Northeast Ohio Regional
Sewer District
Protecting Your Health and Environment

March 16, 2007

Jeff Reynolds
50 West Town Street
Suite 700
Columbus, Ohio 43215

Dear Mr. Reynolds,

Enclosed you will find a copy of a Level 3 Project Study Plan titled"2007 Lake Erie Bacteriological Sampling of Edgewater, Euclid, and Villa Angela Beaches." If you have any questions regarding the content of this study plan, please do not hesitate to contact Mark Citriglia, Analytical Services Manager or myself. We can be reached by phone (216) 641-6000 or by email; citrigliam@neorsd.org or perciadoc@neorsd.org.

Sincerely,

Catherine Perciado
Wastewater Analyst II

Level 3 Project Study Plan

2007 Lake Erie Bacteriological Sampling of Edgewater, Euclid and Villa Angela Beaches

(1) Objective

The purpose of this study is to evaluate the impact of Northeast Ohio Regional Sewer District (NEORSD) facilities and other sources on water quality in Lake Erie at Edgewater, Euclid, and Villa Angela beaches and to support the NEORSD Combined Sewer System Operational Plan. Microorganisms from urban runoff, combined sewer overflows (CSOs), wildlife, bather shedding, and nonpoint sources are potentially a determinant of illness for individuals swimming in contaminated water. The U.S. Environmental Protection Agency has defined *Escherichia coli (E. coli)* as one of the best indicator organisms at freshwater bathing beaches because the presence of these bacteria indicates that pathogenic microorganisms may also be present. *E. coli* densities will be monitored at these three beaches during the recreation season. The data obtained from this sampling will be reported to the Ohio Department of Health (ODH) and may be used for public notification of water quality advisories. In addition to beach sampling, water samples will be collected from Euclid Creek to determine the impact on water quality at Villa Angela and Euclid Beaches. NEORSD will use the results of this study to determine water quality standards attainment in Lake Erie. Additionally, NEORSD will assist the United States Geological Survey in research and development of alternative methods for prediction of *E. coli* using models that quickly and accurately assess water quality at Edgewater and Villa Angela Beaches.

(2) Nonpoint/Point Sources

Edgewater Beach
Point Sources:
Publicly Owned Treatment Works, CSOs, storm sewers and area streams

Nonpoint Sources: urban runoff (specifically also runoff from Route 2), bathers, feces from birds, dogs and other wildlife

Euclid Beach and Villa Angela Beach
Point Sources:
Publicly Owned Treatment Works, CSOs, storm sewers and area streams

Nonpoint Sources: urban runoff, bathers, feces from birds, dogs and other wildlife

(3) Parameters Covered

All samples collected will be analyzed for *E. coli* densities. Field parameters to be measured during the study will include: pH, temperature (air and water), conductivity and turbidity. Dissolved oxygen may be analyzed as necessary, but will not be a routine analysis. In addition, overall beach observations will be assessed and recorded such as: number of swimmers and birds, wave direction, minimum/maximum height, and period, wind speed and direction, water clarity, weather/sky conditions.

(4) Field Collection and Data Assessment Techniques

Water samples will be collected from an east and west location at each of the three beaches. The samples will be collected at a depth of 3 feet at each location. At the time of collection, field parameters will be taken. Notes and observations pertaining to the beach and water conditions will be recorded using the attached sheet (Appendix B). All water samples and field parameters will be collected as specified in NEORSD SOP 3004 (Appendix C) and *Manual of Ohio EPA Surveillance Methods and Quality Assurance.*

E. coli results will be compared to the bathing water quality standard to determine when water quality criteria have been exceeded. The data obtained from the east sampling location from each beach will be reported to the ODH for a daily assessment of bathing water quality. The ODH will use this data to determine whether a beach advisory posting should occur. NEORSD will use the data from the east and west locations to determine possible trends in water quality. The USGS will use the data from the east and west locations to develop a predictive model for each beach.

Once a week, additional samples will be collected from the east and west sampling locations from each beach. These samples will be combined at the laboratory into a composite sample for each beach. The combined samples will be analyzed for *E. coli* and turbidity. The results obtained from composite and individual samples will be compared and analyzed statistically to determine if composite sampling provides a realistic representation of the water quality. The results from analysis of the composite samples will be used for research purposes only. NEORSD is not requesting at this time that they be considered Level 3 credible data by Ohio EPA.

Additional weekly sampling will be done at depths of 1 and 2 feet for both the east and west locations at Edgewater Beach. *E. coli* and turbidity analysis will be done for these samples and results will be compared to the 3 foot samples collected.

The purpose of this sampling is to determine possible variance associated with near shore and far shore sampling.

NEORSD has a defined Emergency Response Plan and will take additional samples at Edgewater Beach after a discharge has occurred from CSO 069 (3PA0002069), a storm water outlet for the Northwest Interceptor. The CSO location is near a highly utilized public recreation area; therefore, such sampling is necessary in the event of a CSO discharge. These samples will be taken 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. Further sampling locations may be added depending upon environmental conditions. An outline for actions and sampling during a discharge at CSO-069 is located in ERP 2.2.4 Edgewater Overflow.

(5) Sampling Locations

Two locations each will be sampled at Edgewater Beach and Euclid and Villa Angela Beaches in Cleveland for the duration of the study (Appendix D). One of the sampling locations will be on the east side of the beach, while the other will be on the west side. Additional samples will be taken from two (2) locations within Euclid Creek. The following table details the sampling locations.

Location	Latitude	Longitude	River Mile	Description	Quadrangle	Purpose
Edgewater Beach	N41.4893°	W81.7392°	NA	Eastern half of beach in line with the brick stack on the other side of the freeway.	Cleveland South	Impact determination of point and nonpoint sources, Public swimming safety awareness and determination of water quality standard attainment
Edgewater Beach	N41.4887°	W81.7404°	NA	Western half of beach in line with the large metal pole that is on the other side of the freeway.	Cleveland South	
Euclid Beach	N41.5843°	W81.5686°	NA	Eastern half of beach inline with the East side of the pile of stones on the beach.	East Cleveland	

Location	Latitude	Longitude	River Mile	Description	Quadrangle	Purpose
Euclid Beach	N41.5838°	W81.5694	NA	Western half of beach between the 2 break walls at the second set of stairs from the structure at Euclid Beach.	East Cleveland	
Euclid Creek	N41.5831°	W81.5594°	0.55	Downstream of Lakeshore Avenue	East Cleveland	
Euclid Creek	N41.5854°	W81.5641°	0.16	Downstream of Wildwood Bridge	East Cleveland	
Villa Angela Beach	N41.5851°	W81.5677°	NA	Eastern half of beach mid-distance between the 3rd and 4th break walls.	East Cleveland	
Villa Angela Beach	N41.5861°	W81.5667°	NA	Western half of beach at the beginning of the 2nd break wall.	East Cleveland	

(6) Schedule

Sampling will be performed Monday through Friday from approximately May 21, 2007, until September 14, 2007, for Edgewater and Villa Angela Beaches. Sampling may continue to occur through October at a reduced frequency. Euclid Beach sampling will start approximately May 21, 2007, and continue until August 31, 2007. Due to increased crowds during the week of July 4th, NEORSD will sample all three beaches during the weekend of July 4th and the July 4th holiday. All sampling will be dependent on weather conditions. Composite and near shore samples at depths of one (1) foot and two (2) foot will be taken once a week at Edgewater Beach.

