U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 2 RAC2 PROGRAM

CONTRACT NUMBER EP-W-10-007
WORK ASSIGNMENT NUMBER 011-RICO-0269

LOS ALAMOS TECHNICAL ASSOCIATES

REVISED WORK PLAN
Revision 01

27 June 2014

EIGHTEEN MILE CREEK SITE – OU3
Remedial Investigation/Feasibility Study

Los Alamos Technical Associates, Inc.

1090 King Georges Post Road, Suite 108 / Edison, New Jersey 08837 / www.lata.com

27 June 2014

Ms. Peggy DeLuca, Contracting Officer
U.S. Environmental Protection Agency
290 Broadway, 27th Floor
New York, New York 10007-1866

SUBJECT: USEPA RAC2 CONTRACT NUMBER EP-W-10-007
USEPA WORK ASSIGNMENT NUMBER 011-RICO-0269
EIGHTEEN MILE CREEK SITE – OU3 RI/FS
REVISED WORK PLAN, REVISION 01

Dear Ms. DeLuca:

Los Alamos Technical Associates, Inc. (LATA) is pleased to submit the enclosed plan for the subject Work Assignment.

The Revised Budget Estimate (Revision 01) has been submitted under separate cover. If you have any questions, please call me at (732) 947-3277 or email me at wcolvin@lata.com.

Sincerely,

William R Colvin

William R. Colvin, PMP, CHMM, PG
LATA RAC2 Program Manager

CF: K. Moncino, Project Officer
T. Taccone, Work Assignment Manager

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Eighteen Mile Creek Site – OU3
Remedial Investigation/Feasibility Study

Prepared by: Marcia M. Galloway	**Signature:** Marcia M. Galloway	**Title:** E & E Project Manager	**Date:** 27 June 2014
Reviewed by: Gene Florentino	**Signature:** Gene Florentino	**Title:** E & E Program Manager	**Date:** 27 June 2014
Approved by: William R. Colvin	**Signature:** William R Colvin	**Title:** LATA RAC2 Program Manager	**Date:** 27 June 2014

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1.0 INTRODUCTION

This work is being performed under U.S. Environmental Protection Agency (EPA) Remedial Action Contract 2 (RAC2) Contract Number EP-W-10-007. The Original Work Assignment Form (WAF) for the Remedial Investigation/Feasibility Study (RI/FS) to be performed by Los Alamos Technical Associates (LATA) for the Eighteen Mile Creek Site – Operable Unit 3 (OU3) (Site) was issued on 23 September 2013.

The Draft Work Plan and Budget Estimate were submitted on 14 February 2014. The continued performance of Task 01 activities (Project Planning and Support) was authorized via WAF Amendments 002 and 003 issued on 30 April 2014 and 10 June 2014, respectively.

On 09 April 2014 the LATA Team received comments on the Draft Work Plan and held a conference call with the WA Manager (WAM) on 23 April 2014 to discuss the comments. During that call, it was decided that the EPA and LATA Team risk assessors should discuss the comments; that conference call was held on 05 May 2014. Following the call, the LATA Team assessed the technical activities needed to be performed to address EPA's comments. On 14 May 2014, LATA sent the WAM descriptions of the technical activities planned to be performed to revise the Draft Work Plan; the WAM concurred with the technical activities the next day. On 04 June 2014, the LATA Team Project Manager met with the WAM to review the details of the sampling program that would be included in this Revised Work Plan (Revision 01).

Ecology and Environment, Inc. (E & E) is a Team Subcontractor to LATA on this contract and has a key role in this project. All communications between EPA and E & E that might potentially affect cost, level of effort (LOE) hours, scope, and/or schedule will be directed through the LATA Point of Contact (POC).

1.1 PURPOSE AND SCOPE

The purpose of this WA is to plan and implement a RI/FS for OU3 of the Eighteen Mile Creek Site (the Creek Channel). OU3 will address contaminated sediment in the Creek Channel from the north end of the Creek Corridor in Lockport to its location of discharge into Lake Ontario in Olcott, New York. The scope includes activities to determine the extent of contamination, perform human health and ecological risk assessments, delineate the extent of wetlands along the Creek Corridor, conduct Stage 1A cultural resource evaluations of effected properties in the Creek Corridor, provide continued community relations support, and assist with development and issuance of a proposed plan and record of decision (ROD) in accordance with the National Contingency Plan (NCP) and all applicable EPA RI/FS guidance. The scope will supplement the RI completed by the EPA Great Lakes National Program Office (GLNPO) for the Creek Channel (CH2MHill and EEEPC 2012).

OU1 will address contaminated soil at the Residential Properties on Water Street in Lockport, New York, and will address conditions of a building located on the former Flintkote Plant property (former Flintkote Building). OU2 will include the portion of OU1 that is along the creek banks and the remaining properties in the Creek Corridor and the creek channel within the Corridor. The EPA completed a ROD for the preferred alternative for OU1 (issued on 30 September 2013) and most of the OU1 activities have been completed.

1.2 BACKGROUND

The LATA team completed a review of existing data and prepared a memorandum entitled *Evaluation of Existing Data for the Eighteenmile Creek Superfund Site OU3* (LATA and E & E, 2014b). The memorandum was submitted on 27 January 2014 and was provided as Appendix A of the Draft Work Plan (Revision 0) submitted on 14 February. Comments on the memorandum were provided in conjunction with the comments on the Draft Work Plan (Revision 0). The memorandum was updated to address EPA's comments and is included in this Revised Work Plan (Revision 01) as Appendix A.

The memorandum in Appendix A provides background information for OU3 including a description and history of the site. The memorandum also includes figures and tables summarizing the sampling program that will be undertaken for the OU3 field investigation.

2.0 SUMMARY OF SITE CONDITIONS

The memorandum provided in Appendix A includes a summary of site conditions OU3.

3.0 TASK PLAN FOR THE EIGHTEEN MILE CREEK RI/FS

The EPA Region 2 Superfund Program supports the adoption of green site assessments and remediation, which is defined in the SOW for this WA as the practice of considering all environmental impacts of remedy studies, selection and implementation, and incorporating strategies to maximize the net environmental benefit of cleanup actions. The LATA Team has explored green strategies to reduce energy use, promote material reuse and recycling, and plans to implement the following approaches to reduce negative impacts on the environment during the period of performance (POP) of this WA:

Office and Community Relations Activities

- Use the smallest on-road rental vehicles (hybrid, if possible) practical for travel.
- Recycle office wastes through segregation, collection, storage, and removal of paper, liquid containers, ink cartridges, batteries, and other items.
- Submit documents in digital rather than hardcopy format to save paper, unless otherwise directed by the EPA.
- Ensure the heating and cooling systems in LATA Team offices are maintained by the building management companies.
- Use "Energy Star" appliances, compact fluorescent lights, and recycled products in LATA Team offices to the greatest extent possible.
- Minimize travel and use public transportation for travel to meetings with the EPA in New York City.

Field Activities

- Use the smallest on-road rental vehicles (hybrid if possible) practical for travel/fieldwork.
- Recycle non-contaminated wastes through segregation, collection, storage, and removal of paper, liquid containers, batteries, and other items.
- Recycle drums used for storage of investigation derived waste (IDW).
- Prepare and submit daily activity summary reports to the LATA Team Project Manager and EPA representative in digital rather than hardcopy format to save paper.

Additionally, in accordance with the requirements of the SOW for this WA, the LATA Team will consider the efficient use of natural resources and energy and the reduction of waste to the maximum extent possible in the conduct of the FS phase of the project. The objective will be to incorporate approaches and strategies to maximize the net environmental benefit of the cleanup action(s) considered for implementation. Therefore, for Tasks 11 and 12 the LATA Team will:

- Incorporate green remediation best practices for each remedy as part of the cost evaluation;
- Analyze the feasibility of alternate energy sources for remedial alternatives;
- Evaluate low-energy remedial alternatives;

- Assess the cost of the energy required for alternatives projected out 30 years;
- Consider future use of the site in determining the short- and long-term effectiveness of the remedy;
- Consider using local vendors to the greatest extent possible to lower the environmental footprint through reduced transportation;
- Focus on minimizing high quality fresh water use;
- Assess the use of reclaimed water where applicable;
- Evaluate the amount of soil necessary to be displaced/disturbed to remove one pound of contaminant; and
- Evaluate the amount of raw materials extracted, processed, or disposed of for each pound of contaminant treated.

The following sections describe the work to be performed to meet the objectives of this WA.

3.1 TASK 1: PROJECT PLANNING AND SUPPORT

3.1.1 Project Administration (Subtask 1.01)

This subtask contains two main components: setting up the project in the LATA and E & E financial systems; and conducting monthly administration tasks and coordination between LATA and E & E. These components are summarized below.

Project Setup

Activities include: entering project charge numbers in accordance with the WA work breakdown structure (WBS); entering budgets for the various tasks and subtasks; and entering the charge categories for the tasks and subtasks (labor, other direct costs, travel, team subcontractors, and subpool). Setup includes the effort to open charge numbers as the project proceeds.

Monthly Administration

Activities include: tracking of expenditures and the project schedule by task and subtask on a weekly basis; generating and reviewing WA-specific RAC2 Reports; preparing and reviewing the progress report for the WA; monthly invoicing to LATA; and conducting overall management of the execution of the WA. This subtask also includes the preparing, issuing, and acceptance of purchase orders between LATA and E & E needed for each change in WA Expenditure Limits resulting in the updating of the LATA and E & E financial systems.

3.1.2 Scoping Meeting (Subtask 1.02)

The E & E Project Manager contacted the EPA Work Assignment Manager (WAM) on 26 September 2013 to schedule the Scoping Meeting, which was held on 18 December 2013 at EPA's New York City office. Meeting minutes were submitted on 19 December 2013.

3.1.3 Site Visit (Subtask 1.03) – Optional

If directed by EPA, the LATA Team will attend a two-day site visit. Two members of the LATA Team will attend the site visit. The site visit may be held in conjunction with OU3 planning.

3.1.4 Draft Work Plan and Budget Estimate (Subtask 1.04)

The LATA Team prepared the Draft Work Plan (Revision 0) based on the SOW in the Original WAF. The Draft Work Plan (Revision 0) was submitted on 14 February 2014 and described the project tasks planned to be performed and the procedures that would be employed to meet the objectives of this WA. The Draft Budget Estimate (Revision 0), submitted on 14 February 2014 was prepared based on the task descriptions in the Draft Work Plan (Revision 0).

3.1.5 Negotiate and Revise Draft Work Plan and Budget Estimate (Subtask 1.05)

To prepare this Revised Work Plan (Revision 01) and Revised Budget Estimate (Revision 01), the LATA Team: reviewed and addressed EPA's 09 April 2014 comments on the Draft Work Plan; held a conference call with the WAM on 23 April 2014 to discuss EPA's comments; participated in the 05 May 2014 conference call with the WAM and the EPA risk assessors to discuss the comments; on 15 May 2014, discussed with the WAM the technical activities needed to be performed to address EPA's comments ; submitted to the WAM, PO, and CO (on 20 May 2014) a description of the activities planned to be performed to revise the Draft Work Plan (Revision 0) and Draft Budget Estimate; and had a follow-up meeting with the WAM on 04 June 2014 to review the details of the sampling program that would be included in this Revised Work Plan (Revision 01).

The LATA Team will participate in a teleconference with EPA to negotiate the Revised Budget Estimate (Revision 01). A memorandum documenting the agreements reached during the negotiation will be submitted for EPA's review. Revisions to the Revised Work Plan (Revision 01) following the negotiation will not be necessary because the revisions were based on the agreements reached in the technical discussions held in May and June 2014 mentioned in the preceding paragraph. Revisions to the Revised Budget Estimate (Revision 01) will be necessary to incorporate the agreements reached in the negotiation which will result in the preparation and submission of the Revised Budget Estimate (Revision 02). The Revised Work Plan (Revision 01) and Revised Budget Estimates (Revisions 01 and 02) will be submitted in both hard copy and electronic formats.

3.1.6 Evaluate Existing Data and Documents (Subtask 1.06)

As part of this subtask, the LATA Team prepared a Data Evaluation Memorandum that: 1) addressed whether additional data are needed to develop a complete Conceptual Model of the Site and whether other modeling is necessary to determine the fate and transport of sediment in the creek and assess adverse risk to humans and ecological receptors; 2) included a qualitative Sediment Erosion and Deposition Analysis (SEDA); and 3) identified data gaps to be addressed through implementation of quality assurance and field sampling plans. The Data Evaluation Memorandum was submitted on 27 January 2014 and was incorporated into the 14 February 2014 Draft Work Plan as Appendix A. Based on EPA's 09 April 2014 comments and technical discussions described in Subtask 1.05 above, Appendix A was revised and included in this Revised Work Plan (Revision 01).

An inventory of technical documents reviewed is provided in Table A-1 of the Data Evaluation Memorandum provided in Appendix A.

3.1.7 Quality Assurance Project Plan (Subtask 1.07)

The LATA Team will prepare a Draft and Revised Quality Assurance Project Plan (QAPP) to support Task 3, if performed. The QAPP will be prepared in accordance with the current Uniform Federal Policy for QAPP (UFP-QAPP) guidance and procedures. The existing QAPPs for the project are not formatted in accordance with UFP-QAPP guidance and, therefore, a new UFP-QAPP will be developed. The figures and tables in Appendix A of this Revised Work Plan (Revision 01) will be used and updated, if necessary, for the UFP-QAPP.

3.1.8 Health and Safety Plan (Subtask 1.08)

The LATA Team will prepare site-specific Health and Safety Plan (HASP) to support Task 3, if performed. The site-specific HASP will specify employee training, protective equipment, medical surveillance requirements, standard operating procedures, and a contingency plan in accordance with 29 CFR 1910.120 (l)(1) and (l)(2). The HASP will be consistent with the previous E & E HASP prepared for field activities at the site.

3.1.9 Non-RAS Analyses (Subtask 1.09)

With the exception of toxicity testing and hexavalent chromium analyses, all sample analyses are planned to be performed by the EPA Region 2 Division of Environmental Science and Assessment (DESA) laboratory or in the EPA Contract Laboratory Program (CLP) or by the EPA-Environmental Response Team (ERT). The LATA team will prepare Laboratory Services Requests for all non-Routine Analytical Services (RAS) analysis not performed by ERT, DESA, or CLP. QC criteria developed for each parameter in the UFP-QAPP prepared under Subtask 1.07 will be incorporated in the Laboratory Service Request.

Samples also will be analyzed for non-RAS under the CLP program including Multi-Media, Multi-Concentration Dioxins and Furans Analysis (DLM02.2) and Multi-Media, Multi-Concentration Chlorinated Biphenyl (CB) Congeners (CBC01.2). A portion of all samples (i.e., 10%) should be analyzed for dioxin/furan, hexavalent chromium, and PCBs congeners in order to have a few representative samples with a full suite of parameters to support human health risk assessment. For analysis of PCBs in surface water, the samples should be analyzed with low-level PCB congener analysis to maintain consistency with historical data and achieve lower detection limits. Table 6 in Appendix A provides a summary of samples by media that will be analyzed for non-RAS.

In regard to certification requirements, the toxicity testing laboratories do not typically maintain certifications the same as environmental laboratories. If certification programs are not available, the LATA team will review the laboratories' qualifications, laboratory QAPP, procedures, and any relevant performance evaluation samples results.

All analytical services will be reported in Analytical Services Tracking System (ANSETS) in accordance with EPA Region 2 requirements.

3.1.10 Meetings/Weekly Conference Calls (Subtask 1.10)

The LATA Team will participate in six progress meetings during the course of this WA. Four meetings will be held via teleconference, one meeting will be held at EPA's New York City office, and one meeting will be held at the Site. Minutes of these meetings will be prepared and submitted via email within five calendar days following each meeting.

3.1.11 Subcontract Procurement (Subtask 1.11)

The LATA Team will identify, solicit, and award five subcontracts for the following services: Court Reporting (Subtask 2.03); Cultural Resources Survey (Subtask 3.01.02); Investigation Derived Waste Characterization and Disposal (Subtask 3.08); and two laboratory services, toxicity testing and hexavalent chromium analyses (Subtask 4.03).

3.1.12 Subcontract Management (Subtask 1.12)

The LATA Team will manage and oversee the five subcontracts awarded for this WA. Progress will be monitored and systems and records will be maintained to ensure that the work proceeds in accordance with the requirements of the respective subcontracts. The LATA Team will review and approve subcontractors' invoices and issue any necessary subcontract modifications.

3.1.13 Pathway Analysis Report (Subtask 1.13)

A Pathway Analysis Report (PAR) will be prepared in accordance with the "Risk Assessment Guidance (RAGS) for Superfund: Part D," dated December 2001.The PAR will be completed based on existing data and will include RAGS, Part D Tables 1 through 6, Exhibit 3-3 Data Usability Worksheet, and a technical memorandum with the necessary explanatory text. Because the PAR includes RAGS, Part D Tables 1 through 6 and the Exhibit 3-3 Data Usability Worksheet, the PAR will be completed after all historical data are tabulated as part of Subtask 6.02. The PAR will focus on how the risk assessment will be prepared for OU3 considering the receptors and exposure pathways outlined in Appendix A, Table 3, for OU3. As discussed in Appendix A Section 3.2, it is anticipated that the stream channel will be divided into five reasonably homogeneous exposure areas (EA) for Human Health Risk Assessment (HHRA) purposes:

1. Reach 1 – Mouth of the creek to Burt Dam;
2. Reach 2 – the Burt Dam impoundment;
3. Reaches 3 and 4 – upstream of the Burt Dam impoundment to the Newfane Dam;
4. Reach 5 – the Newfane Dam impoundment; and
5. Reaches 6 and 7 – upstream of the Newfane Dam impoundment to the bottom of the escarpment. Physical access to Reach 7 may be more difficult due to the woody debris present.

For the ecological risk assessment, a technical memorandum that includes information similar to that presented in the PAR will be provided (see Section 3.7.2).

3.2 TASK 2: COMMUNITY RELATIONS

3.2.1 Community Interviews (Subtask 2.01)

Community interviews were conducted for OU1 and also will be conducted for OU2. The LATA Team will provide support to the EPA to identify new stakeholders, such as appropriate governmental officials, environmental groups, local broadcast and print media, and any other relevant stakeholders who may be interested in or concerned with the Site. These stakeholders may also include public meeting attendees who express interest in being interviewed for the updated Community Relations Plan (CRP). Draft interview questions will be prepared for review

by the EPA WAM and finalized upon receipt of comments from the EPA. The LATA Team will draft and finalize an invitation letter; and coordinate invitation mailings to potential interviewees. Responses from the interviews will be incorporated into the deliverable for subtask 2.02 CRP.

3.2.2 Community Relations Plan (Subtask 2.02)

The LATA Team will prepare two updates of the November 2013 CRP prepared under the OU3 SOW. These updates will reflect additional community concerns and planned activities pertaining to OU3. Updates may also include revisions to the site background; community overview; and planned activities. The plan will also include updated figures, an updated mailing list of contacts and interested parties and residences that may be subject to fishing advisories (mailings will be done by EPA), and any new meeting venue information. The LATA Team will electronically submit the updated draft CRP to the EPA for review and comment and will incorporate comments into a final updated CRP. One electronic copy and 15 hard copies of the updated CRP will be provided.

3.2.3 Public Meeting Support (Subtask 2.03)

The LATA Team will perform the following activities in support of the Public Meeting and Availability Session that will be held on the same day:

- Arrange for one Public Meeting and one Availability Session to be held on two different days. The meeting places will be determined by EPA.
- Prepare the text and graphics for three two-page handouts.
- Prepare one poster board display and slides for a PowerPoint presentation for the Public Meeting.
- Attend the Public Meeting and Availability Sessions and provide sign-in sheets.
- Prepare draft and final presentation materials/visual aids (e.g., slides, handouts, large format maps of the site) incorporating EPA review comments.
- Provide a court reporter for the Public Meeting. A full-page original and a “four on one” page copy, along with an electronic copy of the transcripts will be provided to the EPA after the meeting. Three hard copies will be placed in the information repositories, as required.

For the site tour, the LATA Team will perform the following activities:

- Attend the site tour and provide sign-in sheets.
- Provide technical personnel to describe site activities and a community relations specialist to document public questions and concerns.
- Provide copies of handouts and technical materials prepared under Subtask 2.04 and 6.02.

3.2.4 Fact Sheet Preparation (Subtask 2.04)

The EPA WAM will prepare Draft Fact Sheets and Community Updates. The LATA Team will review, edit, and lay out the two Fact Sheets and Community Updates for the EPA to finalize. The Fact Sheets will be 2 to 4 pages in length. After the EPA finalizes the Fact Sheets, the

LATA Team will photocopy the Final Fact Sheets in black and white and attach mailing labels before delivering them to EPA from where they will be mailed.

3.2.5 Proposed Plan Support (Subtask 2.05)

The EPA will prepare the Proposed Plan. The LATA Team will provide administrative and technical support for the preparation of the Draft and Final Proposed Plan that will describe the preferred alternative and other alternatives evaluated in the Feasibility Study.

3.2.6 Public Notices (Subtask 2.06) – Not Applicable

3.2.7 Information Repositories (Subtask 2.07)

The LATA Team will maintain and update site-specific Administrative Records located in the Lockport Public Library, 23 East Avenue, Lockport, New York. Based on the CRP, the EPA has indicated that they will establish an additional local repository in Newfane presumably has the site activities in OU3 commence. Therefore, the LATA team has included both repositories in our assumptions. The team will assure that all information received from the EPA is documented and filed in the appropriate electronic files and will maintain a list of available documents by subject area. Community involvement plans, meeting logs, and mailing lists will be maintained in addition to technical reports directed to be included by the EPA. Two repository updates will be performed in association with OU3 activities.

3.2.8 Site Mailing List (Subtask 2.08)

The LATA Team will update the mailing list for the entire Eighteen Mile Creek site, as necessary. The LATA Team will provide mailing labels to the EPA upon request. Information will be mailed to the community by the EPA. Two mailing list updates will be performed under the OU3 WA.

3.2.9 Responsiveness Summary Support (Subtask 2.09)

The LATA Team will provide administrative and technical support for a Responsiveness Summary as directed by the EPA WAM. The LATA Team will provide assistance in compiling and summarizing comments received during the public comment period on the Proposed Plan and Feasibility Study. The LATA Team will support the preparation of one responsiveness summary by assisting in addressing approximately 100 separate comments (including duplicates). This support may include: researching official transcripts to ascertain information about community concerns and questions; incorporating written comments and questions into the summary; and categorizing and organizing comments; and preparing technical responses.

3.3 TASK 3: FIELD INVESTIGATION

The memorandum provided in Appendix A includes recommendations for sample collection activities to address data gaps in Section 5 (Data Gaps and Recommendations). These recommendations were the basis for the field investigation task.

3.3.1 Site Reconnaissance and Cultural Resource Assessment (Subtask 3.01)

3.3.1.1 Site Reconnaissance (Subtask 3.01.01)

The existing locations and the updated floodplain will be reviewed to develop a base map for the Creek channel. The base map will consider Creek bank-full delineation completed from the Burt Dam impoundment to the escarpment during the sediment thickness survey conducted in November 2010 as part of the EPA Great Lakes Legacy Act (GLLA) RI and bathymetric survey completed in 2009 for impoundment behind Burt Dam (CH2MHill and EEEPC 2012). The base map for the area below Burt Dam was not developed during the EPA GLLA RI and this area will be updated on the map based on current floodplain and aerials. There will be no additional floodplain delineation. Wetland delineation will be included in the base map based on existing data. The site geologist will identify specific sample locations and access points for the sediment investigation and perform photo documentation during the site visit under Subtask 1.03.

