Onondaga County, New York

CSO 018 Constructed Wetlands Pilot Treatment System

Sampling Plan

Prepared for

New York State Department of Environmental Conservation

Prepared jointly by

Onondaga County Department of WATER ENVIRONMENT PROTECTION and ch2m SM

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Revision 4

Contents

Appendices

Tables

SECTION 1

Objectives

The following are the primary objectives of the sampling plan. Revision 4 of the Sampling Plan is for the period of April 1, 2016 through April 1, 2017 and reflects changes in procedures initiated during the first year of the pilot monitoring program for the Facility.

1. Monitor the overflow parameters required under the State Pollutant Discharge Elimination System (SPDES) permit (Permit Number NY 002 7081; Modification Date: June 4, 2014).
2. Monitor the performance of grit and floatables (G&F) removal system.
3. Assess target pollutant removal efficiencies for the wetland system with respect to the three different wetland types: Floating Wetland Islands (FWI), Vertical Down Flow (VDF) wetlands, and Surface Flow (SF) wetlands; and three different flow sequences (series, parallel, series-parallel).

SECTION 2

Sampling Responsibilities

Flow and water quality monitoring will be performed. Sampling staff will be from the Onondaga Environmental Institute (OEI) under the direction of CH2M and the Onondaga County Department of Water Environment Protection (OCDWEP). Sampling efforts will be coordinated in accordance with the Combined Sewer Overflow (CSO) Event Notification/Sampling Flowchart included in Appendix A. All sampling staff members have received OCDWEP staff training in appropriate sampling and preservation protocols.

The OCDWEP laboratory will be analyzing water quality samples in accordance with standard testing procedures. Data will be compiled by OEI and Quarterly Performance Reports will be submitted to the NYSDEC by OCDWEP. Table 2-1 summarizes the sampling and monitoring-related activities for the project site and lists the responsible party for each activity.

TABLE 2-1
Preliminary Sampling Activity List with Associated Responsibilities

Activity	Routine	Frequency	Responsibility
Wetland - General			
Sampling	Collect samples per SPDES Permit and Deliver to OCDWEP Lab for Analysis	During each qualifying CSO event*	Sampling Staff
Flow Monitoring	Collect data from flowmeters	During/After each CSO event as required by the SPDES Permit	OCDWEP (SCADA)
Lab Analysis	Analyze samples per SPDES Permit	After each CSO event; parameter analysis must meet respective lab method protocols (i.e., 6 hours to deliver to lab for fecal coliforms)	OCDWEP Lab
Water Levels	Check water levels	Weekly and/or following storm events	Sampling Staff
Flow Monitoring Equipment	Perform maintenance checks	Monthly	Savin Engineers under CH2M guidance, OCDWEP involvement if replacement is required
Grit and Floatables Removal System	Perform general maintenance check	After first 2 CSO Events; Monthly	Sampling Staff
	Check screens	Monthly and after storm events	Sampling Staff
	Check/Empty grit storage tank	Monthly and after storm events	OCDWEP

*Note: A qualifying CSO event is defined in Section 4.1.

SECTION 3

Sampling

Sampling staff will monitor the treatment system for the following parameters: target pollutants identified by the SPDES permit, wetland cell water levels and flow rates, in situ environmental parameters, and vegetation. Meteorological conditions will also be monitored. “Treatment system components” referred to in the text signify the grit and floatables (G&F) removal system and wetland cells 1-3. The following sections codify the parameters of interest, indicating general sampling frequency and association with monitoring objectives.

3.1 Parameter Sampling and Flow Monitoring

Per the SPDES permit, samples will be collected and flows will be metered, as shown in Table 3-1. The locations of the parameter sampling and flow metering are shown in the flow diagrams provided in Appendix B. Note that the sampling/metering locations shown in Table 3-1 are for series operation. When in series/parallel or parallel operation, the effluent sampling location will be MH-19, other sampling/metering locations will remain the same. The actual effluent location will be sampled for the appropriate operation scenario. Samples will be collected as stated in Section 4 of this report. Note that additional samples will be collected from FDS-11 and FDS-13 (not required by the SPDES permit) for analyzing and optimizing the treatment system performance.

TABLE 3-1
SPDES Permit Parameter Sampling

Overflow Parameter	Limits, Per Event		Units	Frequency	Sample Type	Sampling/Metering Location – Series		Sampling/Metering Location – Series/Parallel		Sampling/Metering Location – Parallel	
	Type	Limit				Influent	Effluent	Influent	Effluent	Influent	Effluent
Wetlands Discharge Volume	Total	Monitor	MG	Each Event	Recorded	MH-4A	MH-18	MH-4A	MH-19 - MH-5A[3]	MH-4A	MH-19 - MH-5A[3]
Overflow Volume[1]	Total	Monitor	MG	Each Event	Recorded	N/A	MH-5A	N/A	MH-5A	N/A	MH-5A
BOD_5	Average	Monitor	mg/L	1/ 4 hrs	Composite[2]	MH-1D[6]	MH-18	MH-1D[6]	MH-19[4]	MH-1D[6]	MH-19[5]
TSS	Average	Monitor	mg/L	1/ 4 hrs	Composite[2]	MH-1D[6]	MH-18	MH-1D[6]	MH-19[4]	MH-1D[6]	MH-19[5]
Settleable Solids	Average	Monitor	mL/L	1/ 4 hrs	Grab	MH-1D[6]	MH-18	MH-1D[6]	MH-19[4]	MH-1D[6]	MH-19[5]
Oil and Grease	Average	Monitor	mg/L	1/ 4 hrs	Grab	-	MH-18	-	MH-19[4]	-	MH-19[5]
Floatable Material	Total	Monitor	Days	1/ 4 hrs	Visual Observation	-	MH-18	-	MH-19[4]	-	MH-19[5]
Screenings	Monthly Total	Monitor	CY	After each event	Calculated	MH-1D[6]	-	MH-1D[6]	-	MH-1D[6]	-
Chlorine, Total Residual	Average	0.2	mg/L	1/ 4 hrs	Grab	-	MH-18	-	MH-19[4]	-	MH-19[5]
Fecal Coliform	Geometric Mean	200	No./100 mL	1/ 4 hrs	Grab	MH-1D[6]	MH-18	MH-1D[6]	MH-19[4]	MH-1D[6]	MH-19[5]
Ammonia	Average	Monitor	mg/L	1/ 4 hrs	Composite[2]	MH-1D[6]	MH-18	MH-1D[6]	MH-19[4]	MH-1D[6]	MH-19[5]
TKN	Average	Monitor	mg/L	1/ 4 hrs	Composite[2]	-	MH-18	-	MH-19[4]	-	MH-19[5]
Total P	Average	Monitor	mg/L	1/ 4 hrs	Composite[2]	MH-1D[6]	MH-18	MH-1D[6]	MH-19[4]	MH-1D[6]	MH-19[5]
DO	Minimum	Monitor	mg/L	1/ 4 hrs	Grab	-	MH-18	-	MH-19[4]	-	MH-19[5]

[1] Overflow volume refers to volume that bypasses the wetland facility.

[2] Samples will be taken consistent with the Sampling Plan requirement in Additional Condition #5 on Page 13 of the SPDES Permit. This condition states that the sample type for BOD_5, Suspended Solids, Ammonia, TKN and Total Phosphorus shall be composite of grab samples, one taken every four hours during each event.

[3] When in series/parallel or parallel operation under standard or bypass event operating conditions, the wetlands discharge volume will be obtained by subtracting the overflow volume recorded at MH-5A from the volume recorded at MH-19.

[4] If an emergency bypass event occurs when in series/parallel operating condition, effluent samples will be collected from FDS-13 and MH-18 to ensure that the flow sampled does not include a mixture of bypass flow. Refer to Section 4.2.1 for further discussion.

[5] If an emergency bypass event occurs when in parallel operating condition, effluent samples will be collected from FDS-11, FDS-13, and MH-18 to ensure that the flow sampled does not include a mixture of bypass flow. Refer to Section 4.2.1 for further discussion.

[6] MH-1D is synonymous with Box 2.

The following footnotes from the SPDES permit will apply:

1. No discharge from Outfall 018 except for treated effluent associated with the design storm for the CSO 018 Pilot Constructed Wetlands (CW) treatment facility. No discharge from Emergency Bypass Outfall 018A except for flows in excess of the design storm for the CW treatment facility and the hydraulic capacity of the Harbor Brook Interceptor Sewer.
2. Samples will be taken consistent with the Sampling Plan requirement in Additional Condition #5 on Page 13 of the SPDES Permit. This condition states that the sample type for BOD_5, Suspended Solids, Ammonia, TKN, and Total Phosphorus shall be composite of grab samples, one taken every 4 hours during each event.
3. Visual observation is required during each sampling event. Report and list the number of days during the quarter where at least one visual observation indicates the presence of floatables material.
4. The permittee will measure and report each quarter, the total volume of flow discharged from CSO 018A during each event. No discharge except that exceeding the design storm for CSO 018. *Note: For clarification purposes, CSO 018A is understood to be MH-19 and CSO 018 is understood to be MH-18.*
5. The permittee will use Method Chlorine by DPD Chlorine Method (4500-Cl G) for Total Chlorine Residual and also for the following four additional analytes: Mononchloramine, Chloramines, Total Dichloramine, and Chlorine.
6. Effluent disinfection required: seasonal from April 1 to October 15, effective April 1, 2016 unless the permittee demonstrates to the Department's satisfaction that disinfection is not required. Monitoring these parameters is only required during the period when disinfection is required. *Note: In a letter from OCDWEP to the NYSDEC on July 11, 2014, OCDWEP requested an extension of the April 1, 2016 effective date to April 1, 2017 to allow for two full years of facility operation and evaluation. A second letter from OCDWEP to the NYSDEC requesting the same was sent on March 8, 2016.*
7. Auto, Recording Gauge within drainage area. Correlate precipitation records with sampling results.
8. Correlate sampling results with upstream and downstream values derived from the concurrent Ambient Monitoring Program (AMP) and the Microbial Trackdown study.
9. During the establishment of the CSO 018 Pilot Constructed Wetland (CW) treatment facility, the interim effluent limit for fecal coliform shall be "Monitor" until April 1, 2016. *Note: In a letter from OCDWEP to the NYSDEC on July 11, 2014, OCDWEP requested an extension of the April 1, 2016 effective date to April 1, 2017 to allow for two full years of facility operation and evaluation prior to NYSDEC's determination of seasonal disinfection requirements for the effluent. A second letter from OCDWEP to the NYSDEC requesting the same was sent on March 8, 2016.*
10. A bypass event starts at the moment wastewater overflows the bypass weir and discharges through CSO 018 and/or CSO 018A and continues until the overflow from the outfall(s) stops. Sampling during each bypass event shall occur within the first 60 minutes of the bypass and every 4 hours thereafter. If the bypass does not occur for more than 30 minutes, it is not necessary to collect a sample.

3.2 Water Levels and Flow

Water levels in wetland Cells 1 and 3 (FWI and SF, respectively) will be recorded during weekly site visits from staff gauges. Water levels will not be recorded in Cell 2 (VDF) since the cell drains quickly and remains dry at the surface during non-storm event conditions.

Flow will be measured using in-pipe ISCO flowmeters. Permanent flowmeters, installed in the discharge pipe from Cell 3 (MH-18), the discharge pipe into Harbor Brook (MH-19), and at the influent to the G&F facility (MH-4A), will transmit data to OCDWEP via their supervisory control and data acquisition (SCADA) system. Data from the wetland emergency bypass flowmeter (in MH-5A) will be downloaded monthly via direct

connection to the meter. Additional temporary flow meters will be installed in the outlet pipes from FDS-11 and FDS-13 to quantify flows from Cell 1 and 2, respectively, when the system is operating in parallel or series/parallel modes. Data from the temporary flow meters will be downloaded monthly via direct connection.

3.3 In Situ Environmental Parameters

In situ measurements of diagnostic parameters provide insight into the biogeochemical processes at work within the treatment system and provide metrics of wetland health. Relating these variables to pollutant load reductions can help to indicate strategies for optimizing wetland performance and future system designs. Measurements will be made on grab samples obtained during storm events.

3.4 Floatables

If floatables are present during an effluent discharge event, sampling staff will record a description of the floatables on the "Floatables Description Form" included in Appendix C. The forms will be provided to the NYSDEC in the quarterly reports submitted by OCDWEP. If no floatables are observed, a form will not be completed.

3.5 Meteorological Conditions

Per the SPDES permit, precipitation will be logged and recorded hourly. An automatic, recording rain gauge installed at the City of Syracuse's Wadsworth Park will be used for hourly precipitation data and intensity. In the event of a malfunction with the Wadsworth Park rain gauge, OCDWEP's Metro Facility rain gauge will be used as a backup.

3.6 Maintenance Concerns

Weekly site visits will afford the monitoring team the opportunity to address structural and practical concerns, including but not limited to water levels, berm integrity, operation of the G&F system, wildlife, vandalism, odors, and vector control. These items will be tracked per SPDES requirements (Part 750). See the *Wet Weather Operating Plan* for more information.

