Northeast Ohio
Regional Sewer District

Level 3 Project Study Plan

2022 Lake Erie Beach Monitoring

Table of Contents

(1) List of Acronyms 2
(2) Objective 3
(3) Non-point/Point Sources 3
(4) Parameters Covered 4
(5) Field Collection and Data Assessment Techniques 4
(6) Stream Flow Measurements 5
(7) Sampling Locations 6
(8) Schedule 6
(9) QA/QC 7
(10) Work Products 7
(11) Qualified Data Collectors 8
(12) Contract Laboratory 10
(13) Scientific Collectors Permit 10
(14) Digital Catalog Statement 10
(15) Voucher Statement 11
(16) Sample Location(s) Statement 11
(17) Additional Data Type Signed Statement 11
(18) Trespassing Statement 11
Appendix A. Site Maps 13
Appendix B. Parameter Information 15
Appendix C. Standard Operating Procedures 17
Appendix D. Field Form 63
Appendix E. Meter Specifications 65
Appendix F. Sampling Schedule 72
Appendix G. Training Form 77
Appendix H. Audit Form 79
Appendix I. Laboratory Certifications 81

(1) List of Acronyms

EIMS	Environmental Information Management System
EPA	Environmental Protection Agency
HUC	Hydrologic Unit Code
NELAC	National Environmental Laboratory Accreditation Conference
NEORSD	Northeast Ohio Regional Sewer District
ODH	Ohio Department of Health
QDC	Qualified Data Collector
RM	River Mile
SOP	Standard Operating Procedures
USGS	United States Geological Survey
WQIS	Water Quality & Industrial Surveillance

(2) Objective

The purpose of this study is to monitor water quality in Lake Erie at Edgewater, Euclid, and Villa Angela beaches in order to communicate beach conditions to the public and to evaluate water quality standards attainment.

Microorganisms from urban runoff, combined sewer overflows (CSOs), wildlife, bather shedding, and non-point sources can be a contributing factor to illnesses for individuals utilizing the beaches. The U.S. Environmental Protection Agency has adopted *Escherichia coli* (*E. coli*) as one of the best indicator organisms at freshwater bathing beaches because its presence has been correlated to other pathogenic microorganisms that can cause illnesses. During this study, *E. coli* densities will be monitored, weather permitting, at these three beaches throughout the recreation season. Sampling will be conducted by the Northeast Ohio Regional Sewer District's (NEORSD) Water Quality and Industrial Surveillance (WQIS) division and may occur between May 1, 2022, and October 31, 2022. NEORSD's Analytical Services division will perform sample analysis. WQIS will evaluate the collected data and distribute the daily results. The data obtained from this sampling will be reported to the Ohio Department of Health (ODH) and used for public notification of water quality advisories. WQIS will be responsible for evaluating the results to determine water quality standards attainment.

In addition to water quality sampling at the beaches, water samples will also be collected from Euclid Creek, which, historically, has had elevated bacteriological densities that may be adversely impacting Villa Angela and Euclid Beaches. NEORSD will compare the results to the applicable water quality standards to determine the attainment status of Euclid Creek.

(3) Non-point/Point Sources

Point Sources	Non-point Sources
Publicly Owned Treatment Works	Stormwater runoff
CSOs	Sand
Storm sewer outfalls	
Bathers	
Feces (birds, dogs, wildlife)	

A map has been provided in Appendix A to show potential point sources that may be influencing the water quality at each sample location. These sources of pollution, along with the non-point sources listed in the table above, may be negatively impacting the water quality conditions at the beaches. Other factors that may influence water quality and

bacteriological densities during the study may include wet weather, wind, wave action, and beach morphology.

(4) Parameters Covered

Samples collected will be analyzed for *E. coli* densities as outlined by NEORSD's most current Standard Operating Procedures (SOP) for *Total Coliform and E. coli by Colilert®, Enterococci by Enterolert ®* or *Determination of E. coli by Membrane Filtration*. Field parameters to be measured during the study will include pH, water temperature, specific conductance, and turbidity (Appendix B). In addition, a field assessment of the beach will be conducted following the procedures outlined in NEORSD's *Beach Sampling* SOP (Appendix C). Observations such as number of swimmers and birds, wave height, average and maximum wind speed, wind direction, water color, clarity, odor and surface coating, lake surface conditions, and weather conditions may be recorded on a field sheet or in electronic format using an Apple iPad equipped with GIS data entry software. Examples of *Beach Sampling Field Data Forms* can be found in Appendix D.

(5) Field Collection and Data Assessment Techniques

Individual bacteriological samples will be collected from one site on Euclid Creek (river mile (RM) 0.55), and at each of the three beaches (east location) in at least a 250-milliliter sterilized polypropylene container and up to a 2000-milliliter sterilized polypropylene container, depending on the needs of NEORSD's Analytical Services. A 473-milliliter plastic bottle will be used to collect a water sample from each site to be analyzed for turbidity.

Field blanks are not required by method 1603 or by the National Environmental Laboratory Accreditation Conference (NELAC) for bacteria analysis. NEORSD's Analytical Services has procedures in place which are required by NELAC to demonstrate that the sample containers are clean and sterile. If the sterility check comes back positive, all equipment is re-cleaned and sterilized. Additionally, bacteriological field replicates will be collected from a randomly chosen site at a frequency not less than 5% of the total samples collected.

All samples will be collected as grab samples where the total depth of water at each beach sample site is approximately three feet. Samples will be collected approximately 6-12 inches below the water surface, as stated in Appendix C. At the time of collection, field parameters (pH, specific conductance, and temperature) will be measured directly in the lake or creek. Field analyses will include the use of the following meters to measure pH, water temperature and conductivity: Hanna HI 98129, YSI 600XL Sonde, YSI EXO1 Sonde, or YSI EXO2 Sonde. Turbidity samples will be collected with a 473-milliliter container and measured using one of the following portable field turbidity meters: the Hach 2100Q or Hach 2100P Turbidimeter. Specifications for the meters are included in Appendix E.

If weather conditions prevent the sampler from safely wading out to a depth of three feet, a sampling pole will be used to collect a bacteriological sample and turbidity sample from Lake Erie. If weather conditions do not permit the use of a sampling pole, no samples will be collected. Additionally, if sampling at the Euclid Creek site is deemed unsafe due to high flow or other conditions, samples will not be collected. Refer to section 7.6 of Appendix C for an explanation of sample collection during inclement weather.

Notes and observations pertaining to the beach and water conditions will be recorded using the NEORSD *Beach Sampling Field Data Form* (refer to Appendix D for an example form) or recorded in electronic format using an Apple iPad equipped with GIS data entry software. In the case of electronic data submission, daily field sheets may still be electronically generated upon request. Electronic data submission will allow beach modeling experts at the NEORSD WQIS division to enter data into Virtual Beach v3.0 modeling software prior to the return of the sampling team. Implementation of the electronic field data submission should expedite water quality predictions and public beach water quality advisory postings.

All water samples and field parameters will be collected as specified in NEORSD's *Beach Sampling* SOP located in Appendix C and Ohio EPA's *Surface Water Field Sampling Manual for water column chemistry, bacteria and flows* (2021). All bacteriological sample results will be compared to the State of Ohio Water Quality Standards to determine whether any exceedances of the applicable water quality criteria have occurred.

NEORSD will collect additional samples at Edgewater Beach in the event of a discharge from Combined Sewer Overflow (CSO) 069 (Permit Number 3PA0002069), in accordance with its Emergency Response Plan. CSO 069 (41.487253, -81.744972) is a stormwater outlet for the Northwest Interceptor, located on the western edge of the beach. CSO 069 is located near a highly utilized public recreation area; therefore, such sampling is necessary when a CSO discharge occurs during the recreation season. These samples will be collected at three locations on the west side of Edgewater beach, near the CSO outfall and at several near shore and far shore locations to determine the impact of the CSO discharge on the water quality at Edgewater Beach. An outline for actions and sampling during a discharge at CSO 069 is located in NEORSD Emergency Response Plan 2.2.4, Edgewater Overflow. All samples will be collected as specified in Ohio EPA's *Surface Water Field Sampling Manual for water column chemistry, bacteria and flows* (2021). All samples will be analyzed using approved EPA methods as specified in NEORSD's Analytical Services' most current *Quality Assurance Manual* (effective May 15, 2020).

If unusual water quality conditions are noted at the beaches, the NEORSD may collect additional water samples during the field season.

(6) Stream Flow Measurements

Not applicable.

(7) Sampling Locations

One location at the eastern section of Edgewater, Villa Angela and Euclid Beaches in Cleveland will be sampled for the duration of the study. An additional sample will be collected from Euclid Creek at RM 0.55. The locations of the sampling sites are shown on the map given in Appendix A. The following table details the sampling locations with respect to latitude/longitude, general location description, U.S. geological survey HUC 8 name and number, and purpose. Additional pictures and maps of the locations can be found in Appendix 1 of Appendix C.

Water Body	Site	Latitude	Longitude	Location Information	USGS HUC 8 Number-Name	Purpose
Edgewater Beach	East	41.4897	-81.7391	Eastern half of the beach. In line with the brick stack on the other side of the freeway.	04120200-Lake Erie	Public notification of water quality conditions at bathing beaches, determination of water quality standards attainment, and determination of the impact of point and non-point sources.
Villa Angela Beach	East	41.5862	-81.5667	Eastern half of beach mid-distance between the 3rd and 4th break walls.		
Euclid Beach	East	41.5842	-81.5687	In front of the pile of stones on the east side of the beach.		
Euclid Creek	RM 0.55	41.5835	-81.5595	Downstream of Lakeshore Boulevard.	04110003-Ashtabula-Chagrin	

(8) Schedule

Beach monitoring is expected to begin on May 2, 2022, and end on September 29, 2022 (Appendix F). From May 2 through May 19, bacteriological water samples from all sites

listed in section 6 will be collected four days a week (Monday through Thursday). Beginning May 23, and lasting through September 5, bacteriological water quality samples will be collected seven days a week from all sites. From September 5 through September 29, bacteriological water quality sampling at the beach sites is expected to return to four days a week (Monday through Thursday). Additional sampling may take place in October. All sampling will be dependent on weather conditions. Samples will be collected as scheduled, unless surface water conditions are deemed unsafe or there is inadequate staffing availability.

(9) QA/QC

All samples will be collected, labeled and immediately placed on ice inside of a sample cooler. Upon completion of a sampling event at the beach or creek, the sample cooler will be stored inside the field truck. The field truck will remain locked at all times when not occupied or visible. Sampling activities, including sample time and condition of surface water sampled, will be entered in a log book and on the *Beach Sampling Field Data Form* (see Appendix D for examples). The samples will then be delivered immediately to the NEORSD Analytical Services cooler and transferred to the custody of Analytical Services. The NEORSD's Analytical Services *Quality Assurance Manual* (effective date: May 15, 2020) and associated SOPs are on file with Ohio EPA. The Quality Assurance Officer at Analytical Services will send updates, revisions, and any information on document control to Ohio EPA as needed.

(10) Work Products

Reports summarizing, interpreting, graphically presenting and discussing the bacteriological data and any excursions from water quality standards will be submitted to the Ohio EPA or an Ohio EPA approved data warehouse as well as to the Ohio Department of Health. Field parameters and bacteriological data will be used internally, to update a predictive model created using Virtual Beach v.3.0. Results of the predictive modeling will be reported daily to the Cleveland Metroparks for the purpose of posting water quality advisories.

Pictures will be taken during each sampling event by the samplers to document the conditions at the beach. Daily photos will be electronically delivered from the field crew's iPads to an electronic photo catalog. Copies of the *Beach Sampling Field Data Form* and summary reports will also be stored electronically. Additionally, field observations will also be entered into the Environmental Information Management System (EIMS).

(11) Qualified Data Collectors

The following Level 3 Qualified Data Collectors (QDC) certified by Ohio EPA in Chemical Water Quality Assessment may be involved with this study.

Name	QDC Number	Address	Email Address	Phone Number
John W. Rhoades	00008	4747 E. 49th St., Cuyahoga Heights, OH 44125	rhoadesj@neorsd.org	216-641-6000
Seth Hothem*	00010	4747 E. 49th St., Cuyahoga Heights, OH 44125	hothems@neorsd.org	216-641-6000
Eric Soehnlen	01030	4747 E. 49th St., Cuyahoga Heights, OH 44125	soehnlene@neorsd.org	216-641-6000
Hannah Boesinger**	01374	4747 E. 49th St., Cuyahoga Heights, OH 44125	boesingerh@neorsd.org	216-641-6000
Jillian Knittle	00512	4747 E. 49th St., Cuyahoga Heights, OH 44125	knittlej@neorsd.org	216-641-6000
Ron Maichle	00145	4747 E. 49th St., Cuyahoga Heights, OH 44125	maichler@neorsd.org	216-641-6000
Mark Matteson	01020	4747 E. 49th St., Cuyahoga Heights, OH 44125	mattesonm@neorsd.org	216-641-6000
Denise Phillips	01203	4747 E. 49th St., Cuyahoga Heights, OH 44125	phillipsd@neorsd.org	216-641-6000
Francisco Rivera	00262	4747 E. 49th St., Cuyahoga Heights, OH 44125	riveraf@neorsd.org	216-641-6000
Justin Telep	01304	4747 E. 49th St., Cuyahoga Heights, OH 44125	telepj@neorsd.org	216-641-6000

*Project Manager
**Project Leader

All non-QDC samplers will receive training that consists of reviewing all pertinent SOPs and completion of required demonstrations of capabilities for parameters measured in the field. Training on sampling techniques and field analysis will be conducted by having the

samplers assist a QDC at the sites while the techniques are being demonstrated. The non-QDC samplers will then get an opportunity to conduct sampling, and the QDC will determine their proficiency with the techniques by observing sampling being performed and assessing the samplers' techniques. All samplers must meet and complete all requirements satisfactorily to be permitted to sample on their own. A complete checklist of training is provided in Appendix G (*Beach Sampling Training Checklist*). Once samplers have met the outlined criteria, they will be permitted to sample without the direct supervision of a QDC. The QDCs will perform monthly audits of the sampling, using a *Beach Sampling Audit Form* (Appendix H), and correct deficiencies through re-training, if necessary. Re-training will consist of accompaniment to the sampling site, instruction and observation by a QDC until deficiencies are no longer noted.

Official certification letters for the Level 3 Chemical Water Quality Assessment QDC approvals are on file with Ohio EPA.

The following is a list of persons not qualified as Level 3 data collectors who may also be involved in the project. Project leaders, with assistance from the QDCs, will provide training on sampling methodology and conduct the monthly audits. The project manager and leaders will be responsible for the final review of all reports and data analysis prepared prior to completion.

Name	Address	Email Address	Phone Number
Lindsay Baker	4747 E. 49th St., Cuyahoga Heights, OH 44125	bakerl@neorsd.org	216-641-6000
Brittany Dalton	4747 E. 49th St., Cuyahoga Heights, OH 44125	daltonb@neorsd.org	216-641-6000
Rae Grant	4747 E. 49th St., Cuyahoga Heights, OH 44125	grantr@neorsd.org	216-641-6000
Jeffrey Harrison	4747 E. 49th St., Cuyahoga Heights, OH 44125	harrisonj@neorsd.org	216-641-6000
Alex Johnson	4747 E. 49th St., Cuyahoga Heights, OH 44125	johnsonalex@neorsd.org	216-641-6000
Matthew Johnson	4747 E. 49th St., Cuyahoga Heights, OH 44125	johnsonmatthew@neorsd.org	216-641-6000
Shawn Robinson	4747 E. 49th St., Cuyahoga Heights, OH 44125	robinsons@neorsd.org	216-641-6000
Frank Schuschu	4747 E. 49th St., Cuyahoga Heights, OH 44125	schuschuf@neorsd.org	216-641-6000
Wolfram von Kiparski	4747 E. 49th St., Cuyahoga Heights, OH 44125	vonkiparskiw@neorsd.org	216-641-6000

Name	Address	Email Address	Phone Number
Theresa Walsh	4747 E. 49th St., Cuyahoga Heights, OH 44125	walsht@neorsd.org	216-641-6000
Paraprofessional Intern (TBD)	4747 E. 49th St., Cuyahoga Heights, OH 44125	@neorsd.org	216-641-6000
Paraprofessional Intern (TBD)	4747 E. 49th St., Cuyahoga Heights, OH 44125	@neorsd.org	216-641-6000
Paraprofessional Intern (TBD)	4747 E. 49th St., Cuyahoga Heights, OH 44125	@neorsd.org	216-641-6000
Paraprofessional Intern (TBD)	4747 E. 49th St., Cuyahoga Heights, OH 44125	@neorsd.org	216-641-6000

(12) Contract Laboratory

All bacteriological and/or chemical sample analysis will be completed by NEORSD's Analytical Services Division. Evidence of NEORSD's Analytical Services current accreditation and method dates can be found in Appendix I. The contact information for NEORSD's Analytical Service Division is:

Cheryl Soltis-Muth
4747 E. 49th Street
Cuyahoga Heights, Ohio 44056
Soltis-MuthC@neorsd.org
216-641-6000

(13) Scientific Collectors Permit

Not applicable.

(14) Digital Catalog Statement

A digital photo catalog of all sampling locations will be maintained for 10 years and will include photos of the specific sampling location(s), the riparian zone adjacent to the sampling location(s) and the general land use in the immediate vicinity of the sampling location(s).

Print/Signature: Seth Hothem / _____ Date: 3/18/22

(15) Voucher Statement

Not applicable.

(16) Sample Location(s) Statement

I attest that I will make available any and all sampling location information, including but not limited to; the name of the water body sampled, sampling location latitude and longitude, sampling location river mile where possible, general location information, the U.S. geological survey HUC 8 number and name, and the purpose for data collection at each sampling location.

Print/Signature: Seth Hothem / Seth Hothem Date: 3/18/22

(17) Additional Data Type Signed Statement

The Lead Project Manager for all locations is approved for all project data types.

Print/Signature: Seth Hothem / Seth Hothem Date: 3/18/22

(18) Trespassing Statement

I have not been convicted or pleaded guilty to a Violation of section 2911.21 of the Revised Code (criminal trespass) or a substantially similar municipal ordinance within the previous five years.

Print/Signature: Hannah Boesinger / Hannah Boesinger Date: 3/11/22

Print/Signature: Seth Hothem / Seth Hothem Date: 3/18/22

Print/Signature: John W. Rhoades / John W. Rhoades Date: 03/14/22

Print/Signature: Jill Knittle / Jill Knittle Date: 3/11/22

Print/Signature: Ron Maichle / Ron Maichle Date: 03-18-22

Print/Signature: Mark Matteson / Mark Matteson Date: 3/11/22

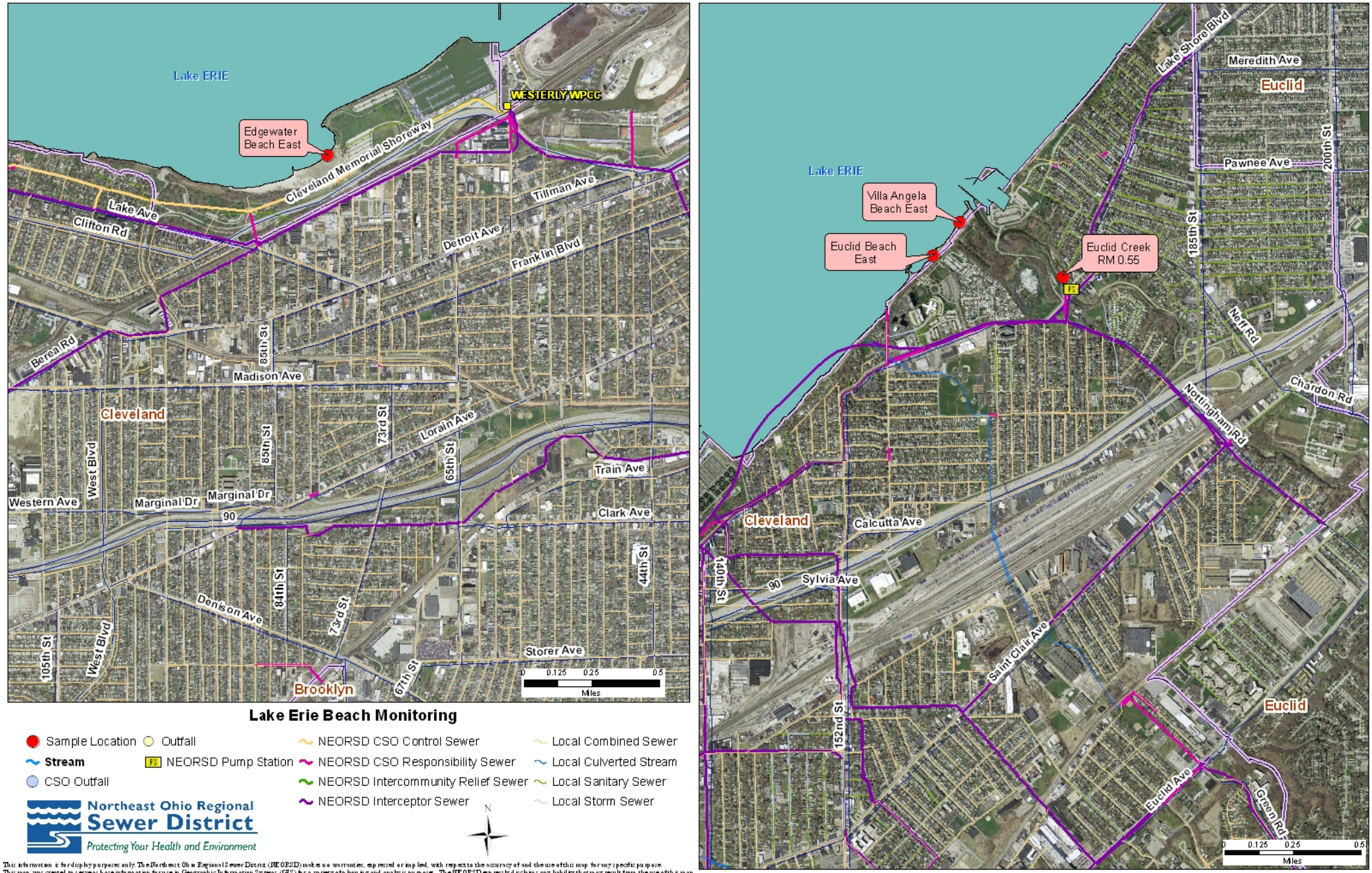
Print/Signature: Denise Phillips / Denise Phillips Date: 3/11/22

Print/Signature: Francisco Rivera / Francisco Rivera Date: 3/11/22

Print/Signature: Eric Soehnlen / Eric Soehnlen Date: 3/11/22

Print/Signature: Justin Telep / Justin Telep Date: 3/11/22

Appendix A. Site Maps



Lake Erie Beach Monitoring

- Sample Location
- Outfall
- Stream
- F2 NEORSD Pump Station
- CSO Outfall
- NEORSD CSO Control Sewer
- NEORSD CSO Responsibility Sewer
- NEORSD Intercommunity Relief Sewer
- NEORSD Interceptor Sewer
- Local Combined Sewer
- Local Culverted Stream
- Local Sanitary Sewer
- Local Storm Sewer

Northeast Ohio Regional Sewer District
Protecting Your Health and Environment

N

Appendix B. Parameter Information

Parameter	Test	Value Reported in	Minimum Detection Limit	Practical Quantitation Limit
E. coli	Colilert QT (SM 9223 B 20th Ed)	MPN (Most Probable Number)	1 MPN	--
	EPA 1603	colony forming units/100mL	1 colony	--
Turbidity*	EPA 180.1	NTU	0.1 NTU	0.2 NTU
Field Parameter	**Test**	**Value Reported in**		
pH	EPA 150.1	s.u.		
Specific Conductivity	SM2510B	µs/cm		
Temperature	EPA 170.1	°C		
Turbidity*	EPA 180.1	NTU		

*Turbidity will be completed either in the field or the laboratory.