As described in Appendix A Section 3 for human health and ecological risk assessment, it is important to collect analytical data for environmental media in nearby reference or background areas in order to distinguish site-specific concentrations, exposures and risks from those found in the general Lake Ontario watersheds. These areas have not been selected and need to be evaluated for suitability during site reconnaissance by a biologist or ecologist. Access to the reference or background areas also will be needed for the site reconnaissance. Specific locations for collection of reference or background samples have not been determined. Possible reference locations include: (1) Oak Orchard Creek, a nearby tributary to Lake Ontario; (2) the East Branch of Eighteenmile Creek; and (3) the headwaters of Eighteenmile Creek upstream from the New York State Barge Canal.

3.3.1.2 Cultural Resource Assessment (Subtask 3.01.02)

Pursuant to Section 106 of the National Historic Preservation Act (NHPA), a Stage 1A Cultural Resource Investigation will be performed to evaluate the existence of cultural and archaeological resources adjacent to the Creek channel in OU3. The assessment of OU1 and OU3 residential properties will be performed first and supporting information will be utilized to the extent possible for the Phase 1A Cultural Resource Assessment Report for OU3.

The following is a general schedule of the cultural resource assessment process. After each step in the process, the Phase 1A report will be submitted to the EPA WAM for review and potential coordination with New York State Historic Preservation Office (NYSHPO).

SUBMITTAL	PHASE	SCHEDULE
Cultural Resource Assessment Report	1A	90 days after Work Plan approval
NYSHPO Consultation	1A	30 days after EPA Approval
Cultural Resource Assessment Field Survey (only if cultural sensitive resources found)	1B	60 days after NYSHPO Review
Cultural Resource Assessment Survey Report	1B	60 days after field work
NYSHPO Consultation	1B	30 days after EPA Approval
Determination of eligibility of for National Registry (only if cultural resources are discovered as potentially eligible resources)	2	90 days after NYSHPO Review
NYSHPO Consultation	2	30 days after EPA Approval
Mitigation Plan	3	Occur as part of Remedial Design Phase

Cultural Resource Assessment Reports will comply with the *State Historic Preservation Office Phase I Archaeological Report Format Requirements* (NYSHPO, May 30, 2005).

The Phase 1A report will be prepared by a qualified cultural resources specialty firm that specializes in New York State requirements. A cultural resource investigation is a complicated professional activity that requires the exercise of careful, subjective judgments related to evaluation of the significance of a resource. Specialty firms have the specific expertise, data bases, resources, and access to New York State cultural resource databases. Specialty firms are able to produce the reports more cost effectively than general environmental and engineering firms. In addition, using a firm that has experience with New York requirements facilitates a faster review of the deliverables prepared for this subtask. The LATA team will provide a Department of Interior, 36 CFR 61 qualified Principal Investigator to oversee the subcontract and coordinate with EPA and the NYSHPO.

3.3.2 Mobilization and Demobilization (Subtask 3.02)

Mobilization and demobilization will be performed for one field investigation event. Mobilization will include coordination with the EPA WAM to obtain access to properties where sampling will be performed. The LATA Team will provide a list of owners to the EPA to obtain access to the sampling locations. A global positioning system (GPS) will be rented, loaded with sample locations from the QAPP, and used to obtain sample coordinates. The GPS locations will be downloaded and checked. The field team will operate from the E & E offices in Lancaster, New York, and travel to the OU3 site in Lockport, New York, on a daily basis.

3.3.3 Sediment and Soil Boring, Drilling, and Testing (Subtask 3.03) – Optional

Sediment chemistry analyses will be performed in conjunction with the sediment toxicity testing at seven locations and in Reach 7 at polychlorinated biphenyls (PCBs) hotspots. Sampling will be conducted with a hand-held Ponar sampler. No vibracore sampling is required. The sediment sampling is discussed under Subtask 3.05.

3.3.4 Hydrological Assessment (Subtask 3.04) – Optional

Groundwater is not considered part of OU3 and hydrological assessment will not be performed.

3.3.5 Environmental Sampling (Subtask 3.05)

Environmental sampling will be performed to address data gaps described the Data Evaluation Memorandum Section 5 (see Appendix A). The sampling recommendations to address data gaps are summarized on Table 5 of Appendix A for the Creek channel. General sampling requirements are as follows:

- Surface sediment (0 to 6 inches beneath the sediment water interface) and surface water samples will be collected in the Creek channel at six sample locations and one reference area location for both chemical parameters and toxicity testing. Sediment samples will be collected in shallow water using a hand-held Ponar sampler (multiple grabs for significant volume) and surface water will be collected using bottle direct fill methods. Chemistry and toxicity samples will be collocated. Surface water parameters (pH, temperature, and specific conductivity) will also be monitored at each location with a Horiba U-22 multi-parameter probe. Approximate sample locations are included on Figure 4 of Appendix A. The reference location will be selected during site reconnaissance as described in Section 3.3.1.1. The actual sample locations will be chosen to represent a concentration gradient as described in Appendix A. The specific locations will be chosen after completion of the Screening Level Ecological Risk Assessment (SLERA) as described in Section 3.7.2. All chemical and toxicity samples will be co-located. The surface water and sediment chemistry will be analyzed for a full suite of parameters to provide additional data for human health and ecological risk assessment as well as assess toxicity.
- Sediment samples will also be collected in Reach 7 to further characterize areas with PCBs greater than 50 parts per million (ppm) for PCBs only to better estimate the volume of contaminated sediment greater than 50 ppm. Sediment samples will be collected in shallow water using a hand-held core sampler collect samples at two depths (i.e., 0 to 6 inches and 6 inches to 3 feet). Approximate sample locations are shown on Figure 5 of Appendix A.
- Fish (forage and edible) will be collected in the Creek corridor using electroshocking and netting techniques. Fish samples also will be collected from a reference area. Fish will be categorized, weighed and measured. Fish filleting will be performed at the laboratory. The target fish species are expected to be juvenile sunfish (*Lepomis* spp.) and adult largemouth bass (*Micropterus salmoides*). Both species are expected to be plentiful in OU3 based on historical sampling. For largemouth bass, skin-on fillet samples will be collected and handled following NYSDEC protocols for use in the human health risk assessment. Whole-body composite samples of juvenile sunfish will be collected for use in the ecological risk assessment. Approximate sample locations are shown on Figure 4 of Appendix A. The reference location will be selected during site reconnaissance as described in Section 3.3.1.1.

The following are summary tables of samples to be collected for shipment to EPA laboratories and subcontract laboratories. The specific analytical parameters are listed on Table 6 in Appendix A.

Summary of Samples Collected

Sample Media	Notes	Number of Samples					Number of Samples per Laboratory				
		Number of locations	Number of Reference Locations	No. of Samples	No. of QA/QC Samples	Total	CLP Analysis Routine – Organic SOM01.2	CLP Analysis Routine – Inorganic ISM01.3	CLP Analysis Non-Routine	Hexavalent Chromium	Other
Sediment	Sediment samples for chemical analysis associated co-located with toxicity samples from six locations in creek and one reference location. Sample depth (0-6")	6	1	7	1	8	8	8	1	1	8
	Sediment samples from Reach 7 to define area of high concentration PCBs. (Two depths 0 to 6 inches and 6 inches to 3 feet)	32		64	4	68	68				
Sediment Toxicity	EPA 100.4 – *Hyalella azteca* (amphipod), 42-day test. Six site samples and one reference area sample.	6	1	7	1	8					8
	EPA 100.4 – *Chironomus dilutus* (midge), life-cycle test. Six site samples and one reference area sample.	6	1	7	1	8					8
Surface Water	Surface water samples chemical analysis associated co-located with toxicity samples from six locations in creek and one reference location.	6	1	7	1	8		8	8	8	
Surface Water Toxicity	EPA 1000.0 – Fathead Minnow Larval Survival and Growth Test. six site samples and one reference area sample.	6	1	7	1	8					8
	EPA 1000.2 – *Ceriodaphnia dubia* Survival and Reproduction Test. Six site samples and one reference area sample.	6	1	7	1	8					8
Fish	Forage Fish – Ten site samples and ten reference area samples.	1	1	20	4	24	24	24	3	3	24
	Sport Fish Fillets – Ten site samples and ten reference area samples.	1	1	20	4	24	24	24	3	3	24
IDW	Toxicity characteristic leaching procedure (TCLP) parameters except herbicides, PCBs, corrosivity, and ignitibility	1		1	0	1					1
	Totals					**165**	**124**	**64**	**15**	**15**	**89**

Summary of Samples Collected for Subcontract Analysis

Parameter	Method	No. of Samples	Remarks
Sediment Toxicity	EPA 100.4 – *Hyalella azteca* (amphipod), 42-day test	7	Six site samples and one reference area sample
	EPA 100.5 – *Chironomus dilutus* (midge), life-cycle test	7	Six site samples and one reference area sample
Surface Water Toxicity	EPA 1000.0 – Fathead Minnow Larval Survival and Growth Test	7	Six site samples and one reference area sample
	EPA 1000.2 – *Ceriodaphnia dubia* Survival and Reproduction Test	7	Six site samples and one reference area sample
Hexavalent Chromium	Sediments and soils	1	10% of samples
	Surface waters	1	10% of samples
	Fish Tissue	3	10% of samples

3.3.6 Ecological Characterization (Subtask 3.06)

Aquatic habitats, wetlands, fish, wildlife, threatened and endangered (T&E) species, and other ecological resources in OU3 will be described based on existing site reports and data, including (E & E 2009), (E & E 2007a), National Wetland Inventory (NWI) maps, New York State designated wetland maps, aerial and ground-level photographs, and T&E species information from the United States Fish and Wildlife Service (USFWS) and New York State Natural Heritage Program (NHP). No formal field activities are planned to further characterize the site ecology given the abundance of existing information.

3.3.7 Geotechnical/Geophysical Survey (Subtask 3.07) – Not Applicable

3.3.8 Investigation Derived Waste (IDW) Characterization and Disposal (Subtask 3.08)

IDW will be generated as part of the field investigation. Disposable sampling equipment and PPE will be decontaminated in the field, double-bagged and placed in a commercial dumpster located at E & E's Lancaster, New York, office. Any removed sediment will be rinsed back into the Creek channel. All sampling equipment will be rinsed in the Creek water and a small quantity of decontamination water may be generated.

The IDW drums containing decontamination water will be moved each day to a secure area inside the fence at the Flintkote property (OU2). The IDW will be tested prior to disposal (analyzed for TCLP parameters excluding herbicides, PCBs, corrosivity, and ignitibility) by the USEPA Region 2 DESA laboratory under Task 3.4. Analytical results will be provided to the waste hauler and the drums will be disposed of as non-hazardous waste by the waste hauler. The LATA Team will explore lower cost options for disposal of water in the sanitary sewer with the City of Lockport Wastewater Treatment Plant during planning for the field sampling program.

3.4 TASK 4: SAMPLE ANALYSIS

3.4.1 Innovative Methods/Field Screening Sample Analyses (Subtask 4.01) – Not Applicable

3.4.2 Analytical Services Provided by CLP or DESA or EPA-ERT (Subtask 4.02)

The majority of the sample analyses will be performed by the EPA Region 2 DESA laboratory or the EPA Contract Laboratory Program as RAS or by EPA-ERT. Non-RAS analyses PCB congeners and dioxin/furan and all biological and fish tissue will be processed and analyzed by the EPA laboratories as discussed at the 18 December 2013 scoping meeting.

3.4.3 Non-Routine (Subcontracted) Analytical Services (Subtask 4.03) – Optional

Sediment toxicity, surface water toxicity, and hexavalent chromium analysis will be performed by non-RAS laboratories that will be subcontracted by LATA.

3.5 TASK 5: ANALYTICAL SUPPORT AND DATA VALIDATION

3.5.1 Collect, Prepare, and Ship Samples (Subtask 5.01)

This activity includes collecting, preparing and shipping the sediment, tissue, and surface water samples collected from the Creek channel and from the IDW drums in accordance with the QAPP. Sample shipments will be made each day after sample collection during the field program. One shipment of IDW samples will be sent at the end of the field program.

3.5.2 Sample Management (Subtask 5.02)

The Project Chemist will establish sample information in Scribe and print labels for the field team during site mobilization. The Project Chemist will coordinate with the field samplers to ensure that field data are collected in accordance with Scribe requirements. After sample collection, the Project Chemist will prepare Chain of Custody forms, shipping documents, and trip reports for all samples that will be analyzed by the EPA DESA, CLP and/or EPA-ERT or subcontract laboratories for toxicity testing and hexavalent chromium. The Project Chemist will ensure consistency between multiple laboratories and that all required parameters in the appropriate format so there are no difficulties preparing and uploading the EDD submittals. The LATA Team will ensure accurate chain-of-custody procedures for sample tracking, protective sample packing techniques, and proper sample-preservation techniques are implemented. The Project Chemist will also coordinate with the Regional Sample Control Coordinator (RSCC) and/or DESA laboratory regarding sample scheduling and sample shipment arrival. The Project Chemist will respond to questions from the RSCC over a six-week period.

3.5.3 Data Validation (Subtask 5.03) – Optional

All sample analyses performed by the EPA Region 2 DESA laboratory, the EPA CLP and/or EPA-ERT will be validated by the EPA. No data validation work will be performed by the LATA Team except for Non-RAS analyses (e.g., sediment toxicity, surface water toxicity, and hexavalent chromium). There are no formal validation procedures for the non-standard tests. Data validation will involve review of the laboratory report against the QAPP requirements and evaluation of quality control data.

3.6 TASK 6: DATA EVALUATION

All existing data and data collected during the previous tasks will be organized and evaluated as described below.

3.6.1 Data Usability Evaluation (Subtask 6.01)

Evaluation of the usability of existing data will be performed for the existing data outlined on Table 1 of Appendix A. Usability evaluations of the data generated in Task 3 will be performed in accordance with the approved UFP-QAPP. As the first step in the data evaluation process, the data will be examined to determine the usability of the electronic and hardcopy results. Specifically, the review will include the format of the hardcopy and electronic deliverables, the completeness of the data package, and the comments of the data validator. Data that was not formally validated will be validated and qualifiers determined and a data validation memorandum prepared. If a data package is determined to be unusable, the evaluator will immediately notify the RSCC who will then inform the analytical laboratory. The geologic and other field data will also be reviewed for completeness and usability.

Data usability for risk assessment purposes will be evaluated by completing the RAGS Part D Exhibit 3-3, the Data Usability Worksheet.

3.6.2 Document Reduction, Tabulation, and Evaluation (Subtask 6.02)

3.6.2.1 Database Development (Subtask 6.02.01)

A database of existing data as outlined on Table 1 of Appendix A will be developed. The sample data comprising the database, if available, will include:

- Location data;
- Collection date and time;
- Field sampling information (e.g., screening data and soil descriptions);
- Analytical results and qualifiers; and
- Quality Assurance (QA)/Quality Control (QC) results.

This subtask also includes formatting the existing data in accordance with EPA Region 2's Electronic Data Deliverable (EDD) requirements. The historical data from 2001 and 2010 will require additional data entry from analytical packages and field notes to complete all the required fields. GIS locations of NYSDEC data points will be checked against the field notes and existing reports and geo-referenced in the GIS database. The database will include a clear indication of the samples associated will each individual property based on reconciled locations and field notes.

This subtask also includes electronically formatting data generated in this WA in accordance with Region 2's EDD requirements. The data will be transmitted to EPA electronically. The following is an estimate of the number of data sets and data packages to be processed.

- Historical data (estimated two data packages) from fish tissue gathered as part of the food web modeling (ERS and USACE 2012) and historical sediment cores

collected by NYSDEC Eighteenmile Creek and Olcott Harbor Sediment Study (NYSDEC 2001) will require data validation and some hand entry to be formatted in accordance with EPA Region 2 EDD requirements.

- Existing data from 10 reports listed in Table 1 of Appendix A are available electronically and will be with processed to a format consistent with EPA Region 2 EDD requirements. Table 1 summarizes the number of samples included each report and what are the appropriate uses.

3.6.2.2 Data Reduction, Tabulation, and Evaluation (Subtask 6.02.02)

Historical data and data generated in this WA will be evaluated, interpreted, and tabulated in an appropriate presentation format for final data tables using the following general guidelines:

- Tables of analytical results for each matrix will be organized by property for each individual parcel. Table organization will be coordinated with the EPA WAM.
- Analytical results will not be organized by laboratory identification numbers. The sample location number will always be used as the primary reference for the analytical results, if available for the existing data.
- Analytical tables will indicate the sample collection dates, detection limits, and data qualifiers.
- Analytical results in the text, tables, and figures will be reported using a consistent convention of mg/kg for soil analyses.
- Field blank and field duplicate results will be evaluated and results eliminated based on field blanks will be consistent with EPA Region 2 data validation standard operating procedures and clearly explained.
- Discussion of approved sampling results will not be qualified by suggesting that a particular chemical is a common lab contaminant or was detected in the lab blank. If the reported result has passed QA/QC it will be considered valid. In cases where the chemical in question was known to have been used and/or disposed of on site, positively identified at high levels in other environmental media, and passes QA/QC protocols, the sampling results will not be questioned as being due to laboratory contaminants.
- Compile data will be presented in GIS format using the base map developed under Subtask 3.01.01.

3.6.3 Modeling (Subtask 6.03)

Modeling may be needed to complete an accurate characterization of the nature, extent, distribution, and movement of site contamination and to help identify additional potential source areas. The historical data and data collected in Task 3 of this WA will be evaluated to make an assessment of and recommendation for the need for modeling. As part of this evaluation and assessment, a work plan will be prepared to describe the scope and technical approach for performance of al modeling effort. A budget for the modeling effort will also be prepared. Work will not proceed with the modeling effort until formally directed to do so by the EPA.

3.6.4 Technical Memorandum (Data Evaluation Report) (Subtask 6.04)

The results of the data evaluation effort will be presented in a Data Evaluation Report (DER) that will be submitted for the EPA's review and approval. The report will:

- Include an evaluation of the historical data;
- Include a summary of the data generated in the optional field investigation and identify data gaps for future investigations; and
- A RAGS Part D Exhibit 3-3 Data Usability Worksheet will be completed and included in the report.

Figures, maps and tables produced under Subtask 6.02 will be evaluated and discussion of nature and extent of contamination and contaminant fate and transport will be added to the DER. A revised DER will not be prepared; however, responses to EPA's comments will be prepared and submitted. Any changes to the information presented in the DER will be incorporated into the Draft Supplemental I report.

3.7 TASK 7: ASSESSMENT OF RISK

After approval of the PAR prepared under Subtask 1.13, a HHRA will be prepared for the Creek Corridor. A Baseline Ecological Risk Assessment (BERA) will also be performed after completion of SLERA. The risk assessments will determine whether site contaminants pose a current or potential risk to human health or the environment in the absence of any remedial action. The risk assessment will address contaminant identification, exposure assessment, toxicity assessment, and risk characterization. The risk assessments will be used to determine whether remediation is necessary at OU3, provide justification for performing remedial actions, and determine what exposure pathways need to be remediated. An evaluation of existing data for use in the risk assessments is provided in Sections 3.2 and 3.3 of Appendix A. Data gaps and recommendations for collection of additional data are provided in Sections 5.2 and 5.3 of Appendix A. These discussions serve as the basis for the following work plan tasks.

3.7.1 Baseline Human Health Risk Assessment (Subtask 7.01)

A Baseline HHRA will be performed in accordance with the approach and parameters described in the approved PAR. The PAR must be reviewed and approved by the EPA prior to the submission of the Draft HHRA Report. Comments on the PAR will be incorporated into the draft HHRA.

Section 3.2 of the memorandum provided in Appendix A provides an evaluation of the site for HHRA.

Draft Baseline Human Health Risk Assessment (Subtask 7.01.01)

The HHRA will be performed in accordance with EPA risk assessment guidance. All applicable parts of EPA's RAGS, Human Health Evaluation Manual, Parts A, B, D, E and F, and associated and supplemental guidance documents will be considered.

The Draft HHRA will include the following:

- Characterization of Site: The physical characteristics of the site, its history, the site setting, nearby populations including potentially sensitive subpopulations, and the nature and extent of contamination will be described.
- Data Usability Assessment: The adequacy and usability of the available data for risk assessment purposes will be evaluated by completing the RAGS Part D Exhibit 3-3 Data Usability Worksheet.
- Hazard Identification: The contaminants of potential concern (COPCs) will be identified and described based on their intrinsic toxicological properties.
- Site Conceptual Model: The CSM will be updated as needed considering the COPCs identified and determine how the various exposure pathways and receptors will be evaluated (quantitatively or qualitatively).
- Exposure Point Concentrations: Exposure point concentrations (EPCs) will be calculated for the exposure areas and environmental exposure media identified for quantitative assessment in the CSM using the latest version of EPA's ProUCL statistical software package.
- Exposure Assessment: The exposure assessment will identify the magnitude of actual or potential human exposures, the frequency and duration of these exposures, and the routes by which receptors are exposed. In preparing the exposure assessment, reasonable maximum and central tendency (when appropriate) estimates of exposure for both current and potential land use conditions at OU3 will be developed. The rationale for use of site-specific over default exposure factors will be clearly explained and justified.
- Toxicity Assessment: The toxicity values (e.g., slope factors and reference doses) for the COPCs and the sources of the toxicity values will be listed according to EPA's current tiered approach (OSWER Directive 9285.7-53). If a toxicity value is not available from one of the preferred sources identified in OSWER Directive 9285.7-53, EPA's Regional Screening Levels (RSLs) table will be consulted. Any chemicals that are based on a Provisional Peer Reviewed Toxicity Value Appendix Value (PPRTVs) will be discussed in the risk characterization based on the considerable uncertainty associated with their derivation. Any toxicity values will be submitted to EPA for approval before use in the assessment.
- Risk Characterization: In the risk characterization, chemical-specific toxicity information will be combined with quantitative and qualitative information from the exposure assessment and measured contaminant levels to determine whether concentrations of contaminants at or near the site are affecting or could potentially affect human health. Estimated excess lifetime cancer risks will be compared to the range of risks generally considered acceptable by EPA – 10^{-6} to 10^{-4}. Hazard indices will be compared to a hazard index of 1, the highest value generally considered protective of human populations including sensitive subgroups while allowing an adequate margin of safety.
- Identification of Limitations/Uncertainties: Critical assumptions and uncertainties will be identified in the report.

Final Baseline Human Health Risk Assessment (Subtask 7.01.02)

EPA comments on the Draft HHRA Report will be incorporated and submitted with the Final HHRA Report, including RAGS Part D Tables.

3.7.2 Baseline Ecological Risk Assessment (Subtask 7.02)

Four deliverables were identified under Task 7.2 in the SOW for OU3 (dated September 2013): (1) Technical Memorandum; (2) SLERA; (3) Draft BERA; and (4) final BERA. The content of these deliverables is described below.

Screening Level Ecological Risk Analysis (Subtask 7.02.01)

Before preparing and submitting the SLERA, a Technical Memorandum that identifies proposed screening values for all media (including critical body residues for tissue data screening), assessment and measurement endpoints, representative receptors, and toxicity reference values (TRVs) will be developed. The EPA will review and approve the memorandum. If necessary, revisions to the Technical Memorandum will be made to produce a final, approvable version for the public record. The information provided in the Technical Memorandum will be used in the SLERA and ERA, although it is possible that the information may need to be revised or augmented based on the SLERA results.

A SLERA will be prepared and submitted in accordance with current Superfund ERA guidance (*Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments* [ERAGS], EPA, 1997 [EPA/540-R-97-006]). The SLERA (ERAGS Steps 1 and 2) will compare maximum contaminant concentration in each medium with conservative eco-toxicity screening values, and use conservative exposure estimates when assessing wildlife risks. The SLERA report will include screening tables for each medium of concern, a description of site habitats, measurement and assessment endpoints, TRVs, food-chain modeling inputs, and bioaccumulation factors (water-to-organism and sediment-to-organism). The EPA will review and approve the SLERA and determine whether a BERA is appropriate for the site. If necessary, revisions to the SLERA will be made to produce a final, approvable version for the public record. The primary purpose of the SLERA is to identify COPCs for further evaluation in a BERA.