A detailed sample schedule will be generated in April prior to the start of sampling and can be provided if requested.

(7) QA/QC

All field equipment and laboratory instrumentation utilized throughout the project will be calibrated, validated and maintained as defined within the standard operating procedures referenced below. Routine calibration or maintenance will be recorded in the appropriate logbook and equipment malfunction will be noted.

- SOP 6000-00, Appendix E: Hanna pH EC/TDS
- SOP 2007, Appendix F: Micro 100 Turbidimeter

NEORSD quality control procedures utilized for sampling and analysis procedures are outlined in the following SOPs:

- SOP 5001, Appendix G: Quality Manual
- SOP 3004, Appendix C: Beach Sampling
- SOP 2016, Appendix H: Bacteria Counting Methods
- SOP 2014, Appendix I: Analysis of *E. coli*

Controlled copies of all SOPs can be audited or reviewed on-site. Due to the fact that all SOP information is time sensitive and may be revised at any time, copies of SOPs given to third parties are uncontrolled documents. Copies of the SOPs submitted with this study plan are considered valid at the time of submission. Updated and revised copies can be obtained by contacting Carol Turner, Quality Assurance Officer for Analytical Services 216-641-6000 ext. 2502.

All *E. coli* Quality Control guidelines will be met based on the specific USEPA: *Microbiological Methods for Monitoring the Environment (EPA 600/8-78-017)*, NEORSD's Standard Operating Procedures (SOP #2016-Bacteria Counting and #2014 *E. Coli*, Appendices H & I), and standards outlined by the National Environmental Laboratory Accreditation Committee (NELAC) Chapter 5.0 "Quality Systems".

(8) Work Products

A summary report will be prepared and sent to ODH Monday through Friday before 3:00 pm. This report will contain the sampling results from the east location from each beach. A copy of this report is attached in Appendix J. A second internal report and the field observation sheets will be sent to personnel from NEORSD and the USGS Monday through Friday before 3:00 pm. This internal report will contain the data from all samples collected for the previous day. The *E. coli* data from each sampling event will be stored in an Excel spreadsheet. This spreadsheet will be used to track trends and water quality exceedances. Following the completion of the project, a summary report that includes all the data collected during the study will be prepared. This summary report, along with the field observation sheets, laboratory bench sheets and chain of custody information, will be sent to the ODH. Other reports summarizing, interpreting, graphically presenting, and discussing the data will also be prepared and used for internal discussions.

Pictures will be taken during each sampling event to document the conditions at the beach. These pictures will be stored electronically and posted on NEORSD's intranet site. Copies of the field observation sheets, daily reports, and pictures will be stored electronically. Additionally, field observations will also be entered into the Laboratory Information Management Systems (LIMS).

Results obtained from all locations will be compared to the composite results of those locations. The analysis reported will be utilized to show variability (if any) when comparing composite and non composite samples from each site. This report will be complied and distributed internally.

(9) Qualified Data Collectors

Except for the project manager, where necessary, the following Level 3 Qualified Data Collectors may provide assistance with this study:

Name	Address	Email Address	Phone Number
Kathryn Crestani (QDC number 011)	4747 E. 49th St., Cuyahoga Heights, OH 44125	crestanik@neorsd.org	216-641-6000
Seth Hothem (QDC number 010)	4747 E. 49th St., Cuyahoga Heights, OH 44125	hothems@neorsd.org	216-641-6000
Tiffany Moore (QDC number 017)	4747 E. 49th St., Cuyahoga Heights, OH 44125	mooret@neorsd.org	216-641-6000
Catherine Perciado* (QDC number 045)	4747 E. 49th St., Cuyahoga Heights OH 44125	perciadoc@neorsd.org	216-641-6000
John Rhoades (QDC number 008)	4747 E. 49th St., Cuyahoga Heights, OH 44125	rhoadesj@neorsd.org	216-641-6000
Ben Tedrick (QDC number 048)	4747 E. 49th St., Cuyahoga Heights, OH 44125	tedrickb@neorsd.org	216-641-6000
Tom Zablotny (QDC number 018)	4747 E. 49th St., Cuyahoga Heights, OH 44125	zablotnyt@neorsd.org	216-641-6000
Cathy Zamborsky (QDC number 009)	4747 E. 49th St., Cuyahoga Heights, OH 44125	zamborskyc@neorsd.org	216-641-6000

* Indicates lead project manager

The following is a list of persons not qualified as level 3 data collectors who may also be involved in the project. In addition to these individuals, 2007 summer interns will be hired to assist with completing the sampling. The names of those individuals will be added to the study plan once they become available. The lead project manager will conduct training with all of these individuals on the proper methods for conducting the sampling as detailed in the attached SOPs. The lead project manager will also be responsible for reviewing all reports and data analysis prepared by these individuals prior to completion.

Name	Address	Email Address	Phone Number
Joseph Broz	4747 E. 49th St., Cuyahoga Heights, OH 44125	brozj@neorsd.org	216-641-6000
Atemus Carter	4747 E. 49th St., Cuyahoga Heights, OH 44125	cartera@neorsd.org	216-641-6000
Eva Hatvani	4747 E. 49th St., Cuyahoga Heights, OH 44125	hatvanie@neorsd.org	216-641-6000
Ildiko Kubiak	4747 E. 49th St., Cuyahoga Heights, OH 44125	kubiaki@neorsd.org	216-641-6000
Francisco Rivera	4747 E. 49th St., Cuyahoga Heights, OH 44125	riveraf@neorsd.org	216-641-6000
Debbie Schordock	4747 E. 49th St., Cuyahoga Heights, OH 44125	schordockd@neorsd.org	216-641-6000
Gina Senes	4747 E. 49th St., Cuyahoga Heights, OH 44125	senesg@neorsd.org	216-641-6000

Name	Address	Email Address	Phone Number
Sandra Weeden	4747 E. 49th St., Cuyahoga Heights, OH 44125	weedens@neorsd.org	216-641-6000
Co-op-I	4747 E. 49th St., Cuyahoga Heights, OH 44125	N/A	216-641-6000
Co-op-II	4747 E. 49th St., Cuyahoga Heights, OH 44125	N/A	216-641-6000
Summer Assistant-I	4747 E. 49th St., Cuyahoga Heights, OH 44125	N/A	216-641-6000
Summer Assistant-II	4747 E. 49th St., Cuyahoga Heights, OH 44125	N/A	216-641-6000

The following individuals will be responsible for the compilation, approval and distribution of the data to the appropriate internal and external parties.

