OHIO EPA - DSW
2010 APR 19 AM 9: 30

Level 3 Project Study Plan

2010 Doan Brook Environmental Monitoring

(1) Objectives

The objective of this study is to conduct benthic macroinvertebrate and water quality sampling on Doan Brook upstream of Northeast Ohio Regional Sewer District (NEORSD)-owned combined sewer overflow (CSO) areas. The resulting upstream data will be compared with the benthic macroinvertebrate data obtained from these streams, downstream of the NEORSD CSO areas on Doan Brook, to determine the extent to which downstream macroinvertebrate communities may be impacted by CSOs or other environmental factors. The downstream sampling is required by the Ohio Environmental Protection Agency (Ohio EPA) National Pollution Discharge Elimination System (NPDES) Permit No. 3PA00002*FD (1997). This sampling will be conducted by the NEORSD's Environmental Assessment group in the Water Quality and Industrial Surveillance department (WQIS) and will occur from June 15 through September 30, 2010, as required in the OEPA *Biological Criteria for the Protection of Aquatic Life Volume III* (1987b)[1].

Sample sites for this study are located on Doan Brook at river miles (RM) 0.75 (downstream site), 6.70 and 1.40 (upstream sites). The monitoring at RMs 6.70 and 1.40 will be conducted only if the NEORSD Stormwater Program is *not* implemented. Monitoring at RM 0.75 will be conducted regardless, because it is required by NPDES Permit No. 3PA00002*FD.

Quantitative and qualitative benthic macroinvertebrate sampling will be conducted at each sample site. The benthic macroinvertebrate results will be compiled and used to calculate an Invertebrate Community Index (ICI) score for each site. Species assemblages and individual metrics will be analyzed. Water sampling data will be compared to applicable Ohio Water Quality Standards (2009b) to determine if there are excursions from water quality criteria. An examination of the individual metrics that comprise the ICI will be used in conjunction with water quality data, the NEORSD Macroinvertebrate Field Sheet, and the Ohio EPA Qualitative Habitat Evaluation Index (QHEI) results in order to identify impacts to the communities. Results will also be compared to historic data to show temporal as well as spatial trends.

NEORSD will also attempt to conduct fish community sampling at each of the sampling sites on Doan Brook. This sampling will be dependent upon weather and stream conditions, as well as availability of NEORSD personnel. If the sampling is conducted, fish community health will be evaluated through the use of Ohio EPA's Index of Biological Integrity (IBI). An examination of the individual

[1] See Appendix I for a list of all references.

metrics that comprise the IBI will be used in conjunction with water quality data and QHEI results in order to identify impacts to the fish community.

(2) Point/Nonpoint Sources

Point Sources	Nonpoint Sources
CSO(s) outside of NEORSD service area	Urban Runoff
Storm Sewer Outfalls	Landfill Leachate
Upstream Tributaries	Spills
Home Sewage Treatment Systems	Agriculture
NEORSD-owned CSOs	
Sanitary Sewer Overflows	

A map has been provided in Appendix A to show point sources that may be influencing the water quality at each sample location. These sources of pollution, along with the nonpoint sources listed in the table above, may be impacting the health of the fish and benthic macroinvertebrate communities. Other factors that may influence ecological conditions during the study include periods of drought and periods of precipitation.

(3) Parameters Covered

Fish specimens will be identified to species level, counted and examined for the presence of external anomalies including deformities, eroded fins, lesions and tumors, known as DELTs. Quantitative fish sampling is expected to be conducted at all locations.

Macroinvertebrate community assemblages will be collected from each location and sent to a Benthic Macroinvertebrate Level 3 Qualified Data Collector (QDC) for identification and enumeration. The QDC, described in section (11), will identify the specimens to the lowest practical taxonomic level and whenever possible, to the level of taxonomy recommended in Ohio EPA's *Biological Criteria for the Protection of Aquatic Life, Volume III* (1987b).

The NEORSD Macroinvertebrate Field Sheet (Appendix B) will be completed at each site during sampler retrieval. In addition, stream habitat will be measured by scoring components of the QHEI at all locations, including the substrate, instream cover, channel morphology, riparian zone and bank erosion, pool/glide and riffle/run quality and gradient.

Water chemistry samples will be collected at all sites. Appendix C lists the parameters to be tested along with the detection limits and practical quantitation limits. At least once, at all sites sampled, chlorophyll *a* (method: EPA 445.0) sampling will occur. Field measurements for dissolved oxygen, pH, temperature, conductivity and flow will also be performed. A NEORSD Surface Water

Condition Sampling Field Data Form will be completed at each site during each sample collection (Appendix D).