Draft Baseline Ecological Risk Assessment Report (Subtask 7.02.02)

If EPA determines that a BERA for OU3 is required a draft BERA will be prepared that includes the following:

- A BERA problem formulation (ERAGS Step 3) that refines the preliminary COPC list from the SLERA, refines the ecological conceptual site model, selects final assessment and measurement endpoints for the BERA, and otherwise satisfies ERAGs Step 3 guidance.
- Characterization of Site and Potential Exposure Pathways: The BERA report will describe the ecological resources at the site, including aquatic habitats, wetlands, and threatened and endangered species, and identify potential ecological receptors and exposure pathways.
- ERAGs Steps 4 and 5: During the conduct of the BERA, the ecological risk assessor will provide input to the project team regarding the type and design of

field and laboratory studies needed to address the ecological data gaps that were identified for OU3 (see Section 3.3.5 for summary of studies to support the OU3 BERA). Study design, data quality objectives, sampling plans, and data analysis plans will be developed by the ecological risk assessor to address the data gaps and describe the use of the new data in the BERA.

- Exposure Assessment (ERAGs Step 6a): The exposure assessment will identify the magnitude of actual or potential ecological exposures, frequency and duration of the exposures, and routes by which receptors are exposed. The exposure assessment will provide a basis for developing acceptable exposure levels to site related contaminants. ProUCL version 5.0 will be used to develop exposure point concentrations for surface water, sediment, and other media.
- Toxicity Assessment/Ecological Effects Assessment (ERAGs Step 6b): The toxicity and ecological effects assessment will address the types if adverse environmental effects associated with chemical exposures, relationships between magnitude of exposure and adverse effects, and related uncertainties for contaminant toxicity (e.g., bioavailability, chemical form).
- Risk Characterization (ERAGs Step 7a): During risk characterization, chemical-specific toxicity information will be combined with quantitative and qualitative information from the exposure assessment and measured contaminant levels to determine whether concentrations of contaminants at or near the site are affecting or could potentially affect ecological receptors at the site.
- Identification of Limitations/Uncertainties (ERAG Step 7b): The BERA will describe critical assumptions and uncertainties in the report.

Final Baseline Ecological Risk Assessment Report (Subtask 7.02.03)

EPA comments on the Draft BERA Report will be incorporated in and submitted with a Final BERA Report. Prior to finalization of the BERA, responses to comments on the draft BERA will be approved by the EPA.

3.8 TASK 8: TREATABILITY STUDY AND PILOT TESTING – NOT APPLICABLE

3.9 TASK 9: SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT

Supplemental RI Report will be prepared to incorporate any new data collected under Task 3 and any existing data added under Subtask 6.01 to provide an overall assessment of the extent of contamination at the Creek Channel (OU3). The key contaminants will be selected based on persistence and mobility in the environment and the degree of hazard as outlined in the baseline HHRA and ERA. The key contaminants identified in the RI will be evaluated for receptor exposure and an estimate of the key contaminants level reaching human or environmental receptors must be made. LATA will use existing standards and guidelines, such as drinking-water standards, water-quality criteria, and other criteria accepted by the EPA, as appropriate, to determine nature and extent. The Baseline HHRA and ERA will be an integral part and consistent with the Supplemental RI Report.

3.9.1 Draft Supplemental RI Report (Subtask 9.01) – Optional

A Draft Supplemental RI Report will be prepared that will include the following sections as detailed in the SOW:

- Executive Summary
- Introduction
- Study Area Investigation
- Physical Characteristics of the Study Area
- Nature and Extent of Contamination
- Contaminant Fate and Transport
- Baseline Risk Assessment
- Summary and Conclusions
- Conclusions
- References
- Tables and Figures
- Appendices

The sections will on new or changed conditions from the existing EPA GLLA RI report and will be as brief as possible (CH2MHill and EEEPC 2012). The Baseline HHRA and ERA sections of the RI report will include the findings and conclusions of the risk assessments prepared by the LATA team under Task 7. The supplemental RI report appendices will include the HHRA, ERA, data analysis, log books, soil boring logs, analytical data, QA/QC evaluation results, and other information relevant to the Supplemental RI.

3.9.2 Final Supplemental RI Report (Subtask 9.02) – Optional

EPA comments on the Draft Supplemental RI Report will be incorporated and submitted with a Final Supplemental RI Report.

3.10 TASK 10: REMEDIAL ALTERNATIVES SCREENING

This task will be performed to develop remedial alternatives that will undergo a comprehensive evaluation. Based on existing data, the results of the additional investigation activities and the HHRA and BERA risk assessments, hazardous waste management alternatives will be evaluated to determine if the measures selected to remediate or control contaminated sediments remaining in the Creek Channel will provide adequate protection of human health and the environment. The potential alternatives will encompass a range of alternatives in which treatment is used to reduce the toxicity, mobility, or volume of wastes. However, these alternatives will vary in the degree to which long-term management of residuals or untreated sediment is required and will include a no-action alternative.

3.10.1 Draft Technical Screening Memorandum (Subtask 10.01)

A Draft Technical Screening Memorandum presenting the existing and potential alternatives will be prepared. The Draft Technical Screening Memorandum will include the following information:

- **Establish Remedial Action Objectives.** Based on existing information and the completed HHRA and BERA, site-specific remedial action objectives (RAOs) will be identified and developed to protect human health and the environment. The

objectives will specify the contaminant(s) and media of concern, the exposure route(s) and receptor(s), and an acceptable contaminant level or range of levels for each exposure route (i.e., preliminary remediation goals).

- **Establish General Response Actions.** General response actions for each medium of interest by defining contaminant, treatment, excavation, or other actions, singly or in combination will be developed to satisfy remedial action objectives. The general response actions include: no action; institutional controls (ICs); monitored natural recovery (MNR); In situ capping; in situ treatment; and removal technology. The response actions will take into account requirements for protectiveness as identified in the RAOs as well as the chemical and physical characteristics of the site.
- **Identify and Screen Applicable Remedial Technologies.** Applicable remedial technologies will be identified and screened based on the developed general response actions. Hazardous waste treatment technologies will be identified and screened to ensure that only those technologies applicable to the contaminants present, their physical matrix, and other site characteristics will be considered. This screening will be based primarily on a technology's ability to effectively address the contaminants at the site, but will also take into account a technology's implementability and cost to select options, as appropriate, to carry forward into alternative development. The need for treatability testing for those technologies that are probable candidates for consideration will be identified during the detailed analysis. Any SEDA modeling completed under Subtask 6.03 also will be considered during detailed analysis.
- **Develop Remedial Alternatives in accordance with National Contingency Plan.** The development of the remedial alternatives will be completed in accordance with the NCP and other guidance outlined in the SOW.
- **Screen Remedial Alternatives for Effectiveness, Implementability, and Cost.** Remedial alternatives will be screened to identify the potential technologies or process options that will be combined into media-specific or sitewide alternatives. The developed alternatives will be defined with respect to size and configuration of the representative process options; time for remediation; rates of flow or treatment; spatial requirements; distances for disposal; and required permits, imposed limitations, and other factors necessary to evaluate the alternatives. If many distinct, viable options are available and developed, the remedial alternatives will undergo a detailed analysis to provide the most promising process options and these options will be screened on a general basis with respect to their effectiveness, implementability, and cost.

3.10.2 Final Technical Screening Memorandum (Subtask 10.02) – Not Applicable

3.11 TASK 11: REMEDIAL ALTERNATIVES EVALUATION

First, the relevant provisions of the NCP and associated EPA guidance will be consulted to determine whether remediation may be needed, and if so, what environmental media and locations need to be addressed.

This task includes efforts associated with the assessment of individual alternatives against each of the nine evaluation criteria and a comparative analysis of all options against the criteria. The analysis will be consistent with the NCP and will consider the Guidance for

Conducting Remedial Investigations and Feasibility Studies under CERCLA and other pertinent OSWER guidance. EPA will make the determination regarding the final selection of remedial alternatives.

Up to five new remedial alternatives will be identified for each of the five homogeneous EA evaluated under the HHRA and BERA as part of Task 7. These alternatives will be evaluated and included in the Draft Technical Evaluation Memorandum prepared for this subtask. The existing data and any new data collected under Task 3 will be used to better delineate the extent of contaminated sediment within the Creek Channel to estimate removal volumes.

All remedial alternatives will be evaluated against the nine evaluation criteria listed below:

- Overall protection of human health and the environment;
- Compliance with the Applicable or Relevant and Appropriate Requirements (ARAR);
- Long-term effectiveness and permanence;
- Reduction in toxicity, mobility, or volume through treatment;
- Short-term effectiveness;
- Implementability – technical and administrative;
- Cost;
- State acceptance; and
- Community acceptance.

ARARS developed for OU2 will be used as the basis for OU3. The ARARs will be reviewed and site-specific ARARs applicable for OU3 will be identified for the alternatives evaluation. A comparative analysis of all the alternatives against the evaluation criteria listed above will also be performed.

3.11.1 Draft Technical Evaluation Memorandum (Subtask 11.01)

A Draft Technical Evaluation Memorandum will be prepared that includes the following:

- A technical description of each alternative that outlines the waste management strategy involved and identifies the key ARARs associated with each alternative.
- A discussion that describes the performance of each alternative with respect to each of the evaluation criteria and a table summarizing the results of this analysis. Once the individual analysis is complete, the alternatives will be compared and contrasted to one another with respect to each of the evaluation criteria.

3.11.2 Final Technical Evaluation Memorandum (Subtask 11.02) – Not Applicable

3.12 TASK 12: FS REPORT

A Draft FS Report consisting of a detailed analysis of any new or changed alternatives will be prepared. The Draft FS report will include a cost-effectiveness analysis in accordance with the NCP and current EPA Feasibility Study Guidance. Three bound copies and an electronic copy of the Draft and Final FS reports will be submitted to the EPA.

3.12.1 Draft FS Report (Subtask 12.01)

A Draft FS Report will be prepared for the OU3 areas. To expedite the development of this report, close contact will be maintained with the EPA WAM throughout the execution of this subtask. Drafts of the chapters will be submitted to the WAM for review as they are developed. The Draft FS Report will be a stand-alone document, incorporating (e.g., text, figures, and tables) pertinent information from the RI and will contain the following:

- Feasibility Study Objectives;
- Remedial Objectives;
- General Response Actions;
- Identification and Screening of Remedial Technologies;
- Remedial Alternatives Description;
- Detailed Analysis of Remedial Alternatives; and
- Summary and Conclusions.

3.12.2 Final FS Report (Subtask 12.02)

After EPA's review, EPA comments on the Draft FS Report will be incorporated into the Final FS Report.

3.13 TASK 13: POST RI/FS SUPPORT

The LATA Team will provide technical support for EPA's preparation of the ROD excluding those activities addressed under Task 2.

3.14 TASK 14: NEGOTIATION SUPPORT – NOT APPLICABLE

3.15 TASK 15: ADMINISTRATIVE RECORD – NOT APPLICABLE

3.16 TASK 16: WORK ASSIGNMENT CLOSEOUT

Upon direction from EPA, the LATA Team will perform the necessary activities to close out this WA in accordance with contract requirements. After WA closeout activities have been completed, the LATA Team will retain the WA files in accordance with Clause H.34, "Retention and Availability of Contractor Files."

3.16.1 Revised Work Plan Budget (Subtask 16.01)

A revised work plan budget will be prepared with the actual costs incurred and the estimate to complete the closeout activities.

3.16.2 Document Indexing (Subtask 16.02)

At the conclusion of this WA, the LATA Team will organize the WA files and provide an index to the Project Officer. At a minimum, the index will contain the following information:

- Project Name and WA Number (in a heading on top of the list); and

- Document date (the documents will be sorted chronologically by date, beginning to end), description/subject of document, who sent the document and who received the document.

The documents to be indexed will include all final deliverables, WA amendments, and working files that may need to be accessed to provide information on why certain technical decisions were made.

3.16.3 Document Retention/Conversion (Subtask 16.03)

The LATA Team will convert all indexed documents into PDFs and prepare CDs containing the indexed documents. The CDs will be delivered to the Project Officer within 45 days of approval of the revised work plan budget.

The boxes of files indexed in Subtask 16.02 will be retained by LATA in accordance with Clause H.34, “Retention and Availability of Contractor Files.”

4.0 PROJECT MANAGEMENT APPROACH

4.1 PROJECT ORGANIZATION

Mr. Colvin, the LATA RAC2 Program Manager, is the primary POC with EPA on the RAC2 contract and this WA. He has overall responsibility for the successful execution of this project, including communicating any project issues that may affect the cost, LOE hours, scope, or schedule to the EPA WAM.

The Project Manager (PM) is Ms. Marcia Galloway of E & E. As the PM, Ms. Galloway will ensure that the day-to-day communications will not result in action taken by E & E personnel that will impact WA cost, LOE hours, scope, and/or schedule. She has the primary responsibility for: development of the Work Plan, Work Plan Budget, and other associated plans; acquisition of specialized technical support including graphic illustrators, editors, community involvement, and engineering and science staff required for WA delivery; and all aspects of the day-to-day activities associated with the project. Ms. Galloway will identify staff requirements, direct and monitor progress, and ensure implementation of quality procedures and adherence to applicable codes and regulations. She will also be responsible for project performance within the established budget and schedule and will oversee the daily activities of E & E personnel. Ms. Galloway is also the Remedial Investigation Lead for this project.

Assisting Ms. Galloway will be two key project personnel: Preetam R. Kuchikulla P.E. (Feasibility Study Lead); and Deepali McCloe (Community Relations Lead). Technical support personnel will include engineers, scientists, and specialists for the execution of task activities including project planning and management, data management, and document preparation and review.

4.2 PROJECT SCHEDULE

The following is the anticipated order in which the subtasks will be performed:

TASK/SUBTASK	DESCRIPTION
3.01	Cultural Resource Assessment
6.01.01	Validation of Existing Data
6.02.01	Database Development for Historical Data
6.02.02	Data Evaluation Tables of Historical Data
7.02.01	Technical Memorandum
7.02.01	SLERA
	Assess Additional Data Needs
1.07	QAPP
1.08	HASP
3.0	Field Investigation
5.03	Data Validation Reports
6.01.01	Validation of New Data
6.02.01	Database Development for New Data
6.02.02	Data Evaluation Tables of New Data
6.04	Data Evaluation Report
1.13	Pathways Analysis Report
7.01.01	Draft Baseline Human Health Risk Assessment Report
7.02.02	Draft Ecological Risk Assessment Report
7.01.02	Final Baseline Human Health Risk Assessment Report
7.02.03	Final Ecological Risk Assessment Report
9.01	Draft Supplemental RI Report
9.02	Final Supplemental RI Report
10.01	Draft Technical Screening Memorandum
11.01	Draft Technical Evaluation Memorandum
12.01	Draft Feasibility Study Report
12.02	Final Feasibility Study Report
16.01	Revised Work Plan Budget

4.3 PROJECT DELIVERABLES

Exhibit 4-1 summarizes the project deliverables.

4.4 BUDGET ESTIMATE

The budget estimate for completing the activities described in this work plan has been provided under separate cover.

Exhibit 4-1

Eighteen Mile Creek Superfund Site RI/FS OU3
Summary of Major Submittals

SUB TASK	SUBMITTAL	DUE/ACTUAL DATE
1.04	Draft RI/FS Work Plan and Budget	14 February 2014
1.05	Revised RI/FS Work Plan and Budget	15 days after negotiation
1.06	Evaluation of Existing Data Memorandum	27 January 2014
1.07	QAPP	TBD
1.08	HASP	TBD
1.10	Meeting Minutes	5 days after meeting
1.13	Pathways Analysis Report	21 days after submission of Data Evaluation Report, submitted under Subtask 6.04
2.02	Community Relations Plan Update	14 days after last interview
3.01	Cultural Resource Assessment	90 days after Work Plan Approval
5.03	Data Validation Reports	30 days after receipt of all analytical results from laboratory
6.03	Assessment of Modeling Needs	15 days of EPA's direction of modeling needs
6.04	Data Evaluation Report	30 days after completion of Subtask 6.02
7.01.01	Draft Baseline Human Health Risk Assessment Report	45 days after approval of Pathways Analysis Report, submitted under Task 1.13
7.01.02	Final Baseline Human Health Risk Assessment Report	14 days after receipt of EPA final comments
7.02.01	Technical Memorandum	The Technical Memorandum will be submitted 21 days after submission of the Data Evaluation Report, submitted under Subtask 6.04.
7.02.02	Screening Level Ecological Risk Assessment (SLERA)	The SLERA will be submitted within 45 days after submission of the DER under Subtask 6.04.
7.02.03	Draft Baseline Ecological Risk Assessment Report (BERA)	The Draft BERA Report will be prepared upon receipt of EPA's direction.
7.02.03	Final BERA	14 days after receipt of EPA final comments on the Draft BERA Report
9.01	Draft Supplemental RI (SRI) Report	90 days after Approval of Data Evaluation Report (Subtask 6.04).
9.02	Final Supplemental RI Report	30 days after receipt of EPA comments on the Draft Supplemental RI submitted under Subtask 9.01.
10.01	Draft Technical Screening Memorandum	60 days after submission after final supplemental RI report

SUB TASK	SUBMITTAL	DUE/ACTUAL DATE
10.02	Final Technical Screening Memorandum	Not applicable. EPA comments on the Draft Technical Screening Memorandum will be addressed in the Draft Technical Evaluation Memorandum under Subtask 11.01.
11.01	Draft Technical Evaluation Memorandum	30 days after receipt of EPA comments on the Draft Technical Screening Memorandum submitted under Subtask 10.01.
11.02	Final Technical Evaluation Memorandum	Not applicable. EPA comments will be addressed in the Draft FS Report under Subtask 12.01.
12.01	Draft Feasibility Study (FS) Report	45 days after receipt of EPA comments on the Draft Remedial Alternatives Evaluation Memorandum submitted under Subtask 11.01.
12.02	Final Feasibility Study Report	30 days after receipt of EPA final comments on the Draft FS Report submitted under Subtask 12.01.
16.01	Revised Work Plan Budget	Within 30 days of EPA's direction for closeout

5.0 REFERENCES

An inventory of the technical documents reviewed is provided in Table A-1 of Appendix A. The following is a list of specific references highlighted in the Draft Work Plan.

CH2M HILL, Inc. and Ecology and Environment Engineering, P.C. (EEEPC). 2012. *Draft Remedial Investigation Report, Eighteenmile Creek, Remedial Investigation / Feasibility Study, Niagara County, New York.* Prepared for USEPA Region 5 RAC2 by CH2M HILL, E & E, and others. WA No. 139-RICO-1527/Contract No. EP-S5-06-01.

Ecology and Environment, Inc. (E & E). 2009. *Eighteenmile Creek Beneficial Use Impairment Assessment. Niagara County, New York.* Prepared for the Niagara County Soil and Water Conservation District.

Ecology and Environment, Inc. (E & E). 2007a. *Eighteenmile Creek State of the Basin Report.* Prepared for the U.S. Army Corps of Engineers.

Los Alamos Technical Associates, Inc. (LATA) and E & E. 2014. *Evaluation of Existing Data for the Eighteenmile Creek Superfund Site OU3*. Prepared for the USEPA Region 2 RAC2 by LATA and E & E, WA , 011-RICO-0269/Contract Number EP-W-10-007.

New York State Department of Environmental Conservation (NYSDEC). 2001. *Final Report, Eighteenmile Creek Sediment Study, Summary of August 17-20 and November 3, 1998 Results*. Prepared by the Division of Water.

United States Environmental Protection Agency (EPA). 2007 *Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments [ERAGs],* EPA/540-R-97-006

Appendix A
Evaluation of Existing Data, Eighteenmile Creek Superfund Site, Operable Unit 3

Evaluation of Existing Data
Eighteenmile Creek Superfund Site
Operable Unit 3
City of Lockport, Niagara County
New York

June 2014
Revision 01

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 2
290 Broadway
New York, New York 10007-1866

Prepared by:

ECOLOGY AND ENVIRONMENT, INC.
368 Pleasant View Drive
Lancaster, New York 14086

Los Alamos Technical Associates, Inc.

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1 Overview

Introduction

This work is being performed under U.S. Environmental Protection Agency (EPA) RAC2 Contract Number EP-W-10-007. The Original Work Assignment Form (WAF) for the Remedial Investigation/Feasibility Study (RI/FS) to be performed by Los Alamos Technical Associates (LATA) for the Eighteenmile Creek Site – Operable Unit 3 (OU 3) (Site) was issued on September 23, 2013. Ecology and Environment, Inc. (E & E) is a Team Subcontractor to LATA on this contract and has the lead technical role in this project. WAF Amendment 001 was issued on December 27, 2013, to revise the project schedule based on the results of the December 18, 2013, scoping meeting. The information in this memorandum will be included in the Revised Work Plan (Revision 01) for this Work Assignment.

Site Overview

Eighteenmile Creek Superfund Site is a National Priorities List (NPL) hazardous waste site under investigation pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund.

The Eighteenmile Creek Superfund Site (Site) is located in Niagara County, New York, on the south side of Lake Ontario (see Figure 1). The main branch of Eighteenmile Creek (the Creek) flows north for approximately 15 miles and discharges into Lake Ontario in Olcott, New York. Much of the flow in the main branch of Eighteenmile Creek comes from water diverted from the New York State Barge Canal (Canal). Eighteenmile Creek watershed also includes the two main tributaries, the east branch and the Gulf Creek, and minor tributaries. The Site consists of contaminated sediments, soil and groundwater in and around the Creek.

To address the cleanup of this Site, EPA has divided the Site into three separate operable units (OUs). OU1 will address contaminated soil at the residential properties on Water Street in Lockport, New York, and also address conditions of a building located on the former Flintkote Plant property (former Flintkote Building). The EPA completed a Record of Decision (ROD) for OU1 on September 30, 2013. OU2 is part of the Eighteenmile Creek corridor (the Creek Corridor), which extends from the Creek's headwaters at the Canal to Harwood Street in Lockport (see Figure 2). OU2 will address contaminated sediments and soil in other areas of the Creek Corridor including the banks of the Residential

Properties of OU1. OU3 will address contaminated sediment in the Creek from the north end of the Creek Corridor in Lockport to the mouth of the Creek in Olcott, New York, where the Creek discharges into Lake Ontario (see Figure 2).

For OU1 and OU2 as defined by the EPA, the New York State Department of Environmental Conservation (NYSDEC) completed a RI/FS and ROD for the Flintkote Plant property and separate RI/FS and ROD for the remainder of the Creek Corridor. For OU3, EPA completed an RI under the Great Lakes Legacy Act (GLLA) program for contaminated sediment in the Creek channel (CH2MHill and EEEPC 2012). The EPA GLLA RI for contaminated sediment also compiled historical sediment data some which included some of the NYSDEC sediment data from OU2. Past studies, site information and existing analytical data from these studies and others were evaluated to determine whether additional data are needed to develop a complete conceptual model for OU3, understand fate and transport of sediment in the Creek, and assess risk to human and ecological receptors. The results of the evaluation are presented in this technical memorandum.

2 OU3 Background

This section includes a description of OU3 and a summary of existing conditions and previous investigations. All of the reports reviewed for this technical memorandum are listed in Appendix A. A description of the data available from each report is presented in Table 1.

2.1 Site OU3 Description

OU3 is defined as the portion of Eighteenmile Creek channel downstream of OU2, or the Creek channel north of Harwood Street. A sediment thickness survey was conducted in November 2010 as part of the EPA GLLA RI. The survey was conducted for shallow portions of the Creek up to the Burt Dam impoundment and included taking measurements of bank-to-bank (bankfull) width (i.e., the width that water begins to leave the channel and discharge onto the floodplain), water depths, and sediment thickness. The width of OU3 is defined as the Creek channel within the bankfull width.

