	<input type="checkbox"/> Performance
Influent water source	<input checked="" type="checkbox"/> PE	
	<input checked="" type="checkbox"/> Hydrant	
	<input checked="" type="checkbox"/> Both	

Wasting Rate	0	
Air Scour	105	scfm
Backwash Frequency	15	min
Run Duration	12	Hrs
CIP	<input checked="" type="checkbox"/> Hypo	<input checked="" type="checkbox"/> Caustic
Composite Sample Schedule	11 Samples, 1 hour apart, 400 mL each 4.4 L total volume	

Date

Event	Day	Time Hr	PE gpm	Hydrant gpm	Coag Dose Al:TSS ratio	Flux Rate gfd	Event/Action	Influent		Effluent		Membrane Tank		Comments
								Grab / Probe	Note	Grab / Probe	Note	Grab / Probe	Note	
0	1	6:30	200	-	0.6		Start Flow to pilot							
1		7:00				50	Start producing effluent							
2		7:30					Start Composite Samplers							
3		7:35					Influent Sample	KCEL: TOC						
4		7:40					Effluent Sample			WPP: Fecal				
5		8:00				100	Change flux rate							
							Change flux							
							Change dilution							
6		9:00	100	100		200	1 stack online							
7		9:35					Influent Sample	Field: Full Set WPP: Full Set KCEL: TOC						
8		9:35					Tank Sample					Field: Full Set WPP: Full Set		
9		9:40					Effluent Sample							
10		10:00	200	0		100	Change flux rate Change dilution Put all stacks back online							
11		10:30					Effluent Sample			WPP: Fecal				
12		11:00				50	Change flux							
13		12:30					Influent Sample	KCEL: TOC						
14		12:35					Effluent Sample			WPP: Fecal				
15		13:00					Stop producing effluent Pause composite samplers							
16		14:00				50	Start producing effluent Restart composite samplers							
17		14:30					Influent Sample	KCEL: TOC						
18		15:00				100	Change flux rate							
19		16:00	100	100		200	Change flux Change dilution 1 stack online							
20		16:30					Influent Sample	KCEL: TOC						
21		17:00	200	0		100	Change flux rate Change dilution Put all stacks back online							
22		18:00					Influent Sample	KCEL: TOC						
23		19:00					Stop producing effluent							

Field Eff	
Turbidity	
Probe reading	
pH	
Temperature	
Conductivity	
WPPLsamples	
Influent composite	
Effluent composite	
-TSS/VSS, Alk, BOD	
Influent grab	
TSS/VSS	
Fecal	
Effluent grab	
TSS/VSS	
Chlorine demand	
Fecal	
Settleable solids	
Tank grab	
TSS/VSS	
KCEL	
Influent grab	
TOC	
Effluent composite	
TOC	

OVIVO Pilot Setpoints Values to be set according to OVIVO's recommendations.

Run# <u>11</u>		Date	FLOW OPTIMIZATION						CHEM DOSING					
System		ONLINE/OFFLINE	Permeate						End of Event					
Inlet System			Permeate Flow	206	gpm				End Cycle					Coagulant
Screen Off Delay	2	min	Pump Start Level	116	in				End of Cycle					Pump Start Inf Flow
Weir Gate Frequency	1800	min	Pump Stop Level	5	in				Hypochlorite CIP					0.1 in
Weir Gate Duration	30	sec	Pump Stop Low Level	100	in				End of Cycle					118 in
Blowers			Single Pump Flow	220	gpm				Citric CIP					Coagulant Min Flow
Scour Air Flow	105	scfm	Backwash Frequency	15	min				End of Cycle					Coagulant Max Flow
Blower Start Level	20	in	Backwash Flow	300	%				Hypo + Caustic CIP					Coag Fixed Flow
Blower Stop Level	8	in	Pre BW Relaxation	30	sec				End of Cycle					Coag TSS Ratio
Lag Blower Start Level	65	%	Backwash Duration	60	sec				Caustic CIP					Coag AI%
Lag Blower Start Delay	120	sec	Post BW Relax Duration	30	sec				End of Event Drain Lvl	5	in			Coag SG
Blower Fail Air Flow	4.5	scfm	Perm Static Pressure	1.7	psi				End of Event Dly	20	sec			Coag Flow Ratio
Blower Fail Delay	140	sec	Turbidity Hi Alarm SP	10	NTU									Coag Fill Flow
Low Air Flow Alarm	55	%	TMP Hi Alarm SP	8	psi									
Low Air Flow Delay	45	sec	Backwash Start TMP	10	psi									
Override Enabled			Max Hi TMP Cycles	1										
TMP Reset														Coagulant Dosing Mode Select
														Fixed Flow
														TSS
														Perm Flow
Membrane Basin Drain Vlv														
WAS Vlv Open TSS														
WAS Vlv Close Lvl														
WAS Valve Duration														
Sodium Hypochlorite														
Citric Acid														
Caustic														
Pre-Drain Disabled														
Pre-Drain Disabled														
Pre-Drain Disabled														

King County Ovivo Pilot

Run # **11**
Date **10/20/2020**

membrane
surface area per stack = **975 sf**

Influent flow = PE + hyd	Test Variables			Calculated		Test Plan	
	permeate flow setpt	stacks in service	surface area in service	instantaneous flux	Flux Goal	Start Time	Stop Time
(gpm)	(gpm)	(#)	(sf)	(GFD)	(GFD)		
200 + 0	204	3	2,925	100	100	6:30	7:00
	102	3	2,925	50	50	7:00	8:00
	204	3	2,925	100	100	8:00	9:00
100 + 100	136	1	975	201	200	9:00	10:00
200 + 0	204	3	2,925	100	100	10:00	11:00
	102	3	2,925	50	50	11:00	13:00
	0	3	2,925	0	0	13:00	14:00
	102	3	2,925	50	50	14:00	15:00
100 + 100	136	1	975	201	200	15:00	16:00
200 + 0	204	3	2,925	100	100	16:00	17:00

Notes:

Switch "stacks online" setting under Ovivo tab on HMI.

Follow High TMP S/D with 30-min CIP

Daily Field Notes

Run
Cond

11

Process and Performance Testing

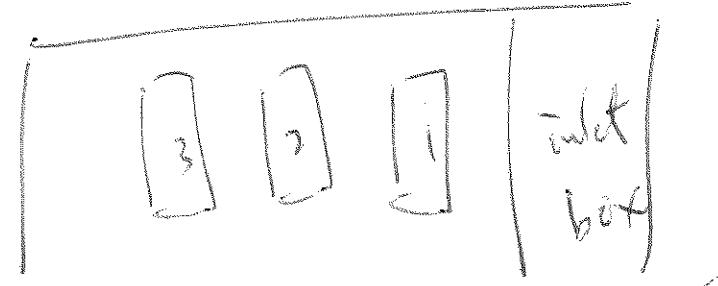
10/20/2020

P6/
*

Date	Time	Observation	Action Item
10/20	0631 hrs	Started PE feed to pilot	
	0633	If not note inlet weir open/closed - need to check	
	0700 hrs	Sample and turbidimetry valves open	post test *
	0704 hrs	Pilot to Stanley due to drop to < 1 ft in membrane tank. Permeate setpt = 206 and influent = 191 gpm	
		Adjusted permeate setpt to 102 (50 gfd)	
	0859	Hydrant water added (100+100) Waiting until after BW to adjust flux	
	9:35	some surface foaming - below the tank's edge	
	12:30	foaming over overflowing from ml top, → not as bad as prev. test	
	1303	Secured PE feed to pilot - pilot to Stanley and secured	
	1405 1402	Restarted pilot - PE feed to pilot and secured Samplers	
	1858	Secured influent and effluent Samplers	
	(924)	Initiated BOE (CIP) after repairing hypochlorite leak on metering Pump (discovered during prime)	

King County Ovivo Pilot

Run # 11
Date 10/20/2020



membrane
surface area per stack = 975 sf

stacks

Influent flow = PE + hyd	Test Variables		Calculated		Test Plan		
	permeate flow setpt	stacks in service	surface area in service	instantaneous flux	Flux Goal	Start Time	Stop Time
(gpm)	(gpm)	(#)	(sf)	(GFD)	(GFD)		
200 + 0	204 ✓	3	2,925	100	100	6:30	7:00
	102 ✓	3	2,925	50	50	7:00	8:00
	204 ✓	3	2,925	100	100	8:00	9:00
100 + 100	136 ✓	1	975	201	200	9:00	10:00
200 + 0	204 ✓	3	2,925	100	100	10:00	11:00
	102 ✓	3	2,925	50	50	11:00	13:00
	0 ✓	3	2,925	0	0	13:00	14:00
	102 ✓	3	2,925	50	50	14:00	15:00
	204 ✓	3	2,925	100	100	15:00	16:00
100 + 100	136 ✓	1	975	201	200	16:00	17:00
200 + 0	204 ✓	3	2,925	100	100	17:00	19:00

1708

1:05

Stacks
1 & 2
offline

← Secured
PE feed

← Stacks
1 & 2
offline

Notes:

Switch "stacks online" setting under Ovivo tab on HMI.

Follow High TMP S/D with 30-min CIP

OVIVO Pilot Setpoints

Values to be set according to OVIVO's recommendations.

Run# 1011

Date 10/14/2020

FLOW OPTIMIZATION								CHEM DOSING		
System	ONLINE/OFFLINE	Permeate	206	gpm	End of Event	Coagulant	Pump Start Inf Flow	1	gpm	
Inlet System		Permeate Flow	116	in			Pump Start Level	0.1	in	
Screen Off Delay		Pump Stop Level	5	in			Overflow Level	118	in	
Weir Gate Frequency		Pump Stop Low Level	100	in	End of Cycle		Coagulant Min Flow	0.5	gph	
Weir Gate Duration		Single Pump Flow	220	gpm	Hypochlorite CIP		Coagulant Max Flow	20	gph	
Blowers		Backwash Frequency	15	min	End of Cycle		Coag Fixed Flow	6.0	gph	
Scour Air Flow		Backwash Flow	300	%	Citric CIP		Coag TSS Ratio	0.60		
Blower Start Level		Pre BW Relaxation	30	sec	End of Cycle		Coag Al%	4.1	%	
Blower Stop Level		Backwash Duration	60	sec	Hypo + Caustic CIP		Coag SG	1.34		
Lag Blower Start Level		Post BW Relax Duration	30	sec	End of Cycle		Coag Flow Ratio	5		
Lag Blower Start Delay		Perm Static Pressure	1.7	psi	Caustic CIP		Coag Fill Flow	8	gph	
Blower Fail Air Flow		Turbidity Hi Alarm SP	10	NTU	End of Event Drain Lvl		Coagulant Dosing Mode Select			
Blower Fail Delay		TMP Hi Alarm SP	8	psi	End of Event Dly		Fixed Flow			
Low Air Flow Alarm		Backwash Start TMP	10	psi	5		TSS			
Low Air Flow Delay		Max Hi TMP Cycles	1		20		Perm Flow			
Override Enabled		TMP Reset		Perm Tank Level Lo		End of Event Drain Lvl				
		Air Extractor Frequency		5		End of Event Dly				
		Air Extractor Duration		4		5				
Sodium Hypochlorite		Citric Acid		Caustic						
CIP Permeate Flow		CIP Permeate Flow		100		CIP Permeate Flow				
Backwash Perm Flow		Backwash Perm Flow		200		Backwash Perm Flow				
Hypochlorite Flow		Citric Flow		100		Caustic Flow				
Pre CIP Relax Duration		Pre CIP Relax Duration		28		50				
Chem Flow Duration		Chem Flow Duration		30		Pre CIP Relax Duration				
Soak Duration		Soak Duration		10		50				
Rinse Duration		Rinse Duration		999		Chem Flow Duration				
Final Relax Duration		Final Relax Duration		60		999				
						Soak Duration				
						60				
						Rinse Duration				
						60				
						Final Relax Duration				
						60				
Pre-Drain Disabled				Pre-Drain Disables				Pre-Drain Disabled		

✓ 10/14/2020
0628dm
JW

Run # 11

10/20/2020

SOP OVIVO PILOT

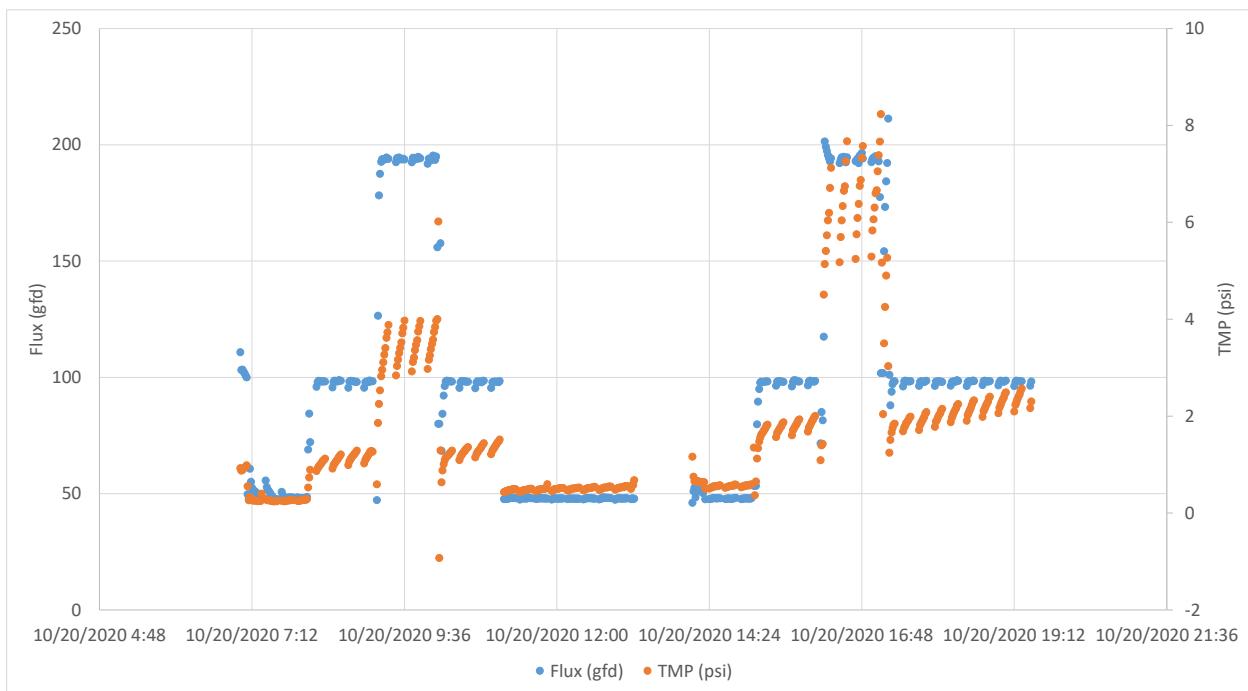
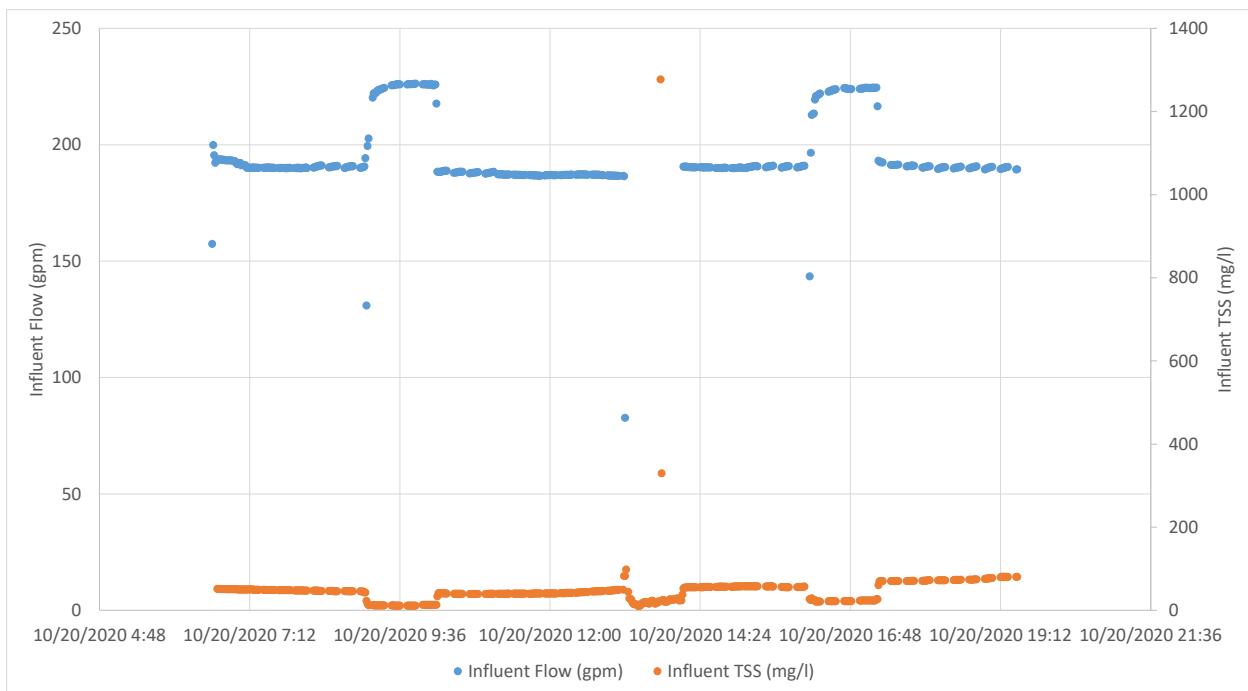
STARTING PROCEDURE

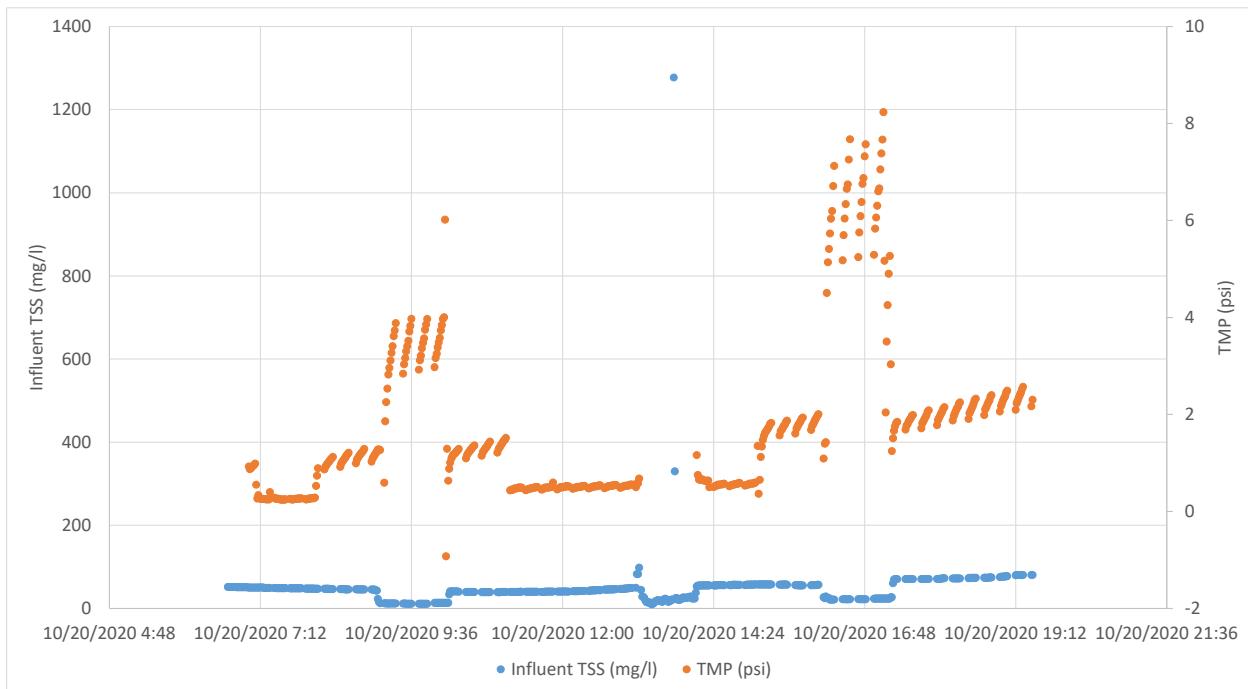
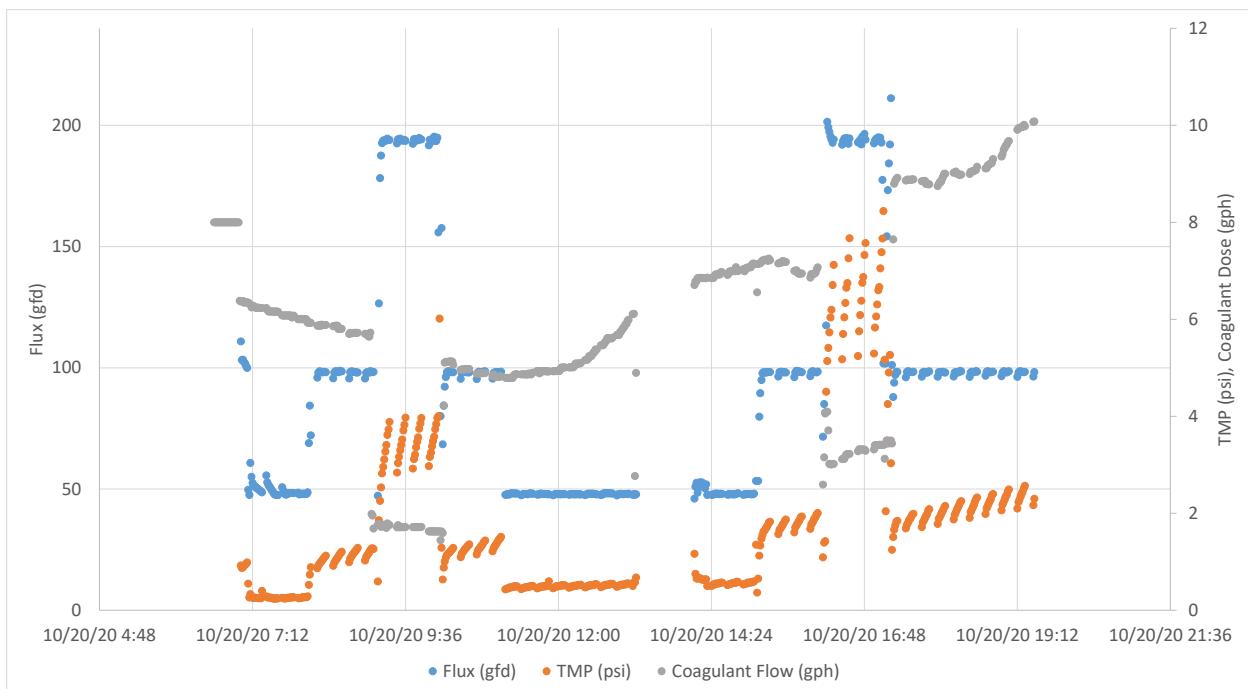
1. Inform WTP Main Control and inquire if there is any issue that would preventing the operation.
2. Contact shift crew to arrange for after hour sampling.
3. Obtain operating parameters and sampling schedule from the test package.
4. If dilution water is required:
 - a. Contact Facility Service to charge the water hydrant.
 - b. Hydrant needs to be secured by 18:00 hrs.
5. Log in. User name = h, password = h.
6. Drain the pilot.
 - a. Drain membrane tank by opening the drain valve from control screen.
 - b. Drain permeate tank by opening the drain valve manually.
7. Check chemical tanks.
 - a. Caustic - transfer of metering pump suction.
 - b. Sodium Hypochlorite - transfer of metering pump suction. (16 gal per run)
 - c. Alum - transfer of totes. (planned for afternoon)
 - d. Contact Facility Services for support moving chemicals.
8. Prime coagulant pump- only if switch to a new tank.
 - Press "Prim 60 sec"
9. Adjust caustic addition valve to RUN position.
10. Go to MAIN SCREEN and verify that all pumps, except for alkalinity, are in AUTO
11. Set operating parameters in the following screen.
 - a. Select FLOW OPTIMIZATION screen
 - b. Verify that system is offline
 - c. Set parameters according to the test plan.
12. Select chemical dosing strategy and set the parameters.
13. Select ALARM. There are certain erroneous alarms that needs to be acknowledged to reset.
14. Select FLOW OPTIMIZATION screen and put the system ONLINE.
15. Turn on PE at the panel by the primary bldg.
 - a. Turn the switch to HAND
 - b. Press START
 - c. Open the PE hand valve completely.
16. Monitor and confirm the increasing tank level.
 - a. Weir gate XVCS-101 is open, once the tank level is 0.1 in., this weir gate will close and the coagulant pump will start.
17. Once coagulant pump start, start caustic pump manually.
 - a. Select PMP-AK 101 (alkalinity addition pump)
 - b. Adjust the pump speed to the target flowrate. 4% = 1.9 gph.
 - c. Verify the flowrate on the pump local display.
18. Monitor and confirm:
 - a. Air blower starts once the tank is at 20 in.
 - b. Permeate pump starts at 116 in.

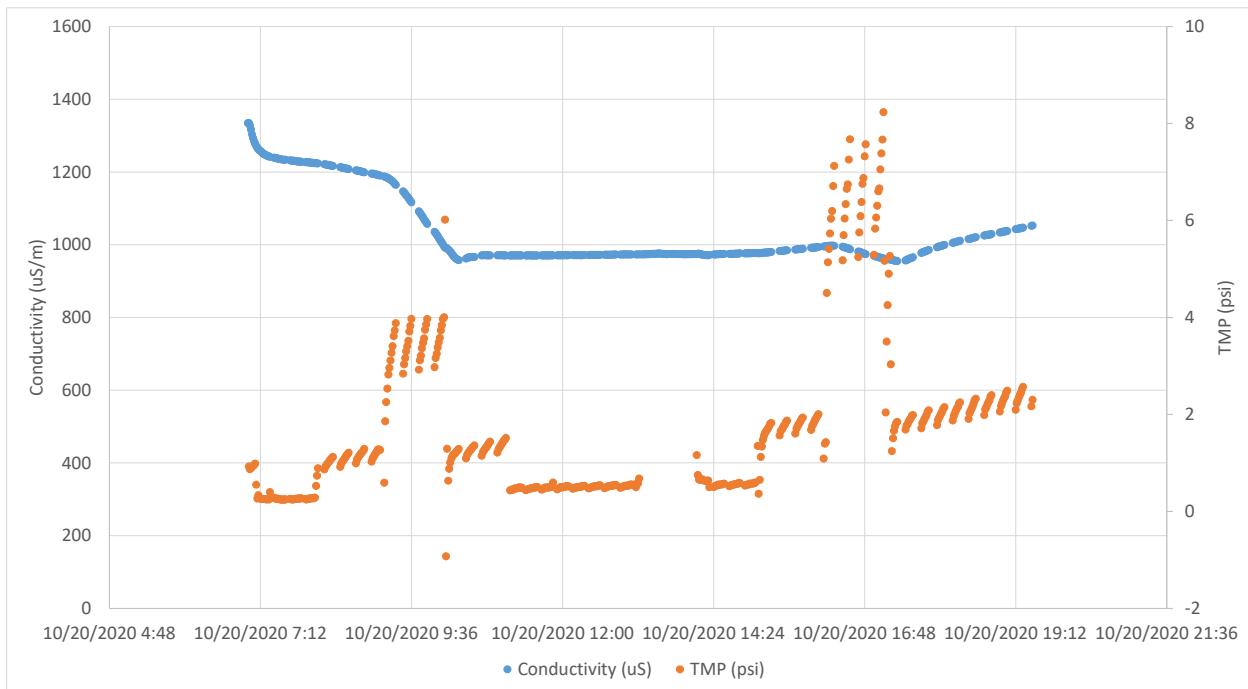
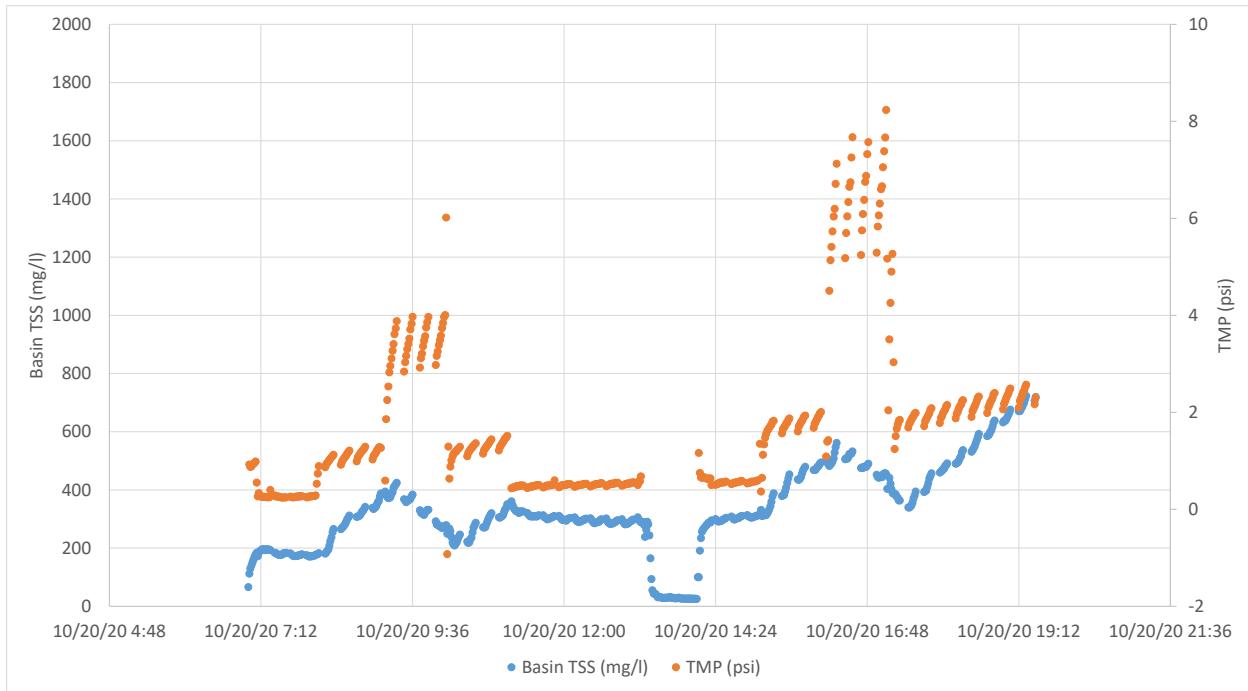
- 0700 hrs*
- c. Confirm that there are sufficient flow through sampling buckets.
 - 19. Open the valve to effluent turbidimeter.
 - 20. Setup auto sampler on influent and effluent.
 - Open valves to get flow through sampling buckets.
 - 21. Allow the system to run for at least 1 full cycle to prior to data & sample collection. Refer to run guidance document on sampling starting time.
 - 22. Start sample collection

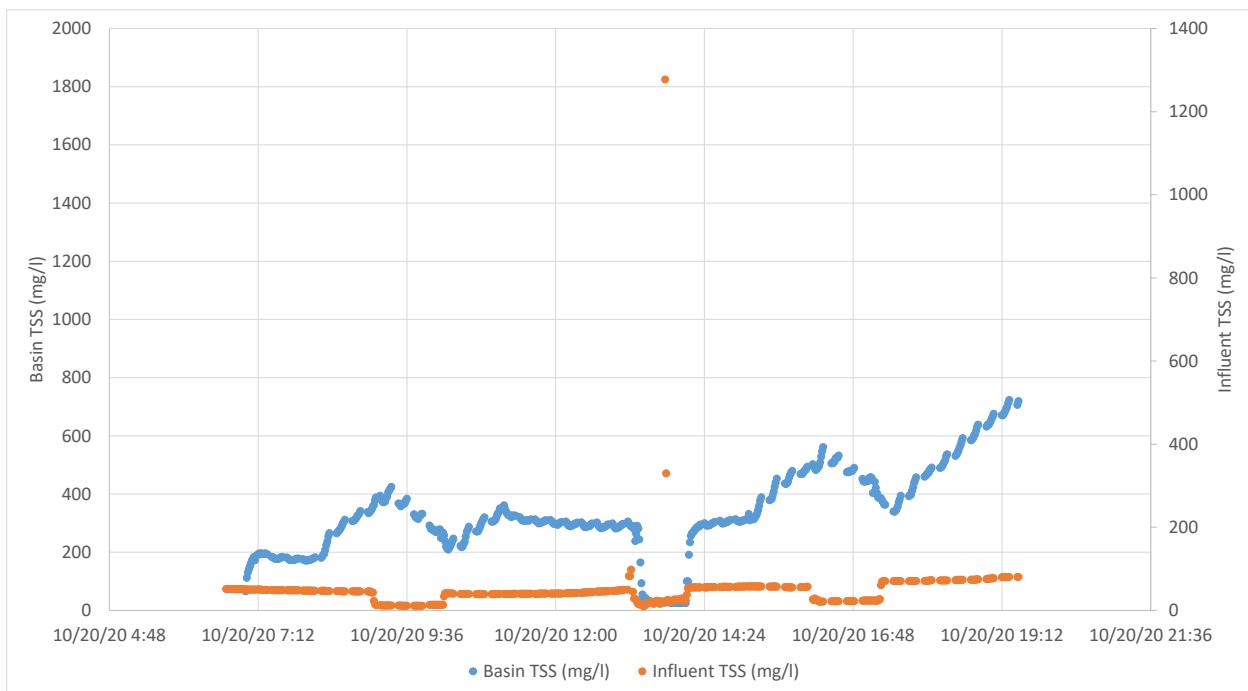
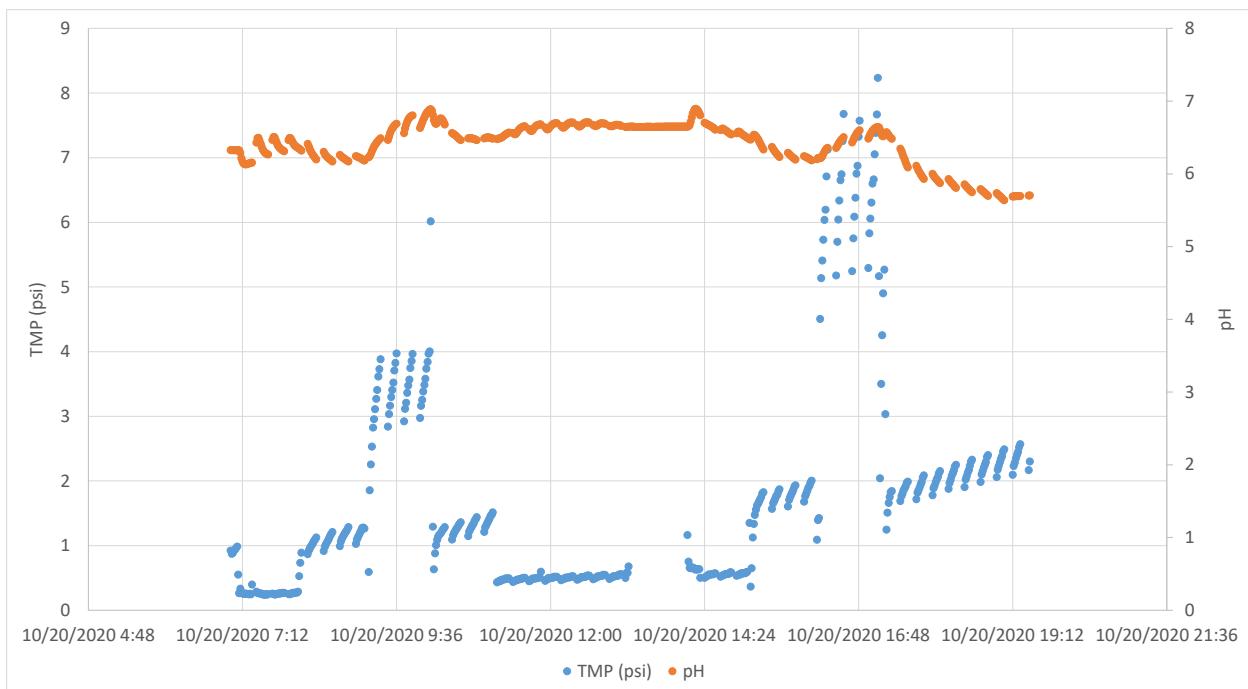
SHUTDOWN & CIP PROCEDURE

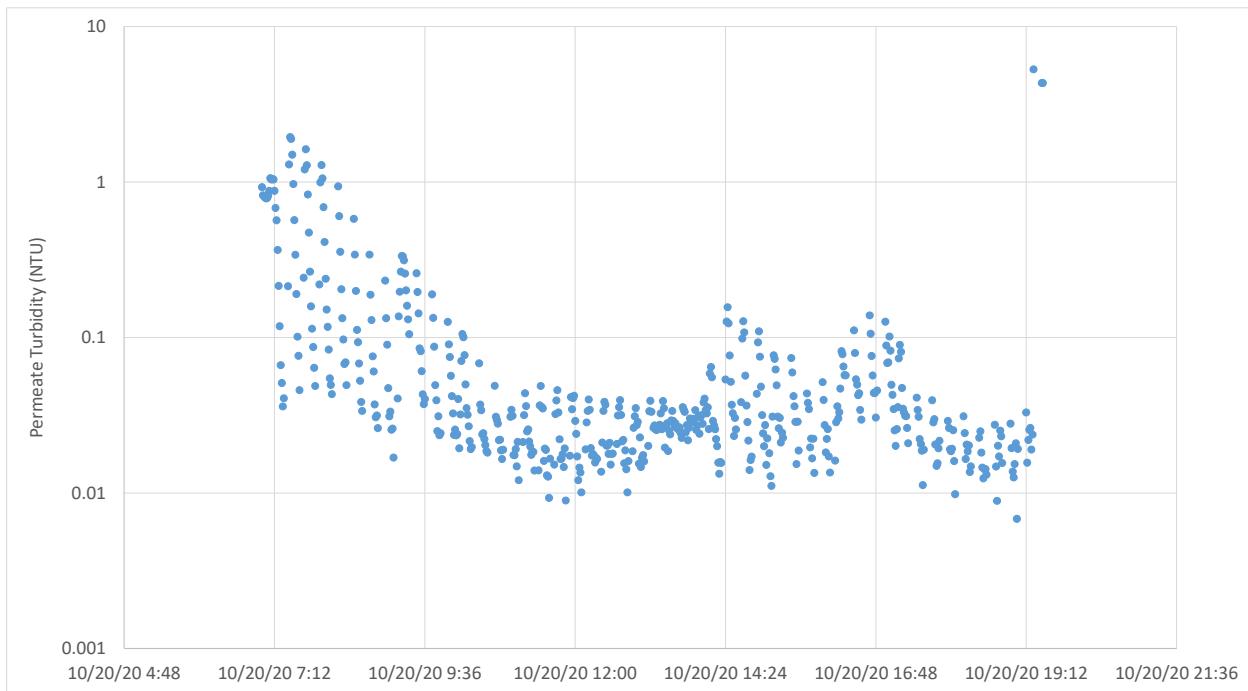
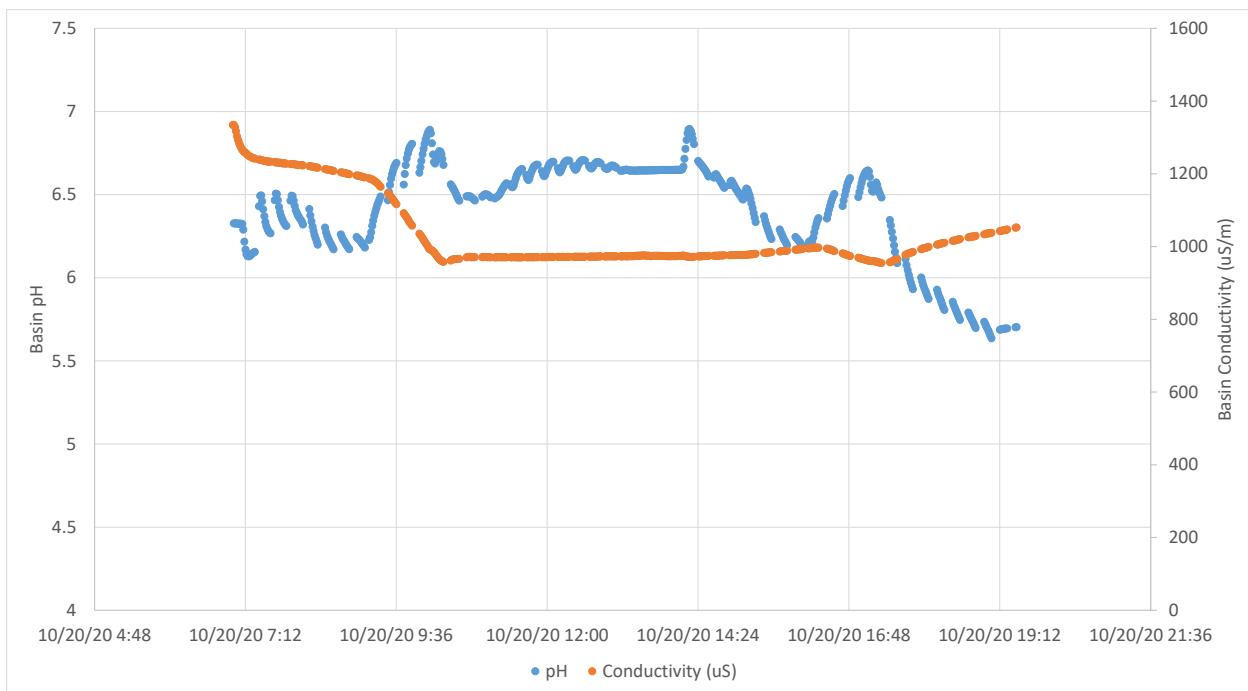
- 1. Check the hypo and caustic levels. Each cleaning cycle require 12 gal.
- 2. Close sampling valves, turbidimeter valves.
- ~~3. Switch alkalinity pump from manual to auto.~~
- ~~4. Prime hypochlorite pump.~~
- ~~5. Switch caustic addition valve position from RUN to CIP position.~~
- 6. Go to CIP screen to check the CIP parameters. If CIP is initiated from this screen, the system will go back into filtration once the CIP is completed (as long as the feed pump is on).
- 7. Wait for pump priming to finish.
- 8. Got to Flow Optimization screen and select "End of cycle".
 - If the pilot stopped/standby due to high TMP, press TMP reset, and the CIP will start.
- 9. Verify that the hypochlorite pump & caustic pumps are on.
- 10. Turn the feed off at the PE panel
 - a. Press STOP
 - b. Turn the switch to OFF
 - c. Close the manual valve
- 11. Spray down the membrane tank to remove foam and scum.
- 12. Log out.