Name	Address	Email Address	Phone Number
Mark Citriglia	4747 E. 49th St., Cuyahoga Heights, OH 44125	citrigliam@neorsd.org	216-641-6000
Eva Hatvani	4747 E. 49th St., Cuyahoga Heights, OH 44125	hatvanie@neorsd.org	216-641-6000
Kristen Greenwood	4747 E. 49th St., Cuyahoga Heights, OH 44125	greenwoodk@neorsd.org	216-641-6000

Name	Address	Email Address	Phone Number
Laura Quinones	4747 E. 49th St., Cuyahoga Heights, OH 44125	quinonesl@neorsd.org	216-641-6000
Cheryl Soltis-Muth	4747 E. 49th St., Cuyahoga Heights OH 44125	soltismuthc@neorsd.org	216-641-6000
Carol Turner	4747 E. 49th St., Cuyahoga Heights, OH 44125	turnerc@neorsd.org	216-641-6000

(10) Documentation of approval of project manager and other personnel as level 3 qualified data collector

See attached (Appendix A).

(11) Contract laboratory contact information

Not applicable.

(12) Copy of ODNR collector's permit

Not applicable.

(13) 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).

Signature: Mark C Taylor Date: 3/21/07

(14) Voucher Specimen Statement

Not applicable.

(15) Trespassing Statement

I, Catherine Porcaro, 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.

Signature: Catherine Porcaro Date: 3/21/07

I, Seth Hothem, 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.

Signature: Seth Hothem Date: 3/21/07

I, Thomas Zablotny, 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.

Signature: Thomas Zablotny Date: 3-21-07

I, Kathryn Crostani, 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.

Signature: KC Date: 3/21/07

I, Tiffany Moore, 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.

Signature: Tiffany L. Moore Date: 3/21/07

I, Ben Tedrick, 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.

Signature: Ben Tedrick Date: 3/21/07

I, Catherine Zatkoorsky, 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.

Signature: Catherine Zatkoorsky Date: 3/21/07

I, JOHN W RHODES, 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.

Signature: _____ Date: 03/21/07

Appendix A

Appendix A.

State of Ohio Environmental Protection Agency

STREET ADDRESS:
Lazarus Government Center
122 S. Front Street
Columbus, Ohio 43215

TELE: (614) 644-3020 FAX: (614) 644-3184
www.epa.state.oh.us

MAILING ADDRESS:
P.O. Box 1049
Columbus, OH 43216-1049

OHIO E.P.A.
DEC - 7 2006
ENTERED DIRECTOR'S JOURNAL

CERTIFIED MAIL

Effective Date: December 7, 2006
Expiration Date: December 6, 2008

Catherine Perciado
Northeast Ohio Regional Sewer District
4818 West 19th Street
Cleveland, Ohio 44109

Re: Qualified Data Collector Approval, Surface Water Volunteer Monitoring Program

Dear Ms. Perciado:

The Division of Surface Water Volunteer Monitoring (Credible Data) Program has reviewed your Qualified Data Collector (QDC) application. Pursuant to Ohio Revised Code (ORC) 6111.53 and Ohio Administrative Code (OAC) 3745-4-03, you are approved as a QDC for the following level and specialty:

QDC Level: 3
QDC Specialty: Chemical Water Quality Assessment
QDC number: 045

Please use this QDC number on all correspondence, study plans, etc. submitted to Ohio EPA.

As noted at the top of this letter, this status is effective as of the date of this letter and expires two years from that date. You may now submit study plans to the Volunteer Monitoring Program.

A renewal application must be submitted in accordance with OAC 3745-4-03(C). As provided in this rule, renewal of status is contingent upon active participation in the Volunteer Monitoring Program at the designated level and specialty. Lack of such participation will prevent you from renewing your status, but you may re-apply for initial QDC status.

I certify this to be an accurate copy of the document filed in the records of the Ohio Environmental Protection Agency.

By: [signature] Date: 12-7-06

As a reminder, your status is contingent upon the absence of any trespassing violation (within the previous five years) by you or any person sampling under your supervision. Always obtain land owner permission prior to sampling.

Additionally, collection (and retention) of aquatic biological samples (this includes fish, macroinvertebrates, mollusks, and shells) requires a collector's permit from the Ohio Department of Natural Resources/Division of Wildlife. Obtain this permit prior to collection of any biological samples.

The approval of this certification is a final action of the director of Ohio EPA and may be appealed to the Environmental Review Appeals Commission pursuant to ORC 3745.04. The appeal must be in writing and set forth the action complained of and the grounds upon which the appeal is based. It must be filed with the Commission within thirty days after notice of the director's action. Notice of the filing of the appeal must be filed with the director within three days after the appeal is filed with the commission. An appeal may be filed with the Commission at the following address: 309 South Fourth Street, Room 222, Columbus, Ohio 43215.

Sincerely,

Joseph P. Koncelik
Director

Appendix B

Appendix B.

USGS
science for a changing world

Field Notes

To be filled out at time of collection:

Sampled by: _____ Date: ____/_____/_2006__ Time: East _____
West _____

Field measurements and observations:

	East	West
Water Temperature: *(nearest 0.1)*	_____ °C	_____ °C
Water pH *(nearest 0.1)*	_____	_____
Water Conductivity (umhos/cm)	_____	_____
Turbidity NTU *(nearest 0.1)*	_____	_____

Air Temperature: _____ °C

Number of Swimmers: _____

Number of Birds: *(manual count)*

Area 1 and 2 (E)_____

Area 3 and 4 (W)_____

Direction of waves (floating object):

_____

Wind Direction_____

Wind Speed max_____

ave_____

Wave Height (measuring stick): **(in inches)**

Maximum_____

Minimum _____

Wave Height: Circle one

0-2 ft, 1-3 ft, 2-4 ft, 3-5 ft, 4-6 ft

Wave Period: _____

(waves/30 sec) _____

(Measure wave period twice)

Sky conditions: clear partly cloudy overcast hazy foggy rain

Water clarity (circle category): **1.** clear **2.** high sediment or algae **3.** floating debris

Other observed (weather, shore conditions, and unusual sightings):

Picture Names

GPS East_____ Overall _____ VP West _____

GPS West_____ VP Central _____ VP East _____

Notes:

Appendix C

Appendix C.

Northeast Ohio Regional Sewer District

Protecting Your Health and Environment

Analytical Services
4747 East 49th. Street
Cuyahoga Hts., OH 44125

Title

Beach Sampling

SOP–3004-02

Effective Date: June 2, 2006

Approvals

Prepared By: Eva Hatvani Date: 08/31/2005

Revised By: Eva Hatvani Date: 05/31/2006

Reviewed By QA Specialist: Carol Turner Date: 06/02/2006

Approved By Manager: Mark Citriglia Date: 06/02/2006

Analytical Services
4747 East 49th. Street
Cuyahoga Hts., OH 44125

TABLE OF CONTENTS

1.0 Scope and Application

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

1.2. Beaches are sampled during the recreational season to monitor levels of bacteria in order to warn 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 rain events, overflows of sewage systems, warm-blooded animal waste and bird contamination. The presence of the bacteria only indicates that other pathogenic bacteria may be present.