Downstream of the Harwood Street, the creek drops down the Niagara Escarpment and winds through approximately 12 miles of rural Niagara County to Burt Dam. This portion of Eighteenmile Creek passes through the towns of Lockport and Newfane. The land use within this portion of Eighteenmile Creek watershed consists primarily of cropland and orchards, with residential, commercial, and small industrial areas located closer to the city of Lockport and around Newfane. (Newfane includes the hamlet of Newfane on Route 78, centrally located in the town and on the east bank of Eighteenmile Creek [see Figure 2]). Several other industrial facilities and inactive hazardous waste sites are located along or in the vicinity of Eighteenmile Creek, including the City of Lockport Wastewater Treatment Plant, VanDemark Chemical, Inc., and the Old Upper Mountain Road Landfill site on Gulf Creek.

Several dams were also constructed to provide power in the more level areas near Newfane, two of which two remain today. Newfane Dam was built in the 1830s near the end of McKee Street and Ewings Road to provide power for the Newfane mill district. Burt Dam was built farther north of Newfane in 1924, creating a 95-acre reservoir within the creek gorge; the reservoir extends approximately 2 miles upstream of the dam. The original dam generated power until the 1950s; it was restored in 1988 and still operates.

Two major tributaries flow into the main channel of Eighteenmile Creek: the stream that drains the northwestern part of Lockport and flows through a ravine known as the Gulf (hereinafter referred to as Gulf Creek) and the East Branch of Eighteenmile Creek. Gulf Creek enters the main channel just north of the Lockport Wastewater Treatment Plant. The East Branch of Eighteenmile Creek enters the main channel just north of Ridge Road.

Eighteenmile Creek was divided into smaller investigation areas, or reaches, based on the physical characteristics of the Creek observed during previous investigations (see Figure 2). The Creek length was determined by digitizing a center line based on review of aerial photographs. The center line was used to establish distance markers along the length of the creek, with zero starting at the headwaters of the Creek at the Erie Canal (using the Headwaters West Branch) and ending at the mouth of the Creek at Lake Ontario.

- **Reach 1** consists of the Creek channel from Burt Dam to the discharge point of the Creek into Lake Ontario. Fisherman's Park is located immediately below the dam and extends through the shallow areas of the channel. The channel deepens and flows approximately 2 miles into Olcott Harbor. The area is also deemed to have "Archeological Sensitivity" by SHPO (accessed at http://pwa.parks.ny.gov/nr/). Olcott Harbor has two parallel foot piers at the entrance with a 12-foot-deep and 140-foot-wide federally maintained navigation channel.
- **Reach 2** consists of the impoundment immediately upstream of Burt Dam. A bathymetric survey conducted by the EPA in 2009 reported shorelines with steep to near vertical slopes and water depths ranging up to about 37 feet. The historic creek channel is still evident throughout most of the survey area. Measurements along transects at the upstream end of the impoundment found sediment thicknesses averaging about 13 feet. The area is similar to other deep lake environments.
- **Reach 3** is characterized by the historic stream channel that was flooded after installation of the dam. The delineation between Reaches 2 and 3 was an estimated boundary marking the separation of the deeper water from the portion of the Creek where the impounded water meets the upstream creek flow. Large sediment deposition areas have formed where the swiftly moving upstream creek flows into the impoundment area and the flow velocities drop quickly. The reach has surrounding marsh and forested wetland areas that were historically flooded.
- **Reach 4** is relatively swift moving and includes comparatively few sediment depositional areas of shallower depths. Sampling locations include areas where sediment was deposited due to obstructions or decrease in flow velocities, near the marshes and old floodplains, and near outfalls. The reach has surrounding marsh and forested wetland areas near Ide Road that were historically flooded.

- **Reach 5** consists of the impoundment area behind Newfane Dam and includes deep water and thick sediment. The dam is privately owned but non-functional and there is the potential for the dam to be removed in the future. The deep water impoundment extends approximately 0.7 miles upstream.
- **Reach 6** is characterized by limited access, relatively shallow sediment deposition areas, and higher flow velocities. There are two isolated Creek oxbow channels and one forested wetland where contaminated sediment may have been deposited during historical overbank flooding. Several outfalls from the Newfane area and agricultural drainage areas may have also contributed contaminants to the Creek. The reach is generally defined by the confluence of the main channel and East Branch of Eighteenmile Creek. The added flow from the East Branch generally increases the flow velocity and reduces the potential for sediment deposition.
- **Reach 7** is characterized by limited access and large stretches of slowly moving water and high sediment deposition. Reach 7 begins at the bottom of the Niagara Escarpment and continues downstream for almost 5 miles to the East Branch confluence. There are several floodplains and drainage areas along the Creek.

2.2 OU3 Summary of Existing Site Conditions

Detailed descriptions of the existing site conditions are provided in previous study reports listed in Table 1. A summary of key points is provided below.

- The most prominent topographic feature in Eighteenmile Creek watershed is the Niagara Escarpment. The watershed is located within both the Ontario and Huron plains, two relatively flat plains that are separated by the escarpment, which runs generally east-west along the northern portion of the city of Lockport. OU3 lies within the Ontario Plain (from Lake Ontario to the Niagara Escarpment), elevations range from 245 feet above mean sea level (AMSL) at the shoreline to approximately 400 feet AMSL at the toe of the escarpment.
- OU3 is also influenced by man-made structures on the Creek, including two dams. Burt Dam is a 600-kilowatt hydro-generating facility currently owned by the Algonquin Power and Utilities Corporation. This run-of-river facility consists of a dam with an integrated intake structure, powerhouse, and tailrace. The facility was reconstructed in 1987 from an old hydroelectric generating plant at the site of an existing dam. Under terms of an agreement with the Federal Energy Regulatory Commission (FERC), the New York State Department of Transportation (NYSDOT) issued a permit in which they agreed to provide a diversion of excess water from the Erie Canal to augment the natural flow of Eighteenmile Creek to maintain a flow of 400 cubic feet per second (cfs) at the dam. The maintenance of this flow to the dam will need to be considered during the development of any remedial alternative. The height of the dam at the crest elevation is

49 feet which raises the water elevation up to 49 feet above the natural elevation of the Creek. The bathymetry survey behind the dam indicates the current water depth is 30 to 35 feet (CH2MHill and EEEPC 2012). Newfane Dam is privately owned and not operational, but the dam does restrict flow and retain water and sediment behind it.

- Sediment contaminated with PCBs and metals has been identified along the entire 15-mile length of the main branch of Eighteenmile Creek. The Creek Corridor (i.e., OU2) has been identified as the source area for PCBs and metals for the entire 15-mile length.
- As part of the Phase 1 reconnaissance conducted for the EPA GLLA, 36 drainage areas and eight outfalls were identified and mapped along Reaches 3 to 7. The potential for these outfalls as sources of contamination were investigated by locating sampling points downstream of the outfalls. Results indicated that the outfalls could be potential sources of lead and PAHs.
- Eighteenmile Creek provides important fish and wildlife habitat. A portion of Eighteenmile Creek 1.5 miles downstream of Burt Dam is designated by the New York State Department of State (NYSDOS) as a Significant Coastal Fish and Wildlife Habitat (SCFWH), and the Creek's estimated 65 acres of emergent and submerged aquatic vegetation comprise one of the largest coastal wetlands along the southwestern shore of Lake Ontario (NYSDOS 1987). The portion of Eighteenmile Creek downstream of Burt Dam is considered a significant recreational resource due to the large numbers of coho and chinook salmon and brown trout that migrate into the creek from Lake Ontario each fall, when these fish ascend the stream to spawn. Because of the fish habitat, Eighteenmile Creek is the second most visited fishing destination in the Lake Ontario basin, attracting up to 15,000 anglers annually (NYSDEC 2007a). The Creek habitat in most of the upstream reaches has not been characterized, and the potential impacts of remediation on habitat have not been addressed.

2.3 OU3 Summary of Existing Data

Detailed descriptions of existing data are provided in the previous study reports listed in Table 1. The usability of data for evaluating fate and transport and assessing risk is summarized in Table 1 and discussed in Section 3. Table 1 also summarizes the sediment data that was included in the EPA GLLA RI. A general summary of the existing studies is presented below:

- Many of the early investigations in the 1990s focused on the evaluation of sediment and water quality to address impacts to the creek below Burt Dam within Eighteenmile Creek Area of Concern. A limited number of older studies were conducted between Burt Dam and Lockport, New York. These investigations were completed under standard, statewide monitoring protocols implemented by the New York State Department of Health. The data are useful for understanding the fate and transport of contaminants of

concern through the watershed. The earlier studies demonstrated the link between the Canal and a broad list of contaminants transported in water that could originated as far away as Lake Erie and the Niagara River, and migrated to Eighteenmile Creek via the Canal.

- The early studies also identified potential sources of specific contamination for PCBs and metals in the OU2 Creek Corridor. The subsequent studies completed in the OU3 portion of the Creek focused on the nature and extent of these specific contaminants. Other contaminants, such as volatile organic compounds (VOCs), pesticides, and polychlorinated dibenzodioxins and dibenzofurans (dioxins/furans), were not found at levels determined to be significant by NYSDEC in the OU2 Creek Corridor site investigations and, therefore, were not considered contaminants of concern for the OU3 portion of the Creek and, thus, were not analyzed in many samples.
- Previous investigations have focused on PCBs and select metals as the primary site-related contaminants. More limited data are available for semivolatile organic compounds (SVOCs), other metals, and pesticides. Very limited data are available for dioxins/furans and VOCs. SVOC analyses were often limited to a list of 16 polynuclear aromatic hydrocarbons (PAHs).
- Previous investigations also established a significant bioaccumulation potential for PCBs in fish tissue. The earliest studies focused on Reach 1 below Burt Dam, but more recent investigations included collection of fish tissue data behind Burt Dam and Newfane Dam.

3 Data Evaluation

The usability of data for evaluating fate and transport and assessing risk is summarized on Table 1. Data generated within the last 10 years are considered potentially usable and representative of current site conditions. Data are considered usable if the results were generated under acceptable quality practices and methods. Not all of the data has been formally validated, but if supporting analytical reports are available to perform validation, it is expected that the data would be found to be usable for risk assessment purposes. Table 1 indicates the studies that contain data that can be imported into a database for the current RI. Table 1 also indicates the reports that have data that will require validation prior to using the data for the current RI. In addition, the EPA GLLA RI focused on the sediments in the OU3 portion of the Creek. As part of this RI, the all existing sediment data collected prior to 2012 were evaluated for usability and compiled into a sediment database. Table 1 summaries the number of sediment samples already compiled for PCBs and other contaminants. An estimate number of sample results available for specific data uses also are summarized in Table 1. However, additional evaluation for each contaminant and media is required.

The total number of samples from existing reports for all media is summarized in Table 2. The sufficiency of the data for evaluating fate and transport of contaminants and assessing risk is described below. Data gaps identified as part of the data evaluation process are summarized in Section 5.

3.1 Fate and Transport of Contaminants

3.1.1 Groundwater

There is no information on groundwater aquifers or the interaction of groundwater with the Creek in OU3 and it has not been evaluated as potential route of contaminant transport. Groundwater was not evaluated in OU3 because OU3 is focused on the Creek channel as a receptor of contaminated sediment from OU2. The primary contaminants at OU2 were PCBs and lead, and the groundwater at OU2 had not been impacted by these contaminants (except for an isolated elevated level of PCBs in 198-F). Any PCBs in the groundwater from this location can only migrate to OU3 via seepage of groundwater to the Creek.

3.1.2 Surface Water

Surface water has not been extensively sampled as part of previous investigations. As part of regional studies, the EPA has conducted semiannual monitoring of surface water discharge from Eighteenmile Creek and several other tributaries (EPA

2011). The current analytical program includes PCBs, mercury, and total suspended solids (TSS). Earlier monitoring events included DDT metabolites (2002 to 2006) and dioxins (2002 to 2003). NYSDEC evaluated the monitoring data from 2002 to 2008 to provide estimates of loading of synthetic chemicals into Lake Ontario from several New York tributaries with special emphasis on dioxins (NYSDEC 2009a). The data indicate that since 2002, Eighteenmile Creek had the highest PCB concentrations in surface water relative to other major tributaries to Lake Ontario. Further discussion of PCBs is provided in Section 4.

3.1.3 Sediment

Sediment has been extensively sampled as part of previous investigations and is discussed further as part of the human and health and ecological risk evaluation. Sediment transport and erosion are discussed in Section 4. The available sediment data are summarized on Table 2 and described below.

Early sediment studies focused on the sediment in Reach 1 and the impoundments behind Burt Dam and Newfane Dam. The EPA GLLA RI focused on the sediments in the OU3 portion of the Creek. Based on a Phase 1 reconnaissance survey, the sample locations in the EPA GLLA RI were originally chosen to be representative of the sample deposition zones or to be downstream from potential sources, such as tributaries, outfalls, or drainage ditches. Based on the expected areas of sediment deposition and thickness, the original sampling plan proposed to target one sample per 500 feet of Creek in Reach 4, one sample per 200 feet of depositional area in Reach 6, and one sample per 100 feet of depositional area in Reach 7. The findings of the first phase of sampling indicated that depositional zones are present throughout creek bed in Reaches 6 and 7 and that targeting of specific depositional zones may not be representative. Statistically, evaluation of the sample location data attempted several scenarios, such as a Visual Sampling Plan and a geo-statistical approach using Voronai polygons. Because of the winding, narrow, linear features of the main Creek channel, a statistical approach to selecting sample locations was not effective. Therefore, as part of second phase of sampling, samples locations were selected to fill data gaps as follows:

- The distance between existing sample locations was evaluated. New sample locations targeted areas with large distances between sample locations (i.e., greater than 500 feet) to provide a greater extent of coverage.
- Sample locations also were chosen near samples that had higher concentrations of PAH and metals and potential sources that were not related to upstream areas in Lockport.
- Confirmation samples were selected to be located near samples with hazardous levels of PCBs (i.e., greater than 50 ppm) and lead. In addition, the difference between concentrations in a sample and the sample's nearest neighbor also were evaluated. Samples were added to between these locations to better define the extent of contamination.

- Additional samples also were collected upstream in the East Branch and Gulf Creek to establish background conditions as well as evaluate potential sources.

The EPA GLLA RI concluded that the PCBs concentrations at the confirmation locations were lower, but high PCBs concentrations were identified at new locations. The results indicate the high variability of the PCB concentrations in the Reach 7 sediment.

For Olcott Harbor and the Town of Newfane marina, the historical data sediment chemistry at depth in the sediments was limited. The subsurface sediments in Olcott Harbor were sampled by NYSDEC in 1994 and no PCBs were detected and the concentration of metals in the subsurface sediments was not higher than surface sediment concentrations of metals. Therefore, based on the 1994 study, none of the subsequent studies evaluated subsurface sediments in this area. Surface sediments were sampled and analyzed for PCBs by the USACE in 2010 and sediments in the federal navigational channel were sampled in 2013. The surface sediment concentrations were lowest in the Newfane area in 2010. In 2013, the USACE determined the sediment in the federal navigation channel at the mouth of the Creek was suitable for open lake disposal. The specific sample results were not obtained. As part of a new proposed dredging plan for the Town of Newfane marina, sediment cores were collected at locations throughout the marina and draft results were provided to NYSDEC as part of the dredging permit. The data appear usable for assessing contaminants in subsurface sediments and the final report and original data can be obtained once submitted to NYSDEC. The number of locations and samples are not included in Tables 1 and 2.

The results of all recent samples are consistent with other surface sediment data that indicate lower concentrations in Reach 1 and in the harbor compared with upstream areas.

For the EPA GLLA, a variation of "systematic point sampling" was implemented over 9 miles of creek to collect the additional sediment thickness data and develop an accurate digital shoreline. An ArcGIS extension "spatial analyst" was used to perform a spatial interpolation of thickness points using the inverse-distance weighted method of interpolation. The elevation was estimated in GIS using the most precise elevation data available: 2008 LIDAR (Light Detection and Ranging) data that was originally developed by the Federal Emergency Management Agency for floodplain delineation and is now in the public domain. The sediment thickness, water depth, and area were modeled for Reaches 2 through 7 and volume was estimated for based on the model. The Creek was divided into 500-foot intervals (because that length was the basis for the sampling design), and the average sediment thickness and water depth was determined. The volume was calculated for each interval based on the area of the 500-foot interval and average sediment thickness. These volume estimates can be combined with the existing chemical data to estimate volumes for evaluation of remedial alternatives.

3.1.4 Soils

To determine if contaminated sediment were deposited on the banks during flooding events, historical creek channels and wetlands were sampled during the EPA GLLA project (see Table 2). Concentrations of the chemicals of potential concern (COPCs) in the soil samples are comparable to or lower than sediments in the main channel. The EPA GLLA RI concluded that the limited soil data suggest that bank soils have not been extensively impacted by contaminated sediments.

3.1.5 Additional Analytical Parameters

Table 2 summarizes the type of analytical data available for samples in various media by each reach. Most all samples were analyzed for PCB and metals, primarily lead. PCBs were analyzed as PCB Aroclors and PCB congeners. The Aroclor and congener data were both included in the EPA GLLA RI database. The analysis of the existing data indicate 97 samples were analyzed for both Aroclors and congeners and the that total PCBs calculated using Aroclors did not correlate with the total PCBs estimated using the congener data. A comparison of the data showed over half of the samples had relative percent differences (RPDs) of over 50% with the total PCBs based on congener data being generally higher than the Aroclor total.

PCB Aroclor data were historically used for evaluating the nature and extent of contamination, because the majority of the existing sediment samples were analyzed for Aroclors. PCB Aroclor data will be used for future evaluation of nature and extent of contamination. PCB congener data were used for the bioaccumulation modeling performed by the USACE in 2008 and 2010 (USACE 2008; e Risk Sciences 2012) and may be useful for ecological risk assessment as described below. PCB congeners were analyzed in place of PCB Aroclors in situations where the Aroclor patterns are expected to be weathered (e.g., in low-level water analysis and fish tissue analysis).

Most samples were analyzed for lead or select metals, including mercury, arsenic, chromium, copper, lead, and zinc. For the EPA GLLA RI all samples were analyzed for Target Analyte List (TAL) metals. Select samples also were analyzed for acid volatile sulfides/simultaneously extracted metals (AVS/SEM) and TOC to assess the bioavailability of divalent metals including cadmium, copper, lead, nickel, and zinc and monovalent silver.

Select samples were analyzed for lead by Toxicity Characteristic Leaching Procedures (TCLP) and the results were compared to hazardous waste levels (6 NYCRR 371). Only one sample with high lead concentrations collected near almost to Reach 5 was analyzed for TCLP metals and the results exceeded hazardous waste criteria. TCLP data compared to the total lead concentrations showed inconsistent correlation, suggesting that the leachability of the lead varies with the type of source material.

Dioxin and furans were COPCs in historical studies because these contaminants are identified as critical in the lake-wide management plan for Lake Ontario. Di-

oxin and furans were included in the Eighteenmile Creek AOC Remedial Action Plan, and select sediment samples from several early NYSDEC investigations were analyzed for dioxin and furans or 2,3,7,8--TCDD only. Dioxin and furans were detected in the samples, but no sources of dioxin and furans in the Eighteenmile Creek were identified, except potentially the Erie Canal (NYSDEC 2001a). Dioxin and furans were not analyzed as part of the NYSDEC RI for the OU2 Corridor Site because dioxin and furans were not detected in the ash waste samples collected during the site investigation at the former Flintkote Plant site (NYSDEC 2000). Dioxin and furans were not analyzed for the EPA GLLA RI project because the investigation focused on determining the extent of primary COPCs identified in the OU2 Corridor Site.

3.2 Human Health Risk Assessment

A Human Health Risk Assessment (HHRA) was not completed for OU3. In previous studies, Eighteenmile Creek OU3 was divided into seven reaches for investigation and characterization purposes, as described in Section 2. The reaches were numbered beginning at the north end of the Creek where it empties into Lake Ontario. Numerous studies have been conducted of the sediment and biota in various reaches of OU3 as listed in Table 1. In general terms, contaminants that have been found in the area that may pose health risks to humans that come into contact with sediment include PCBs, metals, PAHs, and pesticides. Biota have been primarily sampled for PCBs and high concentrations in biota tissue have been identified in all reaches sampled (i.e., Reaches 1, 2, and 5).

Potential exposure pathways and receptors are summarized in Table 3. Potential receptors include recreational users of the Creek – swimmers, waders, boaters, and anglers and their families who might eat their catch. All of these receptors could be exposed to site contaminants through dermal contact with and incidental ingestion of surface water and sediment. Anglers and their families who might eat their catch could also ingest contaminants in the fish tissue. These activities appear likely to occur in different ways and to different degrees in the various reaches of the Creek. Wading is most likely to occur in the shallower Reaches, 1, 3, 4, 6, and 7; swimming in the deeper impoundments behind the Burt and Newfane dams, and possibly in the harbor area of Reach 1 where the Creek discharges to Lake Ontario. Boating could occur in any of the reaches but access above Burt Dam is limited to small boats. Fishing is most popular in the shallow area downstream of Burt Dam but could occur anywhere in Reaches 1 through 7. Significant sediment contact is most likely to occur in the shallow reaches and along the banks of the Creek. Significant contact with bottom sediment is unlikely to occur in the deeper water in the impoundments – Reaches 2 and 5. Therefore, from a human exposure standpoint, the lower Creek can be divided into five relatively homogeneous exposure areas:

- Reach 1 – Mouth of the creek to Burt Dam;
- Reach 2 – the Burt Dam impoundment;

- Reaches 3 and 4 – upstream of the Burt Dam impoundment to the Newfane Dam;
- Reach 5 – the Newfane Dam impoundment; and
- Reaches 6 and 7 – upstream of the Newfane Dam impoundment to the bottom of the escarpment. Physical access to Reach 7 may be more difficult due to the woody debris present.

Assessing potential exposures to site contaminants requires that sufficient data be available to make reliable estimates of contaminant concentrations in the various potential exposure areas. The EPA estimates potential exposures based on a conservative estimate, typically the 95% upper confidence limit (95% UCL) on the average contaminant concentrations within an exposure area. The lesser of the 95% UCL and the maximum detected concentration for a data set will be used as the exposure point concentration (EPC) in accordance with EPA guidance. The EPA has developed the ProUCL statistical software package to evaluate the analytical data and perform the appropriate statistical calculations. The ProUCL Technical Guidance document recommends that at least eight to 10 detected values be available in order to calculate reliable estimates of the 95% UCL values.

3.2.1 Available Data for the Human Health Risk Assessment

The sediment in the stream bed has been sampled and analyzed extensively throughout most of OU3. There are much greater than 10 detected values for PCB Aroclors and metals in all of the homogenous exposure areas described in the previous section. There are fewer analyses for PAHs and pesticides, but greater than 10 positive detect values in most of the exposure areas except for PAH in Reach 1. Most of the available historical PCB data are for the various Aroclor mixtures. There are some PCB congener results available for sediment samples and fish tissue collected downstream of the Newfane Dam to the mouth of the Creek at Olcott.

3.2.2 Additional Analytical Parameters

In order to comply with EPA risk assessment guidance, full Target Compound List (TCL) organics and TAL inorganic analyses are needed for at least some fraction of the samples to provide assurance that no significant COPCs are missed in the RI/remedial assessment process. Some analytical parameters have limited data as described below. In addition, there are limited data for PAH in Reach 1, as noted on Table 2.

Dioxins/furans have been detected in fish collected near the northern end of the Creek at concentrations higher than Oak Orchard Creek, a reference creek to the east. Environmental media in the Creek were not analyzed for dioxins/furans as part of the GLLA RI, because that study evaluated transport of contamination from OU2. Earlier NYSDEC studies of the Canal and Creek channel indicate that dioxins/furans are present in sediments in OU3 and, therefore, could contribute to cumulative risks. Since no sources have been identified in Eighteenmile Creek, only a portion of the samples (i.e., 10%) should be required for future samples in

order to have a few representative samples with a full suite of parameters. Determination of the nature and extent of dioxin/furans is not necessary for assessment of risks.