3.7 Flow Configuration-Sampling Coordination

A crucial monitoring issue for the Harbor Brook CSO 018 Wetland Treatment System will be properly sampling each of the three different flow configurations. The three wetland cells will be able to receive CSO discharge in series, parallel, and series-parallel flow configurations. The following primary directives will be followed to ensure that objectives for smooth operation and adequate data collection are maintained:

- During the first year of system operation, the system will remain in series operation to provide a consistent base of operation as the sampling program is initiated.
- During the second pilot test period, the flow configuration will be set to series as soon as snowpack is anticipated, and will remain as such until spring thaw due to the fact that series flow offers the longest retention time with which to detain runoff associated with snowmelt.
- An effort will be made to monitor each scenario under the full range of seasonal conditions so as to generate a sufficiently robust dataset which will lend itself to valuable statistical inferences.
- Facility operation began on April 22, 2015 after the successful completion of system testing and calibration by the construction contractor. Table 3-2 reflects the actual wetland operating scenarios through 2015 and the planned scenarios for 2016. The various operating scenarios will be evaluated (see Section 4 for "system optimization" monitoring) and the long-term operating scenario will be decided upon after the completion of the initial monitoring period.

TABLE 3-2
Years 1 and 2 Wetland Operational Scenarios

Year 1	**2015**		**2015**			**2015**			**2015-2016**
Season	Spring		Summer			Fall			Winter[2]
Months	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec-March
Configuration[1]	S	S	S	S	S	S	S	S	S
Year 2	**2016**		**2016**			**2016**			**2016-2017**
Season	Spring		Summer			Fall			Winter[2]
Months	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec-March
Configuration[1]	S	S	P	P	P	SP	SP	SP	S

[1] S = Series; SP = Series-Parallel; P = Parallel

[2] Flow sequence will automatically be changed to Series before a snowpack develops, and will remain so until snowmelt and groundwater influences cease.

SECTION 4

Field Data Collection

This section details field protocols for obtaining water samples and taking *in situ* measurements of environmental parameters. All grab sample collection and preservation protocols described here are consistent with those described by the AMP.

All field sampling and preservation techniques referenced herein are per OCDWEP's *Environmental Laboratory Field Preservation Guide* (Appendix D) and are also consistent with standard USEPA protocols (USEPA 600/4-82-029 and 40 CFR 136).

Protocols applicable to the directives of this plan have been chosen from the aforementioned documents and major salient points are presented below.

4.1 Storm Event Sampling Guidelines

Samples will be collected during qualifying CSO events, which are defined as wet weather events where rainfall and/or snowmelt causes flow in the Rowland Street Trunk Sewer (018 sewer) to be above 6 cubic feet per second (cfs). At this point per the County's combined sewer system SWMM model, the Harbor Brook Interceptor Sewer (HBIS) is at its capacity, and a CSO overflow out the 018 outfall would occur. In the event of dry weather flow above 6 cfs due to influence from the Bellevue Country Club detention ponds, the capacity of the HBIS and Metro will be verified by OCDWEP via their SCADA system. If sufficient capacity exists, the dry weather flow will be allowed to flow into the HBIS and eventually to Metro for treatment.

Via the use of OCDWEP's SCADA system, the sampling staff will be notified when wet weather flow reaches 6 cfs and begins to be diverted to the G&F system (referred to as an "Influent diversion event"). Sampling staff are required to acknowledge that they are able to collected samples and will proceed to the sampling site immediately to do so.

Similarly, when flow begins discharging from the wetland facility (referred to as an "Effluent discharge event"), the SCADA system will alert OCDWEP who will in turn alert the sampling staff (if not already on-site) that sampling from the effluent must begin. Currently, SCADA integration of the effluent discharge alarm has not been completed. At this time, sampling staff repeatedly check the effluent flow meter display interface to determine the measured flow rate. Once a positive flow rate of greater than 0.1 cfs is observed, effluent samples are collected. Flow rates of less than 0.1 cfs are considered negligible and are likely not an indication of actual positive flow due to accuracy limits of the flow meter. It is expected that the SCADA integration of the effluent discharge alarm will be completed by mid-summer 2016.

A backflow preventer is installed on the outfall pipe after MH-19 to prevent backflow from the adjacent stream or Harbor Brook from flowing into wetland Cell 3 and skewing analytical and flow data. The backflow preventer does not allow quantifiable flow out of the wetland facility until 20 inches of pressure head difference across the unit is achieved. The elevation of the flow behind the backflow preventer within the wetland facility when the facility begins to discharge varies from event to event. This is because the elevation of Harbor Brook is in constant flux due to rainfall, snowmelt, surrounding groundwater conditions, etc.

Upon arriving at the site, sampling staff will collect samples from the influent, preserve them per OCDWEP standards, and notify the OCDWEP Lab that samples have been collected. If the flow is substantial enough for an effluent discharge event to occur, samples will be collected from the effluent, as well. In most situations, depending on the intensity and duration of the rain event and due to the substantial storage volume within the wetland cells, an effluent discharge event will not occur for an extended duration after the influent diversion begins. After the influent diversion event and/or effluent discharge event is complete, sampling staff will again notify the OCDWEP Lab, and samples will be analyzed for parameters within the

required hold times. In the event that influent samples are collected and an effluent discharge does not occur, the influent sample parameters that have not yet been analyzed will be discarded and results will not be reported in the quarterly performance report.

4.2 Sampling and Metering Approach

The approach of this monitoring and sampling plan will be to collect flow-weighted composite event samples under normal circumstances. Flowmeter data will be collected from the installed flowmeters.

4.2.1 CSO Event Sampling and Metering – SPDES Permit Required

A grab sample will be collected at the influent (MH-1D/Box 2) immediately after sampling staff arrive onsite. Similarly, a grab sample will be collected at the effluent after 30 minutes of discharge occurs. Grab samples will be collected at the influent and effluent again every 4 hours, if the event is of sufficient duration. For parameters that require composite samples, grab samples collected every 4 hours will be composited manually by the OCDWEP Lab prior to analysis. If the discharge does not occur for more than 30 minutes, it is not necessary to collect samples (per SPDES permit requirements).

When in series operation, effluent samples will be collected from MH-18. When in series/parallel or parallel operation, under normal operating conditions, effluent samples will be collected from MH-19. In the event that an emergency bypass event occurs while in series/parallel, effluent samples will be collected from FDS-13 and MH-18 to ensure that the flow sampled does not include a mixture of bypass flow. Similarly, if an emergency bypass event occurs when in parallel operation, effluent samples will be collected from FDS-11, FDS-13, and MH-18 and reported as such. An emergency bypass event is defined as an event that is greater than the design capacity of the wetland facility (44 cfs) and can be identified via monitoring of the influent flows over OCDWEP's SCADA system. If the influent flow is greater than 44 cfs, an emergency bypass event is underway and effluent samples will be collected from the appropriate location. The sampling locations for each operating scenario are identified on the flow diagrams included in Appendix B.

A facility bypass is defined as an event occurring when the entire facility (G&F and wetland cells) is offline. The most likely reason this could occur is during downtime to repair a malfunctioning piece of equipment essential to the operation of the facility. If a facility bypass occurs, untreated discharge volumes will be reported as such in the quarterly performance reports.

During each event, in situ measurements for the appropriate parameters are also measured. The exact date and time that the event starts and ends will be recorded, and after the event is over, sampling staff will coordinate with OCDWEP to obtain flowmeter data from their SCADA system and precipitation data.

Under all operating scenarios, the overflow volume, the volume that bypasses the wetland facility (either during an emergency bypass or facility bypass), will be obtained from the flowmeter in MH-5A. When in series operation, the wetlands discharge volume will be obtained from the flowmeter in MH-18. When in series/parallel or parallel operation and under standard and bypass event operating conditions, the wetlands discharge volume will be obtained by subtracting the overflow volume recorded at MH-5A (if present) from the volume recorded at MH-19.

4.2.2 CSO Event Sampling – System Optimization

After sampling for the SPDES permit is completed, and if an event is of sufficient duration, grab samples will be collected at intermediate points within the system at Cells 1 and 2 (FDS-11 and FDS-13 on the flow diagrams in Appendix B). The samples will be analyzed for the parameters in Table 4-1 to analyze the performance of each of the cells.

TABLE 4-1
System Optimization Parameters

5-day biochemical oxygen demand (BOD_5)
Total suspended solids (TSS)
Total Kjeldahl nitrogen (TKN)
Total Phosphorus (TP)
Fecal Coliform

Samples (SPDES-Required and System Optimization) will immediately be preserved in accordance with sampling and testing standards and delivered to the OCDWEP laboratory for analysis. Three optimization samples for each operating scenario are planned to be collected, as possible.

4.2.3 Extreme Event Sampling

During the first year of operation, two extreme events occurred and as a result, sampling procedures have been established during these types of events in the future.

4.2.3.1 Extreme Event #1 – Backflow from Harbor Brook into Wetland Cell #3 (June 28, 2015)

This extreme event occurs when Harbor Brook is elevated to a point where backflow through the overflow spillway and into Cell 3 occurs. When this occurs, effluent samples will not be collected due to contamination with non-CSO flow. If an effluent discharge event previously began, the event will be classified as completed and the OCDWEP lab will complete data analysis on the samples collected. If an influent diversion is ongoing or starts, samples will be collected in accordance with standard procedures.

Sampling staff will continue to monitor the effluent every 4 hours after the start of backflow to verify when the water levels have receded and backflow conditions are no longer present. Once this occurs, sampling staff will notify CH2M and OCDWEP personnel and effluent samples will be collected again and be considered the start of a new effluent discharge event. Because some of the water within the cells now contains non-CSO flow, when the data for the event is reported in the quarterly performance report, it will be flagged and noted accordingly.

4.2.3.2 Extreme Event #2 – Overflow of Harbor Brook Detention Basin (June 30/July 1, 2016)

This extreme event occurs when Harbor Brook floods and the detention basin fills with water submerging the wetland cells during a very large storm event. Immediately upon discovering this situation, sampling staff will demobilize from the site, relocate to a safe area, and notify CH2M and OCDWEP personnel. If an influent diversion or effluent discharge event previously began, the event will be classified as completed and the OCDWEP lab will complete data analysis on samples collected. If an influent diversion is ongoing or starts, additional samples will not be collected.

Once sampling staff verify that water levels have receded, CH2M and OCDWEP personnel will inspect the site to survey damage (if any) and decide whether the facility will be taken offline for repairs, or if the facility will remain operational. Discharge volumes out the outfall will be metered, if the flow equipment is not damaged, and reported as overflow volume in the quarterly performance report.

4.3 Sample Collection and Preservation

Grab sample collection is described below. Field preservation is per OCDWEP's *Environmental Laboratory Field Preservation Guide* (Appendix D).

4.3.1 Grab Samples

This protocol applies to grab samples collected.

4.3.1.1 Sampling Equipment

1. Stainless steel bucket
2. Coli Sampler
3. YSI 660/6600 or equivalent probe
4. Bucket (for sonde use)
5. LaMotte Test Kits for Cl_2 and pH
6. Sulfuric Acid
7. Sodium Thiosulfate
8. Ice packs/cooler

4.3.1.2 Bottles

1. (1) 1-L white plastic pre-cleaned
2. (1) 1-L white plastic pre-cleaned
3. (2) 125-mL sterile plastic

4.3.1.3 Sampling Procedure

1. Use a stainless steel sampling bucket on a rope to collect water sample from the appropriate sampling point and poured into sample containers.
2. Collect a Coliform sample as per the Coliform Sampling Procedure below.
3. Preserve samples as described below and check samples for the appropriate pH.
4. Place samples on ice.
5. Collect field data with the YSI; place sonde in a sample bucket.
6. Record sample information on the Chain of Custody (COC) and record field observations on the field sheets.

4.3.2 Automated Sampling

Automated sampling equipment at the facility effluent will not be used. During the first year of operation it was determined that there is sufficient time between the start of an influent diversion and the start of an effluent discharge for sampling staff to plan and arrive on site to collect the effluent grab samples.

4.4 Parameter-Specific Sample Preservation

4.4.1 General Sample Preservation Guidelines

In accordance with OCDWEP's *Environmental Laboratory Field Preservation Guide* (Appendix D), the sample preservation and collection guidelines shown in Table 4-2 will be followed.

TABLE 4-2
Sample Preservation and Collection Guidelines

Analyte	Total Volume Needed	Container	Preservation	Maximum Holding Time
BOD_5	0.5 gallon container	Plastic	Cool to 4ºC	48 hours
TSS	1 L			7 days
Settleable Solids	2,000 mL	Plastic	Cool to 4ºC	48 hours
Oil and Grease	1 L	Glass rinsed with hexane or methylene chloride	H_2SO_4 and Cool to 4ºC	28 days
Chlorine, Total Residual	100 mL	Plastic	None Required	28 days
TKN	1 L	Plastic	Cool to 4ºC, H2SO4 to pH < 2	28 days
Ammonia (NH_3)				
TP				
Fecal Coliform	125 ml	Plastic (pre-preserved with sodium thiosulfate crystals)	Cool to 4ºC	6 hours

4.4.2 Additional Fecal Coliform Guidelines

1. Fecal Coliform samples will be collected directly from sampling stream using two sterile 125-ml plastic containers.
2. The first container is filled from the source.
3. The second container (disposable), pre-preserved with Sodium Thiosulfate crystals, is filled from the first container leaving a small airspace to enable the sample to be shaken, and then cooled to 4°C.
4. Samples are checked for residual chlorine using a LaMotte Kit.