Appendix C. Beach Sampling Standard Operating Procedure

Northeast Ohio Regional Sewer District

Protecting Your Health and Environment

Analytical Services
4747 East 49th Street
Cuyahoga Heights, OH 44125

Determination of Total Coliforms and *E. coli* by Colilert® Quanti-Tray
SOP–2109-12

Effective Date: 02/08/2021

Approvals

Prepared by Supervisor: Kristen Greenwood Date: 2/8/2021

Reviewed by QA Manager: Sheela Agrawal Date: 2/8/2021

Approved by Manager of AS: Cheryl Soltis-Muth Date: 2/8/2021

Northeast Ohio Regional Sewer District

Protecting Your Health and Environment

Analytical Services
4747 East 49th Street
Cuyahoga Heights, OH 44125

Table of Contents

1.0 SCOPE AND APPLICATION ..... Error! Bookmark not defined.

2.0 SUMMARY OF METHODS ..... Error! Bookmark not defined.

3.0 DEFINITIONS ..... Error! Bookmark not defined.

4.0 INTERFERENCES ..... Error! Bookmark not defined.

5.0 SAFETY ..... Error! Bookmark not defined.

6.0 EQUIPMENT AND SUPPLIES ..... Error! Bookmark not defined.

7.0 REAGENTS AND STANDARDS ..... Error! Bookmark not defined.

8.0 SAMPLE COLLECTION, PRESERVATION, AND STORAGE ..... Error! Bookmark not defined.

9.0 QUALITY CONTROL ..... Error! Bookmark not defined.

10.0 CALIBRATION AND STANDARDIZATION ..... Error! Bookmark not defined.

11.0 PROCEDURE ..... Error! Bookmark not defined.

12.0 CALCULATIONS ..... Error! Bookmark not defined.

13.0 METHOD PERFORMANCE ..... Error! Bookmark not defined.

14.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA FOR QUALITY CONTROL MEASURES ..... Error! Bookmark not defined.

15.0 METHOD SPECIFIC CORRECTIVE ACTIONS ..... Error! Bookmark not defined.

16.0 CONTINGENCIES FOR OUT-OF-CONTROL/UNACCEPTABLE DATA ..... Error! Bookmark not defined.

17.0 WASTE MANAGEMENT ..... Error! Bookmark not defined.

18.0 POLLUTION PREVENTION ..... Error! Bookmark not defined.

19.0 ANALYST RESPONSIBILITIES ..... Error! Bookmark not defined.

20.0 REFERENCES ..... Error! Bookmark not defined.

21.0 ADDITIONAL INFORMATION ..... Error! Bookmark not defined.

22.0 REVISION HISTORY ..... Error! Bookmark not defined.

1.0 Scope and Application

1.1. This procedure is applicable to wastewater, drinking water, recreational, and ground waters.

1.2. This procedure follows the SM 9223 B 2016 Enzyme Substrate Test, Multi-Well Procedure*, Standard Methods for the Examination of Water and Wastewater.*

1.3. This document describes the procedures for determining the concentration of bacteria by the Colilert® Method.

1.4. The Colilert® and Colilert-18® methods are used for the analysis of Total coliforms and *E. coli*.

2.0 Summary of Methods

2.1 An enzymatic powder reagent is aseptically added to either 100 mL of a sample or a sample diluted to 100 mL and mixed vigorously.

2.2 The solution is poured into the Quanti-Tray® and the tray is sealed.

2.3 After incubation, the number of positive wells is counted for the determination of Total coliforms. The trays are then placed under a fluorescent light and the positive wells (fluorescing) are counted for the determination of *E. coli*.

2.4 The MPN chart is used to determine the result reported as the MPN/100 mL. *See Section 21.0.*

3.0 Definitions

3.1 **Analysis Batch** – A batch consists of 19 samples, a duplicate, a negative, and a positive.

3.2 **CHP** – Chemical Hygiene Plan

3.3 ***E. coli*** – A subgroup of the fecal coliforms commonly found in the intestinal tract of animals.

3.4 ***Klebsiella pneumoniae*** - Organism used to validate Colilert reagent, Total coliform positive, *E. coli* negative

3.5 **Heterotrophic Bacteria –** Bacteria that obtain energy from carbohydrates and other organic material.

3.6 **May** – This action, activity, or procedural step is neither required nor prohibited.

3.7 **May not** – This action, activity, or procedural step is prohibited.

3.8 **Must** – This action, activity, or procedural step is required.

3.9 **Negative Control** – A sample containing no detectable analyte processed simultaneously with and under the same conditions as the samples.

3.10 **Positive Control** – 100-mL of sterile DI water inoculated with ATCC 11775 *E. coli* processed simultaneously with and under the same conditions as the samples.

3.11 ***Pseudomonas aeruginosa*** – Organism used to validate Colilert reagent, Total coliform negative, *E. coli* negative

3.12 **Shall** – This action, activity or procedural step is required.

3.13 **Should** – This action, activity or procedural step is suggested but not required.

3.14 **SSR Form** – OEPA sample submission form

3.15 **Total coliform** – All the aerobic and facultative anaerobic, gram negative, non-spore forming rod shaped bacteria that ferment lactose in 24-48 hours at 35 ± 0.5 °C.

3.16 **Environmental Validation Sample** – A sample set-up to test the cleanliness of the environment in which samples are analyzed.

4.0 Interferences

4.1 The color or turbidity of the sample can interfere with the results. Take a duplicate sample or reserve a portion of the sample to use as a color control blank.

4.2 Sunlight can hydrolyze the indicator compounds in the reagent resulting in a false positive test.

4.3 Samples containing chlorine will interfere with sample results and display a transient blue color when the Colilert reagent is added. Test all samples for

chlorine residual. Do not analyze samples with chlorine present. If samples are for plant regulatory purposes, plant personnel must be notified.

4.4 High concentrations of calcium salt may form a precipitate but should NOT interfere with results.

4.5 Samples with high iron/manganese in combination with hydrogen sulfide, may turn greenish-black with a black precipitate after 24 hours incubation.

4.6 Heterotrophic bacteria present in concentrations >2, 000,000/100 mL can yield a false positive for coliforms.

5.0 Safety

5.1 The analyst must be familiar with the appropriate protective attire such as safety glasses and gloves when working with chemicals or near equipment. Users of this procedure must be cognizant of inherent laboratory hazards. All chemicals and samples shall be treated as a potential health hazard and a reference of material safety data sheets (SDS) shall be available to all personnel involved in the chemical analysis. All laboratory personnel performing this analysis must be familiar with the SDS for all materials used in this procedure.

5.2 Proper protective equipment is to always be worn.

5.2.1 Lab coat

5.2.2 Protective Gloves (PVC or nitrile)

5.2.3 Safety Glasses – must be approved by Health and Safety Department

5.2.4 Closed Toe Shoes

5.3 Follow the approved Chemical Hygiene Plan (CHP). This includes awareness of the proper disposal procedures of contaminated materials and appropriate segregation of hazardous wastes.

5.4 All personnel handling environmental samples known to contain or to have been in contact with human waste should be immunized against known disease causative agents.

6.0 Equipment and Supplies

6.1 0.22 µm in-line filter, like Whatman Polycap TC catalog # 6717 9501

6.2 IDEXX Quantity Tray® heat sealer

6.3 UV light source (365-366 nm) in a dark environment

6.4 Sample Shaker (Like Thermolyne Big Bill Model M49125)

6.5 Quanti-trays/2000 (NEO Stock# 994322)

6.6 Quanti-tray/200 (NEO Stock# 994798)

6.7 Sterile 500 mL bottles with caps (NEO Stock# 665634)

6.8 Sterile 125 mL bottles with caps, untreated, commercially purchased (NEO Stock# 994320)

6.9 Sterile 250 mL bottles with caps, treated with 10% sodium thiosulfate, commercially purchased (NEO Stock#994753)

6.10 Validated, sterile 25 mL, 10 mL, 1.0 mL serological pipettes (NEO Stock# 276728), (NEO Stock# 276743), (NEO Stock# 994742)

6.11 Validated sterile graduated cylinder, 100 mL, 50 mL, 500 mL (NEO Stock#415203), (NEO Stock#415209), (NEO Stock#415205)

6.12 Incubator capable of maintaining a temperature of 35 ± 0.5 °C

6.13 Quanti-Tray 2000® comparator for Colilert® and Colilert-18® (NEO Stock# 994697)

6.14 Quanti-Tray 200® comparator for Colilert® and Colilert-18® (NEO Stock# 994798)

6.15 Inoculation loops (NEO Stock#994605)

6.16 Sterile scoopulas (NEO Stock#490025)

6.17 Weigh boats (NEO Stock#202940)

6.18 Sample Shaker

7.0 Reagents and Standards

7.1 Colilert® analysis – WP200 Nutrient indicator reagent packs (NEO Stock# 994321)

7.2 Colilert®-18 WP020I-18 Nutrient indicator reagent packs (NEO Stock# 994789)

7.3 Comparator for Colilert Quanti-Tray, 2000 NEO Stock #994697 and 200 NEO Stock #994829

7.4 Sterile de-ionized water

7.5 *E. coli* pure culture (ATCC#11775 or 25922)

7.6 *Klebsiella. pneumoniae* pure culture (ATCC#34188)

7.7 *Pseudomonas aeruginosa* pure culture (ATCC#10145)

7.8 Sterilized DI water

7.9 Sterile DI Water dilution bottles (NEO Stock#994974)

7.10 Isopropyl alcohol or propanol (NEO Stock#99017)

7.11 Sterile sand – for solids only

7.12 Tryptic Soy Broth (TSB) (NEO Stock #994651) See *SOP-3015 Media and Reagent Preparation* for validation procedures.

7.13 Double Strength Tryptic Soy Broth (2xTSB) (NEO Stock #994651) See *SOP-3015 Media and Reagent Preparation* for validation procedures.

8.0 Sample Collection, Preservation, and Storage

8.1 **Wastewater, Ambient and Environmental Samples**

8.1.1 Collect all types of samples in sterile bottles, using aseptic technique throughout the sampling process.

8.1.2 Samples are to be kept at ≤ 6 °C during transport and until analyzed.

8.1.3 Samples must be analyzed within 8 hours of collection time.

8.2 Recreational waters are collected in untreated bottles.

8.3 Wastewater samples are collected in bottles treated with 10% sodium thiosulfate.

8.4 Drinking Water Samples

8.4.1 Collect samples in treated, sterile bottles only, using aseptic technique throughout the sampling process.

8.4.2 Select an appropriate tap such as a faucet, petcock, or small valve. Avoid taps with a leaky stem or a swivel joint.

8.4.3 Remove the aerator prior to sample collection.

8.4.4 Place all carbon filters, sediment filters, and water softeners on bypass.

8.4.5 Flush the tap for one minute the close the valve.

8.4.6 Disinfect the nozzle for 2 minutes with a sanitizing solution using a spray bottle or a plastic bag to get the sanitizing solution into the faucet.

8.4.7 Open the tap fully and flush for 3 – 5 minutes then reduce the flow to allow the sampling bottles to fill without splashing.

8.4.8 Verify that the water is within the expected concentration range for chlorine using a digital or colorimetric/DPD colorimeter.

8.4.9 Aseptically fill the sample bottle making sure to not overflow as this will wash out the sodium thiosulfate.

8.4.10 Immediately recap the bottle.

8.4.11 Samples are to be kept at ≤ 6 °C during transport and until analyzed.

8.4.12 Samples must be analyzed within 30 hours of collection date and time.

9.0 Quality Control

9.1 Aseptic technique is to be used throughout the procedure. *See SOP 3028.*

9.2 Initial Demonstration of Capability (IDOC) – Four unknown samples will be analyzed. Each new analyst that will be performing the method must perform an IDOC before analyzing samples. *Refer to SOP 5045 Micro DOC for procedures.*

9.3 Ongoing Demonstration of Capability (DOC) – Four unknown samples will be analyzed. Each analyst performing the method must perform a DOC each year. *Refer to SOP 5045 Micro DOC for procedures.*

9.4 Negative control (Method Blank) is to be analyzed with every batch of samples.

9.5 A Positive control is to be analyzed with every batch of samples.

9.6 Each lot of Colilert® and Colilert®-18 enzymatic reagents must be validated prior to use. See *SOP-3015 Microbiological Media and Reagent Preparation and Validation.*

9.6.1 *E. coli* pure culture (ATCC#11775)- positive Total coliform, positive *E. coli*

9.6.2 *K. pneumoniae* pure culture (ATCC#34188) - positive Total coliform, negative *E. coli.*

9.6.3 *P. aeruginosa* pure culture (ATCC#10145) - negative Total coliform, negative *E. coli*

9.7 1% (4 bottles) of a lot of bottles must be checked for sterility and to verify the 100 mL volume before use. *See SOP 3018 Microbiological Equipment Preparation, Sterilization and Validation.*

9.8 1% of each lot of Quanti-Trays® must be checked for sterility before use. See *SOP-3018 Equipment Prep and Sterilization.*

9.9 The sterile DI/dilution water must be validated before use. *See SOP 3015 Media Prep and Validation.*

9.10 The 99 mL dilution bottles must be validated before use. *See SOP 3015 Media Prep and Validation.*

9.11 The autoclave timer is to be validated quarterly.

9.12 *Negative* – a negative must be analyzed with each batch of samples.

9.13 *Positive* – a positive sample must be analyzed with each batch of samples.

9.14 *Duplicate* – a duplicate must be analyzed with every batch.

9.15 The autoclave must be validated monthly using the appropriate spore test. (Section 7.12)

9.16 The dry sterilization oven must be validated using the appropriate spore test. (Section 7.13)

9.17 Twice a year, a validation of the environment where sample analysis is conducted must be performed. See Section 21.0 for the procedure.

9.18 See *SOP-3015 Media and Reagent Preparation* for validation procedures.

9.19 See *SOP-3018 Equipment Preparation and Sterilization* procedures.

10.0 Calibration and Standardization

10.1 A comparator is used to compare the color of analyzed samples to that of the standard positive.

10.2 The balance is validated daily for accuracy. Top loading balances must have readability to 0.1 g and analytical balances to 0.001 g. *See SOP 5006.*

10.3 The pH meter must be calibrated prior to use and be accurate to 0.02 pH units. Refer to SOP-2001.

11.0 Procedure

11.1 Only analysts with current DOC's for drinking water can perform all analyses of public and private drinking waters if samples are for regulatory reporting purposes.

11.2 Use aseptic technique throughout the procedure. *See SOP 3028.*

11.3 In the LIMS, navigate to the backlog for the Microbiology department for the Chlorine Check process.

11.4 Select the samples to be analyzed by creating the Chlorine Check prep batch This is done by clicking on the sample(s) and click on the "Create Batch" button. Save the batch that was created.

11.5 Print the Batch Worklist report. This report is the sample request list and proof of chain of custody for the samples.

11.6 Receive the samples from Sample Control.

11.7 Sterilize the work area with isopropanol prior to beginning any analysis.

11.8 Label all test vessels and Quanti-Trays®, one tray for each bottle, with the sample ID and analysis volume.

11.9 **Aqueous Sample Analytical Procedure**

11.9.1 Perform the Chlorine Check

11.9.1.1 Any sample that is from a known chlorinated source, or from an unknown source where chlorination is suspected, is to be checked for the absence of chlorine residual.

11.9.1.2 Mix the sample and pour about 5 mL into a plastic cup (DO NOT dip the chlorine strip directly into the sample). Using a chlorine residual test strip, test the 5 mL portion of the sample for chlorine residual.

11.9.1.3 Document the result on Form 2086.

11.9.1.4 **If any regulatory WWTP sample (effluent, bypass, overflow) is positive for chlorine, notify the following immediately: Sample Receiving, Supervising Biologist, Manager of Analytical Services, Superintendent of Environmental Services and Regulatory Compliance, The WWTP Superintendent, the on-call Supervisor (if it is a weekend), and the QA/QC Department.**

11.9.1.5 If chlorine is present in the sample, notify the supervisor and the QA Manager immediately. Do not proceed with the analysis of the sample.

11.9.1.6 Complete the Chlorine Check prep batch in the LIMS. Enter the correct analyst name, date, and time that the chlorine check was performed by selecting “Negative” or “Positive” in the Text column. Save all results and click on “Complete Review.”

11.9.2 Set-up the Negative

11.9.2.1 Pour 100 mL of sterile DI water into a validated test vessel.

11.9.2.2 Add the contents of the Colilert® or Colilert-18® reagent to the test vessels, cap, and mix.

11.9.3 Create the analysis batch in the LIMS by navigating to the backlog for the Microbiology department and the E COLI AQ (9223) analysis process.

11.9.4 Select the sample(s) to be analyzed by highlighting the sample and then click on the "Create Batch" button.

11.9.5 The method blank (MB), positive (LCS) and a duplicate are automatically assigned to the batch. The duplicate is automatically assigned to the first sample in the batch.

11.9.6 If the duplicate is not being performed on that sample, reassign the duplicate to the appropriate sample or delete the duplicate that was automatically assigned and assign a duplicate to the appropriate sample.

11.9.7 SAVE the batch.

11.9.8 Perform Sample Set-up

11.9.8.1 Gently mix the sample.

11.9.8.2 Determine if any of the samples should be diluted due to suspected high results.

11.9.8.3 If the sample is a drinking water sample, <u>100 mL must be analyzed.</u>

11.9.8.4 Measure the appropriate volume of sample and aseptically add it to the test vessel using a sterile graduated cylinder or pipette. If analyzing 100 mL, the sample can be poured into the test vessel up to the certified 100 mL mark.

11.9.9 If less than 100 mL of sample is being analyzed, add the measured sample to the vessel and dilute up to the 100 mL line with sterile DI water.

11.9.9.1 Dilutions > 500X are to be prepared using Sterile DI water dilution bottles.

11.9.9.2 Add 1 mL of the sample to 99 mL of sterile DI water and mix. Pipette the appropriate volume of that sample

dilution to the sterile 125 mL test vessel and dilute up to the 100 mL line with sterile DI water.

11.9.10 Aseptically add the contents of one enzymatic reagent pack to each vessel and replace the cap.

11.9.11 Mix each bottle to allow the reagent to dissolve.

11.9.12 Pour the sample solutions into the corresponding Quanti-Trays®.

11.9.13 Carefully place the Quanti-Tray® onto the rubber tray template making sure that none of the sample spills out.

11.9.14 Place your hand along the top of the tray and using you other hand, gently smooth the tray from bottom to top to distribute the solution throughout the tray.

11.9.15 Seal the Quanti-Tray® using the IDEXX tray heat sealer.

11.10 **Set-up the Positive**

11.10.1.1 Pour 100 mL of sterile DI water into a validated test vessel. Inoculate with a colony of E. coli 11775.

11.10.1.2 Add the contents of the Colilert® reagent to the test vessel, cap, and mix.

11.10.1.3 Pour contents into the corresponding Quanti-Tray®.

11.10.1.4 Repeat Steps §11.9.12-§11.9.15.

11.11 **Place the batch in incubator**

11.11.1 Place the batch of Quanti-Trays® in the appropriate incubator (35 ± 0.5 °C), wells facing down, to incubate for 24-28 hours for Colilert® and 18-22 hours for Colilert-18®.

11.11.2 Be sure to leave plenty of space between the stacks of trays so that the air can circulate well throughout the incubator. **NOTE: Do not cover the temperature probes installed in the incubators.**

11.11.3 Use *Form 2086* for Total coliform and *E. coli* or drinking water *Form 3231*.

11.12 **Solid Sample Analysis (research purposes only)**

11.12.1 Weigh out a predetermined mass of sample and transfer to a sterile bottle. Add the sterile DI water to the bottle and replace the cap.