Total chromium concentrations appear to be elevated in environmental media in Eighteenmile Creek. Chromium can exist in two valence states, Cr(III), and Cr(VI). The Cr(VI) is generally much less common in environmental media, but it is much more toxic than Cr(III), therefore, it is important to know the chemical form of the chromium present. Historical evaluation of the industry in OU2 did not indicate any potential sources of Cr(VI) to the sediment and surface water and therefore Cr(VI) is not expected to be present in the sediments and surface water of OU3. Samples collected by EPA's Removal Program in the soils at the Water Street residential yards did not find Cr(VI). Therefore, further analyses for Cr(VI) for all samples are not recommended. However, about 10% of all samples also will be analyzed for Cr(VI) to confirm there are no other potential sources of Cr(VI) in OU3.

3.2.3 Additional Environmental Media

Some of the potential exposure scenarios that may occur in OU3 involve contact with surface water (i.e., swimming, wading and fishing), and consumption of fish and/or crayfish caught from the creek. Analytical data is available for surface water or fish or crayfish tissue, but primarily for PCBs.

The potential for contaminated sediments to impact floodplains has only been assessed at a few locations where historical Creek areas were visible. Sediment transport and the potential for flooding have not been documented in OU3.

3.2.4 Background and Reference Areas

A number of the contaminants found in OU3 are naturally occurring (e.g., most metals, such as iron, lead, copper, zinc, and aluminum), or are ubiquitous in environmental media (PAHs and dioxin/furan) as a result of natural processes like combustion or other regional or global human activities. Consequently it is important to collect analytical data for environmental media in nearby reference or background areas in order to distinguish site-specific concentrations, exposures, and risks from those found in the other Lake Ontario watersheds. Some tissue samples were collected from Oak Orchard creek in 2007 (E & E 2009). Basin-wide monitoring programs also can be used as references for surface water and historical sediment data. The EPA has developed several guidance documents describing:

- How background locations should be identified;
- How background concentrations should be determined (statistical procedures);
- How contaminant concentrations in site soil should be compared with background concentrations; and

- How background concentrations should be taken into consideration in CERCLA remedy selection decisions.

All of this guidance will be taken into consideration in developing and using background concentrations.

3.3 Ecological Risk Assessment

Data available to support the Baseline Ecological Risk Assessment (BERA) for OU3 is presented in this section. A Screening Level Ecological Risk Assessment (SLERA) has not yet been conducted for OU3; however, it seems likely that an unacceptable screening level risk will be identified in OU3 when a SLERA is conducted, for at least two reasons:

1. Elevated levels of PCBs, copper, lead, zinc, and other contaminants in sediment and fish tissue have been reported in OU3 in several recent investigations (e.g., CH2M Hill 2012; E & E 2009, 2012a, 2012b); and

2. Fish, wildlife, and other ecological receptors are abundant in and along the creek in OU3 given the diversity of natural habitats present (E & E 2009).

The information presented in this memorandum is intended to assist the EPA with understanding the potential data needs to conduct a BERA for OU3, should the EPA decide to do so after completion of the SLERA.

E & E's evaluation of the sufficiency of the available data to support a BERA for OU3 was based on the following:

1. The preliminary ecological CSM for OU3 (see Figure 3);

2. The preliminary list of assessment endpoints, risk questions, and measures (see Table 4); and

3. A review of the available data for OU3 as presented in recent site investigation reports, including the GLLA RI (CH2MHill and EEEPC 2012), Beneficial Use Impairment Investigation Report for Eighteenmile Creek (E & E 2009), and other recent site reports as described in Table 1.

As the risk assessment process for OU3 advances, it is expected that refinements will be made to the CSM and assessment and measurement endpoints. The following summarizes available data for OU3. Recommendations to fill identified data gaps are presented in Section 5.

3.3.1 Available Data for Ecological Risk Assessment

Table 2 provides a summary of existing data. The following points are noteworthy regarding the sufficiency of the available data to support a BERA for OU3:

- Existing sediment chemistry data appear to be adequate for determining the extent of contamination;
- There are no sediment toxicity data and the available bioaccumulation test data are limited to PCBs, except for downstream of Burt Dam (Reach 1);
- Surface water sample data are available for PCB congeners, mercury, pesticides, and dioxins/furans. No data are available for metals, PAHs, and surface water toxicity;
- Fish tissue and other biological data are available for Reach 1 and behind both impoundments; and
- Benthic community and other wildlife surveys have only been completed for Reach 1.

3.3.2 Additional Analytical Parameters

PCB congener data have been collected for the Eighteenmile Creek system in several investigations. Recently, all 209 PCB congeners were measured in fish and sediment samples collected to support a Trophic-Trace model for Eighteenmile Creek (E. Risk Sciences 2012). PCB congener data is useful for assessing exposure instances when PCB patterns from Aroclors are weathered or degraded.

Select samples from the escarpment to Burt Dam have been analyzed for AVS/SEM to evaluate the bioavailability of metals (see Table 2). The results indicate that the metals in Eighteenmile Creek sediments are unlikely to be bioavailable or toxic. Actual toxicity studies are needed to confirm these results.

3.3.3 Background and Reference Areas

As described for the HHRA, a number of the COPCs found in OU3 are naturally occurring (metals), or are ubiquitous in environmental media (PAHs and dioxin/furan) as a result of natural processes like combustion or other regional or global human activities. Consequently, it is important to collect analytical data for environmental media in nearby reference or background areas in order to distinguish site-specific concentrations, exposures and risks from those found in the general Lake Ontario watersheds.

One possible reference area for OU3 is Oak Orchard Creek, which was used as a reference area for the Eighteenmile Creek AOC Beneficial Use Impairment Investigation conducted in 2007 (E & E 2009). Oak Orchard Creek has many similarities with Eighteenmile Creek. Both creeks are tributaries of Lake Ontario, are of similar size and surrounding geography, and are subject to water level fluctuations due to changes in lake water levels. In addition, each creek has a hydro-electric dam located some distance from their confluences with the lake. Oak Orchard Creek is not a Great Lakes AOC and was recommended as a suitable reference location by NYSDEC. Finally, the BUI investigation demonstrated that PCBs and dioxin/furans in brown bullheads (whole-body samples) collected from Eighteenmile Creek were an order of magnitude greater than in brown bullheads collected from Oak Orchard Creek.

Other potential reference areas are the East Branch of Eighteenmile Creek or upstream areas of Oak Orchard Creek closer to the Erie Canal. Aquatic and terrestrial habitats within these potential reference area or areas may be more comparable to Reaches 6 and 7 of Eightenmile Creek.

4 Sediment Erosion and Deposition Analysis (SEDA)

Migration of the PCBs and lead contamination from the Creek Corridor downstream to Lake Ontario is well documented. The highest lead contamination in sediments in OU3 is detected at depths of 2 to 8 feet in the reservoir behind Burt Dam. Radiochemical dating of the sediment cores indicate the sediment at this depth was deposited prior to 1954. The highest PCB contamination in sediments is shallower and the sediment was deposited in the mid-1960s. Persistent higher concentrations of both PCBs and lead in shallow sediments throughout the Creek indicate continued migration of contamination downstream of the Corridor. Therefore, understanding sediment transport is of primary concern for determining remedial alternatives in OU3. The source of contaminated sediment is believed to be primarily located in OU2 and that contaminated sediment is migrated downstream through deposition, re-suspension due to scour and settling; however, these processes have not been modeled.

The sediment thickness, water depth, and area were modeled for OU3 and sediment volume was estimated based on the model as part of the GLNPO RI; however, the data for Reach 1 were limited. The average sediment thickness and water depths in the depositional areas behind the dams increase from upstream to downstream. The average sediment thickness and water depths in rest of the main channel decrease from upstream to downstream.

The model can be used to evaluate sediment deposition. Current bathymetry of the reservoir behind Burt Dam shows a significant sediment deposition area where main channel Creek flow discharges into the impoundment. As the water depth increases closer to the dam, the sediment scour appears to decrease. Sediment capping in this area is a potential remedial alternative and sediment transport in this area needs to be evaluated. Sediment deposition also is present behind Newfane Dam, but the varying concentration profiles at depth indicated sediment contaminant movement after deposition.

Olcott Harbor also is a depositional area but the water and sediment depths in the marina are unknown. Water depth in the harbor is monitored and maintained by the USACE as a federal navigational channel. The USACE is scheduled to dredge the navigation channel to the project depth of 12 feet below low water datum (LWD) in 2014.

Sediment depositional areas were identified in shallower areas of the Creek with higher concentrations of PCBs and lead at the bottom of the cores. However, the extents of the isolated PCB and lead "hot spots" have not been delineated and the results from subsequent confirmatory samples have shown inconsistent results. The findings suggest that the distribution of PCB and lead contamination in sediments varies significantly and conditions change over time. Deposition in the shallow areas is also caused by the significant amount of woody debris obstructing the water flow throughout these portions of the Creek.

Sediment transport off the Creek bank due to flooding is not well documented, but limited sampling of the historical Creek channels and wetlands indicate minimal impacts based on the low concentrations of contamination.

Two major tributaries, East Branch of Eighteenmile Creek and Gulf Creek, contribute significant flow to the main channel. Many smaller tributaries and drainage areas throughout the flat agricultural portion of the Creek from the escarpment to Newfane have been documented to contribute intermittent flow to the main channel. The impact of the tributaries on sediment transport has not been established. However, a preliminary model of hydrology and sediment transport within the watershed was developed for the USACE in 2005 using the Soil and Water Assessment Tool (BSGLC 2005). The model estimated the annual total surface water runoff to the Creek and sub basins to be 412 millimeters (mm), while the annual runoff ratio (i.e., total surface water runoff divided by precipitation amounts) was 0.45 mm. The sub-basins with the largest proportion of urban development produced the greatest amounts of runoff. Across all sub-basins, the annual average runoff ranged from 369 to 461 mm (BSGLC 2005). The model is limited because United States Geological Service (USGS) stream flow gage data is not available for Eighteenmile Creek watershed and the artificially controlled flow from the Canal presents unique challenges to modeling the hydrology within Eighteenmile Creek watershed.

EPA semiannual monitoring of Lake Ontario tributaries indicate that since 2002 the highest PCB concentrations in surface water were observed in Eighteenmile Creek. In 2008 PCB concentrations in Eighteenmile Creek were more than 40 times greater than observed in any tributary and two to three orders of magnitude higher than observed in any other tributary in 2009 to 2010. Both the EPA and NYSDEC estimated loadings for Eighteenmile Creek based on estimated flow rates because the Creek is not gauged by the USGS. The EPA estimated the PCB loadings to be 10 to 20 grams per day. Limited NYSDEC surface water sampling for dissolved PCBs in the Creek Corridor indicate the highest concentration of dissolved PCBs are present downstream of the Flintkote property. The relationship between the dissolved PCBs in the surface water and sediment transport of contamination is not understood in OU3.

5 Data Gaps and Recommendations

The following data gaps and recommendations are based on the data evaluation presented in Section 3. The data gaps and sampling recommendations to address them are in this section and on Table 5. A summary of recommend samples and analytical parameters is provided in Table 6. Suggested sampling locations are presented on Figures 4 and 5.

5.1 Fate and Transport

PCBs, lead, and other contaminants were detected at the Creek in all reaches and media sampled. The following are recommendations to fill data gaps by media:

5.1.1 Groundwater

Groundwater below escarpment is not considered to be part of OU3 because OU3 is limited to contaminated sediments moving downstream from OU2. Therefore, E & E does not recommend a groundwater investigation as part of OU3.

5.1.2 Surface Water

Lakewide monitoring studies of dissolved PCBs in water indicate that there is a source of PCBs to the surface water within OU2 and the Creek is significant source of PCBs to Lake Ontario. Until the source area in OU2 is found and investigated and this source can be eliminated, additional evaluation of surface water is not recommended. The existing surface water data can be used to estimate human exposure in the HHRA. Sediment and surface water toxicity samples are recommended as part of the ecological risk evaluation. Surface water samples will be collocated with the sediment samples. These samples will be analyzed for all parameters so that this data also can be used for both the HHRA and BERA. For analysis of PCBs, the samples should be analyzed with low level PCB congener analysis to maintain consistency with historical data and achieve lower detection limits.

5.1.3 Sediment

Sediment has been extensively sampled as part of previous investigations. Recently collected data are available to assess the depth and level of contamination in sediments in Town of Newfane Marina as part of a dredging investigation. Results from the 1994 NYSDEC subsurface study did not find high concentrations. The USACE is planning to dredge the federal navigational channel in 2014. Their data indicate the sediment contamination at the surface in Reach 1 is significantly lower than above Burt Dam and it is not clear if contaminated sediment from OU2

and upstream in OU3 impacts the area near the lake entrance or if shoaling from Lake Ontario contributes to sediments in the area. Historical studies suggest that most of the contaminated sediment was deposited behind Burt Dam and was not transported farther into Reach 1. Additional sampling of sediments at depth is not recommended in the Town of Newfane Marina because the Town of Newfane plans to dredge the marina in the future if funding can be obtained.

No other additional sampling is needed to evaluate fate and transport. Sediment and surface water toxicity samples are recommended as part of the ecological risk evaluation. Sediment samples for chemistry analysis will be collocated with the sediment collected for toxicity. These samples will be analyzed for all parameters so that this data also can be used for both the HHRA and BERA.

Sediment sampling to evaluate the extent of "hot spots" in the shallower reaches has not been effective in delineating the extent of contamination because concentrations changed between sampling events. PCB sediments greater than 50 ppm will have higher disposal cost than PCB sediments with lower concentrations and will require a different evaluation of remedial alternatives. Additional sampling to identify hotspots is recommended for PCBs only to better estimate the volume of contaminated sediment greater than 50 ppm. Approximate sample locations are shown on Figure 5. The samples will be collected using the hand-core method used for previous sediment sampling during the EPA GLLA RI. Most sediment cores previously collected were less than 3 feet. Samples should be collected at the surface and at the subsurface to determine if the PCB concentrations are higher at depth.

Any other sampling and analysis is not recommended until risk assessment and sediment transport modeling is completed. The existing sediment thickness model will provide sufficient data to evaluate the physical dimensions, water levels and sediment depth throughout the Creek. Contaminated sediment concentrations were determined at less than 500 intervals and this data can be interpolated in GIS to establish the extent of contamination. Therefore, this existing data can be used to estimate volumes of all other contaminated sediment within the margin of error acceptable for evaluation of remedial alternatives in the FS.

5.1.4 Soils

Minimal sampling of floodplain soils has been completed and the initial results do not indicate a larger flooding concern. No additional sampling is recommended until risk assessment and sediment transport modeling is complete.

5.2 Human Health Risk Assessment

As stated in Section 3, the data available for soil and sediment in the stream bed and banks generally appears to be sufficient for most COPCs. However the additional sample parameters, sample locations, and environmental media listed in the following subsections are recommended to complete the HHRA.

5.2.1 Additional Samples

Data gaps for specific analytical parameters in specific reaches were identified as shown in Table 2. No samples have been collected for PAH analyses in Reach 1 below Burt Dam. However, there are sufficient samples for PAH in the other reaches. For other measured parameters, the concentrations in the sediment in Reach 1 are significantly lower. If PAH data from upstream are used to assess risks for Reach 1, then risks may be overestimated in this area.

For dioxin/furan, historical data from previous studies in 1994, 1998, and 2003 can be used for screening level risk assessment. Sediments also were not analyzed for hexavalent chromium, which may be a risk driver if total chromium concentrations are used to estimate risks from hexavalent chromium. Because most of the available PCB data are for Aroclors, PCB Aroclor data can be used in the HHRA except possibly for evaluation of the fish ingestion pathway for which the congener data may be useful. It is recommended at a portion of all samples (i.e., 10%) should be analyzed for dioxin/furan, Cr(IV) and PCBs congeners in order to have a few representative samples with a full suite of parameters. Determination of the nature and extent of these contaminants is not necessary for assessment of risks.

Sediment and surface water data collected for BERA toxicity evaluation can also be used for the HHRA to fill data gaps on the lack of full-scan analysis. Sampling at depth is not required for the HHRA. We do not recommend additional sampling in Reach 1 only to collect data on PAH concentrations in sediment. The upstream data can be used to estimate risk for this parameter in Reach 1.

5.2.2 Additional Environmental Media

Additional samples to assess exposure pathways from fish consumption are not recommended for PCBs; however, there are no fish tissue data to assess exposure pathways for additional parameters. PCBs are expected to be the primary risk driver in fish consumption, but some additional limited fish tissue data are recommended for additional parameters. The data gaps for fish tissue are summarized on Table 5. Although PCBs are not a data gap for fish tissue, PCB analysis is included in the planned analyses presented on Table 6 in order to have a complete data set for the comparison to historical results. Historical data sets include both PCB Aroclors and PCB congeners. Since the PCBs are not a data gap for fish tissue, the samples should be analyzed by PCB Aroclor methods with 10% of the samples analyzed for PCB congeners.

5.2.3 Additional Sampling Locations

Suitable comparison or background areas need to be identified, sampled, and analyzed to establish general area concentrations of chemicals that might be site-related COPCs. Background data collected for OU2 also can be used for OU3.

5.3 Ecological Risk Assessment

5.3.1 Additional Samples

As presented in Section 3, most reaches have sufficient samples to assess ecological exposures for the majority of analytical parameters, but there is insufficient data for all parameters. Previous sample investigations have not assessed the toxicity of contaminated water or sediment to aquatic organisms. Additional sampling is recommended as summarized below and noted on Table 5.

The recommendations are summarized below.

- Sufficient sediment samples were collected throughout the Creek to determine the nature and extent of contamination and for risk assessment purposes, except samples for sediment toxicity, which is recommended for the BERA. Sediment toxicity is at three locations between Burt and Newfane dams and three locations above Newfane Dam. Sediment chemistry samples should be collected at locations where sediment toxicity is evaluated to help understand the causative agents of toxicity, if any.
- Surface water toxicity testing is recommended along with collocated surface water chemistry samples to help evaluate the causative agents of toxicity, if any. Sampling for metals should include total and dissolved forms.

Approximate locations for the sediment and surface water toxicity samples are shown on Figure 4. The specific locations will be chosen based on more detailed review of existing data. The samples collection should cover a range of contaminant concentrations (low, medium, high) so that both toxic and non-toxic samples are collected. Because contaminant concentrations in sediment vary with grain size, a range of sediment textures (e.g., sand and silt) should be sampled.

Data compiled in support of the Trophic-Trace model for Eighteenmile Creek provides sufficient evaluation of exposure to PCBs. However, no data for metals and other organics in forage fish (e.g., juvenile sunfish) from the Creek channel are available. These data are needed to develop reliable exposure estimate for piscivorous wildlife to site-related contaminants. Collection of fish-forage composite samples for analysis of site-related contaminants is recommended for the BERA. PCBs are expected to be the primary risk driver in fish consumption, but some additional limited fish tissue data are recommended for additional parameters. The data gaps for fish tissue are summarized on Table 5. Although PCBs are not a data gap for forage fish, PCB analysis is included in the planned analyses presented on Table 6 in order to have a complete data set for the comparison to historical results. Historical data sets include both PCB Aroclors and PCB congeners. Since the PCBs are not a data gap for forage fish, the samples should be analyzed by PCB Aroclor methods with 10% of the samples analyzed for PCB congeners.

5.2.2 Additional Sampling Locations

Suitable comparison or background areas need to be identified, sampled, and analyzed to establish general area concentrations of chemicals that might be site-related COPCs. One possible reference area is the Oak Orchard Creek. Background data collected for OU2 also can be used for OU3.

5.4 SEDA

The transport mechanisms for the PCB contamination downstream are not fully understood. PCBs strongly adsorb to sediment particles, have low water solubility, are persistent in the environment (do not readily break down), and thus do not typically show much migration in a given environment. The adsorption of PCBs onto solids is greatest in solids containing high organic matter and clay, similar to the sediment encountered in portions of Eighteenmile Creek. The adsorbed PCBs will be transported downstream with the sediments they are sorbed to. The PCB concentrations in the water discharging into Lake Ontario indicate that PCBs are being mobilized in the water column throughout Eighteenmile Creek. PCB concentrations in the surface sediments below Burt Dam are relatively low, but site-specific bioaccumulation testing indicates PCBs in surface sediments are highly bioavailable. High concentrations of PCBs in fish collected below Burt Dam support this conclusion. If PCBs contamination transport mechanism was primarily on sediment particles, then higher concentrations of PCBs would be expected in sediment depositional areas. Higher PCBs concentrations were found in sediment deposits in Reaches 2, 3, 6, and 7, but PCB concentration in subsurface sediments deposited behind Newfane Dam in Reach 5 are relatively low. The findings indicate additional evaluation of the sediment transport downstream of PCBs is warranted.