Note: Sample volumes for this parameter are crucial. Bottles will be filled to just above the shoulder of the bottle leaving a small (approximately 2.5 cm) airspace to enable sample to be shaken. Water will not be allowed to rise above the threads of the bottle.

SECTION 5

Field Data Collection QA/QC

All field data collection quality assurance/quality control (QA/QC) protocols have been adapted for use in this monitoring program from the AMP.

5.1 Sample Containers

All sample containers are new except for the pre-preserved sample containers.

5.2 Sample Labeling

All sample bottles will be labeled with the time, date, analytes to be tested, pH if known, and any field preservation techniques employed.

5.3 Chain of Custody

Chain of Custody (COC) forms will be filled out for every sample taken during a field visit (see example COC form in Appendix E). Forms include: sample type, container types, details on preservation techniques, and analysis to be performed, in addition to project personnel who had handled the bottle in the field. COC forms will be submitted to the OCDWEP laboratory when samples are delivered for analysis. OCDWEP staff will be responsible for filing the original and scanning a digital copy. Care will be taken to either print COC forms on waterproof "Rite in the Rain" paper or provide other adequate protections so that field notes can be taken during storm events.

5.4 Field Equipment Calibration

5.4.1 YSI Sonde

Detailed protocol for calibration and maintenance for the YSI Sonde can be found in the 2009 AMP. A summary field calibration checklist is as follows:

1. Calibration is typically performed the morning before use (and no more than 24-hours before use).
2. If dissolved oxygen (DO) membrane is replaced, the unit must be allowed to stabilize overnight.
3. Temperature calibration is set by factory and does not require frequent calibration.
4. DO membranes should be checked and replaced as needed after each use.
5. The pH reference probe and temperature probes should be cleaned with 1:1 hydrochloric acid (HCl) and a cotton swab on an as-needed basis.
6. The pH probe calibration solution should be replaced daily.
7. For long-term storage, sondes are stored in a clean, dry space in a case.
8. For short-term storage, sondes are stored in a calibration cup of tap water.
9. Watertight connectors are lubricated when necessary in order to ensure a waterproof connection.

5.5 Health, Safety, & Training

Considering the Harbor Brook Wetland Treatment System will be capturing combined sewage, health and safety for field staff is an important concern. All field personnel will be supplied with pertinent personal protective equipment (PPE), consistent with the requirements of OCDWEP sample collection field staff. A list of the required equipment with winter modifications is supplied in Appendix F. All samples will be taken, handled, and preserved with disposable nitrile gloves. Chemical splash goggles will be worn during sample preservation.

To maintain consistency with the OCDWEP, all field personnel associated with the Harbor Brook CSO 018 Wetland Treatment System will receive field training from OCDWEP staff apropos to “gray infrastructure” wastewater treatment facilities. Additionally, the New York State Environmental Laboratory Approval Program (NYS ELAP) Certification Manual requires that all field staff that collect “analyze immediate” parameters in the field such as pH, temperature, or chlorine residual, undergo training as specified under Item 249. To this end, OCDWEP hosts annual ELAP-certified “pH Training,” which all field staff will be required to attend. Lighting installations will be maintained onsite if night visits are necessary. A minimum of two staff members will accompany each other on field visits at all times.

SECTION 6

Analytical Protocols

This section describes the lab protocols that will be used for water sample analysis. OCDWEP will conduct water sample analyses for analytes discussed in this monitoring and sampling program. The OCDWEP laboratory is a participating member of the NYS ELAP. All methodologies used by OCDWEP are therefore approved by NYS. The following section details the QA/QC protocols used by OCDWEP to maintain NYS approved laboratory standards. As the OCDWEP lab will be performing virtually all analyses associated with this monitoring plan, the following section is directly excerpted from the 2009 AMP. Omissions have only been made to remove discussion of analytes or equipment not relevant to this monitoring plan. Table 6-1 summarizes analytical methodologies for all analytes of interest.

TABLE 6-1
Analytical Procedures for Water Quality Analysis

Parameter	Code	Methods	Minimum reportable limit (mg/L)
BOD_5	BOD_5	1: (5210 B-01,-11)	3.0
TSS	TSS	1: (2540 D-97,-11)	2.5
Settleable Solids	SS	1: (2540 F-97,-11)	1.0
Oil and Grease	O&G	EPA 1664-A	3.0
Chlorine, Total Residual	Cl	1: (4500)-Cl G	0.04
TKN	TKN	2: (10-107-06-2)	0.15
Ammonia (NH_3)	NH_3	2: (10-107-6-1-B, J)	0.03
TP	TP	2: (10-115-01-1-E,F) or 1: (4500-P E-99,11)	0.050 or 0.003
Fecal Coliform	FCOLI-MF	1: (9222 D-97)	10 (cells/100 ml)

1: Indicates Standard Methods

2: Indicates Lachat Instruments QuikChem Methods: Approved for use by USEPA- NYSDOH- ELAP

6.1 Chemicals and Reagents

Reagent grade water at the OCDWEP environmental laboratory consists of DI water purified by means of mixed bed deionization. The processed water is required to attain a minimum resistivity of 10 mSiemen. A final pass through another mixed bed deionization filter at point of use maintains the highest quality possible (18 mS output). Actual Conductivity is determined daily. The date, conductivity at 25°C, and the analyst's initials are recorded in a tabular format in a bound notebook.

To monitor the quality of reagent grade water for bacteriological use, the tests tabulated in Table 6-2 are performed.

TABLE 6-2
Reagent Grade Water Tests

Parameter	Frequency	Acceptable
Free Residual Chlorine	Monthly	None acceptable
Standard Plate Count	Monthly	<500 colonies/ml
Heavy Metals (Pb,Cd,Cu,Cr,Ni,Zn)	Yearly	<0.05 mg/l per metal <0.1 mg/l total
Suitability Test	Yearly	Ratio between 0.8-3.0

6.2 Reagents

Only American Chemical Society (ACS) grade or better chemicals are used. Chemicals are discarded within manufacturer's expiration date or 2 years, whichever comes first. Date of receipt is recorded on each container.

6.3 Standard Solutions/Titrants

Anhydrous reagent chemicals are oven dried at 100-105°C for at least 2 hours. Standard solutions or titrants not prepared from a primary standard are standardized against a primary standard at the frequency specified by the method or every 6 months if no frequency is specified. Standard solutions or titrants are not kept longer than 1 year. The date prepared and the expiration date appear on the container, along with title of standard or titrant, concentration, and preparer's initials. In a bound notebook, the preparation date, title of solution, concentration, manufacturer and lot number of reagent grade chemical(s) used, quantity prepared, expiration date, preparer's signature and, if appropriate, drying times and temperatures, tare and net weight, citation of preparation of primary standard, standardization titers and calculations are recorded.

6.4 Bench or Shelf Reagents

These are non-standardized solutions prepared by laboratory personnel. All of the pertinent information listed for standard solutions is recorded on both bottle label and in a bound notebook.

6.5 Calculations and Charts

A laboratory control chart will be constructed on the basis of at least 20 reference samples. Warning and control limits will be maintained based on standard OCDWEP laboratory calculations. Calculations for control and warning limits, percent recovery, surrogate standards and duplicate analysis can be found in the QAPP of the 2009 AMP.

6.6 Laboratory Equipment

Analytical Balance

Analytical balances are serviced and calibrated internally by a qualified service organization once per year and a dated certification sticker is provided.

Analytical balances are checked daily in two ranges with weights certified and calibrated to ASTM E617, Class 1 tolerance. The ranges selected reflect the routine use of the balance. For example, the analytical balance used principally for evaporating dishes and aluminum dishes would need Class S weights having target values of bracketing the expected weights of the dishes. The date, target reading, actual reading, and analyst's initials are recorded in a bound notebook.

pH Meter

pH meters are calibrated daily using standard buffers and a two point calibration. This consists of creating a slope using standard pH buffers of pH 4.0 and 10.0. The slope is then checked using a standard buffer of pH 7.0, with an acceptable reading of +/- 0.05 pH units. The date, pH buffer target values, set points, actual readings, and analyst's initials are recorded in a tabular format in a bound notebook.

Conductivity Meter and Cell

The conductivity cell constant is determined annually using a 0.01-M potassium chloride solution. The date, resistance readings, average resistance, temperature, calculations, and the analyst's initials are recorded in a bound notebook.

The conductivity meter and cell is calibrated daily with a 0.001 M potassium chloride solution. An acceptable reading is +/- 20 percent of target value. The date, target value, actual reading, temperature, and the analyst's initials are recorded in a tabular format in a bound notebook.

Thermometers

The OCDWEP environmental laboratory possesses a National Institute of Standardized Temperature (NIST) traceable, factory-certified thermometer, which is checked at the various temperatures mandated by a variety of analytical requirements. Correction factors and adjustments to correction factors, new correction factors and analysts initials are recorded in a tabular format in a bound notebook.

Each working thermometer has a dedicated use, and is calibrated annually at the temperature of interest using the NIST thermometer. The date, thermometer designation, calibration temperature, correction factor, and the analyst's initials are recorded in a bound notebook.

Refrigerators

Laboratory refrigerators maintain a temperature of 1° to 5°C. These temperatures are checked once daily. A NIST-certified thermometer with 1°C graduations is used. The date, times, temperature readings, and the analyst's initials are recorded in tabular format in a bound notebook.

BOD Incubators

The BOD Incubator maintains a temperature of 20°, +/- 1°C. Temperature readings are taken twice per day. This thermometer has graduations of 0.2°C. The same data is recorded as for refrigerators.

Ovens

Ovens are maintained at the target temperature of interest during use. Temperatures are checked at the beginning and end of each use. A dedicated thermometer with graduations of 1°C is used. The date, target temperature, time and temperature at the start and end of each cycle, oven use, and the analysts' initials are recorded in a tabular format in a bound format.

Automated Ion Analyzer, Atomic Absorption Spectrophotometer, Inductively Coupled Plasma (ICP) Spectrophotometer

For instruments at this level of sophistication, the procedures for ensuring correct analytical results are too lengthy for this manual, and the USEPA/ELAP instructions should be followed for specific information. Good general laboratory procedures (GLP) are followed in the daily operation of this instrument; including, but not limited to:

1. Daily calibration for each analyte of interest.
2. Instrument blank for each analyte.
3. Method blank, duplicates, spikes, reference, and check standards are utilized daily for each analyte.

6.7 Laboratory Quality Control Documentation Requirements

A summary of analyte-specific protocols can be found in Table 6-3.

TABLE 6-3
OCDWEP Laboratory Quality Control by Parameter

Parameter	Laboratory QC Measure required	Frequency
BOD_5	Laboratory Reagent Blank (LRB) Glucose and Glutamic Acid Standard (GCA)	Once/batch where batch cannot exceed 20 samples
TKN, NH_3, Nitrate (NO_3), TP	Laboratory Reagent Blank (LRB) Laboratory Fortified Blank (LFB) Matrix Spike (MS) Laboratory Control Standard (LCS)	Once/batch where batch cannot exceed 20 samples
	Laboratory Duplicate	Once/10 samples
TSS, Settleable Solids	Laboratory Reagent Blank (LRB) Laboratory Duplicate (LD)	Once/batch where batch cannot exceed 20 samples
	Laboratory Control Standard (LCS)	Once/month
Oil & Grease	Laboratory Reagent Blank (LRB) Laboratory Fortified Blank (LFB)	Once/batch where batch cannot exceed 20 samples
	Matrix Spike (MS) Laboratory Fortified Spike Duplicate (MSD)	Once/10 samples
	Laboratory Control Standard	Once/month
Fecal Coliform	Laboratory Reagent Blank	Once/batch where batch cannot exceed 20 samples

6.7.1 Standard Curves

Standard curves are prepared as specified in QA/QC manuals. All standard curves are dated and labeled with method, analyte, standard concentrations, and instrument responses.

A best-fit, straight line is drawn on graphed curves: the axis is labeled. The correlation coefficient is calculated. An acceptable correlation coefficient is 0.995 or greater.

Instrument response for samples is less than the highest standard. The lowest standard is near the detection limit.

If a specific method does not provide guidance in the preparation of a standard curve, the following guidelines are followed. For manual colorimetric methods, a blank and five standards that lie on the linear portion of the curve are used. A new curve is prepared each time an analysis is run. At each use, the curve is checked with a blank and a high standard. The high standard selected is greater than the expected sample concentrations. For automated colorimetric methods, a blank and a minimum of five standards are used. A new curve is prepared for each run. Instrument response is checked with a QC reference sample after each 10 samples. Low level standards are freshly prepared for each run.

6.7.2 Method Blank

A method blank consists of laboratory-pure water, which is processed and analyzed as if it were a sample. A method blank is run daily or with each batch of samples. Samples are related to the method blank by means of a date or batch identifier. Where applicable, the blank is calculated as a sample and a tabulation of blank results for each analyte with the date run and its appropriate acceptance criteria is maintained. Acceptance criteria for a method blank is a result less than the Minimum Reportable Limit (MRL) only.

6.7.3 Instrument Blank

An instrument blank consists of laboratory water, which is analyzed without adding reagents, filtering, etc. It is used for instrument set-up and no readings are recorded.