11.12.1.1 The mass of sample and volume of DI water can be different for individual samples.

11.12.1.2 The sample mass is chosen based on the expected concentration of *E. coli*, the composition of the matrix (sand, mud etc.), and experience.

11.12.1.3 The volume of DI water to use is determined by the amount of sample needed for the analysis and the expected concentration of *E. coli* in the sample.

11.12.1.4 The mass of sterile sand used for the negative is not critical. An example is 50 g sand and 500 mL of DI water.

11.12.1.5 For the positive, inoculate 100 mL of sterile DI water with *E. coli as explained in §11.10.*

11.12.2 Document the weight of the sample and volume of DI water *on Form 2143*

11.12.3 Place the bottles on a sample shaker. Use rubber bands to secure the bottles in place.

11.12.4 Shake the samples for 2-5 minutes.

11.12.5 Remove the bottles from the shaker.

11.12.6 Allow the solids to settle for about 10 seconds.

11.12.7 Measure the desired sample volume for analysis from the supernatant and transfer to a labeled, sterile bottle.

11.12.7.1 Some solid samples require filtering to remove suspended solids that can interfere with the analysis. Choose a filter with pore size > 0.45 µm so the bacteria do not get filtered out of the sample. Coffee filters are an example.

11.12.8 Continue with steps 11.5 through 11.8 for all aqueous samples and steps 11.12.1 through 11.12.7 for all solid samples.

11.13 **Data Analysis for Total coliform and *E. coli***

11.13.1 Remove the trays from the incubator after 24-28 hours for Colilert® and 18-22 hours for Colilert-18®.

11.13.2 Read out the method blank (negative) first.

11.13.3 A yellow color means positive for Total coliforms. If the yellow color is faint:

11.13.3.1 Compare the intensity of the yellow color to that of the comparator.

11.13.3.2 If the intensity of the yellow color is less than that of the comparator the result is negative.

11.13.3.3 If the intensity of the yellow color is equal to or greater than that of the comparator the result is positive for total coliform.

11.13.3.4 It is helpful to mark a black dot on the total coliform positive wells so that when the tray is placed under the UV light, it is easy to determine the total coliform positive wells. If a well fluoresces but is not total coliform positive, it is not counted as *E. coli* positive.

11.13.4 Place the tray under the UV light and count the number of positive large and small wells that fluoresce and document on *Form 2086, 3267 or 3231.*

11.13.4.1 If the intensity of the yellow color is equal to or greater than that of the comparator and fluoresces, the well is positive for *E. coli*.

11.13.5 Continue with the unknown samples and positive control.

11.13.6 Write the number of large and small positive wells on the form.

11.13.7 Using the MPN chart, determine the initial results for each sample.

11.14 **Data Entry in LIMS and Reporting**

11.14.1 For entering data in the LIMS, see the Horizon LIMS SOP's.

11.14.2 Locate the Analysis batch created in Section 11.3 – 11.5 in the LIMS.

11.14.3 Add all batch objects in the Additional Information Section and "SAVE" the batch.

11.14.4 The method blank and positive were automatically added to the analytical batch when it was initially created and saved.

11.14.5 For each sample, only one result is reported. Enter the sample result that has the greatest sample volume analyzed (or smallest dilution factor) that produced a result on the MPN chart.

11.14.5.1 Do not enter a ">" result unless all dilution results are ">". In that situation, enter the largest dilution (smallest analysis volume) result.

11.14.5.2 A comment will need to be added on this sample if a ">" result is reported. See Section 16.1 for an example of the comment.

11.14.6 For each sample, enter the analysis volume and initial result from the MPN chart and click "SAVE".

11.14.7 Review all data and results entered.

11.14.8 If the analysis was performed on a drinking water sample, another trained analyst with a current DOC must review the number of positive well counts for Total coliform and E. coli and the MPN result(s).

11.14.8.1 The co-worker then signs off on Form 3231 as reviewed.

11.14.9 Print and sign the batch report.

11.14.10 Click on "Complete Review" a box will open that lists the reports available. Select the "General Batch Report," click on preview and print the report. Click on the "DONE" button to confirm the data entered and push to the peer review process.

11.14.11 Submit the data package to the supervisor for approval.

11.14.11.1 Data Validation Sheet *Form 2131*

11.14.11.2 LIMS General Report

11.14.11.3 Bench Sheet *Form 2086* for aqueous samples and *Form 3267* for solid samples, *Form 3231* for drinking water samples.

11.14.11.4 Batch Worklist Report

11.15 **Preparation for Next Day**

11.15.1 At the end of business each day, the lead analyst arranges the next day's readout data packets in order from earliest to latest readout times.

11.15.2 The analyst then initials the correct day on the white board calendar in the area to signify that this task waws completed.

12.0 Calculations

12.1 The Colilert® MPN chart is used to determine the initial results. To calculate the final result of the sample, multiply the initial result by the dilution factor if appropriate. *See Section 21.0* for the MPN charts.

12.2 **Precision Calculations:**

Add the range log values for 30 samples (each QC chart contains 30 points)

$\Sigma R_{log} = x_1 + x_2 + x_3 \ldots..$

Find the average of the range log

$$\text{Average } R = \frac{\Sigma R_{log}}{30}$$

Multiply the average range by 3.27

Upper Control Limit = 3.27*R

Where: R = range (difference between the log of the sample result and the log of the duplicate sample result)

X = range of log of MPN values

13.0 Method Performance

13.1 The MDL for the Colilert® method is 1 MPN/100 mL.

13.2 Analyzing 100 mL of sample with the Quanti-Tray 2000® allows results up to 2420 MPN.

13.3 Analyzing 100 mL of sample with the Quanti-Tray 200® allows results up to 200 MPN.

14.0 Data Assessment and Acceptance Criteria for Quality Control Measures

14.1 **Initial Demonstration of Capability (IDOC)**

14.1.1 The average result for each of the 4 unknown samples analyzed must fall within the calculated limits to pass the IDOC.

14.1.2 If one or more of the 4 results fail, the entire IDOC must be performed again.

14.2 **Ongoing Demonstration of Capability**

14.2.1 The average result for each of the 4 unknown samples analyzed must fall within the calculated limits to pass the DOC.

14.2.2 If one or more of the 4 results fail, the entire DOC must be performed again.

14.3 **Negative Control**

14.3.1 If the negative control is negative, results can be reported.

14.3.2 If the negative has positive wells, results can be reported for samples that are negative.

14.3.3 If the method blank has positive wells, results can be reported for concentrations > 10X that of the negative.

14.4 **Positive Control**

14.4.1 If the positive control has positive results, results for samples can be reported.

14.4.2 If the positive does not have any positive wells, see Section 15.0 for corrective actions.

14.5 **Range of Log for Duplicates**

14.5.1 The Range of the Log of the MPN should fall within the calculated control limits. See QC Charts, W:\Organic Team\BACTI\BACTI QC.

14.6 **Environmental Validation Sample**

14.6.1 If the result is negative for Total coliform and *E. coli*, analysis may continue in the area and results can be reported.

14.6.2 If the result is positive for either Total coliform or Total coliform and E. coli, the results for the batch will need to be qualified or the samples re-collected and re-analyzed in a different area/bench with another Environmental Sample.

15.0 Method Specific Corrective Actions

15.1 If the negative does not meet requirements, stop the analysis and implement a corrective action to determine the source of contamination.

15.2 If the positive does not meet requirements, stop the analysis and implement a corrective action to determine the source of the issue.

15.3 If the Environmental Sample validation fails by having any positive results, a corrective action must be initiated to determine the cause of the contamination.

15.3.1 All analysis in the area must stop until the corrective action is resolved.

16.0 Contingencies for Out-Of-Control/Unacceptable Data

16.1 If the results exceed the quantitative limits of the method, results are reported as estimates with qualifying documentation and comment. For example, "For *E. coli* – the result was outside of the MPN chart range analyzed at 1X and 100X dilutions, result is estimated," then initial and date.

16.2 If the negative is contaminated, results may be reported as AE or reported with qualification.

17.0 Waste Management

17.1 The laboratory must comply with all federal, state and local regulations governing waste management, particularly the discharge regulations, hazardous waste identification rules, and land disposal regulations. All potential releases from laboratory operations should be minimized to protect the air, water, and land.

17.2 Pure cultures and equipment used for microbiological analysis are biological hazards. All materials that encounter bacteria must be autoclaved prior to disposal.

17.3 All laboratory supplies must be disposed of properly.

17.3.1 Spent sample disposal is handled by dumping remaining sample down the drain with copious amounts of water.

17.3.2 Glass items require special care. Broken vials, cylinders, and beakers are placed into the sharps bucket located in the area. Empty acid bottles are rinsed with copious amounts of water, the plastic protective coating is removed and disposed of in the regular trash and the empty bottle is placed in the sharps bucket.

17.3.3 Other supplies, including but not limited to paper towels, gloves, and pump tubing are placed in the regular trash receptacles.

17.4 If an accidental release occurs, laboratory management must be notified immediately.

17.5 Follow the Chemical Hygiene Plan (CHP) SOP 3022.

17.6 See SOP 7003 and 7011 for Autoclaving waste procedures.

18.0 Pollution Prevention

18.1 Pure cultures and equipment used for microbiological analysis are biological hazards. All materials that encounter bacteria must be autoclaved prior to disposal.

18.2 Sample bottles are recycled when possible to minimize solid waste.

18.3 All laboratory supplies must be disposed of properly.

18.4 The quantity of chemicals purchased should be based on expected usage during their shelf life as well as the associated disposal costs of any unused materials. Actual reagent preparation volumes should reflect anticipated usage and reagent stability.

18.5 All biological waste must be autoclaved prior to disposal.

19.0 Analyst Responsibilities

19.1 All safety measures put into place must be followed. Any deviations from the prescribed measures must be reported immediately to the supervisor. Any injuries occurring while performing any part of this procedure must be reported immediately to the supervisor.

19.2 This procedure is restricted to use by, or under the supervision of, analysts experienced in the analysis of samples using flow injection and automated analysis. It is the responsibility of the analyst to read and understand this

SOP, adhere to the procedures outlined, perform her initial demonstration of capability and to properly document data in the appropriate logbooks. Any deviations from the procedure, even if unintentional or unavoidable, as well as irregularities with the samples, must be recorded in the appropriate logbook or form and reported to the supervisor immediately.

19.3 It is the responsibility of the supervisor to oversee that analysts follow the SOP and properly document their work. The supervisor should perform periodic review of the area as well as logbooks and forms.

19.4 The analyst must exercise extreme care with the samples. Every precaution should be taken to eliminate contamination.

19.5 It is the responsibility of the analyst to make sure that all quality control procedures are followed.

19.6 The analyst must review all results and complete all documentation prior to submitting the data packet for approval.

20.0 References

20.1 SM 9223 B 2016 Enzyme Substrate Test, Multi-Well Procedure*, Standard Methods for the Examination of Water and Wastewater*, American Public Health Association

20.2 *Colilert® Test Kit Instructions*, Colilert®, Defined Substrate Technology.

20.3 *Colilert-18® Test Kit Instructions*, Colilert®, Defined Substrate Technology.

20.4 *Laboratory Manual for the Microbiological Analyses of Public Drinking Water,* Ohio EPA, 2014.

20.5 *Quanti-Tray and Quanti-Tray/2000, Diluting Water Samples for Use with the Quanti-Tray or Quanti-Tray/2000 System*, Reporting Quant-Tray Results, Idexx 2018.

21.0 Additional Information

21.1 MPN Charts for Quanti-Tray 200

51-Well Quanti-Tray MPN Table

No. of wells giving positive reaction per 100 ml sample	Most Probable Number	95% Confidence Limits Lower	Upper
0	<1	0.0	3.7
1	1.0	0.3	5.6
2	2.0	0.6	7.3
3	3.1	1.1	9.0
4	4.2	1.7	10.7
5	5.3	2.3	12.3
6	6.4	3.0	13.9
7	7.5	3.7	15.5
8	8.7	4.5	17.1
9	9.9	5.3	18.8
10	11.1	6.1	20.5
11	12.4	7.0	22.1
12	13.7	7.9	23.9
13	15.0	8.8	25.7
14	16.4	9.8	27.5
15	17.8	10.8	29.4
16	19.2	11.9	31.3
17	20.7	13.0	33.3
18	22.2	14.1	35.2
19	23.8	15.3	37.3
20	25.4	16.5	39.4
21	27.1	17.7	41.6
22	28.8	19.0	43.9
23	30.6	20.4	46.3
24	32.4	21.8	48.7
25	34.4	23.3	51.2
26	36.4	24.7	53.9
27	38.4	26.4	56.6
28	40.6	28.0	59.5
29	42.9	29.7	62.5
30	45.3	31.5	65.6
31	47.8	33.4	69.0
32	50.4	35.4	72.5
33	53.1	37.5	76.2
34	56.0	39.7	80.1
35	59.1	42.0	84.4
36	62.4	44.6	88.8
37	65.9	47.2	93.7
38	69.7	50.0	99.0
39	73.8	53.1	104.8
40	78.2	56.4	111.2
41	83.1	59.9	118.3
42	88.5	63.9	126.2
43	94.5	68.2	135.4
44	101.3	73.1	146.0
45	109.1	78.6	158.7
46	118.4	85.0	174.5
47	129.8	92.7	195.0
48	144.5	102.3	224.1
49	165.2	115.2	272.2
50	200.5	135.8	387.6
51	> 200.5	146.1	infinite