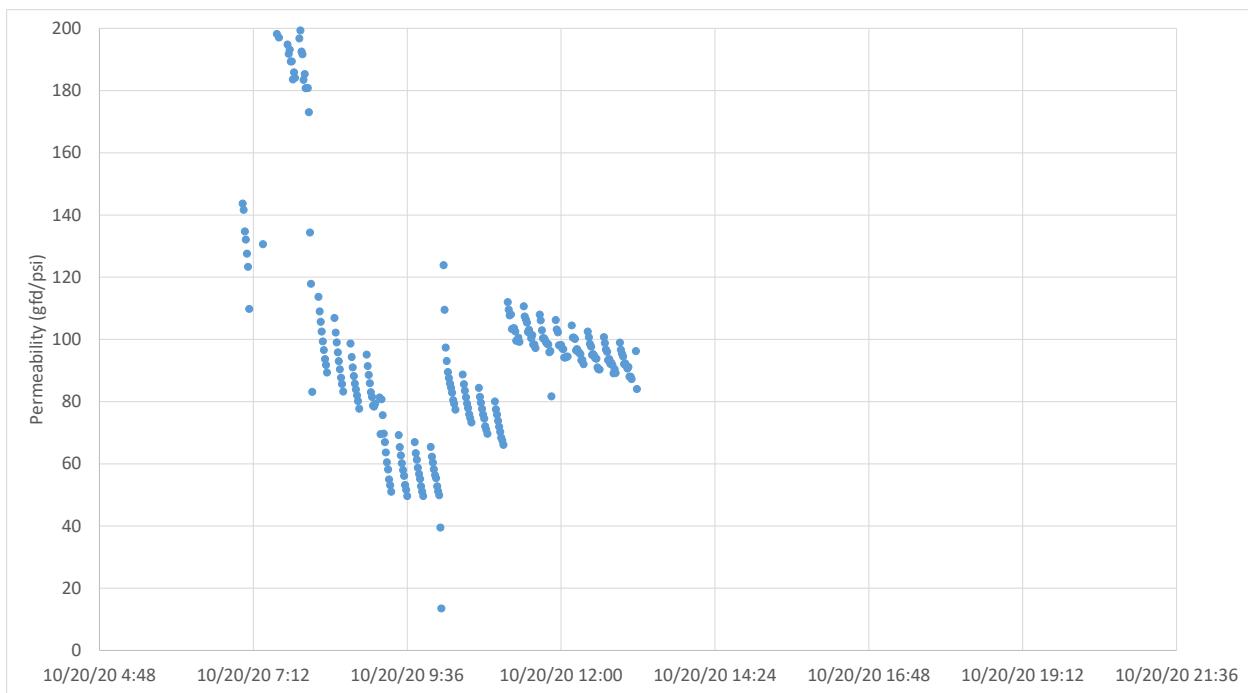


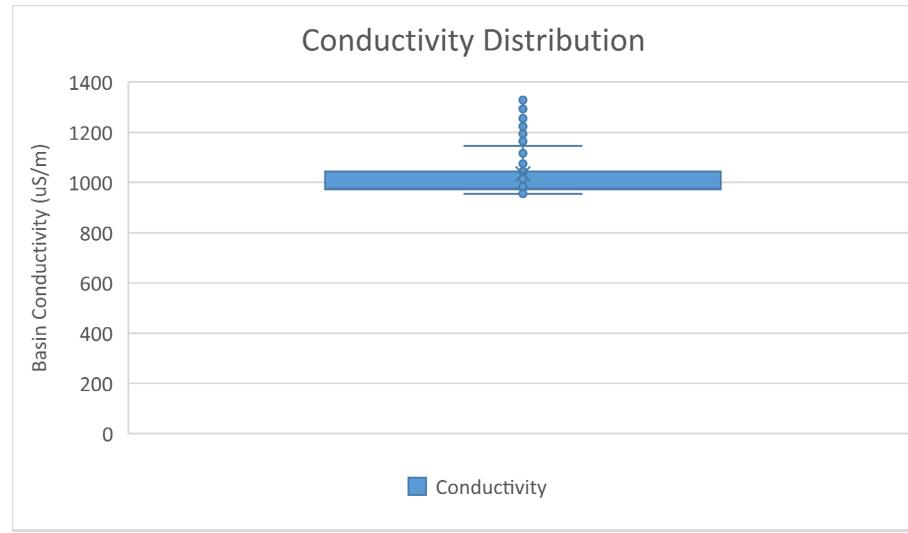
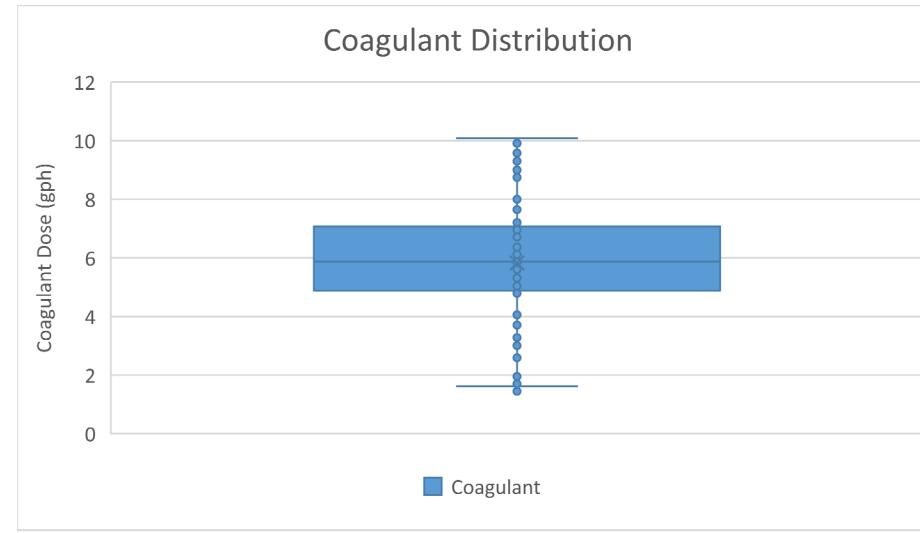
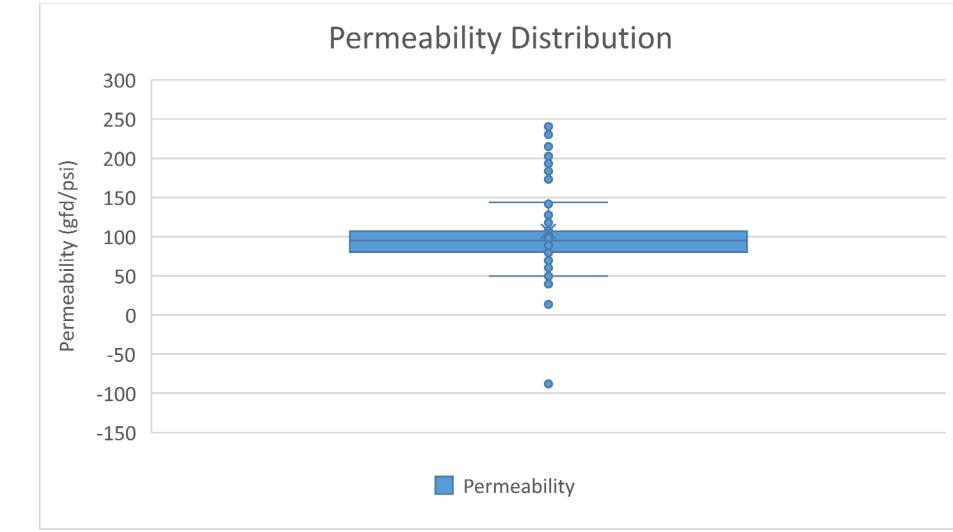
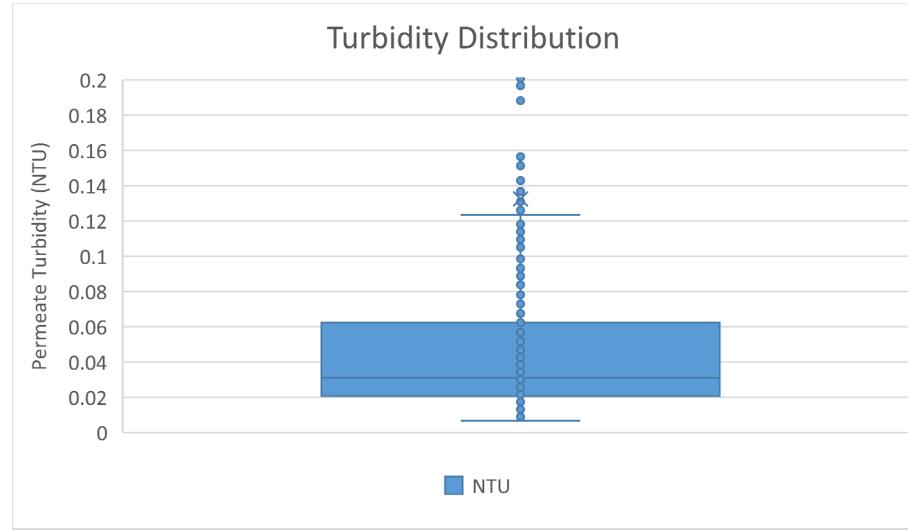
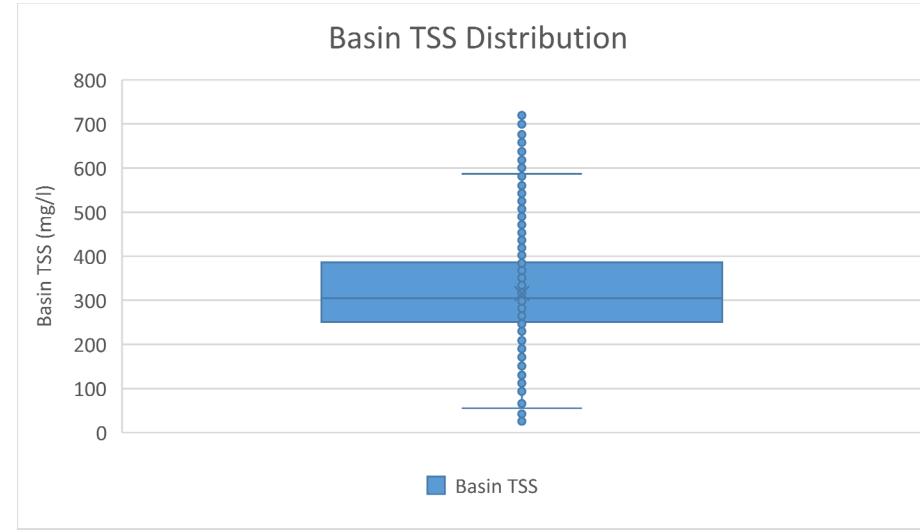
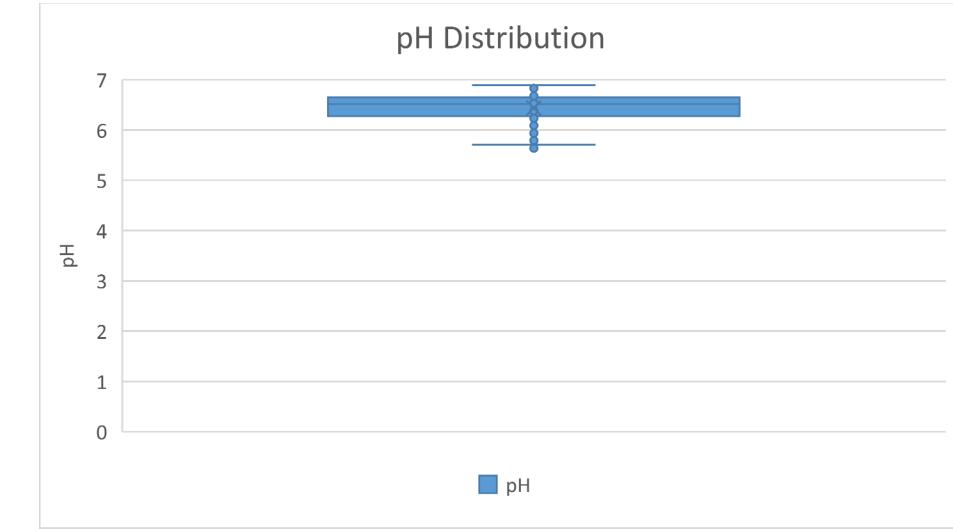
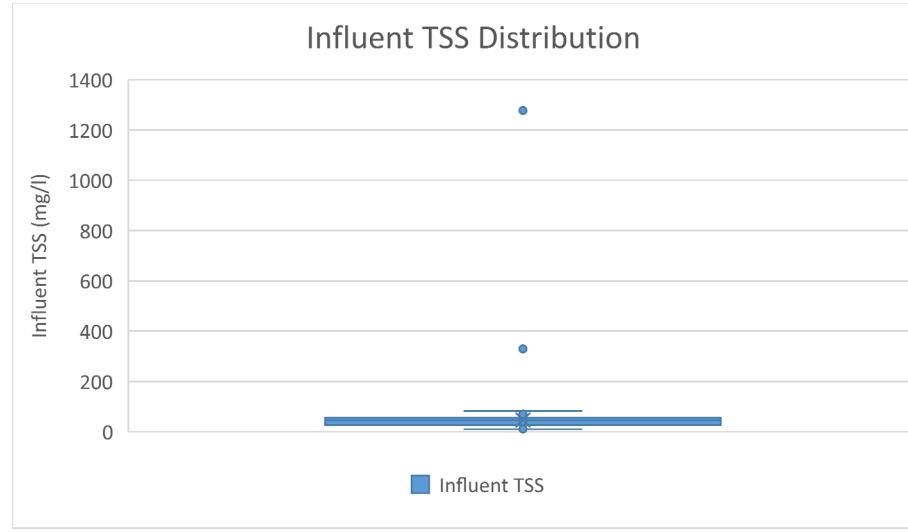
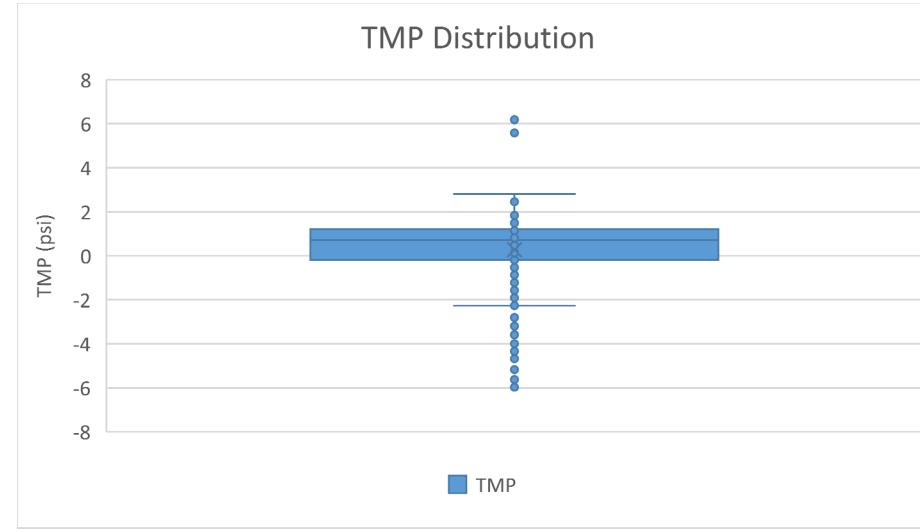












OVIVO PROJECT

Sample	Sample Date	Test Date	pH	Alkalinity	Conductivity	Turbidity	TSS	COD	Comments
A1 (PE)	10/12/2018	10/13/2018 pH, Cond, Turb 10/15/2018 TSS & Alk	7.44	211	943.6	24.9	34		pH was out of holding time
A2 (PE & Coagulant)	10/12/2018	10/13/2018 pH, Cond, Turb 10/15/2018 TSS & Alk	7.47	205	960.8	27.9	82		pH was out of holding time
A3 (End of Test)	10/12/2018	10/13/2018 pH, Cond, Turb 10/15/2018 TSS & Alk	7.78	205	938	27.8	94		pH was out of holding time
Jar test #1	10/18/2018	10/19/2018		215				31	
Jar test #2	10/18/2018	10/19/2018		207				128	
Jar test #3	10/18/2018	10/19/2018		205				206	
Jar test #4	10/18/2018	10/19/2018		202				286	
Jar test #5	10/18/2018	10/19/2018		194				348	
Jar test #6	10/18/2018	10/19/2018		192				500	
A1 PE + C3	10/18/2018	10/19/2018	7.14	194	944.1	30.9	40		pH was out of holding time
A3 (End of Test)	10/18/2018	10/19/2018	7.89	187	910.6	30.4	78		pH was out of holding time
A1	10/23/2018	10/23/2018 pH, 10/24/2018 Cond, Turb, TSS, Alk, COD	7.06	197	1095	26.4	35	161	
A2	10/23/2018	10/23/2018 pH, 10/24/2018 Cond, Turb, TSS, Alk, COD	7.13	191	1094	28.5	113	145	
A3	10/23/2018	10/23/2018 pH, 10/24/2018 Cond, Turb, TSS, Alk, COD	7.91	188	1082	24.6	120	143	
A4	10/23/2018	10/24/2018						111	
PE Grab	10/23/2018	10/24/2018						41	
A1	10/24/2018	10/25/2018	7.51	192		26.6	36	138	pH was out of holding time
A2	10/24/2018	10/25/2018	7.28	185		34.5	164	142	pH was out of holding time
A3	10/24/2018	10/25/2018	7.86	184		31.3	172	142	pH was out of holding time
PE Grab	10/24/2018	10/25/2018	179					42	
Jar test 1	10/29/2018	10/30/18 TSS, Alk, COD	6.55	40				12	50
Jar test 2	10/29/2018	10/30/18 TSS, Alk, COD	6.42	38				32	
Jar test 3	10/29/2018	10/29/18 pH, 10/30/18 TSS, Alk, COD	6.27	34				48	
Jar test 4	10/29/2018	10/30/18 pH, 10/30/18 TSS, Alk, COD	6.08	35				32	
Jar test 5	10/29/2018	10/29/18 pH, 10/30/18 TSS, Alk, COD	5.93	33				20	
Jar test 6	10/29/2018	10/30/18 pH, 10/30/18 TSS, Alk, COD	5.69	32				20	
Jar test 7	10/29/2018	10/29/18 pH, 10/30/18 TSS, Alk, COD	6.65	40				36	
A1	11/1/2018	11/2/2018 TSS, Alk, COD, Turb, Conductivity	8.24	182	1167	22.9	34	120	
A3	11/1/2018	11/2/2018 TSS, Alk, COD, Turb, Conductivity	8.28	182	1175	23.5	36	118	
A4	11/1/2018	11/2/2018 TSS, Alk, COD, Turb, Conductivity	7.14	180	1256	44.8	41	262	
A1	11/6/2018	11/6/2018 pH, Conductivity, Turbidity	7.74	182	1034	25	33	114	
A2	11/6/2018	11/6/2018 pH, Conductivity, Turbidity	7.37	169	1063	34.3	172	119	
A3	11/6/2018	11/6/2018 pH, Conductivity, Turbidity	7.88	174	1051	27.7	180	118	
A4	11/6/2018	11/6/2018 pH, Conductivity, Turbidity	7.18	162	817.8	38.2	46	208	
A1	11/8/2018	11/8/2018 pH, Alk, Cond, Turb, COD	7.33	188	966.8	26.6	26	175	
A2	11/8/2018	11/8/2018 pH, Alk, Cond, Turb, COD	7.32	185	988.9	35	152	148	
A3	11/8/2018	11/8/2018 pH, Alk, Cond, Turb, COD	7.91	182	968.2	31.7	184	148	
A4	11/8/2018	11/8/2018 pH, Alk, Cond, Turb, COD	7.14	180	892.5	47.8	47	288	
A1	11/13/2018	11/13/2018 pH, Alk, Cond, Turb, COD	7.2	211	1030	30.4	36	164	
A2	11/13/2018	11/14/2018 TSS, COD	7.18	205	1039	40.8	156	164	
A3	11/13/2018	11/13/2018 pH, Alk, Cond, Turb, COD	7.82	203	1018	37.3	196	176	
PE Grab	11/13/2018	11/13/2018 pH, Alk, Cond, Turb, COD	7.12	188	932.6	55.4	44	280	
A1	11/15/2018	11/16/2018 TSS, COD	7.4	205	974	24.3	32	125	
A2	11/15/2018	11/16/2018 pH, Alk, Cond, Turb, COD	missed	missed	missed	missed	missed	missed	
A3	11/15/2018	11/16/2018 pH, Alk, Cond, Turb, COD	7.97	190	989.4	28.6	200	119	
A4 (PE grab)	11/15/2018	11/15/2018 pH, Alk, Cond, Turb, COD	7.14	178	860.1	45.2	46	231	
A1	11/26/2018	11/26/2018 pH, TSS, COD	7.09	19	172.5	9.22	15	32	
A2	11/26/2018	11/27/2018 pH, TSS, COD	5.97	13	200.7	10.9	44	32	
A3	11/26/2018	11/27/2018 pH, TSS, COD	6.24	14	198.7	11.7	44	34	
A4 (PE grab)	11/26/2018	11/27/2018 TSS, Alk, Cond, Turb, COD	7.15	69	675.9	36.7	70	124	
A1	11/28/2018	11/28/2018 Cond, pH, TSS, COD	7.36	82	267.4	37	48	116	
A2	11/28/2018	11/28/2018 Cond, pH, TSS, COD	6.9	72	276.2	44.1	176	122	
A3	11/28/2018	11/28/2018 Cond, pH, TSS, COD	7.55	68	276.3	41.1	176	106	
A4 (PE grab)	11/28/2018	11/29/2018 pH, Alk, COD, Turb, TSS	7.23	82	252.7	34	48	112	
A1	12/11/2018	12/12/2018 COD, Cond, Alk, Turb, TSS	7.26	62	901.5	19.3	22	78	
A2	12/11/2018	12/12/2018 COD, Cond, Alk, Turb, TSS	7.35	60	909.8	22.4	54	79	
A3	12/11/2018	12/12/2018 COD, Cond, Alk, Turb, TSS	7.82	61	906.5	22.5	62	82	
A4 (PE grab)	12/11/2018	12/12/2018 COD, Cond, Alk, Turb, TSS	7.17	127	1844	41	50	253	
A1	12/18/2018	12/18/2018 pH, Alk, Cond, Turb, 12/19/18: TSS and COD	7.48	28	118.8	10.5	20	34	
A2	12/18/2018	12/18/2018 pH, Alk, Cond, Turb, 12/19/18: TSS and COD	7.2	27	121.4	11.6	28	36	
A3	12/18/2018	12/18/2018 pH, Alk, Cond, Turb, 12/19/18: TSS and COD	7.73	30	121.2	11.3	26	45	
A4 (PE grab)	12/18/2018	12/18/2018 pH, Alk, Cond, Turb, 12/19/18: TSS and COD	7.17	52	230.2	20.4	30	74	
A1	12/19/2018	12/19/2018 pH, Alk, Cond, Turb, 12/20/18: TSS and COD	7.29	54.5	163.3	27	40	88	
A2	12/19/2018	12/19/2018 pH, Alk, Cond, Turb, 12/20/18: TSS and COD	7.22	52	164.9	28.4	68	92	
A3	12/19/2018	12/19/2018 pH, Alk, Cond, Turb, 12/20/18: TSS and COD	7.69	55	166.9	30.1	68	100	
A4 (PE grab)	12/19/2018	12/19/2018 pH, Alk, Cond, Turb, 12/20/18: TSS and COD	7.04	55	161.6	25.5	28	86	
A1	12/20/2018	12/21/2018 COD, Turb, Cond., TSS; Alk	7.07	49	153.3	22.2	32	76	
A2	12/20/2018	12/21/2018 COD, Turb, Cond., TSS; Alk	7.43	38	176	28.2	50	80	
A3	12/20/2018	12/21/2018 COD, Turb, Cond., TSS; Alk	7.58	37	175.6	28	54	80	
A4 (PE grab)	12/20/2018	12/21/2018 COD, Turb, Cond., TSS; Alk	7.05	50	164.4	25.5	38	80	
A1	1/15/2019	1/15/2019 pH, Cond, Turb, Alk 1/16/2019 COD, TSS	7.26	164	707.5	27.1	32	150	

TSS on A3 and A4 are being rerun. Results do not match up with COD.

Retest still shows A3 TSS of 200mg/l and COD of 104/100 and COD on A4 is 178/176

Sample	Sample Date	reruns		troubleshooting		blank standard	0, -5 41, 23
		sCOD, mg/L	COD, mg/L	sCOD, mg/L	COD, mg/L		
Ovivo Pilot Alum	7/16/2019 11:18	4	7				
Ovivo Pilot ACH	7/16/2019 13:00	11	6	17	13		
Ovivo Pilot ACH	7/16/2019 13:01					under range	
Ovivo Pilot ACH non-washed filter	7/16/2019 13:01					under range	
Ovivo Pilot ACH washed filter	7/16/2019 13:01					23, 28, 27	
Ovivo Pilot ACH	7/16/2019 13:00					8, 7, 6	
Ovivo Pilot ACH non-washed filter	7/16/2019 13:00					all underrange	
Ovivo Pilot ACH washed filter	7/16/2019 13:00					1, under range	

OVIVO PILOT TESTING

WO # C165282

Day	Sample Date	Unit	# of samples	Sample Frequency	Tue				Tue				Tue				Tue			
					10/20/2020		10/20/2020		10/20/2020		10/20/2020		10/20/2020		10/20/2020		10/20/2020			
	S1-G			Military Time (hours)		935														
TSS	mg/L			1	1/run		15													
VSS	mg/L			1	1/run		11													
tCOD	mg/L					48														
sCOD	mg/L					23														
BOD	mg/L					22														
Alkalinity	mg/L					64														
Fecal Coliform Sample ID					#1	#2			#1	#2			#1	#2			#1	#2		
Fecal Coliform Sample Time							930													
Fecal Coliform	MPN/100mL				2	2/run		1,600,000	NS											
	S1-C			Military Time (hours)		935														
TSS	mg/L			1	hourly		19													
VSS	mg/L			1	hourly		17													
Alkalinity	mg/L			1	hourly		150													
COD	mg/L			1	hourly		140													
BOD	mg/L			1	hourly		69													
	S2-G			Military Time (hours)		935														
TSS																				
VSS																				
Cl2 Demand	mg/L			1	1/run		1.608													
SS	ml/l			1	1/run		0													
Alkalinity	mg/L						33													
tCOD	mg/L						28													
sCOD	mg/L						30													
Fecal Coliform Sample ID					#1	#2	#3	#4	#1	#2	#3	#4	#1	#2	#3	#4	#1	#2	#3	
Fecal Coliform Sample Time							10/20 740	930	1030											
Fecal Coliform	MPN/100mL				4	4/run		0	0	0	490									
	S2-C			Military Time (hours)		935														
TSS	mg/L			1	hourly		0													
VSS	mg/L			1	hourly		1													
Alkalinity	mg/L			1	hourly		44													
UV Abs	cm ⁻¹			1	hourly		0.17													
BOD	mg/L			1	hourly		29													
	S3-G			Military Time (hours)		935														
TSS	mg/L			1	1/run		738													
VSS	mg/L			1	1/run		408													
Alkalinity	mg/L						87													
tCOD	mg/L			1	1/run		652													
sCOD	mg/L			1	1/run		34													
	S3-G, Flow Box			Military Time (hours)		935														
TSS	mg/L			1	1/run															
VSS	mg/L			1	1/run															
Alkalinity	mg/L																			
tCOD	mg/L			1	1/run															
sCOD	mg/L			1	1/run															

Weekly Check of online instruments

Date/Time/Initials																			
Turbidity online reading																			
Turbidity lab reading																			
pH online reading																			
pH lab reading																			
Temperature online reading																			
Temperature lab reading																			
Conductivity																			
Hypo Strength %																			

Bottle Kit	Volume
FE grab	2L
FE Fecal	4 125-ml sterile
FE cl2	1L amber bottle
FE comp	4L
Inf grab	2L
Inf Fecal	2 125-ml sterile
Inf comp	2L
TNK	500mL

S1-G
S1-C
S2-G
S2-C
S3-G

Field Measurements

Date	Time	Locations	pH	Temp, C	Cond, uS	TDS, ppm	UVT (%)	UVA
	9:30	Inf	7.5	17.4	1126	795	72.5	0.139
	9:35	Tank	7.2	17.1	530	375		
	9:40	Eff	7	17.4	511	360	86.7	0.061
	12:30						29.5	0.529
	14:30						23.9	0.62

Appendix B.12

Supplemental Test 01

Run# Supp 01

Run Description Verify Ovivo's peak 12-hour design condition

Type	<input checked="" type="checkbox"/> process	<input type="checkbox"/> Performance
Influent water source	<input checked="" type="checkbox"/> PE	
	<input checked="" type="checkbox"/> Hydrant	
	<input checked="" type="checkbox"/> Both	

Flux rate	<input checked="" type="checkbox"/> Constant	
	<input type="checkbox"/> Varies	

Wasting Rate	0
Air Scour	105 scfm
Backwash Frequency	15 min
Run Duration	12 Hrs
CIP	<input checked="" type="checkbox"/> Hypo <input checked="" type="checkbox"/> Caustic <input type="checkbox"/> Citric
Composite Sample Schedule	6 Samples, 1 hour apart, 800 mL each 4.8 L total volume

Date

*NOTE: Composite samples to only be tested for TSS, VSS, and COD.

Event	Day	Time Hr	PE gpm	Hydrant gpm	Coag Dose Al:TSS ratio	Flux Rate gfd	Event/Action	Influent		Effluent		Membrane Tank		Comments
								Grab / Probe	Note	Grab / Probe	Note	Grab / Probe	Note	
0	1	9:00	100	100	0.6		Start Flow to pilot							
1		9:30				100	Start producing effluent 3 stacks online (100 gfd to verify clean condition)							
2		10:00				150	Change flux 2 stacks online							
3		10:00					Start Composite Samplers							
4		12:00					Influent Sample	WPP: TSS/VSS, COD						
5		12:05					Effluent Sample		Set WPP: TSS/VSS, COD					
6		16:00					Stop producing effluent							
7														
8														
9														
10														
11														
12														
13														

Field	Eff
Turbidity	
Probe reading	
pH	
Temperature	
Conductivity	

WPPLsamples	
Influent composite	
Effluent composite	
-TSS/VSS, Alk, BOD	
Influent grab	
TSS/VSS	
Fecal	
Effluent grab	
TSS/VSS	
Chlorine demand	
Fecal	
Settleable solids	
Tank grab	
TSS/VSS	

KCEL	
Influent grab	
TOC	
Effluent composite	
TOC	

OVIVO Pilot Setpoints **Values to be set according to OVIVO's recommendations.**
Run# **Supp 01**Date **11/10/2020**

FLOW OPTIMIZATION				CHEM DOSING				
System	ONLINE/OFFLINE			Permeate		End of Event		Coagulant
Inlet System				Permeate Flow	206	gpm	End Cycle	Pump Start Inf Flow
Screen Off Delay	2	min		Pump Start Level	116	in	Enable	Pump Start Level
Weir Gate Frequency	1800	min		Pump Stop Level	5	in	Disable	Overflow Level
Weir Gate Duration	30	sec		Pump Stop Low Level	100	in		Coagulant Min Flow
Blowers				Single Pump Flow	220	gpm		Coagulant Max Flow
Scour Air Flow	105	scfm		Backwash Frequency	15	min		Coag Fixed Flow
Blower Start Level	20	in		Backwash Flow	300	%		Coag TSS Ratio
Blower Stop Level	8	in		Pre BW Relaxation	30	sec		Coag Al%
Lag Blower Start Level	65	%		Backwash Duration	60	sec		Coag SG
Lag Blower Start Delay	120	sec		Post BW Relax Duration	30	sec		Coag Flow Ratio
Blower Fail Air Flow	4.5	scfm		Perm Static Pressure	1.7	psi		Coag Fill Flow
Blower Fail Delay	140	sec		Turbidity Hi Alarm SP	10	NTU		
Low Air Flow Alarm	55	%		TMP Hi Alarm SP	8	psi		
Low Air Flow Delay	45	sec		Backwash Start TMP	10	psi		
TMP Reset				Max Hi TMP Cycles	1			
Override Enabled				Perm Tank Level Lo	20	in	Membrane Basin Drain Vlv	
				Air Extractor Frequency	5	min	WAS Vlv Open TSS	6,000 mg/l
				Air Extractor Duration	4	min	WAS Vlv Close Lvl	117 in
							WAS Valve Duration	0 sec
Sodium Hypochlorite				Citric Acid			Caustic	
CIP Permeate Flow	100	gpm		CIP Permeate Flow	100	gpm	CIP Permeate Flow	100 gpm
Backwash Perm Flow	200	gpm		Backwash Perm Flow	200	gpm	Backwash Perm Flow	100 gpm
Hypochlorite Flow	100	gph		Citric Flow	28	gph	Caustic Flow	50 gph
Pre CIP Relax Duration	30	sec		Pre CIP Relax Duration	30	sec	Pre CIP Relax Duration	30 sec
Chem Flow Duration	10	min		Chem Flow Duration	10	min	Chem Flow Duration	10 min
Soak Duration	999	min		Soak Duration	999	min	Soak Duration	999 min
Rinse Duration	60	sec		Rinse Duration	60	sec	Rinse Duration	60 sec
Final Relax Duration	60	sec		Final Relax Duration	60	sec	Final Relax Duration	60 sec
Pre-Drain Disabled				Pre-Drain Disabled				Pre-Drain Disabled

Run# Supp 01
 Run Description Verify Ovivo's peak 12-hour design condition

Type	<input checked="" type="checkbox"/> process	<input type="checkbox"/> Performance
Influent water source	<input checked="" type="checkbox"/> PE	
	<input checked="" type="checkbox"/> Hydrant	
	<input checked="" type="checkbox"/> Both	

Flux rate	<input checked="" type="checkbox"/> Constant	
	<input type="checkbox"/> Varies	

Wasting Rate	0
Air Scour	105 scfm
Backwash Frequency	15 min
Run Duration	12 Hrs
CIP	<input checked="" type="checkbox"/> Hypo <input checked="" type="checkbox"/> Caustic <input type="checkbox"/> Citric
Composite Sample Schedule	6 Samples, 1 hour apart, 800 mL each 4.8 L total volume

Date

*NOTE: Composite samples to only be tested for TSS, VSS, and COD.

Event	Day	Time Hr	PE gpm	Hydrant gpm	Coag Dose Al:TSS ratio	Flux Rate gfd	Event/Action	Influent		Effluent		Membrane Tank		Comments	
								Grab / Probe	Note	Grab / Probe	Note	Grab / Probe	Note		
0	1	9:00	100	100	0.6	150	Start Flow to pilot								
1		9:30				100	Start producing effluent 3 stacks online (100 gfd to verify clear condition)								
2		10:00				150	Change flux 2 stacks online								
3		10:00					Start Composite Samplers								
4		12:00					Influent Sample	Field: Full Set WPP: TSS/VSS, COD				INF	pH = 7.5 cond. = 411 temp = 14.0° TDS = 292		
5		12:05					Effluent Sample	Field: Full Set WPP: TSS/VSS, COD				EFF	pH = 7.3 cond. = 343 temp = 14.3° TDS = 258		
6		12:00	15:30				Stop producing effluent						Turb	mg 0.09	
7															
8															
9															
10															
11															
12															
13															

Field	Eff
Turbidity	
Probe reading	
pH	
Temperature	
Conductivity	

WPPLsamples	
Influent composite	
Effluent composite	
-TSS/VSS, Alk, BOD	
Influent grab	
TSS/VSS	
Fecal	
Effluent grab	
TSS/VSS	
Chlorine demand	
Fecal	
Settleable solids	
Tank grab	
TSS/VSS	

KCEL	
Influent grab	
TOC	
Effluent composite	
TOC	

Daily Field Notes

Run

Cond

Supplemental Test #1

Process and Performance Testing

Date	Time	Observation	Action Item
4/10	0650	Installed new filter elements on blowers and functionally test both blowers (manual - 100%) Blower #1 (6.2A, 4 psi) VRD discharge 113 scfm	Blower #2 (5.9A, 4 psi) VRD discharge 112 scfm
	0700	Draned membrane tank	
	0710	Hydrant water charged to pilot	
	0720	Cycled power to cWOT - no Water Export (Device offline)	
	0750	Setup to run @ 150 gfd from start. Confirmed clear piping short (2) gfd period prior to S/D on 4/5.	
	9:10	System ONLINE	
	9:15	noticed blower 1 output ~ 25 scfm \rightarrow problematic	
	9:18	put blower 1 in manual, 100% speed blower 2 failed	
	10:44 hrs	Troubleshooting blowers and secured blower 1 for < 1 min	
	15:35 hrs	Switched back to 100 gfd for 1 filtration cycle prior to securing blower 1 for CIP.	
	16:00	Shutdown Initiated CIP (hypochlorite + caustic)	

King County Ovivo PilotRun # **Supplemental 1**Date **11/10/2020**

membrane
 surface area per stack = **975 sf**

Test Variables			Calculated		Test Plan		
Influent flow = PE + hyd	permeate flow setpt	stacks in service	surface area in service	instantaneous flux	Flux Goal	Start Time	Stop Time
(gpm)	(gpm)	(#)	(sf)	(GFD)	(GFD)		
100 + 100	203	2	1,950	150	100 (SD)	9:00	16:00
	204	3	2,925	100	150 (SD)	16:00	16:30

Notes:**Stacks 2 and 3 in operation during 150 gfd run period****Switch "stacks online" setting under Ovivo tab on HMI.****Follow High TMP S/D with 30-min CIP****Stack 3 in operation during "single stack in service" periods**

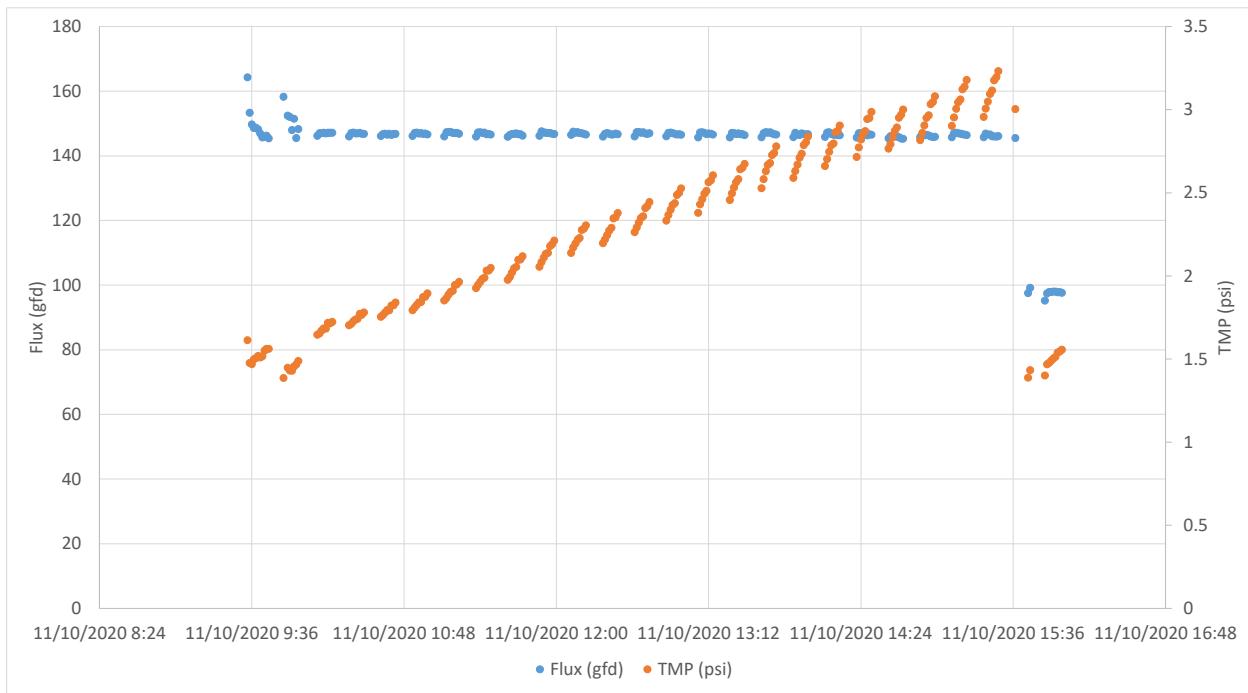
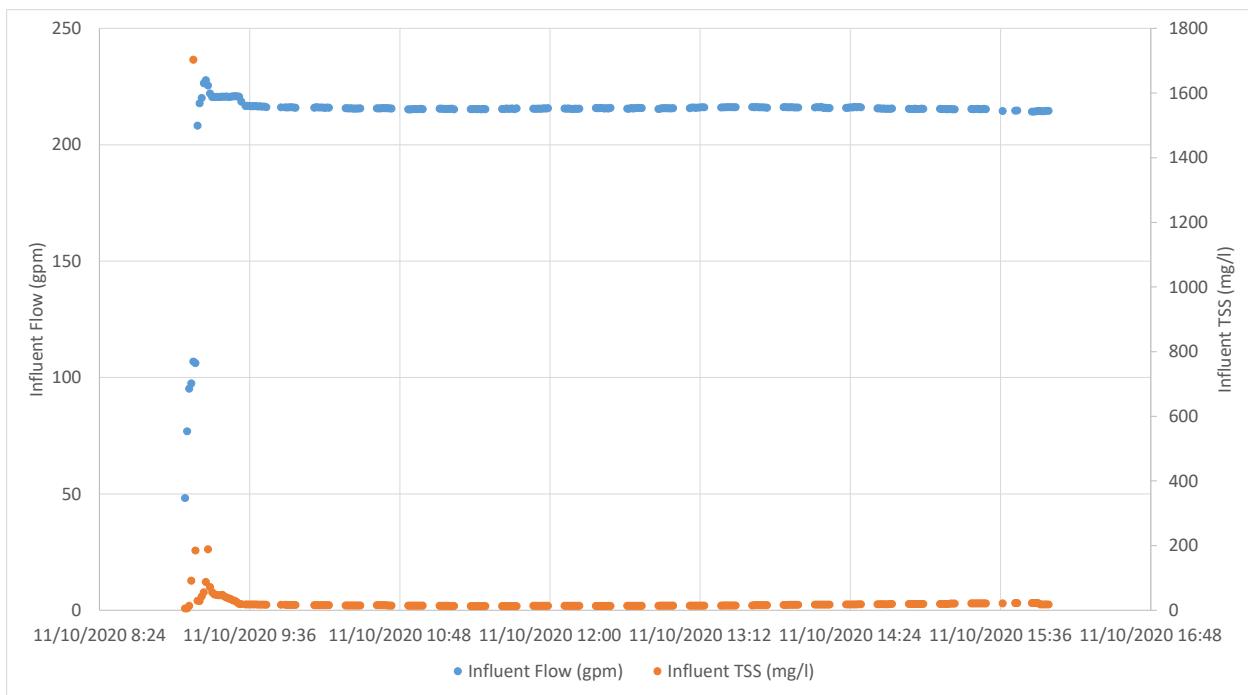
OVIVO Pilot Setpoints Values to be set according to OVIVO's recommendations.