1.4. Comparing *E.coli* concentrations to recreational water quality standards initiates possible beach advisories. The standards are based on the concentrations of coliform and *E. coli* bacteria. The EPA has determined that *E. coli* are of the best indicator organisms of water quality for freshwater bathing beaches.

1.5. 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 postings should be made.

2.0 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 to 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.

3.0 Definitions

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

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

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

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

3.5 Should - This action, activity or procedural step is suggested but not required.

4.0 Safety

4.1 Safety Equipment

11.1.1 Safety equipment is required while sampling

11.1.2 Life Jacket or inflatable Safety Vest

11.1.3 Chest Waders

11.1.4 Gloves

11.1.5 Ring buoy with a 50 foot of nylon rope

11.1.6 Cell phone

4.2 Sampling Safety Procedures

11.2.1 Sampling may not occur during a thunderstorm. During times of inclement weather, check with a supervisor or Manager of Analytical Services prior to sampling.

11.2.2 If inclement weather occurs while sampling seek safety and call a laboratory supervisor for instructions.

11.2.3 Samples will not be taken when wave heights are over 3.5 feet.

11.2.4 The sampler **MUST** put on the chest waders before entering the water.

11.2.5 An inflatable life vest is provided for the sampler and must be worn during sampling. The safety vest is for the protection of the sampler.

11.2.6 The sampler must wade out to 3-ft. deep water to collect samples. The chest waders are marked for a depth indicator. Do not wade out farther than recommended.

11.2.7 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.

11.2.8 Safety training will be given to all employees sampling.

4.3 Employee Safety

11.3.1 When working at locations off District property, all employees should be aware of their surroundings and situations that may be threatening to themselves or the general public. These situations should be reported to the proper authority immediately. The best safety practice is to avoid any situation or circumstances that will place your safety at risk.

11.3.2 When sampling at locations off District property, all employees should stay in contact with the base station via the mobile radio. Refer to SOP-3003 Vehicle and Mobile Radio Operation for the procedures.

11.3.3 A District Cell phone has been provided for additional safety. The phone should be charged and turned on while off District premises.

4.3.3.1 ***Life-Threatening Situations:***

- For all life threatening situations **DIAL 911.**
- If a cell phone is not available or in reach, radio security and state that there is an emergency and you need them to call 911. State your name, unit number and location. Stay by the radio for further instructions

4.3.3.2 ***Non-Life-Threatening Situations:***

- While sampling at the beach or other locations certain situation may occur where an employee may feel their safety or the safety of the public maybe compromised. When a situation like this occurs the employee should call the local authorities or appropriate emergency services.
    - Example Situations:
        - An employee witnesses a robbery or other illegal act.
        - An employee or citizen is being harassed or threatened.
- The employee should also immediately report the situation to their immediate supervisor and security at the nearest District Location.
- When returning to a District facility the appropriate paperwork must be completed.

11.3.4 A list of important emergency phone numbers for the area is provided.

Emergency Call Numbers

DIAL 911 to report an accident, fire, serious illness or crime that requires immediate attention. For all Non-Life-Threatening please call the appropriate department.

Local Services	Police Department	Fire Department
City of Cleveland	216-621-1234	216-664-6350
Cuyahoga Hts.	216-883-6800	216-641-6799
Middleburgh Hts.	440-243-1234	440-243-1212
Newburgh Hts.	216-641-5545	216-641-2128
Euclid	216-731-1234	216-731-1212
Garfield Hts.	216-475-1234	216-475-1212
Additional Emergency Numbers		
Poison Control Center	800-222-1222	
Cleveland Metroparks Rangers	440-333-4991	
Coast Guard	216-937-0141	
Hazmat	216-771-1368	
NEORSD Emergency Numbers		
EMSC Security Cell Phone	216-214-3893	
EMSC	216-641-6000	
Easterly	216-531-4892	
Easterly Security Cell Phone	216-299-2564	
Westerly	216-961-2187	
Westerly Security Cell Phone	216-299-2732	
Southerly	216-641-6000	
Southerly Security Cell Phone	216-299-2177	

5.0 Equipment and Supplies

5.1 Sample Bottles – Two (250 or 500 ml) Untreated Autoclave Bottles for each sample site.

5.2 Sample Tags

5.3 Beach Observation List

5.4 Field Meters Conductivity/pH/Temperature/Probe, Anemometer

5.5 Turbidity Meter – Analysis can be performed in the field or in the lab

5.6 Sample Pole, 12 ft./with pull ties and rubber bands

5.7 Cooler with Ice

5.8 Digital Camera.

5.9 GPS

5.10 Wave Height Stick

6.0 Calibration and Standardization

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

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

7.0 Procedure

7.1 General

11.1.1 Analyst must make sure all equipment and supplies are in good working condition prior to leaving EMSC.

11.1.2 All battery-operated equipment must be fully charged prior to leaving EMSC. Please make sure all equipment is charging the night before.

11.1.3 A District cell phone must be carried at all times and remain on while sampling.

11.1.4 Use proper radio procedures when operating any District vehicle, See SOP-3003, *Vehicle and Mobile Radio Operation* for complete procedures.

7.2 Directions to Beaches

11.2.1 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-77 N. to I-90 E.
- Take I-90 E. to Route 2 W.
- Take Route 2 to the Edgewater Park exit.
- Take the exit and follow the signs to the beach area.
- Take the entrance to the bike path on the left and follow it around to the edge of the beach.

11.2.2 Villa Angela Beach/Euclid 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-77 N. to I-90 E.

- Take I-90 E. to the Lakeshore exit
- Make a right onto Lakeshore Blvd.
- Follow Lakeshore Blvd. until you see the Euclid Beach entrance sign on the left side of the road.
- Take the entrance to the bike path.
- Go onto the bike path very slowly; Watch out for pedestrians.