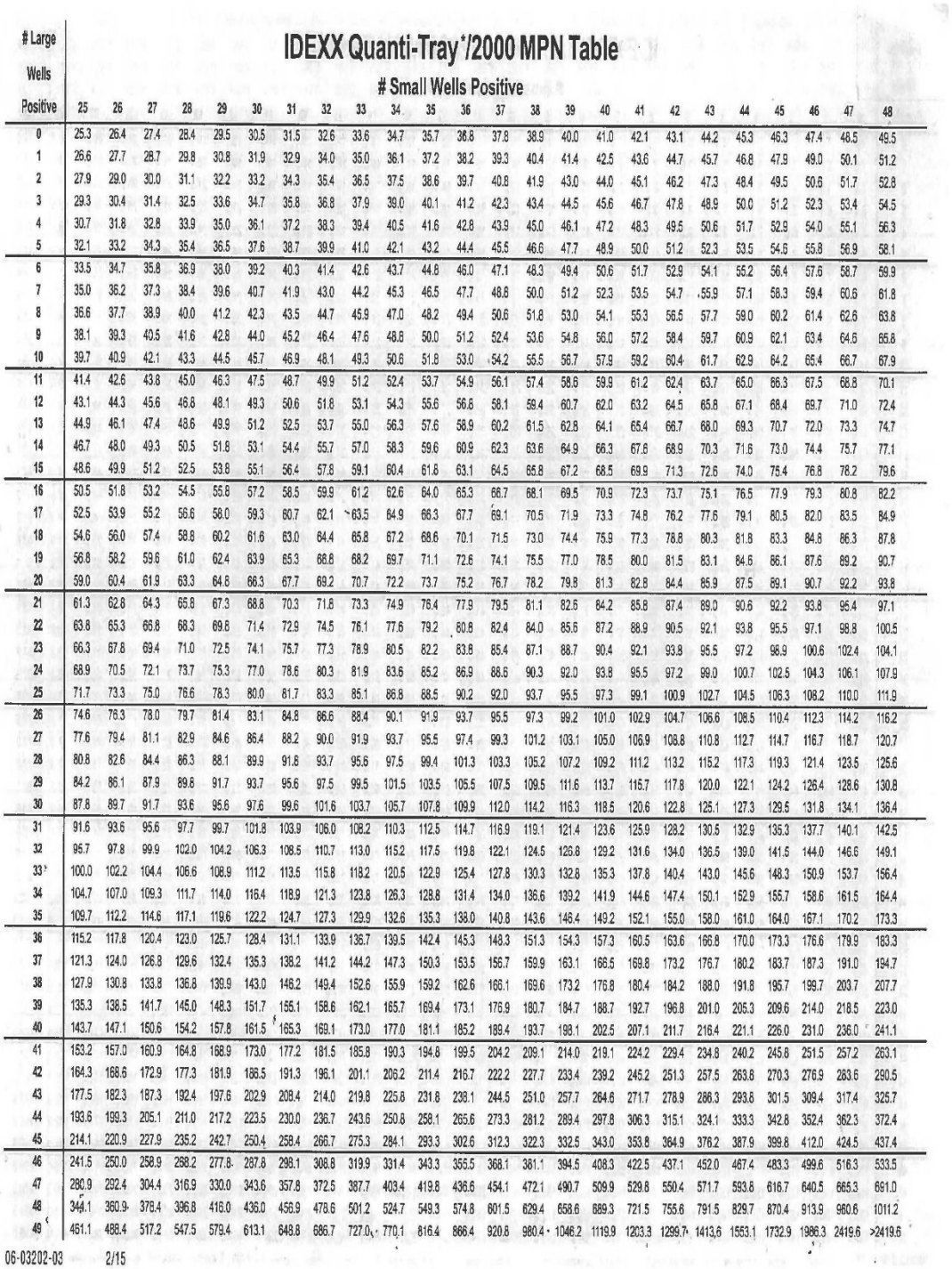
06-03202-03
11/15

21.2 MPN Chart for Quanti-Tray 2000

IDEXX Quanti-Tray*/2000 MPN Table

# Large Wells Positive	# Small Wells Positive																								
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	<1	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.1	15.1	16.1	17.1	18.1	19.1	20.2	21.2	22.2	23.3	24.3
1	1.0	2.0	3.0	4.0	5.0	6.0	7.1	8.1	9.1	10.1	11.1	12.1	13.2	14.2	15.2	16.2	17.3	18.3	19.3	20.4	21.4	22.4	23.5	24.5	25.6
2	2.0	3.0	4.1	5.1	6.1	7.1	8.1	9.2	10.2	11.2	12.2	13.3	14.3	15.4	16.4	17.4	18.5	19.5	20.6	21.6	22.7	23.7	24.8	25.8	26.9
3	3.1	4.1	5.1	6.1	7.2	8.2	9.2	10.3	11.3	12.4	13.4	14.5	15.5	16.5	17.6	18.6	19.7	20.8	21.8	22.9	23.9	25.0	26.1	27.1	28.2
4	4.1	5.2	6.2	7.2	8.3	9.3	10.4	11.4	12.5	13.5	14.6	15.6	16.7	17.8	18.8	19.9	21.0	22.0	23.1	24.2	25.3	26.3	27.4	28.5	29.6
5	5.2	6.3	7.3	8.4	9.4	10.5	11.5	12.6	13.7	14.7	15.8	16.9	17.9	19.0	20.1	21.2	22.2	23.3	24.4	25.5	26.6	27.7	28.8	29.9	31.0
6	6.3	7.4	8.4	9.5	10.6	11.6	12.7	13.8	14.9	16.0	17.0	18.1	19.2	20.3	21.4	22.5	23.6	24.7	25.8	26.9	28.0	29.1	30.2	31.3	32.4
7	7.5	8.5	9.6	10.7	11.8	12.8	13.9	15.0	16.1	17.2	18.3	19.4	20.5	21.6	22.7	23.8	24.9	26.0	27.1	28.3	29.4	30.5	31.6	32.8	33.9
8	8.6	9.7	10.8	11.9	13.0	14.1	15.2	16.3	17.4	18.5	19.6	20.7	21.8	22.9	24.1	25.2	26.3	27.4	28.6	29.7	30.8	32.0	33.1	34.3	35.4
9	9.8	10.9	12.0	13.1	14.2	15.3	16.4	17.6	18.7	19.8	20.9	22.0	23.2	24.3	25.4	26.6	27.7	28.9	30.0	31.2	32.3	33.5	34.6	35.8	37.0
10	11.0	12.1	13.2	14.4	15.5	16.6	17.7	18.9	20.0	21.1	22.3	23.4	24.6	25.7	26.9	28.0	29.2	30.3	31.5	32.7	33.8	35.0	36.2	37.4	38.6
11	12.2	13.4	14.5	15.6	16.8	17.9	19.1	20.2	21.4	22.5	23.7	24.8	26.0	27.2	28.3	29.5	30.7	31.9	33.0	34.2	35.4	36.6	37.8	39.0	40.2
12	13.5	14.6	15.8	16.9	18.1	19.3	20.4	21.6	22.8	23.9	25.1	26.3	27.5	28.6	29.8	31.0	32.2	33.4	34.6	35.8	37.0	38.2	39.5	40.7	41.9
13	14.8	16.0	17.1	18.3	19.5	20.6	21.8	23.0	24.2	25.4	26.6	27.8	29.0	30.2	31.4	32.6	33.8	35.0	36.2	37.5	38.7	39.9	41.2	42.4	43.6
14	16.1	17.3	18.5	19.7	20.9	22.1	23.3	24.5	25.7	26.9	28.1	29.3	30.5	31.7	33.0	34.2	35.4	36.7	37.9	39.1	40.4	41.6	42.9	44.2	45.4
15	17.5	18.7	19.9	21.1	22.3	23.5	24.7	25.9	27.2	28.4	29.6	30.9	32.1	33.3	34.6	35.8	37.1	38.4	39.6	40.9	42.2	43.4	44.7	46.0	47.3
16	18.9	20.1	21.3	22.6	23.8	25.0	26.2	27.5	28.7	30.0	31.2	32.5	33.7	35.0	36.3	37.5	38.8	40.1	41.4	42.7	44.0	45.3	46.6	47.9	49.2
17	20.3	21.6	22.8	24.1	25.3	26.6	27.8	29.1	30.3	31.6	32.9	34.1	35.4	36.7	38.0	39.3	40.6	41.9	43.2	44.5	45.9	47.2	48.5	49.8	51.2
18	21.8	23.1	24.3	25.6	26.9	28.1	29.4	30.7	32.0	33.3	34.6	35.9	37.2	38.5	39.8	41.1	42.4	43.8	45.1	46.5	47.8	49.2	50.5	51.9	53.2
19	23.3	24.6	25.9	27.2	28.5	29.8	31.1	32.4	33.7	35.0	36.3	37.6	39.0	40.3	41.6	43.0	44.3	45.7	47.1	48.4	49.8	51.2	52.6	54.0	55.4
20	24.9	26.2	27.5	28.8	30.1	31.5	32.8	34.1	35.4	36.8	38.1	39.5	40.8	42.2	43.6	44.9	46.3	47.7	49.1	50.5	51.9	53.3	54.7	56.1	57.6
21	26.5	27.9	29.2	30.5	31.8	33.2	34.5	35.9	37.3	38.6	40.0	41.4	42.8	44.1	45.5	46.9	48.4	49.8	51.2	52.6	54.1	55.5	56.9	58.4	59.9
22	28.2	29.5	30.9	32.3	33.6	35.0	36.4	37.7	39.1	40.5	41.9	43.3	44.8	46.2	47.6	49.0	50.5	51.9	53.4	54.8	56.3	57.8	59.3	60.8	62.3
23	29.9	31.3	32.7	34.1	35.5	36.8	38.3	39.7	41.1	42.5	43.9	45.4	46.8	48.3	49.7	51.2	52.7	54.2	55.6	57.1	58.6	60.2	61.7	63.2	64.7
24	31.7	33.1	34.5	35.9	37.3	38.8	40.2	41.7	43.1	44.6	46.0	47.5	49.0	50.5	52.0	53.5	55.0	56.5	58.0	59.5	61.1	62.6	64.2	65.8	67.3
25	33.6	35.0	36.4	37.9	39.3	40.8	42.2	43.7	45.2	46.7	48.2	49.7	51.2	52.7	54.3	55.8	57.3	58.9	60.5	62.0	63.6	65.2	66.8	68.4	70.0
26	35.5	36.9	38.4	39.9	41.4	42.8	44.3	45.9	47.4	48.9	50.4	52.0	53.5	55.1	56.7	58.2	59.8	61.4	63.0	64.7	66.3	67.9	69.6	71.2	72.9
27	37.4	38.9	40.4	42.0	43.5	45.0	46.5	48.1	49.6	51.2	52.8	54.4	56.0	57.6	59.2	60.8	62.4	64.1	65.7	67.4	69.1	70.8	72.5	74.2	75.9
28	39.5	41.0	42.6	44.1	45.7	47.3	48.8	50.4	52.0	53.6	55.2	56.9	58.5	60.2	61.8	63.5	65.2	66.9	68.6	70.3	72.0	73.7	75.5	77.3	79.0
29	41.7	43.2	44.8	46.4	48.0	49.6	51.2	52.8	54.5	56.1	57.8	59.5	61.2	62.9	64.6	66.3	68.0	69.8	71.5	73.3	75.1	76.9	78.7	80.5	82.4
30	43.9	45.5	47.1	48.7	50.4	52.0	53.7	55.4	57.1	58.8	60.5	62.2	64.0	65.7	67.5	69.3	71.0	72.9	74.7	76.5	78.3	80.2	82.1	84.0	85.9
31	46.2	47.9	49.5	51.2	52.9	54.6	56.3	58.1	59.8	61.6	63.3	65.1	66.9	68.7	70.5	72.4	74.2	76.1	78.0	79.9	81.8	83.7	85.7	87.6	89.6
32	48.7	50.4	52.1	53.8	55.6	57.3	59.1	60.9	62.7	64.5	66.3	68.2	70.0	71.9	73.8	75.7	77.6	79.5	81.5	83.5	85.4	87.5	89.5	91.5	93.6
33	51.2	53.0	54.8	56.5	58.3	60.2	62.0	63.8	65.7	67.6	69.5	71.4	73.3	75.2	77.2	79.2	81.2	83.2	85.2	87.3	89.3	91.4	93.6	95.7	97.8
34	53.9	55.7	57.6	59.4	61.3	63.1	65.0	67.0	68.9	70.8	72.8	74.8	76.8	78.8	80.8	82.9	85.0	87.1	89.2	91.4	93.5	95.7	97.9	100.2	102.4
35	56.8	58.6	60.5	62.4	64.4	66.3	68.3	70.3	72.3	74.3	76.3	78.4	80.5	82.6	84.7	86.9	89.1	91.3	93.5	95.7	98.0	100.3	102.6	105.0	107.3
36	59.8	61.7	63.7	65.7	67.7	69.7	71.7	73.8	75.9	78.0	80.1	82.3	84.5	86.7	88.9	91.2	93.5	95.8	98.1	100.5	102.9	105.3	107.7	110.2	112.7
37	62.9	65.0	67.0	69.1	71.2	73.3	75.4	77.6	79.8	82.0	84.2	86.5	88.8	91.1	93.4	95.8	98.2	100.6	103.1	105.6	108.1	110.7	113.3	115.9	118.6
38	66.3	68.4	70.6	72.7	74.9	77.1	79.4	81.6	83.9	86.2	88.6	91.0	93.4	95.8	98.3	100.8	103.4	105.9	108.6	111.2	113.9	116.6	119.4	122.2	125.0
39	70.0	72.2	74.4	76.7	78.9	81.3	83.6	86.0	88.4	90.9	93.4	95.9	98.4	101.0	103.6	106.3	109.0	111.8	114.6	117.4	120.3	123.2	126.1	129.2	132.2
40	73.8	76.2	78.5	80.9	83.3	85.7	88.2	90.8	93.3	95.9	98.5	101.2	103.9	106.7	109.5	112.4	115.3	118.2	121.2	124.3	127.4	130.5	133.7	137.0	140.3
41	78.0	80.5	83.0	85.5	88.0	90.6	93.3	95.9	96.7	101.4	104.3	107.1	110.0	113.0	116.0	119.1	122.2	125.4	128.7	132.0	135.4	138.8	142.3	145.9	149.5
42	82.6	85.2	87.8	90.5	93.2	96.0	98.8	101.7	104.6	107.6	110.6	113.7	116.9	120.1	123.4	126.7	130.1	133.6	137.2	140.8	144.5	148.3	152.2	156.1	160.2
43	87.6	90.4	93.2	96.0	99.0	101.9	105.0	108.1	111.2	114.5	117.8	121.1	124.6	128.1	131.7	135.4	139.1	143.0	147.0	151.0	155.2	159.4	163.8	168.2	172.8
44	93.1	96.1	99.1	102.2	105.4	108.6	111.9	115.3	118.7	122.3	125.9	129.6	133.4	137.4	141.4	145.5	149.7	154.1	158.5	163.1	167.9	172.7	177.7	182.9	188.2
45	99.3	102.5	105.8	109.2	112.6	116.2	119.8	123.6	127.4	131.4	135.4	139.6	143.9	148.3	152.9	157.6	162.4	167.4	172.6	178.0	183.5	189.2	195.1	201.2	207.5
46	106.3	109.8	113.4	117.2	121.0	125.0	129.1	133.3	137.6	142.1	146.7	151.5	156.5	161.6	167.0	172.5	178.2	184.2	190.4	196.8	203.5	210.5	217.8	225.4	233.3
47	114.3	118.3	122.4	126.6	130.9	135.4	140.1	145.0	150.0	155.3	160.7	166.4	172.3	178.5	185.0	191.6	198.9	206.4	214.2	222.4	231.0	240.0	249.5	259.5	270.0
48	123.9	128.4	133.1	137.9	143.0	148.3	153.9	159.7	165.8	172.2	178.9	186.0	193.5	201.4	209.6	218.7	228.2	238.2	248.9	260.3	272.3	285.1	298.7	313.0	328.2
49	135.5	140.8	146.4	152.3	158.5	165.0	172.0	179.3	187.2	195.6	204.6	214.3	224.7	235.9	248.1	261.3	275.5	290.9	307.6	325.5	344.8	365.4	387.3	410.6	435.2

06-03202-03 1/15 *Quanti-Tray is either a trademark or a registered trademark of IDEXX Laboratories, Inc. in the United States and/or other countries. Covered by U.S. Patent Numbers 4,925,789 ; 5,429,933 ; 5,518,892. Other patents pending.



IDEXX Quanti-Tray®/2000 MPN Table

# Large Wells Positive	# Small Wells Positive																							
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
0	25.3	26.4	27.4	28.4	29.5	30.5	31.5	32.6	33.6	34.7	35.7	36.8	37.8	38.9	40.0	41.0	42.1	43.1	44.2	45.3	46.3	47.4	48.5	49.5
1	26.6	27.7	28.7	29.8	30.8	31.9	32.9	34.0	35.0	36.1	37.2	38.2	39.3	40.4	41.4	42.5	43.6	44.7	45.7	46.8	47.9	49.0	50.1	51.2
2	27.9	29.0	30.0	31.1	32.2	33.2	34.3	35.4	36.5	37.5	38.6	39.7	40.8	41.9	43.0	44.0	45.1	46.2	47.3	48.4	49.5	50.6	51.7	52.8
3	29.3	30.4	31.4	32.5	33.6	34.7	35.8	36.8	37.9	39.0	40.1	41.2	42.3	43.4	44.5	45.6	46.7	47.8	48.9	50.0	51.2	52.3	53.4	54.5
4	30.7	31.8	32.8	33.9	35.0	36.1	37.2	38.3	39.4	40.5	41.6	42.8	43.9	45.0	46.1	47.2	48.3	49.5	50.6	51.7	52.9	54.0	55.1	56.3
5	32.1	33.2	34.3	35.4	36.5	37.6	38.7	39.9	41.0	42.1	43.2	44.4	45.5	46.6	47.7	48.9	50.0	51.2	52.3	53.5	54.6	55.8	56.9	58.1
6	33.5	34.7	35.8	36.9	38.0	39.2	40.3	41.4	42.6	43.7	44.8	46.0	47.1	48.3	49.4	50.6	51.7	52.9	54.1	55.2	56.4	57.6	58.7	59.9
7	35.0	36.2	37.3	38.4	39.6	40.7	41.9	43.0	44.2	45.3	46.5	47.7	48.8	50.0	51.2	52.3	53.5	54.7	55.9	57.1	58.3	59.4	60.6	61.8
8	36.6	37.7	38.9	40.0	41.2	42.3	43.5	44.7	45.9	47.0	48.2	49.4	50.6	51.8	53.0	54.1	55.3	56.5	57.7	59.0	60.2	61.4	62.6	63.8
9	38.1	39.3	40.5	41.6	42.8	44.0	45.2	46.4	47.6	48.8	50.0	51.2	52.4	53.6	54.8	56.0	57.2	58.4	59.7	60.9	62.1	63.4	64.6	65.8
10	39.7	40.9	42.1	43.3	44.5	45.7	46.9	48.1	49.3	50.6	51.8	53.0	54.2	55.5	56.7	57.9	59.2	60.4	61.7	62.9	64.2	65.4	66.7	67.9
11	41.4	42.6	43.8	45.0	46.3	47.5	48.7	49.9	51.2	52.4	53.7	54.9	56.1	57.4	58.6	59.9	61.2	62.4	63.7	65.0	66.3	67.5	68.8	70.1
12	43.1	44.3	45.6	46.8	48.1	49.3	50.6	51.8	53.1	54.3	55.6	56.8	58.1	59.4	60.7	62.0	63.2	64.5	65.8	67.1	68.4	69.7	71.0	72.4
13	44.9	46.1	47.4	48.6	49.9	51.2	52.5	53.7	55.0	56.3	57.6	58.9	60.2	61.5	62.8	64.1	65.4	66.7	68.0	69.3	70.7	72.0	73.3	74.7
14	46.7	48.0	49.3	50.5	51.8	53.1	54.4	55.7	57.0	58.3	59.6	60.9	62.3	63.6	64.9	66.3	67.6	68.9	70.3	71.6	73.0	74.4	75.7	77.1
15	48.6	49.9	51.2	52.5	53.8	55.1	56.4	57.8	59.1	60.4	61.8	63.1	64.5	65.8	67.2	68.5	69.9	71.3	72.6	74.0	75.4	76.8	78.2	79.6
16	50.5	51.8	53.2	54.5	55.8	57.2	58.5	59.9	61.2	62.6	64.0	65.3	66.7	68.1	69.5	70.9	72.3	73.7	75.1	76.5	77.9	79.3	80.8	82.2
17	52.5	53.9	55.2	56.6	58.0	59.3	60.7	62.1	63.5	64.9	66.3	67.7	69.1	70.5	71.9	73.3	74.8	76.2	77.6	79.1	80.5	82.0	83.5	84.9
18	54.6	56.0	57.4	58.8	60.2	61.6	63.0	64.4	65.8	67.2	68.6	70.1	71.5	73.0	74.4	75.9	77.3	78.8	80.3	81.8	83.3	84.8	86.3	87.8
19	56.8	58.2	59.6	61.0	62.4	63.9	65.3	66.8	68.2	69.7	71.1	72.6	74.1	75.5	77.0	78.5	80.0	81.5	83.1	84.6	86.1	87.6	89.2	90.7
20	59.0	60.4	61.9	63.3	64.8	66.3	67.7	69.2	70.7	72.2	73.7	75.2	76.7	78.2	79.8	81.3	82.8	84.4	85.9	87.5	89.1	90.7	92.2	93.8
21	61.3	62.8	64.3	65.8	67.3	68.8	70.3	71.8	73.3	74.9	76.4	77.9	79.5	81.1	82.6	84.2	85.8	87.4	89.0	90.6	92.2	93.8	95.4	97.1
22	63.8	65.3	66.8	68.3	69.8	71.4	72.9	74.5	76.1	77.6	79.2	80.8	82.4	84.0	85.6	87.2	88.9	90.5	92.1	93.8	95.5	97.1	98.8	100.5
23	66.3	67.8	69.4	71.0	72.5	74.1	75.7	77.3	78.9	80.5	82.2	83.8	85.4	87.1	88.7	90.4	92.1	93.8	95.5	97.2	98.9	100.6	102.4	104.1
24	68.9	70.5	72.1	73.7	75.3	77.0	78.6	80.3	81.9	83.6	85.2	86.9	88.6	90.3	92.0	93.8	95.5	97.2	99.0	100.7	102.5	104.3	106.1	107.9
25	71.7	73.3	75.0	76.6	78.3	80.0	81.7	83.3	85.1	86.8	88.5	90.2	92.0	93.7	95.5	97.3	99.1	100.9	102.7	104.5	106.3	108.2	110.0	111.9
26	74.6	76.3	78.0	79.7	81.4	83.1	84.8	86.6	88.4	90.1	91.9	93.7	95.5	97.3	99.2	101.0	102.9	104.7	106.6	108.5	110.4	112.3	114.2	116.2
27	77.6	79.4	81.1	82.9	84.6	86.4	88.2	90.0	91.9	93.7	95.5	97.4	99.3	101.2	103.1	105.0	106.9	108.8	110.8	112.7	114.7	116.7	118.7	120.7
28	80.8	82.6	84.4	86.3	88.1	89.9	91.8	93.7	95.6	97.5	99.4	101.3	103.3	105.2	107.2	109.2	111.2	113.2	115.2	117.3	119.3	121.4	123.5	125.6
29	84.2	86.1	87.9	89.8	91.7	93.7	95.6	97.5	99.5	101.5	103.5	105.5	107.5	109.5	111.6	113.7	115.7	117.8	120.0	122.1	124.2	126.4	128.6	130.8
30	87.8	89.7	91.7	93.6	95.6	97.6	99.6	101.6	103.7	105.7	107.8	109.9	112.0	114.2	116.3	118.5	120.6	122.8	125.1	127.3	129.5	131.8	134.1	136.4
31	91.6	93.6	95.6	97.7	99.7	101.8	103.9	106.0	108.2	110.3	112.5	114.7	116.9	119.1	121.4	123.6	125.9	128.2	130.5	132.9	135.3	137.7	140.1	142.5
32	95.7	97.8	99.9	102.0	104.2	106.3	108.5	110.7	113.0	115.2	117.5	119.8	122.1	124.5	126.8	129.2	131.6	134.0	136.5	139.0	141.5	144.0	146.6	149.1
33	100.0	102.2	104.4	106.6	108.9	111.2	113.5	115.8	118.2	120.5	122.9	125.4	127.8	130.3	132.8	135.3	137.8	140.4	143.0	145.6	148.3	150.9	153.7	156.4
34	104.7	107.0	109.3	111.7	114.0	116.4	118.9	121.3	123.8	126.3	128.8	131.4	134.0	136.6	139.2	141.9	144.6	147.4	150.1	152.9	155.7	158.6	161.5	164.4
35	109.7	112.2	114.6	117.1	119.6	122.2	124.7	127.3	129.9	132.6	135.3	138.0	140.8	143.6	146.4	149.2	152.1	155.0	158.0	161.0	164.0	167.1	170.2	173.3
36	115.2	117.8	120.4	123.0	125.7	128.4	131.1	133.9	136.7	139.5	142.4	145.3	148.3	151.3	154.3	157.3	160.5	163.6	166.8	170.0	173.3	176.6	179.9	183.3
37	121.3	124.0	126.8	129.6	132.4	135.3	138.2	141.2	144.2	147.3	150.3	153.5	156.7	159.9	163.1	166.5	169.8	173.2	176.7	180.2	183.7	187.3	191.0	194.7
38	127.9	130.8	133.8	136.8	139.9	143.0	146.2	149.4	152.6	155.9	159.2	162.6	166.1	169.6	173.2	176.8	180.4	184.2	188.0	191.8	195.7	199.7	203.7	207.7
39	135.3	138.5	141.7	145.0	148.3	151.7	155.1	158.6	162.1	165.7	169.4	173.1	176.9	180.7	184.7	188.7	192.7	196.8	201.0	205.3	209.6	214.0	218.5	223.0
40	143.7	147.1	150.6	154.2	157.8	161.5	165.3	169.1	173.0	177.0	181.1	185.2	189.4	193.7	198.1	202.5	207.1	211.7	216.4	221.1	226.0	231.0	236.0	241.1
41	153.2	157.0	160.9	164.8	168.9	173.0	177.2	181.5	185.8	190.3	194.8	199.5	204.2	209.1	214.0	219.1	224.2	229.4	234.8	240.2	245.8	251.5	257.2	263.1
42	164.3	168.6	172.9	177.3	181.9	186.5	191.3	196.1	201.1	206.2	211.4	216.7	222.2	227.7	233.4	239.2	245.2	251.3	257.5	263.8	270.3	276.9	283.6	290.5
43	177.5	182.3	187.3	192.4	197.6	202.9	208.4	214.0	219.8	225.8	231.8	238.1	244.5	251.0	257.7	264.6	271.7	278.9	286.3	293.8	301.5	309.4	317.4	325.7
44	193.6	199.3	205.1	211.0	217.2	223.5	230.0	236.7	243.6	250.8	258.1	265.6	273.3	281.2	289.4	297.8	306.3	315.1	324.1	333.3	342.8	352.4	362.3	372.4
45	214.1	220.9	227.9	235.2	242.7	250.4	258.4	266.7	275.3	284.1	293.3	302.6	312.3	322.3	332.5	343.0	353.8	364.9	376.2	387.9	399.8	412.0	424.5	437.4
46	241.5	250.0	258.9	268.2	277.8	287.8	298.1	308.8	319.9	331.4	343.3	355.5	368.1	381.1	394.5	408.3	422.5	437.1	452.0	467.4	483.3	499.6	516.3	533.5
47	280.9	292.4	304.4	316.9	330.0	343.6	357.8	372.5	387.7	403.4	419.8	436.6	454.1	472.1	490.7	509.9	529.8	550.4	571.7	593.8	616.7	640.5	665.3	691.0
48	344.1	360.9	378.4	396.8	416.0	436.0	456.9	478.6	501.2	524.7	549.3	574.8	601.5	629.4	658.6	689.3	721.5	755.6	791.5	829.7	870.4	913.9	960.6	1011.2
49	461.1	488.4	517.2	547.5	579.4	613.1	648.8	686.7	727.0	770.1	816.4	866.4	920.8	980.4	1046.2	1119.9	1203.3	1299.7	1413.6	1553.1	1732.9	1986.3	2419.6	>2419.6

06-03202-03 2/15

21.3 Validating the Environment in which microbiological analyses are performed

21.3.1 Twice per year, add 50 mL of DI water and 50 mL of double strength TSB to the test vessel.

21.3.2 Place the bottle on the bench in the area where microbiological work is being performed.

21.3.3 DO NOT cap or cover the bottle.

21.3.4 Allow the bottle to remain open to the environment for 15-20 minutes during the processing of a batch of samples.

21.3.5 Incubate with the batch.

21.3.6 If the sample has a positive result, a corrective action is to be initiated and analysis must stop until the cause of the environmental contamination is resolved.

21.3.7 After the validation has been performed and passed, document on Form 3242 QA/QC Checklist for Microbiology.

21.3.8 See Section 15.3 for the steps to take if the Environmental Sample has any positive results for Total coliform or E. coli.

22.0 Revision History

22.1 Revised sections 1.1, 2.3, 2.4, 3.1-3.12, 5.2.1, 7.2, 7.3, 8.5, 9.2, 10.1, 10.3, 10.4, 10.5, 11.1 and 12.3. (K. Greenwood, 4/4/2013)

22.2 Revised entire SOP to include Total coliforms and *E. coli* only. Removed all references to the Enterolert® Method and will create a separate SOP for Enterolert®. (K. Greenwood, 2/20/2017)

22.3 Revised Section 9.0, (K. Greenwood 6/23/2017)

22.4 Revised Section 6.0 – added 0.22 µm filter, Section 7.0 – removed references to the use of PBS ` and PBS buffer dilution bottles and added sterile DI water and sterile DI water dilution bottles, Section 9.0 – removed the OPR and matrix spike, Section 9.4 – changed 5% to 1% of trays need to be validated for sterility, Section 10.1 – removed procedure for setting up the OPR, Section 11.0 – removed the %recovery and RPD calculations and added the precision calculations for QC charting, Section 13.0 – removed references to the OPR, matrix spike and RPD and added the range of logs QC.