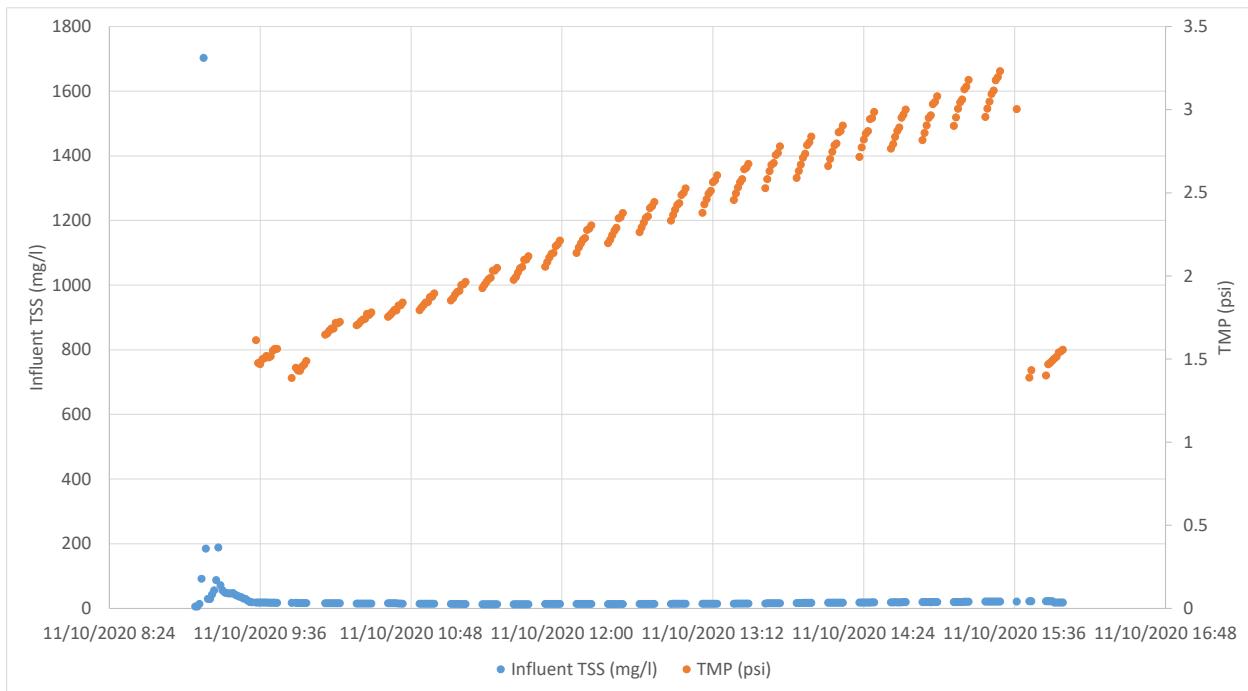
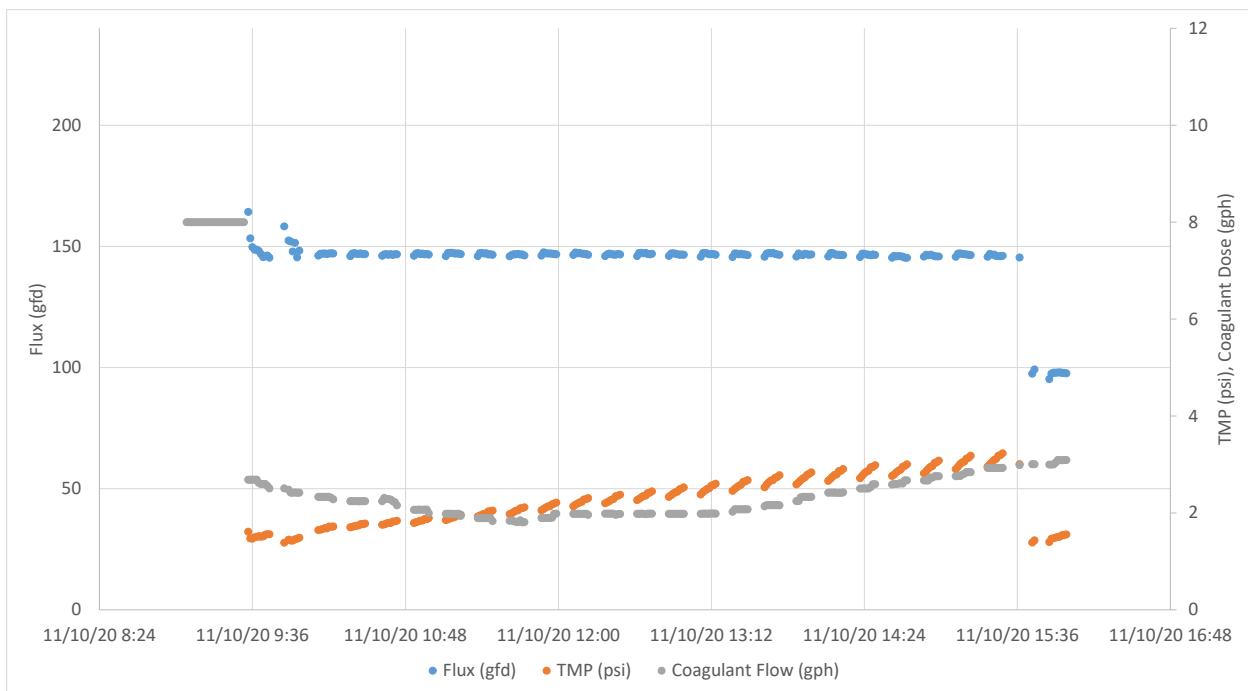
Run# Supp 01

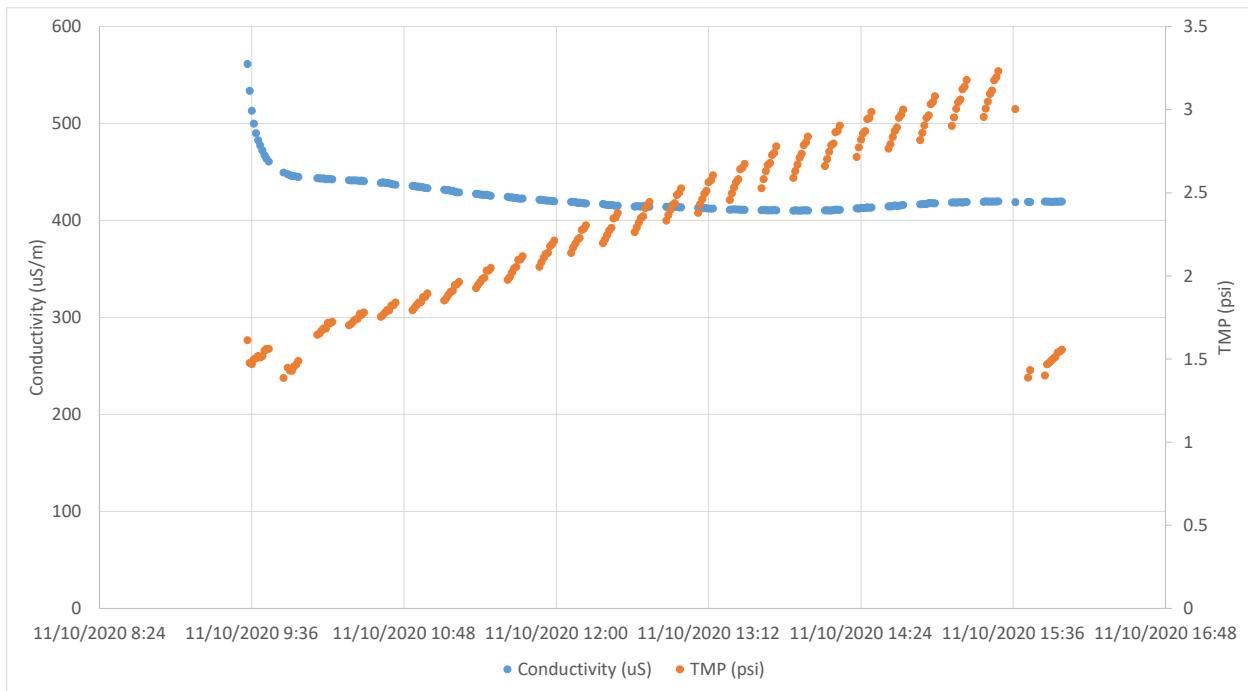
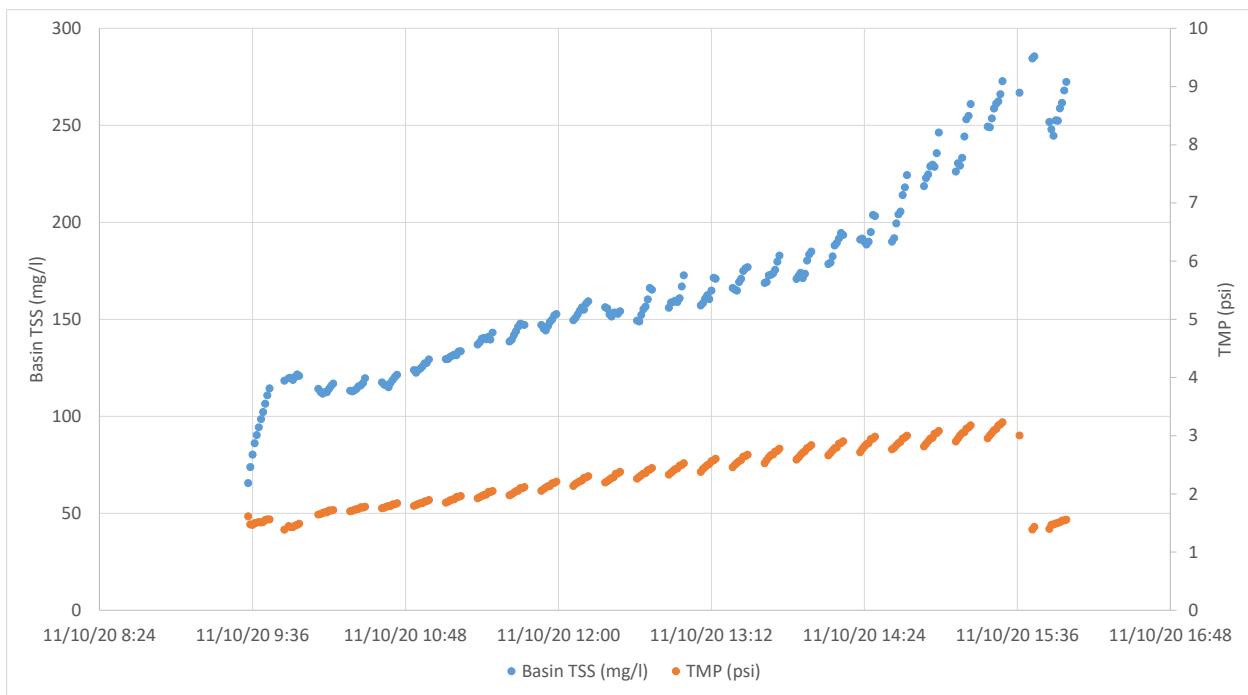
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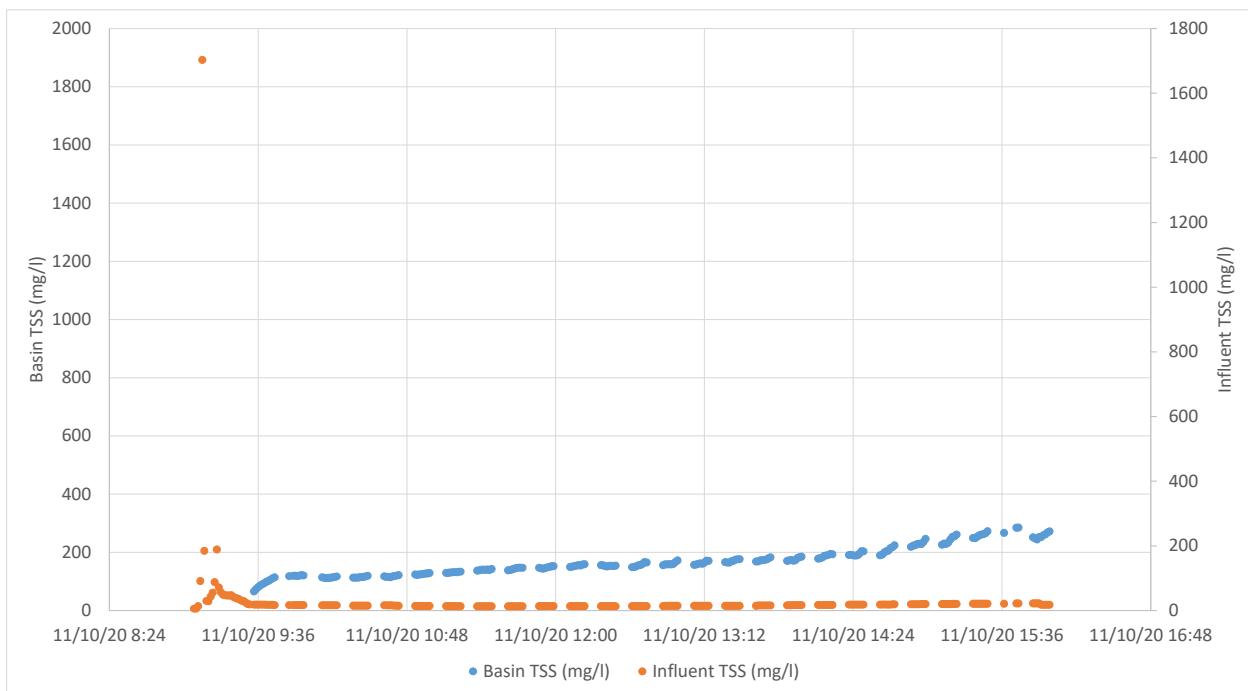
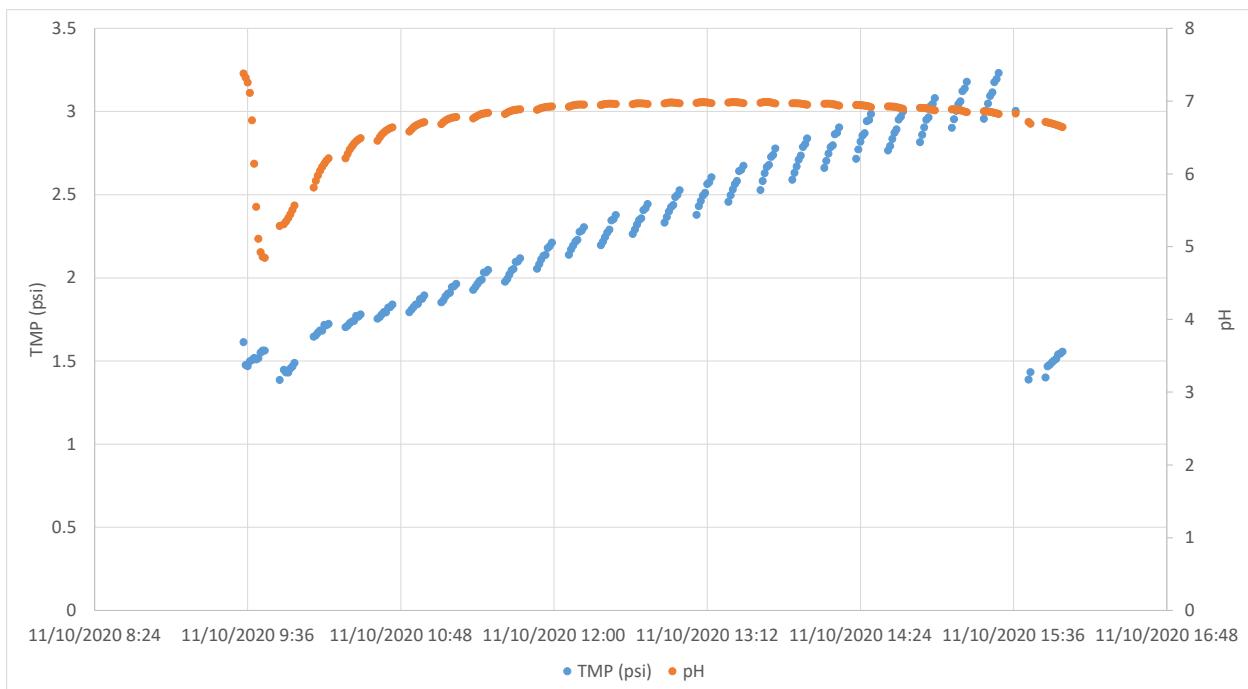
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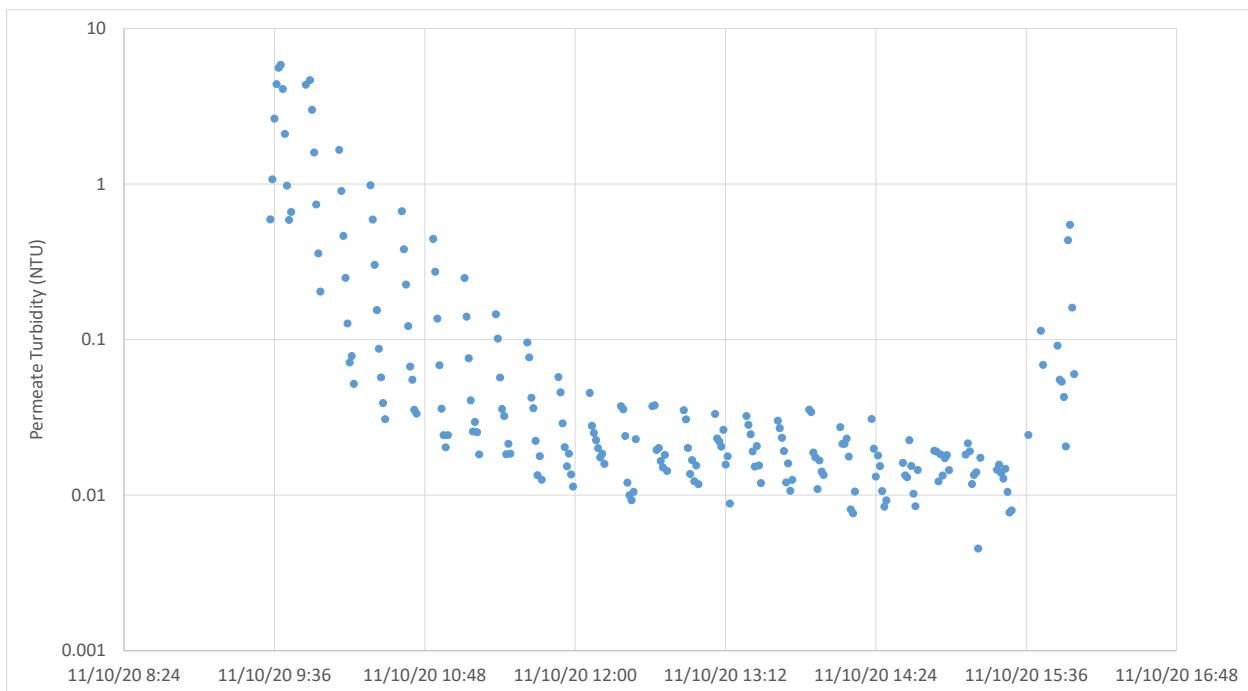
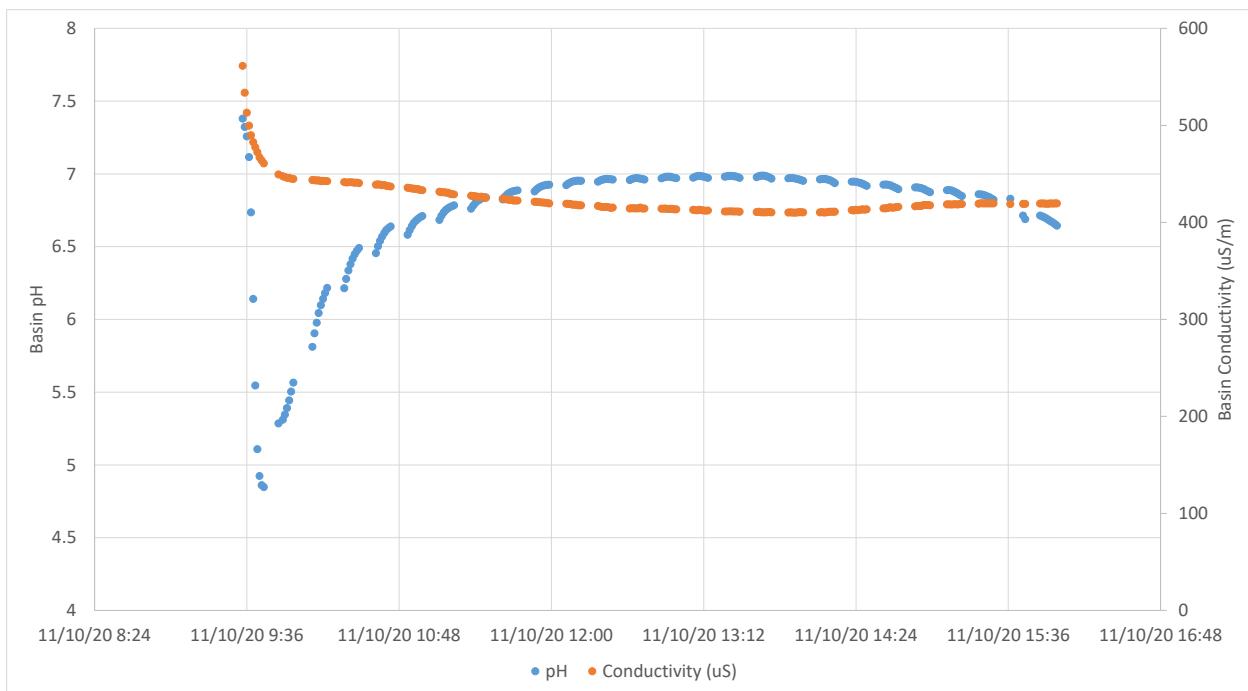
FLOW/OPTIMIZATION						CHEM DOSING								
System	ONLINE/OFFLINE	Permeate	End of Event	Coagulant										
Inlet System		Permeate Flow	200 gpm	Pump Start Inf Flow	1 gpm									
Screen Off Delay	2 min	Pump Start Level	116 in	Pump Start Level	0.1 in									
Weir Gate Frequency	1800 min	Pump Stop Level	5 in	Overflow Level	118 in									
Weir Gate Duration	30 sec	Pump Stop Low Level	100 in											
Blowers		Single Pump Flow	220 gpm	Coagulant Min Flow	0.5 gph									
Scour Air Flow	105 scfm	Backwash Frequency	15 min	Coagulant Max Flow	20 gph									
Blower Start Level	20 in	Backwash Flow	300 %	Coag Fixed Flow	6.0 gph									
Blower Stop Level	8 in	Pre BW Relaxation	30 sec	Coag TSS Ratio	0.60									
Lag Blower Start Level	65 %	Backwash Duration	60 sec	Coag Al%	4.1 %									
Lag Blower Start Delay	120 sec	Post BW Relax Duration	30 sec	Coag SG	1.34									
Blower Fail Air Flow	4.5 scfm	Perm Static Pressure	1.7 psi	Coag Flow Ratio	5									
Blower Fail Delay	140 sec	Turbidity Hi Alarm SP	10 NTU	Coag Fill Flow	8 gph									
Low Air Flow Alarm	55 %	TMP Hi Alarm SP	8 psi											
Low Air Flow Delay	45 sec	Backwash Start TMP	10 psi											
Override Enabled		Max Hi TMP Cycles	1											
Sodium Hypochlorite		TMP Reset			Coagulant Dosing Mode Select									
CIP Permeate Flow	100 gpm	Perm Tank Level Lo			Fixed Flow									
Backwash Perm Flow	200 gpm	Air Extractor Frequency			TSS									
Hypochlorite Flow	100 gph	Air Extractor Duration			Perm Flow									
Pre CIP Relax Duration	30 sec				Membrane Basin Drain Vlv									
Chem Flow Duration	10 min				WAS Vlv Open TSS	6,000 mg/l								
Soak Duration	999 min				WAS Vlv Close Lvl	117 in								
Rinse Duration	60 sec				WAS Valve Duration	0 sec								
Final Relax Duration	60 sec													
Pre-Drain Disabled			Pre-Drain Disabled			Pre-Drain Disabled								

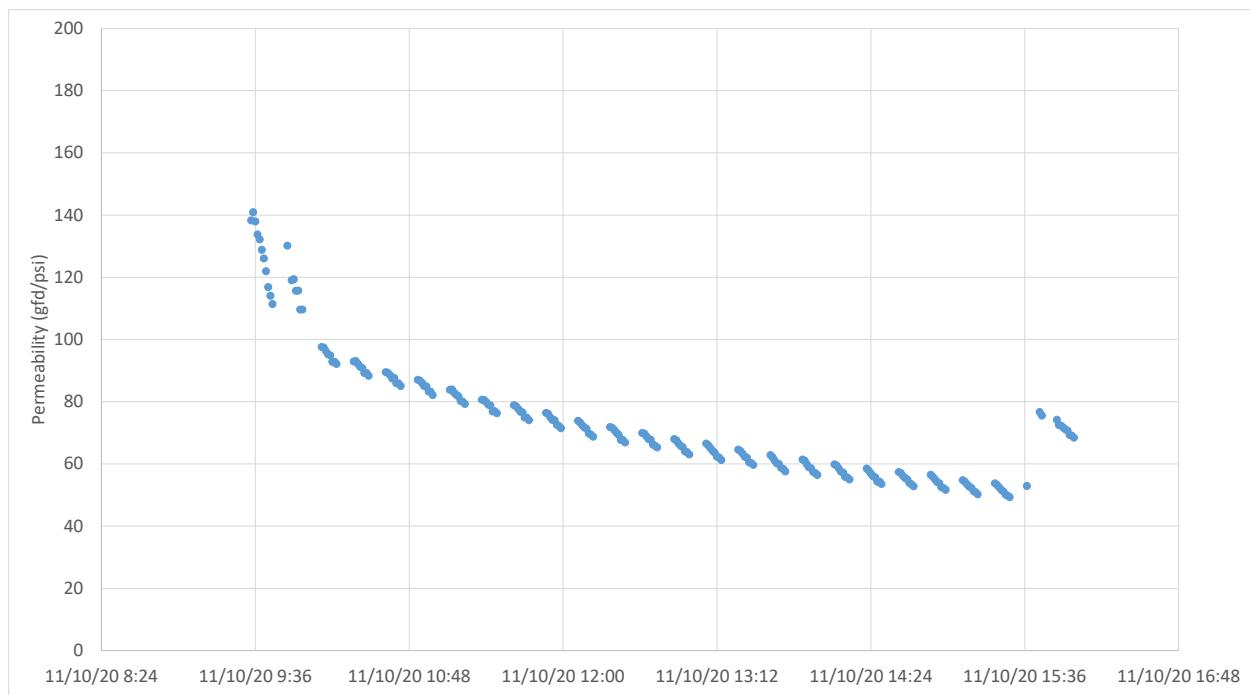


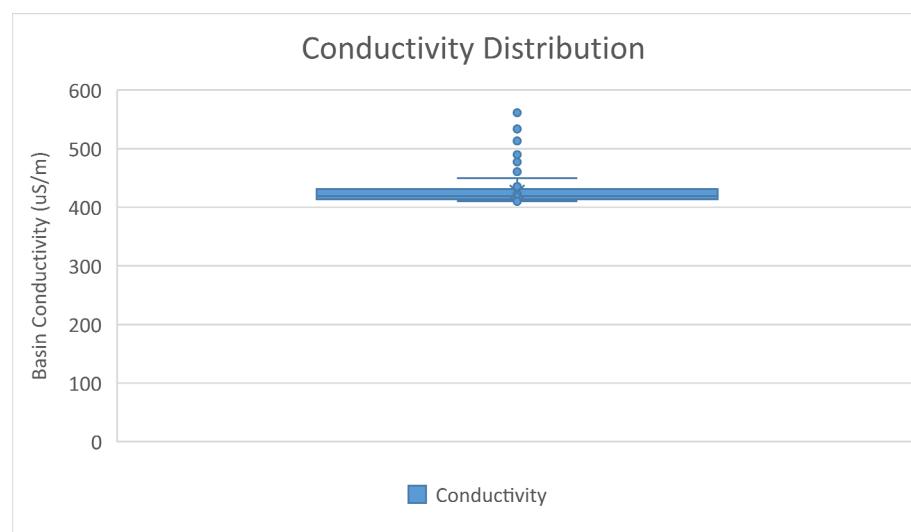
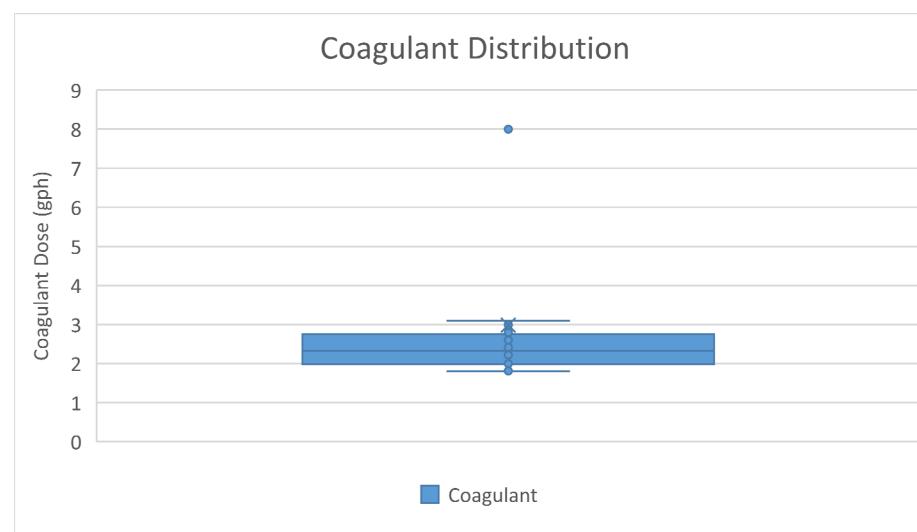
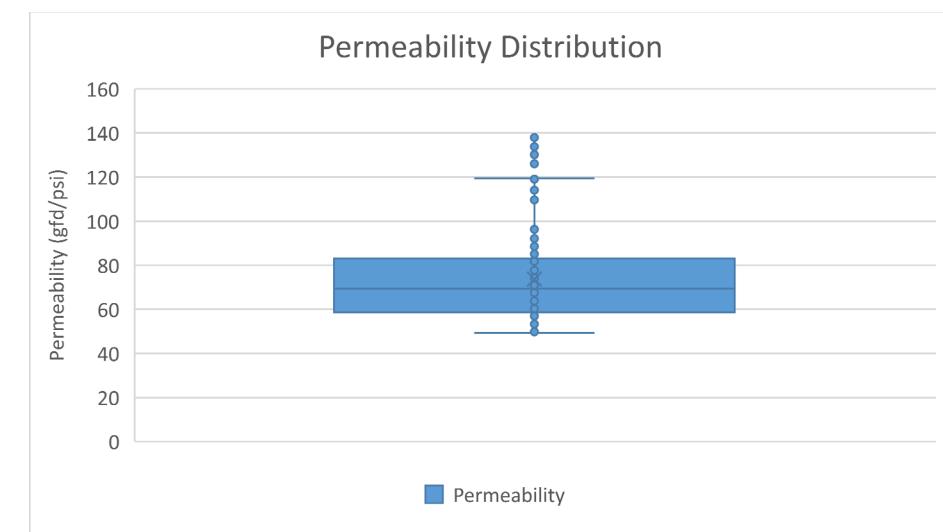
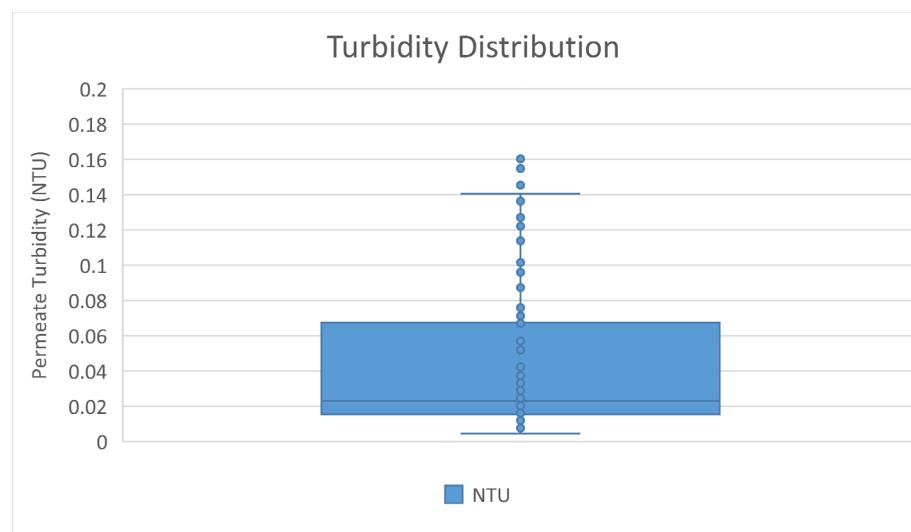
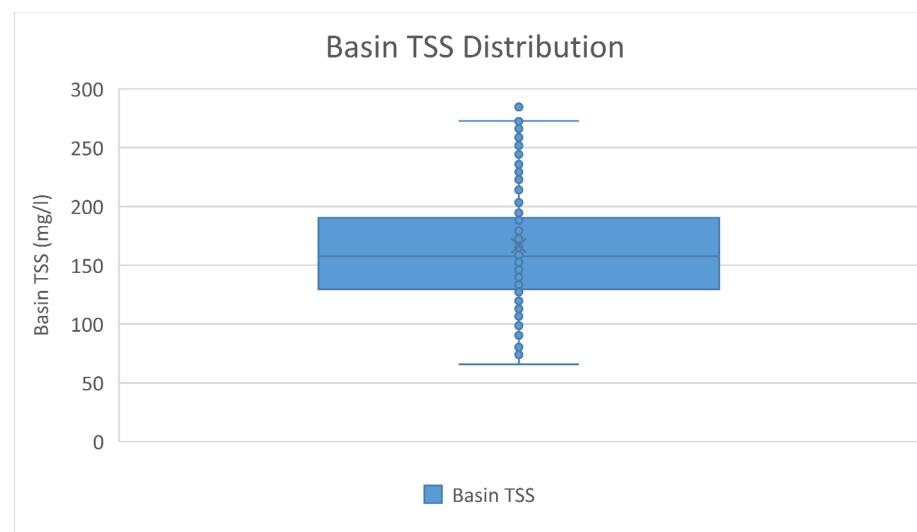
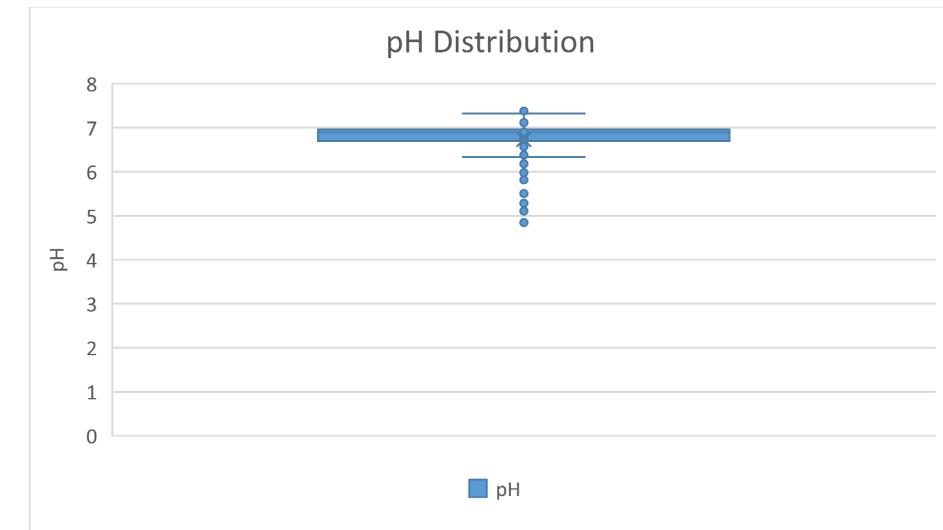
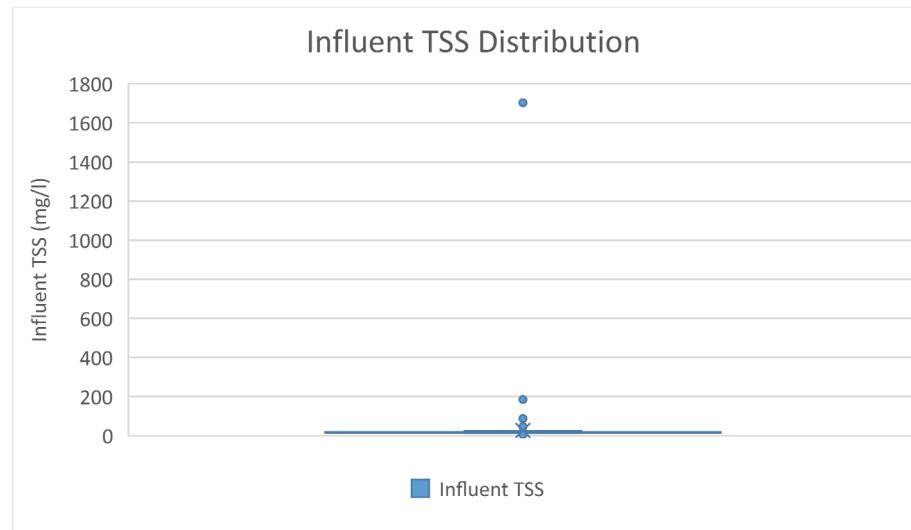
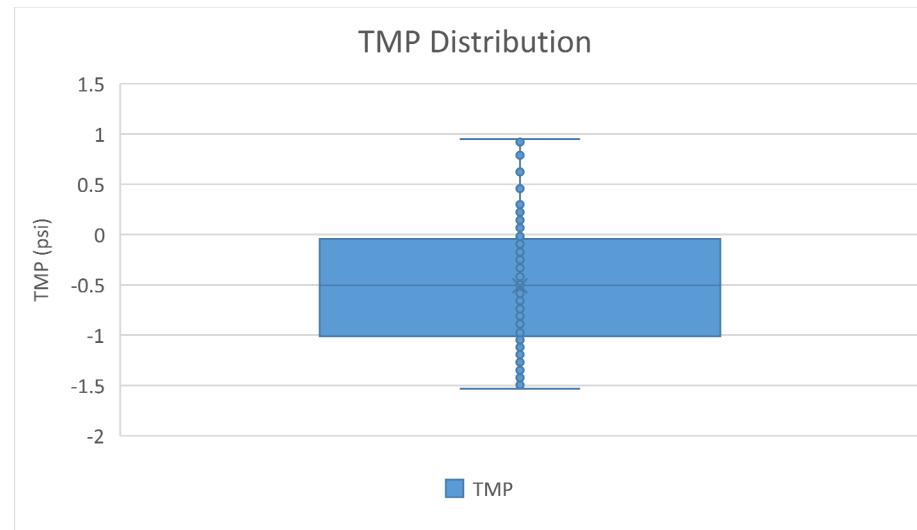












Sample	Sample Date	reruns		troubleshooting		blank standard	0, -5 41, 23
		sCOD, mg/L	COD, mg/L	sCOD, mg/L	COD, mg/L		
Ovivo Pilot Alum	7/16/2019 11:18	4	7				
Ovivo Pilot ACH	7/16/2019 13:00	11	6	17	13		
Ovivo Pilot ACH	7/16/2019 13:01					under range	
Ovivo Pilot ACH non-washed filter	7/16/2019 13:01					under range	
Ovivo Pilot ACH washed filter	7/16/2019 13:01					23, 28, 27	
Ovivo Pilot ACH	7/16/2019 13:00					8, 7, 6	
Ovivo Pilot ACH non-washed filter	7/16/2019 13:00					all underrange	
Ovivo Pilot ACH washed filter	7/16/2019 13:00					1, under range	

OVIVO PILOT TESTING

WO # C165282

Day		# of samples	Sample Frequency	Tue	
Sample Date	Unit			11/10/2020	
S1-G	Military Time (hours)				
TSS	mg/L	1	1/run	16	
VSS	mg/L	1	1/run	14	
tCOD	mg/L			78	
sCOD	mg/L				
BOD	mg/L				
Alkalinity	mg/L				
Fecal Coliform Sample ID				#1	#2
Fecal Coliform Sample Time					
Fecal Coliform	MPN/100mL	2	2/run		
S1-C	Military Time (hours)				
TSS	mg/L	1	hourly	23	
VSS	mg/L	1	hourly	17	
Alkalinity	mg/L	1	hourly		
COD	mg/L	1	hourly	83	
BOD	mg/L	1	hourly		
S2-G	Military Time (hours)				
TSS				1	
VSS				1	
Cl2 Demand	mg/L	1	1/run		
SS	ml/l	1	1/run		
Alkalinity	mg/L				
tCOD	mg/L			20	
sCOD	mg/L				
Fecal Coliform Sample ID				#1	#2
Fecal Coliform Sample Time					
Fecal Coliform	MPN/100mL	4	4/run		
S2-C	Military Time (hours)				
TSS	mg/L	1	hourly	1	
VSS	mg/L	1	hourly	1	
Alkalinity	mg/L	1	hourly		
UV Abs	cm ⁻¹	1	hourly		
COD				32	
BOD	mg/L	1	hourly		
S3-G	Military Time (hours)				
TSS	mg/L	1	1/run		
VSS	mg/L	1	1/run		
Alkalinity	mg/L				
tCOD	mg/L		1/run		
sCOD	mg/L	1	1/run		
S3-G, Flow Box	Military Time (hours)				
TSS	mg/L	1	1/run		
VSS	mg/L	1	1/run		
Alkalinity	mg/L				
tCOD	mg/L		1/run		
sCOD	mg/L	1	1/run		

Weekly Check of online instruments

Date/Time/Initials					
Turbidity online reading					
Turbidity lab reading					
pH online reading					
pH lab reading					
Temperature online reading					
Temperature lab reading					
Conductivity					
Hypo Strength %					

Bottle Kit	Volume
FE grab	2L
FE Fecal	4 125-ml sterile
FE cl2	1L amber bottle
FE comp	4L
Inf grab	2L
Inf Fecal	2 125-ml sterile
Inf comp	2L
TNK	500mL

S1-G
S1-C
S2-G
S2-C
S3-G

Appendix B.13

Supplemental Test 02

Run# Supp 02

Run Description Verify Ovivo's peak 4-hour and peak hour design conditions

Type	<input checked="" type="checkbox"/> process	<input type="checkbox"/> Performance
Influent water source	<input checked="" type="checkbox"/> PE	<input checked="" type="checkbox"/> Hydrant
	<input checked="" type="checkbox"/> Both	
Flux rate	<input checked="" type="checkbox"/> Constant	<input type="checkbox"/> Varies

Wasting Rate		0
Air Scour		105 scfm
Backwash Frequency		15 min
Run Duration		12 Hrs
CIP	<input checked="" type="checkbox"/> Hypo <input checked="" type="checkbox"/> Caustic	<input type="checkbox"/> Citric
Composite Sample Schedule	5 Samples, 1 hour apart, 900 mL each 4.5 L total volume	

*Note: Upon restart, TMP should be less than 1.2 psi. If it is greater, do a longer (4 hour) CIP clean and then continue.

****Skip this last fecal sample if it does not fall at a time suitable for the lab.**

Date

Field
Eff
Turbidity
Probe reading
pH
Temperature
Conductivity
WPPLsamples
Influent composite
Effluent composite
-TSS/VSS, Alk, BOD
Influent grab
TSS/VSS
Fecal
Effluent grab
TSS/VSS
Chlorine demand
Fecal
Settleable solids
Tank grab
TSS/VSS
KCEL
Influent grab
TOC
Effluent composite
TOC

OVIVO Pilot Setpoints **Values to be set according to OVIVO's recommendations.**
Run# **Supp 02**Date **11/3/2020**

FLOW OPTIMIZATION				CHEM DOSING							
System	ONLINE/OFFLINE			Permeate		End of Event		Coagulant			
Inlet System				Permeate Flow	206	gpm		Pump Start Inf Flow	1	gpm	
Screen Off Delay	2	min		Pump Start Level	116	in		Pump Start Level	0.1	in	
Weir Gate Frequency	1800	min		Pump Stop Level	5	in		Overflow Level	118	in	
Weir Gate Duration	30	sec		Pump Stop Low Level	100	in					
Blowers				Single Pump Flow	220	gpm		Coagulant Min Flow	0.5	gph	
Scour Air Flow	105	scfm		Backwash Frequency	15	min		Coagulant Max Flow	20	gph	
Blower Start Level	20	in		Backwash Flow	300	%		Coag Fixed Flow	6.0	gph	
Blower Stop Level	8	in		Pre BW Relaxation	30	sec		Coag TSS Ratio	0.60		
Lag Blower Start Level	65	%		Backwash Duration	60	sec		Coag AI%	4.1	%	
Lag Blower Start Delay	120	sec		Post BW Relax Duration	30	sec		Coag SG	1.34		
Blower Fail Air Flow	4.5	scfm		Perm Static Pressure	1.7	psi		Coag Flow Ratio	5		
Blower Fail Delay	140	sec		Turbidity Hi Alarm SP	10	NTU		Coag Fill Flow	8	gph	
Low Air Flow Alarm	55	%		TMP Hi Alarm SP	8	psi					
Low Air Flow Delay	45	sec		TMP Start TMP	10	psi		Coagulant Dosing Mode Select			
TMP Reset				Max Hi TMP Cycles	1			Fixed Flow			
				Perm Tank Level Lo	20	in		TSS			
				Air Extractor Frequency	5	min		Perm Flow			
				Air Extractor Duration	4	min					
Sodium Hypochlorite				Membrane Basin Drain Vlv							
CIP Permeate Flow	100	gpm		WAS Vlv Open TSS	6,000	mg/l					
Backwash Perm Flow	200	gpm		WAS Vlv Close Lvl	117	in					
Hypochlorite Flow	100	gph		WAS Valve Duration	0	sec					
Pre CIP Relax Duration	30	sec		Citric Acid							
Chem Flow Duration	10	min		CIP Permeate Flow	100	gpm					
Soak Duration	999	min		Backwash Perm Flow	200	gpm					
Rinse Duration	60	sec		Citric Flow	28	gph					
Final Relax Duration	60	sec		Pre CIP Relax Duration	30	sec					
				Chem Flow Duration	10	min					
				Soak Duration	999	min					
				Rinse Duration	60	sec					
				Final Relax Duration	60	sec					
Pre-Drain Disabled				Pre-Drain Disabled				Pre-Drain Disabled			

Run# Supp 02

Run Description Verify Ovivo's peak 4-hour and peak hour design conditions

Type	<input checked="" type="checkbox"/> process	<input type="checkbox"/> Performance
Influent water source	<input checked="" type="checkbox"/> PE	
	<input checked="" type="checkbox"/> Hydrant	
	<input checked="" type="checkbox"/> Both	

Wasting Rate	0
Air Scour	105 scfm
Backwash Frequency	15 min
Run Duration	12 Hrs
CIP	<input checked="" type="checkbox"/> Hypo <input checked="" type="checkbox"/> Caustic <input type="checkbox"/> Citric
Composite Sample Schedule	5 Samples, 1 hour apart, 900 mL each 4.5 L total volume

*Note: Upon restart, TMP should be less than 1.2 psi. If it is greater, do a longer (4 hour) CIP clean and then continue.

