ROUGE RIVER WATERSHED
DISSOLVED OXYGEN MONITORING

SAMPLING PLAN

PREPARED FOR:

ALLIANCE OF ROUGE COMMUNITIES
46036 MICHIGAN AVENUE, SUITE 126, CANTON, MICHIGAN 48188

PREPARED BY:

ENVIRONMENTAL CONSULTING & TECHNOLOGY, INC.
1155 BREWERY PARK BOULEVARD, SUITE 115, DETROIT, MICHIGAN 48207

ECT PROJECT NUMBER: 150440-0500

AUGUST 2017

SECTION A – PROJECT MANAGEMENT

A.1. Title and Approval Page

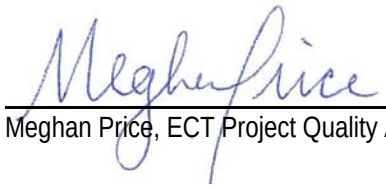
Sampling Plan for

Rouge River Watershed
Dissolved Oxygen Monitoring

Prepared on Behalf of:
Alliance of Rouge Communities

Date: 8/1/2017

Annette DeMaria, ECT Project Manager



Date: 8/1/2017

Meghan Price, ECT Project Quality Assurance Manager

A.2 Table of contents

A.3 Distribution List

This document will be distributed electronically to the following team members involved in this project from the Alliance of Rouge Communities (ARC) and Environmental Consulting & Technology, Inc. (ECT). Additionally, anyone involved in the aspects of this project discussed in this document will receive a copy of the document.

Alliance of Rouge Communities

Name/Title	Contact E-mail
Karen Mondora Technical Committee Chair	kmondora@fhgov.com

ECT, Inc.

Name/Title	Contact E-mail
John O'Meara Project Director	jomeara@ectinc.com
Annette DeMaria Project Manager	ademaria@ectinc.com
Meghan Price Task Manager/QA Manager	mprice@ectinc.com
Surya Muruganantham Field Technician	smuruganantham@ectinc.com
Susan Rusinowski Field Technician	srusinowski@ectinc.com

A.4 Project/Task Organization

The primary objective of this project is to perform water quality monitoring within the Rouge River to demonstrate progress toward the TMDL goals of the municipalities within the Alliance of Rouge Communities (ARC). This will be accomplished by dissolved oxygen (DO) measurement at the selected locations. This document is the sampling plan for data collection that is to occur throughout the project.

Project Organization

Michigan Department of Environmental Quality (MDEQ) is funding the project with funds provided through SAW.

The Alliance of Rouge Communities (ARC) is the fiduciary of the grant funding. As such, the ARC is responsible for keeping the project on schedule and within budget.

Environmental Consulting & Technology, Inc. (ECT) has been hired by the ARC and is designated as the technical contractor for this project. As such, ECT will be responsible for writing the sampling plan, data collection efforts conducted for this project as discussed in this plan, data evaluation and assessment, and reporting. Additionally, ECT will assist the ARC in adhering to all grant reporting requirements.

Roles and Responsibilities

Kevin Goodwin (MDEQ) has been invited to provide unofficial review of this document. Mr. Goodwin will also be provided a copy of the final report.

Karen Mondora, the ARC Technical Committee Chair, will oversee the project.

John O'Meara, P.E., the ECT Project Director, will coordinate all consultant activities with the ARC, and all project partners to ensure that all project objectives are attained. Mr. O'Meara will assure consistency and avoid duplicative efforts among project personnel. Mr. O'Meara will prepare all progress summary memorandums and budget materials and act as the primary consultant point of contact for the ARC.

