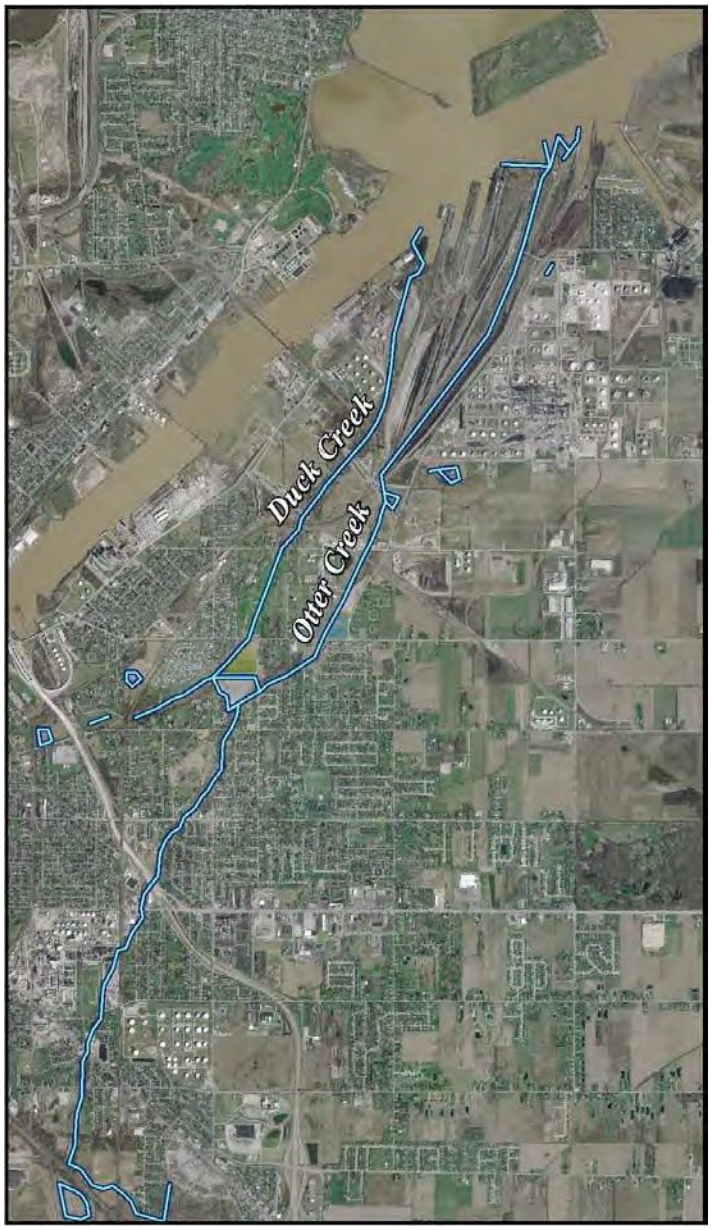
# Final Duck and Otter Creeks

# Natural Resource Damage Assessment Plan

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Public Comments of Draft Assessment Plan

# 1. Introduction

The U.S. Department of the Interior (DOI), represented by the U.S. Fish and Wildlife Service (FWS or the Trustee) is conducting a natural resource damage assessment (NRDA) to restore natural resources and the services they provide, that have been injured as a result of releases of hazardous substances[1] from several Potentially Responsible Parties (PRPs) to the Duck and Otter Creeks in Toledo, Ohio (the Assessment Area). The FWS has identified several PRPs that may be responsible for releases of hazardous substances including, but not necessarily limited to, BP Products North America, Inc., Chevron Corporation, ConocoPhillips Corporation, CSX Corporation, Envirosafe Services of Ohio, Inc., Lubriplate Lubricants Company/Fiske Brothers Refining Company, Marsulex, Inc., Pilkington North America, Inc., Sunoco, Inc and Toledo Edison Company. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) [42 U.S.C. §§ 9607 *et seq*.], the Federal Water Pollution Control Act (Clean Water Act or CWA) [33 U.S.C. §§ 1321 *et seq*.], and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [40 C.F.R. Part 300, Subpart G] provide the Trustee with authority to seek damages and to make the public whole for injuries to natural resources. The FWS prepared a Preassessment Screen and Determination (PAS) following the federal regulations at 43 C.F.R. § 11.23. The PAS was a review of readily available information, from which the Trustee determined that hazardous substance releases[2] from the PRPs' facilities[3] were likely to have injured natural resources (FWS, 2010). The Trustee therefore concluded that an assessment should proceed.

This Draft Assessment Plan (Draft AP) has been prepared in accordance with federal regulations at 43 C.F.R. Part 11. The purpose of the Draft AP is to describe the Trustee's approach for conducting an NRDA at the Assessment Area and to propose assessment work to determine and quantify natural resource restoration necessary to make the public whole for losses caused by natural resource injuries resulting from the PRPs' releases of hazardous substances.

## 1.1 Authority to Conduct a Natural Resource Damage Assessment

As directed by CERCLA [42 U.S.C. §.9607(f)(2)(A)], the President of the United States has designated in the NCP the federal officials who are authorized to serve as natural resource trustees [40 C.F.R. §§.300.600(b)]. The Secretary of the DOI has trustee authority under the NCP for natural resources "belonging to, managed by, held in trust by, pertaining to, or otherwise controlled" by the DOI [40 C.F.R. §§ 300.600(b), (b)(2), and (b)(3)]. Such natural resources include "land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources" [40 C.F.R. § 300.600(a)], as well as "their supporting ecosystems." [40 C.F.R. § 300.600(b)]

The Secretary of the Interior has delegated to bureau directors the authority to act on behalf of the DOI as the authorized official (AO) in conducting NRDA activities. [207 DM 6.3B]. The Regional Director of the FWS Region 3 serves as DOI's AO for the Assessment Area. Acting through the FWS AO, the DOI is authorized under CERCLA [42 U.S.C. § 9007(f)] to act on behalf of the Secretary to conduct NRDA, restoration planning, and implementation for DOI's natural resources. The statutory bases for FWS trusteeship include, but are not limited to, the Fish and Wildlife Coordination Act [16 U.S.C. §§ 661 *et seq*.], the Fish and Wildlife Act [16 U.S.C. §§ 742a *et seq*.], the Bald and Golden Eagle Protection Act

[1] In this document, the term "hazardous substances" refers to hazardous substances as defined in federal regulations at 40 C.F.R. 302.4.

[2] CERCLA Section 101(22) defines "release" as any "spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment.

[3] The application of these regulations is not mandatory, and the Trustees have the option of diverging from them. However, assessments performed in compliance with these regulations have the force and effect of a rebuttable presumption in any administrative or judicial proceeding under CERCLA [42 U.S.C. § 9607(f)(2)(C)].

[16 U.S.C. §§ 668 *et seq*.], the Endangered Species Act [16 U.S.C. §§ 1531 *et seq*.], the Migratory Bird Conservation Act [16 U.S.C. §§ 715 *et.seq*.] and the Migratory Bird Treaty Act [16 U.S.C. §§ 703 *et seq*.].

## 1.2 Preassessment Phase

The preassessment phase (PAS) of an NRDA is the first step in conducting a NRDA. In this phase, Trustees must review available data, determine whether or not to proceed with an assessment [43 C.F.R.§ 11.13(b)], then document this decision in a PAS [43 C.F.R. § 11.23(c)]. The PAS for the Assessment Area was completed on August 19, 2009. A copy of the PAS is available at the U.S. Fish and Wildlife Service, Columbus Ohio Field Office, 4625 Morse Road, Suite 104, Columbus, Ohio 43230 upon request.

The PAS demonstrates that:

- A discharge or release of hazardous substances has occurred.
- Natural resources for which the Trustee may assert trusteeship under CERCLA have been or are likely to have been adversely affected The quantity and concentration of the released hazardous substances are sufficient to potentially cause injury to natural resources.
- Data sufficient to pursue an assessment are readily available or likely to be obtained at a reasonable cost.
- Response actions do not or will not sufficiently remedy the injury to natural resources without further action [43 C.F.R. § 11.23(e)].

The Trustee determined that a NRDA should proceed.

## 1.3 Assessment Plan Phase

After deciding to perform a NRDA, the Trustee prepares a Draft Assessment Plan (Draft AP). The Draft AP ensures that the assessment is well planned, conducted systematically, and that the selected methods for assessment are cost-effective [43 C.F.R. § 11.13(c)]. The Draft AP confirms the exposure of natural resources to hazardous substances, describes the objectives of any testing and sampling for injury or pathway determination and provides a quality assurance project plan (QDRAFT APP) to ensure quality control in testing and sampling [43 C.F.R. § 11.31(C)(4)]. The Trustee intends for this Draft AP to communicate the assessment approach to the public and the PRPs in an effective manner, so that these groups can productively participate in, or comment on, assessment activities.

## 1.4 Decision to Perform a Type B Assessment

43 C.F.R. Part 11 describes two types of assessments: Type A and Type B. The Trustee may select between a "Type A" and a "Type B" NRDA [43 C.F.R. § 11.33]. Type A procedures are simplified procedures that require minimal field observation [43 C.F.R. § 11.33(a)]. A simplified model has been developed only for Type A assessments in Great Lakes environments ("NRDAM/GLE"), coastal and marine environments [43 C.F.R. § 11.33(a)]. Under 43 CFR § 11.34, an AO may use a Type A assessment if the release occurred over a short duration, was a minor event, was relatively homogeneous, and involved a limited number of hazardous substances.

The Trustee has made a determination that a Type B NRDA is warranted for the Duck and Otter Creeks Assessment Area. At this Assessment Area, releases of hazardous substances have occurred continuously since the 1950s, with contamination extending over more than three miles of Duck Creek and seven miles

of Otter Creek. Hazardous substances have been transmitted through the food chain, affecting several different trophic levels. Over 20 listed hazardous substances have been detected in the Assessment Area. Consequently, the releases cannot be considered of short duration, as minor, or as resulting from a single event, and are therefore not readily amenable to a simplified model. At the Duck and Otter Creeks, the spatial and temporal extent and heterogeneity of exposure conditions and potentially affected resources are not suitable for application of simplifying assumptions and the averaged data and conditions inherent in Type A procedures.

The Trustees have, therefore, determined that: a Type B assessment is appropriate.

The parts of a Type B assessment are summarized below.

1. **Injury Determination**: Injury determination establishes whether and what natural resources have been injured as a result of the release of hazardous substances [43 C.F.R.§ 11.13(e)(1)]. It also involves determining the pathway, or route, through which the hazardous substances were transported from sources to the injured resource [43 C.F.R. § 11.61(c)(3)].
2. **Quantification**: Quantification establishes the amount of natural resource restoration necessary to offset the losses caused by natural resource injuries. The extent and degree of injuries, the ability of the resource to recover, and the reduction in services can be included in the quantification [43 C.F.R. § 11.71(c)].
3. **Damage Determination**: Damage Determination establishes the amount of appropriate compensation expressed as a dollar amount required to accomplish sufficient natural resource restoration as compensation for injuries [43 C.F.R. § 11.13(e)(3)]. Damages may include the cost of "restoration, rehabilitation, replacement and/or acquisition of the equivalent of the natural resources and the services those resources provide" and the value of losses from the time of the release to the reestablishment of the services to baseline conditions [43 C.F.R. § 11.80(b)]. Baseline conditions are the conditions that "would have existed at the assessment area had the discharge or release of the hazardous substance under investigation not occurred." [43 CFR § 11.14(e)]. Damages also include the costs of performing the assessment.

## 1.5 Post-Assessment Phase

**The post-assessment phase is the final step in the NRDA process.** After the assessment is complete, the Trustee produces a report of assessment containing the results of the NRDA [43 C.F.R. § 11.90]. The Trustee may then seek recovery of damages from the PRPs [43 C.F.R. § 11.91] and such damages may include direct and indirect costs "necessary to complete all actions identified in the selected alternative for restoration, rehabilitation, replacement, and/or acquisition of equivalent resources" [43 C.F.R. § 11.83(b)]. If damages are awarded, or if a settlement is reached, a restoration plan is developed and implemented using the recovered money.

## 1.6 Public Review and Comment

The Trustee intends for this DRAFT AP to communicate the assessment approach to the public, so that the public can become engaged and actively participate in, or comment on, assessment activities. Public input may also provide the Trustee with new information and ideas that they may incorporate into their assessment. The Trustee, at a minimum intends to hold public comment periods on the following documents.

- Final Duck and Otter Creeks Natural Resource Damage Assessment Plan.

Participation by the PRPs

On May 21, 2010, a Notice of Intent to Perform an Assessment (NOI) letter was sent to the PRPs listed in Table 2.2 notifying and inviting them to participate in the NRDA. Thus far, the Trustee has received responses from the following companies: BP Products North America Inc., ConocoPhillips Company, CSX Corporation, Envirosafe Services of Ohio, Inc., Lubriplate Lubricants Company/Fiske Brothers Refining Company, Pilkington North America, Inc., Sunoco, Inc, and Toledo Edison Company, who have indicated they are interested in meeting with the Trustee to discuss the NRDA process. The Trustee is in the process of ascertaining dates that all interested parties will be available to meet.

## 1.7 Natural Resource Damage Coordination with Response Actions

An NRDA must account for any response actions such as cleanup or other remedial activities [43 C.F.R. § 11.31(a)(3)]. The Trustee realizes that implementing a protective remedy or cleanup is of primary importance for protection of natural resources. However, cleanup cannot achieve full restoration of injured resources and the services provided by those resources because injuries have occurred and will continue to occur during and after cleanup actions are implemented. In general, the more protective (speed and degree) the cleanup, the less residual injury to natural resources. Consequently, less extensive restoration is required to return resources to their baseline condition and less compensation is required to make the public whole for interim losses. The Trustee has coordinated and will continue to coordinate with the U.S. Environmental Protection Agency (EPA) Great Lakes National Program Office (GLNPO) as injuries are investigated at the Assessment Area.