22.5 The following revisions were made by K. Greenwood, 2/24/2018: Section 3.0 – the definition of “Blank” was changed to “Negative”, the definition of “Positive” was added, Section 4.0 – The interference of Sulphur was added,

Section 6.0 – 0.22 µm filter was added, 100 mL bottles were changed to 125 mL, Section 7.0 – phosphate buffer dilution bottles was removed and replaced with sterile DI water dilution bottles, Filter sterilized DI water was added, Section 9.0 – The cultures used to validate the Colilert reagent were added, The validation of the sterile DI water and the sterile DI water dilution bottles were added, OPR was removed, Matrix spike was removed, Section 10.0 – the set-up of the OPR was removed the measurement of the chlorine residual of each sample from a chlorinated source was added, if the sample is a drinking water sample 100 mL must be analyzed was added, dilutions >500x must be prepared in sterile DI water dilution bottles was added, all references to phosphate buffer dilution bottles was changed to DI water dilution bottles, the time for solids to settle was revised from 30 seconds to 10 seconds, form 3267 and 3231 were added, Section 11.0 and 13.0 - all references to the OPR were removed, the range of the log of the MPN results was added for duplicates, Section 19.0 – reference 19.4 was updated to the 2014 version.

22.6 Corrected spelling of 'Quanty' to 'Quanti' in Sections 10.1.3.3 and 10.1.4.3. S. Agrawal 3/1/19

22.7 Added language regarding the use of Ohio EPA certified analysts in Section 10.1. All of the sections following that were automatically updated. S. Agrawal 3/1/19

22.8 Prior to new analyst certifications, I reviewed this SOP and SOP 2109. Since both SOP's included the analysis of drinking water samples, I wanted to make sure that they both contained the same information as it pertains to drinking water analysis. Many revisions were made to ensure both SOP's contained the same information. Section 2.0 Summary of Method, Section 3.0 Definitions, Section 4.0 Interferences, Section 6.0 Equipment and Supplies, Section 7.0 Reagents and Standards, Section 9.0 Quality Control, Section 11.0 Procedure, Section 12.0 Calculations, Section 15.0 method Specific Corrective Actions Section 16.0 Contingencies of Out of Control/Unacceptable Data, Section 18.0 Pollution Prevention and Section 20.0 References, were all revised. (K. Greenwood 10/8/2019)

22.9 Added Section 11.6.1.3 – notification of NEORSD personnel when a WWTP sample is positive for chlorine. (K. Greenwood 12/9/2019)

22.10 Revised the reference section (Section 20.1) to reflect the most current version of Standard Methods, KLG 4/14/2020.

22.11 Added validate chlorine test strips to equipment. KLG/SGA 4/30/2020.

22.12 Revisions to Section 11.0 were made to reflect the change to the procedure for the reporting of results. Beginning October 1, 2020, only one result is to be reported for the Colilert Quanti-Tray method. The result reported is to be the sample replicate with the smallest dilution (or greatest sample analysis volume) that produced a result on the MPN chart. K. Greenwood 9/2020.

22.13 Section 11.0, steps for creating batches in the new LIMS system and data entry instructions were added. K. Greenwood 9/2020.

22.14 Section 16.1 – an example of a comment for results outside of the MPN chart range was added. K. Greenwood 9/2020.

22.15 Section 17.6 – Reference to the Autoclave SOP's was added. K. Greenwood 9/2020.

22.16 Section 20.0 - the reporting instructions from Idexx reference was added.

22.17 Section 11.13 was added to include the procedure for arranging the data packets in order by readout time for the following day. K. Greenwood 9/2020.

22.18 Added sample shaker Section 6.18 because it was missing. K. Greenwood 9/2020.

22.19 Added a note to Section 11.11.2 – do not cover the temperature probes in the incubators. K. Greenwood 9/2020.

22.20 Corrected references to sections that were not correct after revisions in Sections 11.0 and 14.0, K. Greenwood 9/2020.

22.21 To address CA1322, deficiency of not performing a validation of the environment Section 21.2 was added. This section describes the procedure for performing the environmental validation. The procedure is also referenced in Section 9.13. K. Greenwood 11/16/2020.

22.22 Added Sections 9.13, 14.4, 15.3 to address the audit deficiency of not performing an environmental validation in the microbiology analytical area. K. Greenwood 11/16/2020.

22.23 Section 11.4.8 added the peer review of drinking water sample analysis to address CA 1327. K. Greenwood 11/30/2020.

22.24 Added the negative and positive to Section 9.0 because they were not listed.

22.25 Added sections 9.2 and 9.3 QC for IDOC & DOC. K. Greenwood 12/31/2020.

22.26 Added IDOC & DOC requirements to Section 14.0. K. Greenwood 12/31/2020.

22.27 Added the comparators to Section 7.0. KLG 2/3/2021

Northeast Ohio Regional Sewer District

Water Quality and Industrial Surveillance
4747 East 49th Street
Cuyahoga Heights, Ohio 44125

Title

Beach Sampling

SOP–EA016-19

Effective Date: 4/26/2021

Approvals

Prepared By: Eric Soehnlen Date: 4/26/21

Reviewed By Supervisor: Seth Hothem Date: 4/26/21

Approved By Manager: John W. Rhoades Date: 04/29/21

Northeast Ohio Regional Sewer District

Water Quality and Industrial Surveillance
4747 East 49th Street
Cuyahoga Heights, OH 44125

TABLE OF CONTENTS

1. SCOPE AND APPLICATION 3
2. INTERFERENCES 3
3. DEFINITIONS 3
4. SAFETY 4
5. EQUIPMENT AND SUPPLIES 5
6. CALIBRATION AND STANDARDIZATION 6
7. PROCEDURE 6
8. DATA HANDLING AND REVIEW 10
9. ADDITIONAL INFORMATION 10
10. REFERENCES 10
11. REVISION HISTORY ..... ERROR! BOOKMARK NOT DEFINED.

1. Scope and Application

1.1. This SOP describes the procedure for the collection of bacteriological beach water samples.

1.2. Beaches are sampled during the recreational season (May 1-October 31) to monitor levels of bacteria in order to inform the public of a possible risk of exposure to high levels of bacteria.

1.3. *E. coli* are commonly associated with sewage contamination resulting from a number of sources including over ground runoff and overflows of sewage systems from rain events, warm-blooded animal waste and the effects of increased wave height. The presence of the bacteria only indicates that other pathogenic bacteria may be present.

1.4. The EPA has determined that *E. coli* are one of the best indicator organisms of water quality for freshwater bathing beaches.

1.5. *E. coli* densities are compared to the Ohio water quality standards to determine recreation use attainment and beach and bathing water advisories. Beach advisories are based on single sample concentrations of *E. coli* bacteria.

1.6. The data from beach sampling are sent to the Ohio Department of Health for a daily assessment of bathing water quality. The Ohio Department of Health and the Ohio Department of Natural Resources use this data to determine when beach advisory postings should be made.

2. Interferences

2.1. The use of a sample bottle that is not autoclaved may cause elevated bacteria counts or false positives. Autoclaving kills any residual bacteria that may be present in the bottle.

2.2. Do not touch the inside of the bottle or the inside of the cap. This can contaminate the sample.

2.3. Sampling at a distance too close to the shoreline may cause elevated bacteria counts or false positives. Avoid sampling near bird feces, sediment, and floating debris and trash.

2.4. Avoid disturbing and kicking up bottom material at the sampling station.

3. Definitions

3.1. Anemometer- A device used to measure wind speed (maximum and average).

3.2. Beach Sampling Field Data Form- A field form to be filled out at each beach site in order to record field observations and field parameters.

3.3. Edgewater State Park- Lake Erie beach located at 6700 Cleveland Memorial Shoreway, Cleveland.

3.4. EMSC- Environmental Maintenance and Service Center (4747 East 49th Street, Cuyahoga Heights, Ohio 44125; 216-641-6000)

3.5. Sampling pole- Pole that extends to 12 feet and is used to take samples at a distance. Can be used during beach sampling if lake conditions are deemed unsafe due to high wave height.

3.6. Villa Angela/Euclid State Parks- Lake Erie beaches located at 16301 Lakeshore Boulevard, Cleveland.

4. Safety

4.1. Safety Equipment

- 4.1.1. Personal Flotation Device (PFD) (see Section 4.2.7.)
- 4.1.2. Chest waders
- 4.1.3. Gloves, if desired
- 4.1.4. Throw bag with 50 feet of nylon rope (refer to *Throw Bag SOP-EA007-00*)
- 4.1.5. District-issued cell phone

4.2. Sampling Safety Procedures

- 4.2.1. A District cell phone has been provided for additional safety. The phone should be charged and turned on while off District premises.
- 4.2.2. Sampling may not occur during a thunderstorm. During times of inclement weather, check with a Supervisor or Manager of Water Quality and Industrial Surveillance (WQIS) prior to sampling.
- 4.2.3. If inclement weather occurs while sampling, seek safety and call a WQIS Supervisor or Manager for instructions.
- 4.2.4. Samples will not be collected when wave heights are over 3.5 feet.
- 4.2.5. The sampler MUST put on chest waders before entering the water.
- 4.2.6. A PFD is provided for the sampler.
  - 4.2.6.1. A PFD must be worn when factors indicate that a drowning hazard may exist, such as rip current advisories, waves are greater than 2 feet in height and when waters are over waist deep, are swift, cold or turbid.
  - 4.2.6.2. Use of PFD during all other lake conditions is at the discretion of the sampler.

4.2.7. The sampler must wade out to a water depth of 3 feet to collect samples. The wave stick is used as a depth indicator. Do not wade out farther than recommended.

4.2.8. When the water is rough, the sampler may use a 12-foot sampling pole to assist with sampling. The sampler should wade out to a safe distance and then extend the sampling pole to obtain a representative sample. The use of the sampling pole shall be noted on the Beach Sampling Field Data Form.

4.2.9. Safety training will be given to all employees sampling.

4.2.10. Additional safety concerns should be brought to the attention of a WQIS Supervisor or Manager.

5. Equipment and Supplies

5.1. Sample Bottles

5.1.1. 250 milliliter, 500 milliliter, 1000 milliliter, or 2000 milliliter sterilized bacteriological bottle (at least 4 bottles)

5.1.2. 473 milliliter ISCO turbidity bottles (at least 4 bottles)

5.2. Sample Tags and Chain of Custody Sheet

5.3. Beach Sampling Field Data Forms for each beach and creek

5.4. Field Meters

5.4.1. Hanna HI 98129,

5.4.2. YSI 600XL Sonde, or

5.4.3. YSI-556 MPS Multi-Parameter Water Quality Meter

5.4.4. YSI EXO1 Sonde

5.5. Field Turbidity Meter

5.5.1. HACH 2100P Turbidimeter or

5.5.2. HACH 2100Q Turbidimeter

5.6. Anemometer

5.7. Sampling Pole (12 feet) with Zip Ties

5.8. Cooler with Ice

5.9. Throw Bag with 50 feet of Nylon Rope (refer to *Throw Bag SOP-EA007-00*)

5.10. Personal Flotation Device

5.11. District-issued Cell Phone

5.12. Digital Camera

5.13. GPS, if needed

5.14. Wave Height Stick(marked at inch and foot increments)

5.15. Gloves, if desired

5.16. Hand Sanitizer

5.17. Chest Waders

6. Calibration and Standardization

6.1. All field meters must be calibrated daily or verified that the instrument is in calibration by an independent standard.

6.1.1. See "*Operation of the Hanna HI98129 Meter SOP-EA015-00*" for use and calibration of the meter.

6.1.2. Refer to the manufacturer's operations manual or user's guide for the use and calibration of the YSI EXO1 Sonde.

6.1.3. Refer to the manufacturer's operations manual or user's guide for the use and calibration of the HACH 2100P Turbidimeter.

6.1.4. Refer to the manufacturer's operations manual or user's guide for the use and calibration of the HACH 2100Q Turbidimeter.

6.1.5. See "*Procedures for the Calibration and Use of the YSI 556 Multi-Parameter Water Quality Meter & YSI 650 MDS/600XL Sonde SOP-EA010-00*" for the use and calibration of the YSI 556 Multi-Parameter Water Quality Meter and the YSI 600XL Sonde.

6.1.6. Refer to manufacturer's operations manual or user's guide for additional information on all the above meters.

6.2. A log of the calibration history is to be maintained to assure that the meter is working properly.

7. Procedure

7.1. Directions to the Beaches and Euclid Creek

7.1.1. Edgewater Beach – (From 4747 E. 49th Street)

- Take E. 49th Street to Harvard Avenue.
- Make a right turn at Harvard Avenue.
- Make a left onto I-77 N.
- Take I-77N to I-90E.
- Take I-90E to Route 2W.
- Take Route 2 to the Edgewater Park exit.
- Take the exit and follow straight, following the signs to the beach area.
- Park the truck in the parking lot to the left or underneath the pavilion.

7.1.2. Villa Angela Beach/Euclid Beach/Euclid Creek (From 4747 E. 49th Street)

- Take E. 49th Street to Harvard Avenue.
- Make a right turn at Harvard Avenue.
- Make a left onto I-77 N.
- Take I-77N to I-90E.
- Take I-90E to the Lakeshore Boulevard exit.
- Make a right onto Lakeshore Boulevard.
- Follow Lakeshore Boulevard until you see the "Euclid Beach" entrance sign on the left. Turn into the premises (Villa Angela Drive).
- Euclid Creek will be on your right hand side as you enter.
    - Take the bike path on the right hand side and park in the grass at the first bend.
    - RM 0.55 sampling location is approximately 485 feet north of the Lakeshore Boulevard bridge.
- Take a right onto the bike path right before the foot bridge on Villa Angela Drive.
- Go onto the bike path very slowly; watch out for pedestrians.
- Villa Angela is the first beach on your right. Park on the right hand side in the grass by the entrance that leads you down to the beach.
- Euclid Beach is the second beach on your right. Park in the grass near the picnic tables.

7.2. Sampling Locations

7.2.1. Additional sampling locations may be added as needed.

7.2.2. See attached site diagrams for sampling locations (Appendix 1 and 2).

7.2.3. Edgewater Beach – There are 2 buoys and 3 lifeguard stations at this beach.

7.2.3.1. The sample is taken in line with the brick stack on the other side of the freeway.

7.2.3.2. **GPS Location**: 41.489694/-81.739117

7.2.4. Villa Angela Beach – There are 4 stone break walls at this beach. Count them left to right.

7.2.4.1. The sample is taken mid-distance between the 3rd and 4th break walls.

7.2.4.2. **GPS Location:** 41.586242/-81.566656

7.2.5. Euclid Beach – There are 2 stone break walls at this beach.

7.2.5.1. The sample is taken in front of the pile of stones on the east side of the beach.

7.2.5.2. **GPS Location:** 41.584244/-81.568739

7.2.6. Euclid Creek

7.2.6.1. **Euclid Creek RM 0.55 –** Downstream of Lakeshore Boulevard

7.2.6.2. **RM 0.55 GPS Location:** 41.583525/-81.5595

7.3. General Field Analysis/Observations Required at All Sampling Locations

7.3.1. Digital pictures are to be taken prior to sampling to avoid causing any disturbances of the bird activity.

7.3.1.1. Pictures of the east, west and overall views of the beach are to be taken (Appendix 3). Additional pictures of beach conditions that could impact the outcome of the testing should be taken as well as noted on the Beach Sampling Field Data Form.

7.3.2. The sample tag must be completed at the sampling site with the following information:

- Signature
- Employee ID
- Start Time (time sample was collected)

7.3.3. Field observation notes, field parameters and other miscellaneous information must be entered onto the Beach Sampling Field Data Form (Appendix 3) at the sampling site. The form must be filled out completely.

7.3.4. The sample collected in the 250mL, 500mL, 1000mL or 2000mL bottle will be used for microbiological tests at the laboratory. Turbidity will be collected in a 473-mL ISCO bottle.

7.3.5. Once the field collection has been performed, place the sample into the portable cooler filled with ice.

7.3.6. The samples must remain in the cooler until delivered to the Sample Custodian in the Analytical Services Department at the Environmental Maintenance and Service Center (EMSC).

7.3.7. Upon returning to EMSC, the field data and scanned in field forms are entered into eAquaPro and pictures are saved to the W:/ drive.

7.4. Bacteriological and Turbidity Field Sample Collection Protocol

7.4.1. Sampling method shall follow Ohio EPA's *Surface Water Field Sampling Manual for water quality parameters and flow (*2019).

7.4.2. Locate the sampling location by the markers on the beach as indicated in section 7.2.

7.4.3. If necessary, take a GPS reading to verify the location.

7.4.4. Wade out to a water depth of approximately 3 feet. Use the wave stick to verify the depth. The distance from the shoreline will vary daily based on the depth of Lake Erie and wave height.

7.4.5. The sampler must remove the cap from the sterilized bacteriological bottle invert the sample bottle and plunge the sample bottle 6-12 inches below the surface of the water.
7.4.6. The bottle should be rotated with the opening facing the surface to allow sample to fill the bottle. Make sure to leave headspace in order to provide sufficient space for shaking the sample for analysis.
7.4.7. The sample container should be capped and secured.
7.4.8. Repeat steps 7.4.4. through 7.4.6. to obtain the turbidity samples.
7.4.9. All samples are to be placed into the portable cooler containing ice.
7.4.10. Repeat Section 7.4 to collect samples at other sites.

7.5. Field Observations/Parameters
7.5.1. Take the maximum and minimum wave height before returning to the shoreline by using the wave stick. This is done by observing the minimum and maximum height of waves for one minute. Record the minimum and maximum wave heights, in inches, on the Beach Sampling Field Data Form (Appendix 3). Perform the following calculation to get the wave height:

[Maximum height (in)] (-) [-minimum height (in)] = wave height (in)

7.5.2. If you are unable to enter the water because of unsafe conditions, estimate the wave height and indicate so on the Beach Sampling Field Data Form.
7.5.3. Field parameters must be collected in the water at each sample site. Measure pH, conductivity and temperature in the water with the appropriate field meter. A turbidity sample will be collected in a 473-mL plastic bottle and analyzed at EMSC with a turbidimeter.

7.6. Sample Collection During Inclement Weather
7.6.1. Locate the sampling location by the markers on the beach.
7.6.2. If necessary, take a GPS reading to verify the location.
7.6.3. A sampling pole must be used to obtain samples when the water is rough and you are unable to wade out to 3 feet. If the wave height is over 3.5 feet, then samples will not be collected.
7.6.4. Bacteriological Sample Collection
7.6.4.1. Secure the sampling bottle to the pole with at least three zip ties then remove the cap of a sterilized bacteriological bottle.
7.6.4.2. Wade out into the water to a safe depth, at least 1.5 feet deep. The distance from the shoreline will vary based on the depth of Lake Erie and wave height.

7.6.4.3. The sample pole should be extended to maximum length and the sample bottle is inverted and plunged below the surface of the water.

7.6.4.4. Cap and secure the sample.

7.6.5. Repeat steps 7.6.4.1. through 7.6.4.4. using the 473-mL bottle to obtain the turbidity sample.

7.6.6. If unable to obtain field parameters in the water due to high waves or dangerous conditions, field parameters may be obtained from the turbidity sample on the shoreline.

7.6.7. Return to the shoreline, tag the samples and place the samples into the ice-filled portable cooler.

7.6.8. Be sure to fill in the Beach Sampling Field Data Form (Appendix 3) completely and indicate that the sampling pole was used.

7.7. Turbidity Analysis

7.7.1. Turbidity analysis is to be performed at EMSC for all sites.

7.7.1.1. Each beach site is run for turbidity twice and the values are averaged for a final turbidity result.

8. Data Handling and Review

8.1. The Project Leader will review all Beach Sampling Field Data Forms for accuracy and neatness.

8.2. The Project Leader will periodically audit the sampling process.

8.3. Report any unusual circumstances to the Project Leader or WQIS Supervisor.

8.4. For all beach sites, the sampler must enter the field measurements and observations into eAquaPro immediately upon returning to EMSC.

8.5. Scan and save all Beach Sampling Field Data Forms and pictures into the W\: drive upon returning to EMSC.

9. Additional Information

9.1. Using the Anemometer to Measure Wind Speed

9.1.1. Refer to the manufacturer's operations manual or user's guide for the use of the Kestrel 2000 Pocket Weather Meter.