6.7.4 Trip Blank (Special)

Trip blanks are required when analyzing volatile compounds in water. A trip blank is a sample of laboratory-pure water contained in a sample bottle appropriate to the analyte to be determined. Trip blanks are present but unopened at the sampling site and shipped to the laboratory with the environmental samples taken. A trip blank is included with samples collected at each sampling site. The trip blank is analyzed only when samples from a specific sampling site are positive for the analyte of interest. If reportable levels of the analyses of interest are demonstrated to have contaminated the field blank, re-sampling is required.

6.7.5 Reference Sample

A reference sample is prepared by spiking a known amount of analyte into an appropriate solvent. The concentrate or quality control sample is preferably obtained from an external source. When necessary, a sample prepared in-house is prepared independently of the calibration standard. A reference sample is analyzed with every tenth sample or monthly samples if fewer than ten samples per month are analyzed. Environmental samples are tied to the reference standard by means of a date or batch identifier.

Data generated by the analysis of reference standard are used to construct a control chart and control limits established. Instructions for constructing a control chart and computing limits are to be found later in this section.

Should a result fall outside the control limits, the analysis is out of control and immediate action is taken to determine the cause of the outlying result. Data generated on the same day as the outlying result are regarded as unreliable and the analyses repeated after corrective action has been taken and the procedure is back in control.

A new control chart with freshly computed control limits is generated annually. The last 20 reference standard data points for the previous year are used to compute the new control limits.

6.7.6 Spiked Recovery

Spiked recovery for an environmental sample is determined by dividing the sample into two aliquots. The first aliquot is analyzed as usual. The second aliquot is spiked with a known concentration of the analyte of interest. The spike should be approximately 10 times the method's standard deviation (at the level of interest). A spiked environmental sample is analyzed when appropriate at a frequency of 1 spiked sample for every 20 samples or 1 spiked sample per month if fewer than 20 samples per month are analyzed. Samples are related to the spiked recovery date by means of a date or batch identifier.

Data generated by the analysis of spiked samples are used to calculate the percent recovery. The percent recovery data is tabulated and compared against established control limits.

Should a percent recovery fall outside the control limits, the result is regarded as out of control and action is taken to determine the cause of the outlying result. If there are no method specific control limits, then the new control limits are computed using historical data and a new control chart is generated annually.

6.7.7 Duplicate Analysis

A duplicate analysis is required only when a sample yields a positive result. A minimum of 10 percent of all positive samples for a given analyte is analyzed in duplicate. The range between the duplicates is tabulated and acceptance limits established. Instructions for the tabulation and the computation of limits are to be found later in this section.

A new tabulation with a freshly computed acceptance limit is generated annually. The last 20 data points for the previous year are used to compute the acceptable control limits.

6.7.8 External QA/QC

Although the OCDWEP laboratory is a New York State Department of Health Environmental Laboratory Accreditation Program (NYSDOH-ELAP)-certified laboratory, it is also National Environmental Laboratory Accreditation Conference (NELAC)-certified, and is obligated to follow all of the criteria for maintaining this certification under the auspices of the ELAP program. Part of this program consists of a biannual inspection by a NYS Laboratory Inspector, who spends one or more days at each facility checking all aspects of the operation. In addition, performance evaluations are conducted twice per year. This consists of unknown samples sent to the OCDWEP laboratory to be analyzed and the results reported back to ELAP. The laboratory is required to submit results for each parameter that they are certified for, including bacteriology, metals, nutrients, etc.

The USEPA also uses the results from this program to satisfy the requirements of the SPDES permit program that regulates the various wastewater treatment plants in the OCDWEP system.

6.7.9 Internal QA/QC

In addition to the above, the OCDWEP laboratory conducts an internal QA/QC program consisting of unknowns that are generated periodically by the OCDWEP staff and given to technicians as “typical” samples, occurring without the analysts' knowledge. The object of this is to ensure that “typical” samples are analyzed using the same care as the “official” samples.

SECTION 7

Data Validation and Reporting

7.1 Data Review and Validation

Data will be reviewed for technical defensibility and usability. The former assesses the accuracy and precision of lab measurement. The latter assesses weather the dataset is robust enough to meet monitoring program objectives.

Technical defensibility review includes:

1. Internal laboratory quality control: blanks, spikes, replicates, and standard curves.
2. Review of COC forms.
3. Determination as to whether samples were processes within their maximum allowable holding timeframe.

Usability review includes:

1. Charge balance of major cations and anions (if available from conventional samples)
2. Results of field duplicates
3. Statistical evaluation of dataset (outliers etc.)

7.1.1 Precision

Comparison of duplicate samples will provide a metric of reproducibility, following from the relative percent difference method between the two samples (NYSDEC, 2011):

$$RPD = \frac{(c_1 - c_2)\, x\, 100\%}{(c_1 + c_2)/2}$$

Where: *RPD* = relative percent difference
c1 = larger of the two observed values
c2 = smaller of the two observed values

7.1.2 Accuracy

Quantification of matrix spikes, laboratory blanks, and reference standards will provide metrics of accuracy. For matrix spikes, percent recovery will be calculated as follows (NYSDEC, 2011):

$$\%R = 100\%\, x \left(\frac{S - U}{C_{sa}} \right)$$

Where: *%R* = percent recovery
S = measured concentration in spiked aliquot
U = measured concentration in unspiked aliquot
Csa = actual concentration of spike added

When a standard reference material is used:

$$\%R = 100\% \, x \left(\frac{C_m}{C_{srm}} \right)$$

Where: *%R* = percent recovery
Cm = measured concentration of SRM
Csrm = actual concentration of SRM

7.2 Reporting and Documentation

7.2.1 Field and Laboratory Data

Laboratory data is stored both on the Laboratory Information Management System (LIMS) and on paper copy to be filed at OCDWEP. The OCDWEP lab will transmit this data to the sampling and reporting staff after the analyses for each CSO event are completed.

Monitoring results required by the SPDES permit will be provided in reports as required by the permit. Any additional sampling results will be provided in similar report documents for internal review and analysis.

APPENDIX A
CSO Event Notification/Sampling Flowchart

Harbor Brook CSO 018 Constructed Wetlands:
Sample and Data Transmission Flowchart

Wetland Samples

Are samples collected on a weekday between 7:00 AM and 3:30 PM (during working hours)?

YES

Sampling staff shall notify the lab of approximate sample delivery time(s) and deliver samples directly to WEP Lab **by 3:30pm.**
Note: For samples collected at the start of each Event*, an **Event Number Tracking Form** is completed and attached with the C-O-C form which documents the ***Event Start Date and Time.***

NO

Sampling staff shall notify Metro Board of approximate sample delivery time(s) and deliver samples to Metro Board directly (3rd floor POC).

Note: For samples collected at the start of each Event*, an **Event Number Tracking Form** is completed and attached with the C-O-C form which documents the ***Event Start Date and Time.***

Between 4/1 and 10/15 (during disinfection season)

Metro Board calls the WEP lab contact informing them of samples at the Board for pick up.

Lab contact makes arrangements for pick-up of samples from Metro Board for delivery to Lab.

Between 10/16 and 3/31

(outside disinfection season)

Metro Board calls the ETS Primary Contact (first thing the next morning) who is responsible for informing the ETS WWT II Supervisor on-call of samples at the Board for pick-up. The ETS WW T II will arrange for sample pick-up and delivery to the lab by the ETS WW Tech 1 (assigned to Metro TP).

ETS WW Tech 1 assigned to Metro TP picks up samples from Metro Board for delivery to lab.

Flow Meter/ Precipitation Data

WEP (Flow Data: Mike Mulvihill, Rain Gauge: Tony Deskins) sends CH2M (Zach Monge) flow meter data from influent, effluent, and bypass and precipitation data at the end of each month

The sampling staff will document the **Grab # and Event #*** for ***each*** sample collected on the C-O-C form. At the end of each Event, the sampling staff will notify the Lab (during working hours only) and Metro Board (at all other times) that sample collection for the Event* is complete.

Note: For samples collected at the end of each Event*, an **Event Number Tracking Form** is completed and attached with the C-O-C form which documents the ***Event End Date and Time.*** If no samples (Influent or Effluent) are collected with the scheduled cycle, a completed **Event Number Tracking Form** will only be delivered to the Lab/Board to document the completion of the Event.

WEP lab completes analysis within required maximum hold times

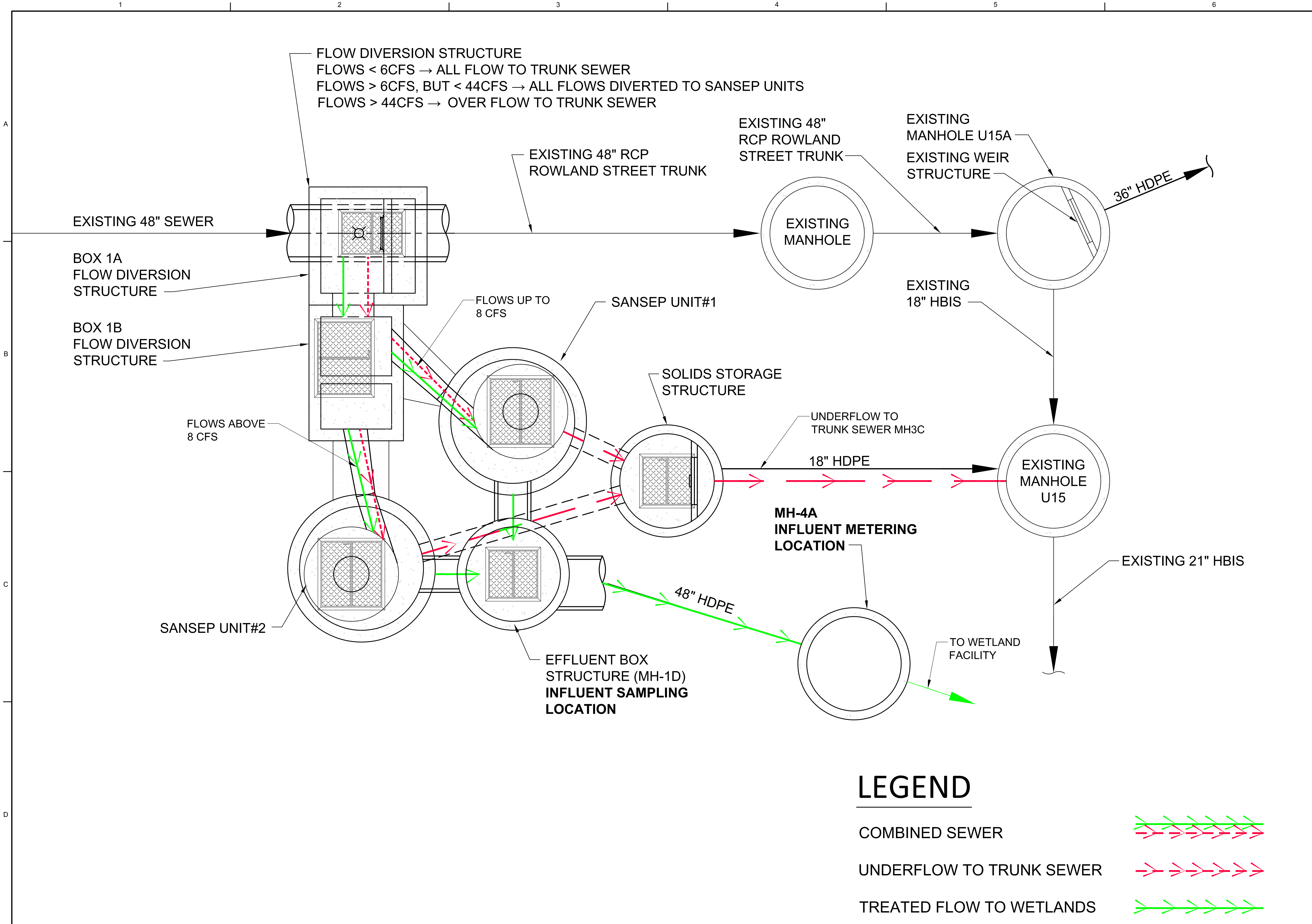
Analysis results sent by WEP Lab (Jeff Noce) to CH2M (Zach Monge)

Sampling staff tabulate data for reporting

See Reporting Flowchart

*Note: Event refers to both the Influent (Diversion) Event and Effluent (Discharge) Event.

