Final Damage Assessment and Restoration Plan/ Environmental Assessment for the July 25-26, 2010 Enbridge Line 6B Oil Discharges near Marshall, MI

Prepared by:

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In Cooperation with:

National Oceanic and Atmospheric Administration
Michigan Department of Environmental Quality
Michigan Department of Natural Resources
Michigan Department of Attorney General

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EXECUTIVE SUMMARY

On July 25, 2010, Lakehead Line 6B (Line 6B), a 30-inch diameter pipeline owned and/or operated by Enbridge[1], ruptured near Marshall, Michigan, and began discharging crude oil into a wetland adjacent to Talmadge Creek. The oil flowed through Talmadge Creek into the Kalamazoo River, a Lake Michigan tributary. The Kalamazoo River was in floodstage at the time of the discharge, and the oil flowed down the river and into its floodplain for approximately 38 miles, to Morrow Lake. The Kalamazoo River is bordered by wetlands, floodplain forest, residential properties, farm lands and commercial properties between Marshall and the Morrow Lake dam. Aquatic and floodplain habitats were oiled as were birds, mammals, turtles and other wildlife. The river was closed to the public for the remainder of 2010 and all of 2011, reopened by sections during 2012, but then some sections were closed again in 2013 and 2014 for additional dredging of submerged oil.

The Trustees have not made an independent determination of the volume of oil discharged and estimates made by others vary. Enbridge, for example, has estimated that the discharges of July 25 and July 26, 2010 resulted in the release of more than 20,000 barrels (840,000 gallons) of oil (Enbridge Line 6B Oil Discharges) while other estimates have been substantially greater than this. Response actions have been intensive and have included recovery of floating oil, stranded oil in the floodplains of Talmadge Creek and the Kalamazoo River, and submerged oil. The United States Environmental Protection Agency has directed the response and the Michigan Department of Environmental Quality is responsible for the long-term remediation and restoration of areas affected by the spill under authorities provided by state law.

This Final Damage Assessment and Restoration Plan/Environmental Assessment (Final DARP/EA) has been prepared by U.S. Fish and Wildlife Service, Nottawaseppi Huron Band of the Potawatomi Tribe, and Match-E-Be-Nash-She-Wish Band of the Pottawatomi Indians in coordination with the National Oceanic and Atmospheric Administration, Michigan Department of Natural Resources, Michigan Department of Environmental Quality, and Michigan Department of the Attorney General, collectively acting as Trustees for the restoration of natural resources and public use services that were exposed and/or injured by the Enbridge Line 6B Oil Discharges. This Final DARP/EA is issued to inform the public concerning the Trustees' authorities and responsibilities under the Oil Pollution Act (33 U.S.C. § 2701, *et seq*.) and the National Environmental Policy Act, as amended, 42 U.S.C. § 4321 *et seq*.

[1] Responsible Parties in this matter include: Enbridge Energy, L.P., Enbridge Pipelines ("Lakehead") L.L.C., Enbridge Energy Partners, L.P., Enbridge Energy Management, L.L.C., Enbridge Energy Company, Inc., Enbridge Employee Services, Inc., Enbridge Operational Services, Inc., and Enbridge Pipelines Inc. (hereinafter "Enbridge" or "Responsible Party")

The Trustees evaluated a range of restoration alternatives which would provide resource services to compensate the public for losses pending natural recovery of resources exposed or injured by the Enbridge Line 6B Oil Discharges. The Trustees have selected restoration alternatives, including projects that provide for wetland and floodplain restoration, upland habitat enhancements, dam removal, culvert replacements, lake fisheries habitat improvements, projects to specifically benefit significantly impacted species, wild rice restoration, and projects to improve natural resource use by the general public and tribal members.

Some types of restoration are expected to be achieved through restoration projects that will be implemented in accordance with requirements of Michigan law, under the direction of the State of Michigan in consultation with Trustees, and some recreational use projects that Enbridge has completed in the area affected by the Enbridge Line 6B Oil Discharges. Restoration projects which have been or will be implemented under the direction of the State of Michigan include wetland restoration, restoration of Talmadge Creek, removal of the dam on the Kalamazoo River at Ceresco and restoration of over 2.5 miles of river channel, erosion control and restoration of large woody debris along the impacted sections of the Kalamazoo River, and several types of monitoring with potential additional restoration actions as necessary.

To adequately compensate for injured natural resources and lost services, the Trustees have selected additional restoration alternatives that will be implemented under the joint direction and control of all Trustees. These additional projects include three projects to improve aquatic connectivity and water quality in Rice Creek and Pigeon Creek, tributaries to the Kalamazoo River that join it near Marshall, Michigan and Talmadge Creek, by replacing undersized and perched culverts and lowering a berm to connect the creek and its floodplain; funding to improve the fishery in at least two lakes within the Fort Custer State Recreation Area by controlling invasive species for at least 3 years; funding to restore 175 acres of oak savanna uplands in the Fort Custer State Recreation Area; a project to improve and monitor turtle reproduction in the impacted section of the Kalamazoo River; a project to restore wild rice in at least two locations in the Kalamazoo River; and a project to better understand and encourage the use of the river corridor by tribal members.

The Final DARP/EA briefly summarizes the Enbridge Line 6B Oil Discharges, spill response, restoration to pre-spill baseline conditions, and legal authorities (Chapter 1); summarizes natural resources found in the area affected by the Enbridge Line 6B Oil Discharges (Chapter 2); describes the nature and extent of the natural resources exposed and/or injured and the lost public uses resulting from the Enbridge Line 6B Oil Discharges (Chapter 3); provides a discussion of restoration options to enhance natural resources affected by the Enbridge Line 6B Oil Discharges (Chapter 4); and provides additional analysis of the selected Trustee actions pursuant to the National Environmental Policy Act (Chapter 5) .

ABBREVIATIONS

Abbreviation	Description
CCCD	Calhoun County Conservation District
DARP/EA	Damage Assessment and Restoration Plan/Environmental Assessment
DOI	U.S. Department of the Interior
DSAYs	Discounted Service Acre Years
EA	Environmental Assessment
EIS	Environmental Impact Statement
FCRA	Fort Custer Recreation Area
FONSI	Finding of No Significant Impact
GLEC	Great Lakes Environmental Center
HAI	Health Assessment Index
HEA	Habitat Equivalency Analysis
MAG	Michigan Department of the Attorney General
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
NEPA	National Environmental Policy Act
NHBP	Nottawaseppi Huron Band of the Potawatomi Tribe
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NRDA	Natural Resource Damage Assessment
NREPA	Natural Resources and Environmental Protection Act
OPA	Oil Pollution Act of 1990
PAH	Polycyclic Aromatic Hydrocarbons
RP	Responsible Party
SCAT	Shoreline Cleanup and Assessment Technique
SHPO	State Office of Archeology and Historical Preservation
SORT	Shoreline and Overbank Reassessment Technique
SSCG	Scientific Support Coordination Group
U.S. EPA	United States Environmental Protection Agency
USDA APHIS	U.S. Department of Agriculture's Animal and Plant Health Inspection Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

COMMON AND SCIENTIFIC NAMES

Common Name	Scientific Name
Insects:	
Aquatic Weevil	*Euhrychiopsis lecontei*
Mitchell's Satyr Butterfly	*Neonympha mitchellii*
Birds:	
American (Common) Merganser	*Mergus merganser*
American Black Duck	*Anas rubripes*
American Coot	*Fulica americana*
American Gallinule (Moorhen)	*Gallinula chloropus*
American Widgeon (Baldpate)	*Anas americana*
American Woodcock	*Scolopax minor*
Blue-winged Teal	*Anas discors*
Bufflehead	*Bucephala albeola*
Canada goose	*Branta canadensis*
Canvasback	*Aythya valisineria*
Cerulean Warbler	*Setophaga cerulea*
Common Goldeneye	*Bucephala clangula*
Gadwall	*Anas strepera*
Grasshoper Sparrow	*Ammodramus savannarum*
Great Blue Heron	*Ardea herodias*
Green Heron	*Butorides virescens*
Green-winged Teal	*Anas crecca*
Henslow's Sparrow	*Ammodramus henslowii*
Lesser Scaup	*Aythya affinis*
Mallard	*Anas platyrhynchos*
Northern Bobwhite Quail	*Colinus virginianus*
Northern Pintail	*Anas acuta*
Redhead Duck	*Aythya americana*
Red-headed Woodpecker	*Melanerpes erythrocephalus*
Ring-necked Pheasant	*Phasianus colchicus*
Snow Goose	*Chen caerulescens*
Trumpeter Swan	*Cygnus buccinator*
Whistling (Tundra) Swan	*Cygnus columbianus*
Wild Turkey	*Meleagris gallopavo*
Wilson's Snipe	*Gallinago delicata*
Wood Duck	*Aix sponsa*
Mammals:	
American Beaver	*Castor canadensis*
Coyote	*Canis latrans*
Eastern Cottontail Rabbit	*Sylvilagus floridanus*

Fox squirrel	*Sciurus niger*
Indiana Bat	*Myotis sodalis*
Muskrat	*Ondatra zibethicus*
Racoon	*Procyon lotor*
Red Fox	*Vulpes vulpes*
Striped Skunk	*Mephitis mephitis*
White-tailed Deer	*Odocoileus virginianus*
Amphibians/Reptiles:	
Blanding's Turtle	*Emydoidea blandingii*
Eastern Box Turtle	*Terrapene carolina carolina*
Eastern Massasauga Rattlesnake	*Sistrurus catenatus catenatus*
Eastern Spiny Softshell Turtle	*Apalone spinifera spinifera*
Map Turtle	*Graptemys geographica*
Northern Copperbelly Water Snake	*Nerodia erythrogaster neglecta*
Painted Turtle	*Chrysemys picta*
Snapping Turtle	*Chelydra serpentina*
Spotted Turtle	*Clemmys guttata*
Fish:	
Blacknose Dace	*Rhinichthys atratulus*
Blackside Darter	*Percina maculata*
Brown Trout	*Salmo trutta*
Central Mudminnow	*Umbra limi*
Common Carp	*Cyprinus carpio*
Common Shiner	*Notropis cornutus*
Creek Chub	*Semotilus atromaculatus*
Golden Redhorse Sucker	*Moxostoma erythrurum*
Grass Pickerel	*Esox americanus*
Green Sunfish	*Lepomis cyanellus*
Johnny Darter	*Etheostoma nigrum*
Largemouth Bass	*Micropterus salmoides*
Mottled Sculpin	*Cottus bairdii*
Northern Pike	*Esox lucius*
Rock Bass	*Ambloplites rupestris*
Sand Shiner	*Notropis stramineus*
Smallmouth Bass	*Micropterus dolomieu*
Spotfin Shiner	*Notropis spilopterus*
White Sucker	*Catostomus commersoni*
Yellow Bullhead	*Ameiurus natalis*
Yellow Perch	*Perca flavescens*
Plants:	
Black Locust	*Robinia psuedoacacia*
Black Walnut	*Juglans nigra*
Box Elder	*Acer negundo*

Carolina Fanwort (Cabomba)	*Cabomba caroliniana*
Downy Sunflower	*Helianthus mollis*
Eurasian Watermilfoil	*Myriophyllum spicatum*
False Boneset	*Kuhnia eupatorioides*
Hackberry	*Celtis occidentalis*
Hickory	*Carya spp.*
Lead Plant	*Amorpha canescens*
Oak	*Quercus spp.*
Starry Stonewaort	*Nitellopsis obtusa*
Water lilies	*Nuphar spp. & Nymphea spp*
Wild River Rice (Mnomen)	*Zizania aquatica var. aquatica*

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FINAL DAMAGE ASSESSMENT AND RESTORATION PLAN/ ENVIRONMENTAL ASSESSMENT FOR THE JULY 25 and JULY 26, 2010 ENBRIDGE LINE 6B OIL DISCHARGES NEAR MARSHALL, MI

1.0 INTRODUCTION

1.1 Purpose and Need for Restoration

This Final Damage Assessment and Restoration Plan/Environmental Assessment (Final DARP/EA) is intended to inform members of the public concerning the natural resource injuries caused by the Enbridge Line 6B Oil Discharges and selected restoration projects that will compensate for those injuries. This document is part of a Natural Resource Damage Assessment (NRDA) being performed pursuant to the Oil Pollution Act of 1990 (OPA) by the Department of the Interior, represented by the U.S. Fish and Wildlife Service (USFWS); the Department of Commerce, represented by the National Oceanic and Atmospheric Administration (NOAA); the Nottawaseppi Huron Band of the Potawatomi Tribe (NHBP); the Match-E-Be-Nash-She-Wish Band of the Pottawatomi Indians (Gun Lake Tribe); the Michigan Department of Natural Resources (MDNR); the Michigan Department of Environmental Quality (MDEQ); and the Michigan Department of the Attorney General (MAG), collectively known as the Trustees.