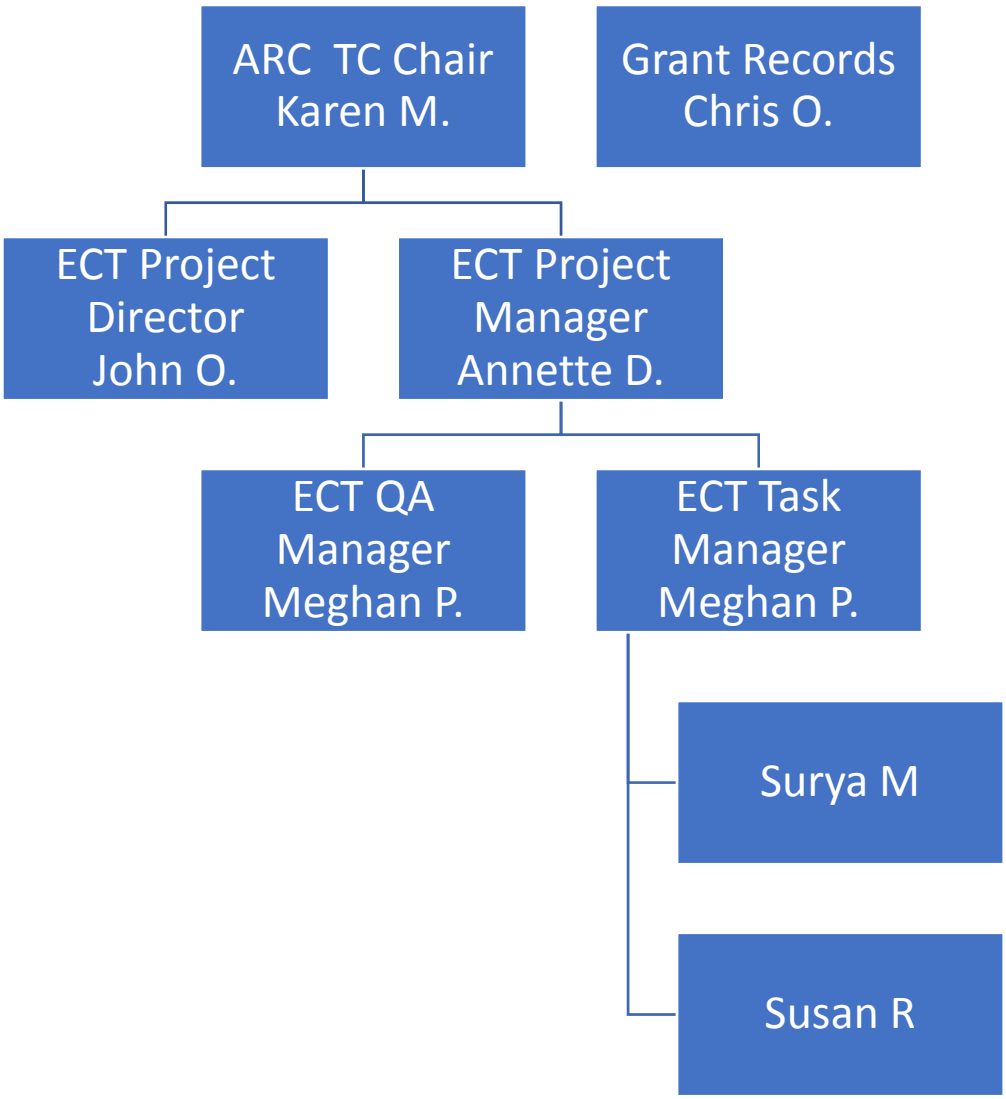
Annette DeMaria, P.E., the Project Manager, will be responsible for the day-to-day operations and management of the project. As such, Ms. DeMaria will be responsible for coordination and oversight of the field monitoring, data review, as well as preparation and submittal of all summary reports.

Meghan Price, the Project QA Manager is responsible for sampling plan development as well as final dispersal. Ms. Price will also be responsible for any training required for field staff, laboratory coordination, and staff scheduling. Ms. Price will be available throughout the project to assist with any quality assurance reviews and/or audits.

Surya Murganantham and Susan Rusinowski of ECT will assist in data collection efforts and will provide feedback and assistance on the final report.

A project organization chart is displayed as Figure 1 – Project Organization Char.

Figure 1 – Project Organization Chart



A.5. Project Objectives

This sampling plan provides a description of the procedures to be followed for the continuous DO monitoring of Rouge River at 6 locations on the river. This will ensure that the data collection methods are of a sufficient quality to allow for adequate data review. The data is expected to be scientifically valid and defensible and that uncertainty has been reduced to a practical minimum. Data and information will be collected to help qualify the existing conditions and provide a conclusion as to the state of DO levels as compared to the MDEQ' Assessment Methodology. This sampling plan sets forth the objectives, responsibilities, protocols, procedures, and methods for collecting data on the status of the project area.