APPENDIX B
CSO 018 Constructed Wetlands Pilot Treatment System Flow and Facility Diagrams



CH2MHILL

430 E. GENESEE STREET, SUITE 400
SYRACUSE, NY 13202
PH (315) 345-1400 - FAX (315) 451-7270
EB 0000072 AA 001992

HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

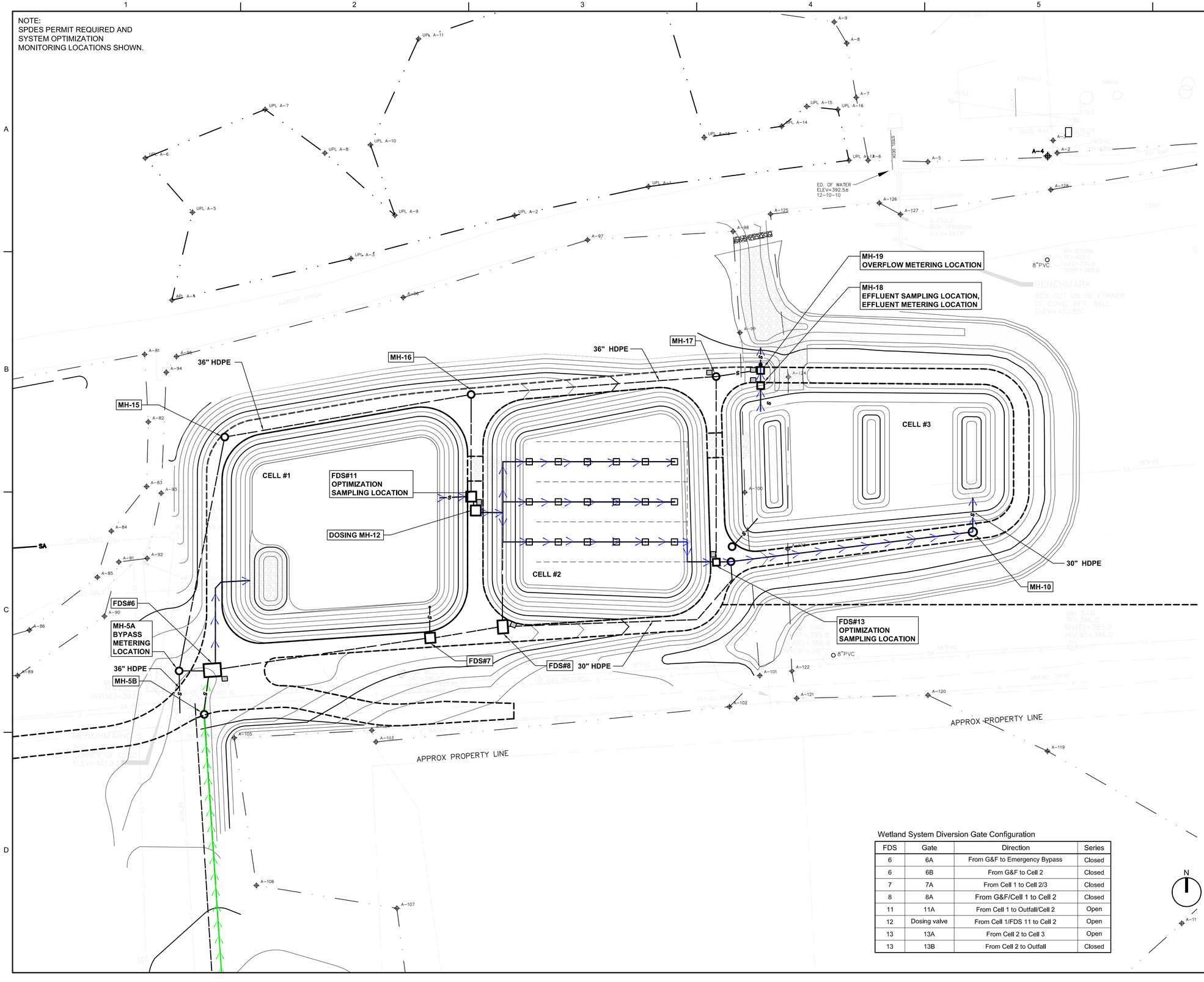
GRIT AND FLOATABLES REMOVAL FACILITY FLOW DIAGRAM

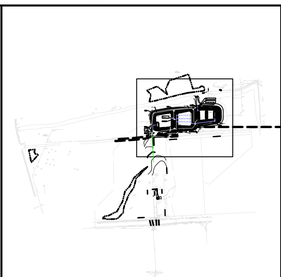
NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	NOVEMBER 2014
PROJ	381098
DWG	FD-1
SHEET	1 of 5

NOTE:
SPDES PERMIT REQUIRED AND
SYSTEM OPTIMIZATION
MONITORING LOCATIONS SHOWN.





SITE KEY MAP
NOT TO SCALE

Wetland System Diversion Gate Configuration

FDS	Gate	Direction	Series
6	6A	From G&F to Emergency Bypass	Closed
6	6B	From G&F to Cell 2	Closed
7	7A	From Cell 1 to Cell 2/3	Closed
8	8A	From G&F/Cell 1 to Cell 2	Closed
11	11A	From Cell 1 to Outfall/Cell 2	Open
12	Dosing valve	From Cell 1/FDS 11 to Cell 2	Open
13	13A	From Cell 2 to Cell 3	Open
13	13B	From Cell 2 to Outfall	Closed

LEGEND

SERIES FLOW PATH

TREATED FLOW
FROM G & F

N

0 30 60 90

SCALE: 1" = 30'

CH2MHILL
430 E. GENESEE STREET, SUITE 400
SYRACUSE, NY 13202-2400
PH (315) 345-1400 - FAX (315) 451-7270
EB 0000072 AA 001992

HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

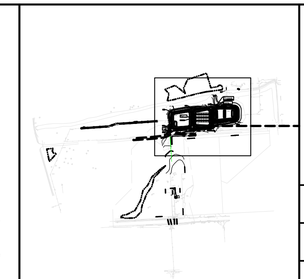
SERIES FLOW DIAGRAM
WETLAND FACILITY

NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	NOVEMBER 2014
PROJ	381098
DWG	FD-2
SHEET	2 of 5

NOTE:
SPDES PERMIT REQUIRED AND
SYSTEM OPTIMIZATION
MONITORING LOCATIONS SHOWN.



SITE KEY MAP
NOT TO SCALE

MH-19
OVERFLOW/ EFFLUENT METERING LOCATION, EFFLUENT SAMPLING LOCATION, DURING STANDARD OPERATING CONDITIONS.

MH-18
CELL #3 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

MH-17

MH-16

MH-15

36" HDPE

36" HDPE

CELL #1

FDS#11
OPTIMIZATION SAMPLING LOCATION. CELL #4 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

DOSING MH-12

CELL #2

CELL #3

30" HDPE

MH-10

FDS#6

MH-5A
BYPASS METERING LOCATION

36" HDPE

MH-5B

FDS#7

FDS#8 30" HDPE

FDS#13
OPTIMIZATION SAMPLING LOCATION. CELL #2 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

APPROX PROPERTY LINE

APPROX PROPERTY LINE

ED. OF WATER
ELEV=392.5±
12-10-10

8"PVC

8"PVC

MH-STORM
TF=400.0
INV(E)=390.9
SUMP=389.0

2.3'X2.3'
BOX OPENING
ELEV=392.6'

LEGEND

- FLOW PATH
- CELL 2 FLOW PATH
- CELL 3 FLOW PATH
- TREATED FLOW FROM G & F

N

0 30 60 90

SCALE: 1" = 30'

Wetland System Diversion Gate Configuration

FDS	Gate	Direction	Parallel
6	6A	From G&F to Emergency Bypass	Closed
6	6B	From G&F to Cell 2	Open
7	7A	From Cell 1 to Cell 2/3	Closed
8	8A	From G&F/Cell 1 to Cell 2	Open
11	11A	From Cell 1 to Outfall/Cell 2	Open
12	Dosing valve	From Cell 1/FDS 11 to Cell 2	Closed
13	13A	From Cell 2 to Cell 3	Closed
13	13B	From Cell 2 to Outfall	Open

NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

CH2MHILL
430 E. GENESEE STREET, SUITE 400
SYRACUSE, NY 13202
PH (315) 345-1400 FAX (315) 451-7270
EB 0000072 AA 001992

HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

PARALLEL FLOW DIAGRAM
WETLAND FACILITY

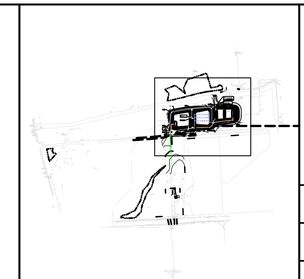
VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	NOVEMBER 2014
PROJ	381098
DWG	FD-3
SHEET	3 of 5

Flow Diagram Exhibit.dwg 12/9/2014 10:37 AM

NOTE:
SPDES PERMIT REQUIRED AND
SYSTEM OPTIMIZATION
MONITORING LOCATIONS SHOWN.



SITE KEY MAP
NOT TO SCALE

MH-19
OVERFLOW/ EFFLUENT METERING LOCATION, EFFLUENT SAMPLING LOCATION, DURING STANDARD OPERATING CONDITIONS.

MH-18
CELL #1/2/3 EFFLUENT SAMPLING LOCATION DURING BYPASS EVENT.

36" HDPE

MH-17

MH-16

MH-15

CELL #1

FDS#11
OPTIMIZATION
SAMPLING LOCATION

DOSING MH-12

CELL #2

CELL #3

30" HDPE

MH-10

FDS#13
OPTIMIZATION SAMPLING LOCATION.
CELL #1/2 EFFLUENT SAMPLING
LOCATION DURING BYPASS EVENT.

FDS#6

MH-5A
BYPASS
METERING
LOCATION

36" HDPE

MH-5B

FDS#7

FDS#8 30" HDPE

APPROX PROPERTY LINE

APPROX PROPERTY LINE

Wetland System Diversion Gate Configuration

FDS	Gate	Direction	Series & Parallel
6	6A	From G&F to Emergency Bypass	Closed
6	6B	From G&F to Cell 2	Closed
7	7A	From Cell 1 to Cell 2/3	Open
8	8A	From G&F/Cell 1 to Cell 2	Closed
11	11A	From Cell 1 to Outfall/Cell 2	Open
12	Dosing valve	From Cell 1/FDS 11 to Cell 2	Open
13	13A	From Cell 2 to Cell 3	Closed
13	13B	From Cell 2 to Outfall	Open

LEGEND

CELL 1-2 SERIES FLOW PATH

CELL 1-3 SERIES FLOW PATH

TREATED FLOW FROM G & F

0 30 60 90
SCALE: 1" = 30'

CH2MHILL
430 E. GENESEE STREET, SUITE 400
SYRACUSE, NY 13202-2400
PH (315) 345-1400 - FAX (315) 451-7270
EB 0000072 AA 001992

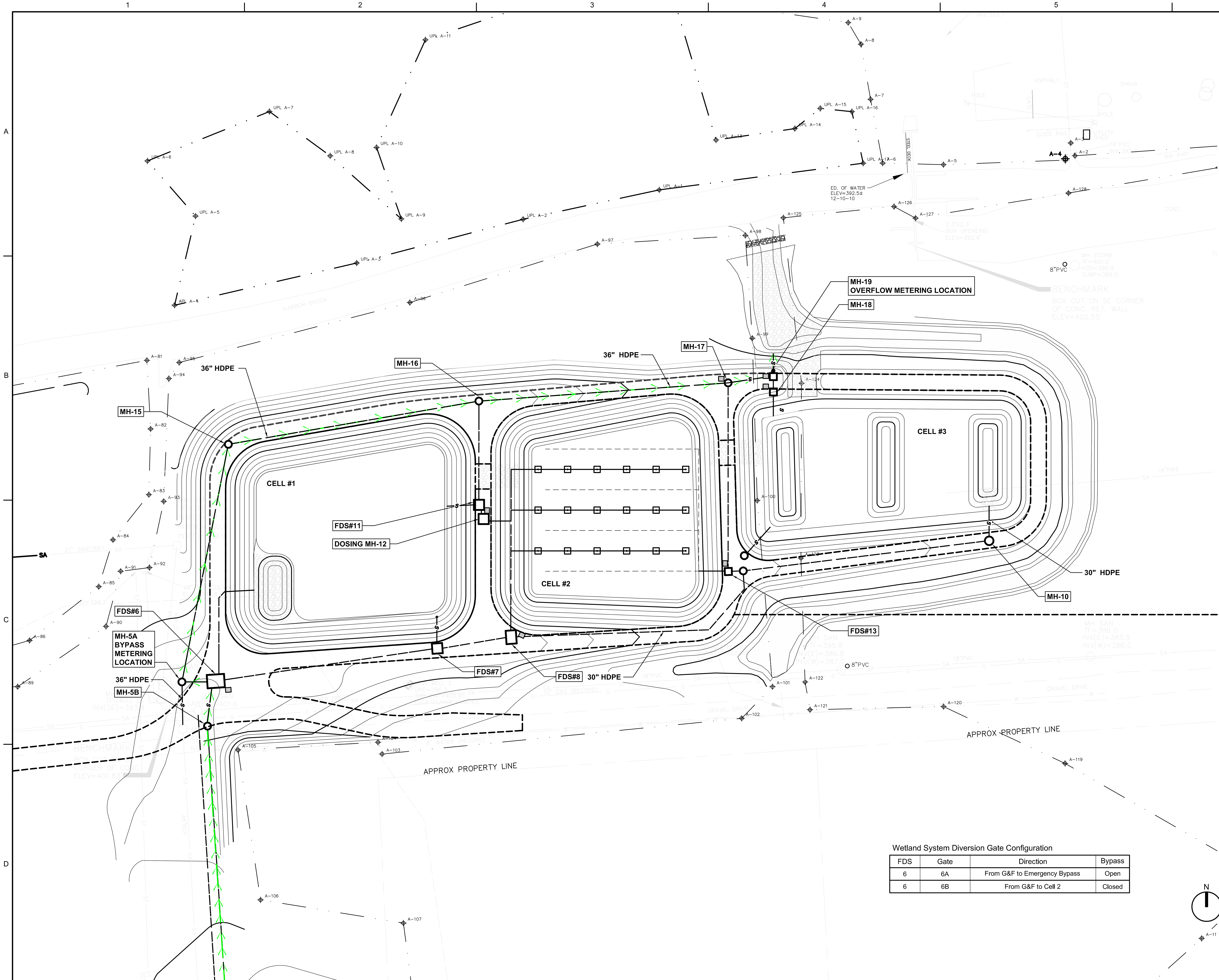
HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