10. References

10.1. Microbiological Methods for Monitoring the Environment Water and Wastes, EPA-600/8-78-017 (1978). Cincinnati, OH.

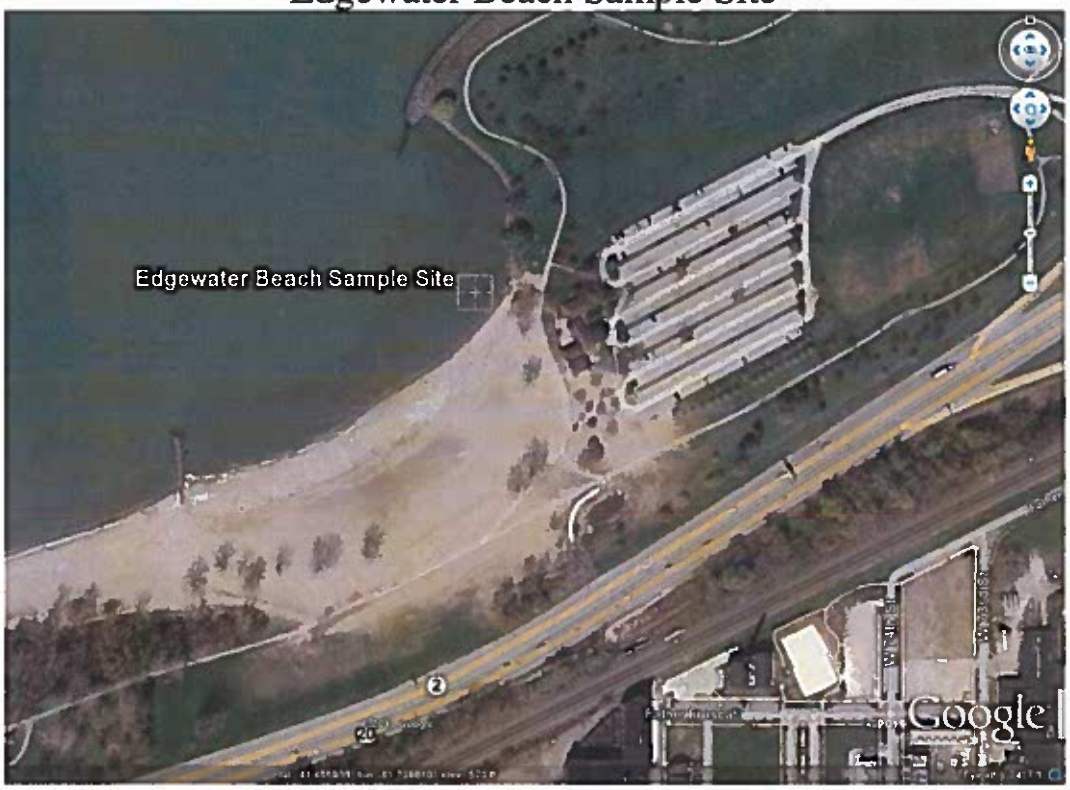
10.2. Ohio Environmental Protection Agency. (2019). *Surface Water Field Sampling Manual for water quality parameters and flow.* Columbus, OH: Division of Surface Water.

10.3. USEPA National Beach Guidance and Required Performance Criteria for Grants (EPA-823-B-02-004). (2002). Chapter 4-Beach Monitoring and Assessment.

10.4. Website: http://www.epa.gov/waterscience/beaches/grants/index.html.

APPENDIX 1

Edgewater Beach Sample Site



SAMPLE SITE
Brick stack on other side of freeway

APPENDIX 2

Villa Angela Sample Site

SAMPLE SITE
Mid-distance between 3rd and 4th break walls

Euclid Beach Sample Site

SAMPLE SITE
Pile of stones

Euclid Creek Sample Site

EUCLID CREEK RM 0.55
Downstream of Lakeshore Boulevard

APPENDIX 3

Example Beach Observation Sheet

NEORSD Beach Sampling Field Data Form

Location: _____ Date: _____ Time: _____ (hrs)

Samplers: _____

Meter(s) Used: _____

Sample ID: _____

General Observations

Weather: _____ 1-Clear 2-Partly Cloudy 3-Overcast 4-Light Rain 5-Heavy Rain 6-Steady Rain 7-Heavy Snow Melt 8-Other

Water Surface Conditions: _____ 1-None 2-Foam 3-Oily 4-Scum 5-Other

Lake Surface Conditions: _____ 1-Calm 2-Ripple 3-Moderate Waves 4-White Caps

Color: _____ 1-Clear 2-Muddy 3-Tea 4-Milky 5-Other

Odor: _____ 1-Normal 2-Petroleum 3-Septic 4-Sewage 5-Chemical 6-Other

Algae: _____ Debris: _____ 1-None 2-Some 3-Floating 4-Thick Layer 5-Multiple Layers

Fecal Matter: _____ 1-None 2-Sparse 3-Some 4-Multiple Areas 5-All Along Shoreline

Number of Swimmers: _____

Number of Birds: Gulls _____ Geese _____ Ducks _____ Other (ie, pigeons) _____ Total _____

Was the sample taken during or following a wet weather event? _____ (Yes/No)

Physical Parameters

Water Temp: _____ (°C)

pH :_____ (SU)

Turbidity: (1) _____ (2) _____ Avg _____ (NTU)

[Duplicate Turbidity: (1) _____ (2) _____ Avg _____ (NTU)]

Conductivity: _____ (µmhos/cm)

Location: _____ Date: _____ Time: _____ (hrs)

Measurements

Wave Height: _____ (in)

Wave Run Up: _____ (1-5)

1 – ≤1ft	3 – 4ft to 6ft	5 – ≥10ft
2 – 1ft to 3ft	4 – 7ft to 9 ft	

Wind Direction: _____ (degrees)

Wind Speed: Max _____ Avg _____ (mph)

Air temp: _____ (°C)

Fecal Contamination on Beach: _____ (%)

Debris on the Beach: _____ (%)

1 – ≤1%	4 – 30-49%
2 – 2- 14%	5 – 50-75%
3 – 15-29%	6 – >75%

Comments

_____

_____

_____

_____

To be completed by Lab Personnel

Storm Water Effects on the Beach _____

0 – No Rain Event	1 – Wet Sand, No Run Off
2 – Wet Sand, Mild Scouring	3 – Wet Sand, Moderate Scouring
4 – Wet Sand, Major Scouring, No Standing Water	
5 – Wet Sand, Major Scouring, Standing and flowing Water	

[Place Label Here]

2/6/14 JM

Appendix D. Field Form

NEORSD Beach Sampling Field Data Form

Location: _____ Date: _____ Time (hrs): _____

Meter(s) Used: _____ Samplers: _____

Was this sample taken during or following a wet weather event? YES / NO

Weather Conditions Air Temp: _____ (°F)

Longshore Wind Speed: Max _____ Avg _____ (mph) Direction _____ (Deg)

Condition: Sunny Mostly Sunny Mostly Cloudy Cloudy Light Rain/Showers
Heavy Rain Heavy Snow Melt Other: _____

Beach Conditions Odor: _____ **1** - Normal **2** - Oil **3** - Septic **4** - Sewage **5** - Chemical 6-Other

Number of People on Beach: _____

Number of Birds: Gull _____ Geese _____ Duck _____ Other _____ Total _____

Number of Wildlife: Dog _____ Raccoon _____ Deer _____ Horse _____ Total _____

Debris on Beach: _____ (1-6)

Fecal Contamination on Beach: _____ (1-6)

1 - ≤1% **2** - 2-14% **3** - 15-29%
4 - 30-49% **5** - 50-75% **6** - >75%

Numer of Dead Organisms: Fish _____ Birds _____ Other _____

Lake Conditions: Number of Swimmers: _____

Color: _____ (1-5) **1** - Clear **2** - Muddy **3** - Tea **4** - Milky **5** - Other Wave Height: _____ (ft)

Wave Condition: _____ (1-3) **1** - Calm **2** - Normal **3** - Rough

Algae: _____ Debris: _____ (1-5) **1** - None **2** - Some **3** - Floating **4** - Thick Layer **5** - Multiple Layers

Water Surface Condition: _____ (1-5) **1** - None **2** - Foam **3** - Oily **4** - Scum **5** - Other

Lake Physical Parameters: Water Temp: _____ (°C) pH: _____ (s.u.)

Conductivity: _____ (µmhos/cm)

Turbidity* (NTU): (1) _____ (2) _____ (Avg) _____

Duplicate Turbidity 1 (NTU): (1) _____ (2) _____ (Avg) _____

General Comments: _____

_____

_____

* Clear = <1.9 NTU, Slightly Turbid = 2-9.9 NTU, Turbid = 10-249.9 NTU, Opaque = >250

Modified April 2021

Appendix E. Meter Specifications

HI 98129

Combo pH/EC/TDS/Temperature Tester with Low Range EC

Description

The HI 98129 Combo waterproof tester offer high accuracy pH, EC/TDS and temperature measurements in a single tester! No more switching between meters for your routine measurements. The waterproof Combo (it even floats) has a large easy-to-read, dual-level LCD and automatic shut-off. pH and EC/TDS readings are automatically compensated for the effects of temperature (ATC). This technologically advanced tester has a replaceable pH electrode cartridge with an extendable cloth junction as well as an EC/TDS graphite electrode that resists contamination by salts and other substances. This gives these meters a greatly extended life. Your tester no longer needs to be thrown away when the pH sensor is exhausted.

The EC/TDS conversion factor is user selectable as is the temperature compensation coefficient (ß). Fast, efficient, accurate and portable, the Combo pH, EC/TDS and temperature tester brings you all the features you've asked for and more!

Specifications

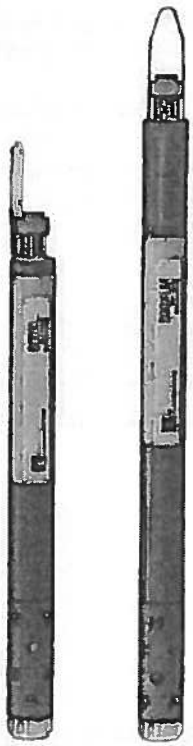
Range	pH	0.00 to 14.00 pH
Range	EC	0 to 3999 µS/cm
Range	TDS	0 to 2000 ppm
Range	Temperature	0.0 to 60.0°C / 32 to 140.0°F
Resolution	pH	0.01 pH
Resolution	EC	1 µS/cm
Resolution	TDS	1 ppm
Resolution	Temperature	0.1°C / 0.1°F
Accuracy	pH	±0.05 pH
Accuracy	EC/TDS	±2% F.S.
Accuracy	Temperature	±0.5°C / ±1°F
Temperature Compensation		pH: automatic; EC/TDS: automatic with ß adjustable from 0.0 to 2.4% / °C
Calibration	pH	automatic, 1 or 2 points with 2 sets of memorized buffers (pH 4.01 / 7.01 / 10.01 or 4.01 / 6.86 / 9.18)
Calibration	EC/TDS	automatic, 1 point
TDS Conversion Factor		adjustable from 0.45 to 1.00
pH Electrode		HI 73127 (replaceable; included)
Environment		0 to 50°C (32 to 122°F); RH max 100%
Battery Type / Life		4 x 1.5V / approx. 100 hours of continuous use; auto-off after 8 minutes of non-use
Dimensions		163 x 40 x 26 mm (6.4 x 1.6 x 1.0")
Weight		100 g (3.5 oz.)

YSI 600XL and 600XLM Sondes

Measure multiple parameters simultaneously

The YSI 600XL and YSI 600XLM compact sondes measure eleven parameters simultaneously:

Temperature	TDS
Conductivity	pH
Specific Conductance	ORP
Salinity	Depth or Level
Resistivity	Rapid Pulse™ DO (% and mg/L)



The YSI 600XL and 600XLM

Connect with Data Collection Platforms

Either sonde can easily connect to the YSI 6200 DAS (Data Acquisition System), YSI EcoNet™ or your own data collection platform, via SDI-12 for remote and real-time data acquisition applications.

Economical Logging System

The YSI 600XLM is an economical logging system for long-term, *in situ* monitoring and profiling. It will log all parameters at programmable intervals and store 150,000 readings. At one-hour intervals, the instrument will log data for about 75 days utilizing its own power source. The 600XL can also be utilized in the same manner with user-supplied external power.

- Either sonde fits down 2-inch wells
- Horizontal measurements in very shallow waters
- Stirring-independent Rapid Pulse® dissolved oxygen sensor
- Field-replaceable sensors
- Easily connects to data collection platforms
- Available with detachable cables to measure depth up to 200 feet
- Compatible with YSI 650 Multiparameter Display System
- Use with the YSI 5083 flow cell for groundwater applications

Pure Data for a Healthy Planet.®

Economical, multiparameter sampling or logging in a compact sonde

Sensor performance verified*

The 6820 V2 and 6920 V2 sondes use sensor technology that was verified through the US EPA's Environmental Technology Verification Program (ETV). For information on which sensors were performance-verified, turn this sheet over and look for the ETV logo.

ETV

www.ysi.com

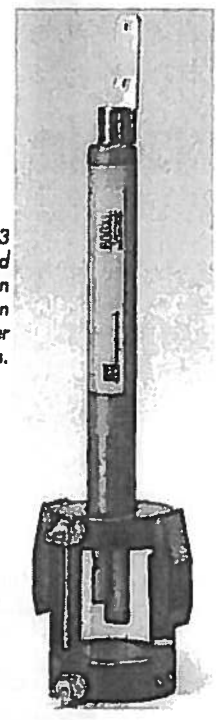
YSI 600XL & 600XLM Sensor Specifications

	Range	Resolution	Accuracy
Dissolved Oxygen % Saturation 6562 Rapid Pulse™ Sensor* ETV✓	0 to 500%	0.1%	0 to 200%: ±2% of reading or 2% air saturation, whichever is greater; 200 to 500%: ±6% of reading
Dissolved Oxygen mg/L 6562 Rapid Pulse™ Sensor* ETV✓	0 to 50 mg/L	0.01 mg/L	0 to 20 mg/L: ± 0.2 mg/L or 2% of reading, whichever is greater; 20 to 50 mg/L: ±6% of reading
Conductivity• 6560 Sensor* ETV✓	0 to 100 mS/cm	0.001 to 0.1 mS/cm (range dependent)	±0.5% of reading + 0.001 mS/cm
Salinity	0 to 70 ppt	0.01 ppt	±1% of reading or 0.1 ppt, whichever is greater
Temperature 6560 Sensor* ETV✓	-5 to +50°C	0.01°C	±0.15°C
pH 6561 Sensor* ETV✓	0 to 14 units	0.01 unit	±0.2 unit
ORP	-999 to +999 mV	0.1 mV	±20 mV
Depth & Level Medium	0 to 200 ft, 61 m	0.001 ft, 0.001 m	±0.4 ft, ±0.12 m
Shallow	0 to 30 ft, 9.1 m	0.001 ft, 0.001 m	±0.06 ft, ±0.02 m
Vented Level	0 to 30 ft, 9.1 m	0.001 ft, 0.001 m	±0.01 ft, 0.003 m

• Report outputs of specific conductance (conductivity corrected to 25° C), resistivity, and total dissolved solids are also provided. These values are automatically calculated from conductivity according to algorithms found in *Standard Methods for the Examination of Water and Wastewater* (ed 1989)

YSI 600XL & 600XLM Sonde Specifications

Medium	Fresh, sea or polluted water
Temperature Operating	-5 to +50°C
Storage	-10 to +60°C
Communications	RS-232, SDI-12
Software	EcoWatch®
Dimensions 600XL | 600XLM Diameter	1.65 in, 4.19 cm | 1.65 in, 4.9 cm
Length	16 in, 40.6 cm | 21.3 in, 54.1 cm
Weight	1.3 lbs, 0.59 kg | 1.5 lbs, 0.69 kg
Power External	12 V DC
Internal (600XLM only)	4 AA-size alkaline batteries



YSI model 5083 flow cell and 600XL. This is an ideal combination for groundwater applications.

YSI

To order, or for more info, contact YSI Environmental.

+1 937 767 7241
800 897 4151 (US)
www.ysi.com

YSI Environmental
+1 937 767 7241
Fax +1 937 767 9353
environmental@ysi.com

Endeco/YSI
+1 508 748 0366
Fax +1 508 748 2543
systems@ysi.com

SonTek/YSI
+1 858 546 8327
Fax +1 858 546 8150
inquiry@sontek.com

YSI Gulf Coast
+1 225 753 2650
Fax +1 225 753 8669
environmental@ysi.com

YSI Hydrodata (UK)
+44 1462 673 581
Fax +44 1462 673 582
europe@ysi.com

YSI Middle East (Bahrain)
+973 1753 6222
Fax +973 1753 6333
halsalem@ysi.com

YSI (Hong Kong) Limited
+852 2891 8154
Fax +852 2834 0034
hongkong@ysi.com

YSI (China) Limited
+86 10 5203 9675
Fax +86 10 5203 9679
beijing@ysi-china.com

YSI Nanotech (Japan)
+81 44 222 0009
Fax +81 44 221 1102
nanotech@ysi.com

ISO 9001
ISO 14001
Yellow Springs, Ohio Facility

YSI incorporated
Who's Minding
the Planet?

2100Q and 2100Q *is* Portable Turbidimeter

The Hach 2100Q and 2100Q is Portable Turbidimeters offer unsurpassed ease of use and accuracy in turbidity measurement. Only Hach offers this unique combination of advanced features, such as assisted calibration and simplified data transfer, and measurement innovation, giving you accurate results every time.

Features and Benefits

Easy Calibration and Verification

Hach 2100Q and 2100Q *is* Portable Turbidimeters provide confidence your measurements are right every time. On-screen assisted calibration and verification save you time and ensure accuracy. With an easy-to-follow interface, complicated manuals are not needed to perform routine calibrations. Single-standard RapidCal™ calibration offers a simplified solution for low level measurements.

Simple Data Transfer

Data transfer with the optional USB + Power Module is simple, flexible, and doesn't require additional software. All data can be transferred to the module and easily downloaded to your computer with a USB connection, providing superior data integrity and availability. With two different module options, you can customize connectivity and power to meet your unique needs.

Accurate for Rapidly Settling Samples

The Hach 2100Q Portable Turbidimeter incorporates an innovative Rapidly Settling Turbidity™ mode to provide accurate, repeatable measurements for difficult to measure, rapidly settling samples. An exclusive algorithm that calculates turbidity based on a series of automatic readings eliminates redundant measurements and estimating.

Convenient Data Logging

Up to 500 measurements are automatically stored in the instrument for easy access and backup. Stored information includes: date and time, operator ID, reading mode, sample ID, sample number, units, calibration time, calibration status, error messages and the result.

Optical System for Precision in the Field

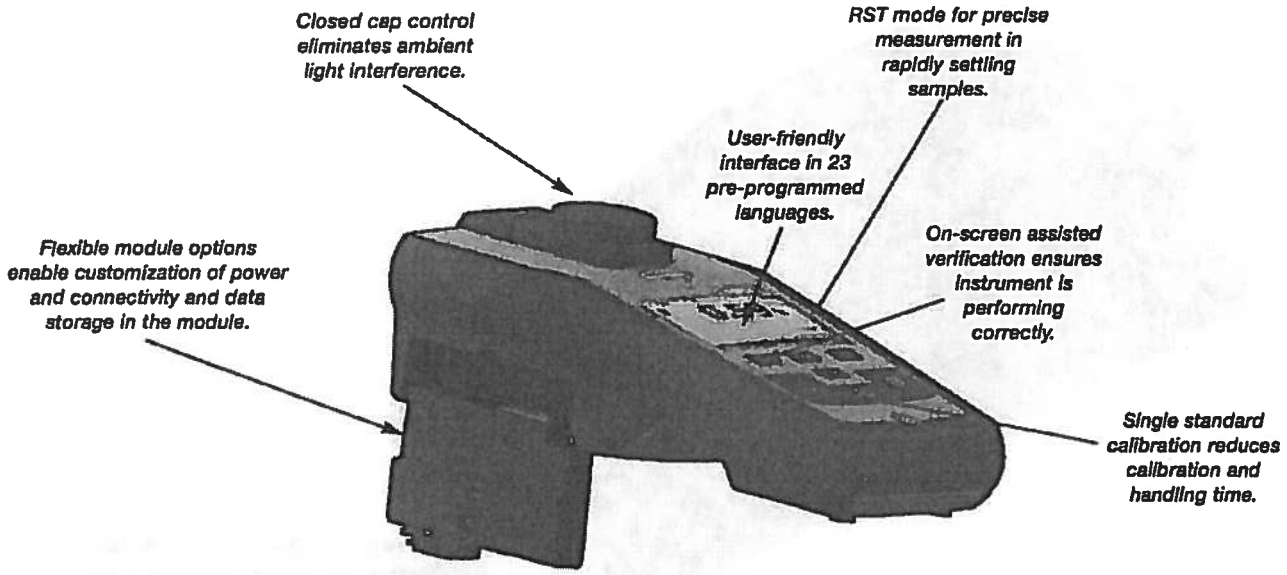
The two-detector optical system compensates for color in the sample, light fluctuation, and stray light, enabling analysts to achieve laboratory-grade performance on a wide range of samples, even under difficult site conditions.

Two Models for Specific Requirements

- **2100Q Turbidimeter**—*Compliant with USEPA Method 180.1 design criteria.*
- **2100Q *is* Turbidimeter**—*Compliant with ISO 7027 design criteria.*

DW = drinking water WW = wastewater municipal PW = pure water / power
IW = industrial water E = environmental C = collections FB = food and beverage

Key Features



Specifications*

Measurement Method
Ratio turbidimetric determination using a primary nephelometric light scatter signal (90°) to the transmitted light scatter signal.

Regulatory
2100Q: Meets EPA Method 180.1
2100Q *is:* Meets ISO 7027

Light Source
2100Q: Tungsten filament lamp
2100Q *is:* Light-emitting diode (LED) @ 860 nm

Range
0 to 1000 NTU (FNU)

Accuracy
±2% of reading plus stray light from 0 to 1000 NTU

Repeatability
±1% of reading, or 0.01 NTU (FNU), whichever is greater

Resolution
0.01 NTU on lowest range

Stray Light
<0.02 NTU (FNU)

Signal Averaging
Selectable on/off

Detector
Silicon photovoltaic

Reading Modes (user selectable)
Normal (Push to Read)
Signal Averaging
Rapidly Settling Turbidity

Data Logger
500 records

Power Requirement
110-230 Vac, 50/60 Hz (with Power or USB+Power Module)
4 AA alkaline batteries
Rechargeable NIMH (for use with USB+Power Module)

Operating Conditions
Temperature: 0 to 50°C (32 to 122°F)
Relative Humidity: 0 to 90% @ 30°C,
0 to 80% @ 40°C, 0 to 70% @ 50°C, noncondensing

Storage Conditions
-40 to 60°C (-40 to 140°F), instrument only

Languages
English, French, German, Italian, Spanish, Portuguese (BR), Portuguese (PT), Bulgarian, Chinese, Czech, Danish, Dutch, Finnish, Greek, Hungarian, Japanese, Korean, Polish, Romanian, Russian, Slovenian, Swedish, Turkish

Interface
Optional USB

Instrument Enclosure Rating
IP67 (closed lid, battery compartment excluded)

Protection Class
Power Supply: Class II

Certification
CE certified

Sample Required
15 mL (0.3 oz.)