This Final DARP/EA also serves as an Environmental Assessment under the National Environmental Policy Act (NEPA) and addresses the potential impact of the selected restoration actions to be implemented under the direction of the Trustees pursuant to this DARP/EA on the quality of the physical, biological, and cultural environment. As described in detail below, this plan includes a variety of restoration projects to be undertaken in the Kalamazoo River watershed.

The purpose of restoration, as outlined in this Final DARP/EA, is to make the public whole for injuries to natural resources and natural resource services resulting from the Enbridge Line 6B Oil Discharges by returning the injured natural resources and natural resource services to their "baseline" condition (i.e., the condition that would have occurred but for the spill) and compensating for associated interim losses.

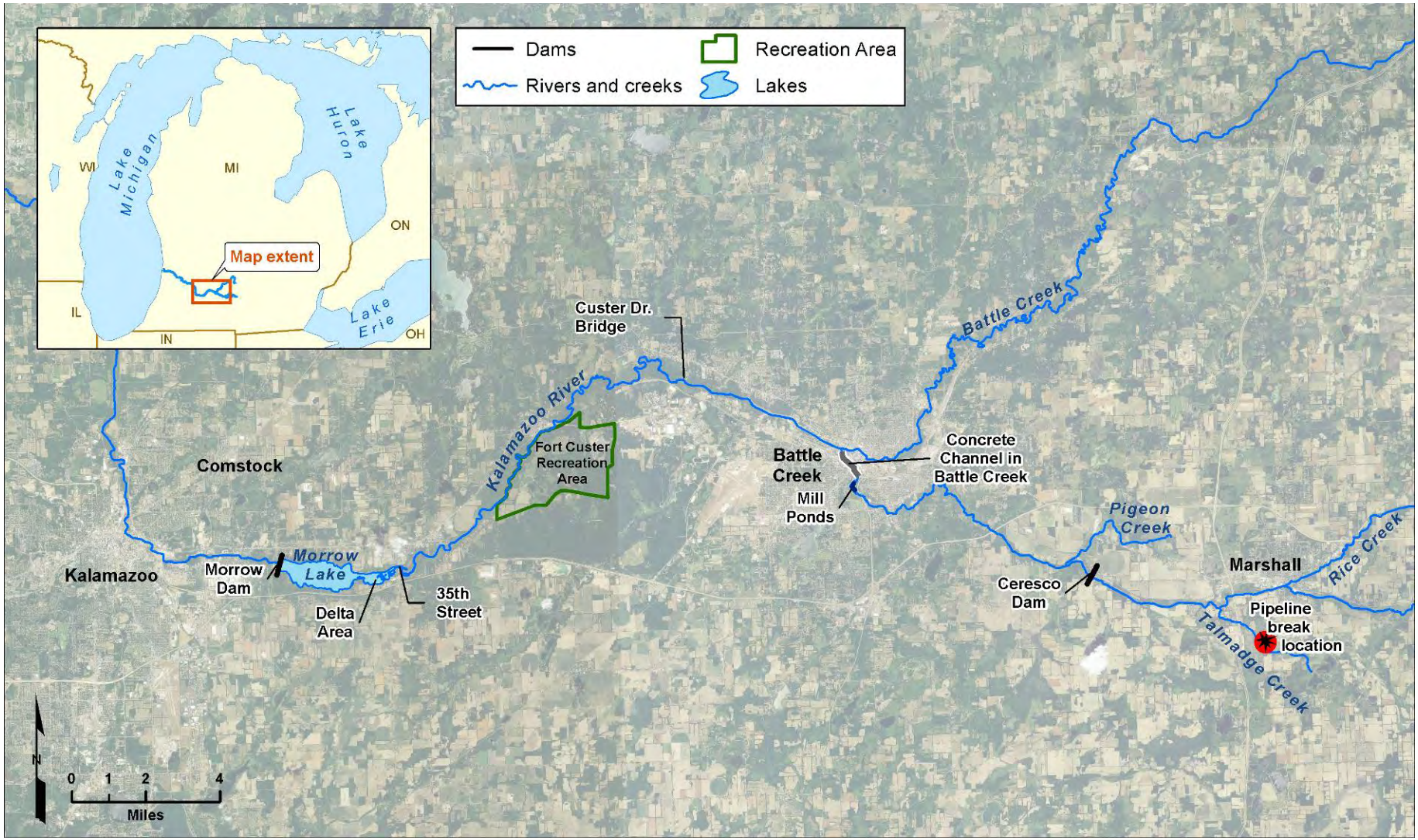
The regulations for conducting a sound NRDA to achieve restoration are found at 15 C.F.R. Part 990. These regulations were promulgated pursuant to the OPA to determine the nature and extent of natural resource injuries, select appropriate restoration projects, and implement or oversee restoration. This Final DARP/EA presents information about the affected environment (Chapter 2), the Trustees' estimates of exposure and/or injury and service losses to natural resources caused by the Enbridge Line 6B Oil Discharges (Chapter 3) and the Trustees' selected restoration alternatives (Chapter 4). Additional analysis of the selected Trustee actions pursuant to NEPA is provided in Chapter 5. Trustees sought comments on the restoration alternatives proposed in the draft DARP/EA and considered the comments (Appendices J and K) when creating this Final DARP/EA.

The Trustees have reached a proposed settlement of natural resource damage claims with Enbridge, the Responsible Party under OPA for the Enbridge Line 6B Oil Discharges. Terms of the proposed settlement are subject to public notice and comment, and the settlement is subject to approval by the United States district court. Following the public comment period on the proposed settlement, if the Trustees seek judicial approval of the settlement, and the district court approves the settlement, then the Trustees will implement restoration projects and/or oversee implementation of restoration projects that are consistent with this Final DARP/EA and the Consent Decree.

1.2 Summary of Enbridge Line 6B Oil Discharges

On July 25, 2010, Lakehead Line 6B, a 30-inch diameter pipeline owned by Enbridge, ruptured near Marshall, Michigan, and began discharging crude oil into a wetland adjacent to Talmadge Creek. The oil saturated that wetland and then flowed through Talmadge Creek into the Kalamazoo River, a Lake Michigan tributary. The Kalamazoo River was in floodstage at the time of the discharge, and the oil flowed down the river and into its floodplain for approximately 38 miles, to Morrow Lake (Figure 1.1). The Kalamazoo River floodplain that was oiled includes wetlands, floodplain forest, residential properties, farm lands and commercial properties. The source area and Talmadge Creek floodplain that were oiled or impacted by the response consisted primarily of wetlands, including a fen-like community.

Figure 1.1. Map Showing Location of Enbridge Line 6B Oil Discharges



Although the Trustees' evaluation of natural resource injuries resulting from the Enbridge Line 6B Oil Discharges that occurred during July 25 and 26, 2010 depends on the studies and analyses discussed below in Chapter 3, rather than on the volume of oil discharged, the Trustees note that there have been numerous estimates of the volume of oil discharged. For example, Enbridge has estimated that the July 25 and 26, 2010 discharges from Line 6B released 20,082 barrels or 843,444 gallons of crude oil. Other estimates have been substantially higher, and the Trustees have not made an independent determination of the volume of oil discharged. The discharged oil consisted of two batches of heavy bituminous crude oil from the oil sand regions of Western Canada diluted with lighter petroleum products to enable the crude to flow more easily (National Transportation Safety Board, 2012).

Initially, the oil appeared to be floating on the surface of the river and flooded areas, but after several days MDNR Fisheries biologists reported that black flakes and sheen appeared when they disturbed the bottom of the river, and the responders realized that oil was sinking to the bottom of the river. Submerged oil was eventually found throughout Talmadge Creek and in depositional areas of the Kalamazoo River up to and including parts of Morrow Lake. Oil was also found stranded in vernal pools and other low areas in the floodplain.

1.2.1 Summary of Response Actions

Enbridge began responding to the Enbridge Line 6B Oil Discharges on July 26, 2010. Within the first day, they constructed an underflow dam in the wetland near the source area, installed oil sorbent and containment boom in the Kalamazoo River at two parks in Battle Creek and used vacuum trucks to recover oil from the source area underflow dam, from the Talmadge Creek stream crossings on Division Drive and 15 1/2 Mile Road, and from the Kalamazoo River at Heritage Park (National Transportation Safety Board, 2012; selected photographs in Appendix A). MDNR and the public were already observing oiled wildlife on July 26, so the U.S. Fish and Wildlife Service (USFWS) advised Enbridge to mobilize professional rehabilitators and begin building rehabilitation facilities that evening. Enbridge activated a hotline for the public, and USFWS provided recommendations on what information to collect and what advice to give anyone calling to report oiled wildlife sightings.

On July 27, 2010, the United States Environmental Protection Agency (U.S. EPA) issued an Administrative Order under Section 311(c) of the Clean Water Act to Enbridge and assumed leadership of a Unified Command in its role as Federal On-Scene Coordinator (FOSC). The Unified Command changed over time, but on August 9, 2010, for example, it included representatives from U.S. EPA, Enbridge, the Michigan Department of Natural Resources and the Environment (which was reorganized into MDEQ and MDNR during the course of the response), Michigan State Police Emergency Management Division, Calhoun County Public Health Department, Calhoun County

Sheriff, Kalamazoo County Sheriff and the City of Battle Creek (U.S. EPA, 2010a). U.S. EPA served as Incident Commander and led the Unified Command throughout the response. U.S. EPA issued multiple Administrative Orders and letters to Enbridge over the course of the response, with the last issued in March 2013 instructing Enbridge to complete additional submerged oil recovery through dredging, by December 31, 2013 (http://www.epa.gov/enbridgespill/documents.html). That deadline was not achieved; however, Enbridge completed required dredging by September 2014. MDEQ will be responsible for oversight of the long-term remediation and restoration of areas affected by the Enbridge Line 6B Oil Discharges under state law authorities.

Immediately following the start of the Enbridge Line 6B Oil Discharges in July 2010, county health agencies closed public access to 39 miles of the river system to protect public health and safety. Initially, lighter constituents of the oil, including benzene, posed a hazard to inhalation. Direct contact with the oil in the river and floodplain and hazards from the response activities were also public health and safety concerns. Eventually, on April 18, 2012, a three-mile portion was opened from Perrin Dam in Marshall to Saylor's Landing near 15 Mile Road and the Kalamazoo River. On June 21, 2012, the remainder of the river was opened for public use, although certain areas remained marked off by buoys to exclude the public from active work areas posing a safety risk. In addition, the Michigan Department of Community Health issued a Fish Consumption Advisory and a Swimming Advisory, both of which were in place until June 28, 2012. Parts of the river were closed again in the summer and fall of 2013 to exclude the public from active work areas posing a safety risk. This included a stretch of the river in Battle Creek between Paddler's Grove and the Mill Ponds that was closed from August 16, 2013 to May 23, 2014. Specific to U.S. EPA-required dredging activities, the river was closed at the 35th Street Bridge in Galesburg to Morrow Dam from July 25, 2013 through July 3, 2014. A smaller reach from the 35th Street Bridge to the E 4.0 Boat Launch remained closed until September 12, 2014. Upstream, the river was closed from the Saylor's Landing site in Marshall to the 12 Mile Road Bridge in Ceresco on July 24, 2013 to accommodate dam removal and river restoration activities and was reopened on October 7, 2014.