Tables

Table 1

Summary and Evaluation of Historical Data

Eighteenmile Creek Superfund Site - Operable Unit 3

Investigations	Study Key	Area	Data Summary	Data Evaluation	Data Availability and Status	Data Use	Import Data for RI	Validate Data for RI	*Sediment Samples in RI Database*			*Summary of Samples by Data Use*		
									Reaches	PCBs	Other Tests	Risk	Nature and Extent	Fate and Transport
NYSDEC 1998. Eighteenmile Creek and Olcott Harbor Sediment Study.	NYSDEC 1998	OU 2 and 3	Sediment sampling at 8 sites on Eighteenmile Creek, tributaries, and Barge Canal. Sampling was completed in 1994.	The report provides detailed description of data collection and data validation procedures. Laboratory results are attached in the appendix. The data is only source of dioxin data for the sediment and therefore can be used for screening purposes. Surface contamination and toxicity results are greater than 10 years old and not representative of current conditions.	A partial data set is available electronically for PCBs, Dioxin and Furan and PCB Congener data from Trophic Trace Model. The available sediment data were imported into GLNPO RI database. Additional data was entered from the original report for missing COPCs. Only total concentrations were entered for PCBs, PAHs, and DDT metabolites. Additional data entry is needed for other parameters and individual compounds.	Dioxin data will be used for risk assessment. Subsurface sediment will be used for nature and extent.	Yes		01 - 05	22	30	30	22	22
NYSDEC. 2001a. Final Report, Eighteenmile Creek Sediment Study, Summary of August 17-20 and November 3, 1998 Results.	NYSDEC 2001	OU 2 and 3	Sediment sampling at 12 sites on Eighteenmile Creek, tributaries, and Barge Canal, water column sampling to evaluate sediment transport from Barge Canal to Eighteenmile Creek. Sampling was completed in 1998. Some of the sampling sites were the same location as the NYSDEC 1998. Provides a detailed description of dioxin and furan data. Report includes radiodating of cores behind Newfane and Burt Dam.	The report provides detailed description of data collection and data validation procedures. Laboratory results are attached in the appendix. The data is only source of dioxin data for the sediment and therefore can be used for screening purposes. Surface contamination and toxicity results are greater than 10 years old and not representative of current conditions.	A partial data set is available electronically for PCBs and metals as well as Dioxin/Furan and PCB Congener data from Trophic Trace Model. The available sediment data were imported into GLNPO RI database. Additional data was entered from the original report for missing COPCs. Only total concentrations were entered for PCBs, PAHs, and DDT metabolites. Additional data entry is needed for dioxins and individual compounds.	Dioxin data will be used for risk assessment. Subsurface sediment will be used for nature and extent. Radiodating will be used to evaluate historical deposition.	Yes	Yes	02 - 07	30	33	33	30	30
USACE 2004a. Volume I, Project Report Overview, Sediment Sampling, Biological Analyses, and Chemical Analyses for Eighteenmile Creek AOC.	USACE 2004	OU3	2004a: Sediment and tissue testing for Reach 1 sediments including PCB congener, dioxin, TOC, PCB Aroclors, metals, mercury and pesticide analysis.	Summary of sediment and tissue sampling and results. Detailed analytical results included in volume II.	A partial data set is available electronically for PCBs, Dioxin and Furan and PCB Congener data from Trophic Trace Model. The available sediment data were imported into GLNPO RI database. Additional data was entered from the original report for missing COPCs. Only total concentrations were entered for PCBs, PAHs, and DDT metabolites. Additional data entry is needed for other parameters and individual compounds.	Data are considered usable for nature and extent of contamination.	Yes		01	21	40		40	
USACE 2004b. Volume II, Laboratory Reports, Sediment Sampling, Biological Analyses, and Chemical Analyses for Eighteenmile Creek AOC.	USACE 2004	OU3	2004b: Laboratory reports of sediment and tissue analysis in Reach 1 Sediments. Sediment results include PCB, pesticide, metals, mercury, TOC, dioxin, and particle sizing analysis. Tissue results include PCB, pesticide, metals and mercury analysis. Bioaccumulation results include final biomass, total lipid content, chlorinated pesticides, PCB congener and heavy metals analysis.	Data were not formally validated and no data validation memos are available. Laboratory data and associated QC results are available in the appendix of the report.										
NYSDEC 2010c. Results From The Sampling Of Erie Canal Suspended Sediments And Creek Waters For PCBs. Eighteen Mile Creek Corridor Site.	NYSDEC 2010	OU2	Additional suspended sediment and water column above sediment sampling for PCB Aroclors in Erie Canal, creek, millrace, and offsite locations.	Data are used to evaluate fate and transport of sediment from Barge Canal. A limited set of pisces samples are available. Data may be useful for evaluation of alternatives.	Data could be usable for PCB comparison in the water column. Suspended sediment sampling was unsuccessful. Filter media used for sediment collection were cut submitted for PCB analysis (extracted, analyzed and reported similar to a “wipe” type samples). There were no positive detections found in these samples. Data were not available electronically and not directly related to nature and extent.	Data are usable for evaluating fateand transport.				6		6	0	

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Eighteenmile Creek Superfund Site - Operable Unit 3

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									Reaches	PCBs	Other Tests	Risk	Nature and Extent	Fate and Transport
Ecology and Environment, Inc. 2007. Final Report for the Eighteenmile Creek PCB Source Trackdown Project. Prepared for NCSWCD.	NCSWCD 2007	OU2	Presents sediment data from Reach 7 and tributaries. PCB and metals results from sediment cores and PCB screening results from sediment grab samples are available electronically.	Data was validated and data review memos are available. Sediment data from the cores are considered usable for the RI.	Sediment data are included in the GLNPO RI database.	Data are usable for risk assessment and fate and transport.	Yes		07	68	10	10	68	68
USEPA 2008. Field Data Report, Eighteenmile Creek Sediment.	USEPA 2008	OU3	Three-sample sediments collected downstream of Burt Dam program and analyzed for PCBs, Metals, Mercury, Pesticides, and TOC.	PCBs are non-detected in the samples, which is not consistent with other data sets. PCB results will not be included. Samples analyzed at the EPA laboratory in Edison, New Jersey.	Sediment results for metals and TOC are available in the report. Sediment data are included in the GLNPO RI database for metals and TOC.	Metals and TOC data for sediment samples are considered usable.	Yes		01	0	3	3	3	3
E & E 2009. Eighteenmile Creek Beneficial Use Impairment Assessment. Niagara County, New York.		OU3	Fish and wildlife surveys for Eighteenmile Creek and PCB and Dioxin/furan results for fish tissue from brown bullheads in Reach 1 are included. Tissue results are available electronically and included in the Trophic Trace model database.	Summary of sample results are included in the report. The fish community survey data, wildlife survey data, bullhead analytical data for PCBs and Dioxin/Furans, bullhead liver pathology report, and bullhead sampling field data sheets are included in the appendix of the report. No sediment data presented in this report. Tissue data was validated and memo is available.	Report is available electronically. Tissue data were not imported into the GLNPO RI database.	Data are usable for risk assessment and fate and transport.	Yes		20			20		20
CH2MHILL and EEEPC 2012. Remedial Investigation Report. Eighteenmile Creek Area of Concern (AOC). Prepared for EPA GLNPO.	USEPA GLNPO	OU3	Sediment data from Reaches 2 through 7 in the AOC, include PCB Aroclor, Metals, PAHs, PCB Congener, and Pesticide data.	Summary of sediment results for PCB Aroclor, metals, PAHs, PCB Congeners and pesticide analysis. Results were validated by various parties and memos are available.	RI report is available electronically along with data packages. Sediment data are included in the GLNPO RI database.	Data are usable for risk assessment and fate and transport.	Yes		02 - 07	495	498	495	498	498
E & E 2012a. Draft Eighteenmile Creek Baseline Fish Sampling Report.		OU3	Established current baseline levels of PCBs in fish from different trophic levels in Eighteenmile Creek.	Summary of sample results are included in the report. The final data sheets, field observations, complete analytical data, laboratory data report with QA/QC results, and data usability summary reports are included in the appendix of the report..	Report is available electronically along with data packages. Analytical data are included in database in Equis format.	Data are usable for risk assessment and fate and transport.	Yes							
E & E 2012b. Draft Eighteenmile Creek Baseline Benthic Community Sampling Report		OU3	Study to evaluate the current condition of the benthic macroinvertebrate community in the Eighteenmile Creek Area of Concern (AOC). The benthic community in riffle and run/glide habitats and pool habitats were examined. Sediment samples were collected from pool habitats for chemical analysis and sediment toxicity.	Summary of sample results are included in the report. Field data sheets, electronic data deliverables, chemistry lab report, toxicity lab report and REIC benthic report are included in the appendix of the report.	Report is available electronically along with data packages. Analytical data are included in database in Equis format.	Data are usable for risk assessment and fate and transport.	Yes				6	6		6

Table 1

Summary and Evaluation of Historical Data

Eighteenmile Creek Superfund Site - Operable Unit 3

Investigations	Study Key	Area	Data Summary	Data Evaluation	Data Availability and Status	Data Use	Import Data for RI	Validate Data for RI	*Sediment Samples in RI Database*			*Summary of Samples by Data Use*		
									Reaches	PCBs	Other Tests	Risk	Nature and Extent	Fate and Transport
E Risk Sciences, LLP (ERS) and USACE. 2012. Final Bioaccumulation Modeling and Ecological Risk Assessment, Eighteenmile Creek Great Lakes Area of Concern (AOC), Niagara County, New York.	USACE 2010	OU3	Bioaccumulation model describing the movement of PCB congeners from sediment and water exposure sources through the aquatic food web. Sediment and fish tissue were analyzed for PCB and TOC content.	Sediment and fish tissue samples were analyzed for PCB and TOC content. Results are summarized in the report. Data were not formally validated and no validation memos are available. QC of results are presented in the report.	Sediment results for PCBs and lead were available electronically were imported into the GLNPO RI database. The remaining data are available electronically. Raw data or QC data not available in report.	Data are usable for risk assessment and fate transport.	Yes	Yes	01	16	16	16		16
						Totals	10	2		658	636	613	667	663

Table 2

RI/FS OU3 -- Summary of Sampling Data for RI/FS

Eighteenmile Creek Superfund Site - Operable Unit 3

Sample Location	Reach	Number of Studies	Sample Date Range		Number of Samples										
					PCB Aroclors	PCB Congeners	Metals	Mercury	PAH	Pesticides	Dioxins/ Furans	Total Organic Carbon	Toxicity	AVS/ SEM	Other[A]
Sediment															
Creek	01	4	5/25/94	10/26/10	32	36	47	47	--	50	42	59			--
Creek	02	3	10/11/94	5/25/10	127	34	127	127	124	14	13	105		2	6
Creek	03	2	8/18/98	5/27/10	80	28	80	80	80	7	9	59		4	3
Creek	04	1	11/16/09	6/23/10	25	3	22	22	15	4	--	22		5	1
Creek	05	3	10/12/94	7/2/10	82	15	83	82	81	13	13	59		3	--
Creek	06	1	11/17/09	7/2/10	62	6	62	62	51	6	--	62		6	11
Creek	07	2	8/23/06	7/1/10	121	19	101	101	67	15	--	101		16	2
Totals	**Subtotals**				**529**	**141**	**522**	**521**	**418**	**109**	**77**	**467**		**36**	**23**
Tributary	04, 07	2	8/17/98	6/29/10	20	2	22	22	22	11	2	20			--
Surface Soils															
Historic Creek	04 - 07	1	11/16/09	12/2/09	9	1	9	9	3	3	--	9			--
Wetland	03 - 07	1	11/16/09	12/2/09	12	2	12	12	4	4	--	12			--
Totals					**41**	**5**	**43**	**43**	**29**	**18**	**2**	**41**			
Surface Water/ PISCES															
Creek	01	1	4/16/02	10/16/08	--	11	--	13	--	9	5	--			13
Creek	06	1	5/1/07	6/10/08	--	7	--	7	--	7	7	--			7
Totals					**0**	**18**	**0**	**20**	**0**	**16**	**12**	**0**			**20**
Biological															
Fish Tissue	01	3	5/1/07	9/13/10	19	39	--	--	--	--	2	--			--
Fish Tissue	02	2	9/13/10	8/20/12	10	41	--	--	--	--	--	--			--
Fish Tissue	05	1		8/20/12	15	15	--	--	--	--	--	--			--
Toxicity	01	1	8/21/12	8/22/12	4	--	4	4	--	4	--	--	6	4	4
Benthic Community	01	1	11/16/09	8/20/12	--	--	--	--	--	--	--	--			5
Bird and Mammal Surveys	01	1		5/1/07	--	--	--	--	--	--	--	--			1
Crayfish	01	1		8/20/12	3	--	--	--	--	--	--	--			--
Crayfish	02	1		8/20/12	3	--	--	--	--	--	--	--			--
Crayfish	05	1		8/20/12	2	--	--	--	--	--	--	--			--

Key:

SVOCs = Semivolatile organic compounds
PAHs = Polycyclic aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
TCL = Toxic compound list
TOC = Total organic carbon
TSS = Total suspended solids

Notes:

A = For sediment: TCLP and water content. For surface water: TOC and water quality parameters (field measured). For biota: lipids and moisture content.

Table 3

Preliminary Selection of Exposure Pathways

Eighteenmile Creek - Operable Unit 3

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current and Future	Sediment	Sediment	Eighteenmile Creek Bed	Anglers and other Site Visitors	All ages	Ingestion, Dermal Contact, Inhalation	Quantitative	Anglers and other Site Visitors may wade in the creek; contaminants are known to be present.
				Swimmers, Waders and Boaters	All ages	Ingestion and Dermal Contact	Quantitative	Swimmers, waders and boaters may wade in the creek; contaminants are known to be present.
	Fish and Crayfish Tissue	Fish and Crayfish Tissue	Eighteenmile Creek	Anglers and their familes	Children and Adults	Ingestion	Quantitative	Anglers and their families may consume fish caught from the creek. Fish caught from the creek are known to be contaminated

Table 4

Preliminary List of Candidate Assessment Endpoints, Risk Questions, and Measures for the Baseline Ecological Risk Assessment

Eighteenmile Creek Superfund Site - Operable Unit 3

Assessment Endpoint	Representative Species	Risk Question	Measure	Analysis Approach
Herbivorous, Insectivorous, and Carnivorous Aquatic-Dependent Mammals (OU2 [creek] and OU3)				
Survival, growth, and reproduction or aquatic mammals	Muskrat, Raccoon, Mink, Bat	Does the daily dose of contaminants received from ingestion of sediment, water, and food items exceed TRVs for survival, growth, or reproduction of mammals?	Contaminant concentrations in sediment, surface water, and food items	Modeled dose from ingestion of sediment, surface water, and food items compared with literature-based TRVs.
Herbivorous, Insectivorous, and Carnivorous Aquatic-Dependent Birds (OU2 [creek] and OU3)				
Survival, growth, and reproduction or aquatic birds	Mallard, Swallow, Heron	Does the daily dose of contaminants received from ingestion of sediment, water, and food items exceed TRVs for survival, growth, or reproduction of birds?	Contaminant concentrations in sediment, surface water, and food items	Modeled dose from ingestion of soil or sediment, surface water, and food items compared with literature-based TRVs.
Benthic Macroinvertebrates (OU2 [creek] and OU3)				
Survival, growth, and reproduction of benthic macroinvertebrates	All freshwater benthic macroinvertebrates	Are contaminant concentrations in sediment greater than screening levels for effects on survival, growth, or reproduction of benthos?	Contaminant concentrations in sediment.	Compare sediment contaminant concentrations with literature-based sediment screening levels for effects on benthic macroinvertebrates.
		Is the survival and growth of lab-reared benthic organisms in site sediment less than their survival and growth in clean control sediment and reference area sediment?	Sediment toxicity test results	Compare survival and growth in site sediment with survival and growth in clean control and reference area sediment as described in EPA protocols.

Table 4

Preliminary List of Candidate Assessment Endpoints, Risk Questions, and Measures for the Baseline Ecological Risk Assessment

Eighteenmile Creek Superfund Site - Operable Unit 3

Assessment Endpoint	Representative Species	Risk Question	Measure	Analysis Approach
Aquatic Biota Exposed to Surface Water (OU2 [creek] and OU3)				
Survival, growth, and reproduction of aquatic organisms exposed to surface water	Fish, invertebrates, amphibians, and plants	Are contaminant concentrations in surface water greater than water quality criteria for protection of aquatic organisms?	Surface-water contaminant concentrations.	Compare surface-water contaminant concentrations with water quality criteria and standards.
		Is survival and growth of laboratory-reared organisms in site surface water less than survival and growth in clean control water?	Surface water toxicity test results	Compare survival and growth in site surface water with survival and growth in clean control water as described in EPA testing protocol.
		Are contaminant concentrations in fish tissues from the site greater than or equal to critical fish tissue concentrations?	Contaminant concentrations in fish tissue samples	Compare contaminant concentrations in fish tissue samples from the site with critical fish tissue concentrations for effects on fish.

Key:

BAP = Biological Assessment Profile (of index values, NYSDEC 2009, page 62).

EPA = Environmental Protection Agency

NYSDEC = New York State Department of Environmental Conservation

OU2 = Operational Unit 2 (Corridor Site)

OU3 = Operational Unit 3 (Rest of Creek)

TRV = Toxicity Reference Value

Table 5

RI/FS OU3 -- Summary of Data Gaps and Recommended Additional Sampling.

Eighteenmile Creek Superfund Site - Operable Unit 3

Matrix and Data Gap	Data Need	Data Gap	Number of Samples Recommended for Each Parameter											Remarks
			PCB Aroclors	PCB Congeners	Metals	Mercury	Cr(III) and Cr(IV)	PAH	Pesticides	Dioxins/ Furans	Total Organic Carbon	Toxicity	AVS/ SEM	Other	
Sediment		***Sufficient samples were collected throughout the creek to determine the nature and extent of contamination, for the FS, and for risk assessment purposes, except for PCB hot spots in Reach 7 and sediment toxicity, which is recommended for the BERA. Sediment chemistry samples (Full suite of parameters) should be collected at locations were sediment toxicity is evaluated to provide data for both HHRA and BERA.***												
Sediment Chemistry	Nature and Extent, HHRA	There is limited sediment data in Reach 1 for select parameters. There is limited data on select parameters that may be HHRA drivers. Additional data are required to characterize high PCB concentrations sediment in Reach 7.	64	--	--	--	-	--	--	--	--	--	--	--	Sediment from the 13 sediment toxicity locations will be analyzed for a full suite to address HHRA missing parameters. PAHs in Reach 1 will be assessed with Upstream Data. PCB Hots spots will be sampled in Reach 7.
Sediment Toxicity	BERA	Sediment toxicity tests with benthic macroinvertebrates have not been conducted upstream from Burt Dam and Newfane Dam. The tests provide direct evidence of sediment toxicity, or lack thereof, and are a critical element of the sediment quality triad approach. Standardized tests based on EPA protocols are available.	--	--	--	--	--	--	--	--	--	13	--	--	Six *Chironomus* (midge) tests and six *Hyalella* (amphipod) tests for a total of 12 toxicity tests from the site. A reference area also should be sampled.
Sediment Chemistry	BERA and HHRA	Needed at locations were sediment toxicity is assessed. Sediment chemistry is another element of the sediment quality triad approach. AVS/SEM is recommended to help evaluate metals bioavailability. Full TCL/TAL scan recommended for Superfund.	7	7	7	7	--	7	7	7	7	--	7	--	Three locations between Burt and Newfane Dams and three locations upstream from Newfane Dam. A reference area also should be sampled.
Surface Soils		***Floodplain contamination has not been fully evaluated but the few samples that were collected do not indicate any immediate concerns. Biota Soil Accumulation Factors (BSAFs) deveoloped for terrestrial habitats in OU2 should be appropriate for the OU3 floodplain, thereby minimizing the types of sampling required for the OU3 floodplain, should EPA decide to evaluate the floodplain.***												
Surface Soils		Evaluation of floodplains is not recommended.	--	--	--	--		--	--	--	--	--	--	--	
Surface Water		***Surface water has been evaluated as part of the longterm EPA and NYSDEC tributary monitoring studies, but these studies are for a limited set of parameters and do not provide all of the data types needed for a BERA. Surface water chemistry samples (Full suite of parameters) should be collected at locations were surface water toxicity is evaluated to provide data for both HHRA and BERA.***												
Surface Water Toxicity	BERA	Surface water bioassays with laboratory-reared organisms have not been conducted in Eighteenmile Creek. The tests provide direct evidence of surface water toxicity, or lack thereof. Standard EPA tests with the fathead minnow and *Ceriodaphnia* (water flea) are available.	--	--	--	--	--	--	--	--	--	13	--	--	Three locations between Burt and Newfane Dams and three locations above Newfane Dam with two tests (fathead minnow and *Ceriodaphnia*) at each location. A reference area also should be sampled.
Surface Water Chemistry	HHRA and BERA	All aquatic organisms are exposed to surface water and wildlife consume water from the creek. Surface water chemistry recommended at locations were toxicity is evaluated. Full TCL/TAL scan recommended for Superfund. Dissolved and total metals should be measured. Other includes TSS, TOC, and water-quality parameters (field measured).	7	7	7	7	--	7	7	7	--	--	--	7	Three locations between Burt and Newfane Dams and three locations above Newfane Dam. A reference area also should be sampled. Surface water from the 13 surface water toxicity locations will be analyzed for a full suite to address HHRA missing parameters.
Biological		***Biological and habitat assessment data have been collected primarily below Burt Dam. More limited data are available in the Burt Dam and Newfane Dam impoundments. No data are available above Newfane Dam. Limited additional data are recommended to support the baseline ecological risk assessment.***												
Forage Fish	BERA	No data for metals and other organics in forage fish (e.g., juvenile sunfish) are available. The data are needed to develop reliable exposure estimate for piscivorous wildlife to site-related contaminants.	--	--	20	20	--	--	20	20	--	--	--	20	Ten site and 10 reference area samples. Metals to be analyzed for may be limited to those that are highly elevated in creek sediment in the Creek (lead, zinc, copper). Additional sampling may not be needed following SLERA.
Sport Fish (Fillet)	HHRA	No data for metals and other organics in edible fish (e.g., largemouth bass, bullhead) are available. The data are needed to develop reliable exposure estimate for human health to site-related contaminants.	--	--	20	20	--	--	20	20	--	--	--	20	Ten site and 10 reference area samples. Metals to be analyzed for may be limited to those that are highly elevated in creek sediment in the Creek (lead, zinc, copper). Additional sampling may not be needed following screening level HHRA.

Key:

AVS/SEM = Acid Volatile Sulfur / Simultaneously Extracted Metals
BERA = Baseline ecological risk assessment
BSAF = Biota soil (or sediment) accumulation factor
ERA = Ecological risk assessment
SLERA = Screening level ecological risk assessment
SVOCs = Semivolatile organic compounds
PAHs = Polycyclic aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
TCL = Toxic compound list
TOC = Total organic carbon
TSS = Total suspended solids

Table 6

RI/FS OU3 -- Summary of Recommended Samples and Analysis.

Eighteenmile Creek Superfund Site - Operable Unit 3

Sample Media	Notes	Number of Samples					Number of Samples per Method								Number of Data Packages				
		Number of Locations	Number of Reference Locations	No. of Samples	No. of QA/QC Samples	Total	CLP Analysis Routine - Organic SOM01.2 PCBs	CLP Analysis Routine - Organic SOM01.2 Pest/SVOCs	CLP Analysis Routine - Organic SOM01.2 VOCS	CLP Analysis Routine - Inorganic ISM01.3	CLP Analysis Non-Routine - Dioxin/Furan DLM02.2	CLP Analysis Non-Routine - CB Congeners CBC01.2	Hexavalent Chromium	Other TOC/ Lipids	CLP Analysis Routine - Organic SOM01.2	CLP Analysis Routine - Inorganic ISM01.3	CLP Analysis Non-Routine	Hexavalent Chromium	Other
Sediment	Sediment samples for chemical analysis associated co-located with toxicity samples from six locations in creek and one reference location. Sample depth (0-6")	6	1	7	1	8	8	8	8	8	1	1	1	8	1	1	1	1	1
	Sediment samples from Reach 7 to define area of high concentration PCBs. (Two depths 0 to 6 inches and 6 inches to 3 feet)	32		64	4	68	68								4	0	0	0	0
Sediment Toxicity	EPA 100.4 - Hyalella azteca(amphipod), 42-day test. Six site samples and one reference area sample.	6	1	7	1	8								8	0	0	0	0	1
	EPA 100.4 - Chironomus dilutus (midge), life-cycle test. Six site samples and one reference area sample.	6	1	7	1	8								8	0	0	0	0	1
Surface Water	Surface water samples chemical analysis associated co-located with toxicity samples from 6 locations in creek and one reference location.	6	1	7	1	8		8	8	8	1	8	8		1	1	1	1	0
Surface Water Toxicity	EPA 1000.0 - Fathead Minnow Larval Survival and Growth Test. six site samples and one reference area sample.	6	1	7	1	8								8	0	0	0	0	1
	EPA 1000.2 - Ceriodaphnia dubia Survival and Reproduction Test. Six site samples and one reference area sample.	6	1	7	1	8								8	0	0	0	0	1
Fish	Forage Fish - Ten site samples and ten reference area samples.	1	1	20	4	24	24	24	24	24	3	3	3	24	2	2	1	1	2
	Sport Fish Fillets. Ten site samples and ten reference area samples.	1	1	20	4	24	24	24	24	24	3	3	3	24	2	2			
IDW	Toxicity characteristic leaching procedure (TCLP) parameters except herbicides, PCBs, corrosivity, and ignitibility	1		1	0	1								1	0	0	0	0	1
	Totals					165	124	64	64	64	8	15	15	89	10	6	3	3	8