**Skip this last fecal sample if it does not fall at a time suitable for the lab.

Date

Event	Day	Time Hr	PE gpm	Hydrant gpm	Coag Dose Al:TSS ratio	Flux Rate gfd	Event/Action	Influent		Effluent		Membrane Tank		Comments	Field
								Grab / Probe	Note	Grab / Probe	Note	Grab / Probe	Note		
0	1	7:00	100	100	0.6		Start Flow to pilot								Eff
							Start producing effluent 3 stacks online (100 gfd to verify clean condition)								Turbidity
1		7:30				100	Change flux 1 stack online								Probe reading
2		8:00				200									pH
3		8:10					Start Composite Samplers	UV T = 50.8							Temperature
4		8:30					Influent Sample	KCEL: TOC	UVA = 0.293						Conductivity
5		8:35					Effluent Sample		WPP: Fecal						WPP samples
6		10:00					Influent Sample	Field: Full Set WPP: Full Set KCEL: TOC	75225-2						Influent composite
7		10:05					Tank Sample								Effluent composite
8		10:10					Effluent Sample			Field: Full Set WPP: Full Set	UV T = 58.3 UVA = 0.061 UV I = 86.7				TSS/VSS, Alk, BOD
9		11:45					Influent Sample	KCEL: TOC	UVA = 0.234						Influent grab
10		11:50					Effluent Sample		WPP: Fecal						TSS/VSS
11		12:00					Stop producing effluent Stop Composite samplers Perform 30 min CIP								Fecal
12		13:00				100	Start producing effluent 3 stacks online (100 gfd to verify clean condition)*								Effluent grab
13		13:30				225	Change flux 1 stack online								TSS/VSS
14		13:50					Influent Sample	KCEL: TOC							Chlorine demand
15		13:55					Effluent Sample**		WPP: Fecal						Fecal
16		14:00					Take final composite sample								Settleable solids
17		14:30					Stop producing effluent								Tank grab
															TSS/VSS
															KCEL
															Influent grab
															TOC
															Effluent composite
															TOC

King County Ovivo Pilot

Run # **Supplemental 2**
 Date **11/3/2020**

membrane
 surface area per stack = **975 sf**

Influent flow = PE + hyd (gpm)	Test Variables			Calculated		Test Plan	
	permeate flow setpt (gpm)	stacks in service (#)	surface area in service (sf)	instantaneous flux (GFD)	Flux Goal (GFD)	Start Time	Stop Time
100 + 100	204	3	2,925	100	100	7:15	8:00
	136	1	975	201	200	8:00	12:00
	0	3	2,925	0	0	12:00	13:00
	204	3	2,925	100	100	13:00	13:30
	153	1	975	226	225	13:30	14:30

CIP

Notes:

Switch "stacks online" setting under Ovivo tab on HMI.

Follow High TMP S/D with 30-min CIP

Stack 3 in operation during "single stack in service" periods

30-min CIP after 200 GFD period will be for single stack (5 minute chemical feed duration)

Daily Field Notes

Run

Cond

Supplemental #2

Process and Performance Testing

11/3/2020

P11

Date	Time	Observation	Action Item
11/3	0656 hrs	Changed factor on influent TSS probe (0.98 - 0.70) based on sampling conducted last Thurs.	
	0700	PE and hydrant flow to pilot	
	0715	Cycled power to cellular modem - No connectivity	
	0720	Washed out influent sampler socket	
	0805	Flux change (0) → 200 g/d (stacks 1 & 2 offline)	
	0811	Cycled power to eNOM(s) - No connectivity	
	1208 hrs	primed hypo pump (prep for short CIP)	
	1212 hrs	Initiated CIP (hypo/constr) with 30 minute soak single membrane stack online	
	1215 hrs	Halted Samplers and closed effluent sampler and permeate values.	
	1307 hrs	Restarted pilot with following mod(s)	
		(a) 3 stacks online 100 g/d	
		(b) drained permeate tank	
		(c) sample valves on effluent remained closed until filtration started	

Daily Field Notes

Run
Cond

Id Notes Supplemental #2

Process and Performance Testing

P2/
2

King County Ovivo Pilot

Run # Supplemental 2
Date 11/3/2020

membrane
surface area per stack = 975 sf

Influent flow = PE + hyd (gpm)	Test Variables		surface area in service (sf)	instantaneous flux (GFD)	Flux Goal (GFD)	Test Plan	
	permeate flow setpt (gpm)	stacks in service (#)				Start Time	Stop Time
100 + 100	204 ✓	3	2,925	100	100	7:15	8:00
	136 ✓	1 *	975	201	200	8:00	12:00
	0 ✓	3	2,925	0	0	12:00	13:00
	204	3	2,925	100	100	13:00	13:30
	153	1 *	975	226	225	13:30	14:30

Notes:

Switch "stacks online" setting under Ovivo tab on HMI.

Follow High TMP S/D with 30-min CIP

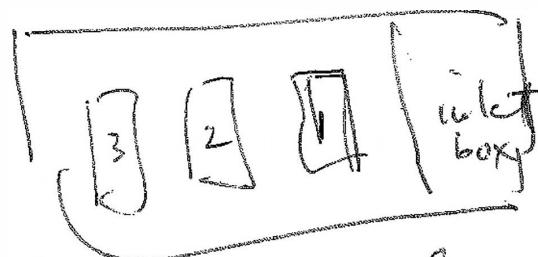
Stack 3 in operation during "single stack in service" periods

30-min CIP after 200 GFD period will be for single stack (5 minute chemical feed duration)

CIP

restated pilot - post CIP

* stacks 1 & 2 offline



Stack config

OVIVO Pilot Setpoints Values to be set according to OVIVO's recommendations.
 Run# Supp 02 Date 11/3/2020

FLOW OPTIMIZATION						CHEM DOSING		
System	ONLINE/OFFLINE	Permeate	End of Event	Coagulant				
		Permeate Flow	.206 gpm	Pump Start Inf Flow	1 gpm			
Inlet System		Pump Start Level	.116 in	Pump Start Level	.01 in			
		Pump Stop Level	.5 in	Overflow Level	.118 in			
		Pump Stop Low Level	.100 in					
		Single Pump Flow	.220 gpm					
		Backwash Frequency	.15 min					
		Backwash Flow	.300 %					
Blowers		Pre BW Relaxation	.30 sec					
		Backwash Duration	.60 sec					
		Post BW Relax Duration	.30 sec					
		Perm Static Pressure	.1.7 psi					
		Turbidity Hi Alarm SP	.10 NTU	Hypo + Caustic CIP				
		Lag Blower Start Level	.65 %					
		Lag Blower Start Delay	.120 sec					
		Blower Fail Air Flow	.4.5 scfm					
		Blower Fail Delay	.140 sec					
		Low Air Flow Alarm	.55 %					
		Low Air Flow Delay	.45 sec					
	Override Enabled	TMP Reset						
Sodium Hypochlorite		Perm Tank Level Lo	.20 in	End of Event Drain Lvl	.5 in			
		Air Extractor Frequency	.5 min	End of Event Dly	.20 sec			
		Air Extractor Duration	.4 min					
				Membrane Basin Drain Vlv				
				WAS Vlv Open TSS	6,000 mg/l			
				WAS Vlv Close Lvl	.117 in			
				WAS Valve Duration	0 sec			
Citric Acid		Citric Acid		Caustic				
		CIP Permeate Flow	.100 gpm	CIP Permeate Flow	.100 gpm			
		Backwash Perm Flow	.200 gpm	Backwash Perm Flow	.100 gpm			
		Hypochlorite Flow	.100 gph	Caustic Flow	.50 gph			
		Pre CIP Relax Duration	.30 sec	Pre CIP Relax Duration	.30 sec			
		Chem Flow Duration	.10 min	Chem Flow Duration	.10 min			
		Soak Duration	.999 min	Soak Duration	.999 min			
		Rinse Duration	.60 sec	Rinse Duration	.60 sec			
		Final Relax Duration	.60 sec	Final Relax Duration	.60 sec			
		Pre-Drain Disabled		Pre-Drain Disabled		Pre-Drain Disabled		

(5 min) chem flow duration with only 1 stack online

11/3/2020 06:00 hrs
 John Borchardt

Run: Supplemental #2

SOP OVIVO PILOT

Date: 11/3/2020

STARTING PROCEDURE

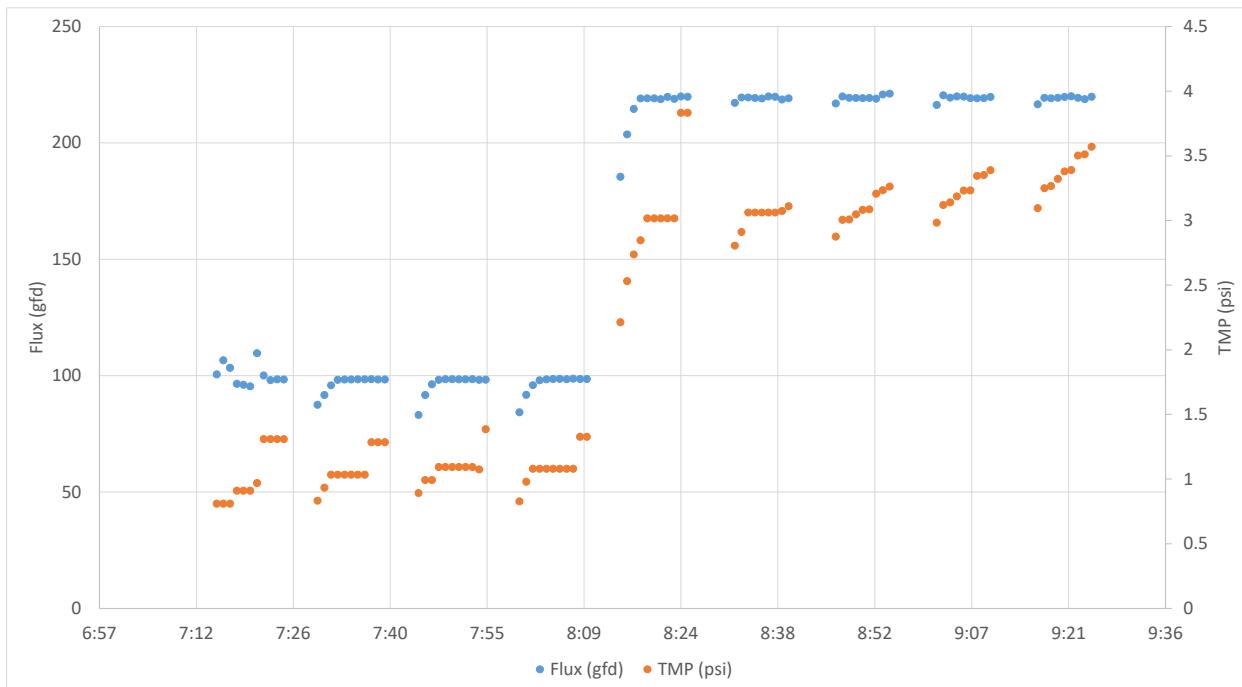
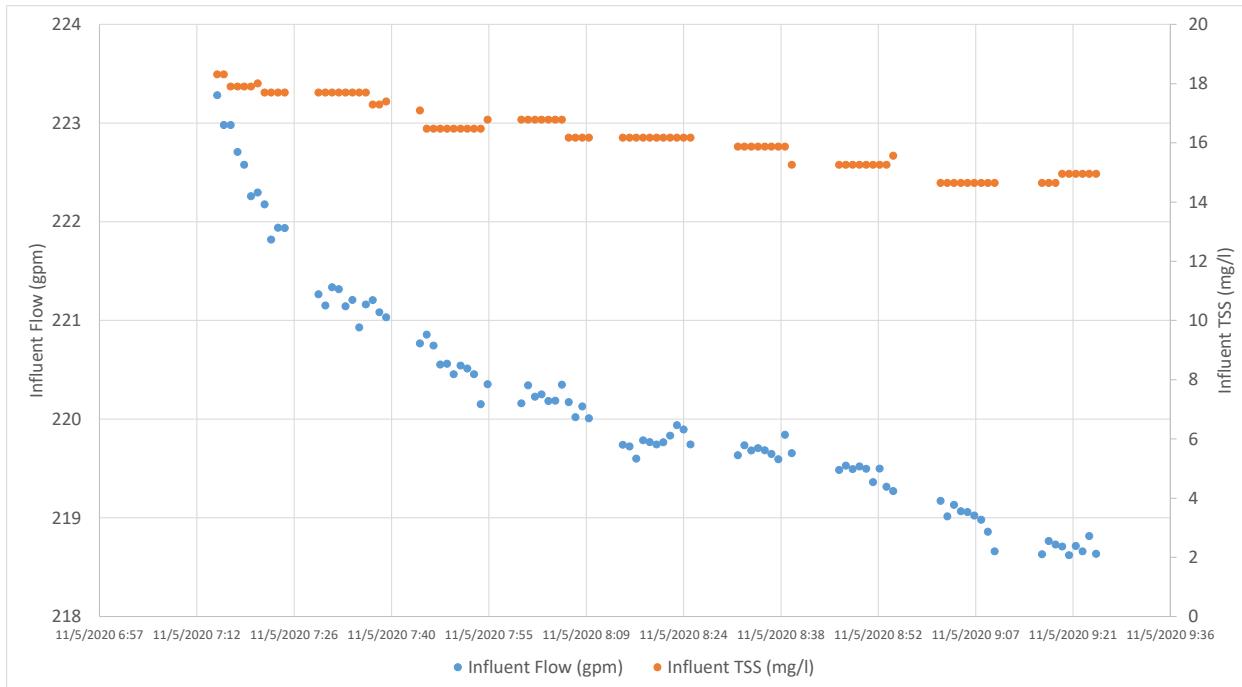
1. Inform WTP Main Control and inquire if there is any issue that would preventing the operation.
2. Contact shift crew to arrange for after hour sampling.
3. Obtain operating parameters and sampling schedule from the test package.
4. If dilution water is required:
 - a. Contact Facility Service to charge the water hydrant.
 - b. Hydrant needs to be secured by 18:00 hrs.
5. Log in. User name= h, password = h.
6. Drain the pilot.
 - a. Drain membrane tank by opening the drain valve from control screen.
 - b. Drain permeate tank by opening the drain valve manually.
7. Check chemical tanks.
 - a. Caustic - transfer of metering pump suction.
 - b. Sodium Hypochlorite – transfer of metering pump suction. (16 gal per run)
 - c. Alum – transfer of totes.
 - d. Contact Facility Services for support moving chemicals.
8. Prime coagulant pump- only if switch to a new tank.
 - Press "Prim 60 sec"
9. Adjust caustic addition valve to RUN position.
10. Go to MAIN SCREEN and verify that all pumps, except for alkalinity, are in AUTO
11. Set operating parameters in the following screen.
 - a. Select FLOW OPTIMIZATION screen
 - b. Verify that system is offline
 - c. Set parameters according to the test plan.
12. Select chemical dosing strategy and set the parameters.
13. Select ALARM. There are certain erroneous alarms that needs to be acknowledged to reset.
14. Select FLOW OPTIMIZATION screen and put the system ONLINE.
15. Turn on PE at the panel by the primary bldg.
 - a. Turn the switch to HAND
 - b. Press START
 - c. Open the PE hand valve completely.
16. Monitor and confirm the increasing tank level.
 - a. Weir gate XVCS-101 is open, once the tank level is 0.1 in., this weir gate will close and the coagulant pump will start.
17. Once coagulant pump start, start caustic pump manually.
 - a. Select PMP-AK 101 (alkalinity addition pump)
 - b. Adjust the pump speed to the target flowrate. 4% = 1.9 gph.
 - c. Verify the flowrate on the pump local display.
18. Monitor and confirm:
 - a. Air blower starts once the tank is at 20 in.
 - b. Permeate pump starts at 116 in.

- c. Confirm that there are sufficient flow through sampling buckets.
19. Open the valve to effluent turbidimeter.
20. Setup auto sampler on influent and effluent.
 - Open valves to get flow through sampling buckets.
21. Allow the system to run for at least 1 full cycle to prior to data & sample collection. Refer to run guidance document on sampling starting time.
22. Start sample collection

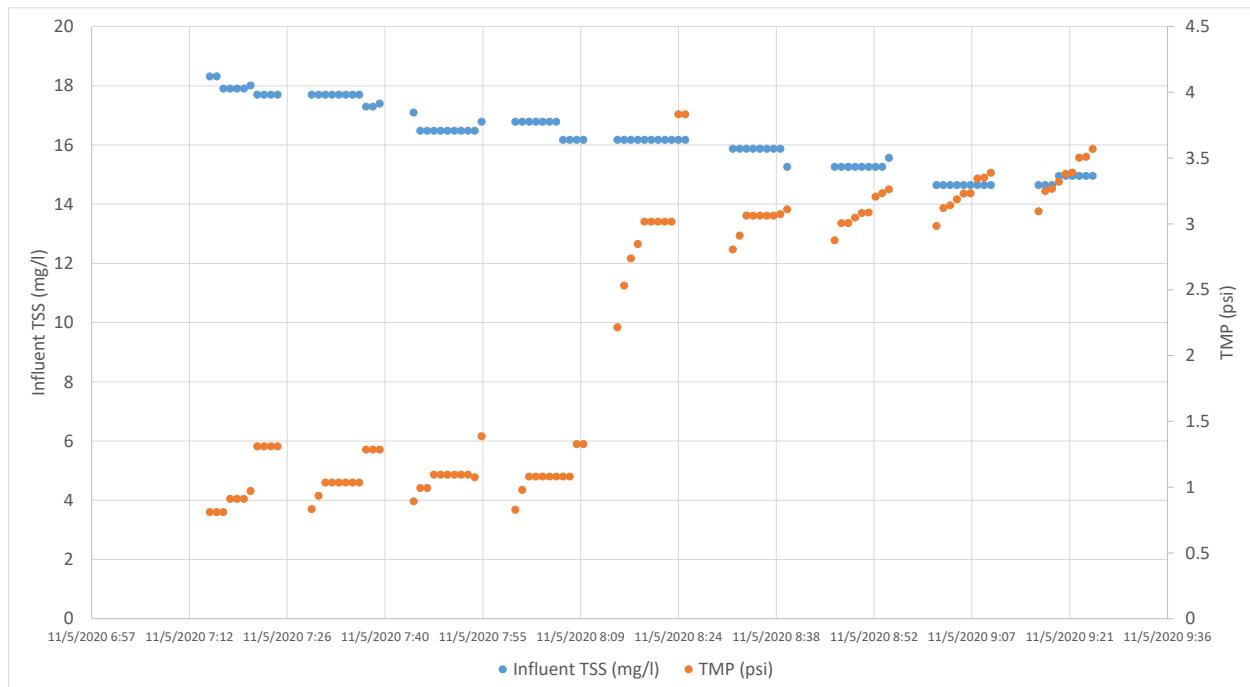
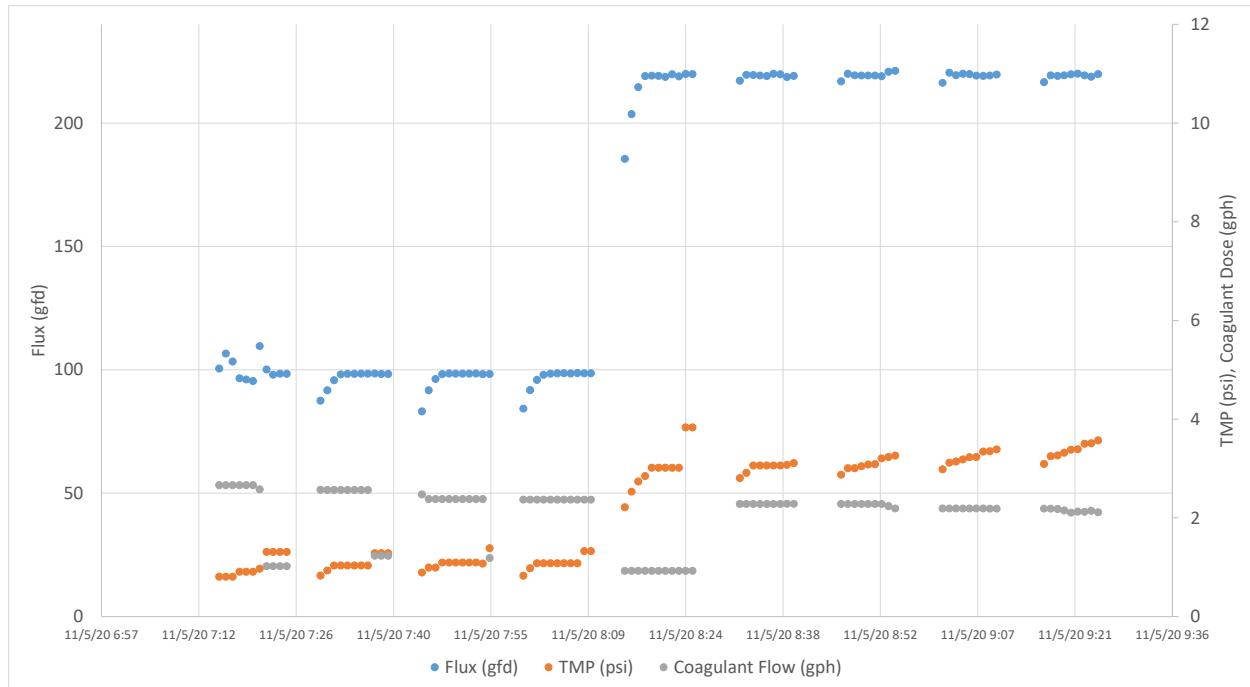
SHUTDOWN & CIP PROCEDURE

1. Check the hypo and caustic levels. Each cleaning cycle require 12 gal.
2. Close sampling valves, turbidimeter valves.
3. Switch alkalinity pump from manual to auto.
4. Prime hypochlorite pump.
5. Switch caustic addition valve position from RUN to CIP position.
6. Go to CIP screen to check the CIP parameters. If CIP is initiated from this screen, the system will go back into filtration once the CIP is completed (as long as the feed pump is on).
7. Wait for pump priming to finish.
8. Got to Flow Optimization screen and select "End of cycle".
 - If the pilot stopped/standby due to high TMP, press TMP reset, and the CIP will start.
9. Verify that the hypochlorite pump & caustic pumps are on.
10. Turn the feed off at the PE panel
 - a. Press STOP
 - b. Turn the switch to OFF
 - c. Close the manual valve
11. Spray down the membrane tank to remove foam and scum.
12. Log out.

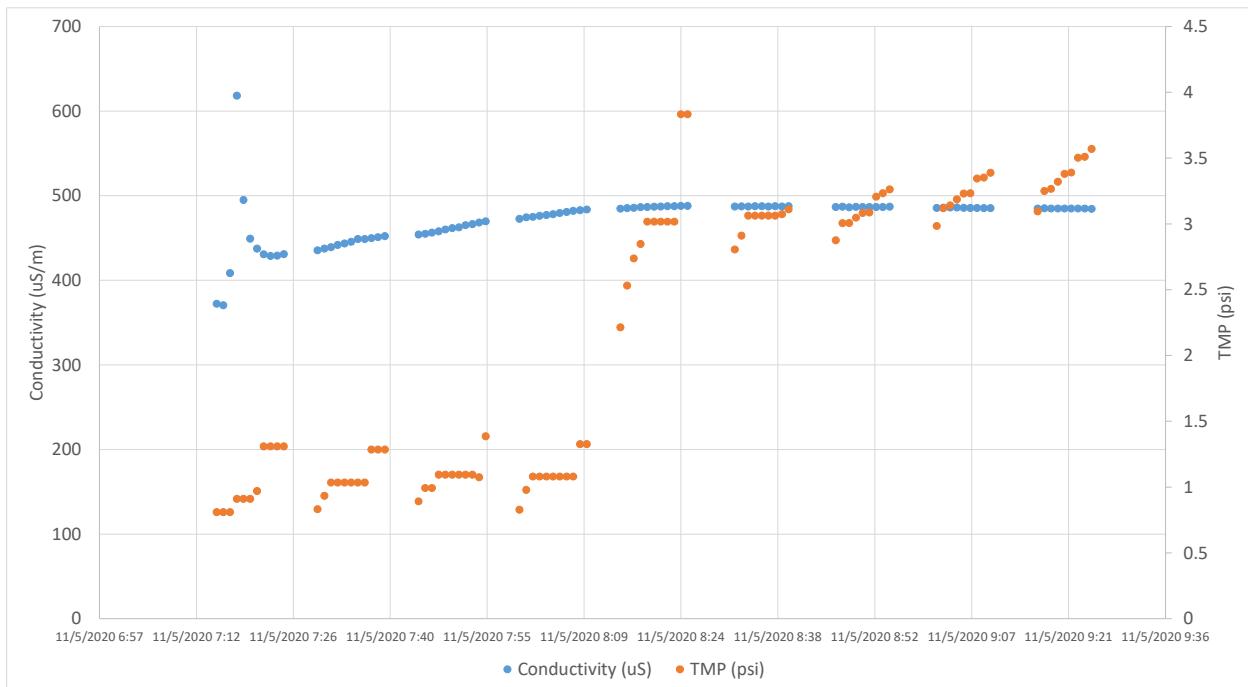
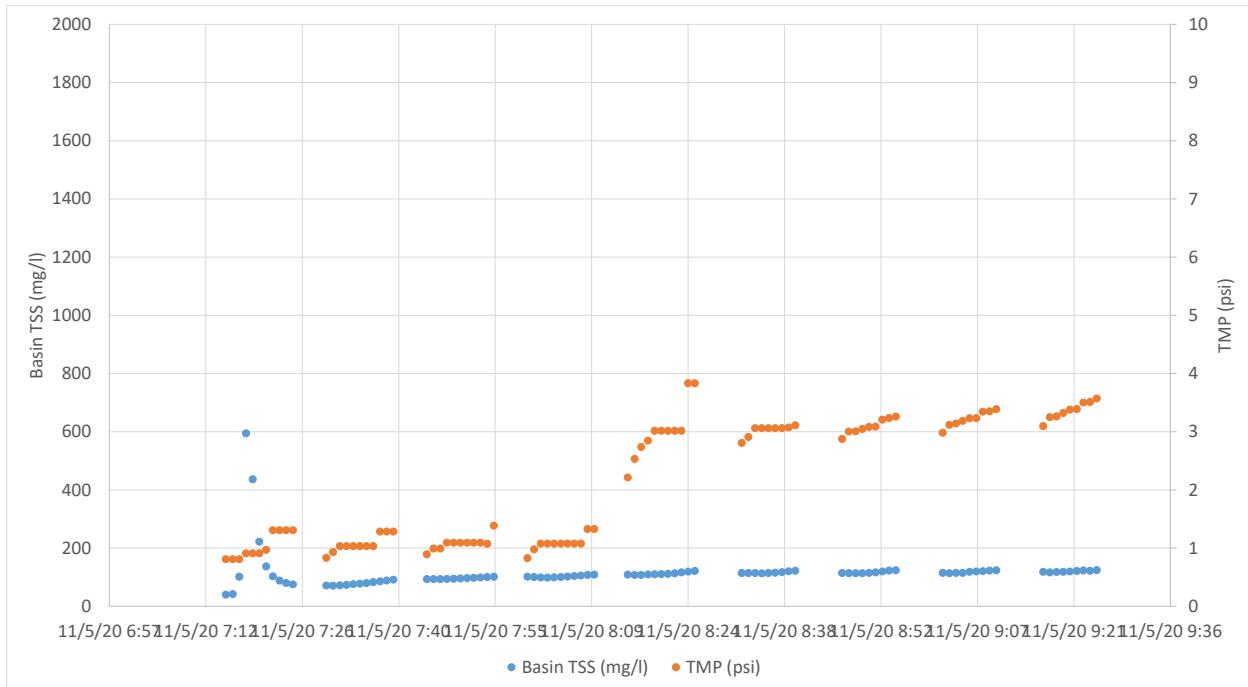
225 gfd for 1 Hour



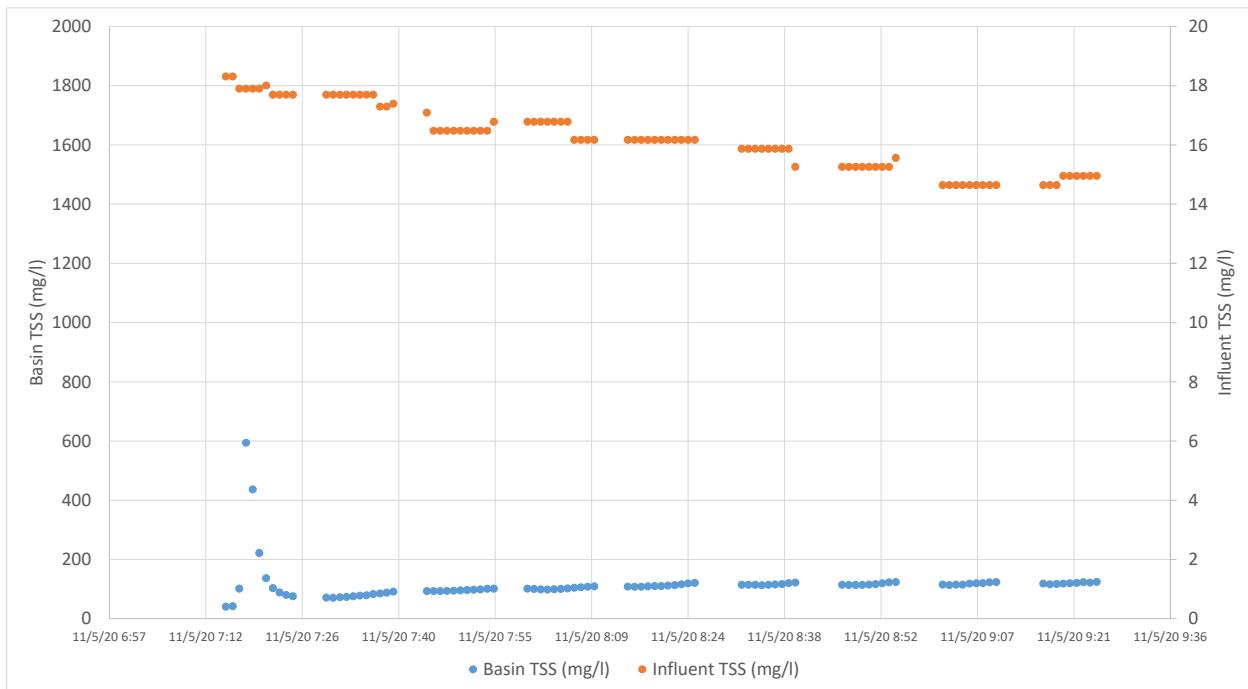
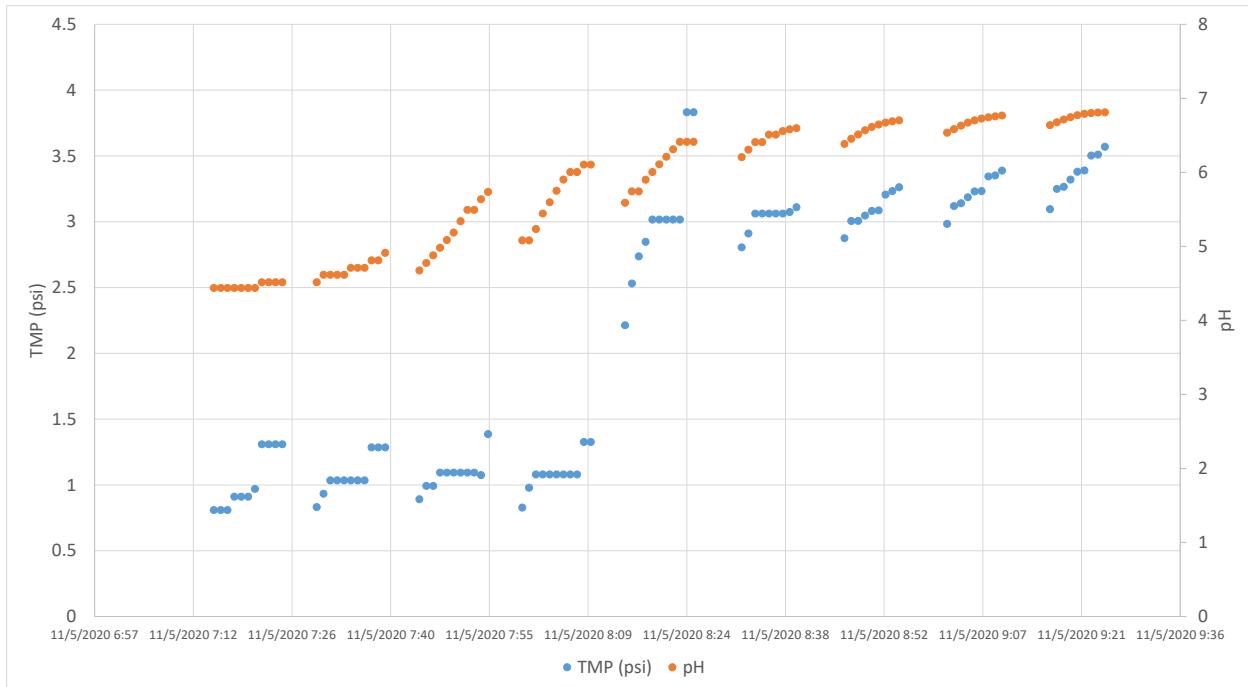
225 gfd for 1 Hour



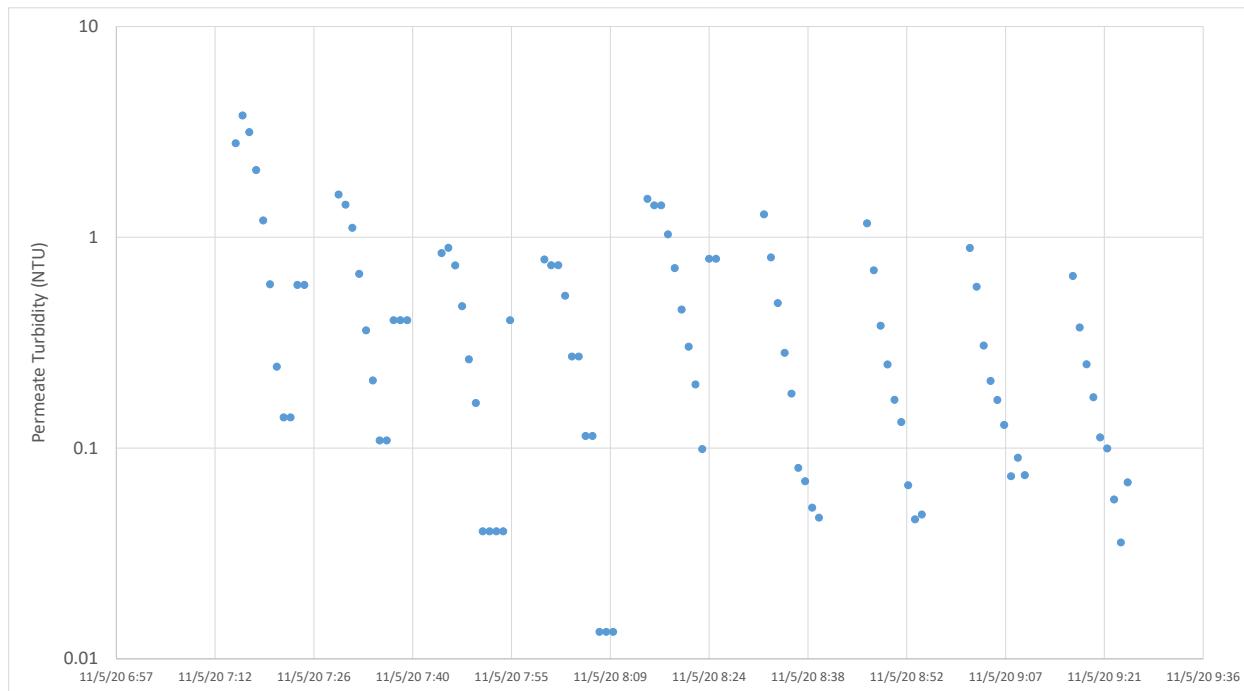
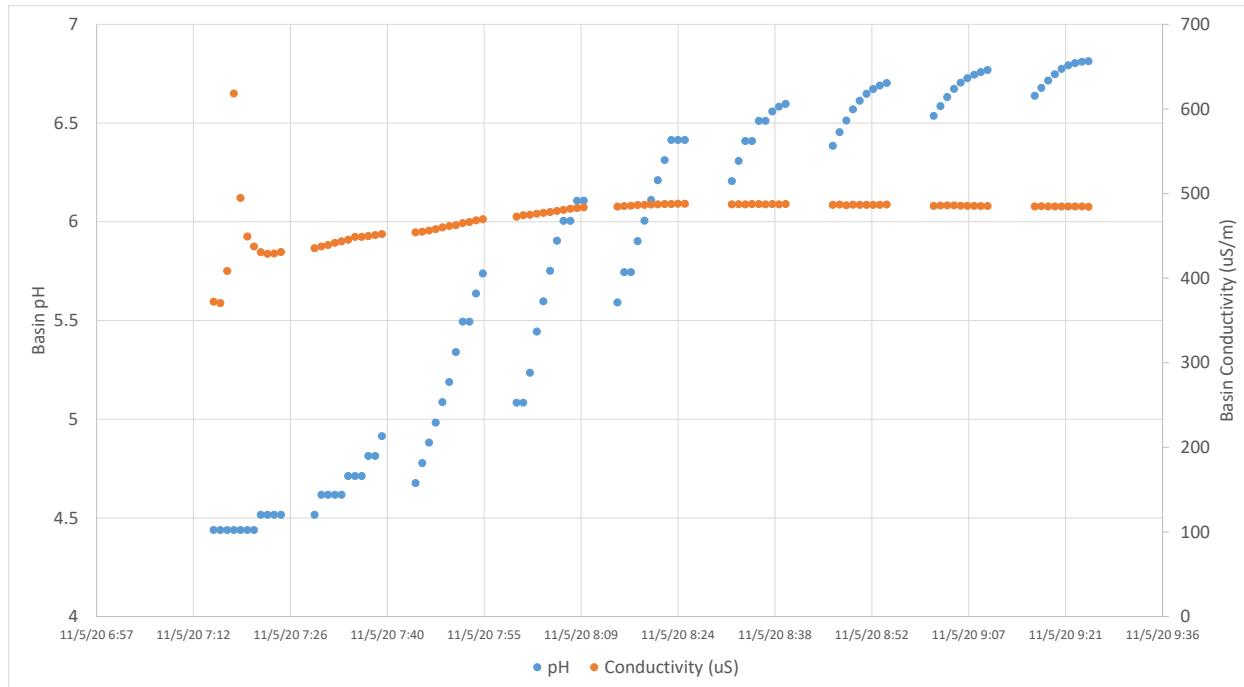
225 gfd for 1 Hour