During the early days of the response, Enbridge and its contractors established over 30 oil containment-and-control points along 38 miles of the Kalamazoo River. The control points consisted of a variety of oil containment strategies, including underflow dams, oil booming, and sorbent booming. Vacuum trucks and oil skimmers were used to remove oil at these locations (National Transportation Safety Board, 2012). Enbridge and its contractor, Focus Wildlife, built and began operating a Wildlife Response Center with the Wildlife Branch of Operations. The USFWS led the Wildlife Branch and worked with MDNR, the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (USDA APHIS), and others to survey for and capture oiled wildlife.

The U.S. EPA completed Situation Reports (Sitreps) for each operational period of the response. Each Sitrep contains detailed information on many different aspects of the response as it was collected from agencies, contractors and Enbridge in real time. U.S. EPA has made all of these available at

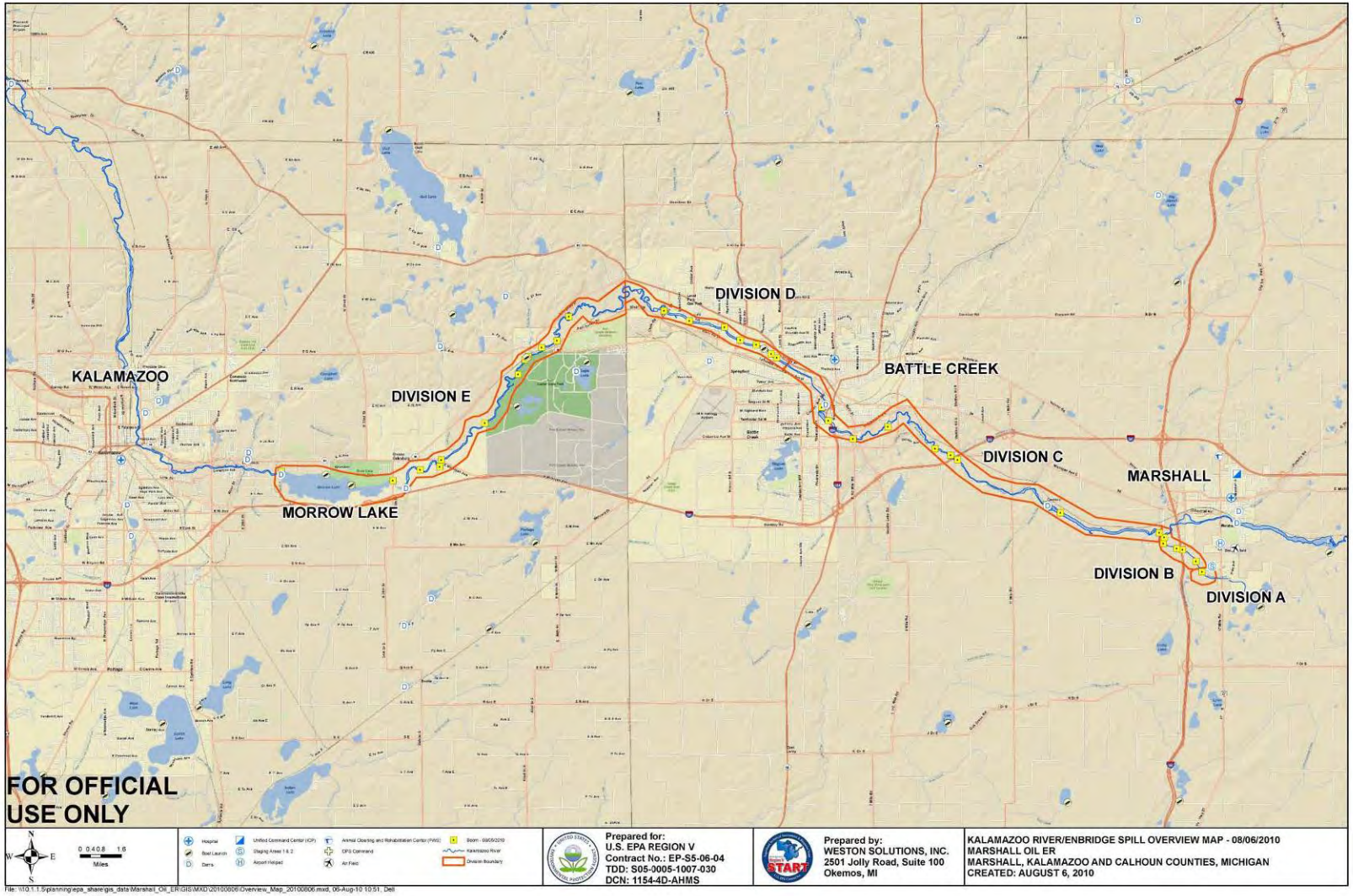
http://www.epa.gov/enbridgespill/documents.html#sitreps. Information from Sitreps, as well as from other cited sources and Trustee observations, is used in the next several paragraphs to describe the response at key or representative time points.

By July 31, 2010, the spill area had been divided into five operational segments arranged from upstream to downstream (Figure 1.2): Division A (source/release area in Marshall), Division B (Talmadge Creek), Division C (confluence of Talmadge Creek with the Kalamazoo River to the Angell Street Bridge), Division D (Angell Street Bridge to the Calhoun/Kalamazoo County line), Division E (Kalamazoo County Line to Morrow Dam).

By August 8, 2010, over 1,200 personnel were on-site and 24-hour operations included operation of 37 booms (161,413' total; marked in yellow on Figure 1.2) and corresponding collection points with skimmers and vacuum trucks, excavation of the source area and the shoreline along Talmadge Creek, cutting of oiled water lilies and other aquatic vegetation, removal of oiled vegetation and debris along the Kalamazoo River shoreline, surveying by Shoreline Cleanup and Assessment Technique (SCAT) teams, sampling of water and sediment, evaluation of residences for re-occupation based on benzene concentrations in air, and daily helicopter flights (U.S. EPA, 2010a). On that day, the USFWS reported that the Wildlife Branch continued to collect oiled animals along the Kalamazoo River and operate the Wildlife Response Center with 171 animals in live care, the majority of which were Canada geese and turtles. The Wildlife Branch had also implemented deterrence tactics to attempt to keep additional wildlife from coming into contact with the oil.

By August 26, 2010, approximately 1,800 personnel were on-site. Operations continued on a 24 hour per day basis and included operation of 33 surface booms (145,118' total) and corresponding collection points, plus gabion baskets filled with oil snares and X-TEX filter curtains being operated to collect oil moving downstream in the water column and with bedload sediment transport (U.S. EPA, 2010b). In addition, crews were continuing excavation in the source area and along Talmadge Creek and backfilling excavations. Enbridge reported laying swamp mat road along Talmadge Creek and constructing berms, flumes, and mat roads. U.S. EPA had created a Submerged Oil Task Force to assess and address the problem of submerged oil. Submerged oil and sheen were observed in Morrow Lake. Over 160 boats were being operated in Division C of the Kalamazoo River (from Talmadge Creek to Battle Creek) alone, and that number was expected to increase. Crews were completely removing vegetation from islands, cleaning pools of oil from island interiors, and continuing to cut oiled vegetation along all divisions of the Kalamazoo River. SCAT surveys, sampling of air, water and sediment, and daily helicopter flights continued. On that day, the USFWS reported that the Wildlife Branch continued to collect oiled animals along the Kalamazoo River and operate the Wildlife Response Center with 229 animals in live care and a total of 335 animals that had been rehabilitated and released.

Figure 1.2. Map Showing Location of Divisions Used for Response to Enbridge Line 6B Oil Discharges



By the fall of 2010, response operations were focused on completing shoreline and overbank cleanup in quarter mile sections of the river, stabilizing excavated areas for the winter, submerged oil investigations, and planning for winter activities. Numerous cleanup completion reports were finalized in September of 2010 (See http://www.epa.gov/enbridgespill/data/index.html#collection and http://epa.gov/enbridgespill/data/scat.html for more details.) By mid-October, the leadership of the Wildlife Branch was transferred to Enbridge as the last rehabilitated birds were released and the cooling temperatures were resulting in fewer oiled turtles being active enough for capture.

In the winter of 2010-2011, Enbridge continued excavation of contaminated soils in the floodplain. They created "frost roads" across wetland areas that allowed them to access contaminated wetlands along the river while intending to minimize soil compaction. They performed work on a daily basis and worked in 17 locations (U.S. EPA, 2011a). Enbridge maintained turtles over the winter that had not been rehabilitated sufficiently to be released in the fall. As spring arrived and ice melted, Enbridge re-installed booms along the Kalamazoo River.

In the summer of 2011, U.S. EPA directed Enbridge to address more than 220 areas in the river that still were moderately to heavily contaminated with submerged oil and were resulting in sheen and flakes being released as the water warmed (U.S. EPA, 2011b). Enbridge used a variety of techniques to agitate the sediments and collect oil and sheen that came to the surface as a result. These techniques included using pumps to jet water or air into the sediments as well as using mechanical techniques like rotary tiller heads to agitate the sediments. Enbridge also continued excavation of contaminated floodplain soils. Entire islands in the river were excavated and backfilled, or in certain instances removed, to address continuing releases of oil. Networks of muskrat burrows that had accumulated significant amounts of oil contributed to the islands being continuing sources of oil to the river.

Also in 2011, Enbridge investigated and remediated impacted areas in and adjacent to Talmadge Creek. Enbridge mobilized workers to conduct a remedial investigation to evaluate the extent of soil, sediment, and groundwater contamination resulting from the Enbridge Line 6B Oil Discharges in the Talmadge Creek area. Based upon the results of the remedial investigation, Enbridge conducted remedial actions to remove affected soil and sediment and brought in clean soil of similar soil types to backfill and restore the channel bed, bank, and overbank to approximate pre-spill conditions. Enbridge then used native vegetation seed mixes and live plantings in an effort to stabilize site conditions. Enbridge collected and analyzed numerous soil and sediment samples during the removal work in an effort to verify the effectiveness of remedial actions in achieving compliance with state law.

In the winter and spring of 2011-2012, U.S. EPA assembled a group of environmental experts to form the Scientific Support Coordination Group (SSCG). Each participant provided the Scientific Support Coordinator (SSC) with their opinions

evaluating the short- and long-term effects of the remaining oil balanced with potential damage to the environment of continued response work through a Net Environmental Benefits Analysis (Fitzpatrick et al., 2012). In support of this work, the SSC recommended to the FOSC that additional sediment analysis, toxicity testing of sediments in areas with submerged oil, and modeling of the expected movement of submerged oil under different flow conditions, and this work was quickly completed. In addition, the SSCG reviewed the time course of results from repeated surveys designed to detect submerged oil, estimates of recoverable oil remaining in the area, and the types of oil recovery techniques being proposed for the summer of 2012. As a result of these evaluations, the FOSC decided to shift the oil recovery tactics from the intensive sediment agitation and excavation work that had been conducted in 2011 to more passive tactics in 2012, including installation of sediment traps and sheen management, i.e. monitoring the river and dispatching boat crews to absorb sheen when it appeared. This strategy was coordinated with a program to dredge major impoundment areas to optimize recovery while minimizing ecological damage.

According to the National Transportation Safety Board (2012): "As of April 30, 2012, the EPA reported that over 17 million gallons of oil and water liquid waste had been collected, from which an estimated 1.2 million gallons of oil had been recovered by the spill response contractors. In addition, about 186,398 cubic yards of hazardous and nonhazardous soil and debris were disposed of, including river dredge spoils." Thus, the volume of oil that had been recovered by the response by early 2012 was greater than the volume estimated to have been spilled, and additional oil remained associated with sediments in the river at that time.

On March 14, 2013, U.S. EPA ordered Enbridge to remove Line 6B oil and oil-containing sediment along parts of the Kalamazoo River where concentrations of submerged oil were continually being detected through poling techniques. Areas dredged are upstream of the Ceresco Dam, in the Mill Ponds area in Battle Creek, in Morrow Lake, Morrow Lake Delta and adjacent areas, and in two of the sediment traps. Enbridge is obligated to continue monitoring and operating traps that gather remaining contaminated sediment and submerged oil pursuant to the State Settlement.