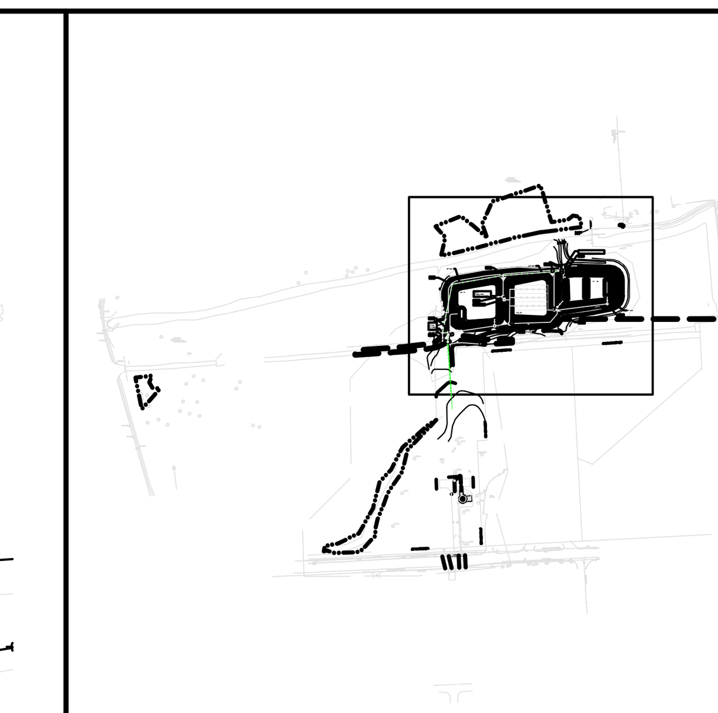
SERIES AND PARALLEL FLOW DIAGRAM
WETLAND FACILITY

NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	NOVEMBER 2014
PROJ	381098
DWG	FD-4
SHEET	4 of 5





SITE KEY MAP

NOT TO SCALE

Wetland System Diversion Gate Configuration

FDS	Gate	Direction	Bypass
6	6A	From G&F to Emergency Bypass	Open
6	6B	From G&F to Cell 2	Closed

LEGEND

BYPASS FLOW PATH

0 30 60 90

SCALE: 1" = 30'

NO.	DSGN	DR	CHK	APVD
0	ZM	GH	MM	MM

CH2MHILL

430 E. GENESEE STREET, SUITE 400
SYRACUSE, NY 13202
PH (315) 345-1400 - FAX (315) 451-7270
EB 0000072 AA 001992

HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

BYPASS FLOW DIAGRAM
WETLAND FACILITY

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	NOVEMBER 2014
PROJ	381098
DWG	FD-5
SHEET	5 of 5

HARBOR BROOK

BACKFLOW PREVENTER TO PREVENT BACKFLOW FROM HARBOR BROOK INTO CELL 3. REQUIRES APPROXIMATELY 20" OF PRESSURE TO FULLY OPEN.

OUTFALL 018/018A

MH-17

MH-16

MH-15

MH-19, ISCO 2150 AREA VELOCITY FLOW MODULE FOR EFFLUENT DISCHARGE VOLUME (ONLINE) OR OVERFLOW VOLUME (OFFLINE) FLOW MEASUREMENT. EFFLUENT SAMPLING LOCATION IN SERIES OR PARALLEL OPERATION.

MH-18, ISCO 2150 AREA VELOCITY MODULE FOR CELL 3 DISCHARGE FLOW MEASUREMENT. CELL 3 SAMPLING LOCATION DURING PARALLEL OPERATION.

ISCO SIGNATURE FLOW METER

ISCO 6712FR AUTO SAMPLER

36" WETLAND BYPASS/ EMERGENCY BYPASS **MH-5A** TO **MH-19**

FDS 11, CELL 1 SAMPLING LOCATION DURING PARALLEL OPERATION. LEVEL SENSOR FOR MEASURING CELL 1 LEVEL.

MH-12, DOSING VALVE FOR DOSING CELL 2 WHEN IN SERIES OPERATION.

MH-10

MH-20

MH-9

FDS-13, CELL 2 SAMPLING LOCATION DURING PARALLEL OPERATION. LEVEL SENSOR FOR CONTROLLING GATE FLOW FROM CELL 2 TO CELL 3 IN SERIES OPERATION.

FDS-6, SLIDE GATES FOR SERIES OR PARALLEL OPERATION.

MH-5A, ISCO 2150 AREA VELOCITY MODULE FOR BYPASS FLOW MEASUREMENT.

PANEL B (SEE O&M)

HBIS **MH-U15**

EXISTING 21" HBIS

MH-4B

FDS-8

FDS-7

HBIS **MH-U15A**, CONTAINS WEIR THAT DIVERTS ROWLAND ST. TRUNK SEWER FLOW TO WETLAND BYPASS WHEN HBIS IS AT CAPACITY.

ONONDAGA COUNTY

18" UNDERFLOW TO HBIS

48" INFLUENT TO WETLANDS

ONONDAGA COUNTY

MH-4A, ISCO 2150 AREA VELOCITY MODULE FOR INFLUENT FLOW MEASUREMENT

PANEL A (SEE O&M)

YARD HYDRANT FOR MANUAL CLEANING OF SAN SEP SCREENS.

MH-3C, SOLID STORAGE STRUCTURE STORES SOLIDS UNTIL EVENT ENDS, THEN RELEASES BACK TO HBIS. SLIDE GATE OPERATES IN TANDEM WITH **BOX 1-A** SLIDE GATE.

SS-1, WASH DOWN SPRAYS TRIGGER AUTOMATICALLY AFTER EVENT.

BOX 2/MH-1D, INFLUENT SAMPLING LOCATION.

SS-2, WASH DOWN SPRAYS TRIGGER AUTOMATICALLY AFTER EVENT.

BOX 1B, CONTAINS WEIR FOR FLOW EQUALIZATION BETWEEN **SS-1** AND **SS-2**.

BOX 1A, CONTAINS SLIDE GATE TO DIVERT FLOW DURING RAIN EVENTS.

EXISTING 42" ROWLAND STREET TRUNK SEWER.

WATER METER VAULT.

MH-3302, ISCO LASER FLOW CONTROLS **BOX 1A** GATE.

WEST ONONDAGA STREET

N

0 30 60 90

SCALE: 1" = 30'

430 E. GENESEE STREET, SUITE 203
SYRACUSE, NY 13202
PH (315) 345-1400 - FAX (315) 451-7270
EB 0000072 AA 001992

CSO 018 WETLAND FACILITY DIAGRAM

HARBOR BROOK CSO 018
CONSTRUCTED WETLANDS
CITY OF SYRACUSE
ONONDAGA COUNTY, NEW YORK

NO.				
DSGN ZM	DR GH	CHK	APVD	

SHEET C-2001
DWG
PROJ 19217
DATE OCTOBER 2015
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
VERIFY SCALE

005-C-2001A-19217.dwg
1/26/2016 9:50 AM

APPENDIX C
Floatables Description Form

LAB SAMPLE ID#: _____

FLOATABLES DESCRIPTION FORM

ONONDAGA COUNTY

DEPARTMENT OF WATER ENVIRONMENT PROTECTION

DATE: _____ TIME: _____

LOCATION / IC Code: _____

SNOW MELT (Y/N):_____

RAIN (Y/N): _____

Flow at CSO Outfall: Yes/No Flow Description: Trickle/Moderate/Substantial

PHYSICAL INDICATOR

Odor Present: ☐

DESCRIPTION	
☐ Sewage	☐ Petroleum/Gas
☐ Sulfide	☐ Laundry
☐ Rancid/Sour	☐ Other _____

Circle Relative Severity Index
(1) Faint
(2) Easily detected
(3) Noticeable from a distance

Color: ☐

DESCRIPTION	
☐ Clear	☐ Gray
☐ Green	☐ Red
☐ Brown	☐ Yellow
	☐ Other _____

Circle Relative Severity Index
(1) Faint color in sample bottle
(2) Clearly visible in sample bottle
(3) Clearly visible in outfall flow

Turbidity: ☐

Circle Relative Severity Index
(1) Slight cloudiness (2) Cloudy (3) Opaque

Floatables[1]: ☐

TYPE	Count[2]	Approx. Size	Circle Relative Severity Index
☐ 1. Suds/Foam	_____	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 2. Visible Oil Film	_____	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 3. Globules of Grease	_____	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 4. Street litter (i.e., Cigarette butts)	_____	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 5. Food Packaging	_____	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 6. Sanitary Items (i.e., sewage toilet paper, condoms, tampon applicators)	_____	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 7. Beverage containers	_____	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 8. Medical Items (i.e., syringes)	_____	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 9. Other	_____	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious

[1] Floatables: Record Floatables observations during sampling event over a 3-5 minute time duration.

[2] Count: Attempt to record count of floatables during the sampling event.

Photograph Taken: Yes/No

Revision: 10/14/2014 JS

APPENDIX D
OCDWEP Environmental Laboratory Field Preservation Guide

WATER ENVIRONMENT PROTECTION LABORATORY

OCDWEP Environmental Laboratory
FIELD PRESERVATION GUIDE

All samples

Cool to <=6^0 C in a cooler (with ice) or refrigerator after preservation

1. General acid preservations

a. METALS SAMPLES - add conc. Trace metal grade Nitric Acid (HNO_3) to adjust the pH range to 1.5 - 2.0. In the case of foaming samples, fill sample container half way, then preserve slowly until sample attains proper pH. Sample Container: see Appendix A. **NOTE 1: No acid is required for bio-solids samples. NOTE 2: For samples which reactive violently from acid addition, such as some sludge samples, document on the C of C and deliver to the laboratory within 24 hrs of collection.**

b. PHENOLS – All phenol samples must be checked for the presence of oxidizers using KI starch paper prior to acidification with Sulfuric Acid. When the paper stays white, add Sulfuric Acid (H_2SO_4) to adjust the pH range to 1.5 - 2.0. Sample Container: see Appendix A.

1. Test with DPD kit, if oxidizer is present, add ascorbic acid, a few crystals at a time, until sample produces no color and then add **0.06g** more.
2. Add Sulfuric Acid to adjust the pH range to 1.5 – 2.0.

c. OIL & GREASE - add conc. Sulfuric Acid (H_2SO_4) to adjust the pH range to 1.5 - 2.0. Sample Container: see Appendix A. ***Specific Instructions for O&G see Appendix B.***

2. Specific analytes

a. CYANIDES --all forms. Sample Container: see Appendix A.

1. Test with DPD kit, if oxidizer is present, add ascorbic acid, a few crystals at a time, until sample produces no color and then add **0.06g** more.
2. Add 10N NaOH to adjust the pH range to 12.0 - 12.5

b. NH3/TKN/TP - Sample Container: see Appendix A. Leave approximately 2.5cm air-space to facilitate mixing of the sample.

1. Determine Cl_2 residual with Hach Pocket Colorimeter Kit – if none is detected, proceed to step #3
2. Add 30% Sodium Thiosulfate dropwise; 1drop/1ppm Cl_2, then add 1 drop excess
3. Add Sulfuric Acid (H_2SO_4) to adjust the pH range to 1.5 - 2.0

Example: Cl_2 measures 2.5ppm - add 4 drops Sodium Thiosulfate - then (H_2SO_4) to pH 1.5 - 2.0

4. If color or turbidity interferes with Cl_2 res. measurement: generally add 2 drops Sodium Thiosulfate, more if high Cl_2 is suspected. Good judgement must be used so that excessive amounts are not added.

Note: In all cases, Cl_2 res. measurement must be attempted and recorded.

c. TP (Total Phosphorus): Sample Container: see Appendix A.
Add Sulfuric acid (H_2SO_4) to adjust pH range to 1.5 – 2.0

Revision Change: Corrected Appendix D and added 2 locations for small O&G jars on page 9 of this guide.

d. SRP (ORTHO-PHOSPHATE): sample must be filtered on site ASAP. Sample Container: see Appendix A. **Leave approximately 2.5cm airspace to facilitate mixing of the sample.**

1. Collect sample in a DI rinsed container
2. Place a previously washed 0.45um filter into filter apparatus
3. Filter sample into the SRP container (125ml plastic) leaving a small airspace
4. Discard filter and rinse apparatus

NOTE: When sample turbidity prevents using one filter to fill container; remove clogged filter, replace with another washed filter and continue filtration. Under extreme conditions, sample may be pre-filtered using a washed glass-microfiber filter, and filtered into a clean container before final filtration with a 0.45um filter.

e. TDP (TOTAL DISSOLVED PHOSPHOROUS) Sample is filtered on site ASAP (see **SRP**) Sample Container: see Appendix A. After filtration, add H_2SO_4 to adjust the pH range to 1.5 - 2.0 (approximately 0.5ml –because sample cannot be pH stripped)

f. TOC (TOTAL ORGANIC CARBON) Sample Container: see Appendix A. Sample is preserved with Phosphoric acid (H_3PO_4) or Sulfuric Acid (H_2SO_4) to adjust the pH range to 1.5 - 2.0. (Not generally preserved in the field by ELS personnel)

g. SULFIDES-TOTAL: Sample Container: see Appendix A.