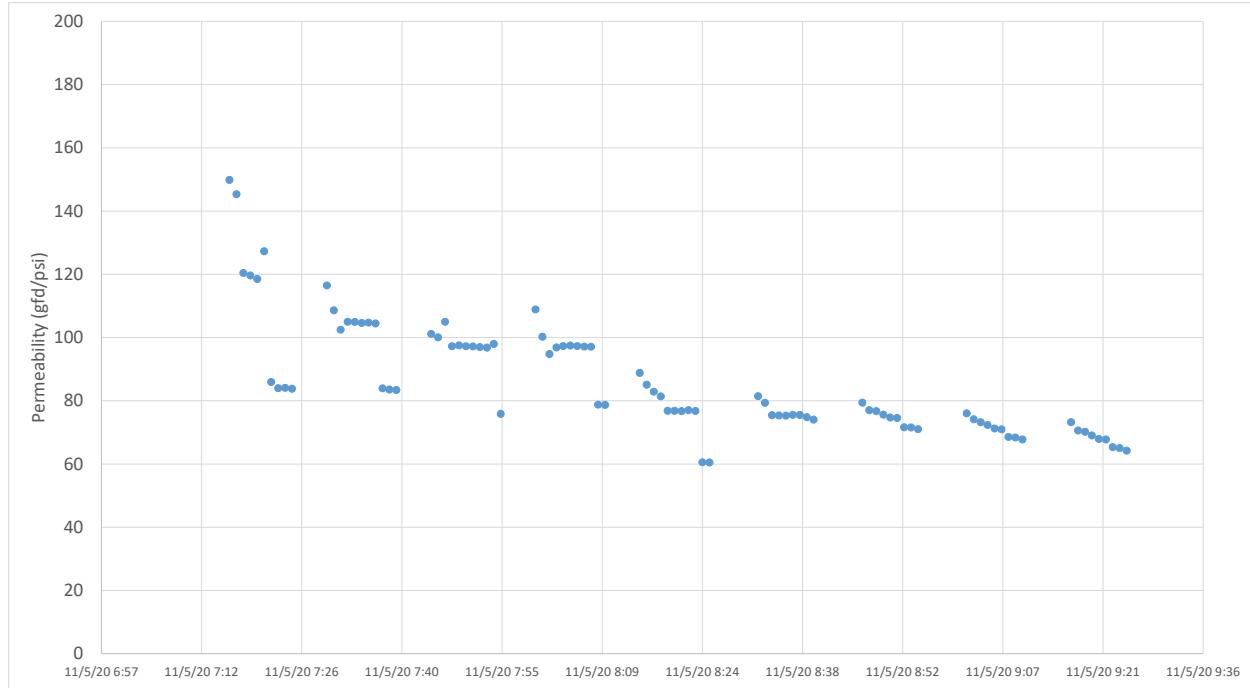
225 gfd for 1 Hour

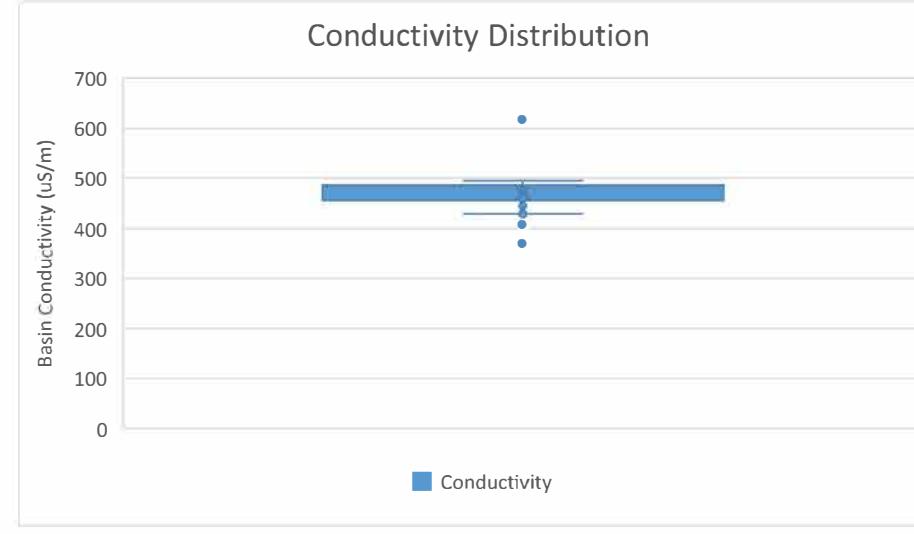
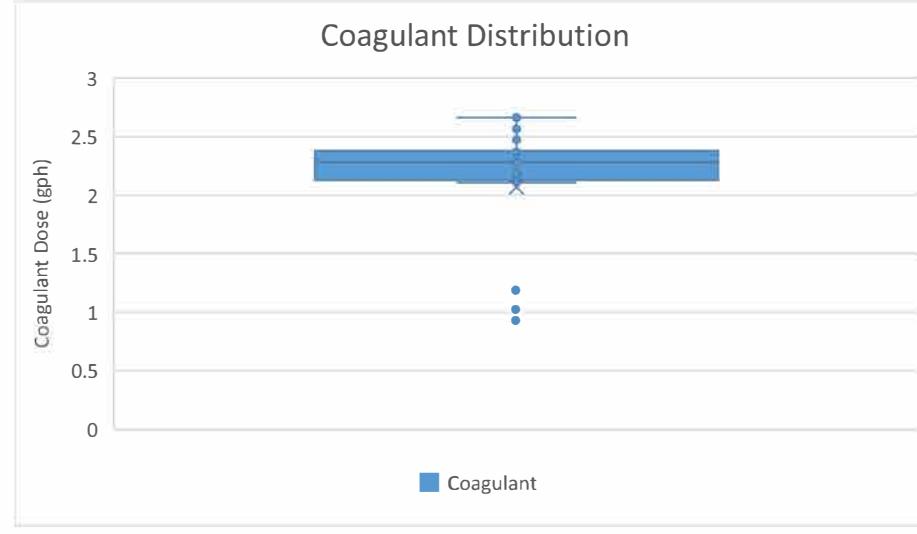
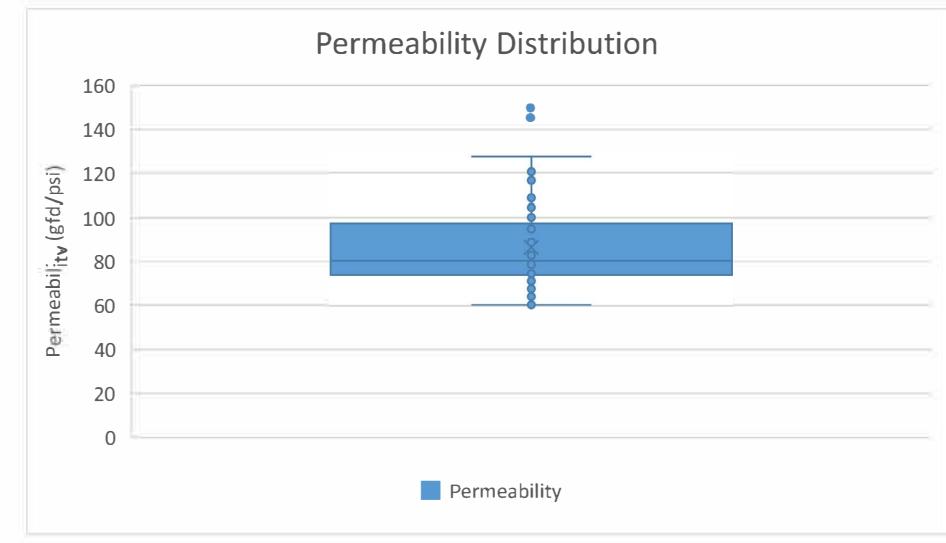
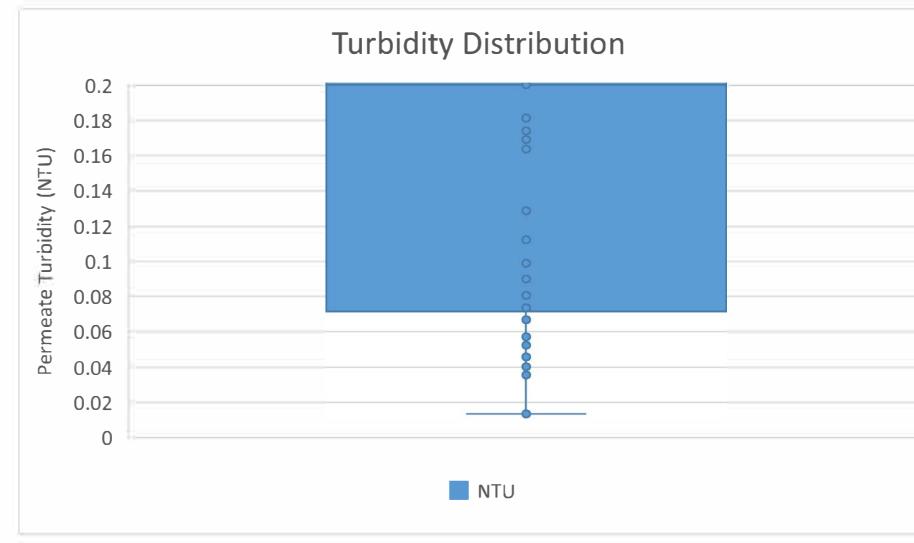
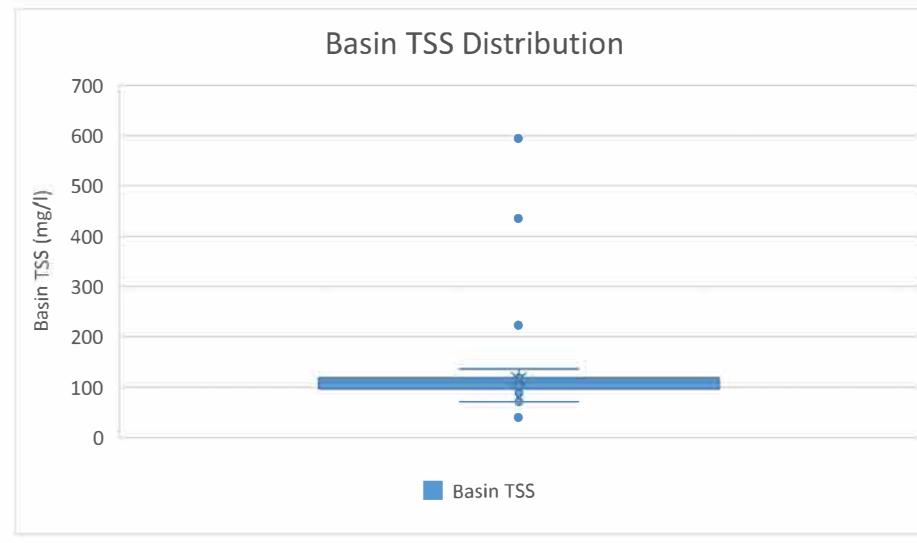
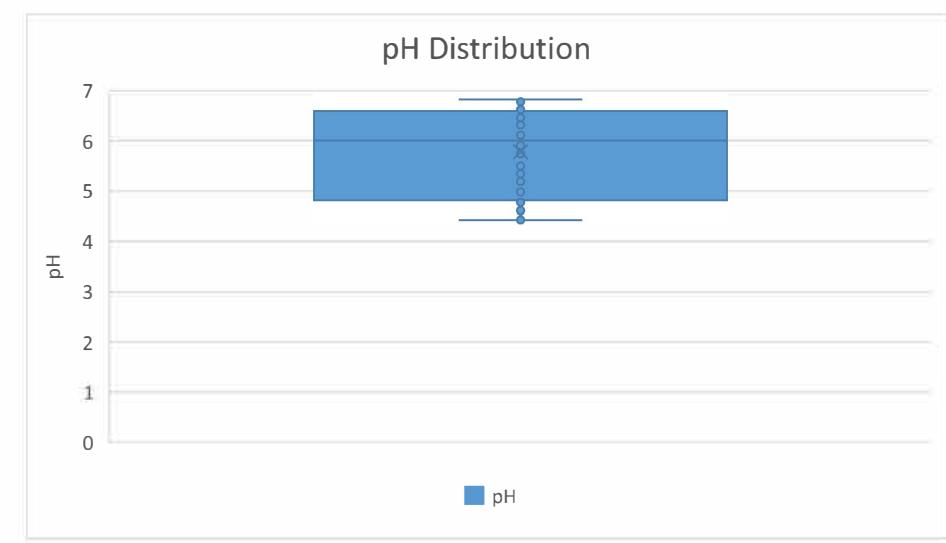
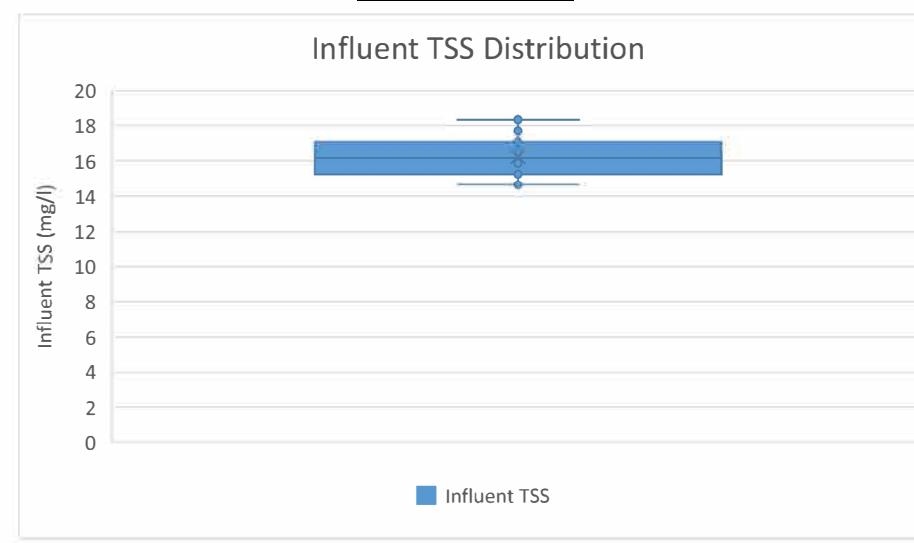
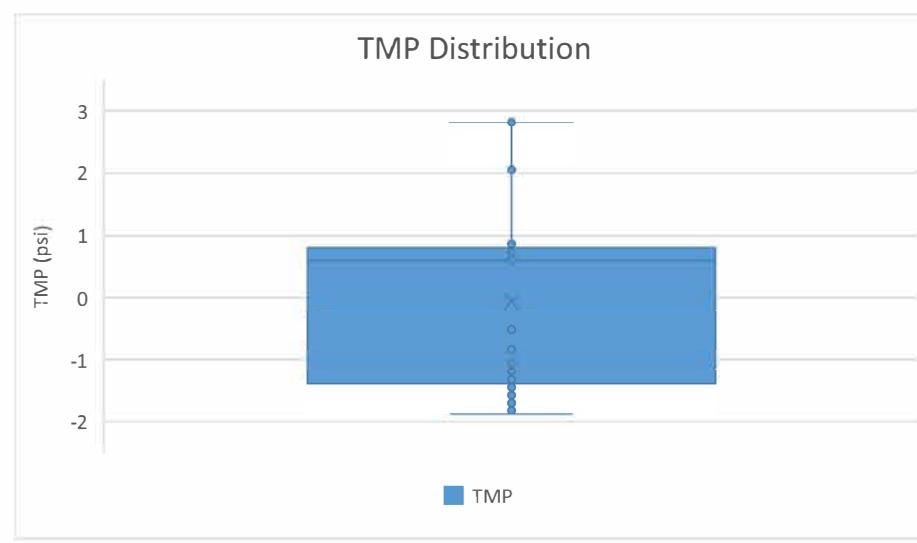


225 gfd for 1 Hour

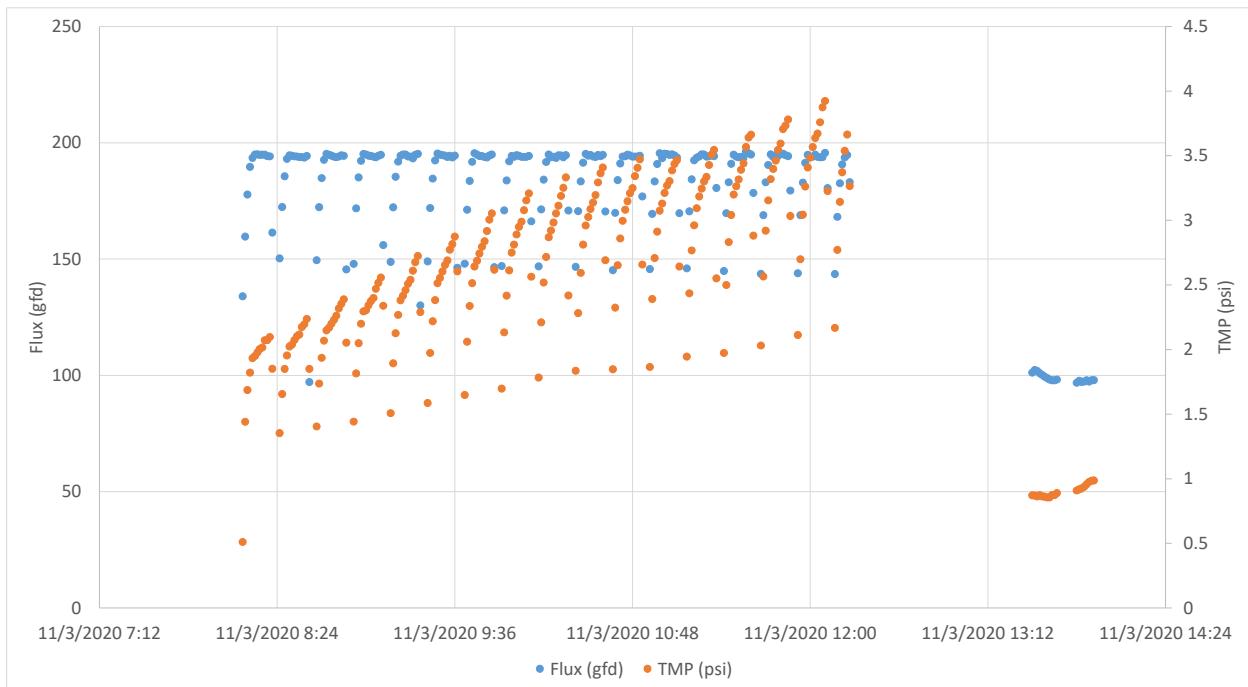
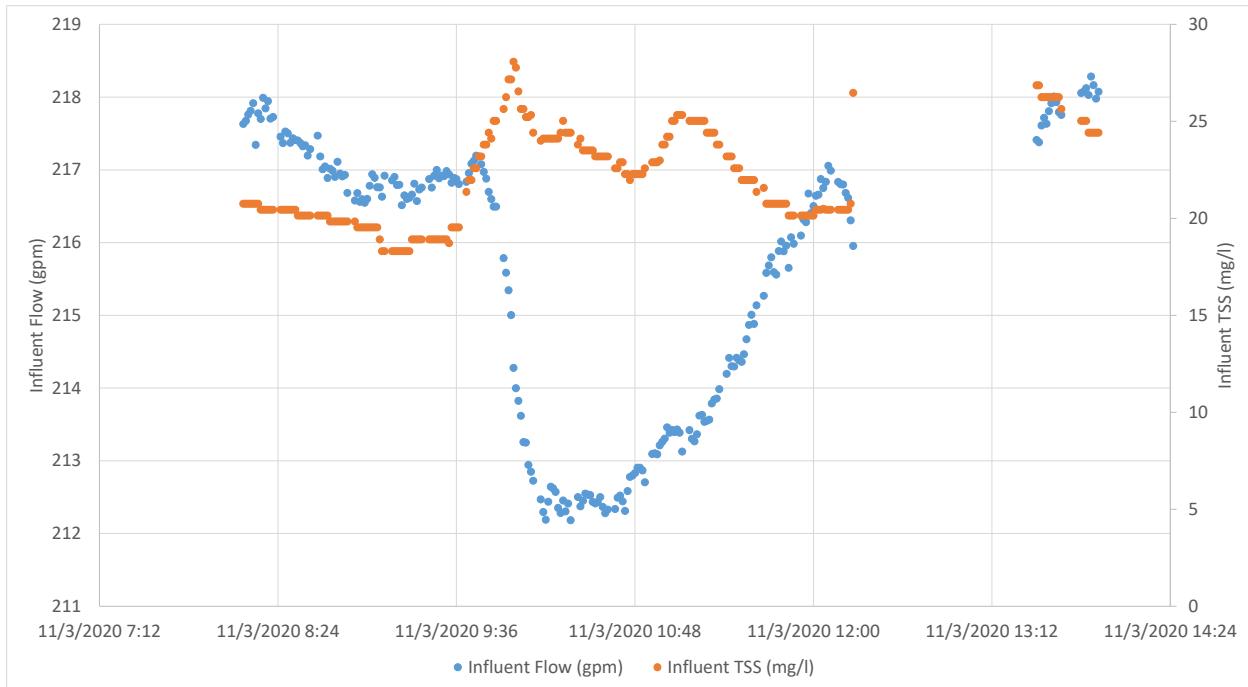


225 gfd for 1 Hour

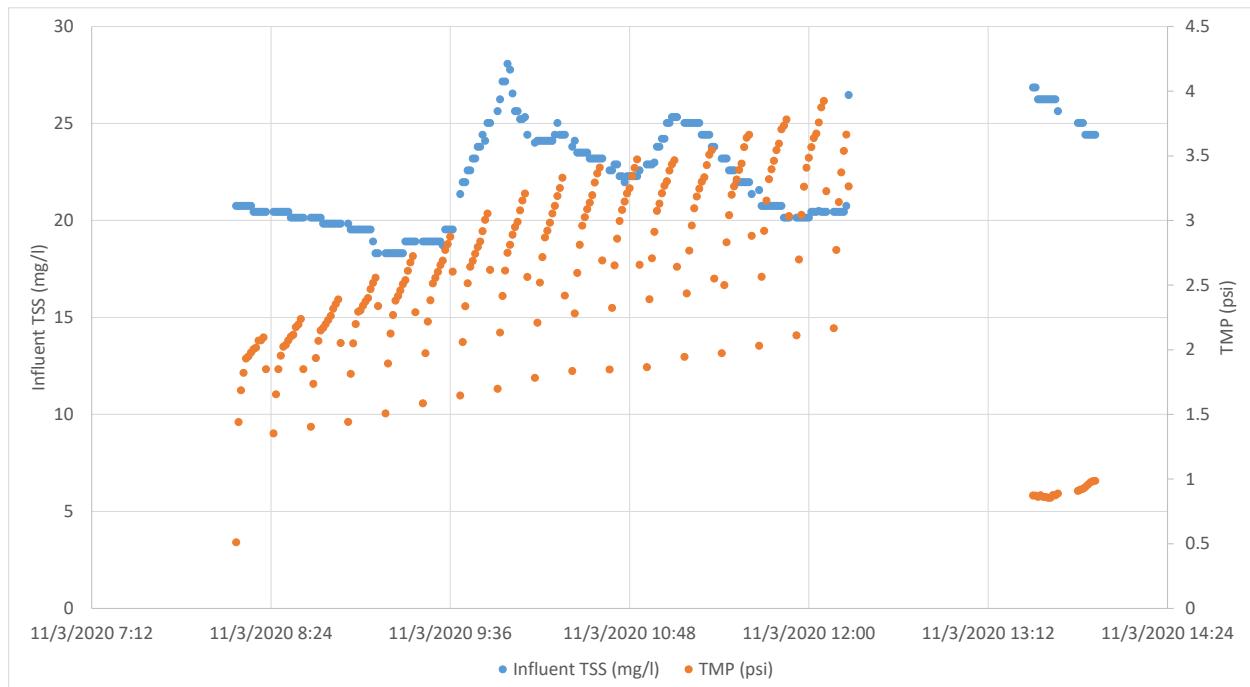
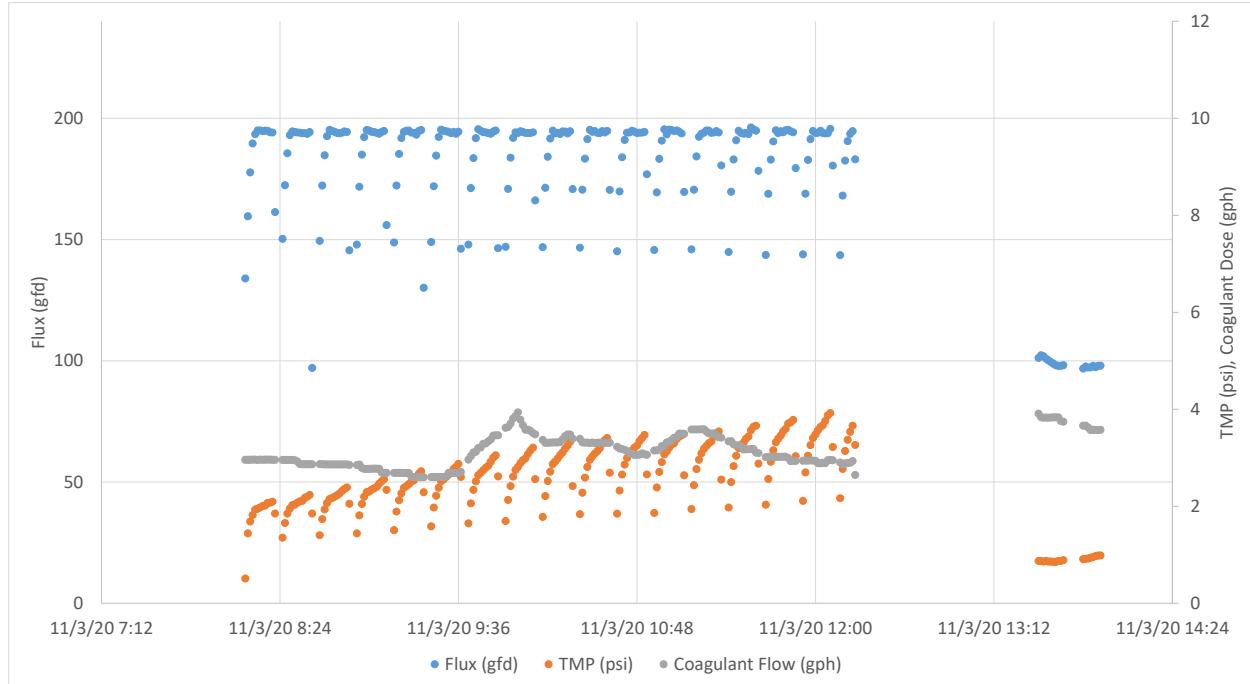




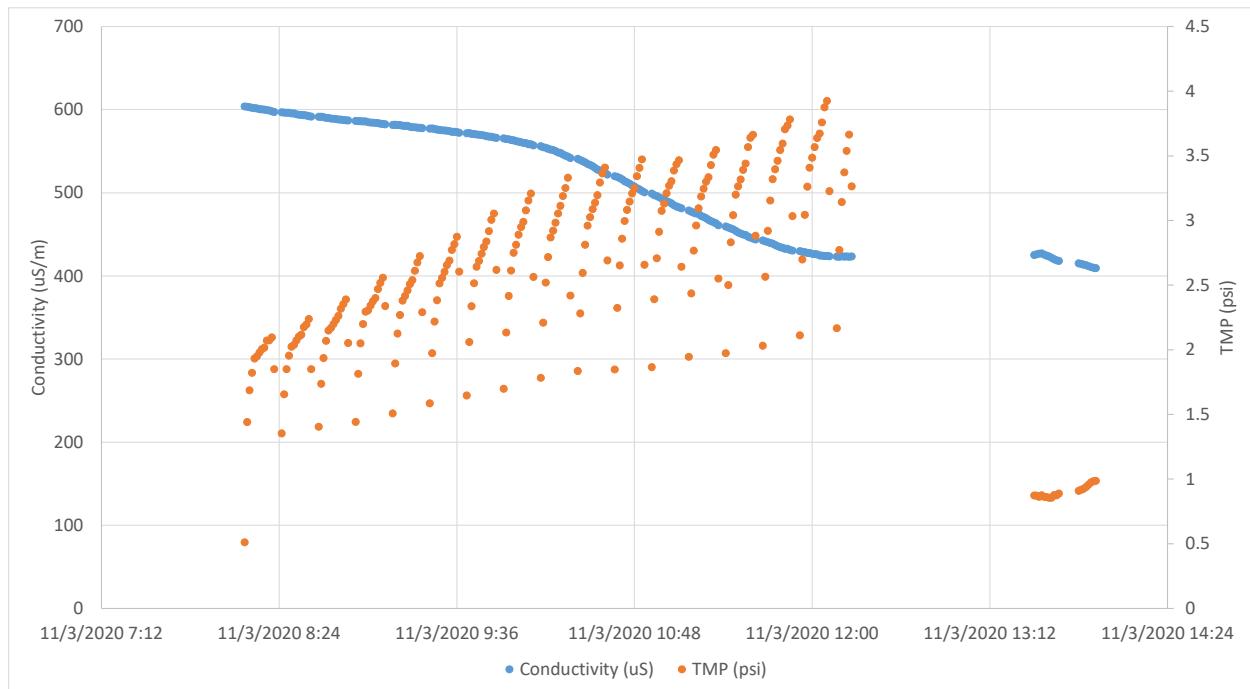
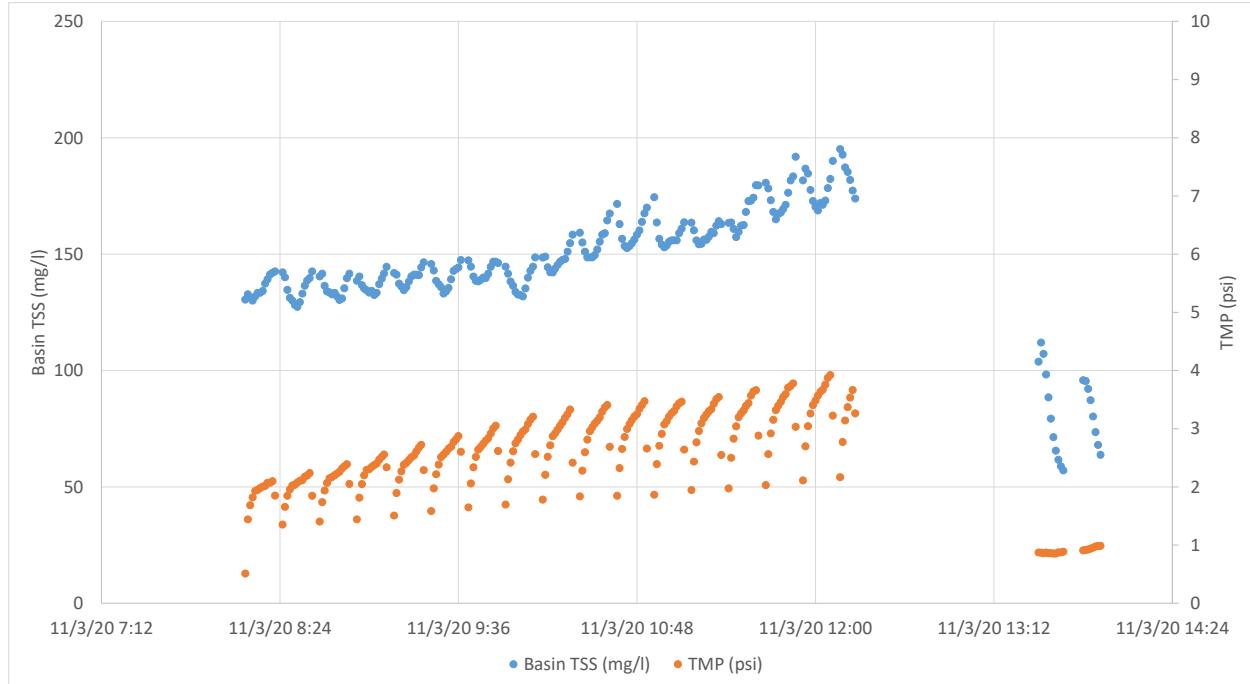
220 gfd for 4 Hours



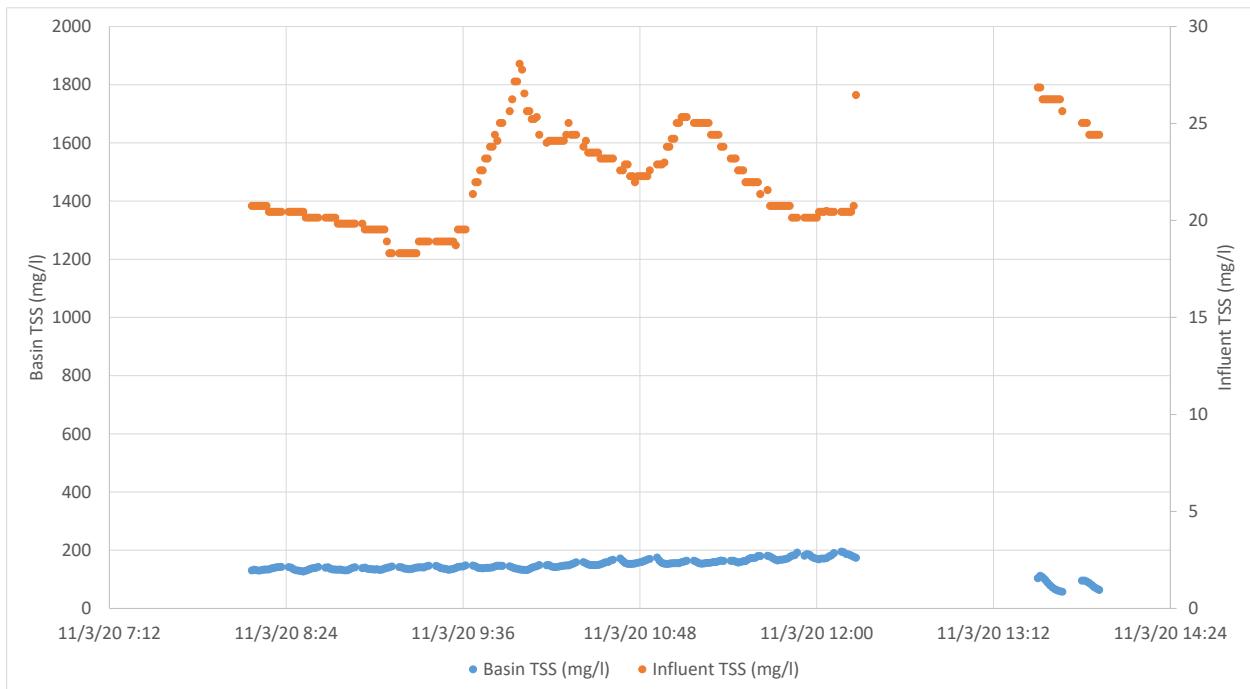
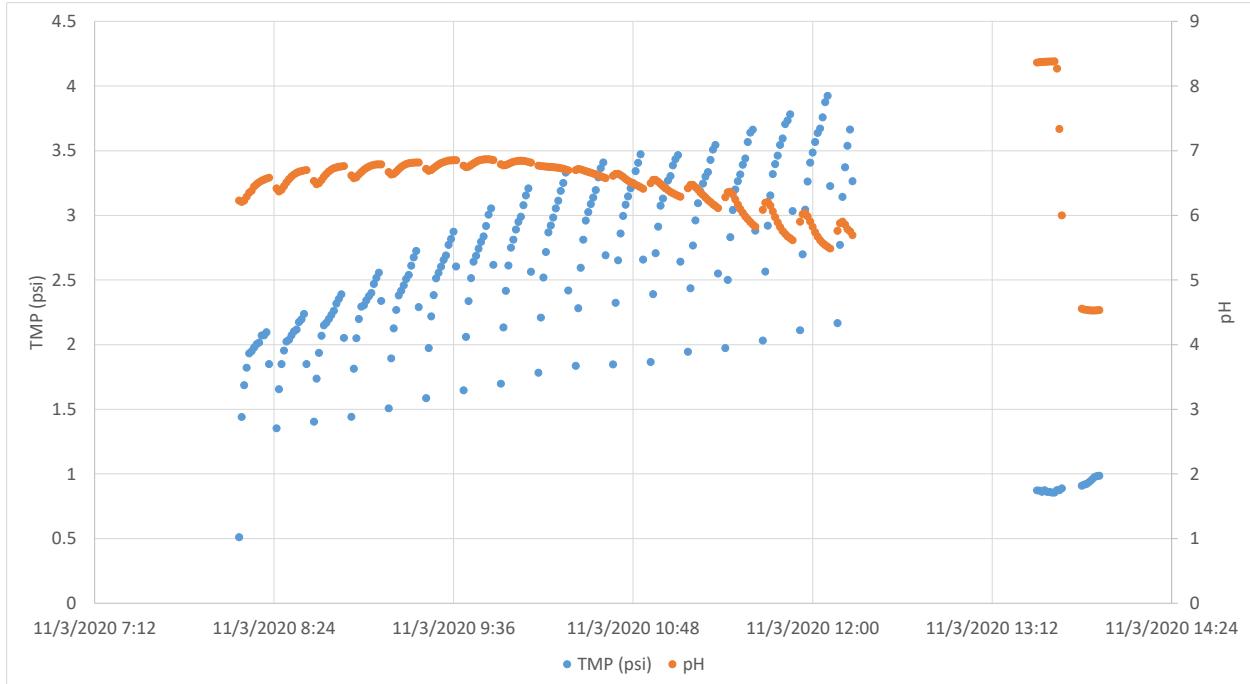
220 gfd for 4 Hours



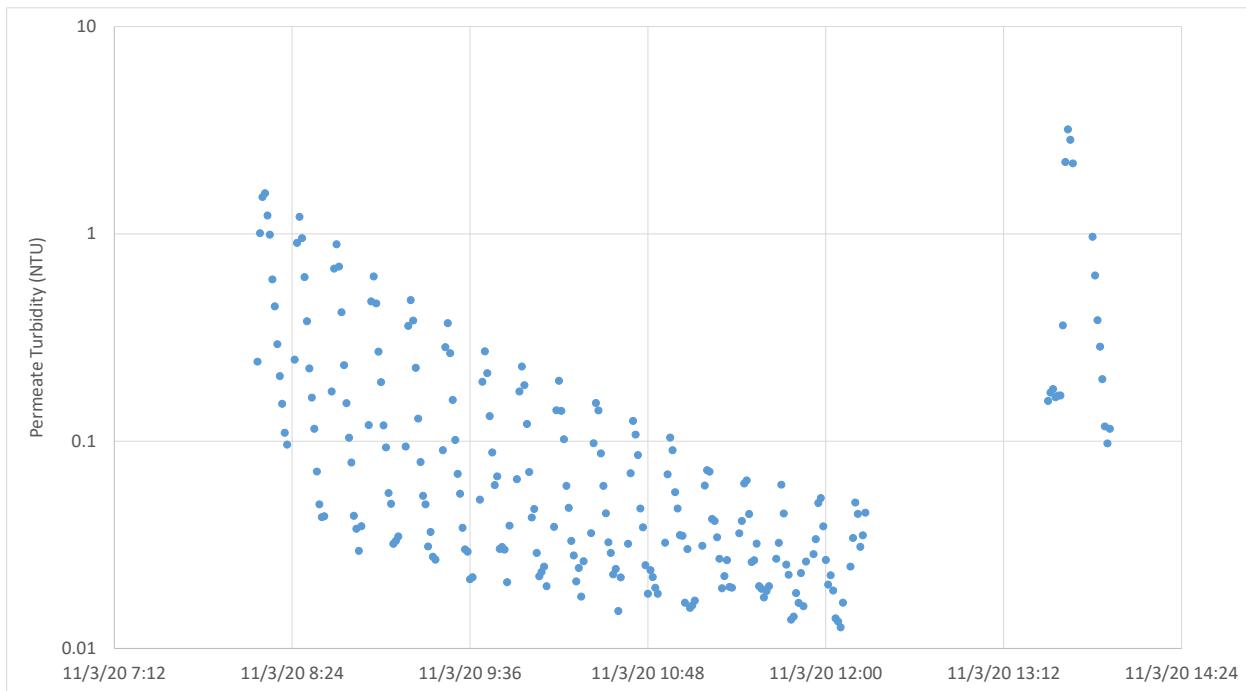
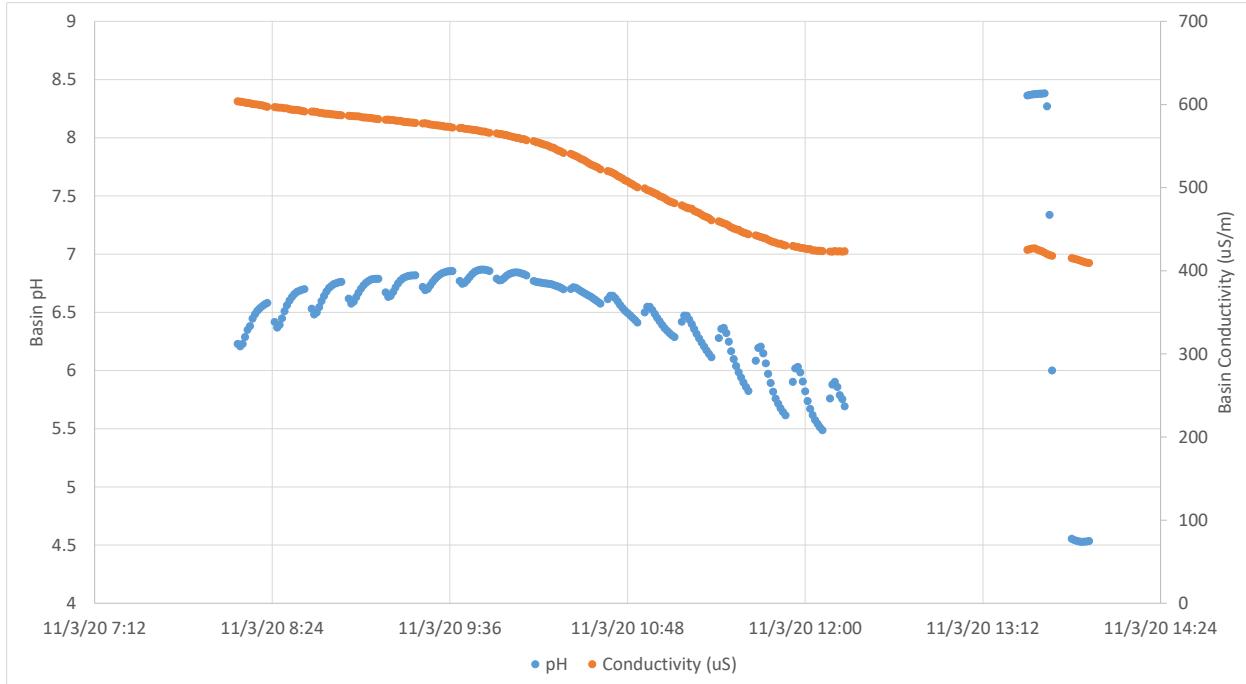
220 gfd for 4 Hours



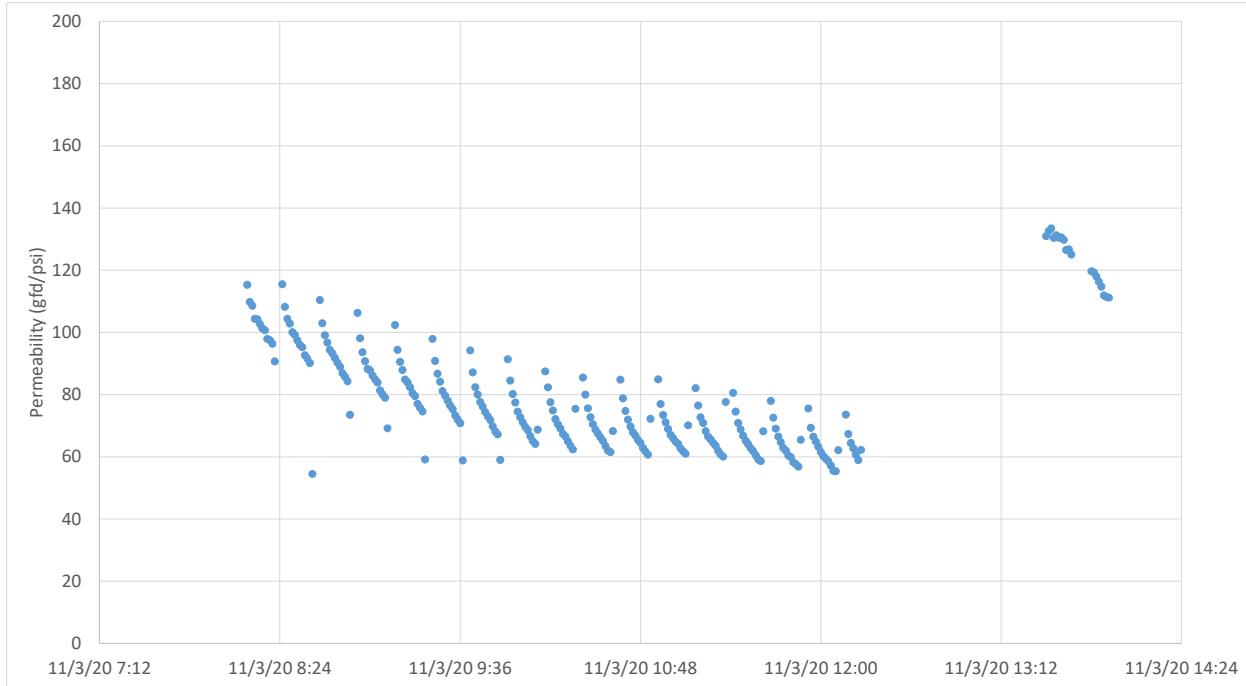
220 gfd for 4 Hours



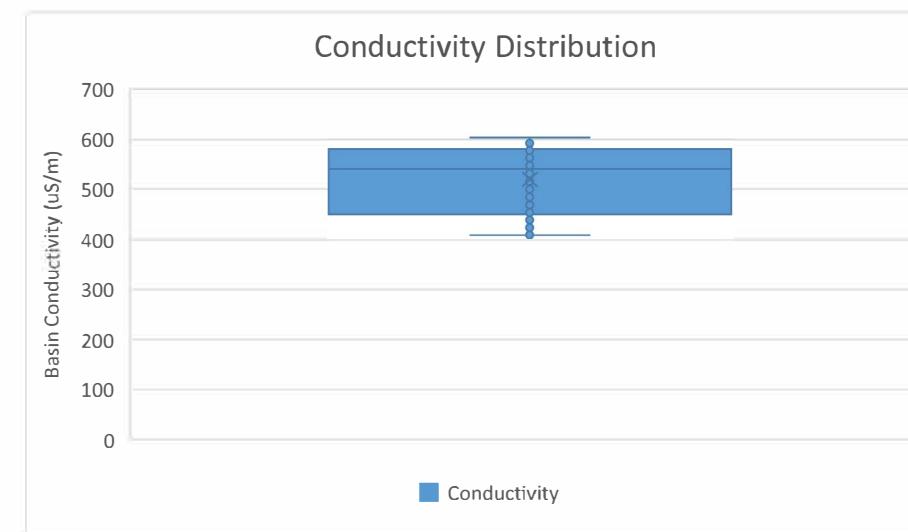
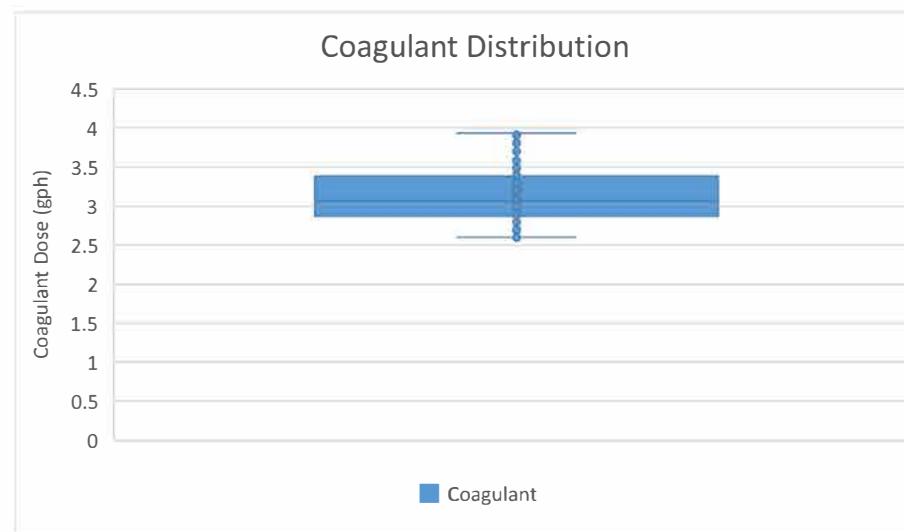
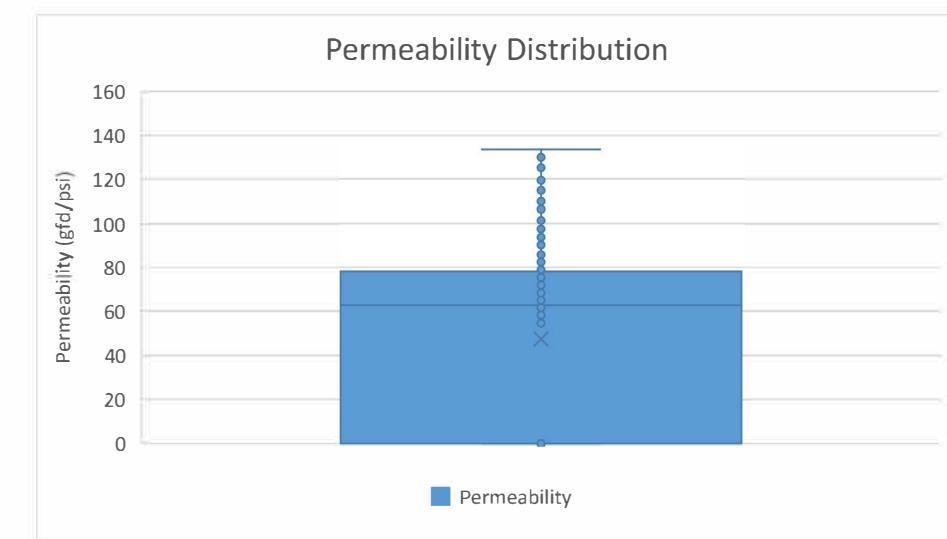
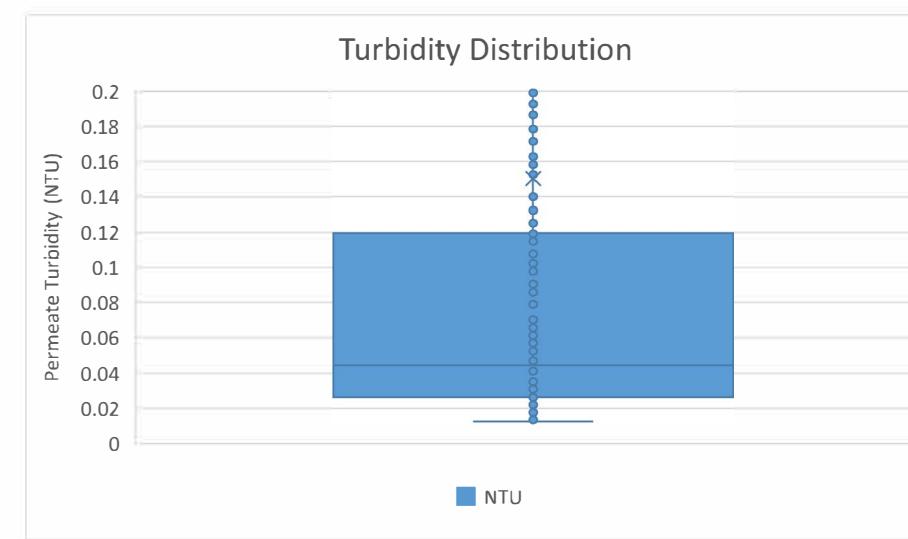
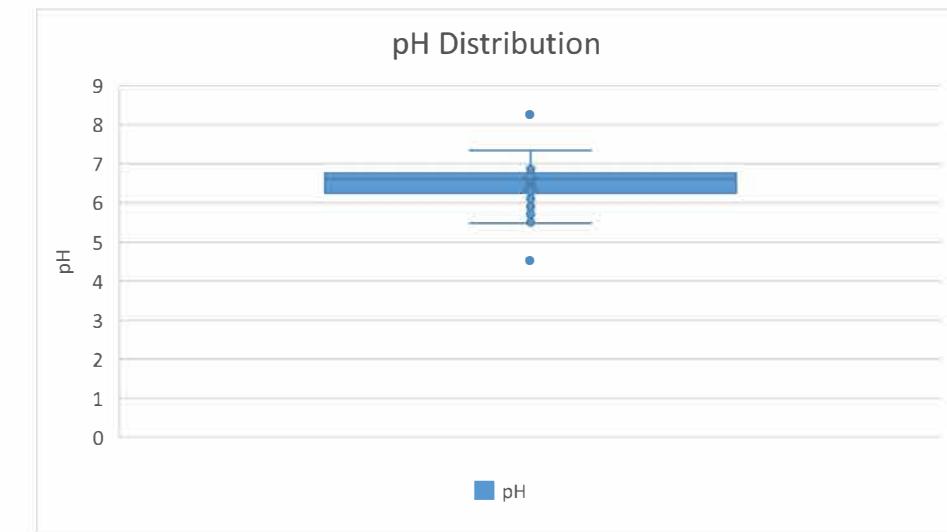
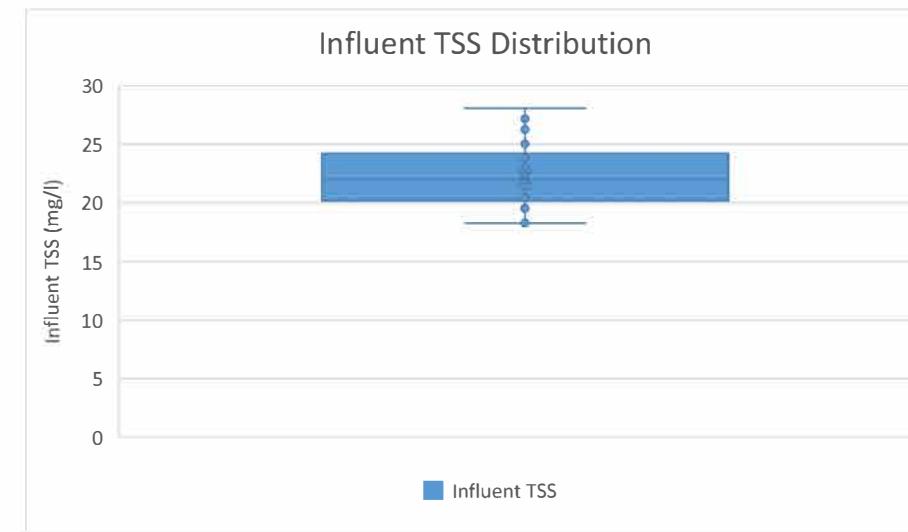
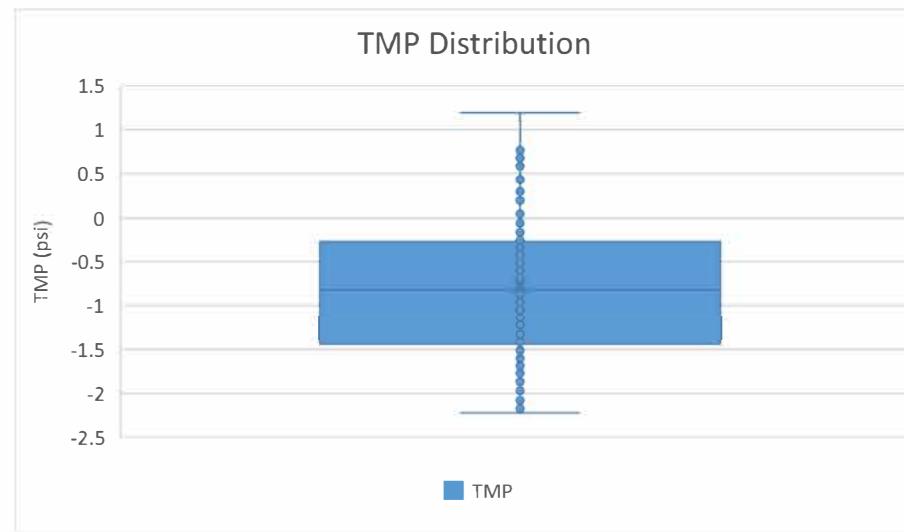
220 gfd for 4 Hours