MDEQ has been working closely with U.S. EPA and Enbridge to ensure that Enbridge's response work will also meet requirements under state law. MDEQ is also overseeing Enbridge's long-term cleanup and restoration efforts consistent with state law authorities, as described further in Section 1.2.2.

1.2.2 State of Michigan Authorities and Settlement

The State of Michigan has authorities for response, NRDA and mitigation under Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). As a part of these authorities, the MDEQ has entered into a settlement agreement with Enbridge (State Settlement) that includes several components that will restore impacted areas and provide compensation for wetland losses, impacts to the stream channel, and lost recreational uses. Also, the State Settlement provides for

monitoring of spill impacts and restoration success along with adaptive management measures to be taken if necessary. These are described further in Section 1.5.

1.3 NRDA Authority and Legal Requirements

The federal Trustees for this NRDA are the U.S. Department of the Interior (DOI), represented by USFWS, and the U.S. Department of Commerce, represented by NOAA. Each of these agencies is a designated natural resource Trustee under Section 1006 (b) of OPA, 42 U.S.C. § 2706(b), and the National Contingency Plan (NCP), 40 C.F.R. Section 300.600, for natural resources injured by the Enbridge Line 6B Oil Discharges. State Trustees for Michigan are designated by the Governor of Michigan pursuant to the NCP, 40 C.F.R. § 300.605, and include the MAG, the MDEQ, and the MDNR. The tribal Trustees are the NHBP and the Gun Lake Tribe. Federally-recognized tribes are designated as Trustees pursuant to the NCP, 40 C.F.R. § 300.610. The Trustees are working together under a Memorandum of Understanding (State of Michigan et al., 2010 and 2012). Each designated Trustee is authorized to act on behalf of the public or their tribe to assess and recover natural resource damages, and to plan and implement actions to restore natural resources and resource services injured or lost as the result of a discharge or discharges of oil.

1.3.1 Overview of Legal Requirements

A NRDA conducted pursuant to OPA and the regulations promulgated thereunder at 15 C.F.R. Part 990, consists of three phases: 1) Preassessment; 2) Restoration Planning; and 3) Restoration Implementation. OPA authorizes federal, state, and tribal natural resource trustees to initiate a damage assessment, among other requirements, when natural resources may have been injured and/or natural resource services impaired as a result of discharges of oil.

OPA regulations provide specific definitions for the following terms:

- "Injury" is "an observable or measurable adverse change in a natural resource or impairment of a natural resource service";
- "Natural resources" are "land, fish, wildlife, biota, air, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States, any state or local government or Indian tribe"; and
- "Natural resource services" are "functions performed by a natural resource for the benefit of another resource and/or the public".

During the Preassessment Phase, the Trustees determined that the provisions and determinations of OPA applied to these Discharges including: (1) one or more incidents

has occurred; (2) the Discharges were not from a public vessel; (3) the Discharges were not from an onshore facility subject to the Trans-Alaska Authority Act; (4) the Discharges were not permitted under federal, state, or local law; and (5) public trust natural resources and/or services may have been injured as a result of the Discharges. On the basis of those determinations, on March 1, 2012, the Trustees issued the Notice of Intent to Conduct Restoration Planning for the NRDA case associated with the Enbridge Line 6B Oil Discharges in Marshall, Michigan. The Trustees then began the Restoration Planning Phase even as they were still finishing some preassessment activities. In the Restoration Planning phase, the Trustees evaluated and quantified the nature and extent of injuries to natural resources and services, and determined the need for, type of, and scale of appropriate restoration actions. Using the information developed during the Restoration Planning Phase, the Trustees developed a Draft DARP/EA, considered public comments on it, and then prepared this Final DARP/EA.

The first component of the Restoration Planning Phase was injury assessment. The Trustees evaluated injury to: (1) instream habitats including riverine and lake (impoundment) types; (2) floodplain habitats including many wetland types (3) upland habitats; (4) specific species groups like birds, turtles and mussels; (5) public recreational uses; and (6) tribal uses. As provided at 15 C.F.R. § 990.14(c)(1), the Trustees invited the Responsible Party (RP) to participate in the injury assessment component of the NRDA (see also Section 1.3.3). The RP, Enbridge, was involved in the design, performance, and funding of several preassessment activities to collect ephemeral data, but declined to participate cooperatively during the Restoration Planning Phase and instead performed independent restoration scaling analyses. The Trustees' assessment used data from the Trustees, Enbridge (when validated), U.S. EPA and other sources. The Trustees' assessment produced relevant information that the Trustees considered in determining the nature and extent of injuries to natural resources.

The second component of the Restoration Planning Phase is restoration selection. Considering the nature and extent of exposure and/or injuries to natural resources caused by the Enbridge Line 6B Oil Discharges, the Trustees developed a plan for restoring the injured resources and services, which is set forth in this Final DARP/EA. In it, the Trustees identify a reasonable range of restoration alternatives, evaluate those alternatives, and using the criteria at 15 C.F.R. § 990.54, determinethe selected alternatives from among them.

In finalizing their selected restoration alternatives, the Trustees considered all of the criteria outlined in the regulations as well as public comments. As a part of this process, the Trustees considered the extent to which restoration alternatives provide benefits to more than one natural resource and/or service. As described in more detail in Section 4.0 of this Final DARP/EA, many of the restoration alternatives selected by the Trustees benefit multiple resources and/or resource services. Overall, the Trustees selected the least expensive, practicable alternatives that are expected to provide the restoration benefits required by these criteria.

Natural resource Trustees may settle claims for natural resource damages under OPA at any time during the damage assessment process, provided that the settlement is:

1) adequate in the judgment of the trustees to satisfy the goals of OPA; and 2) fair, reasonable, and in the public interest, with particular consideration of the adequacy of the settlement to restore, replace, rehabilitate, or acquire the equivalent of the injured natural resources and services. Sums recovered in settlement of such claims, other than reimbursement of Trustee costs, may only be expended in accordance with a restoration plan.

1.3.2 National Environmental Policy Act Compliance

Any restoration of natural resources under OPA must comply with NEPA, as amended (42 U.S.C. 4321 et seq.), and its implementing regulations (40 C.F.R. § 1500-1508) with respect to federal actions that may significantly impact the human environment. In compliance with NEPA and its regulations, this Final DARP/EA summarizes the current environmental setting of the selected restoration to be implemented under the direction and control of the Trustees pursuant to this Final DARP/EA, describes the purpose and need for action, identifies alternative actions, assesses their applicability and environmental consequences, and summarizes public participation in the decision-making process. The DARP/EA was finalized after consideration and response to public comment. Project-specific NEPA documents may also need to be prepared as plans become more specific, and these documents will refer to this DARP/EA.

If there is a significant change to any of the restoration projects selected in this DARP, the Trustees will consider the need to develop additional environmental analysis in accordance with NEPA regulations. These regulations typically require a supplemental NEPA analysis be prepared if new information arises that would substantively impact on previous decision-making or if there is a significant change to a selected restoration project (40 C.F.R § 1502(9)(c)). The decision as to whether a change is significant considers both the context and intensity of the proposed change (40 C.F.R. § 1508.27). Project changes that are not deemed significant could be outlined in a supplemental information report for posting to the administrative record.

1.3.3 Coordination with Responsible Party

The OPA regulations require the Trustees to invite the RP to participate in the damage assessment process. Accordingly, the Trustees worked with the RP to participate in the damage assessment process. Immediately after the Enbridge Line 6B Oil Discharges began, the Trustees and Enbridge cooperatively developed and implemented certain preassessment studies. In 2011, the Trustees corresponded and met with representatives from Enbridge to discuss entering into a Funding and Participation Agreement to continue cooperative assessment activities, but consensus on language was not reached and no Agreement was executed. The Trustees formally invited Enbridge's participation on March 1, 2012, in a letter that also included the Trustees' Notice of Intent to conduct restoration planning. Following that, the Trustees developed several Interim, Partial Claims for Natural Resource Damage Assessment Costs pursuant to 33 U.S.C. § 2713 which Enbridge declined to fund, as described in Table 1.1.

Table 1.1. Summary of Interim, Partial Claims for Natural Resource Damage Assessment Costs Presented to Enbridge

Type of Claim	Amount	Date Presented	Date Enbridge Responded	Enbridge Response
Recreational Use	$636,479	April 4, 2012	June 20, 2012	Declined to participate
Vegetation Survey	$167,100	July 26, 2012	October 10, 2012	Declined to participate
Federal Trustee Assessment Costs	$980,091	February 11, 2013	None	No response within 90 day presentment period

As required by the regulations at 15 C.F.R. § 990.14 (c)(4), the Trustees retain final authority to make determinations regarding injury and restoration. As described above, the Trustees may settle claims for natural resource damages under OPA at any time during the damage assessment process. While proceeding with the assessment process, the Trustees also participated in settlement negotiations with Enbridge.

1.3.4 Public Participation

The Trustees have engaged the public in many ways since initiating this NRDA. During 2010, they made presentations at public meetings and were available at open house sessions, including four in-person press conferences, six weekly press conference calls, four presentations at public meetings, and six public availability sessions from July 26, 2010 through October, 2010. They also spoke with local landowners, other interested parties, and representatives of the Calhoun County Conservation District and the Kalamazoo River Watershed Council about potential restoration projects. In that time period, they began posting updates and documents on their website at http://www.fws.gov/midwest/oilspill/ (later linked to a new NRDA-specific website at http://www.fws.gov/midwest/es/ec/nrda/MichiganEnbridge). The website includes an Administrative Record page. On March 1, 2012, the Trustees issued a public press release announcing the initiation of restoration planning to coincide with sending a Notice of Intent to Conduct Restoration Planning to Enbridge. On March 5, 2012, the Trustees met with MDEQ's Cooperating & Assisting Agencies and made a presentation that included a discussion of their restoration criteria and an overview of what a Draft DARP would contain. The Trustees released a fact sheet on their restoration criteria in June of 2012. The Trustees continued to talk with local natural resource managers and reviewed local planning documents like the Rice Creek Watershed Project Watershed Management Plan (Calhoun County Conservation District, 2003) and the Kalamazoo River Watershed Management Plan (Kalamazoo River Watershed Council, 2011). The Trustees also spoke with local stakeholders at a meeting hosted by MDEQ on April 17, 2015.

The state and federal trustees also met with the public and organizations in the Kalamazoo River watershed as a part of an NRDA for the Allied Paper Inc./Portage Creek/ Kalamazoo River Superfund site that extends from Morrow Dam to Lake Michigan. As a part of this process, they collected information on potential restoration projects in the watershed. This included a public meeting on May 1, 2012 for the Draft Restoration Plan/ Environmental Assessment (RP/EA) for natural resource damages related to the Allied Paper facility and Portage Creek portion of the Kalamazoo River

Superfund site. Also, in February of 2014, they published a Notice of Intent to Prepare a Programmatic Environmental Impact Statement for the Riverwide Restoration Plan in the *Federal Register*.

As an integral component of the restoration planning process, and prior to the finalization of the DARP/EA, a thorough public review process was performed which was consistent with all federal laws and regulations that apply to the NRDA process, including Section 1006 of OPA, 42 U.S.C. §2706; the OPA regulations (15 C.F.R. Part 990); NEPA, as amended (42 U.S.C. §4371, et seq.); and its regulations (40 C.F.R. Parts 1500-1508). As a part of that process, the Draft DARP/EA was available for public comment from June 12, 2012 through July 27, 2015. The Trustees announced the availability of the Draft DARP/EA through a Federal Register Notice of Availability (published June 12, 2015), press releases resulting in more than 12 articles in established media outlets, publication on the Great Lakes Information Network, posting on the USFWS's webpage for this case[2] and through USFWS social media, and direct outreach to interested parties including the Kalamazoo River Watershed Council and MDEQ's Cooperating & Assisting Agencies. The Trustees also met with the MDEQ's Cooperating & Assisting Agencies in person on July 1, 2015.