Figures

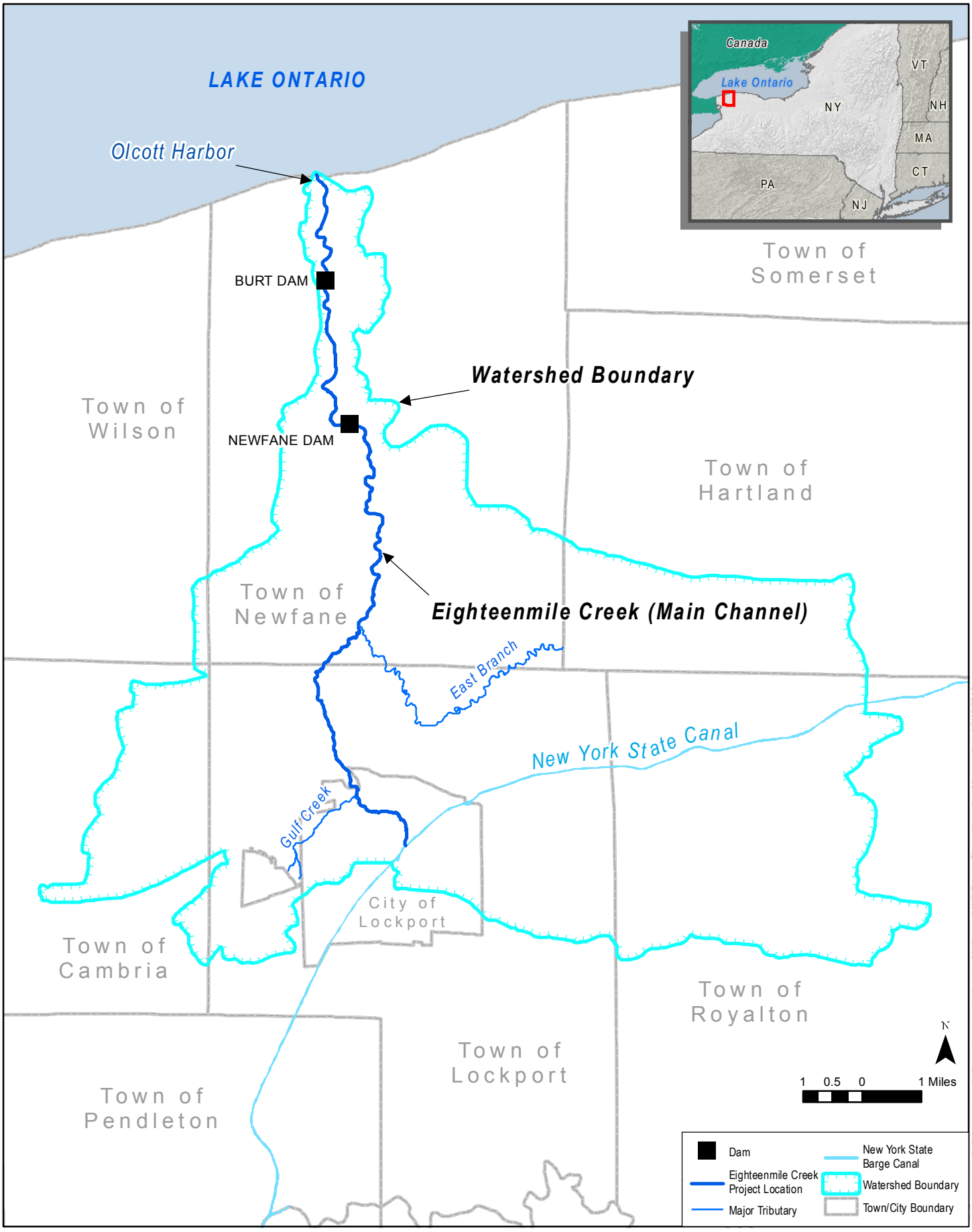

Figure 1 Eighteenmile Creek Site Location

L:\Buffalo\eighteenmile\Mxds\FigureUpdates_Jun2014\OU3-Fig2-18M Operable Unit Overview.mxd - 6/27/2014

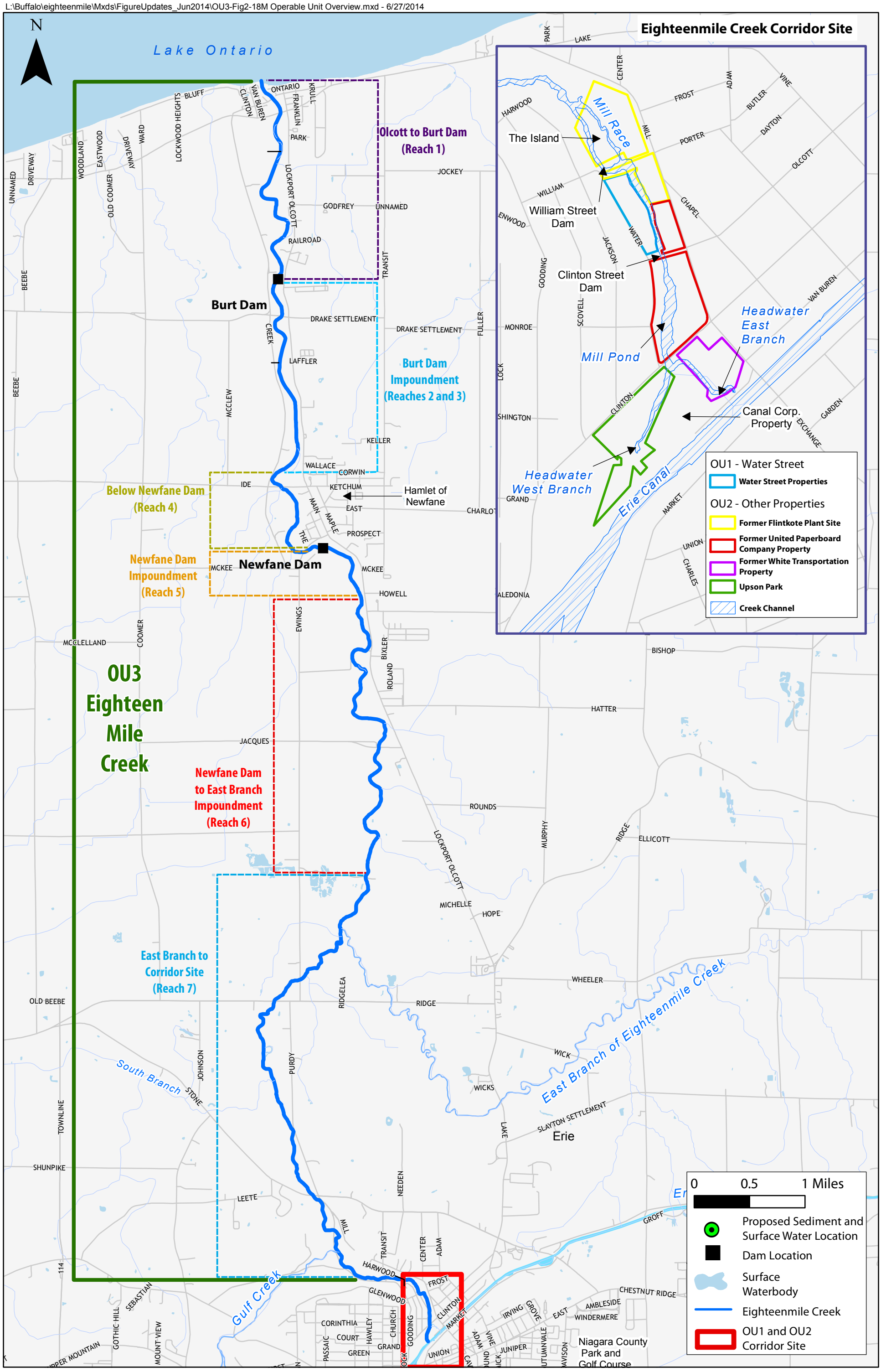

Figure 2 Eighteen Mile Creek Operable Unit Overview

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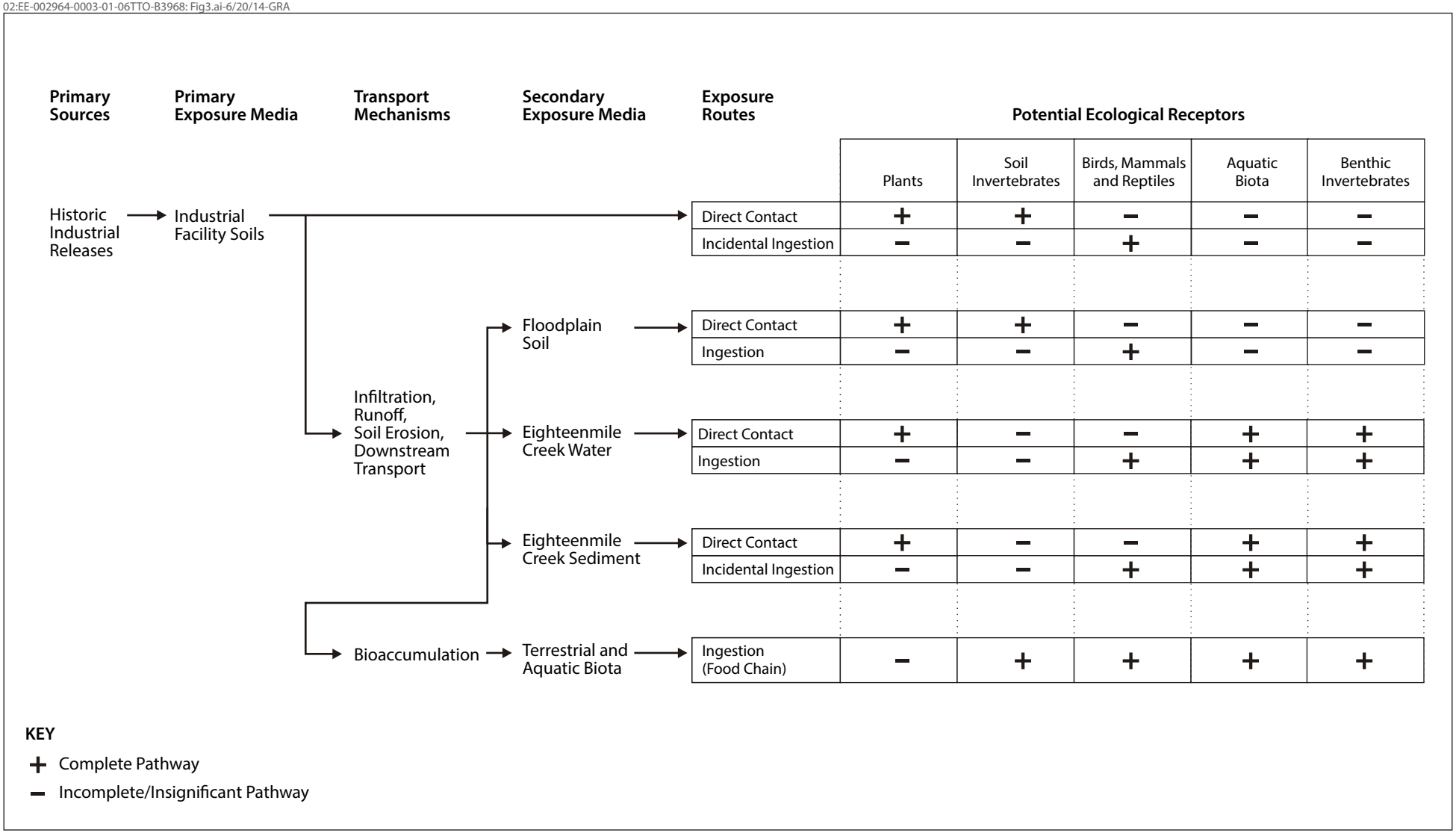


SOURCE: Ecology and Environment, Inc., 2014

Figure 3 Preliminary Ecological Conceptual Site Model, Eighteenmile Creek Corridor Site (OU2) and Downstream Areas (OU3)

L:\Buffalo\eighteenmile\Mxds\FigureUpdates_Jun2014\OU3-Fig4-18M Site Areas Sample Locations.mxd - 6/27/2014

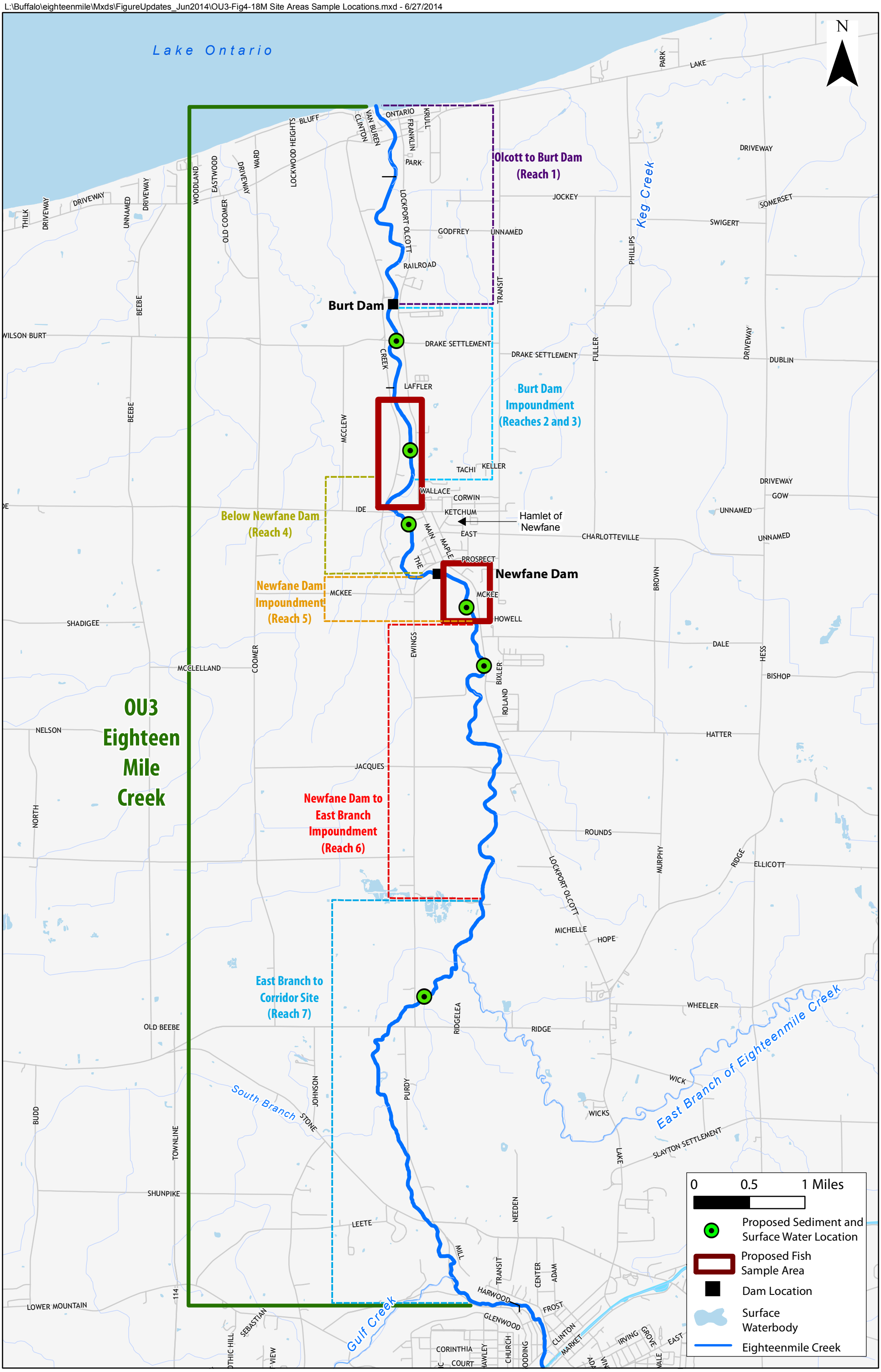
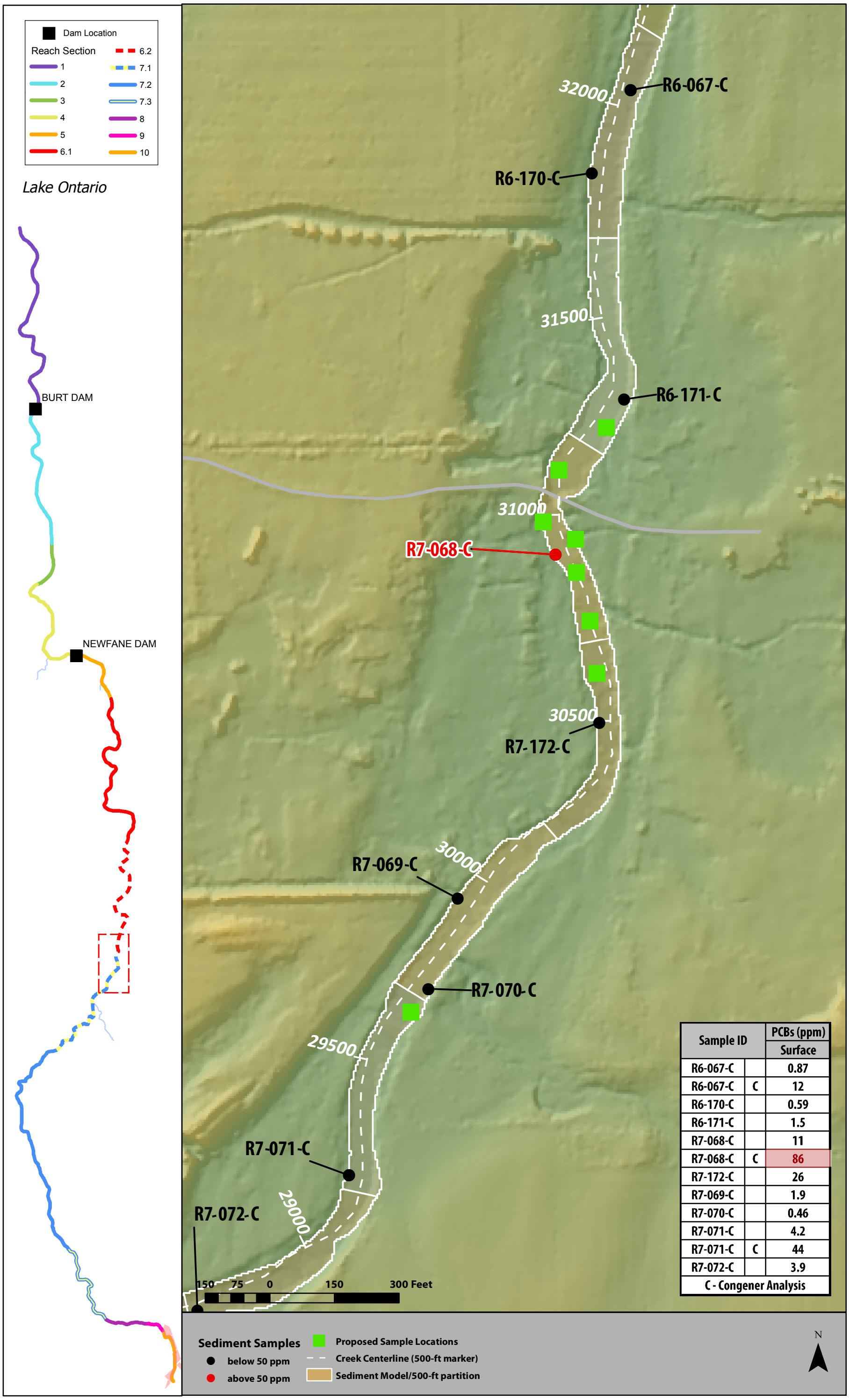


Figure 4 Eighteen Mile Creek Operable Unit 3 Sample Locations

L:\Buffalo\eighteenmile\Mxds\FigureUpdates_Jun2014\OU3-Fig5-SedSamplesCreeka.mxd - 6/27/2014



Sample ID		PCBs (ppm) Surface
R6-067-C		0.87
R6-067-C	C	12
R6-170-C		0.59
R6-171-C		1.5
R7-068-C		11
R7-068-C	C	86
R7-172-C		26
R7-069-C		1.9
R7-070-C		0.46
R7-071-C		4.2
R7-071-C	C	44
R7-072-C		3.9
C - Congener Analysis		

Figure 5a. Eighteen Mile Creek Reach 7 Sediment Sampling Locations

L:\Buffalo\eighteenmile\Mxds\FigureUpdates_Jun2014\OU3-Fig5-SedSamplesCreeka.mxd - 6/27/2014

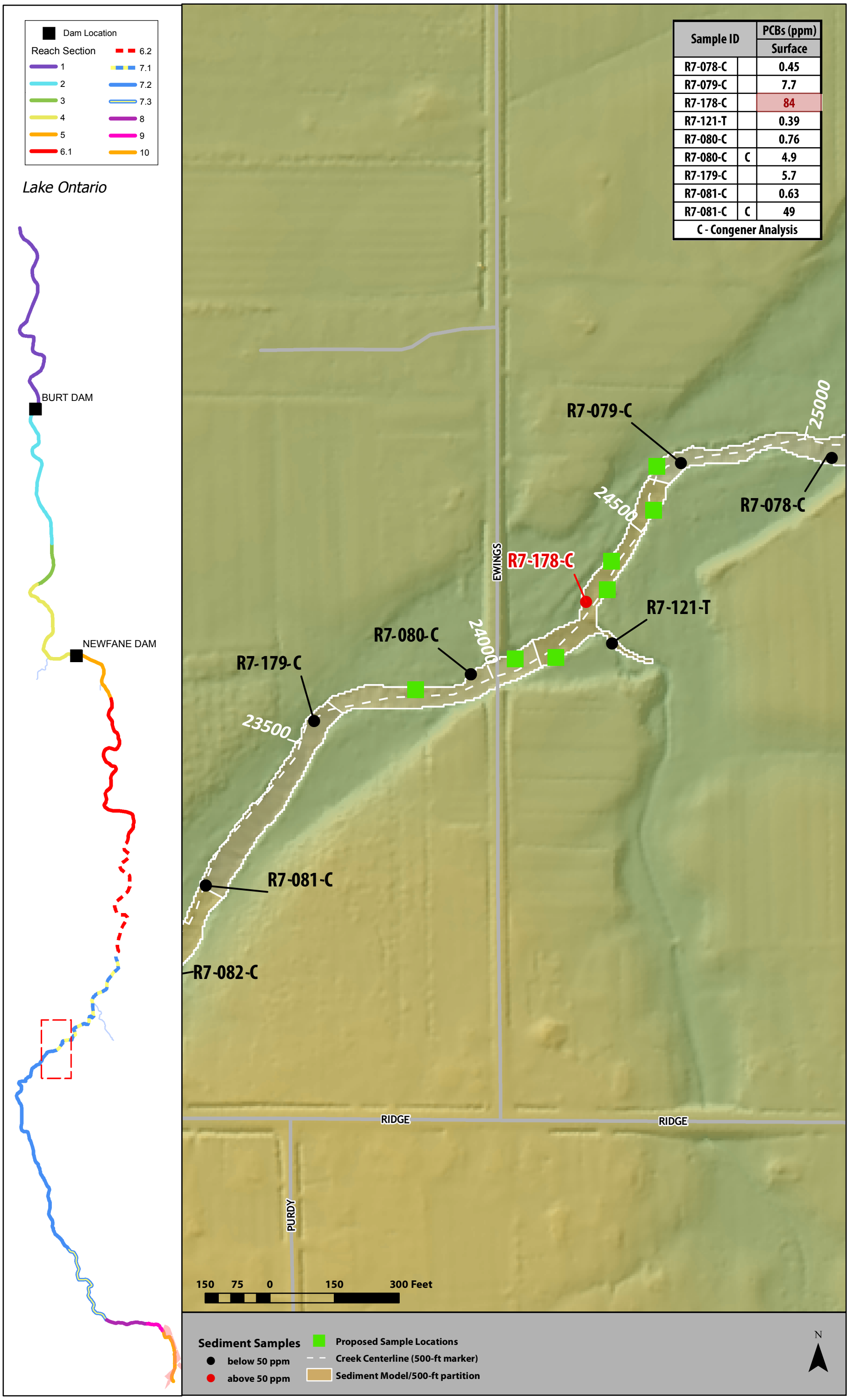


Figure 5b. Eighteen Mile Creek Reach 7 Sediment Sampling Locations

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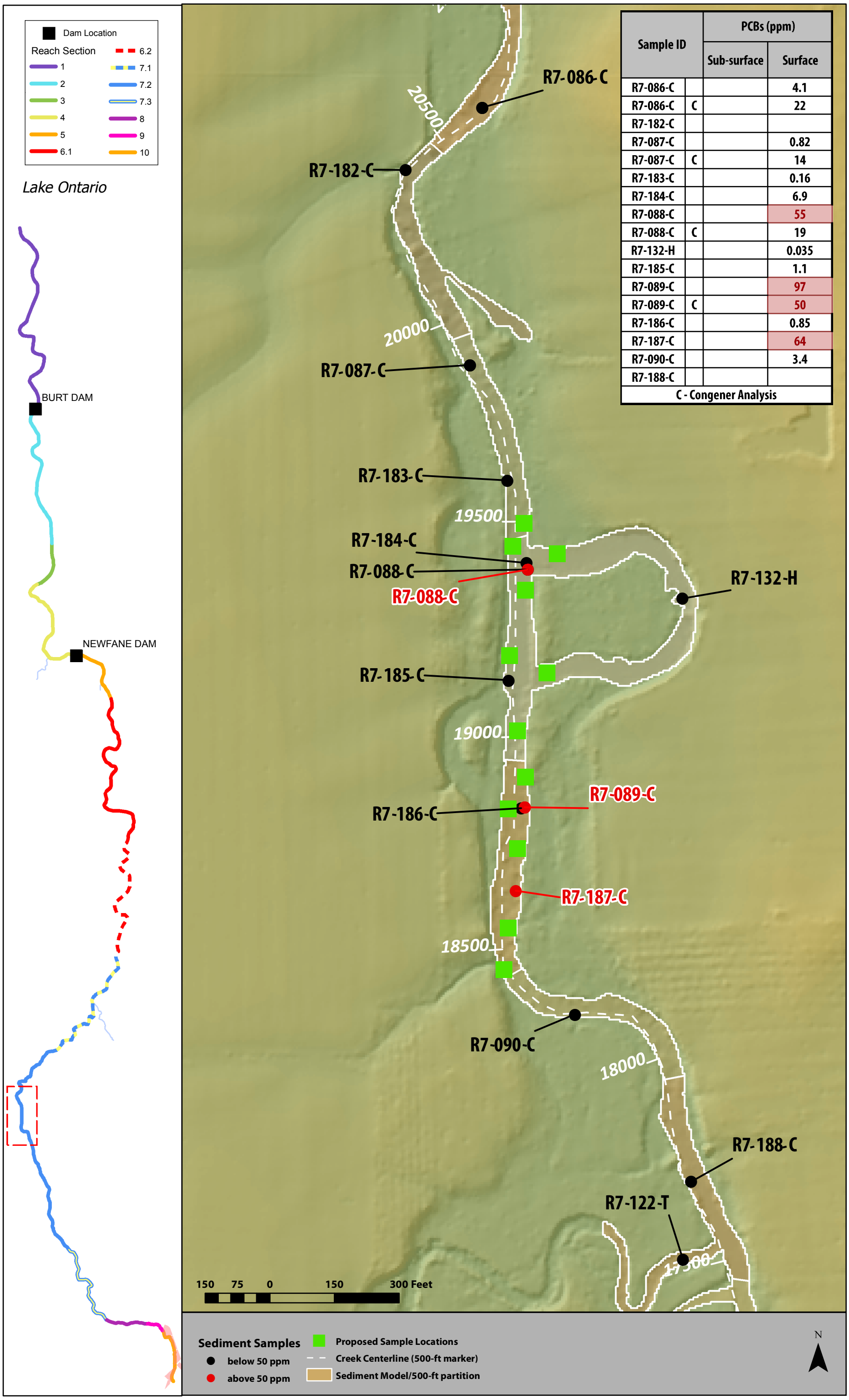