The goals of the coordination are to avoid duplication, reduce costs, and achieve multiple objectives where practical. At a minimum, the Trustee intends to consider the objectives of any cleanup during the continued planning and implementation of NRDA. Whenever practical, the Trustee will explicitly coordinate damage assessment activities with other investigations and will ensure all parties understand the Trustee's NRDA objectives and how their activities impact natural resource injuries, services, and restoration.

## 1.8 Organization of the Assessment Plan

The remaining sections of this DRAFT AP contain the following information. Section 2 describes the geography, ecology and natural resources of the Assessment Area. Section 3 describes the general approaches that the Trustee proposes to follow to document hazardous substance releases, pathways, and injuries, and to scale appropriate restoration through quantification of injuries, damages, and restoration. Additional approaches may be proposed in one or more DRAFT AP addenda to be released to the public in the future.
Section 4 presents the approaches for assessing and quantifying injuries to different natural resources. Additional assessment activities may be described in subsequent addenda. Section 5 describes general quality assurance procedures to be utilized.

# 2. Description of the Assessment Area

In this Section, the Trustee will provide a description of the geographical scope of the Assessment Area, and discuss injuries to natural resources that result from releases of hazardous substances into the Duck and Otter Creeks and Driftmeyer Ditch (Figure 2.1) from PRP discharges, directly or indirectly. The

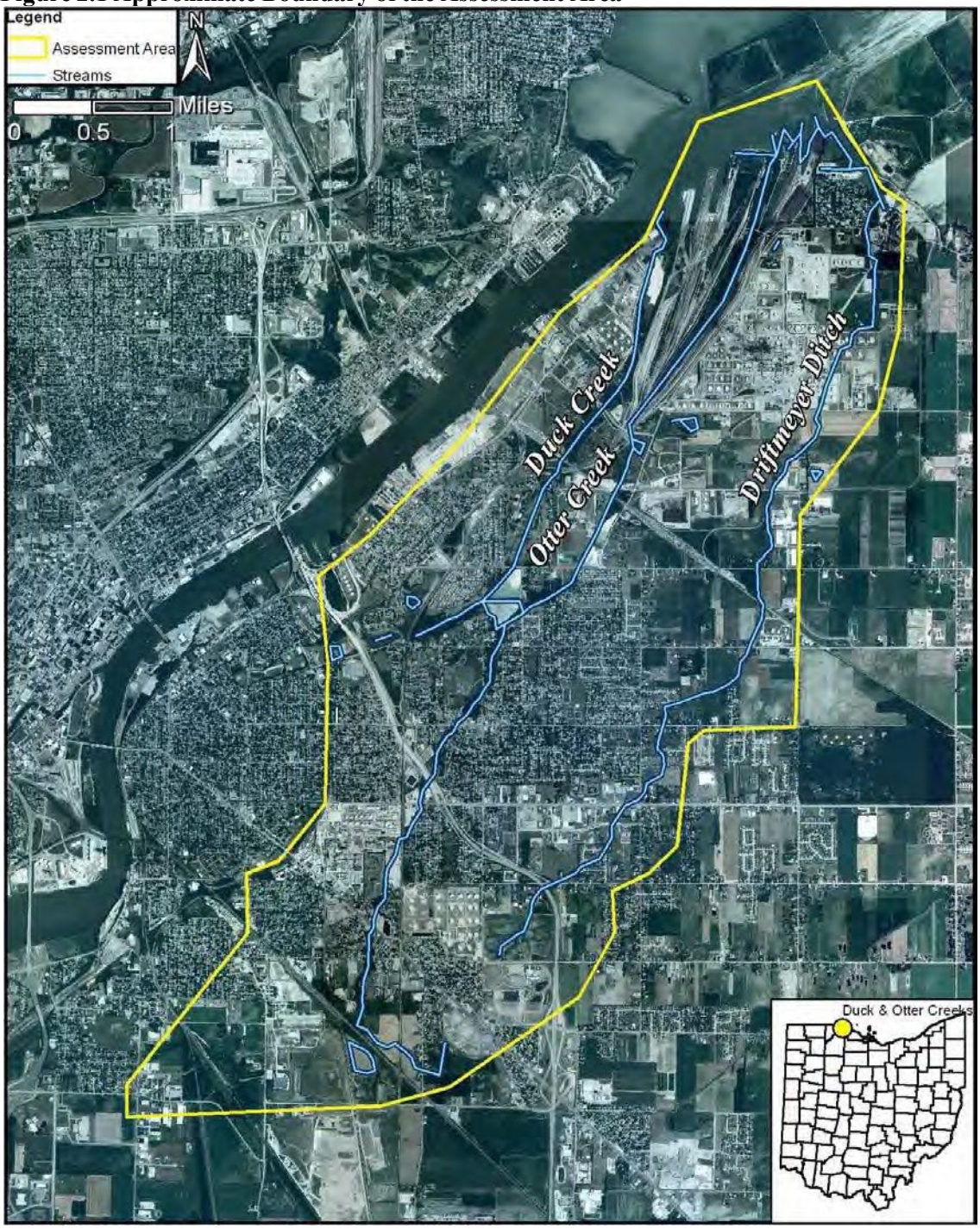
NRDA will focus on the following natural resources: 1) surface waters and sediments; 2) benthic invertebrates and supporting habitats; 3) fishery resources and supporting habitats; and 4) avian and mammalian resources and supporting habitats. Additionally, the following classes of hazardous substances will be discussed: 1) organic compounds including polyaromatic hydrocarbons (PAHs), 2) organochlorines, including polychlorinated biphenyls (PCBs), and 3) metals. The Trustee may modify the focus of the NRDA with respect to natural resources, hazardous substances, and/or PRPs, based on the initial results of assessment activities.

## 2.1 Geographic Scope of the Assessment Area

Duck and Otter Creeks are neighboring watersheds east of the Maumee River in Northwestern Ohio, an area that was known as The Great Black Swamp. The watersheds have a flat topography, significant habitat modification, and the lower reaches of both Creeks are a part of the industrial hub on the southwestern shore of Lake Erie. The Assessment Area includes the watershed of Duck Creek from its upstream terminus downstream four miles to its confluence with the Maumee River, the watershed of Otter Creek from its upstream terminus seven miles downstream to its confluence with the Maumee Bay, and the entirety of Driftmeyer Ditch (see Figure 2.1). The Assessment Area is approximately 9,470 acres wholly within the Maumee River Area of Concern. Duck Creek begins at Collins Park in the City of Toledo, Ohio. It flows in a north to northeasterly direction for approximately four miles before entering the Maumee River near its mouth on Lake Erie. Otter Creek lies to the east of Duck Creek and roughly parallels Duck Creek entering Lake Erie to the east of the mouth of the Maumee River. Otter Creek is approximately seven miles long. Driftmeyer Ditch enters Lake Erie at the confluence with the Toledo Edison Bayshore facility intake. While the data are not available, the lower reaches of Driftmeyer Ditch are bordered by several of the same PRPs as Duck and Otter Creeks; it is therefore reasonable to assume that there may be similar injuries to natural resources.

If data warrant, the assessment boundaries may be expanded to include other areas where hazardous substances have come to be located.

**Figure 2.1 Approximate Boundary of the Assessment Area**




Decades of refining and manufacturing activity and improper waste disposal practices have resulted in the release of hazardous substances to both Duck and Otter Creeks and their watersheds, and potentially Driftmeyer Ditch. Hazardous substances have migrated to Duck and Otter Creeks from refineries and other industrial complexes along their banks, as well as through numerous spills and other releases from

these facilities. Hazardous substances have injured surface waters, sediments, fish and wildlife in both Creeks. There are currently no regulatory activities underway to address the contamination present in sediments, fish and other biota in Duck and Otter Creeks.

## 2.2 Hazardous Substances Released

Hazardous substances released into the Assessment Area include, but are not limited to, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and other compounds listed in Table 2.2. The compounds listed in Table 2.1 are hazardous substances as defined by 40 C.F.R. § 302.4, pursuant to section 102(a) of CERCLA and section 311(b)(2) of the CWA. The Trustee may consider additional hazardous substances released by PRPs, based on the initial results of the assessment.

**Table 2.2. Selected hazardous substances, and their chemical abstract registry numbers, which have been detected in the Duck and Otter Creeks.**

| | | |
|---|---|---|
| Aroclor 1254 (PCB) 11097691 | Aroclor 1260 (PCB) 11096825 | Benzo(a)anthracene 56553 |
| Benzo(a)pyrene 50328 | Benzo(b)fluoranthene 205992 | Benzo(g,h,i)perylene 191242 |
| Benzo(k)fluoranthene 207089 | Cadmium 7440439 | Chromium 7440473 |
| Chrysene 218019 | DDD 72548 | DDE 72559 |
| DDT 50293 | Fluoranthene 206440 | Indeno(1,2,3-cd)pyrene 193395 |
| Lead 7439921 | Mercury 7439976 | Naphthalene 91203 |
| Phenanthrene 85018 | Pyrene 129000 | Selenium 7782492 |

## 2.3 Sources of Releases

Data collected by the United States Environmental Protection Agency (USEPA) and others document the release of hazardous substances from chemical manufacturing, refining and other activities since the 1950s that have resulted in severe contamination of both Duck and Otter Creeks. Chemicals may also have been released from landfills adjacent to the Creeks. The chemicals released to the Duck and Otter Creeks include, but are not limited to, PCBs, PAHs, and chlorinated organic pesticides. More than 30 PAHs, 10 metals, 2 chlorinated pesticides, and PCBs have been detected in bottom sediments of Duck and Otter Creeks at concentrations above those expected to cause injury to benthic organisms, fish and avian species. Both Creeks have been subject to numerous spills and releases, with the most recent significant spill occurring on Duck Creek in spring, 2009.

**Table 2.3 Probable sources of hazardous substances to Duck and Otter Creeks.**

| Site | Address |
|---|---|
| Pilkington North America, Inc./NSG Group | 1769 East Broadway Street<br>Toledo, OH |
| Sunoco, Inc. | 1819 Woodville Road<br>Oregon, OH |
| BP North America Inc. | 4001 Cedar Point Road.<br>Oregon, OH |
| CSX Corporation | 600 Millard Avenue<br>Oregon, OH |
| Chevron Corporation | Front Street, Toledo, OH |
| Fiske Brothers Refining Company/Lubriplate Lubricants Company | 1500 Oakdale Avenue |
| Marsulex Refinery | 1400 Otter Creek Road |

| | |
|---|---|
| Toledo Edison Company/FirstEnergy Corp. | 4701 Bayshore Road<br>Oregon, OH |
| ConocoPhillips Company | 275 Millard Avenue<br>Toledo, OH |
| Envirosafe Services of Ohio, Inc. | 876 Otter Creek Road |

## 2.4 Description of Natural Resources

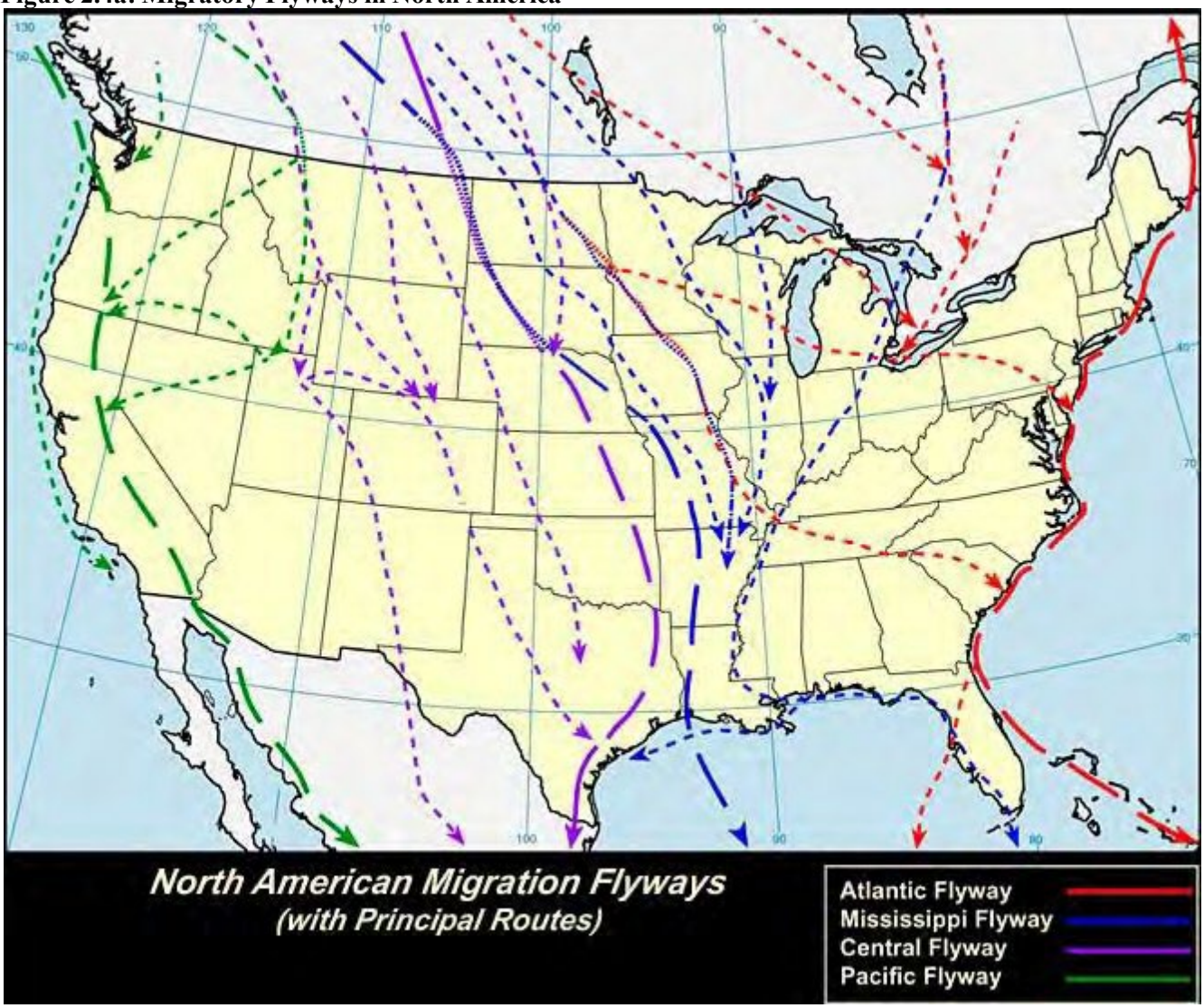
The Duck and Otter Creeks contain a variety of habitats, including emergent wetlands, riparian forest, and lotic (river) waters, and a diverse assemblage of fish and wildlife species. These habitats and fish and wildlife species have been exposed to and/or injured by hazardous substances released by PRPs. The following natural resources and their supporting ecosystems have been, or potentially have been, affected by releases of hazardous substances over the decades: geologic resources, ground water, surface water (including sediments) and biological resources including benthic organisms, fish, fish eating birds, wading birds, water fowl and fish eating mammals in the Assessment Area.