A.6. Overview and Schedule:

The overall goal of this monitoring project is to collect data of a sufficient quantity and quality to allow for a recommendation as to the status of each reach of river on the MDEQ's 303(d) Impaired Waters list. As such, continuous DO monitoring will be performed at each location for a minimum of 3 months, including a period inclusive of hot weather which is the critical conditions for DO levels. Data will be recorded in 15-minute intervals.

Table 1: Proposed Rouge River DO monitoring locations

Site ID	Reach	Coordinates	Major Roads	Monitoring Period
MD18	Ingersol Creek	42.458972, -83.454809	Meadowbrook Rd. & Chattman St.	August – October 2017
M15	Rouge River	42.429135, -83.269132	7 Mile Road and Berg Road	May – July 2018
MD03	Tonquish creek	42.351892, -83.386037	Wayne Road and Joy Road	May – July 2018
MD13	Johnson Creek	42.381706, -83.555045	Napier Rd. & Last Dr.	May – July 2018
U02	Upper Rouge	42.398208, -83.278385	Graham Road and Telegraph Road	May – July 2018
U03	Bell Branch	42.405507, -83.315252	Inkster Road and Meadowbrook Road	May – July 2018

A.7 Special Training/Certification

Only individuals trained and experienced in the use of applicable sampling equipment shall use or supervise the use of such equipment. All individuals responsible for the completion of this work have received training in the applicable sampling equipment and protocols.

A.8 Documents and Records

ECT will maintain a project file, which will act as a repository for all field logs, sampling data, and any additional information used in the completion of this project. This file will be maintained for at least seven years (unless otherwise directed by the ARC). Electronic project files will be maintained on network computers and backed up periodically. The ECT Project Manager will supervise the use of materials in the project file. If requested by the ARC, ECT will provide this information in an administrative record at a later date.

The following information will be included in the hard copy or electronic project files in the central file:

- All approved versions of the sampling plan;
- Any reports and documents prepared;
- All field forms;

- Contract and task order information;
- Results of data quality assessments and audits;
- Communications (memoranda; internal notes; telephone conversation records; letters; meeting minutes; and all written correspondence among the project team personnel, subcontractors, suppliers, or others);
- Maps, photographs, and drawings;
- Studies, reports, documents, and newspaper articles pertaining to the project and
- Spreadsheet data files: physical measurements (hard copy and on CD).

ECT will prepare a summary report for each reach of river that will provide a brief summary of the data set and will provide a recommendation for status change for the reach, when appropriate. Copies of formal reports generated from the data will be maintained in the project file (CD and hard copy) at ECT's Ann Arbor, Michigan office. The data reports will include a summary of the types of data collected, sampling dates, and any problems or anomalies observed during sample collection.

SECTION B – DATA GENERATION & AQCUISITION

B.1 Sensor Deployment:

A YSI 6920 sonde will be housed inside a PVC pipe and held at a fixed angle to the ground by fence posts. The end of the PVC pipe where the sensor is in the water surface is drilled/slotted for free flow of water through the pipe. A chain is attached to the upper end of the probe for retrieving the probe. The sonde has an optical DO sensor, temperature probe, and conductivity sensor. A guard around the sonde at the bottom protects the sensors from physical damage.

The deployment location is selected such that the minimum depth of water at the stream section is at least 1ft deep to ensure that the sensors are always in the water column and the probe is not too close to the banks or any other substrate in the stream. The sonde shall be placed in a spot which will be representative of overall stream characteristics.

The sensor will be calibrated before being deployed in the stream. The probe will be programmed to record measurements in 15-minute intervals.

B.2 Site visits, data download and calibration:

The sonde comes with an inbuilt data logger which stores continuous data from the sensors. The data from the probe will be downloaded in field laptop using the software provided by the sonde manufacturer. For this monitoring project, the probe will be set up to record DO, water temperature and specific conductivity readings at all six sites. The field crew will visit the site every two weeks to download the data from the sonde. During the field visit, the sensor will be checked for any external damage, fouling or clogging of the sonde. The stream conditions [stream flow, fouling, sediment deposition etc.] will be noted down which will later help in reasoning any issues or unexpected values that occur with sensor data. Cleaning and calibration of sonde will also be performed during site visit. The sensor will be calibrated as per the instructions recommended by the manufacturer. This reduces the data errors due to calibration drift and makes sure the accuracy of sensor data is maintained/ restored. The following items shall be present on all field visits to the site(s).