(4) Field Collection and Data Assessment Techniques

Field collections for fish will be conducted at all sites, if possible. Sampling will be conducted using longline electrofishing techniques and will consist of shocking all habitat types within a sampling zone, which is 0.15 kilometers in length for the headwater sites, while moving from downstream to upstream. The stunned fish will be collected and placed into a live well for later identification.

Fish will be identified to species level, counted, and examined for the presence of external anomalies including DELTs. Fish easily identified (commonly collected from year to year) will be returned to the site from which they are collected. Subsamples of difficult to identify species will be brought back to the laboratory for verification by NEORSD Level 3 Fish Qualified Data Collectors (QDC) and, if necessary, sent to The Ohio State University Museum of Biological Diversity for verification by the Curator and/or Associate Curator of Fish. Voucher specimens will be collected as described in section (14). Endangered species and those too large for preservation will not be collected as voucher specimens, but will instead be photographed. Photographed vouchers will include features that permit definitive identification of the particular species.

Fish will be preserved in 10 percent formalin in the field, soaked in tap water for 24 to 48 hours after 5 to 7 days, then transferred to solutions of 30 and 50 percent ethanol for 5 to 7 days each and, finally, to 70 percent ethanol for long-term storage. Specimens larger than six inches will be slit along the right side and then soaked in formalin for approximately 10 to 14 days before being transferred to water and solutions of 30, 50 and 70 percent ethanol. Label information will include location (description and coordinates), date, time, collectors' names and sample identification code for each specimen collected.

Macroinvertebrate sampling will be conducted using quantitative and qualitative sampling techniques. Quantitative sampling will include installation of a Hester-Dendy multi-plate artificial substrate sampler (HD) that is colonized for a six-week period. Multiple HD samplers will be installed at one or all of the locations in case samplers are lost due to vandalism, burial, etc. Qualitative sampling will be conducted using a D-frame dip net when HD samplers are retrieved. The NEORSD Macroinvertebrate Field Sheet will be completed during each HD retrieval. Aquatic Macroinvertebrate Taxonomy (AMT)[2] (Ravenna, Ohio) will

[2] The Northeast Ohio Regional Sewer District Board of Trustees has approved the District to enter into a contract with AMT, however at the time of this writing, the contract has not been fully executed. An amended study plan will be submitted if is the District is unable to enter into a contract with AMT and must contract this service with another vendor.

identify the specimens to the lowest practical taxonomic level and when the condition of the specimen allows, to the level of taxonomy recommended in Ohio EPA's (1987b) *Biological Criteria for the Protection of Aquatic Life, Volume III.* Voucher specimens will be collected as described in section (14). Stream flow will be measured with a Marsh-McBirney FloMate Model 2000 Portable Flow Meter when the HD samplers are installed and retrieved.

A detailed description of the sampling and analysis methods utilized in the fish community and macroinvertebrate surveys, including calculations of the IBI and ICI, can be found in Ohio EPA's (1987a) *Biological Criteria for the Protection of Aquatic Life, Volumes II* and *III* (1987b).

Water chemistry sampling will be completed at all locations. Techniques used for water chemistry sampling and chemical analyses will follow the *Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices* (2009). Chemical water quality samples from each site will be collected with two 4-liter disposable polyethylene cubitainers with disposable polypropylene lids and two 473-mL plastic bottles. All water quality samples will be collected as grab samples. One duplicate sample and one field blank will be collected at a randomly selected site, at the frequency not less than 10% of the total samples collected, for this study plan. The acceptable relative percent difference (RPD) for field duplicate samples will be ≤30 percent; results outside this range will trigger further evaluation along with an investigation into causes for disparities. RPD values above 30 percent, with results less then ten times the practical quantitation limit, will be reviewed on a case-by-case base to determine if there is any merit for further investigation. Acid preservation of the samples, as specified in the NEORSD laboratory's standard operating procedure for each parameter, will occur in the field. Appendix C lists the analytical method, detection limit and practical quantitation limit for each parameter analyzed. Field analyses include the use of either a YSI-556 MPS Multi-Parameter Water Quality Meter or YSI 600XL sonde to measure dissolved oxygen, water temperature, conductivity and pH; and when necessary, a Hanna HI 98129 meter to measure pH. Meter specifications have been included in Appendix E.