1. Add 2 mL Zinc Acetate to 250 mL-glass bottle before adding sample
2. Fill with sample (exclude all air bubbles)
3. Add 1 – 2 mL 10N NaOH to adjust sample pH > 9.

h. SULFIDES-DISSOLVED:

1. Add 2 mL 10N NaOH to a clean, empty 1L glass jar, then fill with sample.
2. Immediately add 3 mL 70% Aluminum Chloride ($AlCl_3$) solution.
3. Secure top and shake vigorously, (floc will form) let settle for 15min.
4. Carefully pour off clear supernatant (Do not shake or agitate after settling) into a 250 mL glass bottle with cone insert in cover, excluding all air bubbles.
5. Preserve the clear supernatant sample per Total Sulfides procedures (see above).
6. Discard the floc.

i. HEX-CHROMIUM: Sample Container: see Appendix A. No chemical additions required, cool to <=6° C. Leave approximately 2.5cm airspace. Holding time is <24 hrs – deliver to lab as soon as possible for processing. **Note: in all cases, add chemicals until the proper pH is attained. Any anomalies make a notation on the chain of custody.**

3. ORGANICS (Containers provided by Contract Lab)

a. AKS (EPA 8015) - Add a few grains of sodium thiosulfate to each vial before filling. Ensure no trapped air bubbles when capping vials. Cool to <=6° C

b. PCB'S/PESTICIDES - No chemical additions required, cool to <=6° C

c. PHTHALATES - No chemical additions required, cool to <=6° C

d. 601/602 (EPA 624) - Add a few grains of sodium thiosulfate to sample container, half-fill with sample, add 2 drops 50% HCl and finish filling vial. Ensure no trapped air bubbles when capping vial. Cool to <=6° C.

Revision Change: Corrected Appendix D and added 2 locations for small O&G jars on page 9 of this guide.

4. CONVENTIONALS

No chemical additions required, cool to <=6^0 C. Sample Container: see Appendix A.

5. SPECIAL CONTAINER SAMPLES

These samples do not require chemical additions but need extra care

a. **FLASHPOINT** - no air bubbles present, cool to 4^{0}C. Sample Container: see Appendix A.

b. **T-ALKALINITY** - no air bubbles present, cool to 4^{0}C. Sample Container: see Appendix A.

6. WINKLER DISSOLVED OXYGEN

Add 1 mL Manganous Sulfate solution and 1ml Alkaline-Iodide-Azide reagent beneath the surface of sample. Do not add air bubbles to the sample. Cap bottle tightly and invert twelve times. Cool to 4^{0}C. Sample Container: see Appendix A.

7. Low level Mercury (EPA Method 1631) for all SPDES permit-related mercury monitoring.

These **GRAB** samples must be collected using the EPA method 1669 "Sampling Guidance" protocols of "**dirty hands / clean hands**" including double bagging.

a. Polyethylene sample bottles must **not** be used. Glass pre-cleaned disposable bottles that are already double bagged must be used.
b. Preservation is **not** done in the field. Rather the laboratory will preserve the samples within 48hrs of collection with 1% high purity HCl acid in a controlled environment.
c. Sample delivery requires the mercury samples to be stored in separate coolers from those used for all other analyses.
d. Discrete samplers have been found to contaminate samples and therefore, they should be avoided when possible.
e. A field blank and field duplicate should be collected during each sampling event.

Revision Change: Corrected Appendix D and added 2 locations for small O&G jars on page 9 of this guide.

PROCEDURE FOR COLLECTION OF BACTERIOLOGICAL SAMPLES

1. Where possible, collect sample from effluent overflow (in cascade).

2. Two sterile must be used. Sample Container: see Appendix A.

3. Fill the first sterile container from the source.

4. Fill the second container from the first container, *leaving a small (approximately 2.5 cm.) airspace* to enable sample to be shaken. Determine Cl_2 res. with Hach Pocket Colorimeter Kit and note on bottle. Do not rinse out the Sterile Sample Container. Note: All forms of chlorine must be measured at regional treatment facilities on site since these tests must be performed within 15 minutes of sample collection.

5. The second sterile container is the sample to be delivered for analysis. Sample must be delivered within ***6 Hours of collection. This will provide the lab a maximum of 2 hours to process.***

NOTE: Sample bottles must not be immersed in water from melting ice during transit. Use water tight containers if necessary to prevent this from occurring.

PROCEDURE FOR FIELD ANALYSIS OF CHLORINE AT RTF'S (NEW)

1. Collect sample from effluent overflow (in cascade).

2. Using "Standard Methods 4500-Cl G" determine the following concentrations using the DPD colorimetric method;
- *Using one of the HACH Pocket Colorimeters, take a 25 mL sample and add a DPD free chlorine tab, mix, and immediately read / record the result for Free "Residual" Chlorine (reading A).*
- *Add 2 very small crystals (0.1 grams) of KI, mix and immediately read / record the result (reading B).*
- *Add several additional crystals (0.25 grams) of KI, mix and wait two minutes. Then read / record the result (reading C).*

3. Calculate the concentration as follows;
- ***Total Residual Chlorine** is equal to (reading A)*
- ***Monochloramine** is equal to (reading B-A).*
- ***Total Dichloramine** is equal to (reading C-B)*
- ***Chloramines** is equal to (reading C-A)*
- ***Total Chlorine** is equal to (reading C)*

4. See Append D for a copy of a spreadsheet for the chlorine calculations.

Revision Change: Corrected Appendix D and added 2 locations for small O&G jars on page 9 of this guide.

PROCEDURE FOR FIELD MEASUREMENT OF pH

1. Calibrate pH meter immediately prior to use (see calibration procedure)

2. Rinse electrode with DI water, then pre-rinse with sample

3. If not using an ATC probe, determine temperature of sample and set meter accordingly

4. Place electrode into sample and wait for reading to stabilize. Record date, time sample was taken, time pH was measured, result, and signature of analyst.

5. Rinse electrode with DI water and place into storage solution

pH METER CALIBRATION

1. Remove electrode from storage solution, rinse with DI water, then remove excess by gently shaking electrode or very carefully blotting dry with labwipe. (Do not wipe electrode. This can set up a static charge and affect subsequent readings)

2. If not using an ATC probe, set meter to buffer temperature

3. Place the electrode into pH 4 buffer and calibrate.

4. Remove electrode, rinse with DI water, dry (see above), place into pH 10 buffer and calibrate.

5. Remove electrode, rinse with DI water, dry (see above), and place into pH 7 buffer. This value must be within 0.05 pH units of 7.00. If not, buffers must be discarded and meter recalibrated with freshly made buffers. If value is still out of range, electrode and meter must be checked for accuracy by the laboratory before any further pH measurements are taken. If reading for pH 7 buffer is within range, equipment is ready for use. Record date, time, pH 4 and 10 buffer checks, reading of pH 7 buffer, and analysts' initials.

Revision Change: Corrected Appendix D and added 2 locations for small O&G jars on page 9 of this guide.

2008 Onondaga Lake & Tributary
ZOOPLANKTON, PHYTOPLANKTON AND CHLOROPHYLL

A.) ZOOPLANKTON

Onondaga Lake Samples:

1. 0-15 Meter Net Haul
2. Upper Mixed Layer (UML)

Sample Containers: (2) 1000 mL plastic bottle
(4) 500 mL containers of 95% Ethanol / Alka Seltzer

Preservation: Pour the entire sample into the 1000-mL plastic jar and rinse any residual into the jar with wash bottle. Place a quarter tablet of Alka-Seltzer into the jar and wait for zooplankton to stop. Add 70% by volume of 95% reagent grade non-denatured ethanol (more ethanol is better). Example: 150-ml sample requires 350-mL ethanol. Repeat the procedure for the sample to be collected at the UML depth.

B.) PHYTOPLANKTON

Onondaga Lake Samples:

1. UML Composite

Sample Container: 500 mL plastic bottle

Preservation: Preserve the sample with enough Lugols Solution to turn the sample iodine color (maroon in color), approximately 5 to 7 mL per 100 mL of sample,

C.) CHLOROPHYLL-A

Onondaga Lake Samples:

1. UML
2. Photic Zone (2 x Secchi Depth)

Tributary Samples:

1. Onondaga Lake Outlet at Long Branch Road – 2 feet
2. Onondaga Lake Outlet at Long Branch Road – 12 feet

Sample Containers: (2) 2 liter Amber Bottles

Preservation: Cool to <=6° C

Revision Change: Corrected Appendix D and added 2 locations for small O&G jars on page 9 of this guide.

APPENDIX A
Approved Sample Container List

Metals:
i. 500 mL or 1 L container for liquids
ii. 120 mL specimen cup, 1L glass, or 500 mL wide-mouth glass jar for Biosolids, Waste Haulers, or Sludges
iii. 250 mL pre-cleaned glass bottle, doubled bagged for low level mercury.

Phenols:
1 L Amber glass with Teflon-lined cover *(Large)*
8 oz. glass with Teflon-lined cover (Small)

***The following sites have been determined to require the 1 L amber jars** at all times:*

Source	*Ind Code*	*Industry*	*Ind Code*
Metro Effluent	*789*	*Baldwinsville Effluent*	*618*
RockTenn-Solvay Mills	*163*	*RockTenn-Southern Container*	*102*

Oil & Grease:
Clear straight-sided, 1 L or 250 mL glass bottle —HEXANE RINSED—with Teflon-lined plain plastic cover. DO NOT USE PLASTIC COVERS WITH A FOAM LINING. DO NOT PUT A TEFLON LINER OVER A FOAM LINER.

Cyanide:
Half-gallon, 1 Liter or 250 mL Plastic container

NH3/TKN/TP:
1liter plastic container or 120 mL Specimen cup

TP (Total Phosphorus):
1liter plastic container or 120 mL Specimen cup

SRP (ORTHO-PHOSPHATE):
125 mL screw-top plastic Erlenmeyer

TDP (TOTAL DISSOLVED PHOSPHATE):
125 mL screw-top plastic Erlenmeyer

TOC (TOTAL ORGANIC CARBON):
Half-gallon plastic container

SULFIDES-TOTAL:
250 mL glass bottle with cone insert in cap

HEX-CHROMIUM:
1 liter plastic container

CONVENTIONAL:

Revision Change: Corrected Appendix D and added 2 locations for small O&G jars on page 9 of this guide.

Half Gal., Gallon Plastic container; Clear 1Liter Glass container for Waste haulers, *and cold cream jar or sample cups for solid or semi-solid samples.*

FLASHPOINT:
250 mL glass bottle with cone insert in cap.

T-ALKALINITY:
500 mL plastic bottle with cone insert in cap

WINKLER DISSOLVED OXYGEN:
300 mL glass BOD bottle

BACTERIA SAMPLING:
125 mL plastic- sterilized, 250 mL plastic- sterilized

PHYTOPLANKTON:
500 mL plastic bottle

DREISSENID VELIGERS:
1000 mL wide-mouth plastic bottle

ZOOPLNKTON:
1000 mL plastic bottle

CHLOROPHYLL AND PHAEOPHYTIN: Two-Liter brown plastic bottle

Revision Change: Corrected Appendix D and added 2 locations for small O&G jars on page 9 of this guide.

WATER ENVIRONMENT PROTECTION LABORATORY

FROM: Mark Fowkes; Quality Control Officer
DATE: ***Tuesday, September 3, 2013***
SUBJECT: Oil & Grease Samples

The standard recommended sample size for an Oil & Grease analysis is 1 Liter (1000mL). Some sampling points are small pipes which necessitate utilizing a smaller than normal sample container. These containers are slid down these pipes to collect a sample. Therefore, field services have two types of sampling containers for the collection of oil and grease. A quart clear glass jar and a 250 mL clear glass jar.

All jars are labeled "O & G" and have been prepared specifically for the collection of Oil & Grease samples. Any other type of similar container lacking the "O & G" label can not be used. The bottle labels and chain of custody should indicate '1QtOG' for the 1 Quart Oil & Grease glass jar **or** "SmOG" for the 250 mL Oil & Grease glass jar. The standard operating procedure will be as follows:

1. Unless otherwise stated, the one quart jar is to be used for most sampling locations.
2. Two jars are to be used per sample.
3. One jar is labeled 'O & G' and one is labeled 'O & G Test'. As per regulations, the 'test' jar is used to determine the amount of acid to be added to obtain a pH of 2.0 or less.
4. The sample is obtained and split into each jar.
5. As per the SOP, after the proper pH is obtained in the 'test' jar, the same quantity of sulfuric acid is to be added to the 'O & G' jar.
6. Both jars are to be delivered to the laboratory.
7. The laboratory will analyze the sample and dispose of the jars in an appropriate manner.
8. In the event that the site does not allow for the one quart jar to be used, or the sample has high solids content, then a 250 mL jar may be substituted. To date, the **following sites have been determined to require the 250 mL jars** at all times:

Industry	Ind Code	Industry	Ind Code
Ameripride	586	Inficon MH #2 & #3	591
Anaren MH#2	267	Kilian	33
Armstrong Molding MH #1	489	Lockheed Martin MH #1 & #2	154
API	118	***Metallico***	***130***
Bell Pak MH #1	530	Muench-Kreuzer Candle	298
Bitzer Scroll #1	301	New Process Gear	10
Byrne Dairy	62	Oberdofer	39
Carrier MH#1 & #2	8	Packaging Corp of America	103
Cintas	340	Plainville Turkey Farms	69
Cargill	485	Sandy's Bumper Mart MH #1	183
Cathedral Candle	296	Solvay Paperboard	163
Clinton's Ditch #1	447	Solvents & Petroleum	280
Diverse Foods	348	Southern Container	102
Empire Expo	17	Specialized Packaging Radisson	426
Empire State	105	***Steri Pharma***	***515***
Feldmeirer	270	Syracuse Hancock Airport	80
G.A. Braun, Inc.	201	Syracuse Newspapers	190
G.C Hanford MH#1	115	Syracuse Packaging MH #4	499
General Chemical MH#1	563	Terrells	15
Giovanni Food Co., Inc. MH#1	71	Ultra Dairy	63
G & L Davis, MH #1	350	Unifirst MH#1	355

Revision Change: Corrected Appendix D and added 2 locations for small O&G jars on page 9 of this guide.