Sample Cells
60 x 25 mm (2.36 x 1 in.) borosilicate glass with screw cap

Dimensions
22.9 x 10.7 x 7.7 cm (9.0 x4.2 x 3.0 in.)

Weight
527 g (1.16 lb) without batteries
618 g (1.36 lb) with four AA alkaline batteries

Warranty
1 year

**Specifications subject to change without notice.*

EXO1 Water Quality Sonde

Recycling

The EXO1 multiparameter water quality sonde collects data with up to four user-replaceable smart sensors and an integral pressure transducer for depth.

Send me a Quote!

Description | Specifications | Resources | Accessories | Request a Quote

The EXO1 with

- 4 sensor ports
- Integral pressure transducer
- 1 peripheral port for power communication
- Depth: 820 ft, 250 m

Medium		Fresh, sea or polluted water
Temperature	Operating Storage	-5 to +50°C -20 to +80°C
Communications		Bluetooth wireless technology; USB cable RS-485, RS-232, SDI-12
Software		KOR®
Dimensions	Diameter Length, no depth Weight	1.85 in. 4.70 cm 25.50 in. 64.77 cm 1.42 kg 3.15 lbs (batteries and sensors installed)
Power	External Internal	9 to 16.5 V DC 2 D-size alkaline batteries

Memory 512 MB; >1,000,000 logged readings

Ratings CE, UL, RoHS, WEEE

Find a Distributor

YSI has Authorized Distributors all over the globe. View a map and find your closest contact for YSI EXO1 Water Quality Sonde products and accessories.

Get Support

Have a question about your YSI EXO1 Water Quality Sonde? Check out the support page with resources compiled just for you.

Product Service Centers

Want to return a product for service? Here you'll find authorized service centers and instructions on how to send in your YSI EXO1 Water Quality Sonde.

Appendix F. Sampling Schedule

2022 Beach Monitoring Sampling Schedule

Day	Date	Edgewater Beach	Villa Angela Beach	Euclid Beach	Euclid Creek RM 0.55
Sunday	5/1/2022				
Monday	5/2/2022	√	√	√	√
Tuesday	5/3/2022	√	√	√	√
Wednesday	5/4/2022	√	√	√	√
Thursday	5/5/2022	√	√	√	√
Friday	5/6/2022				
Saturday	5/7/2022				
Sunday	5/8/2022				
Monday	5/9/2022	√	√	√	√
Tuesday	5/10/2022	√	√	√	√
Wednesday	5/11/2022	√	√	√	√
Thursday	5/12/2022	√	√	√	√
Friday	5/13/2022				
Saturday	5/14/2022				
Sunday	5/15/2022				
Monday	5/16/2022	√	√	√	√
Tuesday	5/17/2022	√	√	√	√
Wednesday	5/18/2022	√	√	√	√
Thursday	5/19/2022	√	√	√	√
Friday	5/20/2022				
Saturday	5/21/2022				
Sunday	5/22/2022				
Monday	5/23/2022	√	√	√	√
Tuesday	5/24/2022	√	√	√	√
Wednesday	5/25/2022	√	√	√	√
Thursday	5/26/2022	√	√	√	√
Friday	5/27/2022	√	√	√	√
Saturday	5/28/2022	√	√	√	√
Sunday	5/29/2022	√	√	√	√
Monday	5/30/2022	√	√	√	√
Tuesday	5/31/2022	√	√	√	√
Wednesday	6/1/2022	√	√	√	√
Thursday	6/2/2022	√	√	√	√
Friday	6/3/2022	√	√	√	√
Saturday	6/4/2022	√	√	√	√
Sunday	6/5/2022	√	√	√	√
Monday	6/6/2022	√	√	√	√
Tuesday	6/7/2022	√	√	√	√
Wednesday	6/8/2022	√	√	√	√
Thursday	6/9/2022	√	√	√	√
Friday	6/10/2022	√	√	√	√
Saturday	6/11/2022	√	√	√	√
Sunday	6/12/2022	√	√	√	√
Monday	6/13/2022	√	√	√	√
Tuesday	6/14/2022	√	√	√	√
Wednesday	6/15/2022	√	√	√	√
Thursday	6/16/2022	√	√	√	√
Friday	6/17/2022	√	√	√	√

		Edgewater Beach	Villa Angela Beach	Euclid Beach	Euclid Creek
Day	**Date**	**East**	**East**	**East**	**RM 0.55**
Saturday	6/18/2022	√	√	√	√
Sunday	6/19/2022	√	√	√	√
Monday	6/20/2022	√	√	√	√
Tuesday	6/21/2022	√	√	√	√
Wednesday	6/22/2022	√	√	√	√
Thursday	6/23/2022	√	√	√	√
Friday	6/24/2022	√	√	√	√
Saturday	6/25/2022	√	√	√	√
Sunday	6/26/2022	√	√	√	√
Monday	6/27/2022	√	√	√	√
Tuesday	6/28/2022	√	√	√	√
Wednesday	6/29/2022	√	√	√	√
Thursday	6/30/2022	√	√	√	√
Friday	7/1/2022	√	√	√	√
Saturday	7/2/2022	√	√	√	√
Sunday	7/3/2022	√	√	√	√
Monday	7/4/2022	√	√	√	√
Tuesday	7/5/2022	√	√	√	√
Wednesday	7/6/2022	√	√	√	√
Thursday	7/7/2022	√	√	√	√
Friday	7/8/2022	√	√	√	√
Saturday	7/9/2022	√	√	√	√
Sunday	7/10/2022	√	√	√	√
Monday	7/11/2022	√	√	√	√
Tuesday	7/12/2022	√	√	√	√
Wednesday	7/13/2022	√	√	√	√
Thursday	7/14/2022	√	√	√	√
Friday	7/15/2022	√	√	√	√
Saturday	7/16/2022	√	√	√	√
Sunday	7/17/2022	√	√	√	√
Monday	7/18/2022	√	√	√	√
Tuesday	7/19/2022	√	√	√	√
Wednesday	7/20/2022	√	√	√	√
Thursday	7/21/2022	√	√	√	√
Friday	7/22/2022	√	√	√	√
Saturday	7/23/2022	√	√	√	√
Sunday	7/24/2022	√	√	√	√
Monday	7/25/2022	√	√	√	√
Tuesday	7/26/2022	√	√	√	√
Wednesday	7/27/2022	√	√	√	√
Thursday	7/28/2022	√	√	√	√
Friday	7/29/2022	√	√	√	√
Saturday	7/30/2022	√	√	√	√
Sunday	7/31/2022	√	√	√	√
Monday	8/1/2022	√	√	√	√
Tuesday	8/2/2022	√	√	√	√
Wednesday	8/3/2022	√	√	√	√
Thursday	8/4/2022	√	√	√	√
Friday	8/5/2022	√	√	√	√
Saturday	8/6/2022	√	√	√	√

		Edgewater Beach	Villa Angela Beach	Euclid Beach	Euclid Creek
Day	**Date**	**East**	**East**	**East**	**RM 0.55**
Sunday	8/7/2022	√	√	√	√
Monday	8/8/2022	√	√	√	√
Tuesday	8/9/2022	√	√	√	√
Wednesday	8/10/2022	√	√	√	√
Thursday	8/11/2022	√	√	√	√
Friday	8/12/2022	√	√	√	√
Saturday	8/13/2022	√	√	√	√
Sunday	8/14/2022	√	√	√	√
Monday	8/15/2022	√	√	√	√
Tuesday	8/16/2022	√	√	√	√
Wednesday	8/17/2022	√	√	√	√
Thursday	8/18/2022	√	√	√	√
Friday	8/19/2022	√	√	√	√
Saturday	8/20/2022	√	√	√	√
Sunday	8/21/2022	√	√	√	√
Monday	8/22/2022	√	√	√	√
Tuesday	8/23/2022	√	√	√	√
Wednesday	8/24/2022	√	√	√	√
Thursday	8/25/2022	√	√	√	√
Friday	8/26/2022	√	√	√	√
Saturday	8/27/2022	√	√	√	√
Sunday	8/28/2022	√	√	√	√
Monday	8/29/2022	√	√	√	√
Tuesday	8/30/2022	√	√	√	√
Wednesday	8/31/2022	√	√	√	√
Thursday	9/1/2022	√	√	√	√
Friday	9/2/2022	√	√	√	√
Saturday	9/3/2022	√	√	√	√
Sunday	9/4/2022	√	√	√	√
Monday	9/5/2022	√	√	√	√
Tuesday	9/6/2022	√	√	√	√
Wednesday	9/7/2022	√	√	√	√
Thursday	9/8/2022	√	√	√	√
Friday	9/9/2022				
Saturday	9/10/2022				
Sunday	9/11/2022				
Monday	9/12/2022	√	√	√	√
Tuesday	9/13/2022	√	√	√	√
Wednesday	9/14/2022	√	√	√	√
Thursday	9/15/2022	√	√	√	√
Friday	9/16/2022				
Saturday	9/17/2022				
Sunday	9/18/2022				
Monday	9/19/2022	√	√	√	√
Tuesday	9/20/2022	√	√	√	√
Wednesday	9/21/2022	√	√	√	√
Thursday	9/22/2022	√	√	√	√
Friday	9/23/2022				
Saturday	9/24/2022				

Sunday	9/25/2022				
		Edgewater Beach	**Villa Angela Beach**	**Euclid Beach**	**Euclid Creek**
Day	**Date**	**East**	**East**	**East**	**RM 0.55**
Monday	9/26/2022	√	√	√	√
Tuesday	9/27/2022	√	√	√	√
Wednesday	9/28/2022	√	√	√	√
Thursday	9/29/2022	√	√	√	√
Friday	9/30/2022				

√= Bacteriological Sampling

Highlight= Duplicate

Appendix G. Training Form

Beach Training

Signature: _____ Project Manager: _____

	Yes	No	Initials	Date
Method Review				
1. Review “2022 Lake Erie Beach Monitoring” Level 3 Project Study Plan				
2. Review "Beach Sampling" SOP.				
3. Review two (2) Turbidity SOPs.				
4. Review District Cell Phone Policy.				
5. Review "Operation of the Hanna HI98129 Meter" SOP.				
6. Review “YSI 600XL Sonde” SOP.				
7. Review “NRS Compact Throw Bag Usage” SOP.				
8. Review “Vehicle and Mobile Radio Operation” SOP				
Safety Equipment Usage				
1. Life jacket or inflatable safety vest (must be worn if wave height is greater than two feet; all other conditions are at the discretion of the sampler)				
2. Chest waders				
3. Gloves, if desired				
4. Throw bag				
5. Cell phone				
6. Sampling pole for inclement weather sampling				
Equipment				
1. Can calibrate and use the Hanna HI98129 meter.				
2. Can use digital camera/iPad and upload images.				
3. Can scan beach observation sheets.				
4. Can upload field data.				
5. Can check and use turbidity meter.				
6. Can use wind anemometer.				
7. Uses wave height stick to measure wave height.				
Sampling				
1. Samples at correct beach sites and Euclid Creek RM 0.55.				
2. Uses appropriate sample bottles.				
3. Uses proper sampling techniques.				
4. Can fill out Beach Sampling Field Data Form.				
5. Uses cooler with ice.				
6. Truck locked when not occupied/visible.				
7. Can sign over samples and complete Chain of Custody.				
LabLynx Skills				
1. Can log in field parameters and approve.				

Revised 02/09/17 ESS

Appendix H. Audit Form

Beach Sampling Audit

Beach/Samplers Audited: _____ QDC Auditing:_____

Safety Equipment	Yes	No	Initials	Date
1. Life jacket or inflatable safety vest (must be worn if wave height is greater than two feet; all other conditions are at the discretion of the sampler)				
2. Chest waders				
3. Throw bag				
4. Cell phone				
5. Sampling pole for inclement weather sampling				
Sampling Equipment Checklist	**Yes**	**No**	**Initials**	**Date**
1. Field Observation Sheet(s) or iPad				
2. Sterile bacti bottles (enough for all sites being sampled)				
3. Sample tags				
4. Bottles for turbidity samples				
5. pH/Conductivity/Temp meter				
6. Wind anenometer				
7. Wave height stick				
8. Digital camera or iPad				
9. Cooler with ice				
Method Review	**Yes**	**No**	**Initials**	**Date**
1. Samplers obtained samples at appropriate sites.				
2. Sampled at appropriate depth of 3 feet using wave height stick to verify.				
3. Samplers exhibited proper sampling technique.				
a. Uses sterile bottles.				
b. Bottle inverted before it enters the water.				
c. Bottle is plunged 6-12 inches below the surface of the water.				
d. Bottle rotated with the opening facing the surface.				
e. Enough headspace left in bottle.				
f. Bottle capped securely.				
g. Second bottle collected for turbidity analysis.				
4. Can fill out Beach Observation Sheet or enter data into iPad correctly				
5. Uses cooler with ice.				
6. Truck locked when not occupied/visible.				
7. Uses buddy system.				
Equipment Skills	**Yes**	**No**	**Initials**	**Date**
1. Can calibrate and use the Hanna HI98129 meter.				
2. Can use digital camera or iPad and upload images to computer.				
3. Can scan beach observation sheets.				
4. Can check and use turbidity meter.				
5. Can use wind anemometer to measure wind speed.				
6. Can use wave height stick to measure wave height.				
LabLynx Skills	**Yes**	**No**	**Initials**	**Date**
1. Can enter field parameters and approve.				

Comments:

Appendix I. Laboratory Certifications

NEW HAMPSHIRE ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

29 Hazen Drive, PO Box 95, Concord, NH 03302 (603) 271-2998

PRIMARY ACCREDITATION ANALYTE LIST

ANALYTE LIST NUMBER: 223821-A

NORTHEAST OHIO REGIONAL SEWER DISTRICT ANALYTICAL SERVICES
4747 EAST 49TH STREET

CUYAHOGA HEIGHTS OH 44125
216-641-6000
Lab ID: 2238

Analyte Code	Analyte Name	Effective Date	Expiration Date	Matrix	Category	Accr. Type
Method Code: 20211443	**Method Ref: SM 9223 B (COLILERT® QUANTI-TRAY®)**		**Revision: 23RD ED**		**Date: 2016**	
2525	ESCHERICHIA COLI	03/23/2021	11/30/2022	D	MIC	NE
2500	TOTAL COLIFORMS	03/23/2021	11/30/2022	D	MIC	NE
Method Code: 20213449	**Method Ref: SM 9223 B (COLILERT®-18 QUANTI-TRAY®)**		**Revision: 23RD ED**		**Date: 2016**	
2525	ESCHERICHIA COLI	03/23/2021	11/30/2022	D	MIC	NE
2500	TOTAL COLIFORMS	03/23/2021	11/30/2022	D	MIC	NE
Method Code: 20214431	**Method Ref: SM 9223 B (COLILERT®-18)**		**Revision: 23RD ED**		**Date: 2016**	
2525	ESCHERICHIA COLI	03/23/2021	11/30/2022	D	MIC	NE
2500	TOTAL COLIFORMS	03/23/2021	11/30/2022	D	MIC	NE
Method Code: 20214442	**Method Ref: SM 9223 B (COLILERT®)**		**Revision: 23RD ED**		**Date: 2016**	
2525	ESCHERICHIA COLI	03/23/2021	11/30/2022	D	MIC	NE
2500	TOTAL COLIFORMS	03/23/2021	11/30/2022	D	MIC	NE
Method Code: 10013806	**Method Ref: EPA 200.7**		**Revision: 4.4**		**Date: 1994**	
1000	ALUMINUM	03/23/2021	11/30/2022	D	MET	NE
1015	BARIUM	03/23/2021	11/30/2022	D	MET	NE
1020	BERYLLIUM	03/23/2021	11/30/2022	D	MET	NE
1030	CADMIUM	03/23/2021	11/30/2022	D	MET	NE
1035	CALCIUM	03/23/2021	11/30/2022	D	MET	NE
1040	CHROMIUM	03/23/2021	11/30/2022	D	MET	NE
1055	COPPER	03/23/2021	11/30/2022	D	MET	NE
1070	IRON	03/23/2021	11/30/2022	D	MET	NE
1085	MAGNESIUM	03/23/2021	11/30/2022	D	MET	NE
1090	MANGANESE	03/23/2021	11/30/2022	D	MET	NE
1105	NICKEL	03/23/2021	11/30/2022	D	MET	NE
1150	SILVER	03/23/2021	11/30/2022	D	MET	NE
1155	SODIUM	03/23/2021	11/30/2022	D	MET	NE
1190	ZINC	03/23/2021	11/30/2022	D	MET	NE
Method Code: 10014605	**Method Ref: EPA 200.8**		**Revision: 5.4**		**Date: 1994**	
1000	ALUMINUM	03/23/2021	11/30/2022	D	MET	NE
1005	ANTIMONY	03/23/2021	11/30/2022	D	MET	NE
1010	ARSENIC	03/23/2021	11/30/2022	D	MET	NE
1015	BARIUM	03/23/2021	11/30/2022	D	MET	NE
1030	CADMIUM	03/23/2021	11/30/2022	D	MET	NE
1040	CHROMIUM	03/23/2021	11/30/2022	D	MET	NE
1075	LEAD	03/23/2021	11/30/2022	D	MET	NE

This analyte list supersedes all previously issued analyte lists. Method accreditation does not imply acceptance for NHDES compliance testing. Laboratory is required to use EPA-approved methods required by regulation. Continuing accreditation status is dependent on successful ongoing participation in the program. Customers may verify the laboratory's current accreditation status by calling (603) 271-2998 or by visiting the NH ELAP website (https://www.des.nh.gov/water/drinking-water/new-hampshire-environmental-laboratory-accreditation-program).

NORTHEAST OHIO REGIONAL SEWER DISTRICT ANALYTICAL SERVICES
4747 EAST 49TH STREET

CUYAHOGA HEIGHTS OH 44125
216-641-6000
Lab ID: 2238

1090	MANGANESE	03/23/2021	11/30/2022	D	MET	NE
1105	NICKEL	03/23/2021	11/30/2022	D	MET	NE
1140	SELENIUM	03/23/2021	11/30/2022	D	MET	NE
1150	SILVER	03/23/2021	11/30/2022	D	MET	NE
1165	THALLIUM	03/23/2021	11/30/2022	D	MET	NE
1190	ZINC	03/23/2021	11/30/2022	D	MET	NE
Method Code: 10036609	**Method Ref: EPA 245.1**		**Revision: 3**		**Date: 1994**	
1095	MERCURY	03/23/2021	11/30/2022	D	MET	NE
Method Code: 10011800	**Method Ref: EPA 180.1**		**Revision: 2.0**		**Date: 1993**	
2055	TURBIDITY	03/23/2021	11/30/2022	D	NMI	NE
Method Code: 10013806	**Method Ref: EPA 200.7**		**Revision: 4.4**		**Date: 1994**	
1755	TOTAL HARDNESS AS CACO3	03/29/2021	11/30/2022	D	NMI	NE
Method Code: 10053200	**Method Ref: EPA 300.0**		**Revision: 2.1**		**Date: 1993**	
1575	CHLORIDE	03/23/2021	11/30/2022	D	NMI	NE
1810	NITRATE AS N	03/23/2021	11/30/2022	D	NMI	NE
1840	NITRITE AS N	03/23/2021	11/30/2022	D	NMI	NE
1870	ORTHOPHOSPHATE AS P	03/23/2021	11/30/2022	D	NMI	NE
2000	SULFATE	03/23/2021	11/30/2022	D	NMI	NE
Method Code: 10067604	**Method Ref: EPA 353.2**		**Revision: 2**		**Date: 1993**	
1810	NITRATE AS N	03/23/2021	11/30/2022	D	NMI	NE
1820	NITRATE PLUS NITRITE AS N	03/23/2021	11/30/2022	D	NMI	NE
1840	NITRITE AS N	03/23/2021	11/30/2022	D	NMI	NE
Method Code: 10070005	**Method Ref: EPA 365.1**		**Revision: 2**		**Date: 1993**	
1870	ORTHOPHOSPHATE AS P	03/23/2021	11/30/2022	D	NMI	NE
Method Code: 20048617	**Method Ref: SM 2510 B-2011**		**Revision:**		**Date: 2011**	
1610	CONDUCTIVITY	03/23/2021	11/30/2022	D	NMI	NE
Method Code: 20050457	**Method Ref: SM 2540 C**		**Revision: 23RD ED**		**Date: 2015**	
1955	RESIDUE-FILTERABLE (TDS)	03/23/2021	11/30/2022	D	NMI	NE
Method Code: 20053127	**Method Ref: SM 2550 B**		**Revision: 22ND ED**		**Date: 2010**	
2030	TEMPERATURE, DEG. C	03/23/2021	11/30/2022	D	NMI	NE
Method Code: 20102414	**Method Ref: SM 4500-F C-2011**		**Revision:**		**Date: 2011**	
1730	FLUORIDE	03/23/2021	11/30/2022	D	NMI	NE
Method Code: 20105220	**Method Ref: SM 4500-H+ B-2011**		**Revision:**		**Date: 2011**	
1900	PH	03/23/2021	11/30/2022	D	NMI	NE
Method Code: 20211443	**Method Ref: SM 9223 B (COLILERT® QUANTI-TRAY®)**		**Revision: 23RD ED**		**Date: 2016**	
2525	ESCHERICHIA COLI	03/23/2021	11/30/2022	N	MIC	NE
2500	TOTAL COLIFORMS	03/23/2021	11/30/2022	N	MIC	NE