The QHEI, as described in Ohio EPA's, *Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI)* (2006) will be used to assess aquatic habitat conditions at each sample location by Level 3 QDCs.

Species assemblages and individual metrics will be analyzed. Graphs that show current QHEI, IBI and ICI scores and how these scores compare to attainment status of biocriteria may be prepared. Water chemistry data collected will be compared to Ohio water quality standards to determine whether any excursions from the applicable water quality criteria have occurred. Comparisons between

water quality and biological community health will only be made if at least three water quality samples have been collected from a particular site.

(5) Sampling Locations

The following locations will be surveyed on Doan Brook during the 2010 field season for general watershed monitoring as outlined in this study plan. HD and water chemistry collection sites are located near the mid point of each electrofishing zone, indicated by river mile, unless otherwise noted. GPS coordinates are recorded at the downstream end of each electrofishing zone.

Site Location	Latitude	Longitude	River Mile	Description	Quadrangle	Purpose
Doan Brook	N41.5330°	W81.6296°	0.75	Downstream of St. Clair Avenue	Cleveland North	Evaluate chemistry, habitat, fish, & macroinvertebrates in support of Ohio EPA Permit #3PA00002*FD
Doan Brook	N41.4838°	W81.5643°	6.70	Upstream of Lee Road	Shaker Heights	Evaluate chemistry, habitat, fish, & macroinvertebrates upstream of NEORSD CSOs
Doan Brook, North Branch	N41.4739°	W81.5593°	1.40	Upstream of Attleboro Road	Shaker Heights	Evaluate chemistry, habitat, fish, & macroinvertebrates upstream of NEORSD CSOs

(6) Schedule

If possible, at least one electrofishing survey per site will be conducted between June 15th and October 15th, 2010. If more than one survey will be conducted, then at least four to five weeks will separate assessments. Specific dates have not been scheduled. River flow and weather conditions will be assessed weekly to determine when each electrofishing pass will be conducted.

Artificial substrate samplers will be installed once at each site, between June 15th and August 19th, 2010, at all of the sites and retrieved six weeks later. Specific dates have not been scheduled. River flow and weather conditions will be assessed weekly to determine when the HD sampler installations and retrievals will be conducted.

Water chemistry samples will be collected a minimum of three times at each site between June 15th and October 15th, 2010.

QHEI habitat evaluations will be conducted one time at each site between June 15th and October 15th, 2010. These evaluations will be conducted around the same time as one of the electrofishing surveys.

(7) QA/QC

Quality assurance and quality control of sampling and analysis methods for habitat, fish, and macroinvertebrate evaluations will follow Ohio EPA's *Biological Criteria for the Protection of Aquatic Life, Volumes II* (1987a) and *III* (1987b) and *Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI)* (2006).

Electrofishing equipment will be used according to the guidelines listed in the operation and maintenance manual provided by Smith-Root, Inc. Malfunctioning equipment will not be used to collect data. Proper steps will be taken to correct the problem as soon as possible, whether by repairing in the field, at the NEORSD Environmental & Maintenance Services Center, or by contacting the supplier or an appropriate service company.

Subsamples of difficult to identify fish species will be brought back to the laboratory for verification by NEORSD Level 3 Fish Qualified Data Collectors (QDC), and if necessary, sent to The Ohio State University Museum of Biological Diversity for verification by the Curator and/or Associate Curator of Fish. Voucher specimens will be collected as described in section (14). Endangered species and those too large for preservation will not be collected as voucher specimens, but will instead be photographed. Photographed vouchers will include features that permit definitive identification of that particular species.

All macroinvertebrate community assemblages will be collected and sent to AMT for identification and enumeration. AMT will identify specimens to the lowest practical taxonomic level and when the condition of the specimen allows, to the level of taxonomy recommended in Ohio EPA's (1987b) *Biological Criteria for the Protection of Aquatic Life, Volume III*. The AMT QA/QC manual is attached (Appendix F). All macroinvertebrate specimens will be returned to NEORSD. Voucher specimens for each site will be separated into individual vials and collected as described in section (14). The remaining specimens for each site will be returned in a single container labeled with the site number, collection method and date. All specimens and accompanying chain-of-custody documentation will be retained by NEORSD and stored at the Environmental & Maintenance Services Center (EMSC) for a period not less than ten years.