The Trustees sought public comment on the Draft DARP/EA regarding the analyses used to define and quantify natural resource injuries and the methods proposed to restore injured natural resources or replace lost resource services as well as the environmental consequences of the alternatives to be implemented. Trustees sought public comment on the restoration being directed by the State of Michigan, in consultation with the Trustees, as well as the proposed additional projects to be implemented by the Trustees pursuant to this Final DARP/EA and described in Sections 4.4 – 4.8. The public had separate opportunities to comment on the implementation of certain projects being completed under the direction of the State of Michigan during the State's permitting processes. Public comments on the Draft DARP/EA and Trustee responses are included in Appendices J and K and can be found in the Adminstrative Record (See Section 1.3.5). As described in Appendix J, the Trustees carefully considered the comments from the public during the finalization of this DARP/EA.

1.3.5 Administrative Record

The Trustees have maintained records to document the information considered by the Trustees as they developed this DARP/EA. These records are compiled in an Administrative Record, which is available to the public online and at the address listed below. The Administrative Record facilitated public participation in the assessment process and will be available for use in future administrative or judicial review of Trustee actions to the extent provided by federal or state law. Additional information and documents, including public comments received on the Draft DARP/EA, and other related restoration planning documents are part of the Administrative Record. The Administrative Record for this document consists of the references cited in Chapter 8

[2] http://www.fws.gov/midwest/es/ec/nrda/MichiganEnbridge

along with theAdministrative Record for the Enbridge Line 6B NRDA case as a whole that is available for inspection online at

http://www.fws.gov/midwest/es/ec/nrda/MichiganEnbridge/adminrecord.html

or during normal business hours at:

U.S. Fish and Wildlife Service
2651 Coolidge Road, Suite 101
East Lansing, MI 48823

Arrangements should be made in advance to review the record or to obtain copies of documents in the record by contacting Lisa L. Williams, Ph.D., Contaminants Specialist, at 517-351-8324 or lisa_williams@fws.gov.

1.4 Summary of Natural Resource Injuries

The injuries from the Enbridge Line 6B Oil Discharges can be divided into the following categories: in-stream habitats, floodplain habitats, upland habitats, birds, mammals, reptiles, amphibians, fish, benthic invertebrates (including freshwater mussels), and human uses. The injuries to each category are summarized here and presented in greater detail in Chapter 3.

- In-stream Habitats: 1,560 acres of in-stream habitat were impacted, and recovery is expected to vary from five to 15 years, depending on the habitat type, degree of oiling, and types of response actions conducted.
- Floodplain Habitats: 2,887 acres of floodplain habitat were initially impacted and, of these, 299 acres had residual oil observed. Recovery is expected to vary from a week to many years, depending on the habitat type, degree of oiling, and types of response actions conducted.
- Upland Habitats: 185 acres of upland habitat were impacted because of response actions, including construction of roads and staging areas. Because most of the upland areas impacted were agricultural fields or areas of early successional habitat prior to the spill, recovery to their pre-spill condition is expected to occur within two to seven years following demobilization and site stabilization.
- Birds: 25 birds were found dead and 27 died while in care. In addition, 144 birds were captured because of being oiled and then successfully rehabilitated and released (Enbridge, 2012). An additional approximately 140 birds were observed oiled but never captured. The primary species impacted and captured were Canada goose (75%), mallard (9%), and great blue heron (5%). The one special status species impacted was trumpeter swan.
- Mammals: 40 mammals were found dead or died during rehabilitation. In addition, 23 mammals were captured because of being oiled and then successfully rehabilitated and released (Enbridge, 2012). An unknown number of mammals are assumed to have been oiled but never found or captured. The primary species impacted were muskrat (45%), raccoon (13%), and beaver (13%).
- Reptiles: 29 reptiles were found dead and 77 died during rehabilitation (Enbridge, 2012). In addition, over 3,800 turtles and 11 snakes were captured because of

being oiled or injured by response work and then rehabilitated and released. Enbridge (2012) reported that 3,923 turtles captured in 2010 and 2011 were oiled, but some of these were recaptured turtles that had been previously cleaned and released. A review of the data in 2013, including dates through July 13, 2013, revealed that 3,931 individual oiled turtles were captured at least once. Of those, 101 were either collected dead or died in care and the rest were cleaned and released. Some turtles were released, re-oiled and then recaptured, cleaned, and released again: 559 individuals were cleaned and released twice, 50 were cleaned and released three times, 10 were cleaned and released four times, and 3 turtles were cleaned and released five times. The primary species impacted were common map turtles (77%), snapping turtles (11%), painted turtles (6%), and eastern spiny softshell turtles (3%). Other species included common musk, Blanding's, and eastern box and spotted turtles. Spotted turtles are a state threatened species in Michigan, and one individual was collected oiled, cleaned, rehabilitated and released in a protected area.

- Amphibians: 73 amphibians were collected because they were oiled or suspected of being oiled. All were released alive.
- Fish: 42 fish were found dead during fish and wildlife response operations. Standardized surveys and other studies indicated that fish communities were impacted in some sections of Talmadge Creek and the Kalamazoo River following the spill.
- Crustaceans: 17 crustaceans were collected because they were oiled or suspected of being oiled. Three were either found dead or were dead on arrival at the WRC, two died in care and 12 were released.
- Benthic Invertebrates: Standardized surveys and other studies indicated that benthic invertebrate communities were impacted in some sections of Talmadge Creek and the Kalamazoo River following the Enbridge Line 6B Oil Discharges. Mussels were crushed by response actions (boat traffic) and mussel demographics may have been impacted by the Enbridge Line 6B Oil Discharges.
- Human Uses: Approximately 100,000 recreational user-days were lost, including activities like recreational fishing and boating and general shoreline park and trail use. Prior to the Enbridge Line 6B Oil Discharges, the NHBP was planning for the restoration of river wild rice for non-recreational uses within the historic range of NHBP tribal lands, which include the section of the Kalamazoo River that was impacted.

1.5 Selected Restoration Alternatives

In response to the Enbridge Line 6B Oil Discharges, the Trustees immediately initiated NRDA efforts pursuant to OPA. The Trustees and representatives for the RP cooperatively developed and implemented certain preassessment studies in 2010. The Trustees and Enbridge discussed continuing the cooperative assessment and restoration planning actions after 2010, but did not reach agreement on how to do so. As a result, the Trustees independently reviewed the results of preassessment studies to make a preliminary determination whether natural resources or natural resource services were injured and/or threatened by ongoing injury due to the Enbridge Line 6B Oil Discharges,

and began planning additional assessment and restoration planning work independently from Enbridge.

The Trustees conducted additional assessment and restoration planning work and have estimated the nature and extent of the natural resources exposed to and/or injured and the lost public uses resulting from the Enbridge Line 6B Oil Discharges, as described in Chapter 3. Although additional assessment work may have assisted in confirming the extent of injuries to natural resources and natural resource services, the Trustees decided to move more expeditiously toward the goal of restoration.

The Trustees have determined that significant restoration and compensation will be achieved by the wetland and river restoration projects and monitoring that will be implemented in accordance with state law as directed by the State of Michigan, in consultation with the Trustees, and by the recreational use projects completed by Enbridge (Table 1.2).

Table 1.2

Restoration and Monitoring Projects Being Directed by the State of Michigan, in Consultation with the Trustees, and Recreational Use Projects

Resource/Service	Restoration Project	Description[3]	Paragraph within State Settlement
Floodplain Wetlands	Wetland Monitoring, Restoration, and Invasive Species Control	Enbridge is obligated to perform monitoring, restoration activities, and invasive species control within a 320 acre footprint of wetlands affected by the Enbridge Line 6B Oil Discharges. The affected area is generally adjacent to the Source Area, Talmadge Creek, and the Kalamazoo River and memorialized in approved work plans.	8.1 & 8.2
Floodplain Wetlands	Wetland Compensation	Enbridge agrees to permanently restore, create, or otherwise protect not less than 300 acres of wetland habitat in compensation for wetland resource losses attributable to the Enbridge Line 6B Oil Discharges, consistent with the State of Michigan's administrative rules on wetland mitigation.	19.2
Riverine Habitats	Talmadge Creek In-Channel Habitat Evaluation and	Enbridge is evaluating stream function within restored areas of Talmadge Creek, developing a work plan for MDEQ	9.2 & 9.3

[3] Approved work plans that will be an enforceable component of the State Settlement are available at http://www.michigan.gov/oilspill.

Table 1.2

Restoration and Monitoring Projects Being Directed by the State of Michigan, in Consultation with the Trustees, and Recreational Use Projects

	Restoration	approval, and will prepare a report detailing any necessary, additional restoration activities to be implemented to restore stream habitat diversity and function to approximate conditions present prior to the Enbridge Line 6B Oil Discharges.	
Riverine Habitats	Dam Removal and River Restoration at Ceresco	Enbridge removed the dam on the Kalamazoo River at Ceresco and implemented natural channel design principles to restore over 2.5 miles of previously impounded river channel, reconnecting the natural flow of the river to provide for increased movement of fish and other aquatic life and further provide enhanced recreational opportunities for the public. Enbridge is obligated to perform monitoring of the restored area under an approved work plan.	19.1
Riverine Habitats	Aquatic Vegetation Surveys and Reports	A survey of the aquatic plant inventory conducted in 2013 consistent with an MDEQ approved work plan, will be replicated by Enbridge in the summer of 2015, with a corresponding report prepared to detail findings from the survey and propose implementation of necessary aquatic vegetation restoration activities, including potential invasive species control.	9.4
Riverine Habitats	Erosion Control & Restoration	Enbridge is obligated to continue monitoring trips consistent with the approved Kalamazoo River Bank Erosion Assessment and Action Plan during the spring of 2015 and will implement necessary restoration activities consistent with the approved work plan.	9.5
Riverine Habitats	Restoration of Large Wood Debris	Enbridge is obligated to restore habitat and function provided by large woody debris removed from the Kalamazoo River as a consequence of the Enbridge Line 6B Oil Discharges through implementation of a	9.6

Table 1.2

Restoration and Monitoring Projects Being Directed by the State of Michigan, in Consultation with the Trustees, and Recreational Use Projects

		work plan approved by the MDEQ in consultation with the MDNR.	
Fish, Recreational Use	Fish Contaminant Monitoring	Enbridge agrees to fund one additional round of fish contaminant monitoring, as conducted by the MDEQ and Michigan Department of Community Health. Enbridge further agrees to develop and implement Corrective Action Plans, subject to MDEQ approval, in the event that monitoring results necessitate a fish consumption advisory attributable to the Enbridge Line 6B Oil Discharges.	9.7 & 9.8
Riverine Habitats	Fish and Benthic Macroinvertebrate Monitoring	Enbridge agrees to fund additional monitoring to be conducted by the MDEQ and MDNR in 2015, evaluating fish status and trends and the health of benthic macroinvertebrate communities within Talmadge Creek and the Kalamazoo River. In the event one or more adverse outcomes, attributable to Enbridge Line 6B Oil Discharges, are identified as a result of monitoring efforts, then Enbridge is obligated to develop and implement Corrective Action Plans subject to MDEQ approval.	9.9 & 9.10
Recreational Use	Recreational Access Projects & Endowment	Enbridge implemented 5 projects along the Kalamazoo River in Calhoun County intended to enhance recreational opportunities for the public and compensate the State for those recreational opportunities lost or diminished as a consequence of the Enbridge Line 6B Oil Discharges. From upstream to downstream, these are Saylor's Landing (new), Calhoun County's Historic Bridge Park (enhanced), Angler's Bend (new) and Paddler's Grove (new). In addition to completed construction activities, Enbridge has created the Kalamazoo River Community Recreational Foundation and endowed the foundation with 2.5 million	19.3 & 19.4

Table 1.2 Restoration and Monitoring Projects Being Directed by the State of Michigan, in Consultation with the Trustees, and Recreational Use Projects			
		dollars in funds to assure perpetual care of the five projects upon transfer of ownership to local units of government or organizations.	