7.3 Sampling Locations

11.3.1 Additional Sampling locations may be added as needed.
11.3.2 See attached site diagram for additional information.
11.3.3 **Edgewater Beach** – There are 5 buoys and 3 lifeguard stations at this beach. Count them from left to right.
7.3.3.1 **West Sample** – The West sample is taken in line with the large metal pole that is on the other side of the freeway. This pole is lined up perpendicular to the shoreline.
7.3.3.2 **GPS Location**:41° 29.320 N 81° 44.422 W
7.3.3.3 **East Sample** –The East sample is taken in line with the brick stack on the other side of the freeway.
7.3.3.4 **GPS Location**: 41° 29.357 N 81° 44.350 W
11.3.4 **Villa Angela Beach** – There are 4 stone break walls at this beach. Count them left to right.
7.3.4.1 **West Sample** – The West sample is taken at the beginning of the 2nd break wall.
7.3.4.2 **GPS Location**: 41° 35.108 N 81° 34.060 W
7.3.4.3 **East Sample** – The East sample is taken mid-distance between the 3rd and 4th break walls.
7.3.4.4 **GPS Locations**: 41° 35.166 N 81° 33.998 W
11.3.5 **Euclid Beach** – There are 2 stone break walls at this beach.
7.3.5.1 **West Sample** – The West sample is taken between the 2 breakwalls at the second set of stairs from the structure at Euclid Beach.
7.3.5.2 **GPS Location**: 41° 35.029 N 81° 34.162 W
7.3.5.3 **East Sample** –The East sample is taken inline with the East side of the pile of stones on the beach.
7.3.5.4 **GPS Location**: 41° 35.058 N 81° 34.118 W

7.4 Sampling Information

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

7.4.1.1 Pictures of the east, west, central and overall views of the beach are to be taken noting the picture number on the observation sheet. An additional picture of the waves should be taken.

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

- Signature
- Employee ID
- Start Time (time of sampling)
- Field Parameters (conductivity, turbidity, pH, temperature °C)

11.4.3 Field notes must be entered onto the sheets provided by the USGS at the sampling site. One sheet is used for each beach. The form must be filled out completely.

7.5 Sample Collection

11.5.1 Complete all information on the sample tags.

11.5.2 Locate the sampling location by the markers on the beach.

11.5.3 Take a GPS reading to verify the location, record the coordinates on the field observation sheet.

11.5.4 Wade out to a water depth of at least 3 feet. The distance from the shoreline will vary based on the depth of Lake Erie and wave height.

11.5.5 The sampler must remove the cap, invert the sample bottle and plunge the sample bottle beneath at least 12 inches below the surface of the water

11.5.6 The bottle should be rotated with the opening facing the surface to allow sample to completely fill the bottle.

11.5.7 The sample container should be capped and secured while the second sample is taken.

11.5.8 Repeat steps 7.5.5 through 7.5.7 for the second bottle.

7.6 Sample Collection Inclement Weather

11.6.1 Locate the sampling location by the markers on the beach.

11.6.2 Take a GPS reading to verify the location, record the coordinates on the field observation sheet.

11.6.3 A sampling pole must be used to obtain the sample when the wave height is over 3 feet.

11.6.4 Remove the cap and secure the sampling bottle to the pole with at least three rubber bands.

11.6.5 Wade out into the water to a safe depth, at least 1.5 feet. The distance from the shoreline will vary based on the depth of Lake Erie and wave height.

11.6.6 The sample pole should be extended to maximum length and the sample bottle is inverted and plunged below the surface of the water.
11.6.7 Cap and secure the sample and obtain a second sample for field analysis.
11.6.8 Return to the shoreline, tag the samples and place one the sample in the cooler for microbiological analysis.

7.7 Field Analysis

11.7.1 Field parameters must be measured on one of the two samples collected.
11.7.2 Use the second sample to measure pH, conductivity, temperature and turbidity.
7.7.2.1The other sample will be used for microbiological tests at the laboratory.
11.7.3 Once the field analyses have been performed place the sample container into the cooler.
11.7.4 Record the results from all field analyses.
11.7.5 The samples must remain in the cooler until delivered to the Sample Custodian at analytical services.
11.7.6 The field observations sheets are given to the supervisor of the microbiology area for review.

8.0 Data Handling and Review

11.1.1 The Supervisor will review all tags and beach logs for accuracy and neatness.
11.1.2 The Supervisor will periodically audit the sampling process.
11.1.3 Report any unusual circumstances to a supervisor.
11.1.4 The analyst must enter the field measurements in the Lablynx application with the use of a laptop computer.
11.1.5 The turbidity analysis must be completed within 1 hour of returning to EMSC. *See SOP 2007-00.*

9.0 References

9.1 *OEPA National Beach Guidance and Performance Criteria for Recreational Waters* (EPA-823-B-02-004) July 2002, Chapter 4-Beach Monitoring and Assessment.
9.2 Website:http://www.oepa.gov/waterscience/beaches/grants/index.html.

10.0 Revision History

10.1 Section 1.4 deleted fecal coliform as a beach standard (E. Hatvani, 5/5/06)

10.2 Section 4.3.2 added reference to SOP-3003 (E.Hatvani 5/5/06)
10.3 Section 5.0 added equipment:
11.3.1 Section 5.4 added Anemometer, E. Hatvani 5/5/06).
11.3.2 Section 5.10 added Wave Height Stick, E. Hatvani 5/5/06).
10.4 Section 7.2.2
10.5 Section 7.7.2 added information on analysis, E. Hatvani 5/5/06).

11.0 Additional Information

11.1 Composite Sampling Done as Requested

11.1.1 When composite samples are done, an additional 500 ml sample must be taken from each sight for a composite sample. Label the Sample "Composite-Beach-Site" Composite-the East and West locations for each beach.
11.1.2 The samples will be combined at the laboratory.
11.1.3 Do not take additional field parameters on this sample.

11.2 Euclid Creek Sampling

11.2.1 A sample will be taken from two locations on Euclid creek. The locations are at the 0.5 location and 30 foot north of the foot bridge.

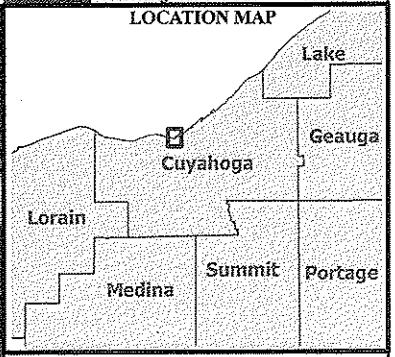
Appendix D

Northeast Ohio Regional Sewer District

Edgewater Beach Sample Sites

Northeast Ohio Regional Sewer District
Protecting Your Health and Environment

LOCATION MAP



Legend

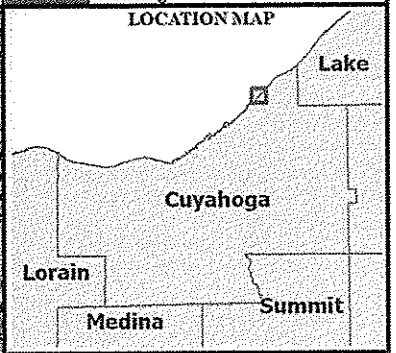
- SampleSites
- Community

320 Feet

Date: 1/10/2006
Creator: M. Day
Purpose: Exhibit
Project: Beach Sampling
File Location:G:\GIS_Documentation\Map Requests\Beach Sampling Sites\EdgewaterBeachSampling.mxd

Northeast Ohio Regional Sewer District

Villa Angela Beach Sample Sites



Legend

- Sample Location
- Community

400 Feet

Date: 1/10/2006
Creator: M. Day
Purpose: Exhibit
Project: Beach Sampling
File Location: G:\GIS_Documentation\Map Requests\Beach Sampling Sites\

Appendix E

Appendix E.