- High visibility safety vests;
- Traffic cones;
- Field notebook;
- Camera;
- Latex or Nitrile gloves;
- Tools for repairs and removal of sonde from the station (including key for lock(s));
- Field laptop and handheld monitor;
- Interface cables;
- Replacement batteries for sonde and handheld monitor;
- Tap water, scrubbing bubbles®, and paper towels for cleaning sonde;
- Sensor cleaning and maintenance equipment;
- Waste container (for calibration solutions);
- Conductivity standard and distilled water;

A station log will be prepared with following details. The station log will be updated during every visit.

- Personnel who visited the site;
- Time and date of visit;
- Site conditions during the time of visit;
- Calibration and data download time;

- If calibration was performed;
- Notes associated with calibration (if performed).

B.3 Precipitation and Air temperature data:

Temperature and rainfall has an effect on DO levels in the stream. For this purpose, air temperature and precipitation data will be downloaded from the nearest weather stations available for each location. The data will be converted to a format compatible with excel. Upon completion of the monitoring period, weather stations will be reviewed to ensure that accurate data has been recorded. Only those stations with data reported for the majority of the monitoring period will be utilized. In the event there are data gaps in the precipitation, the data set will be supplemented with data from another location. This will be detailed in the summary report for that location. Additionally, a coarse review of the precipitation data will be conducted to validate the data matches weather conditions known to have occurred. Stations will be chosen from those available on www.weatherunderground.com as they are readily available and data retrieval is simple and repeatable.

SECTION C – DATA VALIDATION AND USABILITY

C.1 Data Review, Verification, and Validation

The station log will be reviewed by the QA Manager to ensure that measurements were collected in conformance with the sampling plans and applicable standard operating procedures. Additionally, the data will be reviewed by the QA Manager to ensure that it was entered/transferred accurately. Any nonconformity will be noted with the data and considered under Reconciliation with User Requirements below. Duplicate review of all data will be used to ensure that data have been entered into/transferred to electronic spreadsheets accurately. Once data are accurately entered into the spreadsheets, the data will be reviewed once again to assess the reasonableness of data given the collection methods, quality criteria and objectives, and expected results. Any data that appear to be inconsistent with methods, and/or expected results will be further investigated to determine if a correctable error was made or if the data should be eliminated from further use.

C.2 Verification and Validation Methods

Pre- and post-calibration/maintenance stream readings will be used to determine if data correction is required due to sensor drift or fouling of the sensor due to stream conditions. This procedure will follow the methodology used by the USGS. These procedures are outlined in the 2006 USGS document (Wagner, Boulger, Oblinger, & Smith, 2006); but generally occurs as follows. The total error is calculated by adding the absolute value of the change from fouling to the absolute value of the change from drift. If the value of the overall change due to fouling and drift is greater than 0.3 mg/L, data correction is required. The correction shall be applied linearly across the time period affected by the drift/fouling. This generally will occur from one maintenance visit to the following visit. Thus, if a 1 mg/L correction must be applied to a portion of the data set, the first reading will have minimal/no change, whereas the last data point in the subset will show an increase (or decrease) in DO value of 1 mg/L.

C.3 Reconciliation with User Requirements

Data will be used by the ARC to recommend an update to the impairment listing for portions of the watershed. The monitoring data may also be used by the RRAC, MDEQ, EPA, or other agencies to assess the effects of various projects and/or BMPs once implemented. This sampling plan has been carefully prepared in cooperation with the MDEQ, ARC staff, as well as internal ECT staff to ensure that the data will meet the project needs.

The review of data collected shall consider the number and nature of the data collected and any deviations from the sampling plan. If data were obtained by means other than those indicated in the plans, the nature of the deviation will be considered, and the data will be evaluated based on whether they can still meet the user requirements. If the methods used deviated significantly from the plans, the plans will be revised and resubmitted for approval.

References

Wagner, R. J., Boulger, R. W., Oblinger, C. J., & Smith, B. A. (2006). *Guidelines and Standard Procedures for Continuous Water-Quality Monitors: Station Operation, Record Computation, and Data Reporting.* Reston: U.S. Geological Survey.