220 gfd for 4 Hours



220 gfd for 4 Hours



OVIVO PILOT TESTING

WO # C165282

Day		# of samples	Sample Frequency	Tue				Thu				Sat			
Sample Date	Unit			11/3/2020				11/5/2020							
S1-G															
TSS	mg/L	1	1/run					34							
VSS	mg/L	1	1/run					23							
tCOD	mg/L							102							
sCOD	mg/L							32							
BOD	mg/L							40							
Alkalinity	mg/L							76							
Fecal Coliform Sample ID								#1	#2			#1	#2		#1
Fecal Coliform Sample Time								1000							
Fecal Coliform	MPN/100mL	2	2/run					3,500,000	ns						
S1-C															
TSS	mg/L	1	hourly					26							
VSS	mg/L	1	hourly					24							
Alkalinity	mg/L	1	hourly					74							
COD	mg/L	1	hourly					91							
BOD	mg/L	1	hourly					36							
S2-G															
TSS															
VSS															
Cl2 Demand	mg/L	1	1/run					0.84							
SS	m/l	1	1/run					0							
Alkalinity	mg/L							36							
tCOD	mg/L							36							
sCOD	mg/L							35							
Fecal Coliform Sample ID								#1	#2	#3	#4	#1	#2	#3	#4
Fecal Coliform Sample Time								835	1010	1150	1400				
Fecal Coliform	MPN/100mL	4	4/run					0	0	0	0				
S2-C															
TSS	mg/L	1	hourly					3							
VSS	mg/L	1	hourly					1							
Alkalinity	mg/L	1	hourly					2							
UV Abs	cm ⁻¹	1	hourly					0.0655				0.106			
BOD	mg/L	1	hourly					9							
S3-G															
TSS	mg/L	1	1/run					492							
VSS	mg/L	1	1/run					278							
Alkalinity	mg/L							68							
tCOD	mg/L	1	1/run					522.5							
sCOD	mg/L	1	1/run					36							
S3-G, Flow Box															
TSS	mg/L	1	1/run												
VSS	mg/L	1	1/run												
Alkalinity	mg/L														
tCOD	mg/L	1	1/run												
sCOD	mg/L	1	1/run												

Weekly Check of online instruments

Date/Time/Initials															
Turbidity online reading															
Turbidity lab reading															
pH online reading															
pH lab reading															
Temperature online reading															
Temperature lab reading															
Conductivity															
Hypo Strength %															

Bottle Kit	Volume
FE grab	2L
FE Fecal	4 125-ml sterile
FE cl2	1L amber bottle
FE comp	4L
Inf grab	2L
Inf Fecal	2 125-ml sterile
Inf comp	2L
TNK	500mL

S1-G
S1-C
S2-G
S2-C
S3-G

Appendix B.14

Supplemental Test 03

Run# 12

Run Description Confirm process performance at steady state.

Type	<input checked="" type="checkbox"/> process	<input type="checkbox"/> Performance
Influent water source	<input checked="" type="checkbox"/> PE	
	<input type="checkbox"/> Hydrant	
	<input type="checkbox"/> Both	

Wasting Rate	0	
Air Scour	105	scfm
Backwash Frequency	15	min
Run Duration	24	Hrs
CIP	<input checked="" type="checkbox"/> Hypo	<input checked="" type="checkbox"/> Caustic
Composite Sample Schedule	24 Samples, 1 hour apart, 200 mL each 4.8 L total volume	

Date

*NOTE: Composite samples to only be tested for TSS, VSS, and COD.

Event	Day	Time Hr	PE gpm	Hydrant gpm	Coag Dose Al:TSS ratio	Flux Rate gfd	Event/Action	Influent		Effluent		Membrane Tank		Comments
								Grab / Probe	Note	Grab / Probe	Note	Grab / Probe	Note	
0	1	8:00	200		0.6		Start Flow to pilot							
1		8:30				100	Start producing effluent							
2		9:00					Start Composite Samplers							
3		11:00					Influent Sample	Field: Full Set WPP: TSS/VSS, COD						
4		11:05					Effluent Sample			Field: Full Set WPP: TSS/VSS, COD				
5	2	8:30					Stop producing effluent							
6														
7														
8														
9														
10														
11														
12														
13														

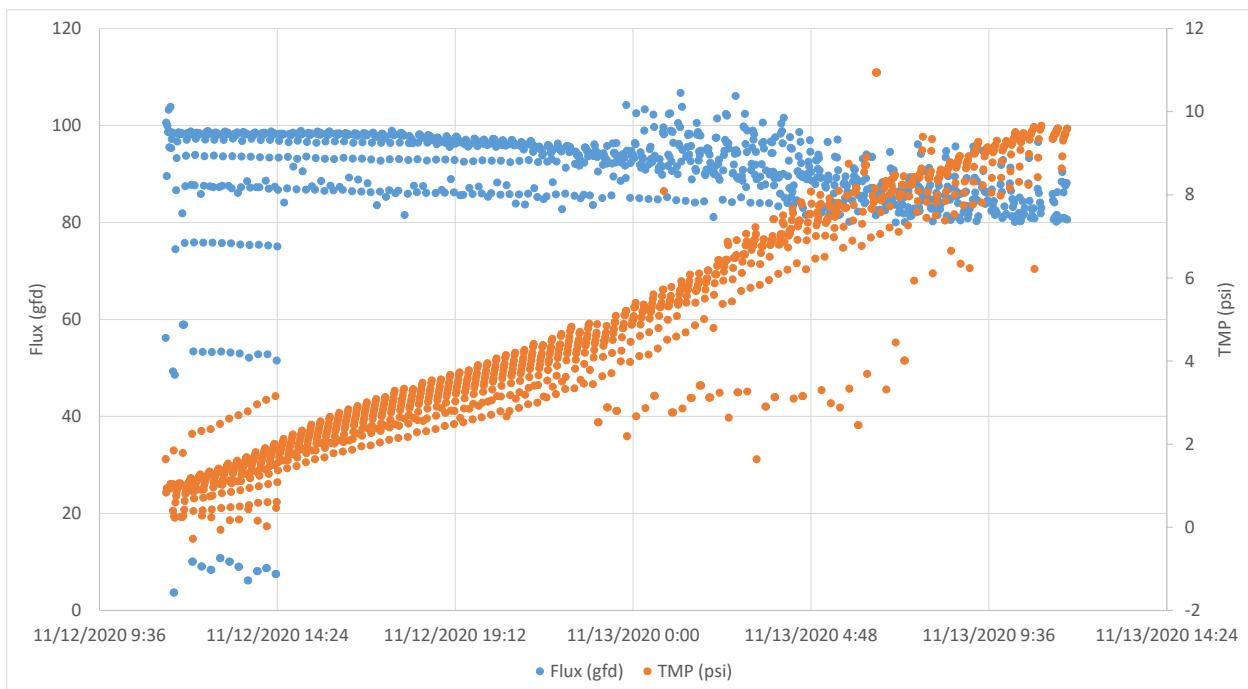
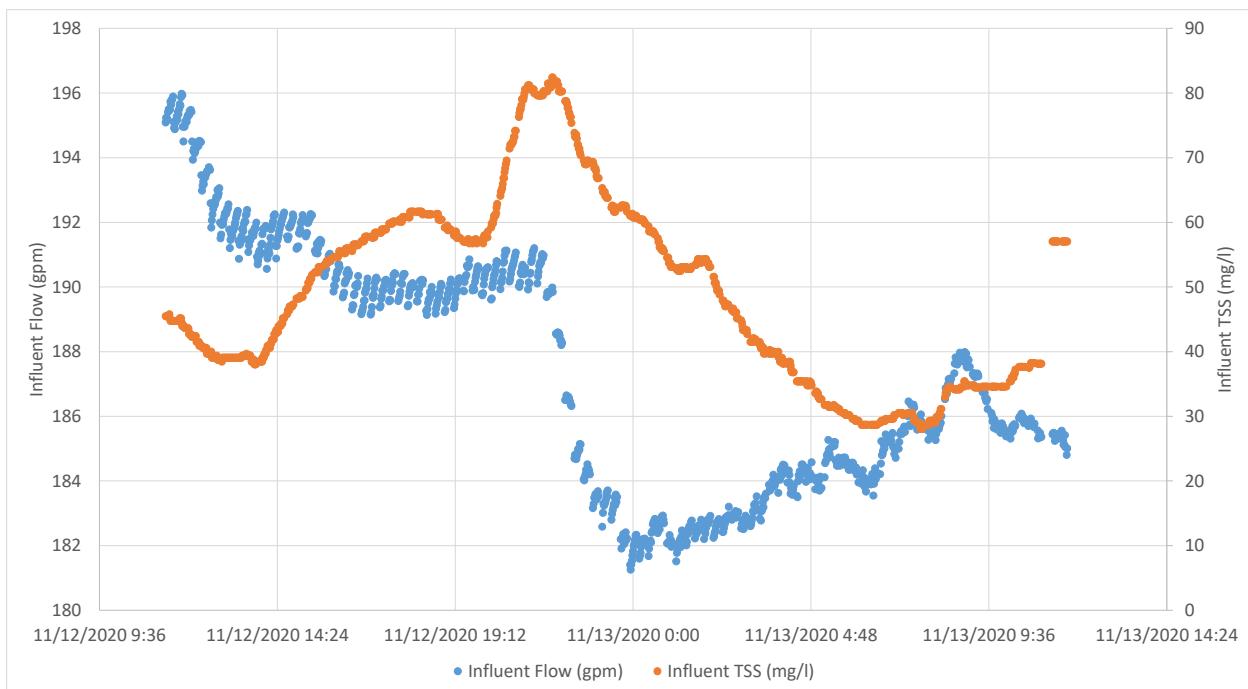
Field	Eff
Turbidity	
Probe reading	
pH	
Temperature	
Conductivity	

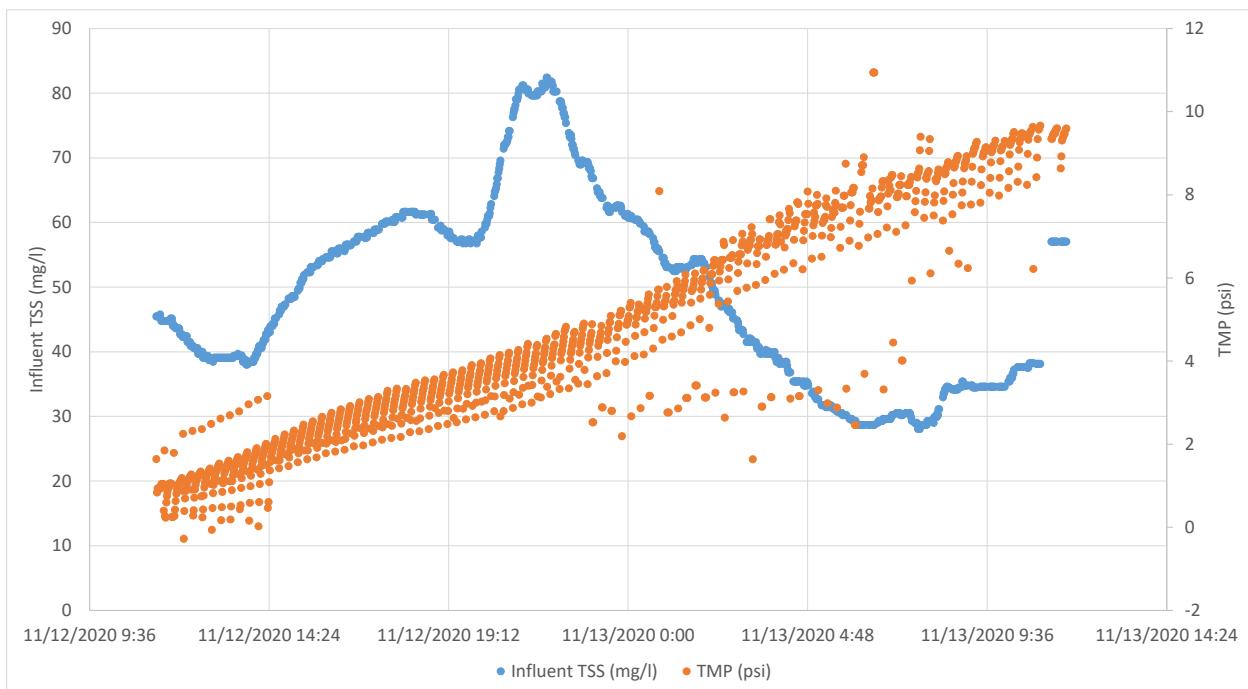
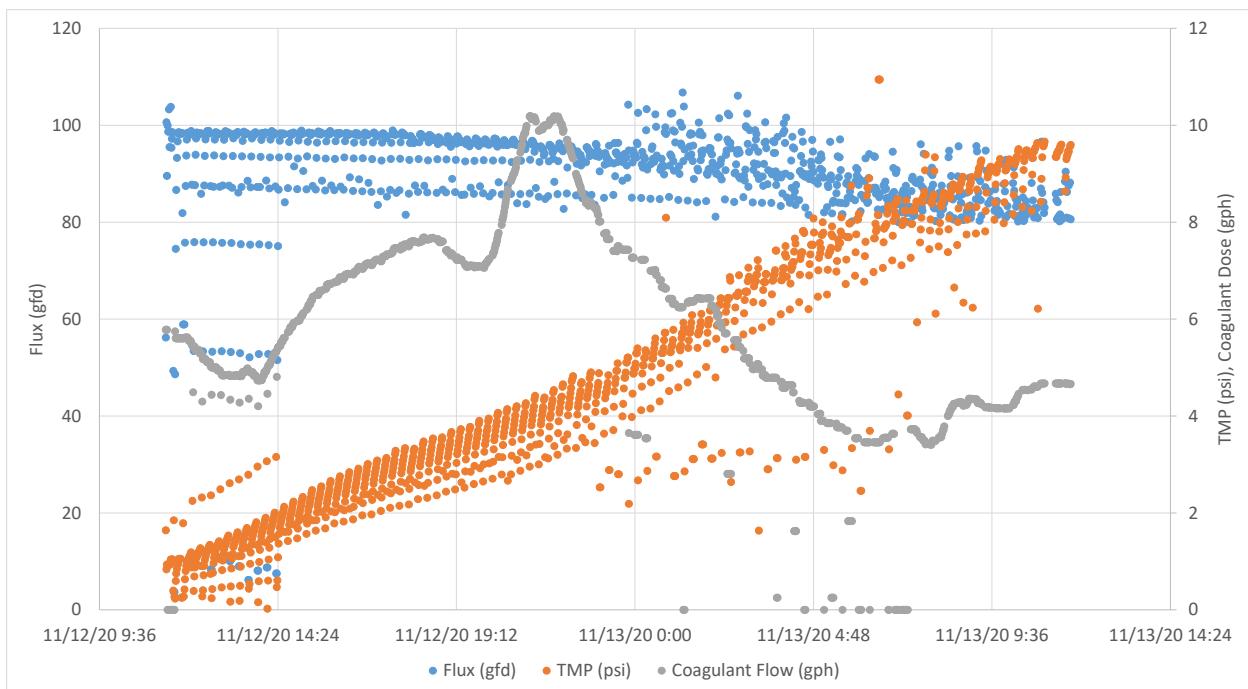
WPPLsamples	
Influent composite	
Effluent composite	
-TSS/VSS, Alk, BOD	
Influent grab	
TSS/VSS	
Fecal	
Effluent grab	
TSS/VSS	
Chlorine demand	
Fecal	
Settleable solids	
Tank grab	
TSS/VSS	

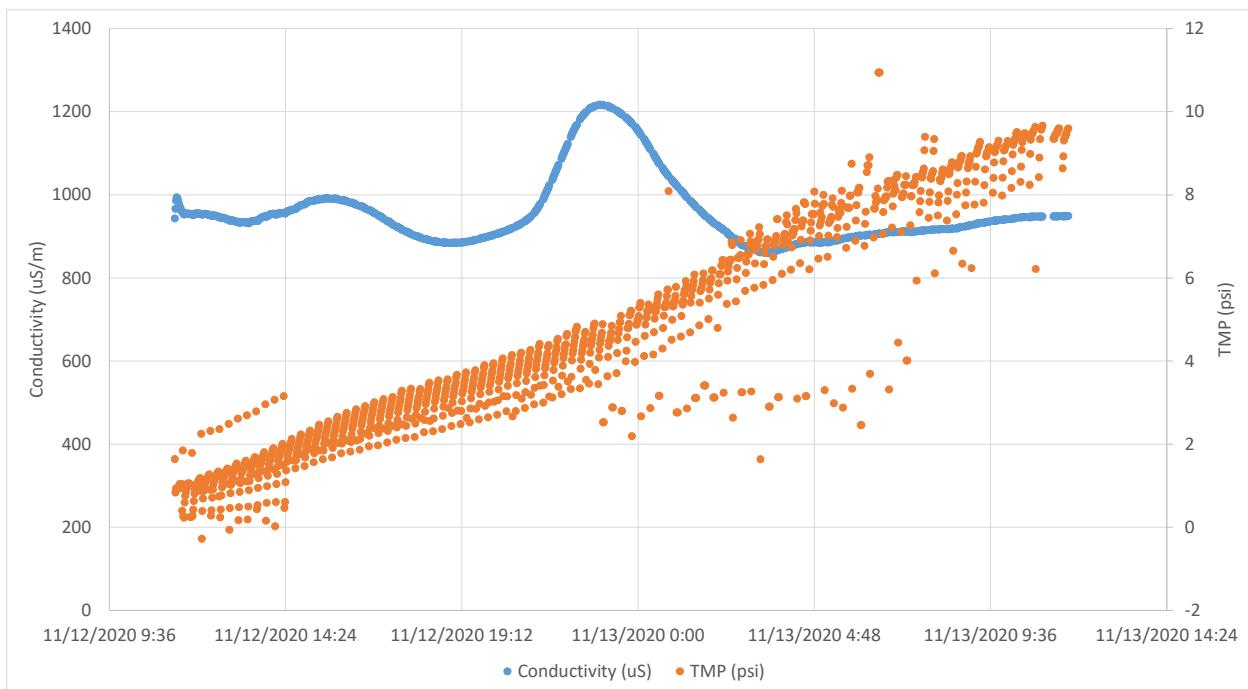
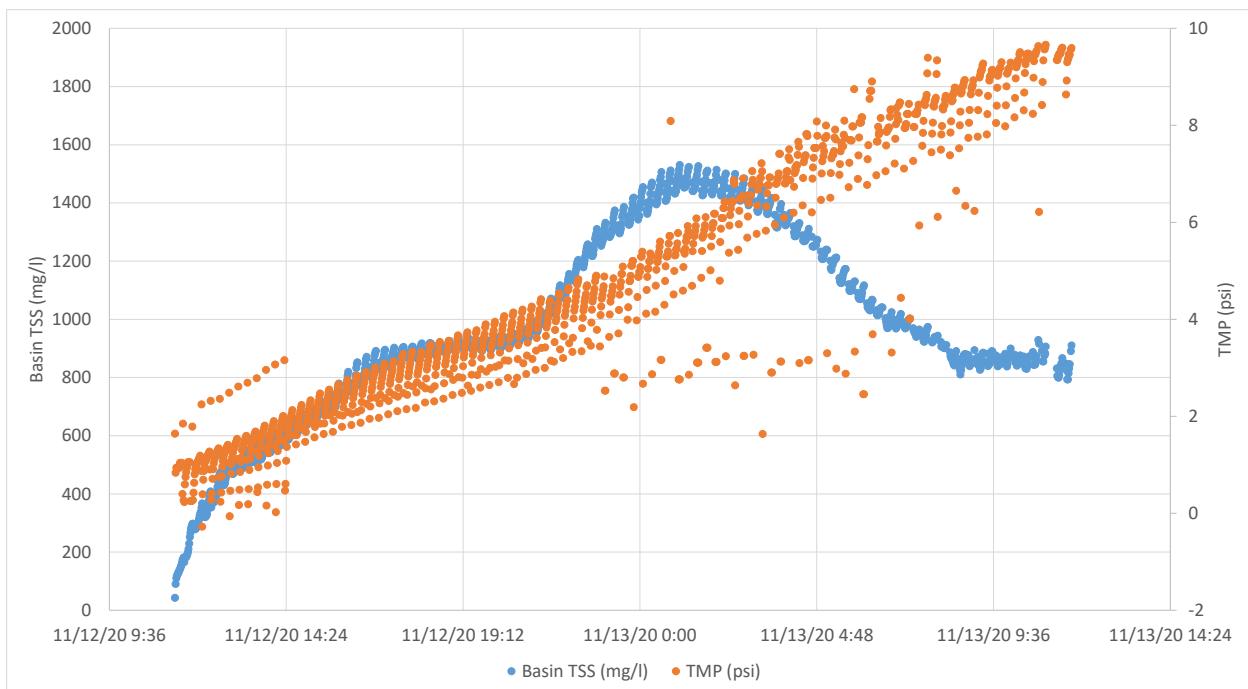
KCEL	
Influent grab	
TOC	
Effluent composite	
TOC	

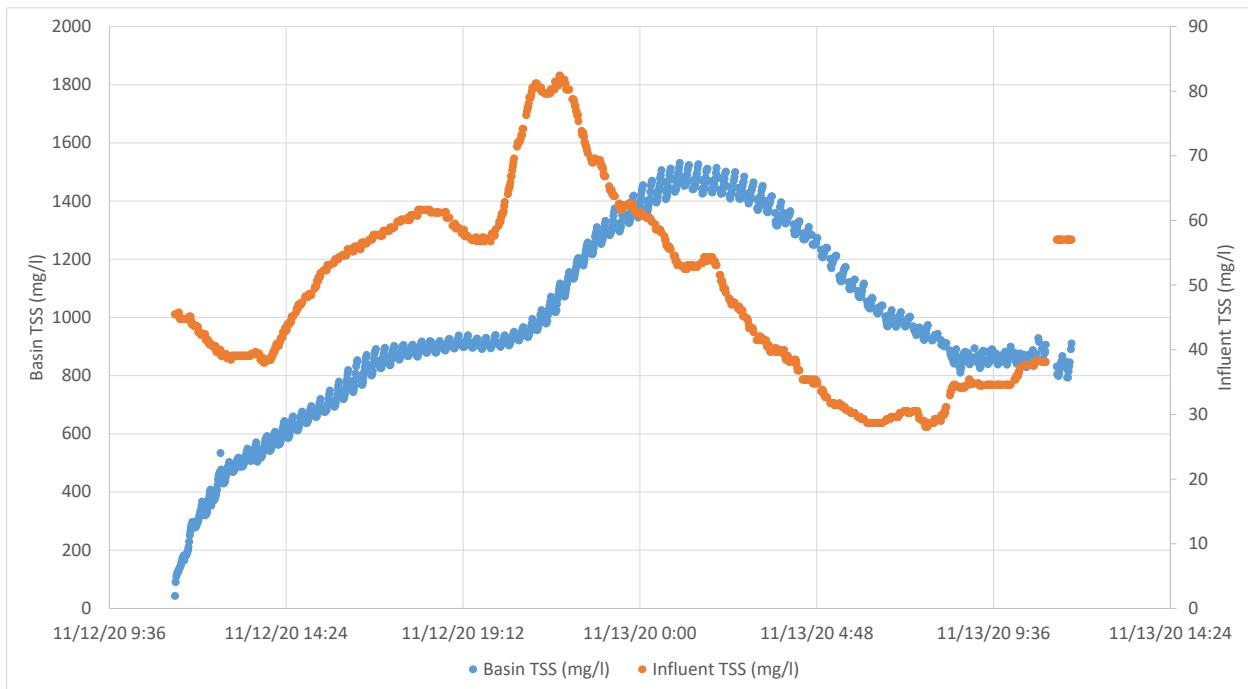
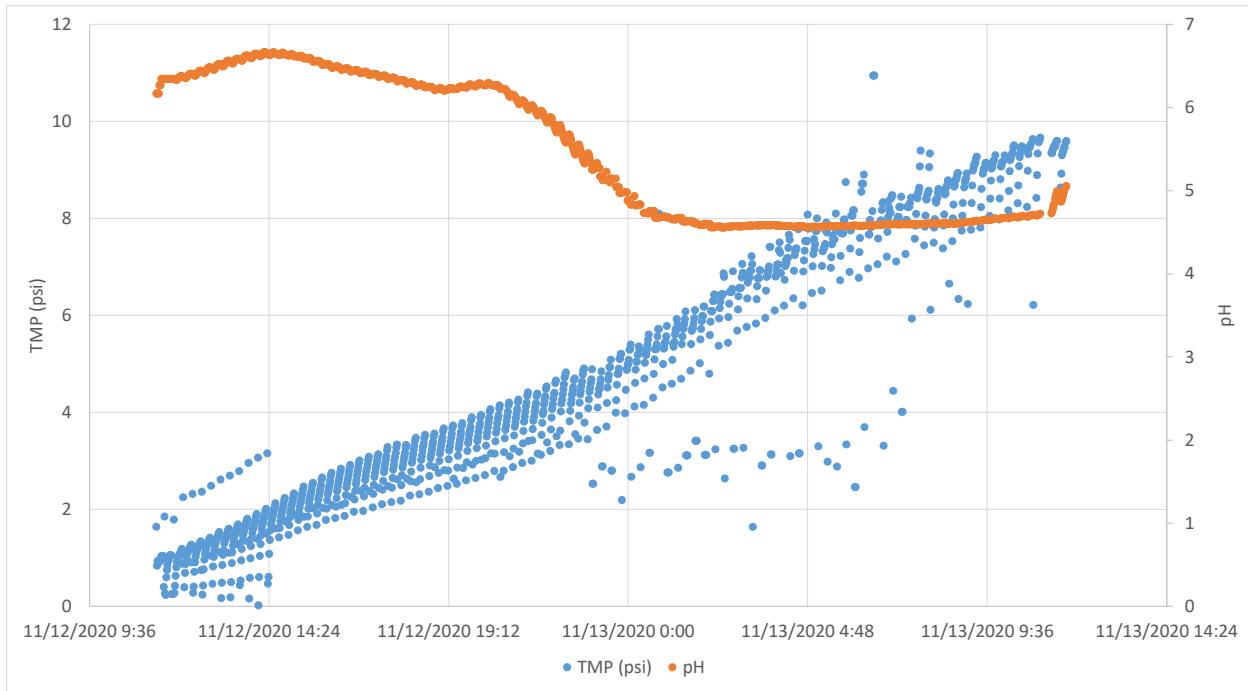
OVIVO Pilot Setpoints Values to be set according to OVIVO's recommendations.

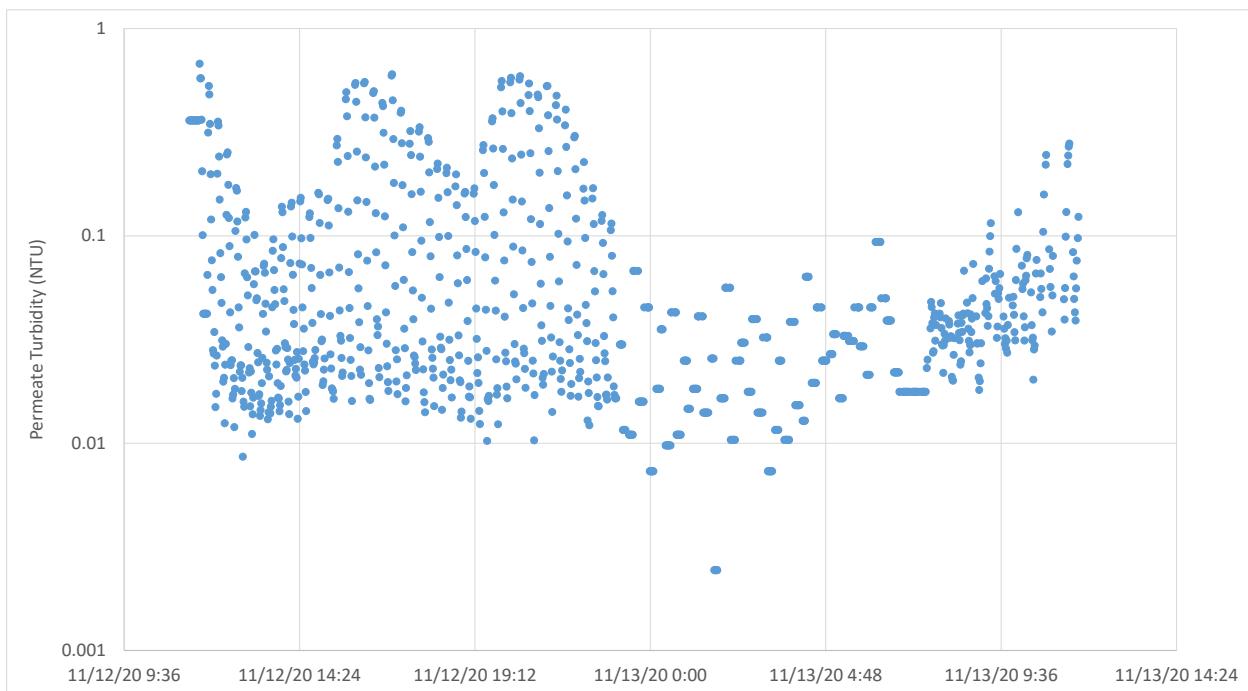
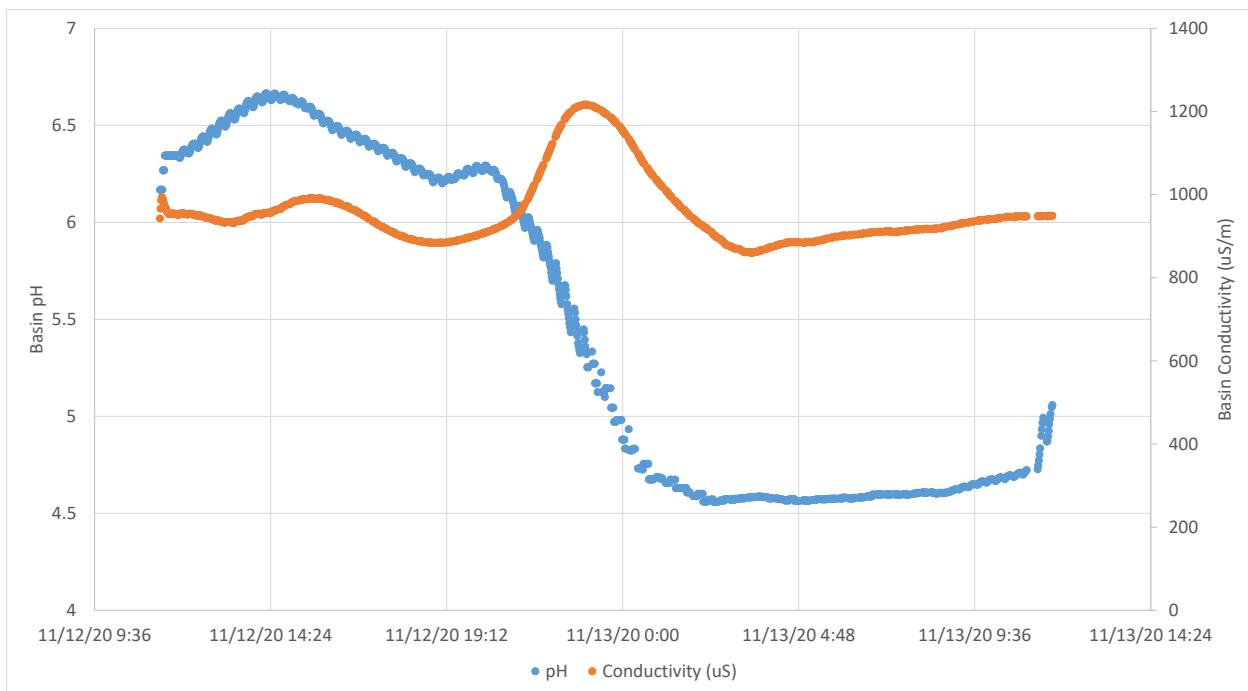
Run# <u>12</u>		Date	FLOW OPTIMIZATION						CHEM DOSING					
System		ONLINE/OFFLINE	Permeate						End of Event					
Inlet System			Permeate Flow	206	gpm				End Cycle				Coagulant	
Screen Off Delay		2 min	Pump Start Level	116	in				End of Cycle				Pump Start Inf Flow	1 gpm
Weir Gate Frequency		1800 min	Pump Stop Level	5	in				Hypochlorite CIP				Pump Start Level	0.1 in
Weir Gate Duration		30 sec	Pump Stop Low Level	100	in				End of Cycle				Overflow Level	118 in
Blowers			Single Pump Flow	220	gpm				Citric CIP				Coagulant Min Flow	0.5 gph
Scour Air Flow		105 scfm	Backwash Frequency	15	min				End of Cycle				Coagulant Max Flow	20 gph
Blower Start Level		20 in	Backwash Flow	300	%				Hypo + Caustic CIP				Coag Fixed Flow	6.0 gph
Blower Stop Level		8 in	Pre BW Relaxation	30	sec				End of Cycle				Coag TSS Ratio	0.60 %
Lag Blower Start Level		65 %	Backwash Duration	60	sec				Hypo + Caustic CIP				Coag A1%	4.1 %
Lag Blower Start Delay		120 sec	Post BW Relax Duration	30	sec				Caustic CIP				Coag SG	1.34
Blower Fail Air Flow		4.5 scfm	Perm Static Pressure	1.7	psi				End of Event Drain Lvl	5 in			Coag Flow Ratio	5
Blower Fail Delay		140 sec	Turbidity Hi Alarm SP	10	NTU				End of Event Dly	20 sec			Coag Fill Flow	8 gph
Low Air Flow Alarm		55 %	TMP Hi Alarm SP	8	psi									
Low Air Flow Delay		45 sec	Backwash Start TMP	10	psi									
Override Enabled			Max Hi TMP Cycles	1										
TMP Reset														
Override Enabled			Perm Tank Level Lo	20	in									
Air Extractor Frequency			Air Extractor Duration	5	min									
Air Extractor Duration				4	min									
Membrane Basin Drain Vlv														
Sodium Hypochlorite			WAS Vlv Open TSS	6,000	mg/l									
CIP Permeate Flow		100 gpm	WAS Vlv Close Lvl	117	in									
Backwash Perm Flow		200 gpm	WAS Valve Duration	0	sec									
Hypochlorite Flow		100 gph												
Pre CIP Relax Duration		30 sec												
Chem Flow Duration		10 min												
Soak Duration		999 min												
Rinse Duration		60 sec												
Final Relax Duration		60 sec												
Pre-Drain Disabled							Pre-Drain Disabled							Pre-Drain Disabled