Northeast Ohio Regional Sewer District

Protecting Your Health and Environment

Analytical Services
4747 East 49th. Street
Cuyahoga Hts., OH 44125

Title

Operation of the Hanna pH EC/TDS Meter

SOP–6000-00

Effective Date: 06/20/2005

Approvals

Prepared By: Carol Turner Date: 06/20/2005

Reviewed By QA Specialist: Mark Citriglia Date: 06/20/2005

Approved By Manager: Mark Citriglia Date: 06/20/2005

Analytical Services
4747 East 49th. Street
Cuyahoga Hts., OH 44125

Table of Contents

1.0 Scope and Application

1.1. This SOP describes the procedure for operation of the portable Hanna pH Meter

2.0 Definitions

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

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

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

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

1.6. Should - This action, activity or procedural step is suggested but not required.

3.0 Safety

3.1 Proper protective equipment is to be worn at all times.

- 3.1.1 Apron or Lab coat
- 3.1.2 Rubber Gloves
- 3.1.3 Safety Glasses

3.2 Follow the approved chemical hygiene plan.

4.0 Equipment and Supplies

4.1 pH Meter (Model # HI98129)

4.2 pH Probe (Cat# HI73127)

5.0 Reagents and Standards

5.1 1431 us/Cm Calibration Solution (Cat# HI70031p)

5.2 Electrode Cleaning Solution (Cat# HI7061M)

5.3 Buffers, pH 4.00, pH 7.00, and pH 10.00

5.4 0.01 M Potassium Chloride Solution

- 5.4.1 Dissolve 0.745 g of potassium chloride (KCl) in appoximately 800 mL of deionized water. Dilute to 1 liter with deionized water.

5.4.2 0.005 M Potassium Chloride Solution

5.4.3 Dissolve 0.372 g of potassium chloride (KCl) in appoximately 800 mL of deionized water. Dilute to 1 liter with deionized water.

6.0 Sample Collection, Preservation, Storage, and Shipment

6.1 Analyses must be done immediately.

7.0 Quality Control

7.1 Calibration for pH must be confirmed with one buffer solution at pH 6.0 or 9.0. The result must be $\pm$ 0.1units of the accepted value.

7.2 Calibration for conductivity must be confirmed with a 0.005M KCl conductivity standard. The conductivity result of this standard must be within $\pm$ 5% of the accepted value.

7.3 Replace batteries when the level drops less than 50 percent.

8.0 Calibration and Standardization

8.1 Calibration for EC/TDS Conductivity

8.1.1 Turn on the meter by pressing the **MODE** button firmly.

8.1.2 Use the **SET/HOLD** button to indicate the parameter for calibration. Conductivity is indicated by the "us" symbol at the top of the display of the instrument.

8.1.3 Press and hold the **MODE** button until the word **"CAL"** is displayed.

8.1.4 Place the meter into the conductivity standard, 0.01M KCL.

8.1.4.1 The meter should read approximately 1413 us/cm.

8.1.5 Once the meter is stable it will display the word **"OK"** and return to the normal operating screen.

8.1.6 The word **"CAL"** will be displayed on the screen to indicate that the meter is calibrated.

8.1.7 Rinse the probe with DI water.

8.2 Calibration for pH

8.2.1 Turn on the meter by pressing the **MODE** button firmly.

8.2.2 Use the **SET/HOLD** button to indicate the parameter for calibration. The pH mode is indicated by the **"pH"** symbol at the top of the display of the instrument.

8.2.3 Press and hold the **MODE** button until the word **"CAL"** is displayed.

8.2.4 Place the meter in a pH 7.00 buffer solution. Once the meter has stabilized the display will read **"4.01 USE".**

8.2.5 Rinse the meter and place in the second buffer. Use either buffer pH 4.00 or pH 10.00 (depending on the expected measurements). The meter will automatically recognize the solution.

8.2.6 Once the meter has stabilized it will display the word **"OK"** and return to the normal operating mode.

8.2.7 The word **"CAL"** will be displayed on the screen to indicate that the meter is calibrated.

8.2.8 Rinse the pH probe with DI water.

8.2.9 Place a small amount of pH 7.00 buffer solution in the reservoir and store the meter for field work.

9.0 Procedure

9.1 General Instructions

9.1.1 To turn on the meter and check battery status, press the **MODE** button firmly for 2-3 seconds.

9.1.2 To turn off the meter press the **MODE** button and **"OFF"** will appear on the lower part of the display screen.

9.1.3 Press the **SET/HOLD** button to toggle between pH, conductivity, and TDS measurements. The top right corner of the display will show the units of the analysis mode.

9.1.3.1 **"pH"** for pH mode

9.1.3.2 **"us"** for Conductivity mode

9.1.3.3 **"PPM"** for TDS mode

9.1.4 To freeze the display press the **SET/HOLD** button for 2-3 seconds.

9.1.5 The word **"CAL"** will be displayed in the lower left corner if the meter has been calibrated for the parameter.

9.1.6 If the word **"CAL"** is not displayed, the meter must be calibrated. Refer to section 8.0 Calibration and Standardization to calibrate the meter.

9.1.7 The field meter must be calibrated daily. Refer to section 8.0 Calibration and Standardization to calibrate the meter.

9.1.8 After calibration validate the pH using a pH buffer of 6.0 or 9.0, depending on the sample range.

9.1.9 After calibration of the conductance probe, validate the with a 0.005 M KCL solution.

9.1.10 Record calibration information in the appropriate analytical logbook.

9.2 Taking Measurements

9.2.1 Turn on the meter and select the parameter to be measured (pH, TDS, or conductivity) by pressing the **MODE** button.

9.2.2 Immerse the probe into the sample. A picture of a clock will be displayed in the upper left corner indicating that the meter is waiting for a stable reading.

9.2.3 Once the clock icon disappears press the **SET/HOLD** button to freeze the display and record the reading in the appropriate logbook. The word **"HOLD"** will appear on the display.

9.2.4 Press the **SET/HOLD** button again to return to normal operation.

10.0 References

10.1 Hanna pH EC/TDS Meter Manual

11.0 Revision History

11.1 No Revisions

Appendix F

Appendix F.

Northeast Ohio Regional Sewer District

Protecting Your Health and Environment

Analytical Services
4747 East 49th. Street
Cuyahoga Hts., OH 44125

Title

Turbidity By Nephelometry, EPA 180.1
SOP–2007-00

Effective Date: 03/16/2007

Approvals

Prepared By: Ben Tedrick Date: 03/14/2007

Approved By Supervisor: Kristen Greenwood Date: 03/14/2007

Reviewed By QA Specialist: Carol Turner Date: 03/15/2007

Approved By Manager: Mark Citriglia Date: 03/14/2007

Analytical Services
4747 East 49th. Street
Cuyahoga Hts., OH 44125

Table of Contents

Analytical Services
4747 East 49th. Street
Cuyahoga Hts., OH 44125

1.0 Scope and Application

1.1. This procedure describes the method for the determination of turbidity caused by suspended colloidal matter such as clay, silt, organic matter, inorganic matter, plankton, and other microscopic organisms.