### 2.4.1 Migratory Birds

The Duck and Otter Creeks are located at an intersection of the Atlantic and the Mississippi flyways, with over three million ducks, geese and other birds using this corridor (Figure 2.4a). Numerous species of migratory neotropical songbirds inhabit the area seasonally. The spring migration along the southwestern shore of Lake Erie is called "The Biggest Week in American Birding" due to the diversity of birds observed, with over 240 species that utilize the western Lake Erie basin migration corridors. (The Biggest Week in American Birding, 2010) Raptors are also highly abundant along this migration corridor, with over 100,000 utilizing the corridor in the vicinity of Duck and Otter Creeks during the fall migration (Figure 2.4b) and up to 20,000 birds in the spring migration. Two active Bald Eagle nests have been observed within a half mile of the Assessment Area, and four active Bald Eagle nests within five miles of the Assessment Area. Many migratory bird species nest on islands and wetlands in the adjacent Maumee Bay, as well as wetlands near the river.

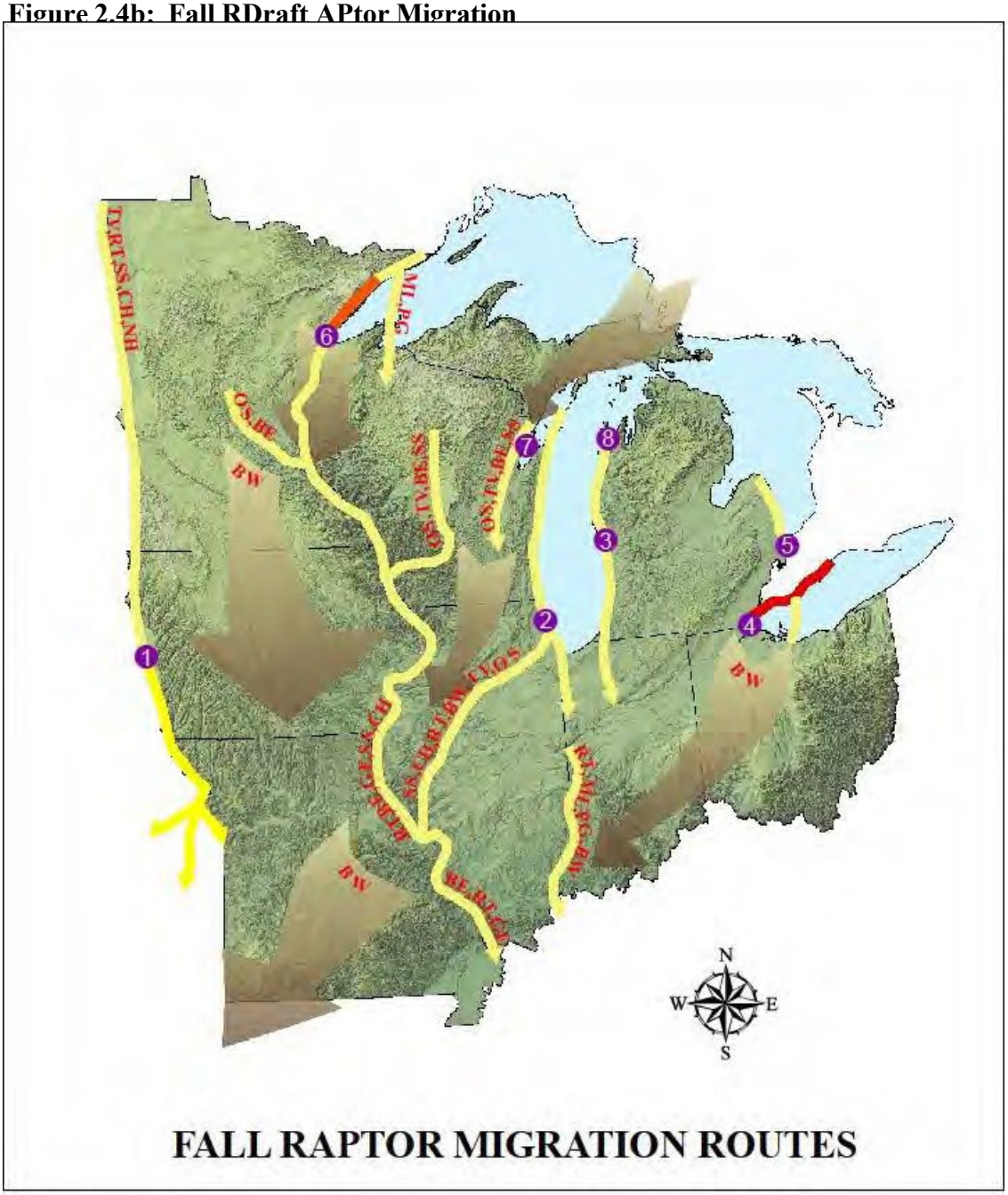
A brief list of the migratory bird species likely found within the Assessment Area include, but are not limited to, the bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus),* wood duck (*Aix sponsa*), Canada goose (*Branta canadensis*), common merganser (*Mergus merganser*), great blue heron (*Ardea herodias*), cliff swallow (*Hirundo pyrrhonta*), tree swallow (*Tachycineta bicolor*), Caspian tern (*Sterna caspia*), Foresters tern (*Sterna fors*teri), common tern (*Sterna hirundo*), mallard duck (*Anas platyrhynchus*), black duck (*Anas rubripes*), lesser scaup (*Aythya affinis*) and kingfisher (*Ceryle alcyon*). In the past few years, two migratory bird species that are listed as endangered under the Endangered Species Act (ESA), the Piping Plover (*Charadrius melodus*) and Kirtland's Warbler (*Dendroica kirtlandii*), have been observed during spring migration in the vicinity of the Assessment Area;.

**Figure 2.4a: Migratory Flyways in North America**




Source: Adapted from Birdnature, 2009

**Figure 2.4b: Fall RDraft APtor Migration**




# FALL RAPTOR MIGRATION ROUTES

| SYMBOL | COMMON NAME |
|---|---|
| AK | American Kestrel |
| BE | Bald Eagle |
| BO | Boreal Owl |
| BW | Broadwing |
| CH | Cooper's Hawk |
| GE | Golden Eagle |
| LEO | Long-eared Owl |
| ML | Merlin |
| NG | Northern Goshawk |
| NH | Northern Harrier |
| NSWO | Northern Saw-whet Owl |
| OS | Osprey |
| PG | Pregrine Falcon |
| RL | Rough-legged Hawk |
| RS | Red-shouldered Hawk |
| RT | Red-tailed Hawk |
| SEO | Short-eared Owl |
| SS | Sharp-shinned Hawk |
| TV | Turkey Vulture |

**Major Raptor Migration Observation Sites**

1. Hitchcock Nature Area (CH,RT,SS,TV,SW,NH)
2. Illinois Dunes State Park (ML,NH,PG,SEO)
3. Muskegon State Park (SS,RL,RT)
4. Lake Erie Metropark (TV,OS,BE,NH,SS,CH,RT, RL,GE,AK,ME,PG)
5. Port Huron (PG,ML)
6. Hawk Ridge, Duluth (TV,OS,BE,NH,SS,BW,NG, RT,RL,AK,ML,PG,BO,NSWO,LEO)
7. Little Suemico (SS,BW,NSWO)
8. Sleeping Bear Dunes NL (RL,RT,SS)

**Legend**
**Number of Birds**
- 2,500 - 25,000
- 25,000 - 50,000
- 50,000 - 100,000
- >100,000

Map Created for: Division of Migratory Birds
October, 2006
Fall Migratory Bird Information provided by
USFWS Migratory Bird Biologist Bob Russell

U.S. Fish & Wildlife Service
Region 3 NWRS
Division of Conservation Planning
Twin Cities, Minnesota 55111

### 2.4.2 Fish

Fish species in the Duck and Otter Creeks may include, but are not limited to, yellow perch (*Perca flavescens*), white bass (*Morone chrysops*), pumpkinseed (*Lepomis gibbosus*), white crappie (*Pomoxis annularis*), black crappie (*Pomoxis nigromaculatus*), goldfish (*Carassius auratus*), emerald shiner (*Notropis atherinoides*), gizzard shad (*Dorosoma cepedianum*), carp (*Cyprinus carpio*), brown bullhead (*Ictalurus nebulosus*), yellow bullhead (*Ameirus natalis*), alewife (*Alosa pseudoharangus*), smallmouth bass (*Micropterus dolomieui*), largemouth bass (*Micropterus salmoides*), rainbow smelt (*Osmerus mordax*), Johnny darter (*Etheostoma nigrum*), walleye (*Stizostedion vitreum*), rainbow trout (*Oncorhynchus mykiss*), spottail shiners (*Notropis hudsonius*), stone roller (*Campostoma anomalum*), blunt nose minnow (*Pimephales notatus*), creek chub (*Semotilus atromaculatus*), log perch (*Percina cDraft AProdes*), freshwater drum (*Draft APlodinotus grunniens*), lake sturgeon (*Acipenser fulvescens*), bowfin (*Amia calva*) and white suckers (*Catostomus commersoni*).

Rainbow smelt *(Osmerus mordax)* and rainbow trout *(Oncorhynchus mykiss)* are anadromous fish species that are potentially present within the Assessment Area. Great Lakes populations of yellow perch *(Perca flavescens)*, lake sturgeon *(Acipenser fulvescens)*, walleye *(Stizostedion vitreum)*, and forage fish are nationally significant fish stocks pursuant to the Great Lakes Fish and Wildlife Restoration Act (GLFWRA).

## 2.5 Confirmation of Exposure

This Section presents data confirming that natural resources have been exposed to hazardous substances releases at or near the Assessment Area.

Federal regulations state that an assessment plan should confirm that:

> "at least one of the natural resources identified as potentially injured in the preassessment screen has in fact been exposed to the released substance." [43 C.F.R. §.11.37(a)]

A natural resource has been "exposed" to a hazardous substance if "all or part of [it]is, or has been, in physical contact with . . . a hazardous substance, or with media containing the . . . hazardous substance" [43 C.F.R. § 11.14(q)]. Federal regulations also state that "whenever possible, exposure shall be confirmed using existing data" from previous studies of the Assessment Area [43 C.F.R. § 11.37(b)(1)]. The following sections provide confirmation of exposure for a number of potentially injured natural resources identified in the PAS.

### 2.5.1 Surface water, fish, and sediments

The DOI regulations define "surface water resources" as waters of the United States, including sediments suspended in water or laying on the bank, bed, or shoreline sediments in or transported through coastal or marine areas. This term does not include ground water, water or sediments in ponds, lakes, or reservoirs designed for waste management under the Resource Conservation Recovery Act (RCRA) [42 U.S.C. §§ 6901-6992] or the CWA or applicable regulations [43 C.F.R. § 11.14(pp)]. In the Assessment Area, sediments have been exposed to hazardous substances including, but not necessarily limited to, PAHs, PCBs, benzo(a)pyrene, lead (Pb), and Arsenic (As). (see Table 2.5.1).

**Table 2.5.1. Concentration ranges for selected hazardous substances in sediments from Duck and Otter Creeks (from Tetra Tech 2008).**

| | Pb | As | Total PCBs | Total PAHs |
|---|---|---|---|---|
| **USEPA Ecological Reference Limit for Sediment** | 35.8 | 9.79 | 0.0598 | 1.61 |
| **Duck Creek Sediment (mg/kg)** | 68.5 – 1,076 | 5.48 - 132 | nd – 0.488 | 0.723-801 |
| **Otter Creek Sediment (mg/kg)** | 66.7-350 | 6.67 – 83.5 | nd-11.3 | 4.71-248 |

PCB = polychlorinated biphenyls
Pb = Lead
As = Arsenic
nd = below analytical detection limits

### 2.5.2 Biological Resources

Biological resources are defined as those natural resources referred to in Section 101(16) of CERCLA as fish and wildlife and other biota. Fish and wildlife include aquatic and terrestrial species; game, nongame, and commercial species; and threatened, endangered, and state sensitive species. Other biota encompass shellfish, terrestrial and aquatic plants, and other living organisms not otherwise listed in this definition [43 C.F.R. § 11.14(f)].