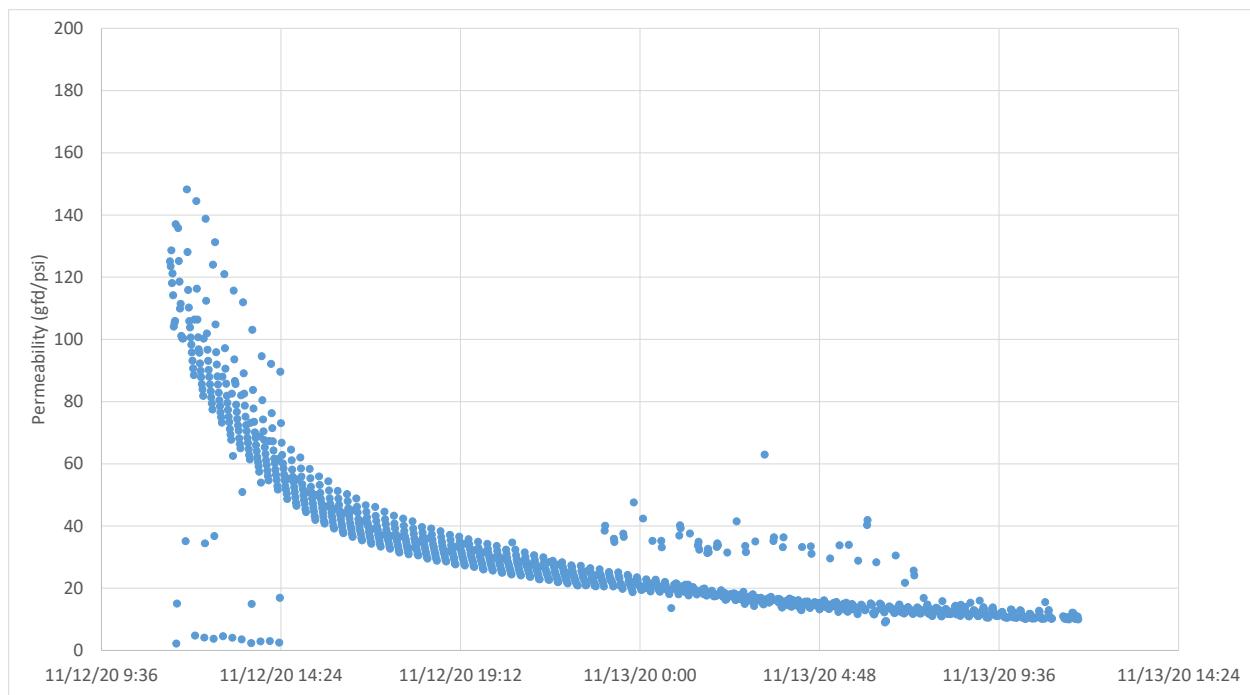


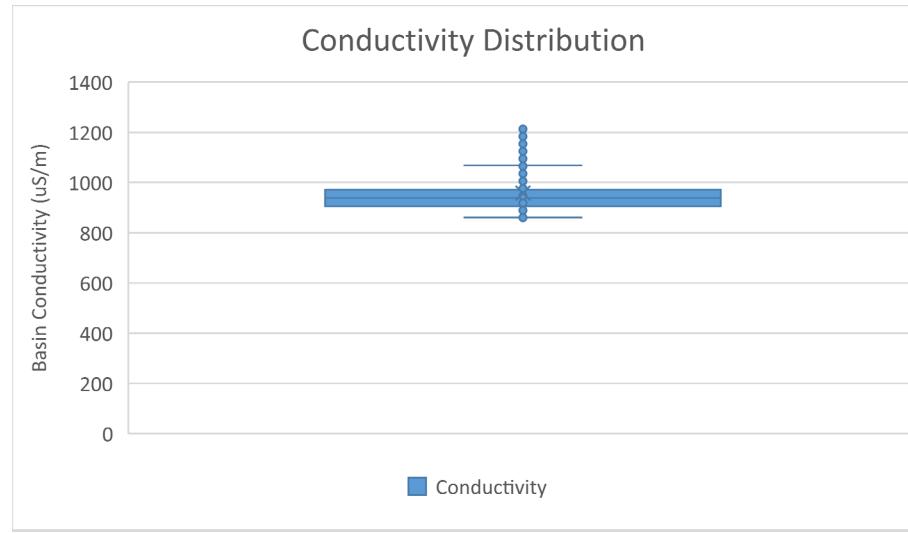
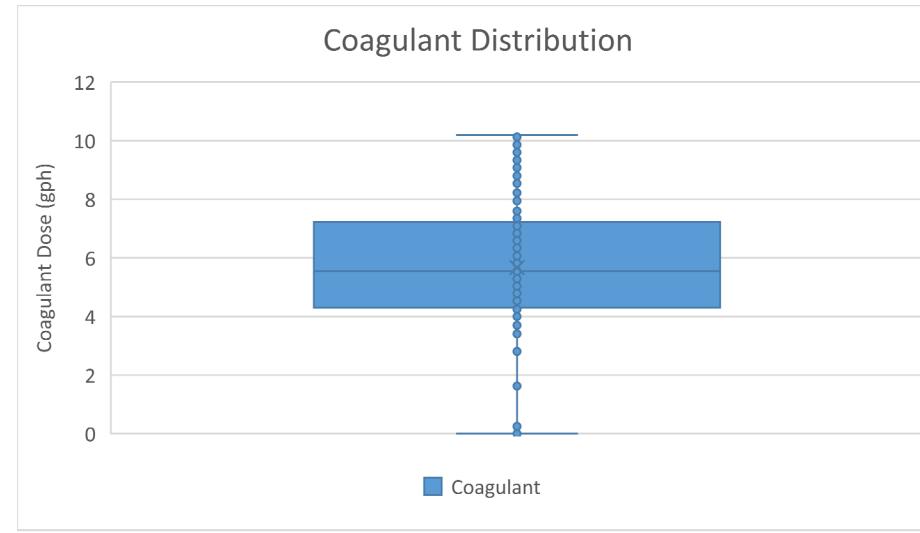
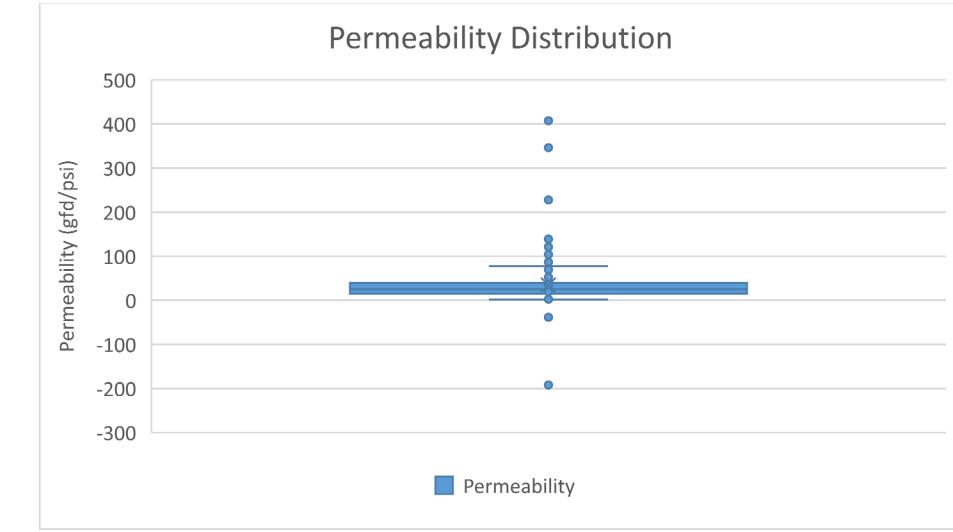
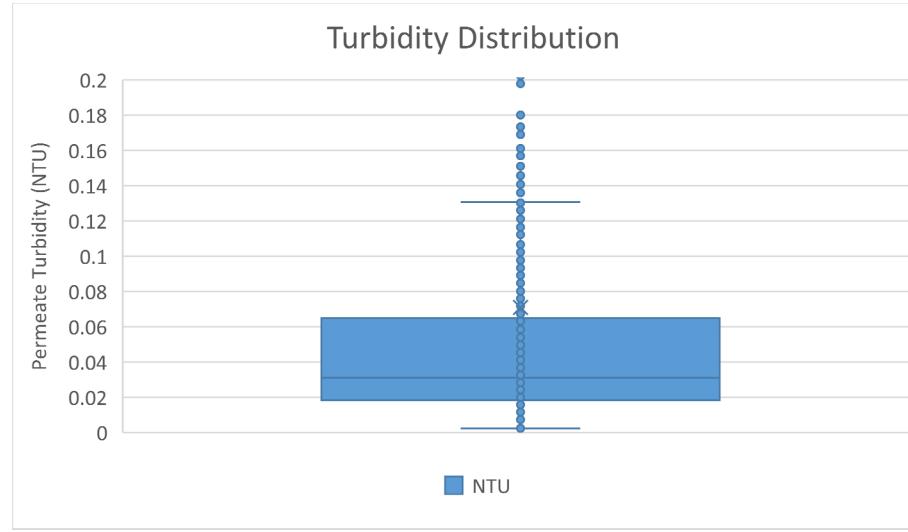
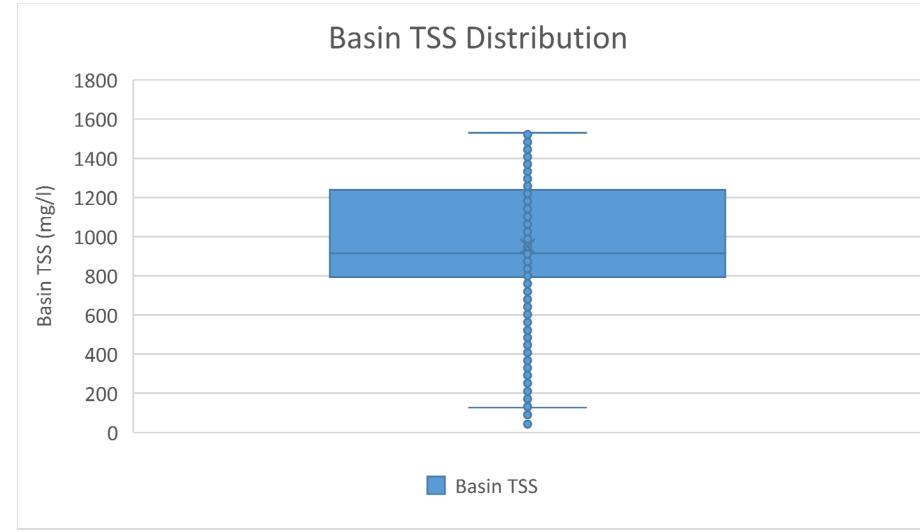
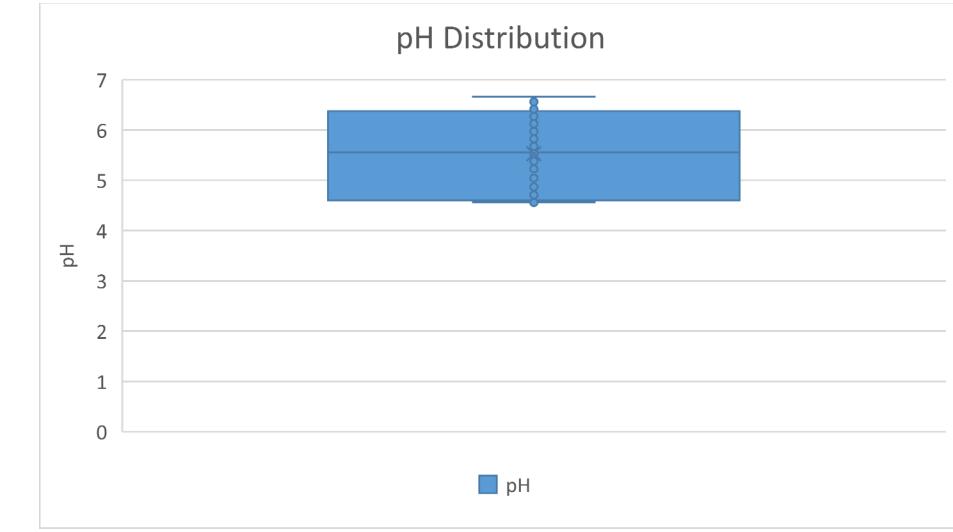
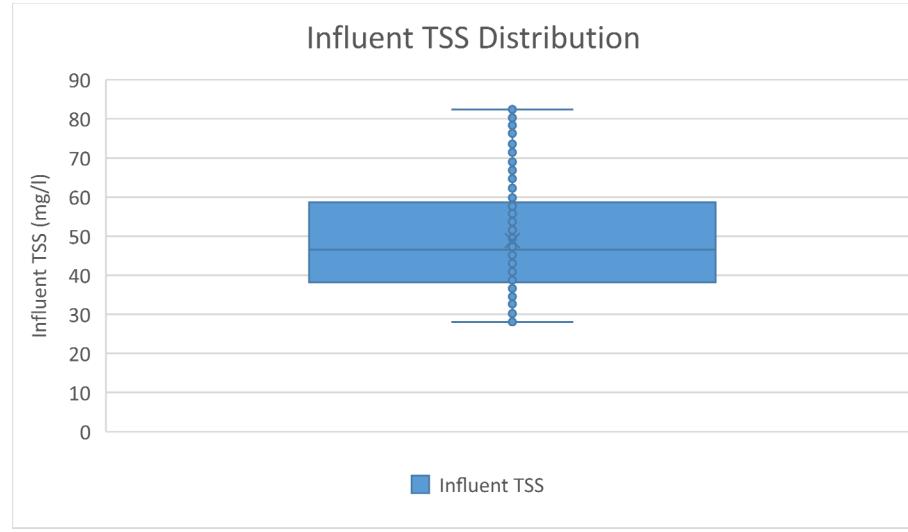
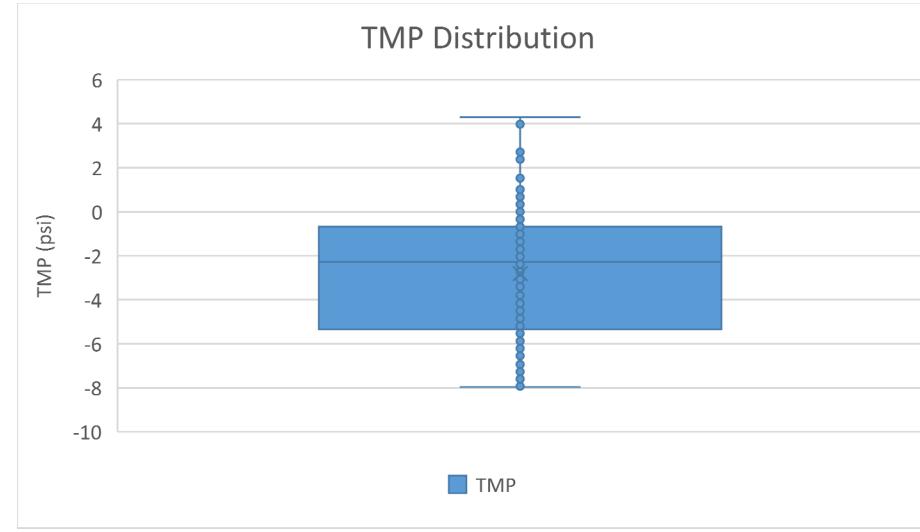












OVIVO PILOT TESTING

WO # C165282

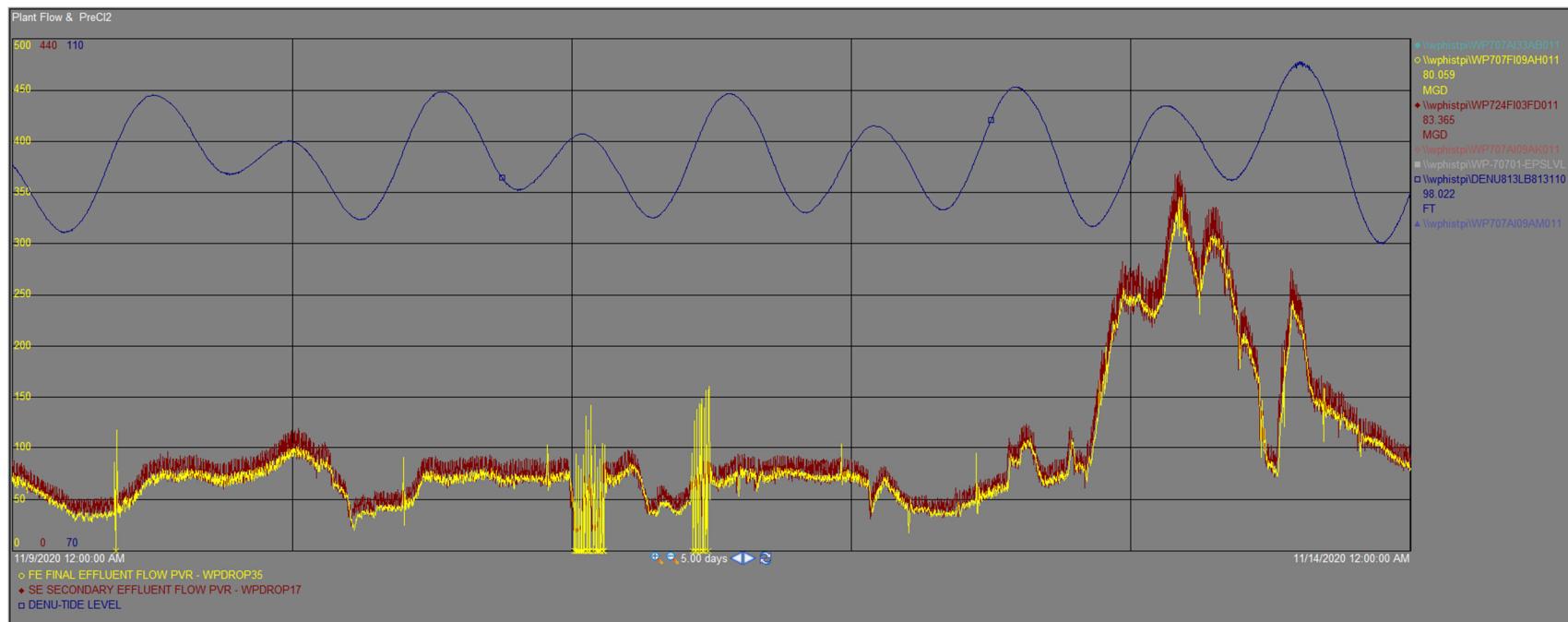
Day		# of samples	Sample Frequency	Thu	Sat
Sample Date	Unit			11/12/2020	
S1-G	Military Time (hours)				
TSS	mg/L	1	1/run	34	
VSS	mg/L	1	1/run	29	
tCOD	mg/L			258	
sCOD	mg/L				
BOD	mg/L				
Alkalinity	mg/L				
Fecal Coliform Sample ID				#1 #2	
Fecal Coliform Sample Time					#1 #2
Fecal Coliform	MPN/100mL	2	2/run		
S1-C	Military Time (hours)				
TSS	mg/L	1	hourly		
VSS	mg/L	1	hourly		
Alkalinity	mg/L	1	hourly		
COD	mg/L	1	hourly		
BOD	mg/L	1	hourly		
S2-G	Military Time (hours)				
TSS				1	
VSS				0	
Cl2 Demand	mg/L	1	1/run		
SS	ml/l	1	1/run		
Alkalinity	mg/L				
tCOD	mg/L			99	
sCOD	mg/L				
Fecal Coliform Sample ID				#1 #2 #3 #4	
Fecal Coliform Sample Time					#1 #2 #3 #4
Fecal Coliform	MPN/100mL	4	4/run		
S2-C	Military Time (hours)				
TSS	mg/L	1	hourly		
VSS	mg/L	1	hourly		
Alkalinity	mg/L	1	hourly		
UV Abs	cm ⁻¹	1	hourly		
COD					
BOD	mg/L	1	hourly		
S3-G	Military Time (hours)				
TSS	mg/L	1	1/run		
VSS	mg/L	1	1/run		
Alkalinity	mg/L				
tCOD	mg/L		1/run		
sCOD	mg/L		1/run		
S3-G, Flow Box	Military Time (hours)				
TSS	mg/L	1	1/run		
VSS	mg/L	1	1/run		
Alkalinity	mg/L				
tCOD	mg/L		1/run		
sCOD	mg/L		1/run		

Weekly Check of online instruments

Date/Time/Initials							
Turbidity online reading							
Turbidity lab reading							
pH online reading							
pH lab reading							
Temperature online reading							
Temperature lab reading							
Conductivity							
Hypo Strength %							

Bottle Kit	Volume
FE grab	2L
FE Fecal	4 125-ml sterile
FE cl2	1L amber bottle
FE comp	4L
Inf grab	2L
Inf Fecal	2 125-ml sterile
Inf comp	2L
TNK	500mL

S1-G
S1-C
S2-G
S2-C
S3-G



Appendix B.15

Supplemental Test 04

Run# Supplemental Test #4

Run Description Vary coagulant to TSS ratio to examine coagulant dosing strategy, 100 gfd, all PE

Type	<input checked="" type="checkbox"/> Process	<input type="checkbox"/> Performance
Influent water source	<input checked="" type="checkbox"/> PE	
	<input type="checkbox"/> Hydrant	
	<input type="checkbox"/> Both	

Flux rate	<input checked="" type="checkbox"/> Constant	
	<input type="checkbox"/> Varies	

Wasting Rate	0
Air Scour	105 scfm
Backwash Frequency	15 min
Run Duration	6.5 hrs
CIP	<input type="checkbox"/> Hypo <input checked="" type="checkbox"/> Caustic <input type="checkbox"/> Citric
Composite Sample Schedule	No composite samples

Field
Eff
Turbidity
Probe reading
pH
Temperature
Conductivity

Date

Event	Day	Time Hr	PE gpm	Hydrant gpm	Coag Dose Al:TSS Ratio	Flux Rate gfd	Event/Action	Influent		Effluent		Membrane Tank		Comments
								Grab / Probe	Note	Grab / Probe	Note	Grab / Probe	Note	
0	1	8:00	200		0.2		Start Flow to pilot							
1		8:40				100	Start producing effluent							
2		9:20					Influent Sample	UV254						
3		9:40					Effluent Sample			UV254				
4		9:40			0.4		Increase Al:TSS ratio							
5		10:20					Influent Sample	UV254						
6		10:40					Effluent Sample			UV254				
7		10:40			0.6		Increase Al:TSS ratio							
8		11:20					Influent Sample	UV254						
9		11:40					Effluent Sample			UV254				
10		11:40			0.8		Increase Al:TSS ratio							
11		12:20					Influent Sample	UV254						
12		12:40					Effluent Sample			UV254				
13		12:40			1.0		Increase Al:TSS ratio							
14		13:20					Influent Sample	UV254						
15		13:40					Effluent Sample			UV254				
16		13:40			1.2		Increase Al:TSS ratio							
17		14:20					Influent Sample	UV254,TSS, VSS, COD						
18		14:40					Effluent Sample			UV254,TSS, VSS, COD				
19		14:40					Stop producing effluent							

OVIVO Pilot Setpoints Values to be set according to OVIVO's recommendations.
Run# Supplemental Test 4Date 11/17/2020

FLOW OPTIMIZATION				CHEM DOSING			
System	ONLINE/OFFLINE	Permeate		End of Event		Coagulant	
Inlet System		Permeate Flow	206 gpm	End Cycle		Pump Start Inf Flow	1 gpm
Screen Off Delay	2 min	Pump Start Level	116 in	End of Cycle	Enable	Pump Start Level	0.1 in
Weir Gate Frequency	1800 min	Pump Stop Level	5 in	Hypochlorite CIP	Disable	Overflow Level	118 in
Weir Gate Duration	30 sec	Pump Stop Low Level	100 in	End of Cycle	Enable	Coagulant Min Flow	0.5 gph
Blowers		Single Pump Flow	220 gpm	Citric CIP	Disable	Coagulant Max Flow	20 gph
Scour Air Flow	105 scfm	Backwash Frequency	15 min	End of Cycle	Enable	Coag Flow	Variable gph
Blower Start Level	20 in	Backwash Flow	300 %	Hypo + Caustic CIP	Disable	Coag TSS Ratio	Variable %
Blower Stop Level	8 in	Pre BW Relaxation	30 sec	End of Cycle	Enable	Coag Al%	4.1 %
Lag Blower Start Level	65 %	Backwash Duration	60 sec	Caustic CIP	Disable	Coag SG	1.34
Lag Blower Start Delay	120 sec	Post BW Relax Duration	30 sec			Coag Flow Ratio	5
Blower Fail Air Flow	4.5 scfm	Perm Static Pressure	1.7 psi			Coag Fill Flow	8 gph
Blower Fail Delay	140 sec	Turbidity Hi Alarm SP	10 NTU				
Low Air Flow Alarm	55 %	TMP Hi Alarm SP	8 psi				
Low Air Flow Delay	45 sec	Backwash Start TMP	10 psi				
Override Enabled		Max Hi TMP Cycles	1				
TMP Reset							
Sodium Hypochlorite		Perm Tank Level Lo	20 in	End of Event Drain Lvl	5 in		
CIP Permeate Flow	100 gpm	Air Extractor Frequency	5 min	End of Event Dly	20 sec		
Backwash Perm Flow	200 gpm	Air Extractor Duration	4 min				
Hypochlorite Flow	100 gph						
Pre CIP Relax Duration	30 sec						
Chem Flow Duration	10 min						
Soak Duration	999 min						
Rinse Duration	60 sec						
Final Relax Duration	60 sec						
Pre-Drain Disabled				Pre-Drain Disabled			
Pre-Drain Disabled				Pre-Drain Disabled			
Pre-Drain Disabled				Pre-Drain Disabled			
CITRIC ACID				CAUSTIC			
CIP Permeate Flow	100 gpm	CIP Permeate Flow	100 gpm	CIP Permeate Flow	100 gpm		
Backwash Perm Flow	200 gpm	Backwash Perm Flow	200 gpm	Backwash Perm Flow	100 gpm		
Hypochlorite Flow	100 gph	Citric Flow	28 gph	Caustic Flow	50 gph		
Pre CIP Relax Duration	30 sec	Pre CIP Relax Duration	30 sec	Pre CIP Relax Duration	30 sec		
Chem Flow Duration	10 min	Chem Flow Duration	10 min	Chem Flow Duration	10 min		
Soak Duration	999 min	Soak Duration	999 min	Soak Duration	999 min		
Rinse Duration	60 sec	Rinse Duration	60 sec	Rinse Duration	60 sec		
Final Relax Duration	60 sec	Final Relax Duration	60 sec	Final Relax Duration	60 sec		

Run# Supplemental Test #4

Run Description Vary coagulant to TSS ratio to examine coagulant dosing strategy, 100 gfd, all PE

Type	<input checked="" type="checkbox"/> Process	<input type="checkbox"/> Performance
Influent water source	<input checked="" type="checkbox"/> PE	<input type="checkbox"/> Hydrant
	<input type="checkbox"/> Both	
Flux rate	<input checked="" type="checkbox"/> Constant	<input type="checkbox"/> Varies

Wasting Rate	0
Air Scour	105 scfm
Backwash Frequency	15 min
Run Duration	6.5 Hrs
CIP	<input checked="" type="checkbox"/> Hypo <input checked="" type="checkbox"/> Caustic <input type="checkbox"/> Citric
Composite Sample Schedule	No composite samples

Field
Eff
Turbidity
Probe reading
pH
Temperature
Conductivity

Date

Event	Day	Time Hr	PE gpm	Hydrant gpm	Coag Dose Al:TSS ratio	Flux Rate gfd	Event/Action	Influent		Effluent		Membrane Tank		Comments
								Grab / Probe	Note	Grab / Probe	Note	Grab / Probe	Note	
0	1	8:00	200		0.2		Start Flow to pilot							
1		8:30				100	Start producing effluent							
2		9:00	120				Influent Sample	UV254	UVT = 62.6					
3		9:20	140				Effluent Sample		UVA = 0.366	UV254	UVT = 76.2			
4		9:30	140		0.4		Increase Al:TSS ratio							
5		10:00	10:20				Influent Sample	UV254	UVA = 0.36					
6		10:20	10:40				Effluent Sample		UVT = 43.6	UV254				
7		10:30	10:40		0.6 ✓		Increase Al:TSS ratio	10:40	Effluent X					
8		11:00	11:20				Influent Sample	UV254	UVT = 44.8					
9		11:20	11:40				Effluent Sample		UVA = 0.125	UV254	UVT = 72.0			
10		11:30	11:40		0.8 ✓		Increase Al:TSS ratio							
11		12:00	12:20				Influent Sample	UV254	UVA = 0.45					
12		12:20	12:40				Effluent Sample		UVT = 35.4	UV254	UVA = 0.132			
13		12:30	12:40		1.0 ✓		Increase Al:TSS ratio							
14		13:00	13:20				Influent Sample	UV254	UVA = 0.591					
15		13:20	13:40				Effluent Sample		UVT = 25.6	UV254	UVA = 0.156			
16		13:30	13:40		1.2 ✓		Increase Al:TSS ratio							
17		14:00	14:20				Influent Sample	UV254,TSS, VSS, COD	UVT = 28.2 UVA = 0.548					
18		14:20	14:40				Effluent Sample		UVT = 29.7 UVA = 0.526	UV254,TSS, VSS, COD	UVA = 0.144 UVT = 71.7			
19		14:30	14:40				Stop producing effluent							

Daily Field Notes
 Run Cond
 Supplemental #4
 Process and Performance Testing

Date	Time	Observation	Action Item
11/17	0812	Pilot started - PC only blower #2 running @ 50%.	
	8:39	inc blower to 75%. filtration started	
	8:48	blower #2 failed - tripped blower #1 running at 50% ~ 19.5 SCFM will continue to operate at this airflow	
		reset blower #2	
	8:58	inc blower to 65% → 15.4 SCFM	
	10:41	changed Coag Ratio → 0.6	
13:27 hrs		Blower #1 tripped (running @ 65%) and blower #2	
13:42 hrs		Increased blower #2 speed 50 → 65%.	
15:07 hrs		Primed hypo dosing pump	
15:14 hrs		Initiated TIP (Hypochlorite + Caustic)	

OVIVO Pilot Setpoints Values to be set according to OVIVO's recommendations.

Run# Supplemental Test 4

Date 11/17/2020

FLOW OPTIMIZATION								CHEM DOSING			
System	ONLINE/OFFLINE		Permeate	End of Event	Coagulant						
Inlet System			Permeate Flow	206 gpm	Pump Start Inf Flow	1 l/min					
Screen Off Delay	2 min		Pump Start Level	116 in	Pump Start Level	0.1 in					
Weir Gate Frequency	1800 min		Pump Stop Level	5 in	Overflow Level	118 in					
Weir Gate Duration	30 sec		Pump Stop Low Level	100 in	Coagulant Min Flow	0.5 gph					
Blowers			Single Pump Flow	220 gpm	Coagulant Max Flow	20 gph					
Scour Air Flow	105 scfm		Backwash Frequency	15 min	Coag Flow	Variable					
Blower Start Level	20 in		Backwash Flow	300 %	Coag TSS Ratio	4.1 %					
Blower Stop Level	8 in		Pre BW Relaxation	30 sec	Coag Al%						
Lag Blower Start Level	65 %		Backwash Duration	60 sec	Coag SG	1:34					
Lag Blower Start Delay	120 sec		Post BW Relax Duration	30 sec	Coag Flow Ratio	5					
Blower Fail Air Flow	4.5 scfm		Perm Static Pressure	1.7 psi	Coag Fill Flow	8 gph					
Blower Fail Delay	140 sec		Turbidity Hi Alarm SP	10 NTU							
Low Air Flow Alarm	55 %		TMP Hi Alarm SP	8 psi							
Low Air Flow Delay	45 sec		Backwash Start TMP	10 psi							
TMP Reset								Coagulant Dosing Mode Select			
Sodium Hypochlorite			Perm Tank Level Lo	20 in	End of Event Drain Lvl	5 in					
CIP Permeate Flow	100 gpm		Air Extractor Frequency	5 min	End of Event Dly	20 sec					
Backwash Perm Flow	200 gpm		Air Extractor Duration	4 min							
Hypochlorite Flow	100 gph										
Pre CIP Relax Duration	30 sec										
Chem Flow Duration	10 min										
Soak Duration	999 min										
Rinse Duration	60 sec										
Final Relax Duration	60 sec										
Chem Dose Enabled				Coag Dose Disabled				Prodrain Disabled			
Citric Acid											
CIP Permeate Flow	100 gpm		CIP Permeate Flow	100 gpm	Caustic	100 gpm					
Backwash Perm Flow	200 gpm		Backwash Perm Flow	100 gpm	CIP Permeate Flow	100 gpm					
Citric Flow	100 gph		Citric Flow	28 gph	Backwash Perm Flow	100 gpm					
Pre CIP Relax Duration	30 sec		Pre CIP Relax Duration	30 sec	Caustic	50 gph					
Chem Flow Duration	10 min		Chem Flow Duration	10 min	Caustic Flow	30 sec					
Soak Duration	999 min		Soak Duration	999 min	Pre CIP Relax Duration	10 min					
Rinse Duration	60 sec		Rinse Duration	60 sec	Chem Flow Duration	999 min					
Final Relax Duration	60 sec		Final Relax Duration	60 sec	Soak Duration	60 sec					
					Rinse Duration	60 sec					
					Final Relax Duration	60 sec					

✓ 11/17/2020

Supplemental Run #4

11/17/2020

SOP OVIVO PILOT

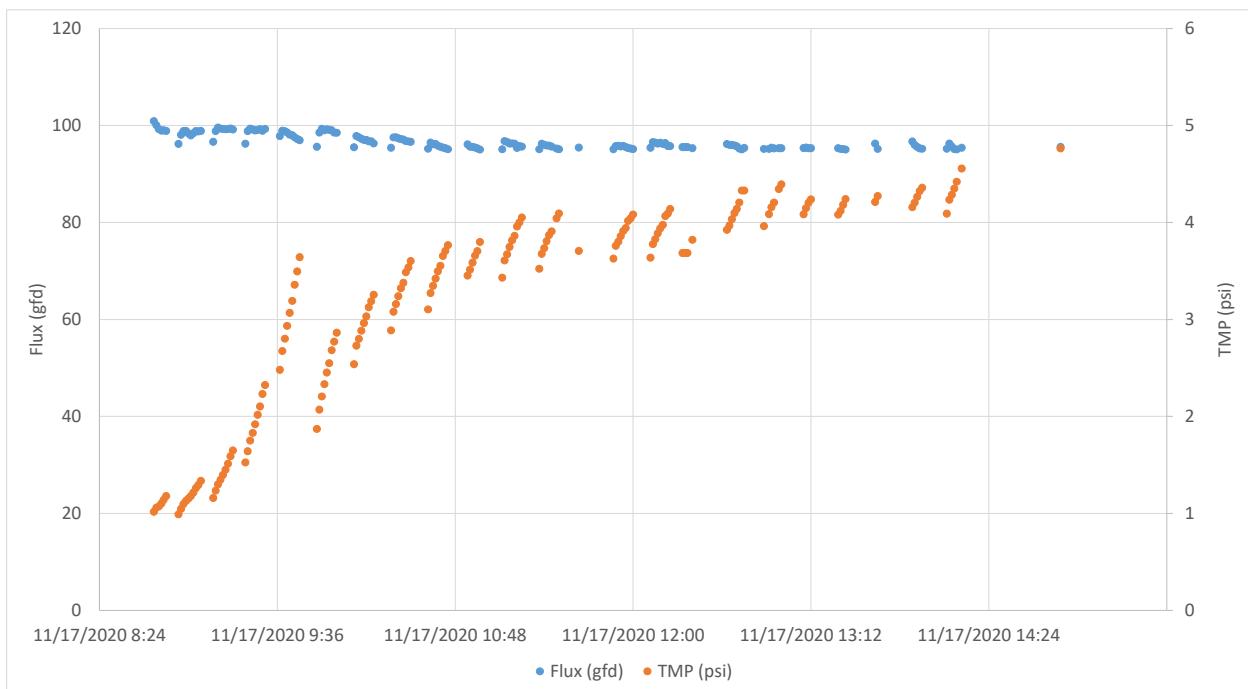
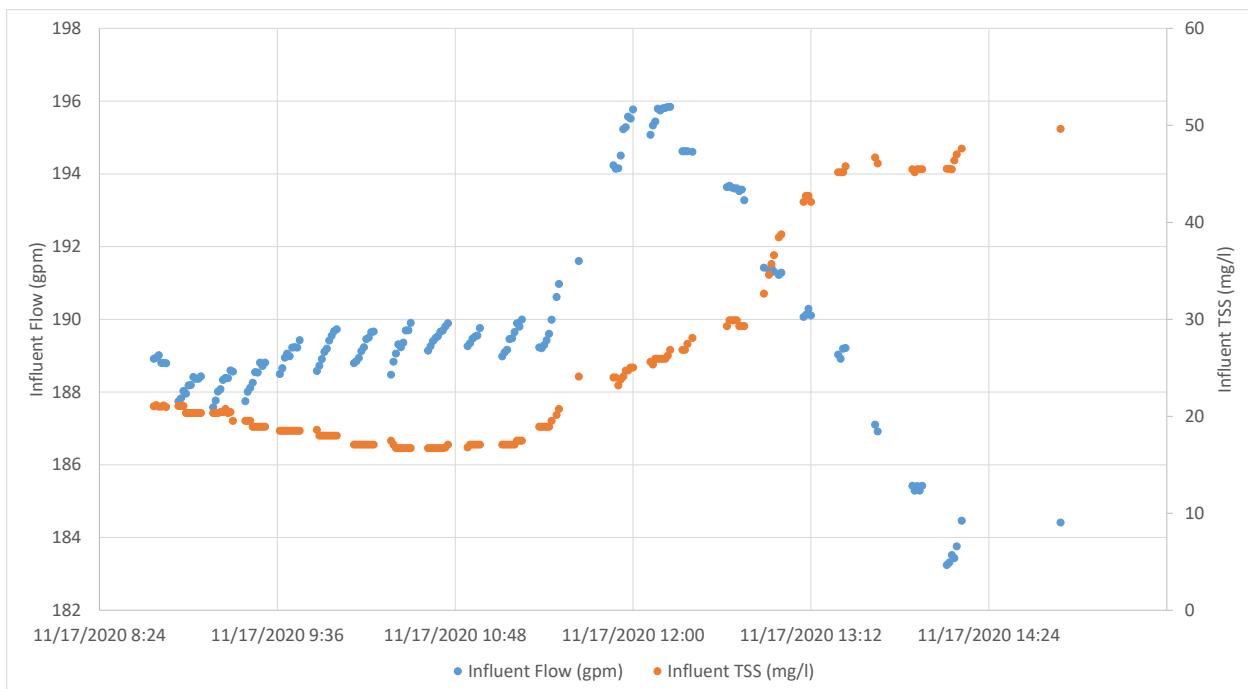
STARTING PROCEDURE

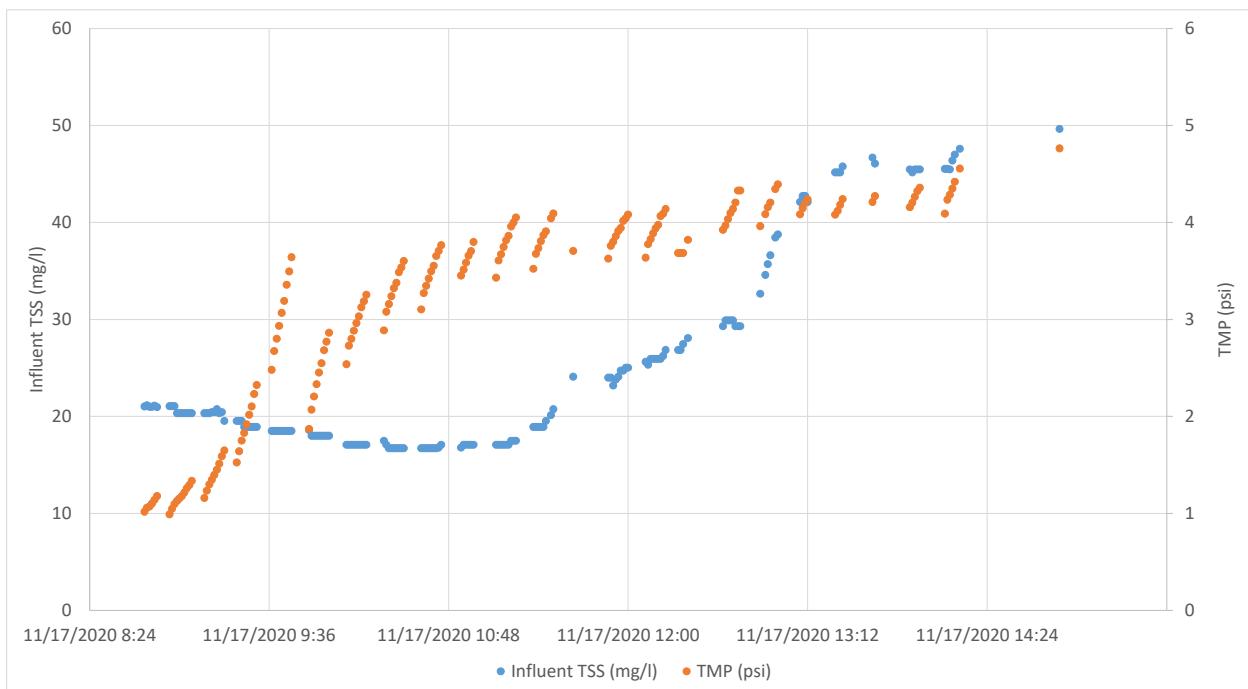
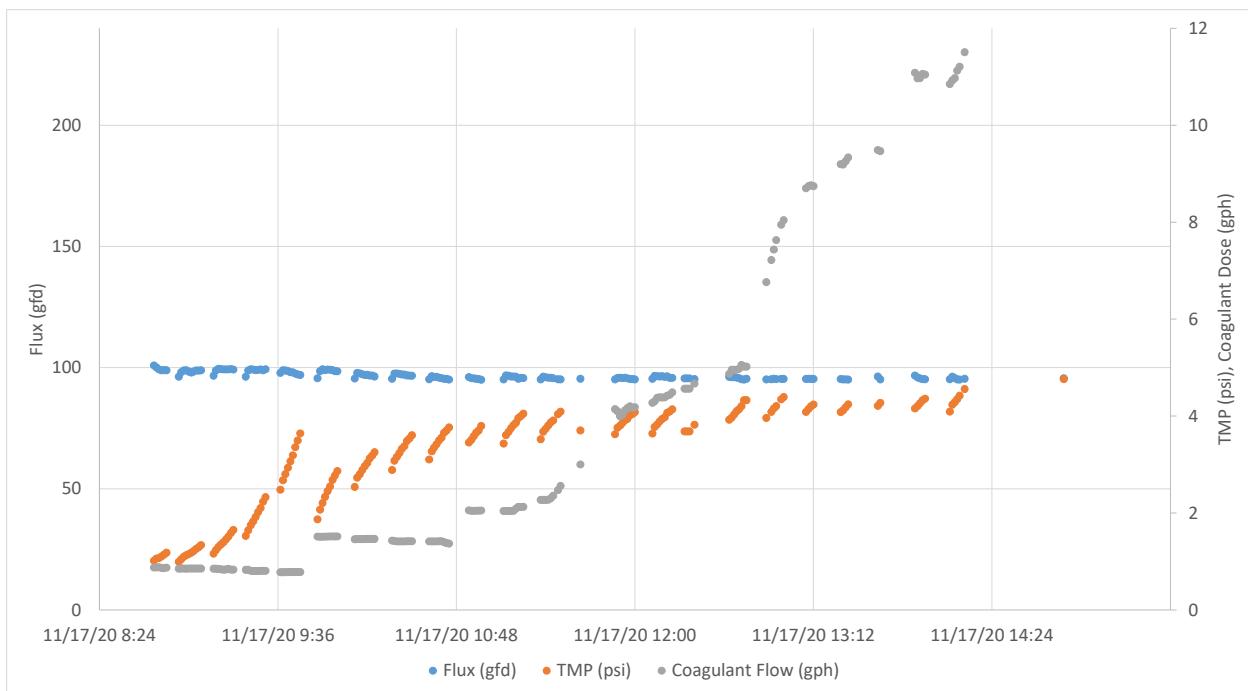
1. Inform WTP Main Control and inquire if there is any issue that would preventing the operation.
 2. Contact shift crew to arrange for after hour sampling.
 3. Obtain operating parameters and sampling schedule from the test package.
 4. If dilution water is required:
 - a. Contact Facility Service to charge the water hydrant.
 - b. Hydrant needs to be secured by 18:00 hrs.
 5. Log in. User name= h, password = h.
 6. Drain the pilot.
 - a. Drain membrane tank by opening the drain valve from control screen.
 - b. Drain permeate tank by opening the drain valve manually.
 7. Check chemical tanks.
 - a. Caustic - transfer of metering pump suction.
 - b. Sodium Hypochlorite – transfer of metering pump suction. (16 gal per run)
 - c. Alum – transfer of totes.
 - d. Contact Facility Services for support moving chemicals.
 8. Prime coagulant pump- only if switch to a new tank.
 - Press "Prim 60 sec"
 9. Adjust caustic addition valve to RUN position.
 10. Go to MAIN SCREEN and verify that all pumps, except for alkalinity, are in AUTO
 11. Set operating parameters in the following screen.
 - a. Select FLOW OPTIMIZATION screen
 - b. Verify that system is offline
 - c. Set parameters according to the test plan.
 12. Select chemical dosing strategy and set the parameters.
 13. Select ALARM. There are certain erroneous alarms that needs to be acknowledged to reset.
 14. Select FLOW OPTIMIZATION screen and put the system ONLINE.
 15. Turn on PE at the panel by the primary bldg.
 - a. Turn the switch to HAND
 - b. Press START
 - c. Open the PE hand valve completely.
 16. Monitor and confirm the increasing tank level.
 - a. Weir gate XVCS-101 is open, once the tank level is 0.1 in., this weir gate will close and the coagulant pump will start.
 17. Once coagulant pump start, start caustic pump manually.
 - a. Select PMP-AK 101 (alkalinity addition pump)
 - b. Adjust the pump speed to the target flowrate. 4% = 1.9 gph.
 - c. Verify the flowrate on the pump local display.
 18. Monitor and confirm:
 - a. Air blower starts once the tank is at 20 in.
 - b. Permeate pump starts at 116 in.
- new alarm
Tote installed*

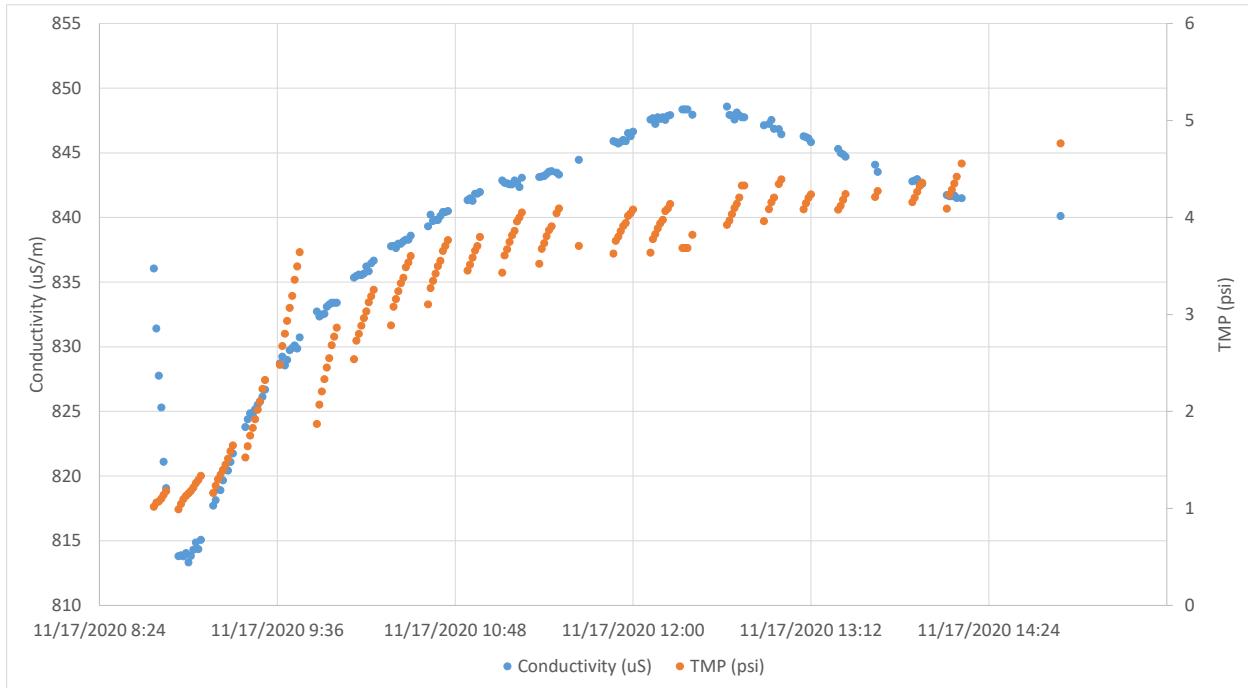
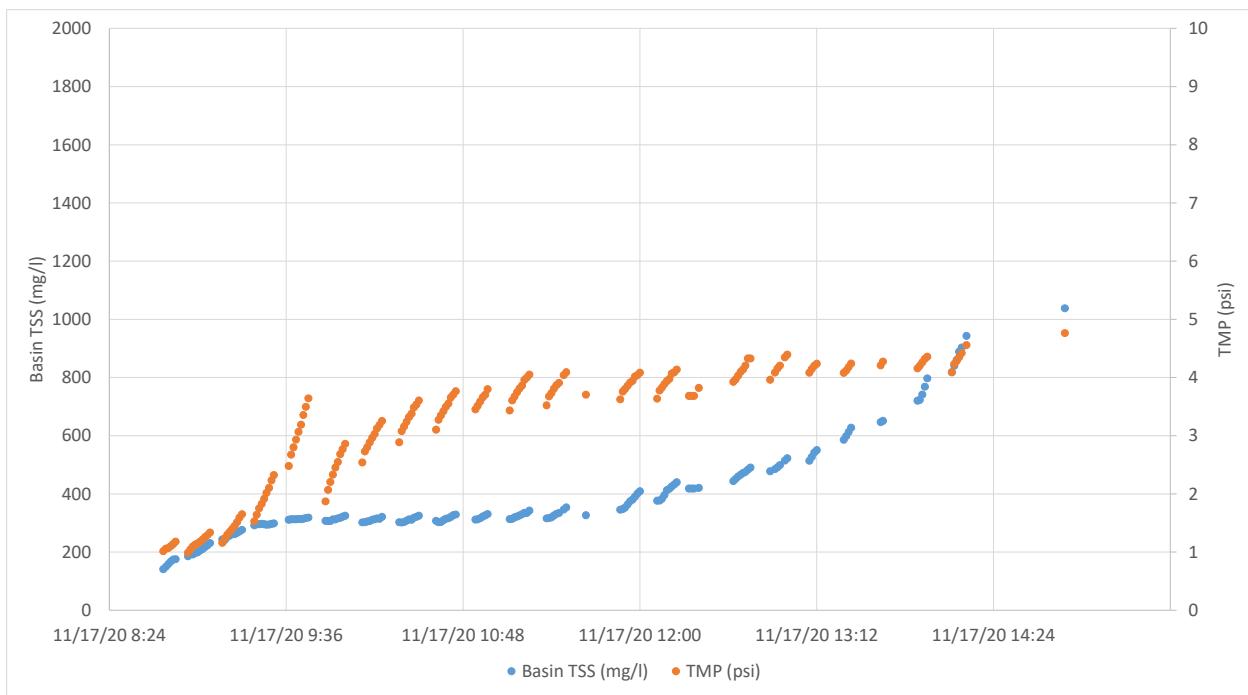
- c. Confirm that there are sufficient flow through sampling buckets.
19. Open the valve to effluent turbidimeter.
20. Setup auto sampler on influent and effluent.
 - Open valves to get flow through sampling buckets.
21. Allow the system to run for at least 1 full cycle to prior to data & sample collection. Refer to run guidance document on sampling starting time.
22. Start sample collection