1.2. This procedure is applicable for drinking water, surface water, saline water, domestic and industrial wastes.

1.3. This procedure is applicable to samples having a directly measurable turbidity within the 0 – 1,000 NTU range.

2.0 Summary of Method

2.1 This method is based on a comparison of the intensity of light scattered by the sample with the intensity of light scattered by a standard reference.

2.2 A Formazin polymer is used as a primary turbidity reference standard.

3.0 Definitions

3.1 Method Blank – A sample containing no detectable analyte processed simultaneously with and under the same conditions as samples through all of the steps of the analytical procedure.

3.2 Continuing Calibration Verification (CCV) – A sample containing no detectable analyte to which a known concentration of a standard from a source other than the standard used to prepare the calibration curve standards has been added. If a separate source is not available, a different lot number of the same source is acceptable.

3.3 Initial Calibration Verification (ICV) – A calibration standard prepared from a source different than that of the standard used to prepare the calibration curve. The concentration of the ICV must be within the linear range of the instrument. The ICV is analyzed to verify the accuracy of the calibration curve.

3.4 Practical Quantitation Limit (PQL) – The lowest level of analyte that can be reliably determined within specified limits of precision and accuracy.

3.5 Method Detection Limit (MDL) - The minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.

3.6 Batch – A group of no more than 20 (twenty) samples analyzed at the same time under the same conditions.

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

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

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

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

3.11 Should - This action, activity or procedural step is suggested but not required.

4.0 Interferences

4.1 The presence of floating debris and rapidly settling coarse sediments will give low results.

4.2 Finely divided air bubbles will give a positive interference.

4.3 The presence of true color may absorb light and diminish light scattering and give low results.

4.4 Particles with light absorbing materials can have a negative effect in samples with high turbidity and a positive effect in samples with low turbidity.

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 (MSDS) shall be available to all personnel involved in the chemical analysis. All laboratory personnel performing this analysis must be familiar with the MSDS for all materials used in this procedure. Proper protective equipment is to be worn at all times.

5.1.1 Apron or Lab coat

5.1.2 Rubber Gloves, (Ex. Nitrile, Latex or other appropriate type)

5.1.3 Safety Glasses

5.1.4 Closed Toed Shoes

5.2 Follow the approved chemical hygiene plan.

6.0 Equipment and Supplies

6.1 Turbidimeter, Micro 100, or equivalent (e.g. AQ4500).

6.2 Various size disposable pipettes.

6.3 Volumetric flask, 100 mL, 1,000 mL.

6.4 Lint-Free Lab cloth or paper towel.

6.5 Sample tubes, glass or plastic

6.5.1 Keep sample tubes scrupulously clean, both, inside and out.

6.5.2 Discard tubes that are scratched or broken (silicone oil may be used to fill in small scratches).

6.5.3 Always use the same size cell.

6.5.4 Silicone Oil

7.0 Reagents and Standards

7.1 Deionized water – turbidity free

7.2 Formazin Polymer Stock Standard commercially purchased 1,000 NTU and 50 NTU.

7.3 Primary standards for calibration:
7.3.1. For Micro 100 Turbidimeter: 0.02 NTU, 10.0 NTU, and 1,000 NTU.
7.3.2. For Thermo: 1.0 NTU, 10.0 NTU, 100 NTU, and 1,000 NTU.

7.4 20 NTU Standard prepared from the stock standard weekly.

7.5 100 NTU Standard prepared from the stock standard weekly.

7.6 Two unknown standards analyzed once every two weeks (May through October only).

8.0 Sample Collection, Preservation, Storage, and Shipment

8.1 Analysis must be performed as soon as possible after sampling to prevent temperature changes and particle flocculation and sedimentation.

8.2 Samples must be kept at 4°C.

8.3 No chemical preservative is added to the samples.

8.4 The holding time for this analysis is 48 hours from collection.

8.5 Sample bottles must be glass or plastic and thoroughly cleaned and rinsed with turbidity free water.

9.0 Quality Control

9.1 A blank (CCB) and two CCVs (20 NTU and 100 NTU) must be analyzed at the beginning of each day of analysis.

9.2 A blank (CCB) and two CCVs (20 NTU and 100 NTU) must be analyzed after every ten samples.

9.3 A blank (CCB) and two CCVs (20 NTU and 100 NTU) must be analyzed after the last sample in an analytical batch.

9.4 Duplicate analyses of at least one sample in each batch.

9.5 During the recreational season (usually May through October) PE samples will be analyzed every other week.

9.6 A demonstration of capability must be done by the analyst performing the analysis.

10.0 Calibration and Standardization

10.1 Perform a calibration using a blank to zero the instrument in the first step and at least three additional standards.

10.2 Follow the Turbidimeter operating instructions for the procedure for sample measurement and calibration.

10.3 For **Micro 100 Turbidimeter calibration** use three turbidity standards 0.02 NTU, 10.0 NTU, and 1,000 NTU from HF Scientific Standardization kit.

10.3.1 Press **Cal** key. Once this key is pushed the **"Ident"** block and **"Cal"** block will illuminate the display.

10.3.2 The turbidity value in the lower row of the display should read 1,000 NTU. This is the first standard that must be used in calibration.

10.3.3 Insert the **1,000 NTU** calibration standard into the sample well by aligning the notch and the indexing pin and wait for the reading to stabilize.

10.3.4 Press the enter key. Instrument will calibrate on the 1,000 NTU level and the upper row of the display should read 1,000 NTU. The lower row of the display now shows that the 10.0 NTU calibration standard is next to be placed in the sample well.

10.3.5 Place the **10.0 NTU** calibration standard into the sample well by aligning the notch and the indexing pin and wait for reading to stabilize.

10.3.6 Press the enter key. Instrument will calibrate on the 10 NTU level and the upper row of the display should read 10 NTU. The lower row of the display now shows that the 0.02 NTU calibration standard is next to be placed in the sample well.

10.3.7 Place the **0.02 NTU** calibration standard into the sample well by aligning the notch and the indexing pin and wait for reading to stabilize.

10.3.8 Press the enter key. Instrument will calibrate on the 0.02 NTU level. The instrument automatically exits out of the calibration mode and then returns to the normal automatic mode.

10.3.9 Instruments display will read 0.02 NTU, since this is a turbidity level of the standard that is still in the sample well. At this point, instrument is calibrated so that it measures accurately across the full range of the instrument.

10.3.10 Instrument is ready and can be used normally for regular samples.

10.3.11 **Note:** The MICRO 100 must be recalibrated after the lamp replacement.