The Assessment Area supports a wide variety of biota potentially exposed to hazardous substance releases. Potentially injured biological resources may include, but are not limited to:

- Riverine, wetland, and floodplain fish and wildlife habitats,
- Mammalian and avian species,
- Fish of various species,
- Reptiles and amphibians,
- Aquatic benthic macroinvertebrates,
- Other aquatic flora and fauna,
- Vegetation, and
- Threatened or endangered species.

# 3. Assessment Approach

This Section provides the general approach that the Trustee will follow in assessing natural resource damages for the Duck and Otter Creeks Assessment Area. The Trustee will conduct an assessment to determine the nature and extent of natural resource injuries, the restoration opportunities that could offset the losses caused by injuries, and the appropriate amount of restoration to make the public whole. The Trustee may use a variety of metrics that address either the natural resources themselves, or the ecological and human services that the natural resources provide. Generally, the purpose of the injury assessment is to determine whether injuries to natural resources have occurred [43 C.F.R. § 11.62], to identify the

environmental pathways through which injured resources have been exposed to hazardous substances [43 C.F.R. § 11.63], and to quantify the degree and extent (spatial and temporal) of injury losses and potential restoration gains compared with baseline conditions [43 C.F.R. § 11.70].

## 3.1 Injuries to Natural Resources and Hazardous Substance Pathways

### 3.1.1 Introduction

It is likely that surface water resources, biological resources, and possibly ground water resources, have been and continue to be injured as a result of exposure to hazardous substances. The purpose of the injury assessment phase is to determine whether natural resources have been injured [43 C.F.R. § 11.61], to quantify the degree and extent (spatial and temporal) of injury [43 C.F.R. § 11.71], and to identify the environmental pathways through which injured resources have been exposed to hazardous substances [43 C.F.R. § 11.63].

The Trustee will determine whether an injury to one or more natural resources has occurred as a result of releases of hazardous substances [43 C.F.R. § 11.62]. DOI regulations define "injury" as a measurable adverse change, either long or short term, in the chemical or physical quality or the viability of a natural resource resulting either directly or indirectly from exposure to a release of a hazardous substance, or exposure to a reaction product resulting from the release of a hazardous substance [43 C.F.R. § 11.14(v)]. The Trustee will use existing literature and data, where available, to determine and quantify injuries. Where these data are insufficient, additional studies needed to determine and quantify injuries may be identified at a later date. This determination will include the following steps:

1. **Injury determination.** First, the Trustee will determine whether injuries that meet the definitions of injury in 43 C.F.R. § 11.62 have occurred.
2. **Pathway determination.** The Trustee will determine whether there is a viable pathway for the hazardous substances from the point of release to a point at which natural resources are exposed to the hazardous substances [43 C.F.R. § 11.63].
3. **Injury quantification.** The Trustee will quantify the effects of the releases of hazardous substances in terms of changes from "baseline conditions" [43 C.F.R. § 11.70(a)]. Specific steps in the quantification phase include measuring the extent of injury relative to baseline conditions and quantifying the spatial and temporal extent of injury [43 CFR § 11.71(b)]. Baseline conditions are the conditions that "would have existed at the assessment area had the . . . release of the hazardous substance . . . not occurred" [43 C.F.R. § 11.14(e)] and are the conditions to which injured natural resources should be restored [43 C.F.R. § 11.14(ll)].

### 3.1.2 Definitions of Injury

Based on an initial review of existing data, the relevant NRDA definitions for the injuries to natural resources of the Assessment Area include the following:

#### 3.1.2.1 Surface water

Relevant definitions of injury to surface water resources that may be evaluated by the Trustee includes the following:

- Concentrations and duration of substances in excess of applicable water quality criteria established by Section 304(a)(1) of the CWA, or by other federal or state laws or regulations that establish such criteria, in surface water that before the discharge or release met the criteria and is

a committed use as habitat for aquatic life, water supply, or recreation. The most stringent criterion applies when surface water is used for more than one of these purposes [43 C.F.R. § 11.62(b)(1)(iii)].

- Concentrations and duration of substances in excess of drinking water standards as established by Sections 1411-1416 of the Safe Drinking Water Act (SDWA), or by other federal or state laws or regulations that establish such standards for drinking water, in surface water that was potable before the discharge or release [43 C.F.R. § 11.62(b)(1)(i)].
- Concentrations and duration of substances sufficient to have caused injury to biological resources when exposed to surface water or suspended sediments [43 C.F.R. § 11.62(b)(1)(v)].

#### 3.1.2.2 Sediments

Relevant definitions of injury to sediments that may be evaluated by the Trustee includes the following:

- Concentrations of hazardous substances sufficient to cause injury to biological or surface water resources that are exposed to sediments [43 C.F.R. §11.62(b)(1)(v)].

#### 3.1.2.3 Aquatic biota resources

Relevant biological injuries defined by DOI regulations [43 C.F.R. § 11.62(f)(1)] include the following:

- Concentrations of a hazardous substance sufficient to exceed action or tolerance levels established under section 402 of the Food, Drug and Cosmetic Act, 21 U.S.C. 342, in edible portions of organisms [43 C.F.R. § 11.62(f)(1)(ii)]
- Concentrations of a hazardous substance sufficient to exceed levels for which an appropriate state health agency has issued directives to limit or ban consumption of such organism [43 C.F.R. § 11.62(f)(1)(iii)]
- Concentrations of a hazardous substance sufficient to cause the biological resource or its offspring to have undergone at least one of the following adverse changes in viability: death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), or physical deformations [43 C.F.R. § 11.62(f)(1)(i)].

#### 3.1.2.4 Terrestrial biota resources

Relevant biological injuries defined by DOI regulations include the following:

- Concentrations of a hazardous substance sufficient to exceed action or tolerance levels established under section 402 of the Food, Drug and Cosmetic Act, 21 U.S.C. 342, in edible portions of organisms [43 C.F.R. § 11.62(f)(1)(ii)]
- Concentrations of a hazardous substance sufficient to exceed levels for which an appropriate State health agency has issued directives to limit or ban consumption of such organism [43 C.F.R. § 11.62(f)(1)(iii)]
- Concentrations of a hazardous substance sufficient to cause the biological resource or its offspring to have undergone at least one of the following adverse changes in viability: death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), or physical deformations [43 C.F.R. § 11.62(f)(1)(i)].

#### 3.1.2.5 Ground water resources

Relevant definitions of injury to ground water resources that may be evaluated by the Trustee includes the following:

- Concentrations of substances in excess of drinking water standards established by sections 1411-1416 of the Safe Drinking Water Act (SDWA), or by other federal or state laws or regulations that establish such standards for drinking water, in ground water that was potable before the discharge or release [43 C.F.R. § 11.62(c)(1)(i)].
- Concentrations of substances in excess of water quality criteria, established by section 1401(1)(d) of the SDWA, or by other Federal or State laws or regulations that establish such criteria for public water supplies, in ground water that before the discharge or release met the criteria and is a committed use as a public water supply [43 C.F.R. § 11.62(c)(1)(ii)].
- Concentrations of substances in excess of applicable water quality criteria established by section 304(a)(1) of the CWA, or by other Federal or State laws or regulations that establish such criteria for domestic water supplies, in ground water that before the discharge or release met the criteria and is a committed use as a domestic water supply [43 C.F.R. § 11.62(c)(1)(iii)].
- Concentrations of substances sufficient to have caused injury to surface water, air, geologic, or biological resources, when exposed to ground water [43 C.F.R. § 11.62(c)(1)(iv)].

## 3.2 Quantification of Injuries, Damages, and Restoration

### 3.2.1 Definition of key terms and concepts

This subsection provides perspective on the restoration planning and damage determination process by defining and discussing key terms and concepts. As described in the NRDA regulations promulgated by the DOI, trustees may recover damages based on injuries to natural resources occurring from the release of hazardous substances through the recovery period, the cost of the assessment and any applicable interest [43 C.F.R. § 11.15]. The damage determination phase includes measuring restoration costs and compensable values for interim losses [43 C.F.R. § 11.80].

*Restoration* refers to actions undertaken to return an injured resource to its baseline condition as measured by the services provided by that resource [43 C.F.R. § 11.14(ll)]. Restoration includes rehabilitation, replacement, or acquisition of resources or services.

*Baseline* refers to the conditions that would have existed in the assessment area had the release of hazardous substances not occurred [43 C.F.R. § 11.14(e)] and *services* are defined as the "physical and biological functions performed by the resource, including the human uses of those functions" [43 C.F.R. § 11.14(nn)]. Restoration can be accomplished by restoring or rehabilitating resources or by replacing or acquiring the equivalent of the injured natural resources and their service flows. Restoration should be distinguished from *remediation* or *response actions* undertaken pursuant to CERCLA or to the NCP.

*Compensable values* include "the value of lost public use of the services provided by the injured resources, plus lost nonuse values" [43 C.F.R. § 11.83(c)(1)]. Under CERCLA, the compensable values for interim services lost to the public ("interim losses") accrue from the time of discharge or release or 1980, whichever is later, until restoration is complete [see 43 C.F.R. § 11.80(b)].

### 3.2.2 Overview of the restoration and compensation determination process

The objective of the restoration planning phase is to develop a "reasonable number of possible alternatives for the restoration, rehabilitation, replacement, and/or acquisition of the equivalent of the injured natural resources," as measured by the services those resources provide [43 C.F.R. § 11.82(a)]. Trustees then evaluate these alternatives, and a preferred alternative is selected (an alternative can consist of single actions or combinations of actions [43 C.F.R. § 11.82(b)(1)]. The costs to perform the preferred alternative become the restoration cost component of total damages.

The NRDA regulations indicate that a Restoration and Compensation Determination Plan (RCDP) shall be prepared that lists a reasonable number of alternatives for restoration, rehabilitation, replacement, and/or acquisition of equivalent resources; selects one of the alternatives; gives the rationale for selecting that alternative; and identifies methodologies to be used to determine the cost of the selected alternative and the compensable value of services lost to the public [43 C.F.R. § 11.81(a)(1)]. The DOI regulations provide that the RCDP may be concurrently developed with the DRAFT AP. However, if existing data are insufficient to develop an RCDP, it can be developed after the completion of the Injury Determination phase [43 C.F.R. § 11.81(c)]. The Trustee has determined that data sufficient to develop the RCDP are not available at this time. Accordingly, when the Trustee develops an RCDP, it will be made available for public review.

### 3.2.3 Restoration planning and scaling

The Trustee anticipates developing a range of alternatives [43 C.F.R. § 11.82(c)] that will include selected restoration projects designed to restore or replace injured resources, as measured by their services. One alternative that must be considered is no action, or natural recovery.

Restoration projects will be aimed at performing activities that restore, enhance, replace, or acquire similar resources/services to those lost. These potential projects will be evaluated and ranked using criteria developed by the Trustee for the Duck and Otter Creeks NRDA. These criteria will be based on factors identified in the DOI NRDA regulations [43 C.F.R. § 11.82(d)].

Once projects have been identified and preferred alternatives have been selected, restoration projects will be "scaled." Scaling is the process of determining the appropriate size of a restoration project.

### 3.2.4 Initial focus

The Trustee will initially explore the possibility of quantifying the following categories of injuries, damages, and restoration:

- The loss or impairment of surface water, including the sediments suspended in water or lying on the bank, bed or shoreline.
- The loss or impairment of recreational fishing and boating opportunities representing the lost human uses of injured biological resources.

# 4. Assessment Tasks

**Injury determination and quantification assessment studies**

Specific assessment activities not provided in this Draft AP will be documented in addenda that will be made available for public review as they are developed. Assessment activities described in addenda will not commence before the end of a 30-day public comment period. Exceptions to this will be considered case by case. Beginning work before the end of the 30-day review will generally be considered only if the Trustee determines that the opportunity to collect important data may be lost if prompt action is not taken.

The Trustee's initial approach to injury determination will be to document the impact of hazardous substances on selected resources that represent key elements of the Assessment Area ecosystem. Specifically, the Trustee intends to examine:

- **Surface water:** Surface water is the immediate receptor of hazardous substances from point and nonpoint sources, and a medium in which biological resources are potentially exposed through direct contact and by propagation through the food chain.
- **Sediments:** Sediments are the medium in which many contaminants discharged or released to surface water come to be located, thus becoming a secondary source of contamination that results in the propagation of contaminants through the food chain.
- **Benthic invertebrates:** Benthic invertebrates are particularly susceptible to injury as a result of direct contact with contaminated sediments. Disruption or impairment of the invertebrate community may result in the impairment of higher-level organisms that depend on invertebrates for food (e.g., fish, birds). Invertebrates may also serve as a pathway by which higher-level organisms are exposed to hazardous substances.
- **Fish:** Fish are important biological resources because of their position in the food chain and their relationship to human uses of the environment. Fish may also provide an exposure pathway to piscivorous birds and mammals.
- **Birds:** Birds represent higher-level biological resources that are susceptible to injury through direct contact with or ingestion of hazardous substances.

## 4.1 Preliminary Evaluation of Injuries and Damages

The first task that the Trustee will pursue is a Preliminary Evaluation of Injuries and Damages. Because there are so many relevant site-specific data, analyses, and previous actions relevant to the Assessment Area, the Trustee believes that completion of many elements of a Type B assessment may be possible without collecting new data or undertaking new analyses. However, existing information must be organized and scrutinized for its exact applicability and relevance to the NRDA process. This evaluation will inform Trustee decisions about what additional new data may still be needed and available at reasonable assessment costs. The results of this evaluation may also lead the Trustee to modify assessment approaches and activities to complete the NRDA. Significant modifications will be described in addenda that will be released for public review.