Water samples obtained for chemical analyses will be collected, preserved (see Section 4), labeled and then placed on ice inside the field truck. The field truck will remain locked at all times when not occupied/visible. Sampling activities, including sample time and condition of surface water sampled, will be entered in a field log book and on the Surface Water Condition Sampling Field Data Form. The samples will then be delivered immediately to the NEORSD Analytical Services cooler, after which the door to the cooler will be locked and the samples

will be transferred to the custody of Analytical Services. The NEORSD Analytical Services Quality Manual and associated Standard Operating Procedures 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.

(8) Work Products

Within one year of completion of the project, fish data (species, numbers, pollution tolerances, the incidence of DELT anomalies and IBI scores), macroinvertebrate data (types and numbers of macroinvertebrates collected and ICI scores), habitat data (QHEI raw data and scores) and water chemistry results will be submitted to the Ohio EPA. Additionally, reports summarizing, interpreting, graphically presenting and discussing the IBI, ICI and QHEI scores and any excursions from water quality standards may be prepared for internal use.

(9) Qualified Data Collectors

The following Level 3 QDCs may be involved with these studies:

Name	Address	Email Address	Phone Number	QDC Specialty(s)
[1]John W. Rhoades	4747 East 49th Street Cuyahoga Hts., Ohio 44125	rhoadesj@neorsd.org	216-641-6000	QDC - 008 CWQA/FCB/SHA/ BMB
Catherine Zamborsky	4747 East 49th Street Cuyahoga Hts., Ohio 44125	zamborskyc@neorsd.org	216-641-6000	QDC - 009 CWQA/SHA
[2,3]Seth Hothem	4747 East 49th Street Cuyahoga Hts., Ohio 44125	hothems@neorsd.org	216-641-6000	QDC - 010 CWQA/FCB/SHA
Kathryn Crestani	4747 East 49th Street Cuyahoga Hts., Ohio 44125	crestanik@neorsd.org	216-641-6000	QDC - 011 CWQA/SHA
Thomas Zablotny	4747 East 49th Street Cuyahoga Hts., Ohio 44125	zablotnyt@neorsd.org	216-641-6000	QDC - 018 CWQA/FCB/SHA
[4,6]Ronald Maichle	4747 East 49th Street Cuyahoga Hts., Ohio 44125	maichler@neorsd.org	216-641-6000	QDC - 145 CWQA/SHA/BMB
Francisco Rivera	4747 East 49th Street Cuyahoga Hts., Ohio 44125	riveraf@neorsd.org	216-641-6000	QDC - 262 CWQA
[5]Tiffany Moore	Aquatic Macroinvertebrate Taxonomy (AMT) 8927 Weaver Road Ravenna, Ohio 44266	tiffany@digitaldesignmedia.com	847-945-8010	QDC - 017 BMB

[1]Lead Project Manager
[2]Fish Community Biology (FCB) Project Manager
[3]Stream Habitat Assessment (SHA) Project Manager
[4]Benthic Macroinvertebrate Biology (BMB) Project Manager
[5]Benthic Macroinvertebrate Identification
[6]Chemical Water Quality Assessment (CWQA) Project Manager

The following is a list of persons not qualified as QDCs who may be involved in the project. Prior to the start of sampling, the project managers will explain to each individual the proper methods for sampling. Sampling will only be completed under the direct observation of a QDC. The lead project manager will be responsible for reviewing all reports and data analysis prepared by qualified personnel prior to completion.