In addition, the Trustees have selected a set of additional restoration projects to benefit the injured natural resources and which they believe will complete the process of making the public whole for lost resources and uses resulting from the Enbridge Line 6B Oil Discharges. These selected projects to be implemented by the Trustees will be located either in the impacted section of the Kalamazoo River or nearby, within the watershed. These selected projects include the following:

- three projects to improve aquatic connectivity in Pigeon Creek and Rice Creek, tributaries to the Kalamazoo River that join it near Marshall, Michigan, by replacing undersized and perched culverts and lowering a berm to connect the creek and its floodplain;

- funding to improve the fishery in at least two lakes within the Fort Custer State Recreation Area by controlling invasive species for at least 3 years;

- funding to restore 175 acres of oak savanna uplands in the Fort Custer State Recreation Area;

- a project to improve and monitor turtle reproduction in the impacted section of the Kalamazoo River by radio-tracking females and then fencing their nest areas;

- a project to restore wild rice in at least two locations in the Kalamazoo River; and

- a project to better understand and encourage the use of the river corridor by tribal members.

The habitat improvement projects selected will also provide benefits to address other types of injuries that the Trustees assessed including benthic invertebrates (including mussels), fish, reptiles, mammals and birds, as well as lost public uses that will be improved as the natural resources themselves improve.

Under the terms of a proposed NRDA settlement between the Trustees and Enbridge that will be subject to public notice and comment and to approval by a federal district court, Enbridge would pay $3,900,000 to the Trustees. The amount of this payment reflects the Trustees' estimate of the costs of planning, implementation, oversight, and monitoring of the selected projects; review and consultation on restoration

actions being directed by the State under the State Settlement; and reimbursement of the Trustees' assessment costs that had not been reimbursed at the time the parties reached an agreement in principle. The title of the specific projects and the breakdown of the $3.9 million are shown in Table 1.3 below. Detailed descriptions of the restoration projects can be found in Chapter 4.

Table 1.3

Summary of the Selected Restoration Projects to be Implemented by Trustees and Associated Costs for Trustee Activities

Resource/Service	Selected Restoration Project	Cost to be Funded from NRDA Settlement with RP
Riverine Habitats	Pigeon Creek, E Drive Crossing Replacement	$153,800
Riverine Habitats	Rice Creek, 29 Mile Road Crossing Replacement	$249,000
Riverine Habitats	Rice Creek, Vansickle Berm Lowering	$36,650
Lake Habitats	Fort Custer Lake Enhancements	$343,713
Upland Habitats	Fort Custer Oak Savanna Restoration	$75,000
Turtles	Turtle Nest Protection Program	$300,000
Non-recreational Use by Tribal Members	Wild Rice Restoration	$275,011
Non-recreational Use by Tribal Members	Non-Recreation Use Analysis and Restoration	$270,000
Total Estimated Cost of NRDA Settlement Restoration Projects		**$1,703,174**
Reimbursement of Trustee Past Costs[4]		$1,634,952
Trustee Future Costs[5]		$561,874
Total NRDA Payment by RP to Trustees		**$3,900,000**

[4] Trustee past costs listed here do not include partial reimbursements that Enbridge previously made to USFWS, NOAA and the full reimbursement made to the State.

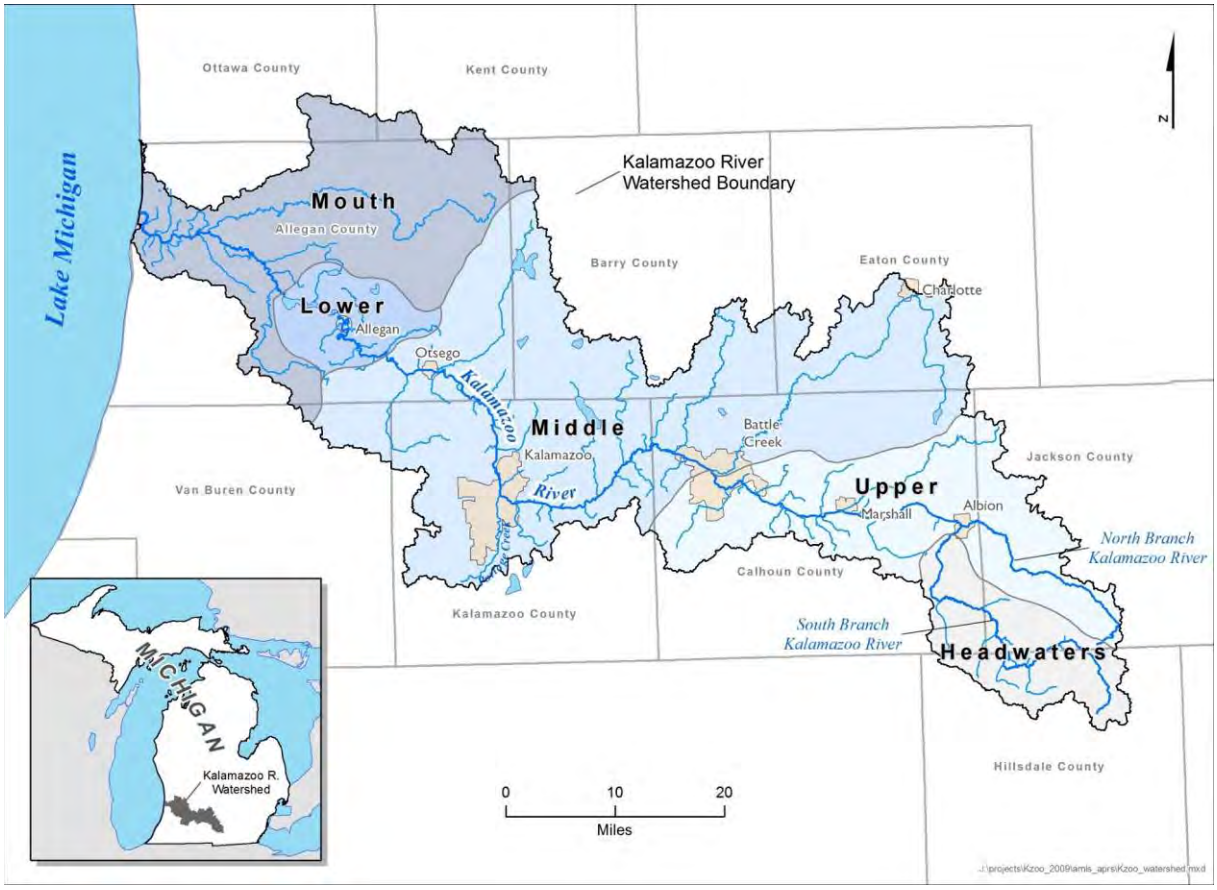
[5] Trustee future costs include federal and tribal assessment costs incurred after dates that past costs were calculated for each Trustee and estimated costs for project planning, oversight and monitoring, as well as review and consultation on restoration actions being directed by the State under the State Settlement. If the Trustees determine that additional monitoring is not necessary at some point, then the Trustees could instead use the funds for additional restoration.

2.0 AFFECTED ENVIRONMENT

2.1 Physical Environment

Restoration activities will occur in the Kalamazoo River watershed, which drains approximately 2,000 square miles of southwestern Michigan, flowing generally westward into Lake Michigan, near Saugatuck (Figure 2.1; see also MDNR, 1981). The watershed contains approximately 400 miles of stream tributaries, most notably Rice Creek, Battle Creek, Portage Creek, and the Rabbit River (MDNR, 1981; Blasland, Bouck & Lee, 1992).

Figure 2.1. Kalamazoo River Watershed



(Source: Wesley, 2005)

The climate in the Kalamazoo area is temperate, with average winter temperatures of approximately 30°F and average summer temperatures of approximately 70°F (Blasland, Bouck & Lee, 1992). Southwest Michigan receives about 35 inches of precipitation each year (National Weather Service, 2013). In the future, Michigan will likely experience higher temperatures and increased winter and spring (Kling et al., 2003; Hayhoe et al., 2010; NOAA, 2011). Summers are expected to be hotter and drier and

more precipitation is likely to fall as rainfall than as snow (Hayhoe et al., 2010; NOAA, 2011).

The affected portion of the Kalamazoo River is designated as a warmwater stream that is bordered by wetland, forest, residential properties, farm land, and commercial properties. Between Marshall, MI and Battle Creek, MI, the Kalamazoo River is warm with stable flows (Wesley, 2005). Once the Kalamazoo River passes through Battle Creek, it becomes larger as it picks up a major portion of the watershed drainage and becomes cooler as groundwater flows to the river increase (Wesley, 2005). The Kalamazoo River is impounded by dams in many locations. In riffle areas, the substrate is primarily gravel and rock. In deep pools, backwaters, impoundments and other depositional areas, the substrate becomes more sandy and silty (Wesley, 2005).

MDNR has identified Talmadge Creek as a small coolwater stream before entering the Kalamazoo River based on the fish species present (Wesley, 2005). For purposes of water quality protection, however, MDEQ designates Talmadge Creek as a warmwater stream. The riparian corridor along Talmadge Creek from where the oil entered it to where the creek enters the Kalamazoo River is largely undeveloped with scattered residences. The land use in the lower watershed beyond the riparian corridor is a mixture of agriculture, residential, and undeveloped land.

Rice Creek is a large tributary that enters the Kalamazoo River at the City of Marshall. The Rice Creek watershed is 58,200 acres (about 91 square miles) in western Jackson and eastern Calhoun County. The dominant land use is agricultural followed by forest land. Rice Creek is characterized as a cool to coldwater stream. The habitat is considered "fair" due to channelization and excessive sediment loading (Calhoun County Conservation District, 2003).

Pigeon Creek is a small tributary that enters the Kalamazoo River just downstream of Ceresco, in Calhoun County upstream of Battle Creek. The dominant land use is agricultural with some undeveloped, forested, and residential areas

2.2 Biological Environment

2.2.1 Aquatic habitat

Aquatic habitat consists of surface water, sediments, overhanging brush, woody structures, pools, riffles, and runs that support all or a portion of the lifecycles of plants, benthic invertebrates, fish, other aquatic organisms, reptiles, amphibians, and birds and mammals. Benthic invertebrates are vitally important in the aquatic food chain, playing essential roles in energy and nutrient transfer from primary producers, such as algae and phytoplankton, to predatory fish, and as decomposers. Benthic invertebrates include organisms such as clams, snails, mussels, and the larval forms of some insects (e.g., dragonflies, midges, mayflies).

The fish community of Kalamazoo River consists mostly of minnows, shiners, rock bass, smallmouth bass, and suckers (Wesley, 2005). The fish community of Talmadge Creek consists mostly of mottled sculpin, blacknose dace, and blackside darter (Wesley, 2005). Fish species common in Rice Creek include white sucker and mottled sculpin, most prevalent game species are brown trout and rock bass (Wesley, 2005). Other species found in Rice Creek are blackside darter, grass pickerel, mottled sculpin, northern pike, rock bass, central mudminnow, common shiners, green sunfish, johnny darter, largemouth bass, white sucker, yellow bullhead, and yellow perch (Calhoun County Conservation District, 2003). Fish species common in Pigeon Creek include creek chub, blacknose dace, and mottled sculpin (Wesley, 2005).

A number of factors contribute to the degradation of aquatic habitat in the Kalamazoo River and its tributaries, including the release of hazardous substances, nonpoint source pollution, dams and associated impoundments, stream channelization, and urban and suburban development.

2.2.2 Riparian habitat

Riparian wetland habitat consists of emergent, shrub-scrub, forested, and rare and unique wetland types like prairie fen. Riparian wetland habitat plays an important role in protecting water quality, especially along lakes and streams because these habitat types intercept pollutants present in groundwater and surface water runoff, including nutrients and sediments. Riparian wetlands can store rain and snow melt and help to reduce the adverse effect of floods, stabilize stream flows, and protect river banks from erosion (KRWC, 2011). Riparian wetland habitat along the Kalamazoo River provides food and cover for both aquatic organisms and terrestrial organisms such as turtles, amphibians, mammals, waterfowl, and songbirds (Blasland, Bouck & Lee, 2000).