APPENDIX B
OIL & GREASE – METHOD 1664A -- SPECIFIC INSTRUCTIONS

1. All O&G samples must be collected in a Hexane-rinsed, straight-sided, 1L or 250 mL glass bottle, with a plain plastic (Teflon-lined) cover. These bottles are to be used ONLY for O&G samples.

2. Sample bottles must not be pre-rinsed with sample before collection.

3. Two sample bottles will be needed for each sample, (1) bottle for testing pH and (1) bottle for final sample. Determining the amount of H_2SO_4 to be added to the sample to reach a pH of 1.5 – 2.0 (verified by approved methodology) is done as follows:

a. Fill both 1L bottles with approx. the same amount of sample; DO NOT FILL ABOVE THE START OF THE THREADS ON THE JARS.

b. Adjust the pH of one bottle to <2 with H_2SO_4, record the # of mL of H_2SO_4 used on COC and initial sample may then be discarded.

c. Add the same # of mL H_2SO_4 to the second sample bottle, cool to <=6^0 C and deliver to Lab.

Note: At no time is an electrode or pH paper to be inserted into the final sample container

Additional samples are to be collected for QA/QC requirements. Per the following frequency:

i. For every five (5) O&G samples that are collected, at an industrial site an **additional** two (2) O&G samples will be collected at one of those industrial sites for a total of three (3) samples collected for delivery to the Lab. The fourth sample (pH test sample) can be discarded and the empty bottle returned to the Lab. The specific sites and days of collection will be determined in advance and placed on the Weekly Schedule. This selection is based on the ability to collect all of the necessary samples – if low flow or other impediment to reliable sample collection is present, another site should be chosen.

Note: *If it's necessary to deliver the test sample to the Lab, please clearly label the bottle as 'test sample' to avoid confusion.*

ii. Note number of final sample bottles collected on the COC (SOP).

iii. Samples are cooled to <=6^o C after preservation

By-Pass

All of the procedures required for Industrial O&G sample collection also apply to By-Pass events with the following exception:

The QA/QC sample requirement of two extra sample bottles will be collected on the first sample event of a By-Pass. This means a total of three (3) final sample bottles will be delivered to the Lab. Again, the fourth sample is for testing and may be discarded.

Revision Change: Corrected Appendix D and added 2 locations for small O&G jars on page 9 of this guide.

APPENDIX C
PHENOL – FIELD DUPLICATE - SAMPLING INSTRUCTIONS

The primary focus of taking field duplicates is to evaluate sampling variability and analytical precision. A set of field duplicates is normally obtained by taken a well mixed, homogenized sample and splitting it into two fractions. Each fraction is then preserved as required by the protocol established for the method. For phenol grab samples, a single ~~one Liter amber~~ glass container with a Teflon lined cover is normally used. These glass ~~amber~~ bottles are further identified by a label with "Phenol" inscribed to help ensure they have been properly cleaned and prepared prior to sampling. When collection also includes taking field duplicates, the process will first involve collection as though a single grab sample is being taken. The phenol sample is then shaken and mixed well to create a homogenized mixture. The sample is then split into two fractions by pouring it into two separate phenol containers followed by the appropriate preservation outlined within this guide.

While most duplicate grab samples are collected in this manner it should be noted that some fractions should not be taken as split samples (such as organics and low level Hg). For samples that may experience a loss of analyte from the homogenization process or where sample volume may make the homogenization process impractical, two separate samples should be collected as closely together chronologically and spatially as possible.

Phenol Duplicate Collection Process:

1. Three clean ~~amber~~ glass containers with Teflon caps are required. All containers should have a "Phenol" label.
2. At the sampling site, collect a single grab sample into one glass container filling it at least half full.
3. Shake and mix the sample well before splitting and pouring contents into the other two glass amber jars.
4. Preserve with concentrated H_2SO_4 (sulfuric Acid) to a pH of < 2 and cool to <= 6° C.
5. Make sure to identify on the sample label that one of the bottles is a duplicate.

Revision Change: Corrected Appendix D and added 2 locations for small O&G jars on page 9 of this guide.

APPENDIX D
FIELD CHLORINE CALCULATIONS FOR RTF - INSTRUCTIONS

The metro permit includes monitoring requirements for the regional treatment facilities. These include Hiawatha and Midland where the permit states that during overflow events, total residual chlorine must be measured every four hours during the discharge. In additional, the permit states that the County must use Chlorine by DPD Colorimetric Method - Standard Methods (4500-Cl G) to measure for total residual (free) chlorine and also for the following four additional analytes: Monochloramine, Chloramines, Total Chloramine, and Total Chlorine. The field spreadsheet below is designed to help facilitate the calculations and input of these results into the laboratory's database for reporting purposes.

Using "Standard Methods 4500-Cl G" determine the following concentrations using the DPD colorimetric method;

- Using one of the HACH Pocket Colorimeters, take a 25 mL sample and add a DPD free chlorine tab, mix, and immediately read / record the result for Free "Residual" Chlorine (reading A).
- Add 2 very small crystals (0.1 grams) of KI, mix and immediately read / record the result (reading B).
- Add several additional crystals (0.25 grams) of KI, mix and wait two minutes. Then read / record the result (reading C).

Calculate the concentration as follows;

- **Total Residual Chlorine** is equal to (reading A)
- **Monochloramine** is equal to (reading B-A).
- **Total Dichloramine** is equal to (reading C-B)
- **Chloramines** is equal to (reading C-A)
- **Total Chlorine** is equal to (reading C)

Analyte	Description	Reading	Result (mg/L)
Total Chlorine Residual (reading A)	take a 25 mL sample and add a DPD free chlorine tab, mix, and immediately read / record the result for Free "Residual" Chlorine. (reading A)		
(reading B)	Add 2 very small crystals (0.1 grams) of KI, mix and immediately read / record the result (reading B)		
Total Chlorine (reading C)	Add several additional crystals (0.25 grams) of KI, mix and wait two minutes. Then read / record the result (reading C)		
Monochloramine		(reading B-A)	
Chloramines		(reading C-A)	
~~*Total Chloramine*~~ *Total Dichloramine*		(reading C-B)	

Revision Change: Corrected Appendix D and added 2 locations for small O&G jars on page 9 of this guide.

APPENDIX E
Onondaga County Chain of Custody Form

CHAIN OF CUSTODY RECORD

Sample #

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
Engineering and Laboratory Services Division
(Revision: Feb 2014 – COC_62002Dbaseportraitmod.DOC)

Project Name	
IC/FC #	
Sewer#/WCode	
Invoice#	
DEC Permit	
Req. By	

Origin of Sample (i.e., Name of Industry, Treatment Plant, Hauler, etc.)

CATEGORY: Treatment Plant | AMP | IND | TP | WHC | SPECIAL | QA/QC

LABORATORY NAME: **HC**

Start Date	End Date	Pickup Date	Start Time	End Time	Samp Type	Bottle #	Container Type	Initial	Preserved YES	Preserved NO	SAMPLE NOTES (Lab) Receipt Temp

Bottles/Comp		**Aliquot/Bottle**		**Sample Interval**		**Sampler ID**		**Refrig/Iced**	
Preservation Checklist	Oxidizer Present?		Oxidizer Removed?		PreKit#		**Field pH**		
	Yes	**No**	**Yes**	**No**	Initials		**Chlorine Residual**		
NH3-N							**Meter#**		
TKN							**Flow**	**Yes / No**	
Phenol									
Color Interference?			**If yes, added [ ] drops Na Thio**						

MATRIX:	Remarks (sample / collection details):	**Bypass Samples**	
Solid		Total Residual Chlorine	
WasteWater		Monochloramine	
SurWater		Total Dichloramine	
PotWater		Chloramine	
		Total Chlorine	

SPLIT WITH (Name/Title/Date):

Floatables	Present / Absent	**If present than attach Floatables Description Form to the Chain of Custody**

PARAMETERS AS LISTED IN ANNUAL SCHEDULE? YES NO → If NO, List Parameters below for all samples:

Lab Comments:

CHAIN OF CUSTODY (Signature, Date of Possession)
1.
2.
3.
4.

Attachments included? YES / NO If yes, list pages: Page ____ of ____.

APPENDIX F
Onondaga County Personal Protective Equipment (PPE) Requirements

OCDWEP-ETS Wastewater Technician Field Staff Personal Protective Equipment Requirements

Job Activity	Hazards												Personal Protective Equipment																														
	Electrical	Falls	Airborne Particles	Foot Injury	Hand Injury	Potentially Harmful Dust	Head Injury	Sun Exposure/Radiation	Chemical Exposure	Hearing/Noise	Harmful Gases	Drowning	Hypothermia	Apron	ANZI Z87 Safety Glasses	Chemical Splash Goggles	Dust Mask	Face Shield	Gloves	Hard Hat	Hearing Protection	Lanyards/Harness	Air Monitor	Floor Fall Protection	Safety Shoes	Safety Vest (Class II)	Safety Vest (Class III)	Class III Rain suit	Ventilation	Life Jackets	First Aid Kit	Waders	Mustang Exposure Suit	Sunscreen	Tyvek Suit	Other
General ETS Sample Collection		X	X	X	X	X	X		X	X	X				X	XP	A	A	X	P	P	S	P,S	S	X	S	S	S			X					
General ETS Sample Preservation			X		X	X			X		X				X	XP	A	A	X				A						X		X					
Lake/River/Tributary- Sampling																																										
By Boat		X		X	X			X	X	X		X	X		X	XP	S	A	X		S			X	X						X	X	S		Av		
Wading (Day)		X		X	X		X	X	X			X	X		X	XP	S	A	X	S		S			X	X					X	X	X		Av		
Wading (Night - Dry Weather)		X		X	X		X	X	X			X	X		X	XP	S	A	X	S		S			X		X				X	X					
Wading (Night - Wet Weather)		X		X	X		X	X	X			X	X		X	XP	S	A	X	S		S			X			X			X	X					
Crane Use (Day)		X		X	X		X	X	X			X	X		X	XP	S	A	X	S		S			X	X					X	X			Av		
Crane Use (Night - Dry Weather)		X		X	X		X	X	X			X	X		X	XP	S	A	X	S		S			X		X					X					
Crane Use (Night - Wet Weather)		X		X	X		X	X	X			X	X		X	XP	S	A	X	S		S			X			X				X					
Wintertime- Lake/River																																										
Tributary		X		X	X		X	X	X			X	X		X	XP		A	X					X		X					X	X	X	X	Av		
Boat		X		X	X		X	X	X			X	X		X	XP		A	X		S	S		X						X	X	X	X	Av		
Ice		X		X	X		X	X	X			X	X		X	XP		A	X					X						X	X	X	X	Av		Refer to SOP.
Electrofishing																																										
Boat	X	X							X	X		X	X	X	X	XP		A	X		X	X			X						X	X					Linesman gloves
Tributary/Backpack	X	X						X	X			X	X	X	X	XP		A	X						X							X			Av		
Larval Trawls		X		X	X			X	X	X		X	X	X	X	XP		A	X		X			X	X						X	X	X		Av		
Macroinvertebrate																																										
Tributary		X						X	X			X		X	X	XP		A	X			X			X							X	X		Av		
Lake		X		X	X			X	X			X		X	X	XP		A	X						X						X	X			Av		
Juvenile Seines		X						X	X			X		X	X	XP		A	X			X			X							X	X		Av		
Nesting Survey		X						X				X										X		X	X						X	X	X		Av		Polarized glasses
Zebra Mussel (Lake and River)		X		X	X			X	X			X		X	X	XP		A	X			X										X	X		Av		
Macrophyte Collection		X						X	X			X		X	X	XP		A	X			X		X							X	X	X		Av		
YSI Sonde Replacement at USGS Sites		X		X	X		X	X				X			X				X			X		X							X	X		Av		
Mooring and YSI Buoy Deployment		X		X	X			X				X	X			XP		Av	X			X		X	X							X	X	X	Av		
Mooring and YSI Buoy Removal		X		X	X		X	X	X			X	X	X	X	XP		Av	X	X		X		X	X							X	X	X	Av	Av	

Key For PPE : X - Required, **XP** - Required during preservation, **P** - Required in Posted Areas/Operations (Including Industries), **A** - As Recommended by Applicable MSDS, **S** - Refer to Supervisor and SOP, **Av** - Available for Use.

Please Take Notice: This is a summary of PPE equipment for various ETS Field Staff activities, and does not supersede any SOP requirements. If you have trouble locating a specific SOP, please contact your immediate supervisor.

January 2011