Name	Address	Email Address	Phone Number
Nick Barille	4747 East 49th Street Cuyahoga Hts., Ohio 44125	Barillen@neorsd.org	216-641-6000
Joseph Broz	4747 East 49th Street Cuyahoga Hts., Ohio 44125	Brozj@neorsd.org	216-641-6000
Tim Dobriansky	4747 East 49th Street Cuyahoga Hts., Ohio 44125	Dobrianskyt@neorsd.org	216-641-6000
Kyle Frantz	4747 East 49th Street Cuyahoga Hts., Ohio 44125	Frantzk@neorsd.org	216-641-6000
Kristina Granlund	4747 East 49th Street Cuyahoga Hts., Ohio 44125	Granlundk@neorsd.org	216-641-6000
Rae Grant	4747 East 49th Street Cuyahoga Hts., Ohio 44125	Grantr@neorsd.org	216-641-6000
Eric Hinton	4747 East 49th Street Cuyahoga Hts., Ohio 44125	Hintone@neorsd.org	216-641-6000
John Junkin	4747 East 49th Street Cuyahoga Hts., Ohio 44125	Junkinj@neorsd.org	216-641-6000
Mark Matteson	4747 East 49th Street Cuyahoga Hts., Ohio 44125	Mattesonm@neorsd.org	216-641-6001
Jillian Novak	4747 East 49th Street Cuyahoga Hts., Ohio 44125	Novakj@neorsd.org	216-641-6000
Cathy O'Grady	4747 East 49th Street Cuyahoga Hts., Ohio 44125	Ogradyc@neorsd.org	216-641-6000
Kevin Roff	4747 East 49th Street Cuyahoga Hts., Ohio 44125	Roffk@neorsd.org	216-641-6000
Frank Schuschu	4747 East 49th Street Cuyahoga Hts., Ohio 44125	Schuschuf@neorsd.org	216-641-6000
Wolfram von Kiparski	4747 East 49th Street Cuyahoga Hts., Ohio 44125	Vonkiparskiw@neorsd.org	216-641-6000
Summer Co-op	4747 East 49th Street Cuyahoga Hts., Ohio 44125	To Be Determined	216-641-6000
Summer Co-op	4747 East 49th Street Cuyahoga Hts., Ohio 44125	To Be Determined	216-641-6000
Summer Co-op	4747 East 49th Street Cuyahoga Hts., Ohio 44125	To Be Determined	216-641-6000

(10) Documentation of approval of project managers and other personnel as Level 3 Qualified Data Collectors

See attached (Appendix G).

(11) Contract laboratory contact information

Any fish that is not positively identified in the field or NEORSD laboratory will be sent to The Ohio State University Museum of Biological Diversity for verification by the Curator and/or Associate Curator of Fish. Fish will be identified to the species level.

The Ohio State University Museum of Biological Diversity
Dr. Ted Cavender, Curator of Fish / Mr. Marc Kibbey, Associate Curator of Fish
1315 Kinnear Road, Columbus, Ohio 43212
cavender.1@osu.edu / kibbey.3@osu.edu
(614) 292-7873

Identification of macroinvertebrates will be completed by AMT (Ravenna, Ohio). Benthic macroinvertebrates will be identified to the lowest practical level as recommended in Ohio EPA's (1987b) *Biological Criteria for the Protection of Aquatic Life, Volume III.*

Tiffany Moore (QDC# 017)
AMT
8927 Weaver Road
Ravenna, Ohio 44266
tiffany@digitaldesignmedia.com
(330) 626-2310

(12) Copy of Ohio Division of Natural Resources (ODNR) collector's permit

To be submitted electronically when issued to NEORSD by ODNR (Appendix H).

Twenty-four hours prior to biological collection, the county ODNR wildlife officer will be contacted by a NEORSD QDC. See table below for contact information for ODNR Wildlife Officers by county. A message may be left instructing: type of sampling, location of sampling, and duration.

County	Contact Person	Phone Number
Cuyahoga County	Hollie J. Fluharty	(330) 245-3033

The most current wildlife officer contact information should always be checked at the following web address:
http://www.dnr.state.oh.us/Home/wild_resourcessubhomepage/about_the_division_landingpage/contactdefault/WildlifeOfficersbyCounty/tabid/7004/Default.aspx

(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).

Print/Signature: John W. Rhoades Date: 04/12/10

(14) Voucher Specimen Statement

NEORSD will maintain a benthic macroinvertebrate and fish voucher collection which includes two specimens, or appropriate photo vouchers, of each species or taxa collected during the course of biological sampling from any stream. When benthic macroinvertebrates from multiple surface waters are collected within the same year and identified by the same QDC, one voucher collection will be created to represent the specimens collected from those streams. When fish specimens from multiple surface waters are collected within the same year, one voucher collection will be created to represent the specimens collected from those streams. A separate collection for each sampling event will not be maintained.

NEORSD will provide specimens or photo vouchers to the Director upon request. This collection will be stored at the NEORSD laboratory in the Environmental and Maintenance Services Center.

Print/Signature: John W. Rhoades / Date: 04/12/10

(15) 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: John W. Rhoades / Date: 04/12/10

Print/Signature: Cathy Zamborsky / Date: 4/12/10

Print/Signature: Seth Hothem / Date: 4/12/10

Print/Signature: Kathryn Crestani / Date: 4/12/2010

Print/Signature: Tom Zablotny / Date: 4-14-10

Print/Signature: Ron Maichle / Date: 04-12-10

Print/Signature: Francisco Rivera / Date: 4/12/10

Appendix A