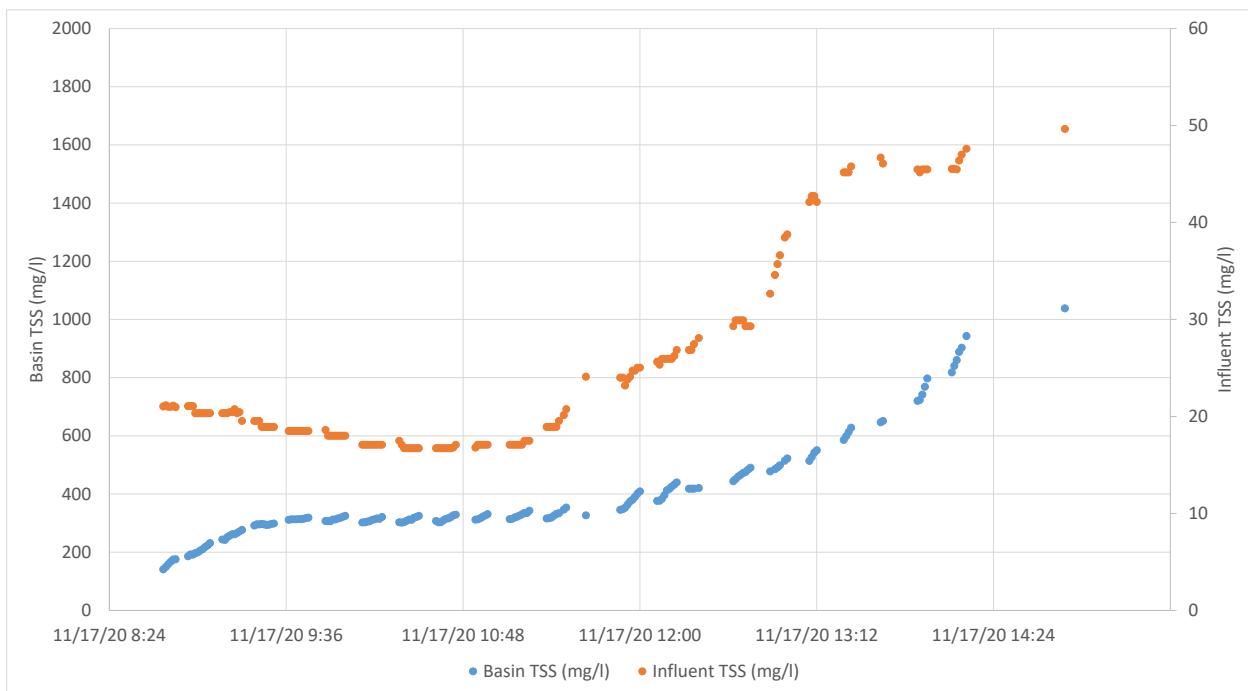
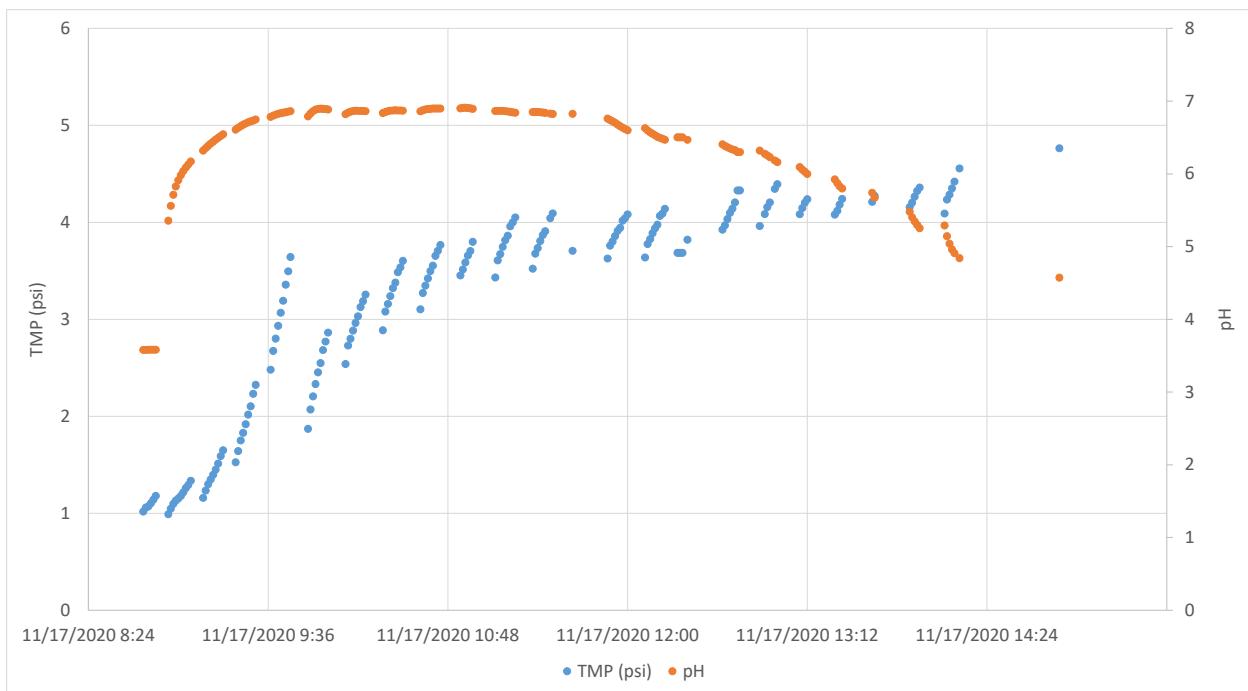
SHUTDOWN & CIP PROCEDURE

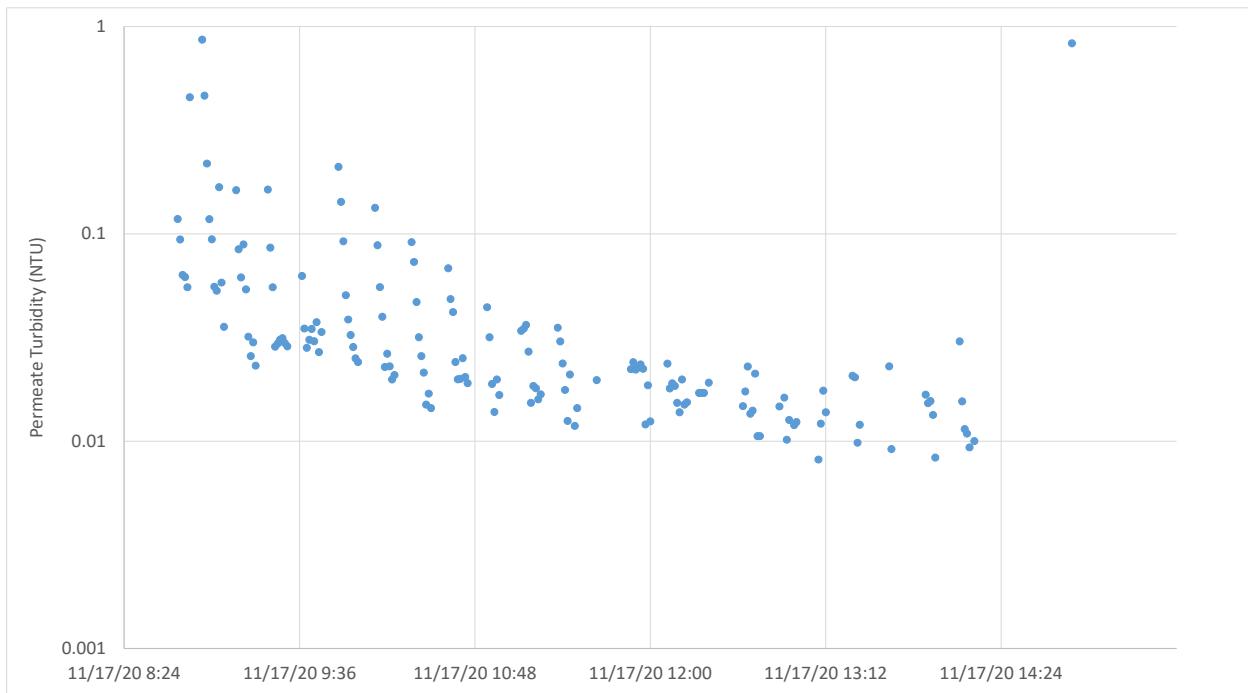
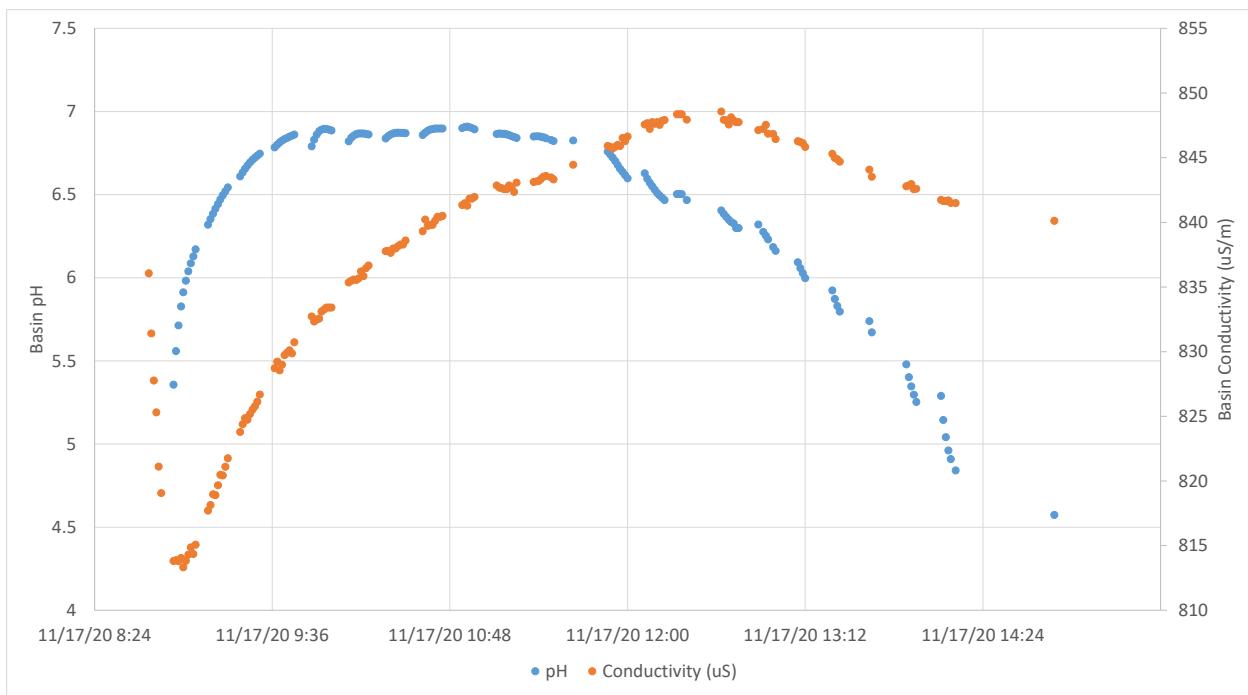
1. Check the hypo and caustic levels. Each cleaning cycle require ~~12~~ gal.
2. Close sampling valves, turbidimeter valves.
3. Switch alkalinity pump from manual to auto.
4. Prime hypochlorite pump.
5. Switch caustic addition valve position from RUN to CIP position.
6. Go to CIP screen to check the CIP parameters. If CIP is initiated from this screen, the system will go back into filtration once the CIP is completed (as long as the feed pump is on).
7. Wait for pump priming to finish.
8. Go to Flow Optimization screen and select "End of cycle".
 - If the pilot stopped/standby due to high TMP, press TMP reset, and the CIP will start.
9. Verify that the hypochlorite pump & caustic pumps are on.
10. Turn the feed off at the PE panel
 - a. Press STOP
 - b. Turn the switch to OFF
 - c. Close the manual valve
11. Spray down the membrane tank to remove foam and scum.
12. Log out.

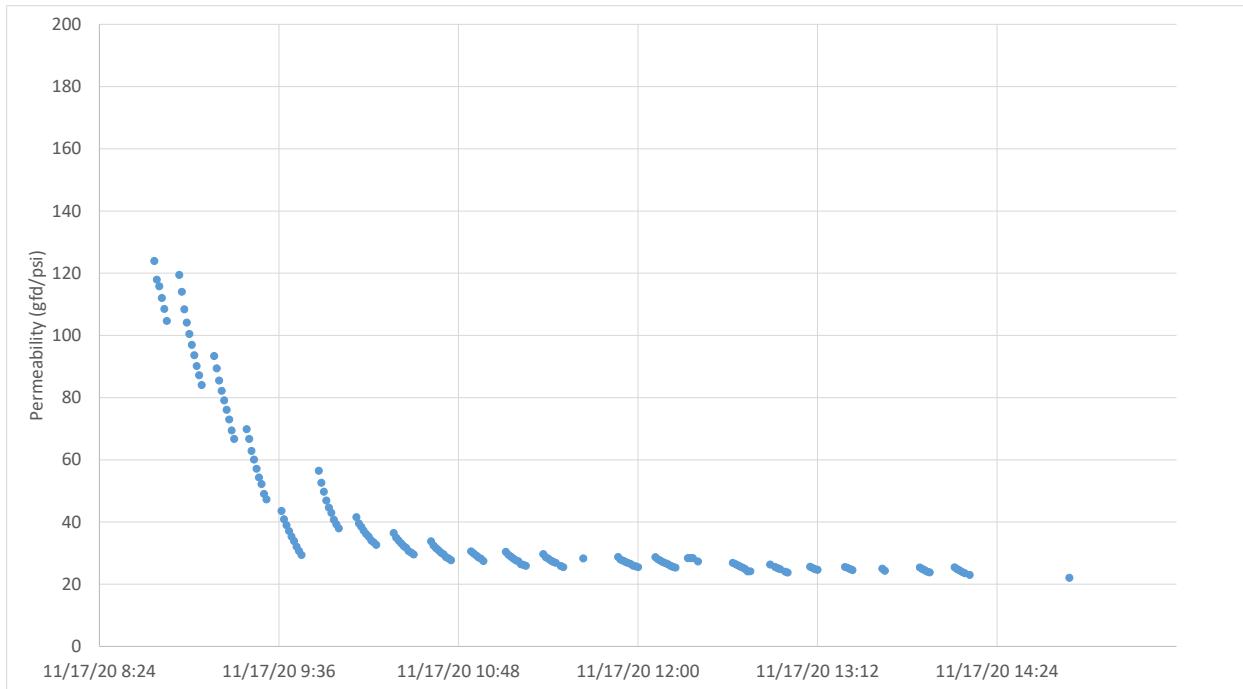


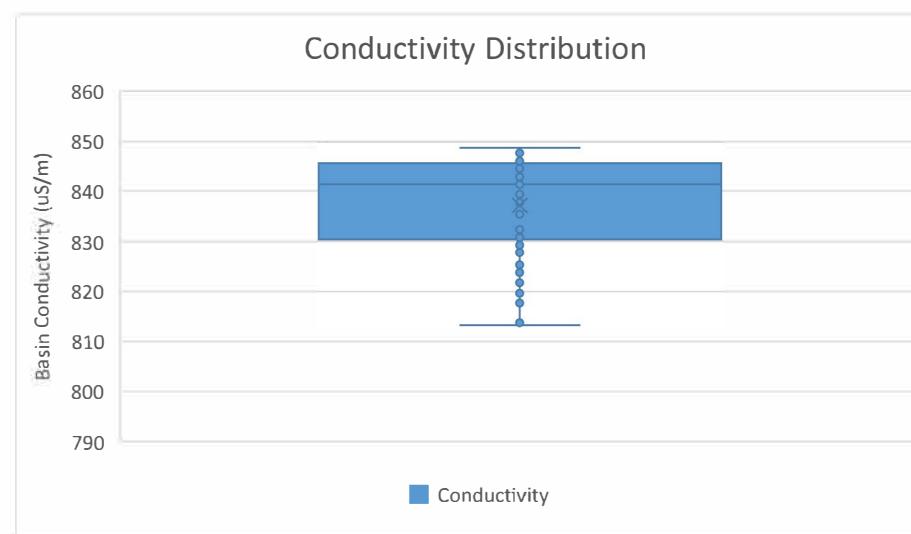
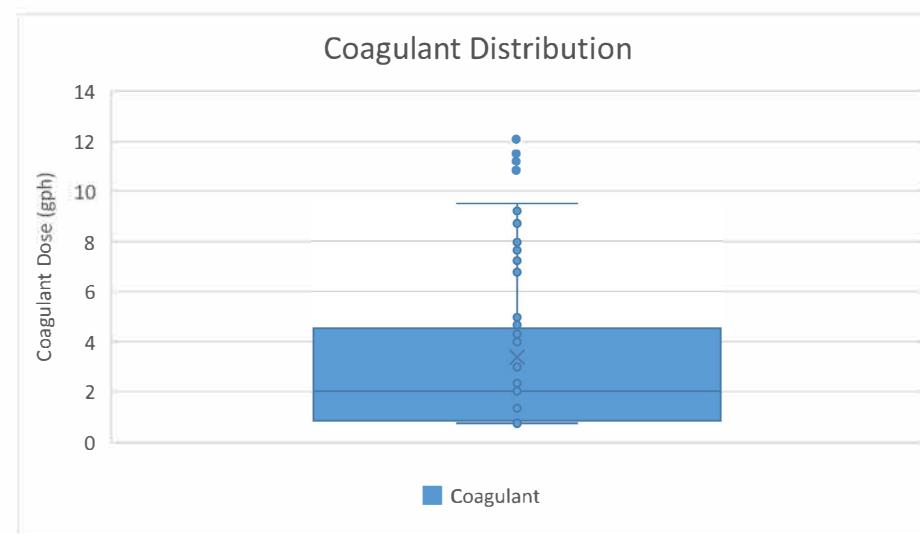
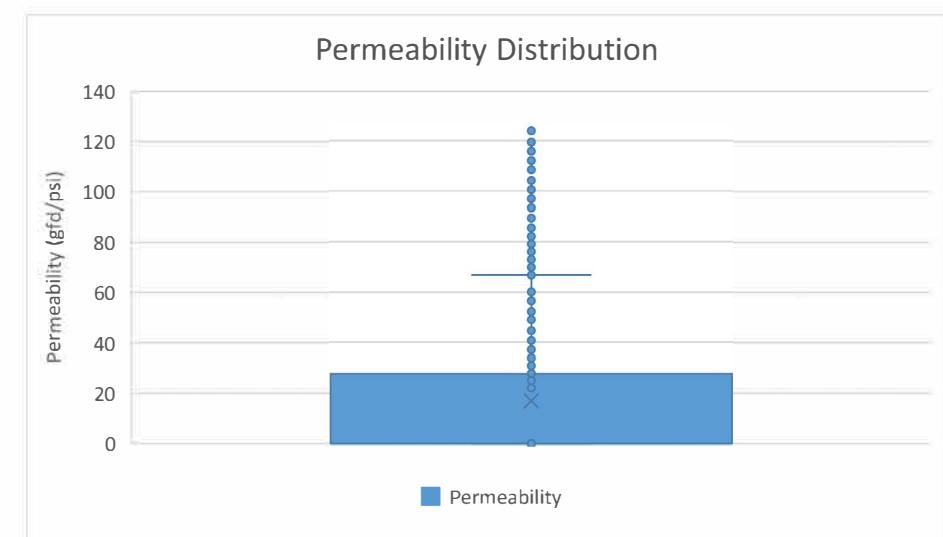
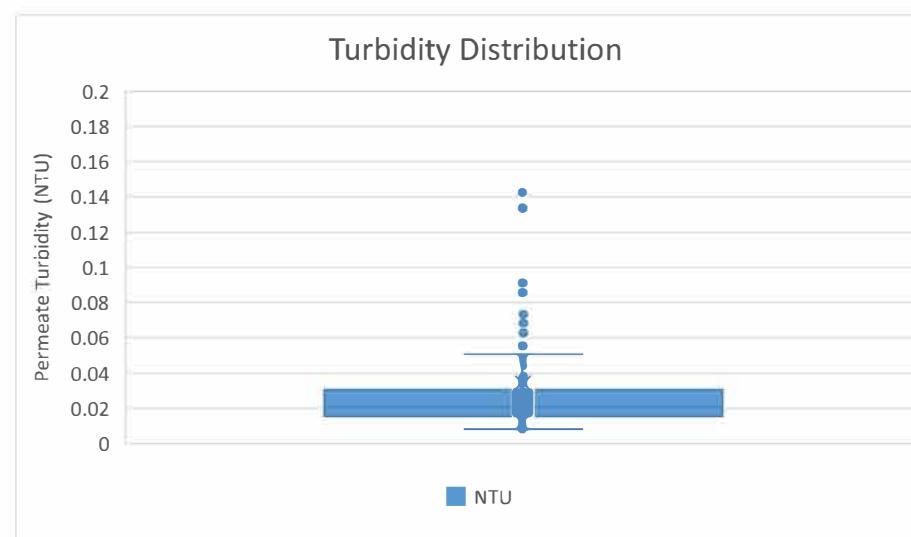
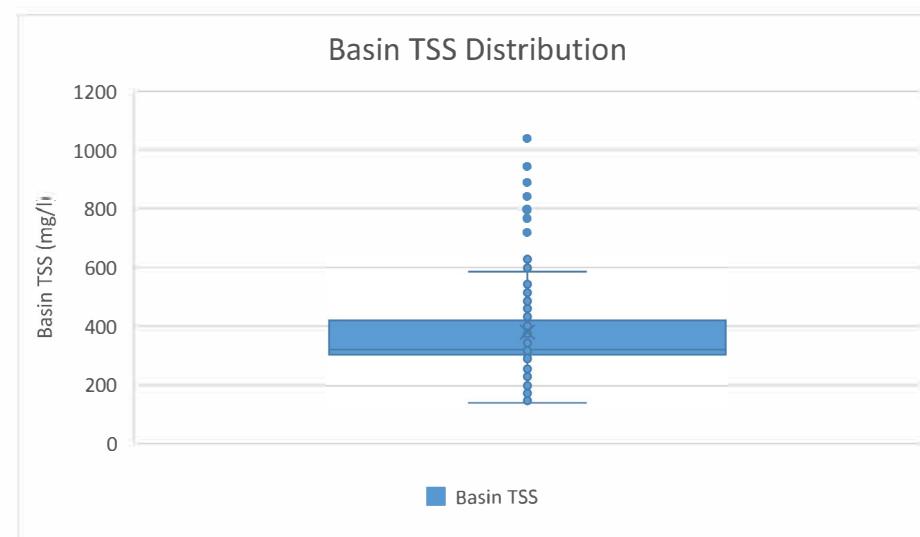
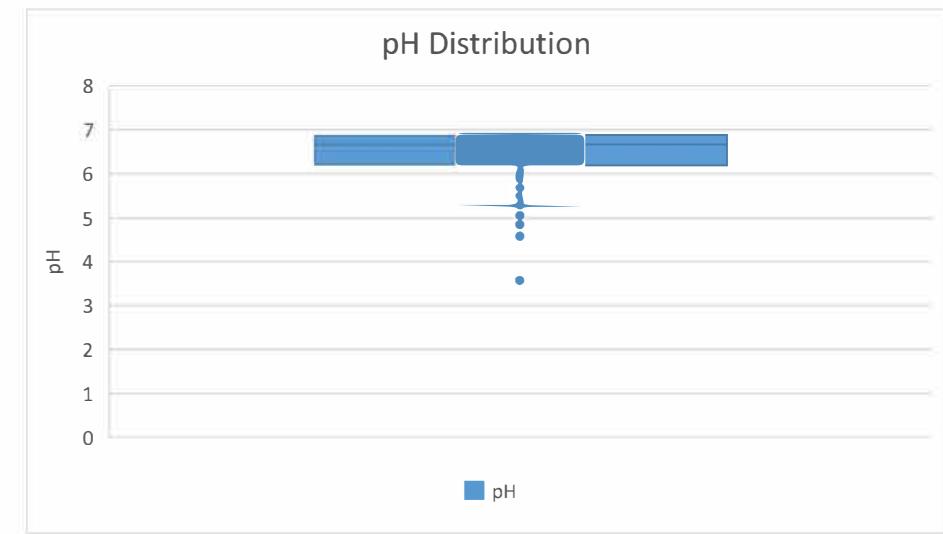
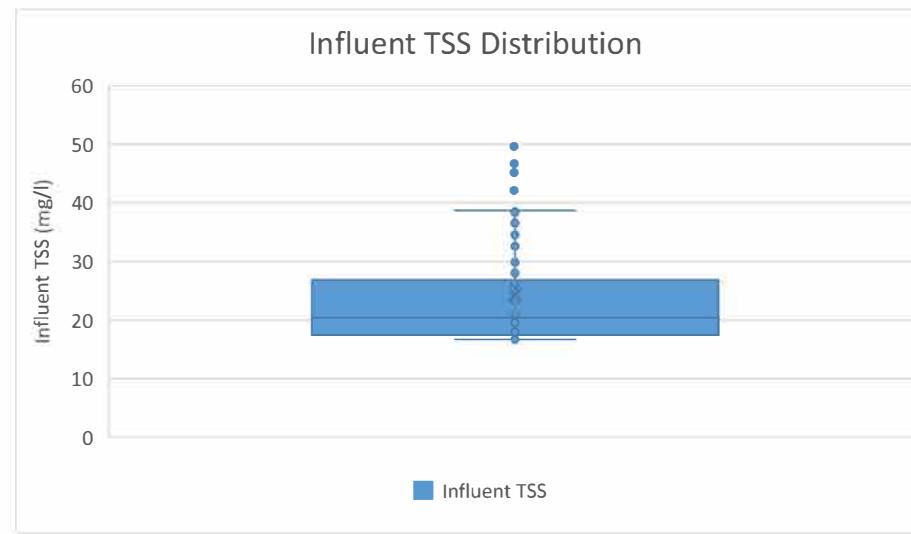
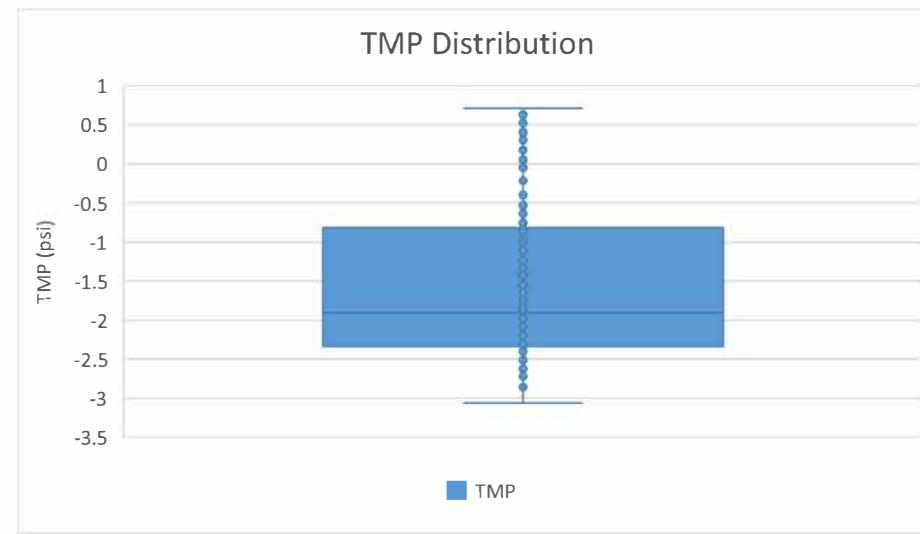










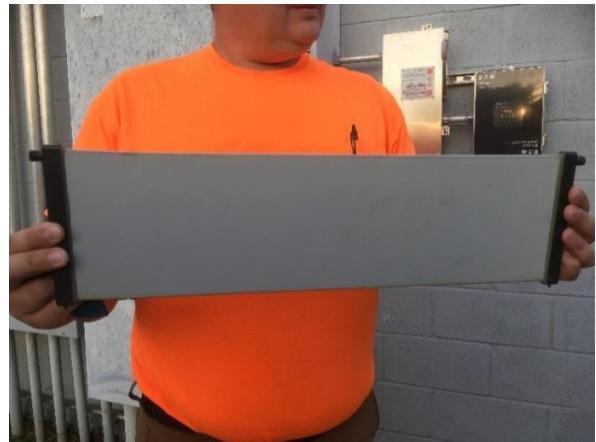


Appendix C

Photo Library



King County Pilot and Associated Piping



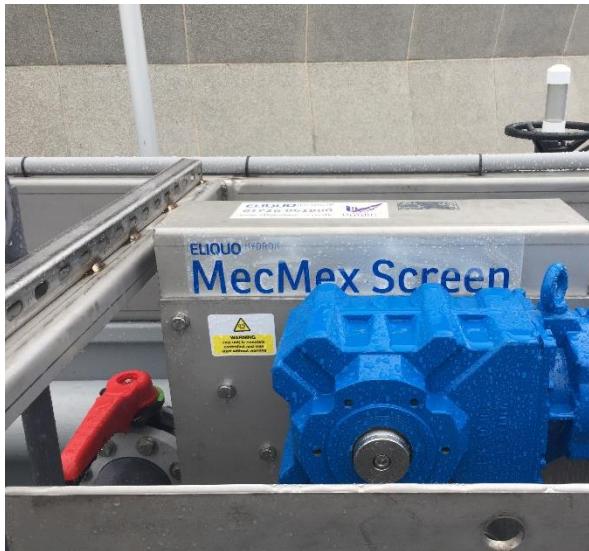
Membrane Plate



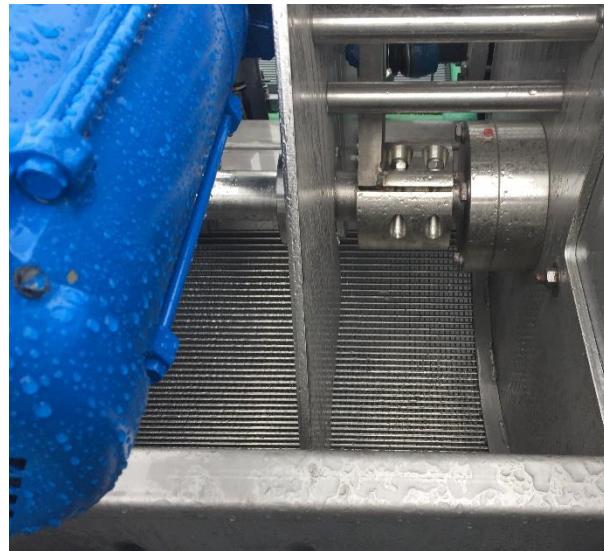
Bench Test Apparatus



Influent Head Box



Upflow Reject Influent Screen



Close-up of Influent Screen – Upflow into Membrane Tank



Head Box Drain Control



Head Box Drain



Head Box Overflow Return to Plant



Membrane Tank with Towers – Head Box in Background



Membrane Tower



Scour / Mixing Blowers



Close-up of Blowers



Foreground: Permeate / Backpulse Pumps –
Background Chemical Feed Pumps



Chemical Feed Pumps and Instruments



Chemical Injection Ports



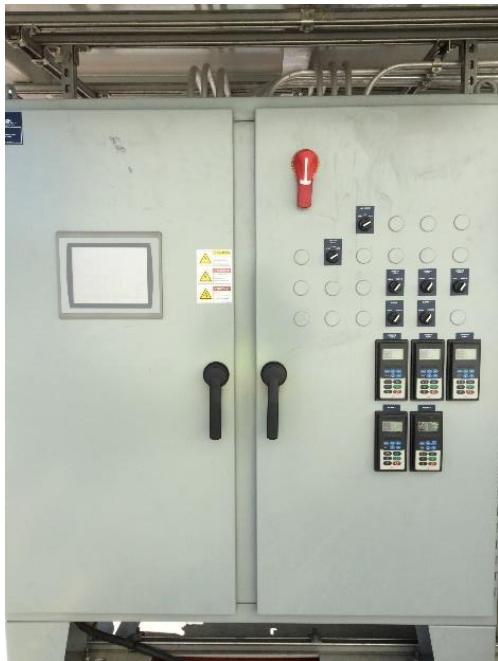
Flow Meter



Instrument Displays (pH, TSS, and turbidimeter)



Back Side of Pilot Showing Control Panel –
Blowers on Upper Deck



Pilot Control Panel and HMI



Submerged Screen Box Next to Membrane Tank



Foaming During Operation

Appendix D

Bench and Jar Test Summary

Bench Test Summary

		Flux @20C (gfd)			Decline rate	Coagulant				Dose Ratio		pH		Alkalinity (mg/L as CaCO ₃)					Max BP flux @20C	Recovered flux		Pressure (psi)				Plate #			
Run	Date	starting	end	decline	gfd/min	Product	Dose (mg/L as Al)	TSS (mg/L)	COD (mg/L)	(mg Al/mg TSS)	(mg Al/mg COD)	Before dosing	After dosing	Consumption	Conductivity (uS/cm)	Turbidity (NTU)	(gfd)	(gfd)	% Recovered	starting	end	increase	Test Duration (min)	Water source		Comments			
1	10/12/2018	140	75	65	3.42	ACH	11	34		32%		7.44	7.47	211	205	6	943.6	24.9				18%			19	PE/eff	2	Pore Plugging Apparent	
2	10/18/2018	53	38	15	0.79	ACH	5.5	40		14%		7.14	7.89	194	187	7	910.6	30.4				47%			19	1:1 PE:eff	2	Less plugging, More like cake layer filtration	
3	10/23/2018	135	101	34		ACH	16.5	35	145	47%	11%	7.06	7.13	197	191	6	1094					~			25-40	1:1 PE:eff	2	Pore Plugging Apparent	
4	10/24/2018	124	118	6	0.21	ACH	33	36	142	92%	23%	7.51	7.28	192	185	7		34.5	370				~			28	1:1 PE:eff	2	Stable Flux
5	11/1/2018	113	38	75	5.00	none	0	33	114	0%	0%	8.24	8.28	182	169	13	1167	22.9	259	74	65%				15	1:1 PE:eff	2		
6	11/6/2018	98	69	29	1.45	ACH	33	33	114	100%	29%	7.74	7.37	182	169	13	1063	34.3	271	86	88%				20	1:1 PE:eff	2	noticed lots of air in the tubing. Later found the diffuser resting too close to the membrane- could be possible cause.	
7	11/8/2018	127	93	34	1.62	ACH	33	26	175	127%	19%	7.33	7.32	188	185	3	967	26.6	237	113	89%				21	1:1 PE:eff	2	noticed lots of air in the tubing. Later found the diffuser resting too close to the membrane- could be possible cause.	
8	11/13/2018	122	127	-5	-0.20	ACH	33	30.4	164	109%	20%	7.2	7.18	211	205	6	1030	30.4	232	121	99%	negl	negl	n/a	25	1:1 PE:eff	3	new setup/hard tubing, new membrane	
9	11/15/2018	113	119	-6	-0.24	ACH	47	32	125	147%	38%	7.4	nd	205	190	15	974	24.3	232	112	99%	negl	negl	n/a	25	1:1 PE:eff	3		
10	11/27/2018	110	94	16	0.64	ACH	33	15	32	220%	103%	7.09	5.97	19	13	6	173	9.22	232	104	95%	1.2	3.6	2.4	25	1:3 PE:DI	3		
11	11/28/2018	91	81	10	0.40	ACH	33	48	116	69%	28%	7.36	6.9	82	72	10	267	37	232	99	109%	4.5	6.5	2	25	EW	3		
12	12/6/2018	85	86	-1	-0.05	ACH	33	0	0			5.45	3						219	85	100%	<1	<1	0	20	DI	3		
13	12/11/2019	80	84	-4	-0.20	ACH	5.5	22	78	25%	7%	7.26	7.35	62	60	2	901.5	19.3	211	99	124%	<1	<1	0	20	1:1 PE:DI	4		
14	12/18/2018	82	87	-5	-0.25	ACH	2.5	20	24	13%	10%	7.48	7.2	28	27	1	118.8	10.5	220	91	111%	<1	<1	0	20	1:1 PE:DI	5		
15	12/19/2018	108	103	5	0.23	ACH	2.5	40	88	6%	3%	7.29	7.22	54.5	52	2.5	163.3	27	235	86	80%	<1	<1	0	22	CSO	4	CSO collected previous day	
16	12/20/2018	93	85	8	0.40	alum	2.5	32	76	8%	3%	7.07	7.43	49	38	11	153.3	22.2	198	85	91%	2.4	4	1.6	20	CSO	3	CSO collected previous day, notice more foam during the test	
17																													

EW Membrane Jar Testing

Date:	10/18/2018
Water source:	50:50 PE:C3
Temperature:	17.6
Coagulant	Sumalchlor50
Stock solution conc:	
Sumalchlor final conc:	
Estimated TSS:	50 mg/L
Estimated BOD:	

Jar #	dose mL	Sumalchlor50 dose			Alkalinity mg/L	Alk consumption mg/L	TSS mg/L	Observation
		mg/L as SC50	mg/L as Aluminum	mg/L as Alum				
1	0	0	0	0	215		31	no floc
2	1	44	5.5	35	207	8	128	5.5 mg/L as Al resulted in small, but well formed floc. As the dose increases, the floc appeared to be fluffier and the supernatant (if let sit) less clear. Therefore, we selected the 5.5 mg/L Al for bench test.
3	2	89	11	70	205	10	206	
4	3	133	16.5	105	202	13	286	
5	4	177	22	140	194	21	348	
6	6	266	33	210	192	23	500	

OVIVO PROJECT

Sample	Sample Date	Test Date	pH	Alkalinity	Conductivity		Turbidity	TSS	COD	Comments
Jar test #1	10/18/2018	10/19/2018		215				31		
Jar test #2	10/18/2018	10/19/2018		207				128		
Jar test #3	10/18/2018	10/19/2018		205				206		
Jar test #4	10/18/2018	10/19/2018		202				286		
Jar test #5	10/18/2018	10/19/2018		194				348		
Jar test #6	10/18/2018	10/19/2018		192				500		
A1 PE + C3	10/18/2018	10/19/2018	7.14	194	944.1		30.9	40		pH was out of holding

EW Membrane Jar Testing

Date:	10/29/2018
Water source:	EW dewatering sample
Temperature:	15
Coagulant	Sumalchlor50
Stock solution conc:	13.3 mL in 100 mL
TSS	12 mg/L
COD	50 mg/L

Jar #	dose mL	Sumalchlor50 dose			Observations	pH	Alk consumption		TSS	
		mg/L as SC50	mg/L as Aluminum	mg/L as Alum			Alk (mg/L)	mg/L		
1	0	0	0	0	no floc	6.55	40		12	
7	0.5	44	5.5	35	small pin floc	6.65	40	0	36	
2	1	89	11	70	smaller pin floc	6.42	38	2	32	
3	2	177	22	140	no floc initially, the floc starting to develop and grow in size with caustic addition	6.27	34	6	48	samples collected before caustic
4	3	266	33	210		6.08	35	5	32	
5	4	354	44	280		5.93	33	7	20	
6	6	443	55	350		5.69	32	8	20	

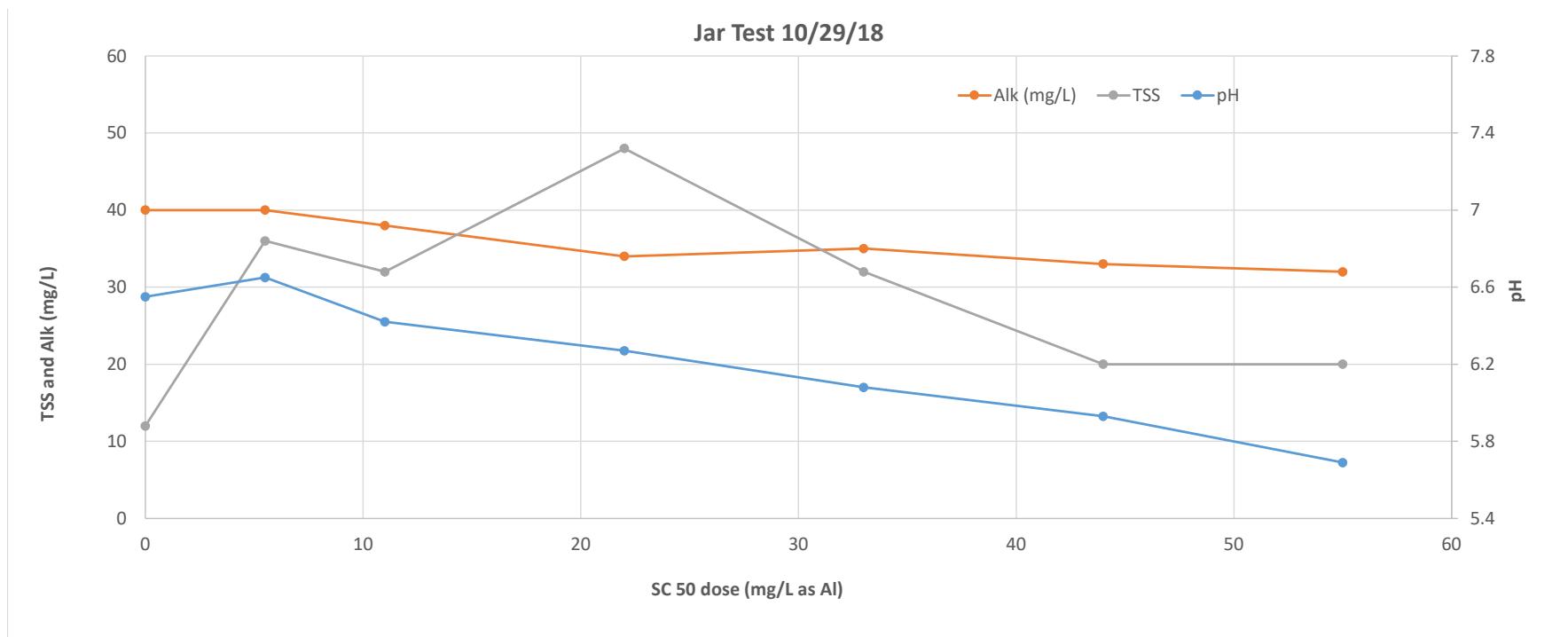
Note:

After SC50 dosing, small pin floc was observed with the dose 5.5 & 11 mg/L as Al. No floc was seen with higher doses. Suspected that the alkalinity was limited.

Add few drops of caustic in the jar 3-6, notice that the flocs starting to form. Higher caustic --> larger flocs.

OVIVO PROJECT

Sample	Sample Date	Test Date	pH	Alkalinity	Conductivity	Turbidity	TSS	COD	Comments
Jar test 1	10/29/2018	10/29/18 pH, 10/30/18 TSS, Alk, COD	6.55	40			12	50	
Jar test 2	10/29/2018	10/29/18 pH, 10/30/18 TSS, Alk, COD	6.42	38			32		
Jar test 3	10/29/2018	10/29/18 pH, 10/30/18 TSS, Alk, COD	6.27	34			48		
Jar test 4	10/29/2018	10/29/18 pH, 10/30/18 TSS, Alk, COD	6.08	35			32		
Jar test 5	10/29/2018	10/29/18 pH, 10/30/18 TSS, Alk, COD	5.93	33			20		
Jar test 6	10/29/2018	10/29/18 pH, 10/30/18 TSS, Alk, COD	5.69	32			20		
Jar test 7	10/29/2018	10/29/18 pH, 10/30/18 TSS, Alk, COD	6.65	40			36		



COD in untreated water = 50 mg/L