### 4.1.1 Evaluate potential reference sites

Reference sites that represent the physical, chemical, and biological conditions in the Assessment Area absent the hazardous substance release can be used as part of the characterization of baseline conditions [43 C.F.R. § 11.72(d)]. The Trustee will evaluate the suitability of selected areas as reference sites for Duck and Otter Creeks. Ohio EPA's Qualitative Habitat Evaluation Index (QHEI) scores and metrics for the Duck and Otter Creeks, and other Lake Erie tributaries will be compiled and compared to evaluate the

comparability of physical habitat between the Assessment Area and potential reference sites. Similarly, when available, water quality data for constituents such as suspended solids, nutrients, temperature, and dissolved oxygen will be compiled and compared between the Assessment Area and potential reference sites. This information will be used, in part, to identify areas that can serve as appropriate reference sites for the Assessment Area.

### 4.1.2 Evaluate surface water with respect to applicable water quality criteria and standards

This evaluation will assess injury to surface water (water column) resources and establish whether surface water is a link in the exposure pathway to other potentially injured resources. Surface water injury has resulted if trustees can measure concentrations in excess of applicable water quality criteria established by section 304(a)(1) of the CWA, or by other federal or state laws or regulations that establish such criteria or standards, in surface water that before the discharge or release met the criteria and is a committed use as a habitat for aquatic life, water supply, or recreation [43 C.F.R. § 11.62(b)(1)(iii)]. One acceptance criterion for injury to surface water is the measurement of concentrations of a hazardous substance in two samples from different locations separated by a straight-line distance of not less than 100 feet [43 C.F.R. § 11. 62(b)(2)(i)(A)].

The Ohio Environmental Protection Agency collected water samples from locations in Duck and Otter Creeks. In evaluating these and any other existing data, the Trustee will provide documentation that samples satisfy regulatory criteria. The Trustee will also provide documentation showing that existing data are the result of sample collection and analysis that was conducted using generally accepted methods [43 C.F.R. § 11.64(b)(2) and (4)]. The Trustee may collect additional water samples, if that is deemed appropriate.

### 4.1.3 Evaluate the nature and extent of sediment contamination

This evaluation will assess contaminant concentrations in the sediments of the Duck and Otter Creeks and associated wetlands, establish whether sediment is a link in the pathway between contaminant sources and biological resources, and provide data necessary for the eventual formulation of an appropriate restoration plan. An injury to a surface water/sediment resource has resulted from the discharge of oil or release of a hazardous substance if trustees can measure concentrations of substances in suspended, bed, bank, or shoreline sediments sufficient to have caused injury to biological resources [43 C.F.R. § 11.62(b)(1)(v)]. Similarly, geologic resources (e.g., wetland soils) are injured if they contain concentrations of substances sufficient to cause injury to other resources (e.g., surface water, ground water, biological). The acceptance criterion for injury to the sediment portion of surface water resources is the measurement of concentrations of a hazardous substance in two samples from different locations separated by a straight-line distance of not less than 100 feet [43 C.F.R. § 11.62(b)(2)(i)(B)]. In evaluating existing data and collecting new data, the Trustee will provide documentation showing that this criterion has been satisfied. The Trustee will also provide documentation showing that existing data and any new data that are collected under this assessment are the result of sample collection and analysis conducted using generally accepted methods [43 C.F.R. § 11.64(b)(2) and (4)].

In light of the potentially useful data, a primary Trustee goal is to identify any significant data gaps. To accomplish this goal, the Trustee proposes to undertake a phased approach. The Trustee will obtain and review existing sediment data sets collected by government agencies, university researchers, and contractors to determine their conformance with the regulatory guidelines. Data that meet the quality standards necessary to document sediment chemistry then will be included in the NRDA. The Trustee will also identify additional sampling that will be necessary or useful at reasonable assessment costs.

### 4.1.4 Evaluate the nature and extent of contamination of the benthic invertebrate population

This evaluation will attempt to determine whether there has been injury to the benthic community and whether the benthic invertebrate community is a pathway of exposure to other potentially injured natural resources. DOI regulations allow the use of chemical analysis of either free ranging organisms or in situ indicator species in establishing pathway(s) for biological resources. The Trustee will attempt to use free ranging benthic invertebrate species. In addition, this evaluation will determine whether benthic invertebrate samples should be collected from the Duck and Otter Creeks, and appropriate reference areas using standard collection methods. If so, a sampling and analysis plan will specify what samples will be collected and how they will be analyzed.

### 4.1.5 Evaluate the nature and extent of fish tissue contamination

This evaluation will seek to document present and historical concentrations of hazardous substances in fish from the Duck and Otter Creeks, and establish whether there is a link in the pathway from surface water (and sediments) to higher trophic level fish, avian, and mammalian species. DOI regulations allow the use of chemical analysis of either free ranging organisms or in-situ indicator species in establishing pathway(s) for biological resources. The Trustee will attempt to use free ranging fish species, however caged fish and other in-situ indicators may be used where appropriate.

State and federal agencies, as well as individual investigators, have collected fish tissue data from the Duck and Otter Creeks. These data will be compiled and evaluated for adherence with accepted quality assurance and quality control practices and the acceptance criteria for demonstrating injury to biological resources. Qualified data will be used to attempt to establish current and historical concentrations of contaminants in fish. In addition, this evaluation will determine whether additional data should be collected from the Duck and Otter Creeks and appropriate reference areas to fill data gaps.

The US EPA Great Lakes National Program Office (GLNPO) has conducted a data gap analysis and as a result a fish tissue chemical residue study (U.S. FWS 2010) is planned for August, 2010. The Fish Tissue Residue Work Plan was noticed for public comment on July 17, 2010.

### 4.1.6 Evaluate the potential impacts of hazardous substances on fish, avian and mammalian populations in the Duck and Otter Creeks

This evaluation will assess exposure and potential injury to fish, birds and mammals in the Assessment Area, as well as the disruption of the Assessment Area ecosystem caused by the presence of hazardous substances. An injury to fish, birds or mammals has occurred if concentrations of discharged oil or released hazardous substances are sufficient to cause the organisms or their offspring to have undergone at least one of the following adverse changes in viability: death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), or physical deformations [43 C.F.R. § 11.62(f)(1)(i)]. In addition, this evaluation will determine whether additional data should be collected from the Duck and Otter Creeks, and appropriate reference areas, to fill data gaps. If so, a sampling and analysis plan will specify what samples will be collected and how they will be analyzed.

### 4.1.7 Evaluate potential restoration opportunities

This evaluation will explore existing site-specific environmental restoration activities, plans, and opportunities in and near the Assessment Area. Potential restoration planning criteria will also be

explored, as well as initial categorization of potential restoration activities. The Trustee will use this information to develop an RCDP for public review.

### 4.1.8 Evaluate potential scaling techniques

This evaluation will explore scaling techniques that may be suitable for injury, restoration, or damages scaling at the Assessment Area for determining necessary baseline restoration or compensable values. The potential applicability of habitat equivalency analysis, resource equivalency analysis, habitat-based replacement costs, benefits transfer, market analysis, fishing and recreational valuation, total valuation, and total equivalency may all be considered.

## 4.2 Procedures for Sharing Data

The NRDA regulations require that the assessment plan includes "procedures and schedules for sharing data, split samples, and results of analyses, when requested, with any identified responsible parties and other natural resource trustee." [43 C.F.R. § 11.31(a)(4)]. To facilitate the data sharing process, the Trustee will, when requested, provide participating PRPs and other state and federal agencies with copies of data once those data are validated. The Trustee will, on request, provide data to non-participating PRPs upon completion and release of the interpretive report(s) using those data. In addition, the Trustee will, upon request, provide split samples to both participating and non-participating PRPs, if required sample volume and sampling procedures permit. Those requesting split samples will be required to cover the costs incurred by the Trustee in collecting additional material, when required, as well as costs associated with splitting and shipping.

# 5. Quality Assurance Project Plan

## 5.1 Introduction

This Quality Assurance Project Plan (QAPP) has been developed to support studies that may be performed as part of the Duck and Otter Creeks NRDA. Under the NRDA regulations [43 C.F.R. § 11.31], a QAPP is required that specifies procedures to ensure data quality and reliability. This QAPP is intended to provide quality assurance/quality control (QA/QC) procedures, guidance, and targets for use in future studies conducted for the NRDA. It is not intended to provide a rigid set of predetermined steps with which all studies must conform or against which data quality is measured, nor is it intended that existing data available for use in the NRDA must adhere to each of the elements presented in this QAPP. Ultimately, the quality and usability of data are based on methods employed in conducting studies, the expertise of study investigators, and the intended uses of the data. The QAPP has been designed to be consistent with the NCP and EPA's Guidelines and Specifications for Preparing Quality Assurance Project Plans (EPA, 1998).

The elements outlined in this plan are designed to:

- provide procedures and criteria for maintaining and documenting custody and traceability of environmental samples,
- provide procedures and outline QA/QC practices for the sampling, collection, and transporting of samples,
- outline data quality objectives (DQOs) and data quality indicators,

- provide a consistent and documented set of QA/QC procedures for the preparation and analysis of samples, and
- ensure that data are sufficiently complete, comparable, representative, unbiased, and precise so as to be suitable for their intended uses.

Before the implementation of NRDA studies, Standard Operating Procedures (SOPs) providing descriptions of procedures typically will be developed. These SOPs will be appended to this QAPP, as developed, to provide an ongoing record of methods and procedures employed in the assessment. SOPs will be developed and updated as methods and procedures are reviewed and accepted for use.

## 5.2 Project Organization and Responsibility

Definition of project organization, roles, and responsibilities helps ensure that individuals are aware of specific areas of responsibility that contribute to data quality. However, fixed organizational roles and responsibilities are not necessary and may vary by study or task. An example of project quality assurance organization, including positions with responsibility for supervising or implementing quality assurance activities, is shown in Figure 5.2. Key positions and lines of communication and coordination are indicated. Descriptions of specific quality assurance responsibilities of key project staff are included below. Only the project positions related directly to QA/QC are described; other positions may be described in associated project plans. Specific individuals and laboratories selected to work on this investigation will be summarized and appended to this QAPP or included in study-specific SOPs when they are established.

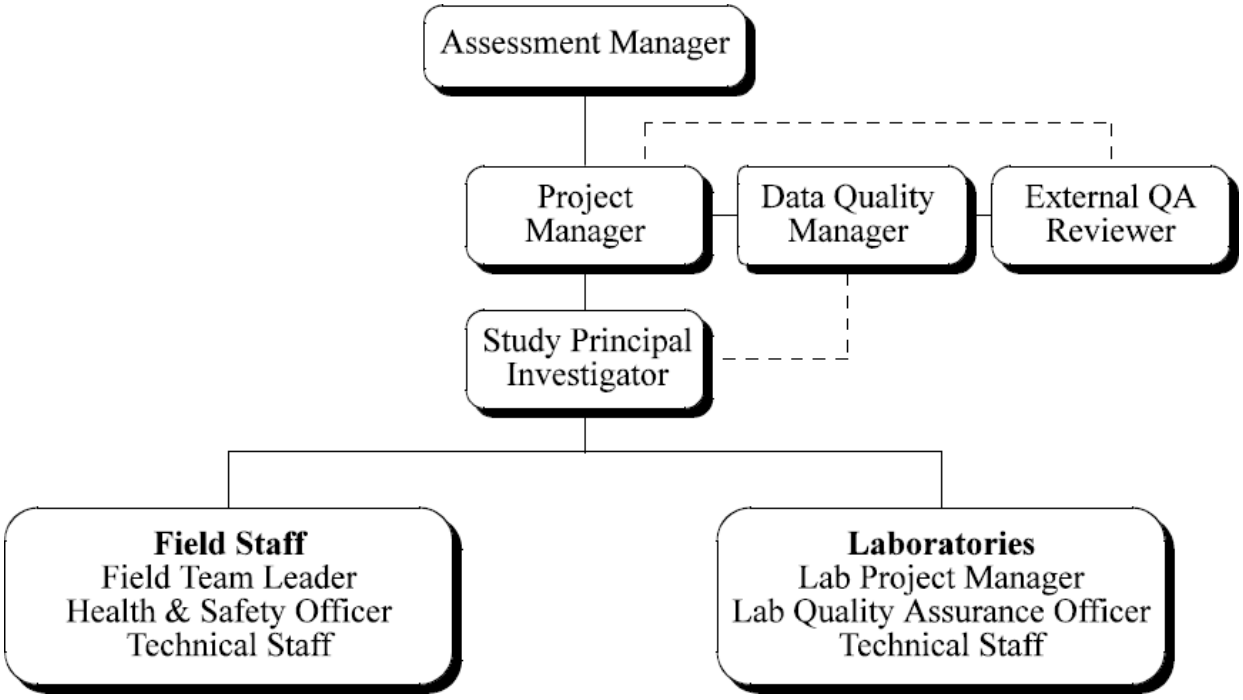



**Figure 5.2: Project organization**

### 5.2.1 Assessment Manager and Project Manager

The Assessment Manager (AM) is responsible for all technical, financial, and administrative aspects of the project. The Project Manager (PM) supports the AM and is responsible for producing quality data and

work products for this project within allotted schedules and budgets. Duties include executing all phases of the project and efficiently applying the full resources of the project team in accordance with the project plans. Specific QA-related duties of the AM and the PM can include:

- coordinating the development of a project scope, project plans, and data quality objectives,
- ensuring that written instructions in the form of SOPs and/or associated project plans are available for activities that affect data quality,
- monitoring investigative tasks for their compliance with plans, written procedures, and QC criteria,
- monitoring the performance of subcontractors in regard to technical performance and specifications, administrative requirements, and budgetary controls,
- participating in performance and/or systems audits and monitoring the implementation of corrective actions,
- reviewing, evaluating, and interpreting data collected as part of this investigation,
- supervising the preparation of project documents, deliverables, and reports, and
- verifying that all key conclusions, recommendations, and project documents are subjected to independent technical review, as scheduled in the project plans.