Waterfowl observed in the Kalamazoo River watershed include mallard duck, black duck, wood duck, Canada goose, blue-winged teal, American coot, snow (blue) goose, whistling swan, redhead duck, canvasback, goldeneye, American merganser, bufflehead, lesser scaup, American gallinule, Wilson's snipe, baldpate, pintail, gadwall, and green-winged teal (MDNR, 1981). Species that were observed oiled and known to utilize riparian habitat include, but are not limited to, muskrat, raccoon, beaver, common map turtle, snapping turtle, painted turtle, Canada goose, mallard, and great blue heron (Enbridge, 2012).

Bird surveys conducted along the Kalamazoo River 1992–1994 by the Kalamazoo River Nature Center found approximately 100 species each year. A high proportion (about 60%) of birds observed were neotropical migrants, which breed in the United States or Canada and migrate to Central or South America for winter. Other species use the Kalamazoo River area as winter habitat. Resident species are also present (Adams et al., 1998).

Current threats to wetlands include filling and draining for development purposes including industrial, residential, agricultural and recreational land uses. Altered hydrology and changes to soil structure are significant threats to most wetland types.

Invasive species and polluted runoff from nearby or adjacent developments also threaten wetlands.

2.2.3 Upland habitat

The upland habitat of the Kalamazoo River watershed includes land use such as agricultural lands, residential, and industrial use (Kalamazoo River Watershed Council, 2011). Undeveloped areas include upland forests dominated by oak, hickory, hackberry, box elder, and black walnut trees (Stratus Consulting, 2013). The watershed has oak savanna and prairie remnants. The oak savannas are characterized by a grassy prairie-type ground cover underneath the trees with an open tree canopy. They are commonly found bordering prairies.

Upland habitats in the Kalamazoo River watershed support wildlife species such as red fox, fox squirrel, raccoon, striped skunk, coyote, eastern cottontail rabbit, white-tailed deer, American woodcock, ring-necked pheasant, bobwhite quail, and wild turkey (MDNR, 1981; U.S. EPA, 2000). Upland prairie habitats support breeding populations of grassland birds (e.g. Henslow's sparrow, grasshopper sparrow), red-headed woodpecker, and Eastern box turtles (per com, Glen Palmgren, MDNR).

Current threats to upland habitat include habitat destruction for development, fragmentation, and invasive species. Prairies and oak savannas are fire-dependent systems, therefore altered fire regimes have a significant impact to these habitat types (Kalamazoo River Watershed Council, 2011).

2.3 Endangered and Threatened Species

The counties in which these selected projects will occur, Calhoun and Kalamazoo, support the following Federally-listed species: Indiana bat (endangered), eastern massasauga rattlesnake (candidate), northern copperbelly watersnake (threatened), and Mitchell's satyr butterfly (endangered).

Requests to review projects for potential impacts to endangered and threatened species protected by state law are sent to the Michigan State University Extension Service, Michigan Natural Features Inventory (MNFI). This review will be completed as part of the project-specific planning processes and selected projects will be modified as necessary to avoid adverse effects on federal and state listed species.

2.4 Historic and Cultural Resources

Humans have used the Kalamazoo River Basin for more than 11,000 years (Kalamazoo River Watershed Public Advisory Council, 1998). Artifacts dating back to approximately 10,000 BC have been found along the lower Kalamazoo River (MDNR, 1981). The Kalamazoo River watershed is rich with archaeological sites of historic and cultural significance. There are over 375 sites located in the upper and middle portions of the watershed (Wesley, 2005).

Historical records confirm that portions of the Potawatomi Nation, which lived throughout the upper Mississippi River region, used the Kalamazoo River for transportation and that a Potawatomi village was located on its banks in the vicinity of the current City of Kalamazoo (Kalamazoo Public Library, 2010). Prior to 1833, the reservation of the Match-E-Be-Nash-She-Wish Band of Pottawatomi was located on the Kalamazoo River in the present location of the City of Kalamazoo (Tanner, 1987). The Nottawaseppi Huron Band of the Potawatomi's predecessors also possessed reservation lands near the Kalamazoo River in what are now Kalamazoo, St. Joseph and Calhoun Counties (Tanner, 1987). Historic and modern records also confirm that the Potawatomi and Ottawa tribes hunted seasonally in the Kalamazoo River corridor (MDNR, 1981). Potawatomi communities have remained in Allegan and Calhoun Counties in discrete communities since the early/mid-1800s (Kalamazoo River Watershed Public Advisory Council, 2000).

The first Europeans came to the area in the late 1600s, and the area was frequented by fur traders in the late 1700s (Kalamazoo River Watershed Public Advisory Council, 2000). By the early 1800s, small communities, including Kalamazoo, were established and farming replaced fur trapping as the main industry. The river was used to ship goods downstream until a railroad was built in the 1840s. By the mid-1800s, other mill towns and commercial centers developed along the river, including Battle Creek, Parchment, Plainwell, and Otsego.

2.5 Human Use Services

The Kalamazoo River and its floodplain provide important natural resource and recreational services year-round. At the time of the Enbridge Line 6B Oil Discharges, public lands and parks along the river from Marshall to Morrow Dam included the Marshall River Walk, Historic Bridge Park, Battle Creek Linear Park, Fort Custer State Recreation Area, Galesburg Community Center Park, River Oaks County Park, the MDNR Boat Access Site on Morrow Lake, and informal access points at bridges and dams. All waters of Michigan, including the Kalamazoo River, are designated for the following uses: agriculture, navigation, industrial water supply, public water supply, warm water fishery, other indigenous aquatic life and wildlife, partial body contact recreation, and total body contact recreation during the months of May through October (MDEQ, 1994). Water-based recreation on the Kalamazoo River and its tributaries includes fishing, motor-boating, paddling, floating, swimming, and boat-based hunting and trapping. Shoreline-based activities include general recreational activities occurring at parks or other recreational areas along the shoreline such as walking, running, cycling, skiing, nature and wildlife observation, hunting, picnicking, and sightseeing. Recreational fishing in this part of the river is primarily for warmwater species including northern pike, largemouth bass, panfish, common carp, and suckers (MDNR, 1981).

The Kalamazoo River and its floodplain also provide important natural services that have been vital to tribal communities for generations and the re-vitalization of traditional ceremonies and uses of resources has been the focus of significant initiatives of the tribal Trustees. Non-recreational uses by tribal members include harvesting fish, turtles, and

other animal species for subsistence or for ceremonial feasts; making traditional handicrafts (i.e. turtle shell rattles); gathering plants for food, traditional medicines or handicrafts; and religious/traditional ceremonies.

Talmadge Creek and Pigeon Creek are small streams that provide limited recreational opportunities including wildlife observation and fishing and hunting from road crossings and by riparian landowners. Rice Creek is a larger stream with similar uses along with additional public access at Ketchum Park in Marengo Township.

3.0 INJURY ASSESSMENT AND QUANTIFICATION

3.1 Introduction

The Trustees for the Enbridge Line 6B Oil Discharges initiated preassessment activities on July 26, 2010 immediately following being notified of the discharges. Preassessment activities, as defined by OPA, focused on collecting ephemeral data essential to determine whether: (1) injuries have resulted, or are likely to result, from the discharges of oil: (2) response actions have adequately addressed, or are expected to address, such injuries; and (3) feasible restoration actions exist to address the potential injuries. Trustees assessed injuries to natural resources resulting from the discharges of oil by Enbridge into Talmadge Creek, the Kalamazoo River, and adjoining floodplains.

The Trustees assessed two broad categories of injuries and losses: 1) ecological and 2) human use service losses. For both of these categories, Trustees evaluated injuries and service losses caused by the Enbridge Line 6B Oil Discharges, as well as injuries and losses as a result of response and remedial activities undertaken because of the Enbridge Line 6B Oil Discharges. Ecological injuries and service losses reviewed include floodplain habitat; in-stream habitat losses for aquatic organisms; impacts to the fluvial geomorphology of the river (e.g. erosion of shoreline, banks and river bottom); and impacts including mortality to birds, turtles, and other organisms directly affected by the Enbridge Line 6B Oil Discharges. Human use loss assessment focused on recreational service losses as a result of closure of the river to all public use as well as issuance of fish consumption and swimming advisories. Losses to non-recreational uses by tribal members were investigated through discussions with tribal elders and members.

Based on information collected since July 2010, the Trustees determined that natural resources and services have been injured and that response actions were not expected to fully address the injuries. Throughout the injury assessment and restoration planning process, the Trustees used available information, expert scientific judgment, information generated through response activities, shoreline assessments, and literature on the fate and effects of oil spills to arrive at the best estimate of the injuries caused by the Enbridge Line 6B Oil Discharges. There is, however, some uncertainty inherent in the assessment of impacts from oil spills. While in certain instances collecting more information may increase the precision of the estimate of impacts, by July of 2013 the Trustees believed that the type and scale of restoration actions would not substantially change as a result of more assessment studies. The Trustees sought to balance the additional benefits of developing more assessment information with the reality that further study would delay the implementation of the restoration projects, at the expense of the local environment and the public who use and enjoy the area's natural resources.

3.2 Impact Surveys and Studies

The Trustees conducted surveys and studies and also gathered information that was relevant to the NRDA from U.S. EPA, MDEQ, MDNR, Enbridge and others.

3.2.1 Floodplain Habitat Impact Surveys

From August 9, 2010 through September 2, 2010, the Trustees conducted on-the-ground surveys in the floodplain of the Kalamazoo River to document the extent and degree of oiling. These surveys were conducted cooperatively with Enbridge's representatives under jointly approved work plans. The Trustees and Enbridge staffed joint teams to conduct the work. The field teams walked transects that were approximately 50 meters apart from each other in floodplain habitats on both sides of the river from Talmadge Creek to Morrow Lake, a distance of approximately 25 river miles. Selected areas (e.g., islands, areas of heavy oiling of at least 50 ft^2 in the floodplain) were surveyed at a more detailed level. Field crews surveyed a total of 742 transects on both sides of the river. Field teams recorded percentages of oil present on soils and vegetation, habitat type, and some habitat features (e.g. vernal pools, downed trees). The report summarizing this work documents the presence of oil stranded in the floodplain (Appendix B).

The Trustees conducted rapid vegetation assessments in the floodplain of both the Kalamazoo River and Talmadge Creek in August of 2010 to characterize the types of habitat and vegetation present within the floodplain. The Trustees and Enbridge cooperatively developed and implemented the work plan for this rapid vegetation assessment. Although a report was not generated from the 2010 study, the results were used to inform the Trustees' comments on response related excavation plans during the winter of 2010-2011. The Trustees and Enbridge repeated the rapid vegetation assessment in the fall of 2011, and added quantitative measurements to the study protocols. The Trustees intended to repeat these cooperative surveys to monitor invasive species and determine the rate and extent to which the vegetation was recovering in the impacted area; however, 2010 and 2011 data are being used by the State and Enbridge to inform the restoration and long term monitoring of wetlands as required by the State Settlement.

U.S. EPA, the State, and Enbridge conducted SCAT surveys in 2010 to assess oiling along the riverbanks. SCAT reports characterized the degree of oiling and types of habitat and substrate present in each quarter-mile segment of the river and identified recommended cleanup techniques to be used in each segment. U.S. EPA has made all of the SCAT completion reports available to the public at http://epa.gov/enbridgespill/data/scat.html.

U.S. EPA, the State, and Enbridge conducted a Shoreline and Overbank Reassessment Technique (SORT) survey in 2011 and repeated it in 2012. Methods were based on the SCAT survey system modified to apply to a riverine environment, including assessment of overbank (i.e. floodplain) areas. Similarly as to what was done during SCAT, SORT observers also recorded the degree and type of oiling and the type of habitat and substrate present.

MDEQ worked with Enbridge to compile and reconcile these multiple datasets, including the Trustees' floodplain survey, SCAT, SORT, and various other observations collected for response and remediation purposes, into a single geographic information

system database to document the extent of oiling and the nature and extent of impacts from response activities within the floodplain. The Trustees used the reconciled data to estimate that approximately 2,588 acres of wetlands were oiled only briefly as the oil floated on the floodwaters and 299 acres of wetlands were oiled significantly and subjected to response actions.