10.4 For **Thermo Orion Turbidimeter AQUAfast field kit model AQ4500 calibration** use primary standards 1 NTU, 10 NTU, 100 NTU, and 1,000 NTU from AQ4500 calibration kit. Perform an initial calibration with primary standards every six months, or whenever a calibration check standard exceeds +/- 10% of the expected value.

10.4.1 Select the measurement mode, EPA 180.

10.4.2 Press **Cal** key. "H2O INSERT" will be displayed.

10.4.3 Insert vial containing pure water and press **Yes** key.

10.4.4 "H2O WAIT" will be displayed. Then 1.00 yes?

10.4.5 If standard is 1.00, insert standard vial and press **YES** key.

10.4.6 If standard is another value, press **UP(6)** or **DOWN(3)** key. "CHANGE" will be displayed. Press **Yes** key. "STD VAL?" will be displayed. Enter value of the standard using numeric keypad. Press **Yes** key to accept.

10.4.7 Repeat step 10.4.6. for each standard.

10.4.8 When the calibration is complete AQ4500 will proceed to the measure mode.

10.4.9 After performing the initial calibration with the primary calibration standards, perform an instrument performance check by taking measurements of the secondaru sealed standards and the blank (turbidity-free water).

10.5 Confirm any calibration with CCB (turbidity free water) and the initial CCV; 10.0 NTU for low level range and with 100 NTU standard for high level range. CCVs standards shall be from a source independent of the standards used for the calibration purposes.

10.6 CCB must read less than 0.1 NTU.

10.7 The initial CCVs must recover within ±10% of the certified value for the calibration to be acceptable.
10.8 Perform a calibration daily unless the CCVs do not recover within 10%.
10.9 Recalibrate if a CCB reads greater than 0.1 NTU and/or CCV does not recover within 10%.

11.0 Procedure

11.1 Apply a drop of the silicone oil on the outside wall of the clean, dry cell and spread it around with a lint-free paper towel or a lint-free cloth.
11.2 Mix the sample thoroughly, but gently (to disperse any solids present). Wait until air bubbles disappear.
11.3 Pour or pipette the sample (about 2/3 full) into the cell and invert several times to purge. Dispose of the sample.
11.4 Pour or pipette approximately 20 mLs of the sample into the cell.
11.5 Cap the cell and gently invert.
11.6 Place the cell in the well of a turbidimeter .
11.7 Read the turbidity of the sample directly from the instrument display.
11.8 Record the reading. This is your **first** turbidity reading of the sample.
11.8.1 Results are recorded in the Turbidity Analysis Logbook (Form 3107 when using the Micro 100 in the laboratory and Form 3108 when using the AQ4500 in the the field).
11.9 Dispose the first sample from the cell.
11.10 In the same cell, transfer the second 20 mL portion.
11.11 Cap the cell and gently invert.
11.12 Read the turbidity of the sample.
11.13 Record the reading. This is your **second** turbidity reading of the sample.
11.14 Take measurements until two measurements meet the following criteria:
11.15.01 For values less than 10 NTU, the first and the second reading must be within 1 NTU.
11.15.02 For values greater than 10 NTU, the first and the second reading must be within 10 percent.

12.0 Calculations

12.1 The turbidity result is read directly from the instrument.
12.2 Diluted samples are corrected for the dilution used.
12.3 Results are to be reported as follows:

Range (NTU)	Report to nearest:
0.00 – 1.0	0.05
1.0 – 10	0.01
10 – 40	1

40 – 100	5
100 – 400	10
400 – 1,000	50
> 1,000	100

13.0 Method Performance

13.1 The instrument should be able to detect a turbidity difference of 0.02 NTU or less in samples having a turbidity of less than 1 NTU. Detection limit: 0.02 NTU.

13.2 The applicable range is 0-1,000 NTU.

14.0 Data Assessment and Acceptance Criteria for Quality Control Measures

14.1 Blank

14.1.1 If the blank result is less than the PQL, results can be reported.

14.1.2 If the blank exceeds the PQL, results can be reported for samples that are 10 times the PQL or higher.

14.1.3 If the blank exceeds the PQL, results can be reported for samples that are below the PQL.

14.1.4 If the blank exceeds the PQL, repeat the blank and if the blank is now less than the PQL results may be reported for all remaining samples.

14.1.5 If the second blank exceeds the PQL, corrective action is to be initiated and the analysis repeated for samples that have results not addressed above.

14.2 CCV

14.2.1 If the CCV recovery is 90-110% of the true values, results can be reported.

14.2.2 If the CCV is greater than 110%, samples with results less than the PQL can be reported.

14.2.3 Reanalyze the CCV. If the second recovery is 90-110%, the remaining results may be reported.

14.2.4 If the second CCV recovery is not 90-110%, corrective action is to be initiated and sample with reportable levels must be reanalyzed.

14.3 Relative Percent Difference (RPD) of Duplicate Analyses

14.3.1 If the RPD is 30% or less results can be reported.

14.3.2 If the RPD exceeds 30% report the results for the sample analyzed in duplicate as estimated values due to matrix interferences.

14.4 PE Samples

14.4.1 Performance evaluation sample results must recover within the specified limits stated on the Certification Statement received with the performance evaluation standard.

15.0 Method Specific Corrective Actions

15.1 If the blank does not meet requirements, the glassware may be contaminated and need cleaning.

15.2 If the CCV does not meet requirements, it may need to be replaced or recalibration may be needed.

15.3 If the RPD requirements for duplicate analyses are not met, it is an indication of processing difficulties.

15.4 If the PE sample does not recover within specified limits, run the analysis again along with another PE sample.

16.0 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 need to be minimized in order to protect the air, water and land.

17.2 All laboratory supplies must be disposed of properly.

17.2.1 Spent sample disposal is handled by dumping remaining sample down the drain containing the disposal with copious amounts of water. The sample container is then rinsed.

17.2.2 Expired buffer solutions can be poured down the drain with copious amounts of water.

17.2.3 Glass items require special care. Broken vials, cylinders and beakers are placed into the sharps bucket located in the area.

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

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

17.0 Analyst Responsibilities

17.1 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.

17.2 This procedure is restricted to use by, or under the supervision of, analysts experienced in the analysis of samples using this method. It is the responsibility of the analyst to read and understand this SOP, adhere to the procedures outlined, perform the initial demonstration of capability, and to properly document their 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.

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

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

17.5 All analysts are responsible for reviewing data before it is submitted for approval.

18.0 References

18.1 *Methods of Chemical Analysis of Water and Wastes, EPA 600/4-79-020.*

18.2 *Standard Methods for the Examination of Water and Wastewater, 20th Edition,* Method 2130 B.

18.3 Anderson, C.W., 2004, Turbidity, (version 2): U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A6, section 6.7, accessed September 24, 2004.

18.4 Micro 100 Turbidimeter Operator's Manual, HF Scientific, Rev. 1.9, 2001.

19.0 Revision History

19.1 No Revisions. New SOP.

Appendix G