### 5.2.2 Data Quality Manager

A Data Quality Manager can be assigned to be responsible for overall implementation of the QDRAFT APP. Duties include conducting activities to ensure compliance with the QDRAFT APP, reviewing final QA reports, preparing and submitting QA project reports to the AM and PM, providing technical QA assistance, conducting and approving corrective actions, training field staff in QA procedures, and conducting audits, as necessary. Specific tasks may include:

- assisting the project team with the development of data quality objectives,
- managing the preparation of and reviewing data validation reports,
- submitting QA reports and corrective actions to the PM,
- ensuring that data quality, data validation, and QA information are complete and are reported in the required deliverable format,
- communicating and documenting corrective actions,
- maintaining a copy of the QAPP,
- supervising laboratory audits and surveillance,
- ensuring that written instructions in the SOPs and associated project plans are available for activities that affect data quality,
- monitoring investigative tasks for their compliance with plans, written procedures, and QC criteria,
- monitoring the performance of subcontractors in regard to technical performance and specifications, administrative requirements, and budgetary controls, and
- reviewing, evaluating, and interpreting data collected as part of this investigation.

### 5.2.3 External QA Reviewer

External QA Reviewers can review QA documentation and procedures, perform data validation, and perform field and laboratory audits if needed.

### 5.2.4 Principal Investigator

Study-specific Principal Investigators (PIs) ensure that QA guidance and requirements are followed. The PI or the designee will note significant deviations from the QDRAFT APP for the study. Significant deviations will be recorded and promptly reported to the PM and Data Quality Manager. In addition, the PI typically is responsible for reviewing and interpreting study data and preparing reports.

### 5.2.5 Field Team Leader

The Field Team Leader (FTL) supervises day-to-day field investigations, including sample collection, field observations, and field measurements. The FTL generally is responsible for all field QA procedures defined in the QDRAFT APP, and in associated project plans and SOPs. Specific responsibilities may include:

- implementing the field investigation in accordance with project plans,
- supervising field staff and subcontractors to monitor that appropriate sampling, testing, measurement, and recordkeeping procedures are followed,
- ensuring the proper use of SOPs associated with data collection and equipment operation,
- monitoring the collection, transport, handling, and custody of all field samples, including field QA/QC samples,
- coordinating the transfer of field data, including field sampling records, chain-of-custody records, and field logbooks, and
- informing the PI and Data Quality Manager when problems occur, and communicating and documenting any corrective actions that are taken.

### 5.2.6 Laboratory Project Manager

A Laboratory Project Manager may be responsible for monitoring and documenting the quality of laboratory work. Duties can include:

- ensuring that the staff and resources produce quality results in a timely manner are committed to the project,
- ensuring that the staff are adequately trained in the procedures that they are using so that they are capable of producing high quality results and detecting situations that are not within the QA limits of the project,
- ensuring that the stated analytical methods and laboratory procedures are followed, and the laboratory's compliance is documented,
- maintaining a laboratory QA manual and documenting that its procedures are followed,
- ensuring that laboratory reports are complete and reported in the required deliverable format,
- communicating, managing, and documenting all corrective actions initiated at the laboratory, and
- notifying the Data Quality Manager, within one working day of discovery at the laboratory, of any situations that will potentially result in qualification of analytical data.

### 5.2.7 Technical staff

Project technical staff represents a variety of technical disciplines and expertise. Technical staff should have adequate education, training, and specific experience to perform individual tasks, as assigned. They are required to read and understand any documents describing the technical procedures and plans that they are responsible for implementing.

## 5.3 Quality Assurance Objectives for Measurement Data

### 5.3.1 Overview

The overall QA objectives are to help ensure that the data collected are of known and acceptable quality for their intended uses. QA objectives are qualitative and quantitative statements that aid in specifying the overall quality of data required to support various data uses. These objectives often are expressed in terms of accuracy, precision, completeness, comparability, representativeness, and sensitivity. Laboratories involved with the analysis of samples collected in support of this NRDA will make use of various QC samples such as standard reference materials (SRMs), matrix spikes, and replicates to assess adherence to the QA objectives discussed in the following sections and in specific laboratory QA/QC plans. Field and laboratory QC targets for chemical analyses, frequency, applicable matrices, and acceptance criteria are listed in Table 5.3.1.

**Table 5.3.1. Laboratory and field quality control sample targets for chemical analyses.**

| QC element | Target frequency | Applicable matrices | Target acceptance criteria |
|---|---|---|---|
| Method blank | 1 in 20 samples | S, SW, T | Method dependent |
| Laboratory duplicate | 1 in 20 samples | S, SW, T | Method dependent |
| Matrix spike | 1 in 20 samples | S, SW, T | Method dependent |
| Standard reference material | 1 in 20 samples | S, SW, T | Method dependent |
| Equipment blank | 1 in 20 samples | SW | Study dependent |
| Field duplicate | 1 in 20 samples | S, SW, T | Study dependent |
| Surrogates | All samples for organics analysis | S, SW, T | Method dependent |
| Laboratory control sample | 1 in 20 samples | S, SW, T | Method dependent |

S = Sediment; SW = surface water; T = tissue

Because numeric QC criteria are specific to a study, method, or laboratory, criteria are not included in this QDRAFT APP. When appropriate, criteria can be established when study and method procedures are approved; such criteria will be appended to this QAPP or included in study-specific SOPs. Criteria will be determined based on factors that may include:

- specific analytical methods and accepted industry standards of practice,
- matrix-specific control limits for acceptable sample recovery, accuracy, or precision,
- historical laboratory performance of selected analytical methods, and
- intended uses of the data.

Where statistically generated or accepted industry standards of practice are not available, QC criteria may be defined by the Data Quality Manager working with the Laboratory QA Officer and PIs.

### 5.3.2 Quality control metrics

**Accuracy**
Accuracy is a quantitative measure of how close a measured value lies to the actual or "known" value. Sampling accuracy is partially evaluated by analyzing field QC samples such as field blanks, trip blanks, and rinsates (or equipment blanks). In these cases, the "true" concentration is assumed to be

undetectable, and any detected analytes may indicate a positive bias in associated environmental sample data.

Laboratory accuracy is assessed using sample (matrix) spikes and other QC samples. For example, a sample (or blank) may be spiked with an inorganic compound of known concentration and the average percent recovery (%R) calculated as a measurement of accuracy. A second procedure is to analyze a standard (e.g., SRMs or other certified reference materials) and calculate the %R for that known standard. As an additional, independent check on laboratory accuracy, blind SRMs submitted as field samples may be used.

Accuracy criteria are established statistically from historical performance data, and often are based on confidence intervals set about the mean. Where historical data are not adequate for statistical calculations, criteria may be set by the Laboratory Project Manager, Data Quality Manager, and PIs. Accuracy criteria will be appended to this QAPP or included in study-specific SOPs, when established. Accuracy may be assessed during the data validation or data quality assessment stage of these investigations.

**Precision**

Precision is a measure of the reproducibility of analytical results under a given set of conditions. The overall precision of a set of measurements is determined by both sampling and laboratory variables. Reproducibility is affected by sample collection procedures, matrix variations, the extraction procedure, and the analytical method.

Field precision typically is evaluated using sample replicates, which are usually duplicate or triplicate samples. Sample replicates may be generated by homogenizing the sample, splitting the sample into several containers, and initiating a blind submittal to the laboratory with unique sample numbers. For a duplicate sample, precision of the measurement process (sampling and analysis) is expressed as:

$$\text{Relative Percent Difference (RPD)} = \frac{\text{(Duplicate Sample Result – Sample Result)}}{\text{(Duplicate Sample Result + Sample Result)}} \times 200$$

For a triplicate analysis, precision of the sampling and analysis process is expressed as:

$$\text{Relative Percent Standard Deviation (\%RSD)} = \frac{\sigma_{n-1}}{\text{mean}} \times 100$$

where $\sigma_{n-1}$ is the standard deviation of the three measurements.

Laboratory precision typically is evaluated using laboratory duplicates, matrix spike duplicates, or laboratory control sample or SRM duplicate sample analysis. Duplicates prepared in the laboratory are generated before sample digestion. Laboratory precision is also expressed as the relative percent difference (RPD) between a sample and its duplicate, or as the %RSD for three values.

Precision criteria are established statistically from historical performance data, and are usually based on the upper confidence interval set at two standard deviations above the mean. Where historical data are not adequate for statistical calculations, criteria may be set by the Laboratory Project Manager, Data Quality Manager, and PIs. Precision criteria will be appended to this QAPP or included in study-specific SOPs, when established.

**Completeness**
Completeness is defined as the percentage of measurement data that remain valid after discarding any invalid data during the field or laboratory QC review process. A completeness check may be performed following a data validation process. Analytical completeness goals may vary depending on study type, methods, and intended uses of the data.

Analytical data completeness will be calculated by analyte. The percent of valid data is 100 times the number of sample results not qualified as unusable (R), divided by the total number of samples analyzed. Data qualified as estimated (J) because of minor QC deviations (e.g., laboratory duplicate RPD exceeded) will be considered valid.

**Comparability**
Comparability is a qualitative parameter expressing the confidence with which one dataset can be compared to another. Comparability is facilitated by use of consistent sampling procedures, standardized analytical methods, and consistent reporting limits and units. Data comparability is evaluated using professional judgment.

**Representativeness**
Representativeness expresses the degree to which data accurately and precisely represent a defined or particular characteristic of a population, parameter variations at a sampling point, a processed condition, or an environmental condition. Representativeness is a qualitative parameter that is dependent on the proper design of the sampling program and proper laboratory protocol. Sampling designs for this investigation will be intended to provide data representative of sampled conditions. During development of sampling plans and SOPs, consideration will be given to existing analytical data, environmental setting, and potential industrial sources. Representativeness will be satisfied by ensuring that the sampling plan is followed.

**Sensitivity**
Detection limit targets for each analyte and matrix will be appended to this QDRAFT APP or included in study- specific SOPs as they are established.

## 5.4 Sampling Procedures

### 5.4.1 Sample collection

Samples are collected and handled in accordance with the procedures contained in SOPs or specific project plans. These documents typically describe sample collection, handling, and documentation procedures to be used during field activities. SOPs and work plans/protocols may cover the following topics, as appropriate:

- procedures for selecting sample locations and frequency of collection,
- sample site selection, positioning, and navigation procedures,
- sampling equipment operation, decontamination, and maintenance,
- sample collection and processing, which includes sample collection order and homogenization procedures, sample containers, and volume required,
- field QC sample and frequency criteria,
- sample documentation, including chain-of-custody (COC) and field documentation forms and procedures, and
- sample packaging, tracking, storage, and shipment procedures.

### 5.4.2 Sample containers, preservation, and holding times

Containers will be prepared using EPA specified or other professionally accepted cleaning procedures. Analysis statements for containers prepared by third-party vendors will be included in the project file. Since the investigations involved with this NRDA may involve samples not amenable to typical environmental sample containers (such as whole body tissue samples), multiple types of containers may be required. Sample containers may include aluminum foil and watertight plastic bags for tissue samples and whole body samples.

When appropriate, sample coolers will contain refrigerant in sufficient quantity to maintain samples at the required temperatures until receipt at the laboratories.

### 5.4.3 Sample identification and labeling procedures

Before transportation, samples should be properly identified with labels, tags, or markings. Identification and labeling typically includes, but need not be limited to, the following information:

- project identification
- place of collection
- sample identification
- analysis request
- preservative
- date and time of collection
- name of sampler (initials)
- number of containers associated with the sample.

### 5.4.4 Field sampling forms

Field sampling forms should be described in the appropriate SOP or associated project plans. Forms typically must be completed in the field at the same time as the sample label. As with the sample label, much of the information can be preprinted, but date, time, sampler's initials, and other specific field observations should be completed at the time of sampling.

### 5.4.5 Sample storage and tracking

In the field, samples may be stored temporarily in coolers with wet or dry ice (as appropriate). Security should be maintained and documentation of proper storage should be provided in the project field notebook. Samples stored temporarily in coolers should be transported to a storage facility as soon as logistically possible. When possible, samples will be shipped directly to the appropriate laboratories from the field.

Before analysis, samples will be stored under appropriate conditions at the storage facility or laboratory (refrigerator or freezer). Security should be maintained at all times. A log book or inventory record typically is maintained for each sample storage facility refrigerator or freezer. The log books or inventory records are used to document sample movement in and out of the facility. In general, samples will be placed into a freezer and information regarding sample identification, matrix, and study will be recorded. Additional information in the record for each sample may include the date of the initial storage, subsequent removal/return events with associated dates, and initials of the person(s) handling the samples. Additional information may also include study name and special comments. If required, unused samples

or extra samples will be archived in a secure location under appropriate holding conditions to ensure that sample integrity is maintained.

Documentation should allow for unambiguous tracking of the samples from the time of collection until shipment to the laboratory. The tracking system should include a record of all sample movement and provide identification and verification (initials) of the individuals responsible for the movement.

## 5.5 Sample Custody

COC procedures are adopted for samples throughout the field collection, handling, storage, and shipment process. Each sample will be assigned a unique identification label and have a separate entry on a COC record. A COC record should accompany every sample and every shipment to document sample possession from the time of collection through final disposal.