NEW HAMPSHIRE ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

29 Hazen Drive, PO Box 95, Concord, NH 03302 (603) 271-2998

PRIMARY ACCREDITATION ANALYTE LIST

ANALYTE LIST NUMBER: 223821-A

NORTHEAST OHIO REGIONAL SEWER DISTRICT ANALYTICAL SERVICES
4747 EAST 49TH STREET

CUYAHOGA HEIGHTS OH 44125
216-641-6000
Lab ID: 2238

Method Code: 20213449	**Method Ref: SM 9223 B (COLILERT®-18 QUANTI-TRAY®)**		**Revision: 23RD ED**		**Date: 2016**	
2525	ESCHERICHIA COLI	03/23/2021	11/30/2022	N	MIC	NE
2500	TOTAL COLIFORMS	03/16/2021	11/30/2022	N	MIC	NE
Method Code: 10013806	**Method Ref: EPA 200.7**		**Revision: 4.4**		**Date: 1994**	
1000	ALUMINUM	12/01/2019	11/30/2022	N	MET	NE
1005	ANTIMONY	12/01/2019	11/30/2022	N	MET	NE
1010	ARSENIC	12/01/2019	11/30/2022	N	MET	NE
1015	BARIUM	12/01/2019	11/30/2022	N	MET	NE
1020	BERYLLIUM	12/01/2019	11/30/2022	N	MET	NE
1030	CADMIUM	12/01/2019	11/30/2022	N	MET	NE
1035	CALCIUM	12/01/2019	11/30/2022	N	MET	NE
1040	CHROMIUM	12/01/2019	11/30/2022	N	MET	NE
1050	COBALT	12/01/2019	11/30/2022	N	MET	NE
1055	COPPER	12/01/2019	11/30/2022	N	MET	NE
1070	IRON	12/01/2019	11/30/2022	N	MET	NE
1075	LEAD	12/01/2019	11/30/2022	N	MET	NE
1085	MAGNESIUM	12/01/2019	11/30/2022	N	MET	NE
1090	MANGANESE	12/01/2019	11/30/2022	N	MET	NE
1100	MOLYBDENUM	12/01/2019	11/30/2022	N	MET	NE
1105	NICKEL	12/01/2019	11/30/2022	N	MET	NE
1125	POTASSIUM	12/01/2019	11/30/2022	N	MET	NE
1140	SELENIUM	12/01/2019	11/30/2022	N	MET	NE
1150	SILVER	12/01/2019	11/30/2022	N	MET	NE
1155	SODIUM	12/01/2019	11/30/2022	N	MET	NE
1160	STRONTIUM	12/01/2019	11/30/2022	N	MET	NE
1165	THALLIUM	12/01/2019	11/30/2022	N	MET	NE
1175	TIN	12/01/2019	11/30/2022	N	MET	NE
1180	TITANIUM	12/01/2019	11/30/2022	N	MET	NE
1185	VANADIUM	12/01/2019	11/30/2022	N	MET	NE
1190	ZINC	12/01/2019	11/30/2022	N	MET	NE
Method Code: 10014605	**Method Ref: EPA 200.8**		**Revision: 5.4**		**Date: 1994**	
1000	ALUMINUM	12/01/2019	11/30/2022	N	MET	NE
1005	ANTIMONY	12/01/2019	11/30/2022	N	MET	NE
1010	ARSENIC	12/01/2019	11/30/2022	N	MET	NE
1015	BARIUM	12/01/2019	11/30/2022	N	MET	NE
1020	BERYLLIUM	12/01/2019	11/30/2022	N	MET	NE
1030	CADMIUM	12/01/2019	11/30/2022	N	MET	NE

This analyte list supersedes all previously issued analyte lists. Method accreditation does not imply acceptance for NHDES compliance testing. Laboratory is required to use EPA-approved methods required by regulation. Continuing accreditation status is dependent on successful ongoing participation in the program. Customers may verify the laboratory's current accreditation status by calling (603) 271-2998 or by visiting the NH ELAP website (https://www.des.nh.gov/water/drinking-water/new-hampshire-environmental-laboratory-accreditation-program).

NORTHEAST OHIO REGIONAL SEWER DISTRICT ANALYTICAL SERVICES
4747 EAST 49TH STREET

CUYAHOGA HEIGHTS OH 44125
216-641-6000
Lab ID: 2238

1035	CALCIUM	12/01/2019	11/30/2022	N	MET	NE
1040	CHROMIUM	12/01/2019	11/30/2022	N	MET	NE
1050	COBALT	12/01/2019	11/30/2022	N	MET	NE
1055	COPPER	12/01/2019	11/30/2022	N	MET	NE
1070	IRON	12/01/2019	11/30/2022	N	MET	NE
1075	LEAD	12/01/2019	11/30/2022	N	MET	NE
1085	MAGNESIUM	12/01/2019	11/30/2022	N	MET	NE
1090	MANGANESE	12/01/2019	11/30/2022	N	MET	NE
1100	MOLYBDENUM	12/01/2019	11/30/2022	N	MET	NE
1105	NICKEL	12/01/2019	11/30/2022	N	MET	NE
1125	POTASSIUM	12/01/2019	11/30/2022	N	MET	NE
1140	SELENIUM	12/01/2019	11/30/2022	N	MET	NE
1150	SILVER	12/01/2019	11/30/2022	N	MET	NE
1155	SODIUM	12/01/2019	11/30/2022	N	MET	NE
1160	STRONTIUM	12/01/2019	11/30/2022	N	MET	NE
1165	THALLIUM	12/01/2019	11/30/2022	N	MET	NE
1175	TIN	12/01/2019	11/30/2022	N	MET	NE
1180	TITANIUM	12/01/2019	11/30/2022	N	MET	NE
1185	VANADIUM	12/01/2019	11/30/2022	N	MET	NE
1190	ZINC	12/01/2019	11/30/2022	N	MET	NE
Method Code: 10036609	**Method Ref: EPA 245.1**		**Revision: 3**		**Date: 1994**	
1095	MERCURY	12/01/2019	11/30/2022	N	MET	NE
Method Code: 10237204	**Method Ref: EPA 1631E**		**Revision:**		**Date: 2002**	
1095	MERCURY	12/01/2019	11/30/2022	N	MET	NE
Method Code: 20066266	**Method Ref: SM 3500-CR B-2011**		**Revision:**		**Date: 2011**	
1045	CHROMIUM VI	12/01/2019	11/30/2022	N	MET	NE
Method Code: 10011800	**Method Ref: EPA 180.1**		**Revision: 2.0**		**Date: 1993**	
2055	TURBIDITY	12/01/2019	11/30/2022	N	NMI	NE
Method Code: 10013806	**Method Ref: EPA 200.7**		**Revision: 4.4**		**Date: 1994**	
1755	TOTAL HARDNESS AS CACO3	03/29/2021	11/30/2022	N	NMI	NE
Method Code: 10014605	**Method Ref: EPA 200.8**		**Revision: 5.4**		**Date: 1994**	
1755	TOTAL HARDNESS AS CACO3	03/29/2021	11/30/2022	N	NMI	NE
Method Code: 10053200	**Method Ref: EPA 300.0**		**Revision: 2.1**		**Date: 1993**	
1540	BROMIDE	12/01/2019	11/30/2022	N	NMI	NE
1575	CHLORIDE	12/01/2019	11/30/2022	N	NMI	NE
1810	NITRATE AS N	12/01/2019	11/30/2022	N	NMI	NE
1840	NITRITE AS N	12/01/2019	11/30/2022	N	NMI	NE

NORTHEAST OHIO REGIONAL SEWER DISTRICT ANALYTICAL SERVICES
4747 EAST 49TH STREET

CUYAHOGA HEIGHTS OH 44125
216-641-6000
Lab ID: 2238

1870	ORTHOPHOSPHATE AS P	12/01/2019	11/30/2022	N	NMI	NE
2000	SULFATE	12/01/2019	11/30/2022	N	NMI	NE
Method Code: 10055206	**Method Ref: EPA 310.2**		**Revision:**		**Date: 1974**	
1505	ALKALINITY AS CACO3	12/01/2019	11/30/2022	N	NMI	NE
Method Code: 10063602	**Method Ref: EPA 350.1**		**Revision: 2**		**Date: 1993**	
1515	AMMONIA AS N	12/01/2019	11/30/2022	N	NMI	NE
Method Code: 10065404	**Method Ref: EPA 351.2**		**Revision: 2**		**Date: 1993**	
1795	TOTAL KJELDAHL NITROGEN (TKN)	12/01/2019	11/30/2022	N	NMI	NE
Method Code: 10067604	**Method Ref: EPA 353.2**		**Revision: 2**		**Date: 1993**	
1810	NITRATE AS N	12/01/2019	11/30/2022	N	NMI	NE
1820	NITRITE PLUS NITRITE AS N	03/09/2020	11/30/2022	N	NMI	NE
1840	NITRITE AS N	03/23/2021	11/30/2022	N	NMI	NE
Method Code: 10070005	**Method Ref: EPA 365.1**		**Revision: 2**		**Date: 1993**	
1870	ORTHOPHOSPHATE AS P	12/01/2019	11/30/2022	N	NMI	NE
1910	TOTAL PHOSPHORUS	12/01/2019	11/30/2022	N	NMI	NE
Method Code: 10077404	**Method Ref: EPA 410.4**		**Revision: 2**		**Date: 1993**	
1565	CHEMICAL OXYGEN DEMAND (COD)	12/01/2019	11/30/2022	N	NMI	NE
Method Code: 10079400	**Method Ref: EPA 420.1**		**Revision:**		**Date: 1978**	
1905	TOTAL PHENOLICS	12/01/2019	11/30/2022	N	NMI	NE
Method Code: 10081400	**Method Ref: EPA 445**		**Revision: 1.2**		**Date: 1997**	
9345	CHLOROPHYLLS	12/01/2019	11/30/2022	N	NMI	NE
Method Code: 10261617	**Method Ref: EPA 1664B**		**Revision:**		**Date: 2010**	
1803	N-HEXANE EXTRACTABLE MATERIAL (O&G)	12/01/2019	11/30/2022	N	NMI	NE
Method Code: 20048617	**Method Ref: SM 2510 B-2011**		**Revision:**		**Date: 2011**	
1610	CONDUCTIVITY	03/23/2021	11/30/2022	N	NMI	NE
Method Code: 20049438	**Method Ref: SM 2540 B-2015**		**Revision:**		**Date: 2015**	
1950	RESIDUE-TOTAL (TS)	08/22/2021	11/30/2022	N	NMI	NE
Method Code: 20050457	**Method Ref: SM 2540 C**		**Revision: 23RD ED**		**Date: 2015**	
1955	RESIDUE-FILTERABLE (TDS)	03/23/2021	11/30/2022	N	NMI	NE
Method Code: 20051223	**Method Ref: SM 2540 D-2015**		**Revision:**		**Date: 2015**	
1960	RESIDUE-NONFILTERABLE (TSS)	08/22/2021	11/30/2022	N	NMI	NE
Method Code: 20053127	**Method Ref: SM 2550 B**		**Revision: 22ND ED**		**Date: 2010**	
2030	TEMPERATURE, DEG. C	12/01/2019	11/30/2022	N	NMI	NE
Method Code: 20080426	**Method Ref: SM 4500-CL E-2011**		**Revision:**		**Date: 2011**	
1940	TOTAL RESIDUAL CHLORINE	12/01/2019	11/30/2022	N	NMI	NE
Method Code: 20085216	**Method Ref: SM 4500-CL C-2011**		**Revision:**		**Date: 2011**	
1575	CHLORIDE	12/01/2019	11/30/2022	N	NMI	NE
Method Code: 20097023	**Method Ref: SM 4500-CN$^-$ G**		**Revision: 23RD ED**		**Date: 2016**	
1510	AMENABLE CYANIDE	03/23/2021	11/30/2022	N	NMI	NE

NEW HAMPSHIRE ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

29 Hazen Drive, PO Box 95, Concord, NH 03302 (603) 271-2998

PRIMARY ACCREDITATION ANALYTE LIST

ANALYTE LIST NUMBER: 223821-A

NORTHEAST OHIO REGIONAL SEWER DISTRICT ANALYTICAL SERVICES
4747 EAST 49TH STREET

CUYAHOGA HEIGHTS OH 44125
216-641-6000
Lab ID: 2238

Method Code: 20105220	**Method Ref: SM 4500-H+ B-2011**		**Revision:**		**Date: 2011**	
1900	PH	12/01/2019	11/30/2022	N	NMI	NE
Method Code: 20135039	**Method Ref: SM 5210 B-2016**		**Revision:**		**Date: 2016**	
1530	BIOCHEMICAL OXYGEN DEMAND (BOD)	03/23/2021	11/30/2022	N	NMI	NE
1555	CARBONACEOUS BOD (CBOD)	03/23/2021	11/30/2022	N	NMI	NE
Method Code: 20137637	**Method Ref: SM 5310 B-2014**		**Revision: 23RD ED**		**Date: 2014**	
2040	TOTAL ORGANIC CARBON (TOC)	03/23/2021	11/30/2022	N	NMI	NE
Method Code: 20138630	**Method Ref: SM 5310 C-2014**		**Revision: 23RD ED**		**Date: 2014**	
2040	TOTAL ORGANIC CARBON (TOC)	03/23/2021	11/30/2022	N	NMI	NE
Method Code: 60007161	**Method Ref: LACHAT 10-204-00-1-X**		**Revision:**		**Date: 2005**	
1645	TOTAL CYANIDE	03/23/2021	11/30/2022	N	NMI	NE
Method Code: 60031450	**Method Ref: OIA 1677-09**		**Revision:**		**Date: 2010**	
1523	AVAILABLE CYANIDE	03/23/2021	11/30/2022	N	NMI	NE
Method Code: 10133207	**Method Ref: SW-846 3005A**		**Revision: UPDATE I**		**Date: 1992**	
1438	PRECONCENTRATION UNDER ACID	12/01/2019	11/30/2022	N	PRE	NE
Method Code: 10133605	**Method Ref: SW-846 3010A**		**Revision: UPDATE I**		**Date: 1992**	
1420	HOT PLATE ACID DIGESTION (HNO3 + HCL)	12/01/2019	11/30/2022	N	PRE	NE
Method Code: 10134006	**Method Ref: SW-846 3015A**		**Revision: UPDATE IV**		**Date: 2007**	
1430	MICROWAVE-ASSISTED ACID DIGESTION OF TCLP EXTRACTS	03/23/2021	11/30/2022	N	PRE	NH
Method Code: 10214207	**Method Ref: EPA 1000.0 - FATHEAD MINNOW, 7-DAY CHRONIC, DAILY**		**Revision:**		**Date: 2002**	
3470	IC25 (ON) GROWTH	12/01/2019	11/30/2022	N	TOX	NE
3475	NOEC (GROWTH)	12/01/2019	11/30/2022	N	TOX	NE
3465	NOEC (SURVIVAL)	12/01/2019	11/30/2022	N	TOX	NE
Method Code: 10253040	**Method Ref: EPA 1002.0 - CERIODAPHNIA DUBIA, 3-BROOD CHRONIC,**		**Revision:**		**Date: 2002**	
3480	IC25 REPRODUCTION	12/01/2019	11/30/2022	N	TOX	NE
3465	NOEC (SURVIVAL)	12/01/2019	11/30/2022	N	TOX	NE
3485	NOEC REPRODUCTION	12/01/2019	11/30/2022	N	TOX	NE
Method Code: 10013806	**Method Ref: EPA 200.7**		**Revision: 4.4**		**Date: 1994**	
1000	ALUMINUM	12/01/2019	11/30/2022	SC	MET	NE
1005	ANTIMONY	12/01/2019	11/30/2022	SC	MET	NE
1010	ARSENIC	12/01/2019	11/30/2022	SC	MET	NE
1015	BARIUM	12/01/2019	11/30/2022	SC	MET	NE
1020	BERYLLIUM	12/01/2019	11/30/2022	SC	MET	NE
1030	CADMIUM	12/01/2019	11/30/2022	SC	MET	NE
1035	CALCIUM	12/01/2019	11/30/2022	SC	MET	NE
1040	CHROMIUM	12/01/2019	11/30/2022	SC	MET	NE
1050	COBALT	12/01/2019	11/30/2022	SC	MET	NE

NORTHEAST OHIO REGIONAL SEWER DISTRICT ANALYTICAL SERVICES
4747 EAST 49TH STREET

CUYAHOGA HEIGHTS OH 44125
216-641-6000
Lab ID: 2238

1055	COPPER	12/01/2019	11/30/2022	SC	MET	NE
1070	IRON	12/01/2019	11/30/2022	SC	MET	NE
1075	LEAD	12/01/2019	11/30/2022	SC	MET	NE
1085	MAGNESIUM	12/01/2019	11/30/2022	SC	MET	NE
1090	MANGANESE	12/01/2019	11/30/2022	SC	MET	NE
1100	MOLYBDENUM	12/01/2019	11/30/2022	SC	MET	NE
1105	NICKEL	12/01/2019	11/30/2022	SC	MET	NE
1125	POTASSIUM	12/01/2019	11/30/2022	SC	MET	NE
1140	SELENIUM	12/01/2019	11/30/2022	SC	MET	NE
1150	SILVER	12/01/2019	11/30/2022	SC	MET	NE
1155	SODIUM	12/01/2019	11/30/2022	SC	MET	NE
1160	STRONTIUM	12/01/2019	11/30/2022	SC	MET	NE
1165	THALLIUM	12/01/2019	11/30/2022	SC	MET	NE
1175	TIN	12/01/2019	11/30/2022	SC	MET	NE
1180	TITANIUM	12/01/2019	11/30/2022	SC	MET	NE
1185	VANADIUM	12/01/2019	11/30/2022	SC	MET	NE
1190	ZINC	12/01/2019	11/30/2022	SC	MET	NE
Method Code: 10036609	**Method Ref: EPA 245.1**		**Revision: 3**		**Date: 1994**	
1095	MERCURY	12/01/2019	11/30/2022	SC	MET	NE
Method Code: 10063602	**Method Ref: EPA 350.1**		**Revision: 2**		**Date: 1993**	
1515	AMMONIA AS N	12/01/2019	11/30/2022	SC	NMI	NE
Method Code: 10065404	**Method Ref: EPA 351.2**		**Revision: 2**		**Date: 1993**	
1795	TOTAL KJELDAHL NITROGEN (TKN)	12/01/2019	11/30/2022	SC	NMI	NE
Method Code: 10070005	**Method Ref: EPA 365.1**		**Revision: 2**		**Date: 1993**	
1910	TOTAL PHOSPHORUS	12/01/2019	11/30/2022	SC	NMI	NE
Method Code: 10198455	**Method Ref: SW-846 9045D**		**Revision: UPDATE IIIB**		**Date: 2004**	
1900	PH	03/23/2021	11/30/2022	SC	NMI	NE
Method Code: 20005270	**Method Ref: SM 2540 G-2011**		**Revision:**		**Date: 2011**	
1947	RESIDUE - FIXED	12/01/2019	11/30/2022	SC	NMI	NE
1950	RESIDUE-TOTAL (TS)	12/01/2019	11/30/2022	SC	NMI	NE
1970	RESIDUE-VOLATILE	12/01/2019	11/30/2022	SC	NMI	NE
Method Code: 10136002	**Method Ref: SW-846 3051A**		**Revision: UPDATE IV**		**Date: 2007**	
1426	MICROWAVE DIGESTION OF SOLIDS	03/23/2021	11/30/2022	SC	PRE	NE

NEW HAMPSHIRE ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

29 Hazen Drive, PO Box 95, Concord, NH 03302 (603) 271-2998

PRIMARY ACCREDITATION ANALYTE LIST

ANALYTE LIST NUMBER: 223821-A

NORTHEAST OHIO REGIONAL SEWER DISTRICT ANALYTICAL SERVICES
4747 EAST 49TH STREET

CUYAHOGA HEIGHTS OH 44125
216-641-6000
Lab ID: 2238

NORTHEAST 11/30/2021

Bill Hall
NH ELAP Program Manager
Issue Date: 11/30/2021

Matrix Legend: AE=Air; BT=Tissue; D=Drinking Water; N=Non-Potable Water; SC=Solid and Chemical Materials

Category Legend: MIC=Microbiology; MET=Metals; NMI=Non-Metal Inorganics; PRE=Preparation; VOC=Volatile Organic Compounds; SBN=SVOC-BNA; SHE=SVOC-Herbicides; SNO=SVOC-NOS; SPC=SVOC-PCB; SPE=SVOC-Pesticides; RAD=Radiochemistry; WET=Wet, PFC=Perfluorinated compound

Accreditation Legend: NE=NELAP; NH=NH State Certification; CE=State Certification; IN=Interim (NELAP); WI=Withdrawn; AP=Applied; RE=Revoked; SU=Suspended

This analyte list supersedes all previously issued analyte lists. Method accreditation does not imply acceptance for NHDES compliance testing. Laboratory is required to use EPA-approved methods required by regulation. Continuing accreditation status is dependent on successful ongoing participation in the program. Customers may verify the laboratory's current accreditation status by calling (603) 271-2998 or by visiting the NH ELAP website (https://www.des.nh.gov/water/drinking-water/new-hampshire-environmental-laboratory-accreditation-program).

State of New Hampshire

Environmental Laboratory Accreditation Program

Awards

PRIMARY NH ELAP ACCREDITATION

to

NORTHEAST OHIO REGIONAL SEWER DISTRICT ANALYTICAL SERVICES

of

CUYAHOGA HEIGHTS, OH

For the matrix, method and analytes listed on the latest Analyte List in accordance with the provisions on the 2009 TNI Standards and Env-C 300.

Certificate Number: 223821

Effective Date: 12/1/2021

Expiration Date: 11/30/2022

Laboratory ID: 2238

NORTHEAS11/18/2021

Bill Hall
NH ELAP Program Manager

Method accreditation does not imply acceptance for NHDES compliance testing. Laboratory is required to use EPA-approved methods required by regulation. Continuing accreditation status is dependent on successful ongoing participation in the program. Customers may verify the laboratory's current accreditation status by calling (603) 271-2998 or by visiting the NH ELAP website (https://www.des.nh.gov/water/drinking-water/new-hampshire-environmental-laboratory-accreditation-program).