Sample ID		PCBs (ppm) Sub-surface	PCBs (ppm) Surface
R7-086-C			4.1
R7-086-C	C		22
R7-182-C			
R7-087-C			0.82
R7-087-C	C		14
R7-183-C			0.16
R7-184-C			6.9
R7-088-C			55
R7-088-C	C		19
R7-132-H			0.035
R7-185-C			1.1
R7-089-C			97
R7-089-C	C		50
R7-186-C			0.85
R7-187-C			64
R7-090-C			3.4
R7-188-C			

C - Congener Analysis

Figure 5c. Eighteen Mile Creek Reach 7 Sediment Sampling Locations

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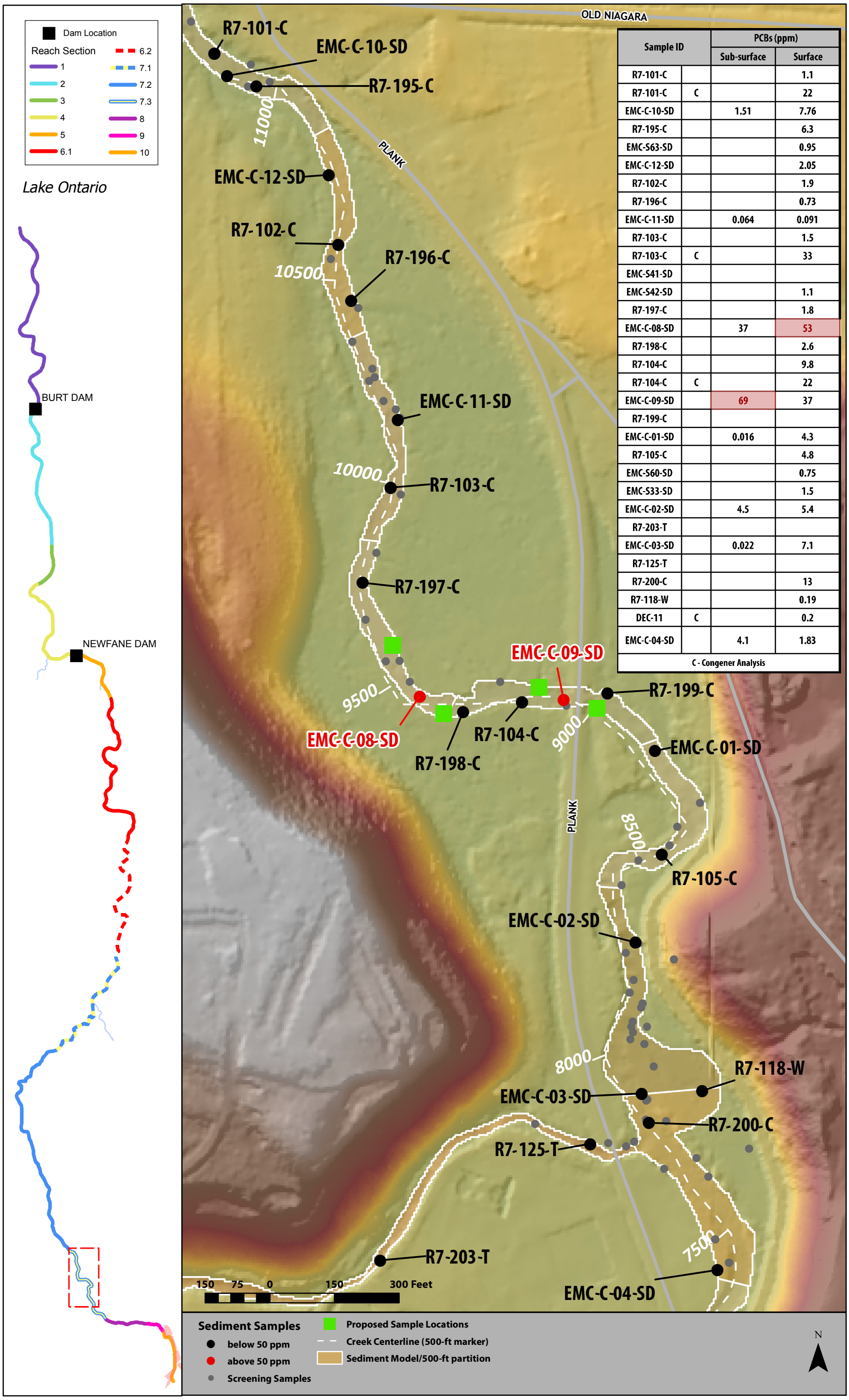

Sample ID		PCBs (ppm)	
		Sub-surface	Surface
R7-101-C			1.1
R7-101-C	C		22
EMC-C-10-SD		1.51	7.76
R7-195-C			6.3
EMC-S63-SD			0.95
EMC-C-12-SD			2.05
R7-102-C			1.9
R7-196-C			0.73
EMC-C-11-SD		0.064	0.091
R7-103-C			1.5
R7-103-C	C		33
EMC-S41-SD			
EMC-S42-SD			1.1
R7-197-C			1.8
EMC-C-08-SD		37	53
R7-198-C			2.6
R7-104-C			9.8
R7-104-C	C		22
EMC-C-09-SD		69	37
R7-199-C			
EMC-C-01-SD		0.016	4.3
R7-105-C			4.8
EMC-S60-SD			0.75
EMC-S33-SD			1.5
EMC-C-02-SD		4.5	5.4
R7-203-T			
EMC-C-03-SD		0.022	7.1
R7-125-T			
R7-200-C			13
R7-118-W			0.19
DEC-11	C		0.2
EMC-C-04-SD		4.1	1.83

C - Congener Analysis

Figure 5d. Eighteen Mile Creek Reach 7 Sediment Sampling Locations

A Reports Reviewed

Table A-1

Inventory of Previous Studies and Guidance Reviewed

Eighteenmile Creek Superfund Site - Operable Unit 2 and 3

Reference Key	Area	Year	Reference
	OU2 and OU3	2005	Buffalo State Great Lakes Center (BSGLC). 2005. *Sediment Modeling for the Eighteenmile Creek Watershed, Niagara County.* Final project report. Prepared by Shreeram Inamdar, Ph.D., Great Lakes Center and Department of Geography, SUNY Buffalo State College, for the U.S. Army Corps of Engineers Buffalo District. December 2005.
	OU3	1983	Burt Dam Associates. 1983. *Application for Exemption for Licensing for the Burt Dam Hydroelectric Project* . Submitted to the Federal Energy Regulatory Commission.
	OU3	2009	CH2M HILL, Inc. and EEEPC. 2009a. *Phase 1 Reconnaissance Survey Eighteenmile Creek Area of Concern, Niagara County, New York, for the Remedial Investigation/Feasibility Study* . Prepared for the United States Environmental Protection Agency.
	OU3	2009	CH2M HILL, Inc. and EEEPC. 2009b. *Field Sampling Plan for the Eighteenmile Creek AOC Site Characterization, Niagara County, New York* .
	OU3	2011	CH2M HILL, Inc. and EEEPC. 2011. *Data Summary Report, Site Characterization Eighteenmile Creek Area of Concern, Niagara County, New York.*
USEPA GLNPO	OU2 and OU3	2012	CH2M HILL, Inc. and EEEPC. 2012. *Draft Remedial Investigation Report, Eighteenmile Creek, Remedial Investigation / Feasibility Study, Niagara County, New York.* Prepared for USEPA Region 5 RAC2 by CH2M HILL, E & E, and others. WA No. 139-RICO-1527/Contract No. EP-S5-06-01.
	OU1 and OU2	2011	City of Lockport. 2011. CSO Longterm Control Plan - Draft, Niagara County, New York. Prepared by the Clough Harbor and Associates, September 16, 2011.
	OU1 and OU2	2006	City of Lockport. 2006. City of Lockport Zoning Map, Niagara County, New York. Prepared by the City of Lockport Engineering Department, February 2006.
	OU2 and OU3	2007	E & E. 2007a. Eighteenmile Creek State of the Basin Report. Prepared for the U.S. Army Corps of Engineers.
NCSWCD 2007	OU2 and OU3	2007	E & E. 2007b. *Final Report for the Eighteenmile Creek PCB Source Trackdown Project* . Niagara County, New York.

Table A-1

Inventory of Previous Studies and Guidance Reviewed

Eighteenmile Creek Superfund Site - Operable Unit 2 and 3

Reference Key	Area	Year	Reference
	OU2	2007	E & E. 2007C. *Phase 1 Environmental Site Assessments, Eighteenmile Creek Corridor Sites: Upson Park, United Paperboard Company, and White Transportation. City of Lockport, New York* . Prepared for the New York State Department of Environmental Conservation.
	OU3	2009	E & E. 2009. *Eighteenmile Creek Beneficial Use Impairment Assessment* . Niagara County, New York. Prepared for the Niagara County Soil and Water Conservation District.
	OU3	2011	E & E. 2011. *Interim Eighteenmile Creek Area of Concern (AOC) Strategic Plan for Beneficial Use Impairment (BUI) Delisting, Contract Number W912P4-10-D-0002.* Prepared for the United States Army Corps of Engineers.
	OU3	2012	E & E. 2012a. Draft Eighteenmile Creek Baseline Fish Sampling Report. Prepared for Niagara County Soil and Water Conservation District, Lockport, NY by E & E, Lancaster, NY.
	OU3	2012	E & E. 2012b. Draft Eighteenmile Creek Baseline Benthic Community Sampling Report. Prepared for New York State Department of Environmental Conservation, Albany, NY by E & E, Lancaster, NY.
USACE 2010	OU3	2012	E Risk Sciences, LLP (ERS) and USACE. 2012. *Final Bioaccumulation Modeling and Ecological Risk Assessment, Eighteenmile Creek Great Lakes Area of Concern (AOC), Niagara County, New York.* Prepared by E Risk Sciences, LLP, Allston , Massachusetts, and U.S. Army Corps of Engineers, Engineer Research and Development Center, Vicksburg, Mississippi.
	OU3	2011	EA Engineering P.C. and EA Science and Technology (EA Engineering). 2011. *Final Remedial Investigation Report Old Upper Mountain Road (932112) Lockport, New York, Site Number 932029, Town of Lockport, Niagara County* . Prepared for NYSDEC Region 9.
NYSDEC SRI	OU2	2009	EEEPC. 2009a. *Final Supplemental Remedial Investigation Report for the Eighteenmile Creek Corridor Site (Site No. 932121), City of Lockport, New York* . Prepared for the New York State Department of Environmental Conservation.
NYSDEC SRI-A	OU2	2009	EEEPC. 2009b. *Final Additional Investigation Addendum to the Supplemental Remedial Investigation Report for the Eighteenmile Creek Corridor Site (Site No. 932121), City of Lockport, New York* . Prepared for the New York State Department of Environmental Conservation.
	OU2	2009	EEEPC. 2009c. *Final Feasibility Study Report for the Eighteenmile Creek Corridor Sit (Site 932121) and Adjacent Upland Properties (Water Street Residential Properties, Former United Paperboard Company, White Transportation, and Upson Park)* . City of Lockport, New York. Prepared for New York State Department of Environmental Conservation, Albany, NY by E & E, Lancaster, NY.

Table A-1

Inventory of Previous Studies and Guidance Reviewed

Eighteenmile Creek Superfund Site - Operable Unit 2 and 3

Reference Key	Area	Year	Reference
	OU3	2011	Environment Canada et al. 2011. Lake Ontario Lakewide Management Plan, Annual Report 2011. Prepared by a binational partnership of Environment Canada, Fisheries and Oceans Canada, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, Ontario Ministry of Environment, Ontario Ministry of Natural Resources and New York State Department of Environmental Conservation. Available online at: http://binational.net/lamp/lo_ar_2011_en.pdf.
	OU3	2007	NCSWCD. 2007. *Eighteenmile Creek Remedial Action Plan, 2006 Status Report* . Prepared with funding provided by the U.S. Environmental Protection Agency. March 2007.
	OU3	2011	NCSWCD. 2011. *Eighteenmile Creek Remedial Action Plan, Stage II - Update* . Prepared with funding provided by the U.S. Environmental Protection Agency. Final Draft, December 2011.
	OU3	2011	New York State Department of Health (NYSDOH). 2011. *Health Advice on Eating Fish You Catch for Erie, Niagara, Cattaraugus, Genesee, Orleans, Wyoming, and Chautauqua Counties.*
	OU3	1987	New York State Department of State (NYSDOS). 1987. Coastal Fish and Wildlife Habitat Rating Form for Eighteenmile Creek – Lake Ontario.
	OU2	1998	Nutter Associates. 1998. *City of Lockport Comprehensive Plan.* Prepared for City of Lockport, Niagara County, New York. May 1998.
	Reference Data	2009	NYS GIS Clearinghouse. 2009. GIS Metadata from NYS Cyber Security. "NIAGARA_County_Ortho_4bed_1ft." Remote sensing image. NYS Digital Ortho-Imagery Program 2008 imagery in Niagara County. NYSCSCIC, Albany, NY. Accessed online at http://gis.ny.gov/gateway/mg/2008/niagara/.
	OU2	2000	NYS Canal Corporation. 2000. Evaluation of Sediment Quality of the Erie Canal between the Niagara River and Rochester, NY.
	OU3	1996	NYSDEC. 1996. *Trackdown of Chemical Contaminants to Lake Ontario from New York State Tributaries.*
	OU3	1997	NYSDEC. 1997. Eighteenmile Creek Remedial Action Plan. Prepared by the Division of Water.

Table A-1

Inventory of Previous Studies and Guidance Reviewed

Eighteenmile Creek Superfund Site - Operable Unit 2 and 3

Reference Key	Area	Year	Reference
NYSDEC 1998	OU 2 and 3	1998	NYSDEC. 1998. Eighteenmile Creek and Olcott Harbor Sediment Study, Niagara County, New York.
	Guidance	1999	NYSDEC. 1999. Technical Guidance for Screening Contaminated Sediments. Prepared by the Division of Fish, Wildlife and Marine Resources, Albany, New York.
NYSDEC 2000	OU 2 Flintkote	2000	NYSDEC. 2000. Site Investigation Report, Former Flintkote Plant Site, 198 & 300 Mill Street, City of Lockport, Niagara County, New York. Prepared by the Division of Environmental Remediation. September 2000.
NYSDEC 2001	OU 2 and 3	2001	NYSDEC. 2001a. Final Report, Eighteenmile Creek Sediment Study, Summary of August 17-20 and November 3, 1998 Results. Prepared by the Division of Water.
	OU2	2001	NYSDEC. 2001b. City of Lockport Sewer System, PCB Trackdown Project, 1998-2000, Draft Summary Report. Prepared by NYSDEC Division of Water. October 2001.
	OU 2 Flintkote	2002	NYSDEC. 2002. Sampling Report, Former Flintkote Plant Site, 143 Water Street, City of Lockport, Niagara County, New York. Prepared by the Division of Environmental Remediation.
	OU1	2003	NYSDEC. 2003. Sampling Report, Water Street Properties, City of Lockport, Niagara County, New York. Prepared by the Division of Environmental Remediation.
NYSDEC 2004	OU1 and 2	2004	NYSDEC. 2004. Site Investigation Scope of Work. Eighteenmile Creek Corridor: New York State Barge Canal to North Transit Road. August 2003, revised February 2004.
	Guidance	2005	NYSDEC. 2005. New York State Comprehensive Wildlife Conservation Strategy. Available online at: http://www.dec.ny.gov/docs/wildlife_pdf/ontarioswtxt.pdf
NYSDEC RI	OU1 and 2	2006	NYSDEC. 2006a. Remedial Investigation Report, Eighteenmile Creek Corridor, Lockport, Niagara County, New York, Site Number 932121. Prepared by the Division of Environmental Remediation.

Table A-1

Inventory of Previous Studies and Guidance Reviewed

Eighteenmile Creek Superfund Site - Operable Unit 2 and 3

Reference Key	Area	Year	Reference
	OU 2 Flintkote	2006	NYSDEC. 2006b. Record of Decision for the Former Flintkote Plant Site.
	OU3	2007	NYSDEC. 2007a. Lake Ontario Annual Report 2007. Lake Ontario Tributary Creel Survey, Fall 2005 - Spring 2006, Fall 2006 - Spring 2007. Prepared by Scott Prindle and Daniel Bishop, Region 7 Fisheries, Cortland, New York.
	OU2	2007	NYSDEC. 2007b. PCB Sources - Flintkote. Internal Memorandum. Prepared by Glenn May August 2007.
	OU2 and OU3	2009	NYSDEC. 2009a. Toxic Chemicals in NYS Tributaries to Lake Ontario: A Report on Sampling Undertaken in 2007 and 2008 with Special Emphasis on the Polychlorinated Dibenzodioxins and Furans. Prepared for the U.S. Environmental Protection Agency.
	Guidance	2010	NYSDEC. 2010a. CP-51: Soil Cleanup Guidance Policy.

Table A-1

Inventory of Previous Studies and Guidance Reviewed

Eighteenmile Creek Superfund Site - Operable Unit 2 and 3

Reference Key	Area	Year	Reference
	OU1 and OU2	2010	NYSDEC. 2010b. Record of Decision for the Eighteenmile Creek Corridor Site Operable Unit Nos. 1,3,4,5 and 6, State Superfund Project Lockport, Niagara County, New York Site No. 932121.
NYSDEC 2010	OU2	2010	NYSDEC. 2010c. Results from the Sampling of Erie Canal Suspended Sediments and Creek Waters for PCBs, Eighteenmile Creek Corridor Site, Site No. 932123, City of Lockport, Niagara County, New York.
	OU3	2012	NYSDEC. 2012. Personal communication, letter dated January 17, 2012, from Jean Pietrusiak, NYSDEC Information Services, to Marcy Werth, E & E, Inc., in response to a data request regarding rare and state-listed animal and plant species.
	OU 2 Flintkote	2005	TVGA. 2005a. Site Investigation Report: Site Investigation/Remedial Alternatives Report (SI/RAR) Former Flintkote Site.
	OU 2 Flintkote	2005	TVGA. 2005b. Final Remedial Alternatives Report Former Flintkote Site.
	OU2	2006	URS Corporation. 2006. Summary Report for PCBs Detected in NYS Barge Canal Sediments During the Investigation of NYSEG's Transit Street and State road Former MGP Sites, Sites #9-32-098 and #9-32-109, Lockport, NY. New York State Electric and Gas, Binghamton, New York.
USACE 2004	OU3	2004	USACE. 2004a. *Volume I (Project Report Overview): Sediment Sampling, Biological Analyses, and Chemical Analyses for Eighteenmile Creek OAC, Olcott, New York.* Prepared for USACE Buffalo District, by USACE Engineer Research and Development Center, Vicksburg, MS.
	OU3	2004	USACE. 2004b. Volume II (Laboratory Reports): Sediment Sampling, Biological Analyses, and Chemical Analyses for Eighteenmile Creek AOC, Olcott, New York. Prepared for USACE Buffalo District, Buffalo, NY by USACE Engineer Research and Development Center, Vicksburg, MS.
USEPA 2008	OU3	2008	USACE. 2008. Eighteenmile Creek, Great Lakes Area of Concern (AOC), Niagara County, New York: Concentrations, Bioaccumulation and Bioavailability of Contaminants in Surface Sediments.
	OU3	2010	USACE. 2010. Memo from Karl Gustavson, Ph.D., and Sara Hendrix, U.S. Army Engineer Research and Development Center, and Katherine von Stackelberg, Sc.D., E Risk Sciences, LLP, to Bryan Hinterberger, and Scott Pickard, USACE, Buffalo District, and Victor DiGiacomo, Jr., Niagara County Soil & Water Conservation District, regarding Eighteenmile Creek Area of Concern Food Web Modeling: Final Data Gaps. August 3, 2010.

Table A-1

Inventory of Previous Studies and Guidance Reviewed

Eighteenmile Creek Superfund Site - Operable Unit 2 and 3

Reference Key	Area	Year	Reference
	OU3	2011	USACE. 2011. Memo from Katherine von Stackelberg, Sc.D., E Risk Sciences, LLP, and Karl Gustavson, Ph.D., U.S. Army Engineer Research and Development Center, to Bryan Hinterberger, USACE, Buffalo District, and Victor F. DiGiacomo, Jr., Eighteenmile Creek Remedial Action Plan Coordinator, Niagara County Soil & Water Conservation District, regarding Eighteenmile Creek Area of Concern: Final Conceptual Site Model (CSM). January 21, 2011.
	OU3	2013	USACE. 2013. Public Notice. Operationa and Maintenance Dredging and Dredged Material Placement. FY 14 Disaster Relief Appropriations Act (Hurricane Sandy) Supplemental Lake Ontario Harbor Maintenance Dredging. Notice No: LOHD-14
	Guidance	1989	USEPA. 1989. *Risk Assessment Guidance for Superfund, Volume I Human Health Evaluation Manual (Part A),* Office of Emergency and Remedial Response, EPA/540/1-89/002, Washington, D.C., December 1989
	OU3	2008	USEPA. 2008. *Field Data Report, Eighteenmile Creek Sediment* .
	OU3	2011	USEPA. 2011. *Field Data Report, Lake Ontario Tributaries 2009-2010.* USEPA Monitoring and Assessment Branch

Key:

EEEPC	Ecology and Environment Engineering, P.C.
USEPA	U.S. Environmental Protection Agency
USACE	U.S. Army Corps of Engineers
E & E	Ecology and Environment, Inc.
NYSDEC	New York State Department of Environmental Conservation
NCSWCD	Niagara County Soil and Water Conservation District