### 5.5.1 Definition of custody

A sample is defined as being in a person's custody if one of the following conditions applies:

- The sample is in the person's actual possession or view,
- The sample was in the person's possession and then was locked in a secure area with restricted access, or
- The person placed it in a container and sealed the container with a custody seal in such a way that it cannot be opened without breaking the seal.

### 5.5.2 Procedures

The following information typically will be included on COC forms:

- place of collection
- laboratory name and address
- sample receipt information (total number of containers, whether COC seals are intact, whether sample containers are intact, and whether the samples are cold when received)
- signature block with sufficient room for "relinquished by" and "received by" signatures for at least three groups (field sampler, intermediate handler, and laboratory)
- sample information (field sample identifier, date, time, matrix, laboratory sample identifier, and number of containers for that sample identifier)
- name of the sampler
- airbill number of overnight carrier (if applicable)
- disposal information (to track sample from "cradle to grave")
- block for special instructions
- analysis request information.

The sample identification, date and time of collection, and request for analysis on the sample label should correspond to the entries on the COC form and in associated field log books or sampling forms.

The Data Quality Manager or designated representative is responsible for reviewing the completed COC forms. Any inconsistencies, inaccuracies, or incompleteness in the forms must be brought to the attention of the field staff completing the form. If the problem is significant, corrective action should be taken and documented. Depending on the problem, this may involve informing the laboratory that a sample ID or

analysis request needs to be changed, or notifying the FTL that retraining of field staff in COC procedures is indicated. The corrective action and its outcome should be documented.

## 5.6 Analytical Procedures

Analytical methods will be consistent with, or equivalent to, EPA methods or some other commonly accepted or approved method, as approved by the Data Quality Manager. All laboratory equipment and instruments will be operated, maintained, calibrated, and standardized in accordance with EPA-accepted or manufacturer's practices.

Several methods or procedures may be used to measure analytes in different environmental media. For example, PCBs may be measured by quantification of Aroclors using Method 8081, quantification of total PCBs using Method 8081, or quantification of PCB congeners and coplanars using gas chromatography with electron capture detection (GC/ECD) and/or gas chromatography with mass spectrophotometry (GC/MS). Coplanar PCB congeners may be analyzed and reported with the PCB congener analysis. Preconcentration steps (e.g., carbon column cleanup) may be required to obtain adequate detection limits for these compounds. General QC considerations and targets for analyses are described below, along with considerations for biological testing.

Laboratory method detection limit (MDL) studies should be conducted for each matrix per analytical method, according to specifications described in 40 C.F.R. Part 136 or other comparable professionally accepted standards. The MDL is a statistically derived, empirical value that may vary.

Laboratory QC samples, which include a method blank, replicate (matrix spike or duplicate) analyses, laboratory control sample, and SRM, will be performed at a target frequency of 1 per 20 samples per matrix per analytical batch. Method blanks should be free of contamination of target analytes at concentrations greater than or equal to the MDL, or associated sample concentrations should be greater than 10 times the method blank values. The matrix spike/matrix spike duplicate and laboratory control sample analyses should meet the specific accuracy and precision goals for each matrix and analytical method.

## 5.7 Calibration Procedures and Frequency

This section provides information on general calibration guidelines for laboratory and field methods.

### 5.7.1 Laboratory equipment

All equipment and instruments used for laboratory analyses will be operated and maintained according to the manufacturer's recommendations, as well as by criteria defined in the laboratory's SOPs. Operation, maintenance, and calibration should be performed by personnel properly trained in these procedures. Documentation of all routine and special maintenance and calibration should be recorded in appropriate log books and reference files.

Calibration curve requirements for all analytes and surrogate compounds should be met before sample analysis. Calibration verification standards, which should include the analytes that are expected to be in the samples and the surrogate compounds, should be analyzed at a specified frequency and should be within a percent difference or percent drift criterion.

### 5.7.2 Field equipment

All equipment and instruments used to collect field measurements will be operated, maintained, and calibrated according to the manufacturer's recommendations, as well as by criteria defined in individual SOPs. Operation, calibration, and maintenance should be performed by personnel properly trained in these procedures. Documentation of all routine and special maintenance and calibration should be recorded in appropriate log books or reference files. Field instruments that may be used include thermometers/temperature probes, scales, pH meters, dissolved oxygen meters, and global positioning system units.

## 5.8 Data Validation and Reporting

### 5.8.1 General Approach

Data generated by the laboratory and during field measurements may undergo data review and validation by an External QA Reviewer. Laboratory data may be evaluated for compliance with data quality objectives, with functional guidelines for data validation, and with procedural requirements contained in this QAPP.

### 5.8.2 Data reporting

Laboratories should provide sufficient information to allow for independent validation of the sample identity and integrity, the laboratory measurement system, the resulting quantitative and qualitative raw data, and all information relating to standards and sample preparation.

### 5.8.3 Data review and validation of chemistry data

Data review is an internal laboratory process in which data are reviewed and evaluated by a laboratory supervisor or QA personnel. Data validation is an independent review process conducted by personnel not associated with data collection and generation activities. External and independent data validation may be performed for selected sample sets as determined by the PM and Data Quality Manager. Each data package chosen for review will be assessed to determine whether the required documentation is of known and documented quality. This includes evaluating whether:

- field COC or project catalog records are present, complete, signed, and dated, and
- the laboratory data report contains required deliverables to document procedures.

Two levels of data validation may be performed: full or cursory validation. Initial data packages received for each sample matrix may receive full validation. This consists of a review of the entire data package for compliance with documentation and quality control criteria for the following:

- analytical holding times
- data package completeness
- preparation and calibration blank contamination
- initial and continuing calibration verifications
- internal standards
- instrument tuning standards
- analytical accuracy (matrix spike recoveries and laboratory control sample recoveries)
- analytical precision (comparison of replicate sample results)

- reported detection limits and compound quantitation
- review of raw data and other aspects of instrument performance
- review of preparation and analysis bench sheets and run logs.

Cursory validation may be performed on a subset of the data packages at the discretion of the PM and Data Quality Manager. Cursory review includes the comparison of laboratory summarized QC and instrument performance standard results to the required control limits, including:

- analytical holding times
- data package completeness
- preparation and calibration blank contamination
- analytical accuracy (matrix spike recoveries and laboratory control sample recoveries)
- analytical precision (comparison of replicate sample results).

The full or cursory validation will follow documented QC and review procedures as outlined in the guidelines for data validation (EPA, 1998b) and documented in validation and method SOPs. Various qualifiers, comments, or narratives may be applied to data during the validation process. These qualifier codes may be assigned to individual data points to explain deviations from quality control criteria and will not replace qualifiers or footnotes provided by the laboratory. Data validation reports summarizing findings will be submitted to the Data Quality Manager for review and approval.

Laboratory data will be evaluated for compliance with data quality objectives. Data usability, from an analytical standpoint, may be evaluated during the data evaluation. The data users (the PI, PM, AM) will determine the ultimate usability of the data.

## 5.9 Performance and System Audits

A Data Quality Manager or designee will be responsible for coordinating and implementing any QA audits that may be performed. Checklists may be prepared that reflect the system or components being audited, with references to source of questions or items on the checklist. Records of all audits and corrective actions should be maintained in the project files.

### 5.9.1 Technical System Audits

Technical System Audits (TSAs) are qualitative evaluations of components of field and laboratory measurement systems, including QC procedures, technical personnel, and QA management. TSAs determine if the measurement systems are being used appropriately. TSAs are normally performed before or shortly after measurement systems are operational, and during the program on a regularly scheduled basis. TSAs involve a comparison of the activities described in the study plan and SOPs with those actually scheduled or performed. Coordination and implementation of any TSAs will be the responsibility of the Data Quality Manager or designee.

**Analytical data generation (laboratory audit)**
Laboratory audits may be performed to determine whether the laboratory is generating data according to all processes and procedures documented in the associated project plans, QAPP, SOPs, and analytical methods. Laboratory audits can be performed by an External QA Reviewer, a Data Quality Manager, or their designee.

**Field audits**
Field audits may be performed to determine whether field operations and sample collection are being performed according to processes and procedures documented in the study plan, QAPP, and SOPs.

### 5.9.2 Performance evaluation audits

Performance evaluation audits are quantitative evaluations of the measurement systems of a program. Performance evaluation audits involve testing measurement systems with samples of known composition or behavior to evaluate precision and accuracy, typically through the analysis of standard reference materials. These may be conducted before selecting an analytical laboratory.

### 5.10 Preventative Maintenance Procedures and Schedules

Preventative maintenance typically is implemented on a scheduled basis to minimize equipment failure and poor performance. In addition to the scheduled calibration procedures described above, the following procedures may be followed.

- Thoroughly clean field equipment before returning to the office. The equipment generally should be stored clean and dry.
- Replaceable components such as pH electrodes and dissolved oxygen membranes should be inspected after and before each use, and replaced as needed to maintain acceptable performance.
- Equipment that is malfunctioning or out of calibration will be removed from operation until repaired or recalibrated.

## 5.11 Procedures Used to Assess Data Usability

Data usability ultimately is a function of study methods, investigator expertise and competence, and intended uses. QA/QC procedures are designed to help ensure data usability but, in themselves, neither assure data usability nor — if not implemented — indicate that data are not useable or valid. Data validity and usability will ultimately be determined by the PI, PM, and AM using their best professional judgment. Independent data validation, consultations with Data Quality Managers, and review of project-wide databases for data compatibility and consistency can be used to support usability evaluations. The usability and validity of existing and historical data, which were not collected pursuant to the QAPP presented in this Draft Assessment Plan, will be determined by the AM, PM, PIs, and Trustee technical staff using their best professional judgment.

## 5.12 Corrective Actions

### 5.12.1 Definition

*Corrective actions* consist of the procedures and processes necessary to correct and/or document situations where data quality and/or QA procedures fall outside of acceptance criteria or targets. [These criteria/targets may be numeric goals such as those discussed in Section 5.12, or procedural requirements such as those presented throughout the QAPP and other project documents (e.g., SOPs)].

The goal of corrective action is to identify as early as possible a data quality problem and to eliminate or limit its impact on data quality. The corrective action information typically is provided to a Data Quality Manager for use in data assessment and long-term quality management. Corrective action typically involves the following steps:

1. discovering any nonconformance or deviations from data quality objectives or the plan

2. identifying the party with authority to correct the problem
3. planning and scheduling an appropriate corrective action
4. confirming that the corrective action produced the desired result
5. documenting the corrective action

### 5.12.2 Discovery of nonconformance

The initial responsibility of identifying nonconformance with procedures and QC criteria lies with the field personnel and bench-level analysts. Performance and system audits are also designed to detect these problems. However, anyone who identifies a problem or potential problem should initiate the corrective action process by, at the least, notifying a PI or Data Quality Manager of his or her concern.

Deviations from QAPP or SOP procedures are sometimes required and appropriate because of field or sample conditions. Such deviations should be noted in field or laboratory logbooks and their effect on data quality evaluated by a PI and Data Quality Manager. Occasionally, procedural changes are made during an investigation because method improvements are identified and implemented. Even though these procedural improvements are not initiated because of nonconformance, they are procedural deviations and typically should be documented.

### 5.12.3 Planning, scheduling, and implementing corrective action

Appropriate corrective actions for routine problems depend on the situation and may range from documentation of the problem to resampling and reanalysis to the development of new methods. When the corrective action is within the scope of these potential actions, the bench-level analyst or the field staff can identify the appropriate corrective action and implement it. Otherwise, the corrective action should be identified and selected by the PM, the FTL, the Laboratory Manager, or the Data Quality Manager.

### 5.12.4 Confirmation of the result

While a corrective action is being implemented, additional work dependent on the nonconforming data should not be performed. When the corrective action is complete, the situation should be evaluated to determine if the problem was corrected. If not, new corrective actions should be taken until no further action is warranted, either because the problem is now corrected or because no successful corrective action has been found.

### 5.12.5 Documentation and reporting

Corrective action documentation may consist of the following reports or forms:

- corrective action forms initiated by project staff that will be collected, evaluated, and filed by the Data Quality Manager
- corrective action log maintained by the Data Quality Manager to track the types of nonconformance problems encountered and to track successful completion of corrective actions
- corrective action plans, if needed, to address major nonconformance issues
- performance and systems audit reports, if such audits are performed
- corrective action narratives included as part of data reports from independent laboratories
- corrective action forms initiated by laboratory staff and summarized in the report narrative.

### 5.12.6 Laboratory-specific corrective action

The need for corrective action in the analytical laboratory may come from several sources: equipment malfunction, failure of internal QA/QC checks, method blank contamination, or failure of performance or system audits; and/or noncompliance with QA requirements.

When measurement equipment or analytical methods fail QA/QC checks, the problem should immediately be brought to the attention of the appropriate laboratory supervisor in accordance with the laboratory's SOP or Quality Assurance Manual. If failure is due to equipment malfunction, the equipment should be repaired, the precision and accuracy should be reassessed, and the analysis rerun.

All incidents of QA failure and the corrective action tasks should be documented, and reports should be placed in the appropriate project file. Corrective action should also be taken promptly for deficiencies noted during spot checks of raw data. As soon as sufficient time has elapsed for a corrective action to be implemented, evidence of correction of deficiencies should be presented to a Data Quality Manager or PI.

Laboratory corrective actions may include, but are not limited to:

- reanalyzing the samples, if holding time criteria permits and sample volume is available
- resampling and analyzing
- evaluating and amending sampling analytical procedures
- accepting data and acknowledging the level of uncertainty.

**References:**

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City of Oregon. (2004) Analytical Results for Surface Water Samples Collected at Four Locations in Otter Creek in the Second through Fourth Quarters of 2004 as Part of the City's Storm Water Management Plan. May through November.

OhioEPA. (2010) Biological and Water Quality Study of the Portage River Basin, Select Lake Erie Tributaries, and Select Maumee River Tributaries, 2006 – 2008. OHIO EPA Technical Report EAS/2010- 4-4.

SulTRAC (2007) Sediment sampling report for Duck and Otter Creeks, Toledo and Oregon, Ohio.

Tetra Tech EM Inc. (2008) Screening and baseline Ecological Risk Assessment Duck and Otter Creeks, Toledo and Oregon, Ohio.

U.S. FWS. (2009) Preassessment Screen for Duck and Otter Creeks.

U.S. FWS. (2010) Fish Tissue Residue Work Plan.

**APPENDIX A**

**Public Comments ***

***Public comments will be addressed at the completion of the assessment.**

ENVIRON

October 22, 2010

**VIA EMAIL**

Kevin Tloczynski
U.S. Fish and Wildlife Service
4625 Morse Road, Suite 104
Columbus, OH 43230

**Re: Draft Duck and Otter Creeks Natural Resource Damage Plan**

Dear Mr. Tloczynski:

Thank you for the opportunity to comment on the Draft Duck and Otter Creeks Natural Resource Damage Plan, dated 6 August 2010. ENVIRON prepared the attached comments on behalf of the Duck and Otter Creek Industrial Partners (DOCIP), including BP Husky Refining LLC, Chevron U.S.A., Pilkington North America, Inc., and Sunoco, Inc. If you have any questions or would like to discuss these comments, please do not hesitate to contact me at 440-834-1460 x 2, or by email at pfuchsman@environcorp.com.

Sincerely,

Phyllis Fuchsman

Phyllis Fuchsman
Project Manager

cc: DOCIP members (via email with enclosure)

# Duck and Otter Creeks Industry Partners' Comments on *Draft Duck and Otter Creeks Natural Resource Damage Assessment Plan*, Dated August 6, 2010

1. General: The FWS conclusions regarding any particular source of hazardous substances are not supported by the record. The significance of other potential sources - non-point source, general urban impact, orphan sites, should be acknowledged. Duck and Otter Creeks and Driftmeyer Ditch are located in an area that has been industrialized for over 100 years. Therefore, it is likely that the creeks and ditch were affected by historical operations over this 100-year period, and not merely since the 1950s as the NRD Assessment Plan suggests. Further, it also is likely that many of the sources of any adverse impacts to the creeks and ditch are not parties identified in the NRD Assessment Plan and that some are no longer viable entities.

2. Section 1, Introduction: The introductory sentence states that resources "have been injured as a result of the releases of hazardous substances from several…PRPs…to the Duck and Otter Creeks…" The pathway evaluation and injury determination are components of the NRDA that have not yet been conducted. We recommend revising this sentence to say that resources "may have been exposed to hazardous substances associated with Duck and Otter Creeks."

3. Section 1, Introduction: The role of other co-Trustees (State of Ohio and National Oceanic and Atmospheric Administration) should be clarified - particularly as it may affect finalization of the Assessment Plan, the Restoration and Compensation Determination Plan, and the Restoration Plan.

4. Section 1, Introduction, Figure 2.1, and Section 2.1, Geographic Scope of Assessment Area: The description of the "Assessment Area" is vague and does not match the boundaries presented in Figure 2.1. Later in the assessment plan, the assessment area is expanded to include Driftmeyer Ditch and the entire watersheds for Duck and Otter Creeks, including all wetlands. The rationale for the inclusion of the entire watershed is not provided, but does not appear to be tied to potential injury due to hazardous substances associated with the surface water or sediment within Duck and Otter Creeks. Similarly, the rationale for including Driftmeyer Ditch appears to be based on proximity of several PRPs identified for Duck and Otter Creeks. Driftmeyer Ditch was not included in the Pre-Assessment Screen and has physical and environmental constraints which make its inclusion in the NRDA questionable. There is no substantive documentation provided by FWS and we recommend it be removed. Based on the proposed focus on sediment, surface water, fish, invertebrates, and birds (as described in Section 4), we recommend revising the Assessment Area to include only the stream channels of Duck Creek and Otter Creek.

5. Section 1, Introduction: The Plan should expressly state that FWS will add additional PRPs if it obtains relevant information regarding any other parties.

6. Section 1.4, Decision to Perform a Type B Assessment: The statement that "hazardous substances have been transmitted through the food chain, affecting several different

trophic levels" is not supported by existing data for the Assessment Area. Indeed, the recent fish and invertebrate sampling efforts (analyses pending) were designed to fill this data gap. The language should be softened (e.g., "may be," "potentially") or the statement should be removed.

7. Section 1.5, Post-Assessment Phase: The last sentence refers to a monetary settlement. This sentence should be revised to account for settlements that include money and/or other compensation (e.g., restoration projects).

8. Section 1.7, Participation by the PRPs: Please add Chevron U.S.A. to the list of participating PRPs.

9. Section 1.7, Participation by the PRPs: It should be noted that participation in the process does not indicate concurrence with this Assessment Plan. The parties reserve all of their rights to challenge any of the facts and the legal conclusions contained in the Assessment Plan.

10. Section 1.8, Natural Resource Damage Coordination with Response Actions: Considering the benefits of coordinating the GLLA project and the NRDA, the GLLA data gap investigation and report should be completed prior to planning and implementation of additional field work for the NRDA. The results of the GLLA investigation should contribute to determining whether any critical data gaps remain and, if needed, should inform the design of any additional NRDA field work.

11. Section 1.8, Natural Resource Damage Coordination with Response Action: While cleanup will not address past losses, it is possible that remediation will prevent future losses. Therefore, the third sentence of this section should be deleted.

12. Section 2.1, Geographic Scope of Assessment Area: See comment #4. Acreage should be recalculated based on revised area. References to Driftmeyer Ditch should be deleted.

13. Section 2.1, Geographic Scope of Assessment Area: This section states that "if data warrant, the assessment boundaries may be expanded…" Note that the boundaries of the Assessment Area may also be reduced based on data evaluation.

14. Section 2.1, Geographic Scope of Assessment Area: We are unaware of documentation that "hazardous substances have migrated to Duck and Otter Creeks from refineries and other industrial complexes along their banks…" Please revise or delete this sentence.

15. Section 2.1, Geographic Scope of Assessment Area: Replace the sentence that begins "hazardous substances have injured" with "hazardous substances may have injured."

16. Section 2.1, Geographic Scope of Assessment Area: The reference to "Collins Park" should be replaced with "Ravine Park."

17. Section 2.2, Hazardous Substances Released: The reference to Table 2.1 in this section appears to be a typographical error.

18. Section 2.3, Sources of Releases: Please remove the word "severe" from the description of the site history.

19. Section 2.3, Sources of Releases and Table 2.3: Historical releases of hazardous substances have occurred. Statements on the severity of impacts and assertion that such impacts are attributable to "chemical manufacturing, refining, and other activities" implies that refining operations (and chemical manufacturing) are the causes of severe contamination. The preassessment qualifies such statements describing them as potential sources. Use of "potential sources" is appropriate for this work plan as well. This section should also acknowledge that there are other potential sources of releases of hazardous substances to Duck and Otter Creeks. Finally, the table should be deleted or revised to include a basis for listing these companies as "probable sources."

20. Section 2.4, Description of Natural Resources: The natural resources that are being evaluated vary throughout the Assessment Plan. In this section, they are identified as "geological resources, ground waters, surface water (including sediments) and biological resources including benthic organisms, fish, fish eating birds, wading birds, water fowl, and fish eating mammals in the Assessment Area." However, in Section 3.1.1 the discussion includes surface water, biological resources, and ground water. In Section 3.2.4 the "initial focus" is only on surface water, sediment, and fish. Section 4.1.3 also refers to wetland soil and groundwater. In Section 4 (introduction), the assessment will examine surface water, sediment, benthic invertebrates, fish, and birds. The list in Section 4 (introduction) appears to be the final list based on the proposed tasks. Therefore, the rest of the Assessment Plan should be revised to reflect the five natural resources presented in Section 4.

21. Section 2.4.1, Migratory Birds, and Section 2.4.2, Fish: The Assessment Plan implies a more diverse ecosystem than may be present in much of Duck and Otter Creeks. In most locations, the creeks are little more than shallow ditches. Additionally, conditions exist that may limit fish movement in the creeks (shallow stream channels, seasonal stressors such as high water temperature and low dissolved oxygen, culverted portions). The discussion of species may include a list of species present, but should acknowledge the differences between fish assemblages near Lake Erie versus those at the headwaters.

22. Section 3, Assessment Approach: A conceptual schedule sequencing the work tasks – known and potential – would be very useful. Specifically it would be important to identify key activities (e.g., Preliminary Evaluation of Injuries and Damages report, planned assessment tasks [such as Section 4.1.7 Evaluate potential restoration opportunities], potential assessment tasks, potential SOP development). The schedule should also include linkages to the GLLA project, as well as interaction with Ohio EPA, which will impact preparation and finalization the Resource Compensation and Determination Plan and the Assessment Plan.

23. Section 3, Assessment Approach: The Resource Compensation and Determination Plan should be considered as part of the damage determination phase of the Assessment Plan.

24. Section 3, Assessment Approach: The conceptual schedule should identify documents to be issued for public review and comment and include applicable schedule time.

25. Section 3.1.1, Introduction: Change "it is likely" to "it is possible."

26. Section 3.1.2.5, Ground water resources: See comment #20. This section should be removed.

27. Section 3.2.2, Overview of the restoration and compensation determination process: Please clarify whether the scope of work/work plan for the Resource Compensation and Determination Plan will be available for review and comment prior to beginning the Resource Compensation and Determination Plan development.

28. Section 3.2.3, Restoration planning and scaling: More detail is needed on the criteria for evaluating and ranking restoration projects.

29. Section 3.2.4, Initial Focus: The description of the initial focus does not match the assessment tasks proposed in Section 4. In particular, Section 3.2.4 emphasizes fishing and boating (which are of little importance in Duck and Otter Creeks) and does not reference fish, invertebrates, or birds.

30. Section 4, Assessment Tasks: This section states "Specific assessment activities not provided in this Assessment Plan will be documented in addenda that will be made available for public review as they are developed." This section implies that the scopes of work/work plans for such additional activities will be available for review prior to commencing work. This should be clarified.

31. Section 4, Assessment Tasks: Sediment contamination does not necessarily result in trophic transfer. Please revise the bulleted section to reflect this.

32. Section 4, Assessment Tasks: In Section 3.1.1, the Assessment Plan states that the overall assessment approach will be based on three steps: injury determination, pathway determination, and injury quantification. The tasks identified in Sections 4.1.2 through 4.1.6 focus on injury determination and when compared to baseline (Section 4.1.1) may be used for injury quantification. However, it is not clear how the pathway determination step will be conducted based on the listed assessment tasks. Please revise Section 4 to include some discussion of how the determination of a viable pathway will be conducted and how it will be integrated with the other assessment tasks.

33. Section 4.1, Preliminary Evaluation of Injuries and Damages: The Assessment Plan states that the first task undertaken by the Trustee will be a Preliminary Evaluation of Injuries and Damages, and that this evaluation will inform Trustee decisions about what additional new data may be needed and available at reasonable cost. The current on-going data collection being performed under the Duck and Otter Creek GLLA Project should be acknowledged as a source of data which can be used to support the Evaluation of Injuries and Damages.

34. Section 4.1.1, Evaluate potential reference sites: Reference sites which represent the contribution of hazardous substances from an urban watershed should be used in the characterization of baseline conditions. Duck and Otter Creeks have been extensively modified by channelization and development alongside the creek banks over many decades. Selection and use of appropriate reference stream(s) can be used to evaluate the impact of these substantial physical habitat/drainageway modifications. In addition to considering habitat scores and water quality data, FWS should select reference sites that have undergone urbanization comparable to Duck and Otter Creeks, to the extent practicable. However, we note that ideally comparable reference streams may not exist, such that reference stream data should be considered together with other relevant information to develop an understanding of baseline conditions.

35. Section 4.1.1, Evaluate potential reference sites: It may be useful to distinguish the term "reference stream" for Assessment Plan application versus Ohio EPA's use of this terminology, as we have noted confusion regarding this term in discussions for the GLLA project.

36. Sections 4.1.2 through 4.1.6. Any proposed studies should be linked to critical data gaps associated with restoration and should detail how the data will be used. In a cooperative assessment, it will often be appropriate to rely on existing data, managing uncertainty by making conservative assumptions.

37. Section 4.1.3, Evaluate the nature and extent of sediment contamination: The Assessment Plan refers to both existing data and new data which may be collected. Identification of existing data could be an opportunity for collaboration with participating PRPs and integration with the ongoing GLLA project (e.g., the sediment database being compiled for the GLLA project). We agree with the phased approach to additional data collection.

38. Section 4.1.6, Evaluate the potential impacts…: Please delete "as well as the disruption of the Assessment Area ecosystem." Causation by hazardous substances has not been established.

39. Section 4.2, Procedures for Sharing Data: We recommend identifying to the extent possible information, as well as data, which will be shared with Participating PRPs. We believe sharing the initial FWS Preliminary Evaluation of Injuries and Damages would be mutually beneficial.

40. Section 5, Quality Assurance Project Plan: This section is presented as the QAPP to be used to support the various studies that may be performed as part of the Duck and Otter Creeks NRDA. Given the potential differences in the types of studies that could be undertaken, it is recommended that the work plans for any specific NRDA investigations include appropriate information to ensure that the data collected are of known quality, sufficient to support the intended data uses.

41. Section 5.6, Analytical Procedures: Please remove the PCB method example. Chemicals of concern will be addressed in subsequent sampling plan(s).