3.2.2 Aquatic Habitat Impact Surveys

U.S. EPA and Enbridge developed a poling procedure for determining the extent of submerged oil in the river. From U.S. EPA (2013b):

> Poling involves manually agitating soft sediment (river mud) using a pole with an attached disc combined with a global positioning system to record the exact location. When the sediment is agitated, submerged oil rises to the surface in the form of oil sheen and globules. A team, composed of mostly Enbridge personnel with oversight and direction from EPA and MDEQ employees, categorizes the response of the submerged oil to poling at each location as "heavy," "moderate," "light," or "none."

This procedure was used in 2010-2013, during time periods when water temperatures were warm enough to result in oil mobilization and sheening. A photo of this procedure is included in Appendix A. Enbridge mapped the poling data, and these maps were used to plan response actions for submerged oil. The Trustees used these mapped data to estimate both the extent of oiling and the timing and extent of response actions.

Enbridge was required to monitor the presence of large woody debris and the extent of bank erosion in and along the Kalamazoo River. The Trustees obtained some data from this monitoring through MDEQ and considered it when estimating in-stream habitat losses and recovery rates.

MDEQ used aerial photographs to map the extent of aquatic macrophyte beds that were impacted by the Enbridge Line 6B Oil Discharges and by spill response activities. The Trustees considered the extent of impacts to aquatic macrophyte beds in each river reach when estimating in-stream habitat losses and recovery rates.

3.2.3 Oiled Wildlife Surveys and Rehabilitation

MDNR and USFWS received the first reports of oiled wildlife on July 26, 2010, and USFWS advised Enbridge to mobilize professional rehabilitators and begin building rehabilitation facilities that evening. A wildlife hotline was established that night so that the public and responders could report sightings of oiled wildlife. Enbridge mobilized their contractor, Focus Wildlife, and they built a complete rehabilitation facility over the next several days. The USFWS developed and led the Wildlife and Environmental Assessment Branch within the Operations Section of the response. This Branch provided

technical assistance to U.S. EPA on natural resource issues and field observations; led reconnaissance, capture, rehabilitation, and release of oiled animals; installed deterrence measures to try to minimize wildlife oiling and road fatalities; and provided a link between NRDA field activities and the ICS management of the overall response. The USFWS, MDNR, USDA APHIS, and contractors employed by USFWS and Enbridge performed daily reconnaissance for oiled wildlife, responded to hotline calls, and captured oiled wildlife when possible on a daily basis until mid-October of 2010 when responsibility was turned over to Enbridge and their contractors. Enbridge and Focus Wildlife led the rehabilitation functions, with Binder Park Zoo taking a major role in rehabilitation of turtles and other reptiles and amphibians. Personnel from additional zoos and volunteers also assisted in animal care and cleaning oiled wildlife (National Response Team, 2012). Wildlife releases were coordinated among USFWS, MDNR, Enbridge, and contractors.

Trustees obtained wildlife data that were collected as a part of these activities. These data identify the number, species, and locations of birds, turtles, frogs, and other biota that were found dead or oiled, as well as the number and species of biota that were rehabilitated and released, cleaned in the field and released, or died during rehabilitation. A summary of these impacted wildlife is provided above in Section 1.4 and additional details are provided in Appendix C.

3.2.4 Fish Surveys and Studies

In the first week after the Enbridge Line 6B Oil Discharges, MNDR Fisheries biologists surveyed the river for fish kills and monitored dissolved oxygen in the river. Although dissolved oxygen levels dropped as a result of the Enbridge Line 6B Oil Discharges, they recovered before reaching lethal levels for the fish species present. Wildlife response crews collected a total of 42 dead fish during the course of the response in 2010. Given the size of the impacted area and the number of observers on the river, the Trustees consider this to be a negligible number of dead fish over this time period.

As a part of the early response efforts, operators at the dam that forms Lake Allegan lowered the level of the reservoir. This drawdown resulted in the loss of some fish and mussels in Lake Allegan. MDNR collected 27 dead fish on August 5, 2010, and estimated the total number of dead fish at 168 individuals and characterized these losses as relatively minor for Lake Allegan (Appendix D).

In August of 2010, MDNR collected fish for a fish health assessment. Dr. Mohamed Faisel of the Fish Health Laboratory at Michigan State University examined the fish for a baseline health assessment following the Enbridge Line 6B Oil Discharges. Three species of fish were collected at each of three locations. Species collected included spotfin, common and sand shiners, white and golden redhorse suckers and rock bass. All fish were collected live. While the fish appeared to be in generally good health, dermal lesions were present, fin and ventral hemorrhages were “prevalent,” and ocular hemorrhages were observed. Mild to moderate congestion was observed in a few livers and kidneys of common white sucker and common shiners. No other signs of disease were noted.

In August 2010, at the request of the USFWS, the U.S. Geological Survey (USGS) performed a gross pathological assessment of general fish health on fish collected from the oiled area and a reference area and calculated a Health Assessment Index (HAI) for those fish. They also collected and preserved tissue and bile samples for histological, biochemical, and chemical analyses. Fish collected from three oiled sites showed significant adverse changes in several bioindicators relative to fish collected from upstream, including reduced condition factors, greater numbers and severity of anomalies and lesions, increased mucous producing cells and cytochrome P4501A activity in the gills, and increased macrophage aggregates in the spleen (Papoulias et al., 2014, included as Appendix F). The Trustees and Enbridge also collected and preserved bile samples from fish collected by the State of Michigan in October 2010. Bile samples have not been analyzed.

The MDNR's Fisheries Division standard fish community assessment (Streams Status and Trends Program Sampling Protocol; Wills et al., 2008) was conducted on September 8, 2010 in both Talmadge Creek and several stations on the Kalamazoo River, and were repeated in the summers of 2011, 2012, and 2013. These surveys were performed in accordance with standardized procedures used by the MDNR for ordinary monitoring efforts, and as such, were performed by state personnel in 2011-2013 and by state personnel accompanied by Enbridge NRDA representatives in 2010. MDNR completed an annual report for 2010 (Appendix G), shared preliminary data from 2011, 2012 and 2013 with Trustees, and will be finalizing their full reports pending further data analysis. Preliminary results for the Kalamazoo River show a decrease in smallmouth bass density in 2010 at 15 Mile Road and 11 Mile Road sampling sites, which are within the area impacted by the discharges of oil. Overall, fish diversity and growth were variable across all years and sites on the Kalamazoo River. In Talmadge Creek, fish abundance and diversity were both reduced in 2010. Fish abundance and diversity increased in the impacted sections of Talmadge Creek in 2011, 2012 and 2013 with some changes in species composition that may have been related to changes in stream habitat type. Abundance and diversity of fish in the upstream reference reach of Talmadge Creek decreased in those years, possibly as a result of habitat changes in the impacted area downstream of the reference reach that resulted in poor connectivity between upper and lower reaches of the creek for some species.In 2011, Enbridge reported that fish were observed dying during sediment agitation in one of the areas the river. Small areas of the river were enclosed with turbidity curtains while sediment agitation was being conducted. MDNR biologist Jay Wesley instructed them to begin pumping fresh water into the enclosed area where the fish were dying. When he arrived on-site, fish in the enclosed area appeared to be recovering, but he collected the following fish that had died: two green sunfish, one largemouth bass, one johnny darter, four yellow bullheads, and three minnows.

3.2.5 Benthic Invertebrate Surveys and Studies

MDEQ conducted the State's standard benthic macroinvertebrate surveys (Procedure 51) shortly after the Enbridge Line 6B Oil Discharges in both Talmadge Creek and several stations on the Kalamazoo River, and repeated them during the summers of 2011 through 2014. Additional surveys will be conducted in 2015 and 2016

prior to the synthesis of all data into a final report. MDEQ personnel conducted these surveys using their standardized procedures and were accompanied through 2011 by Enbridge NRDA representatives. Available reports summarizing surveys conducted to date are provided as Appendix H. After showing initial impacts, the data generally indicate trends toward recovery with trends interrupted during periods when additional oil recovery efforts occurred. In August of 2010, the Trustees and Enbridge cooperatively developed work plans for the collection and chemical analysis of mussel tissue samples for oil constituents such as polycyclic aromatic hydrocarbons (PAHs) and alkylated PAHs as well as other indicator chemicals. The Trustees and Enbridge staffed joint teams to collect the samples along with co-located sediment samples from six locations, and Enbridge contracted with a laboratory for analysis. Most of the chemical concentrations were below the limits of detections and this sampling effort was not repeated. No summary report was written.

In October 2010, the Trustees and Enbridge cooperatively developed a mussel shell survey work plan to document crushed and broken shells that likely resulted from response activities in the river (Appendix I). Scientists from the Michigan Natural Features inventory led the survey with sampling teams staffed jointly with representatives from the Trustees and Enbridge. Five locations were sampled along the Kalamazoo River, including an upstream reference area. Fresh, recent, and moderately worn shells, which were indicative of mussel deaths post-spill, were most common in segments and survey sites within areas impacted by the Enbridge Line 6B Oil Discharges. These observations were atypical compared to what was observed in the reference segment. In addition, crushed shells were observed in segments impacted by the Enbridge Line 6B Oil Discharges and were not observed in the reference segment. Crushed shells were most often found in shallow water habitats downriver from boat ramps being used by spill response crews. Based on observations of boat activity made while in the field, it was concluded that these shells were damaged from being crushed by boats, or possibly by foot traffic.

As part of the SSCG investigations, sediment toxicity to benthic invertebrates was measured in 20 samples collected from the impacted reaches of the Kalamazoo River in February of 2012. Ten-day whole sediment toxicity tests using midges (*Chironomus dilutus)* and amphipods (*Hyalella azteca)* were performed by the Great Lakes Environmental Center, Inc. (GLEC), and included survival, growth and biomass as the toxicity endpoints (GLEC, 2012). The 20 samples were also analyzed for spill-related contaminants and other sediment characteristics that can influence the growth and survival of benthic invertebrates. Based on comparisons to sediment toxicity benchmarks for PAHs, some but not all heavily oiled sites were expected to pose adverse chronic risks to benthic fauna, and the toxicity testing showed reductions in growth and survival in some of the samples (Bejarano, 2012). Based on the weight of evidence approach and additional risk metrics, the author of the data analysis concluded that in 2012, residual oil from the Enbridge Line 6B Oil Discharges in 2010, particularly in heavily oiled areas, may pose some risks to benthic receptors, although other factors need to be considered (Bejarano, 2012).

During the summer of 2012, independent researchers from Central Michigan University looked at the unionid mussel assemblages at sites upstream (n=5) of Marshall, in the reach impacted by the Enbridge Line 6B Oil Discharges (n=4), and downstream (n=3) of Morrow Dam (Woolnough and Parker, 2013). They used timed, transect, and quadrat surveys to determine the assemblage, size classes, gravidity and shell deposits at all sites. Overall, fewer live species of unionids were found in the impacted spill reach as compared to the upstream and downstream regions. When standardized by area surveyed, more shells were found in the spill region compared to the upstream and downstream regions with less evidence of reproduction in the spill region.

3.2.6 Chemical Analysis of Water

In July 2010, the Trustees and Enbridge cooperatively developed work plans for the collection and chemical analysis of oil constituents such as polycyclic aromatic hydrocarbons (PAHs) and alkylated PAHs at different depths within the water column. At the time, water samples being taken as part of the response efforts were being collected from the surface of the water only and alkylated PAHs were not being measured. The Trustees and Enbridge staffed joint teams to collect the water samples during three different sampling events from July 29, 2010 through August 19, 2010. Enbridge contracted with a laboratory for analysis of the water samples. The Trustees compared the analytical results to various U.S. EPA and MDEQ water quality criteria. Most of the chemical concentrations were below criteria concentrations. The Trustees and Enbridge jointly decided that additional sampling was unnecessary. No summary report was written.

In 2011, the Trustees and Enbridge cooperatively developed a work plan to document exposure of fish to oil constituents including PAHs and alkylated PAHs at likely fish spawning locations. The purpose was to document potential exposure of these constituents to fish embryos. Surface water samples were collected from eight different locations (including upstream references) and field filtered. Samples were collected once per week for four weeks and then once every two weeks for three additional sampling periods for a total of seven sampling periods from April 12, 2011 through July 13, 2011. The Trustees compared PAH concentrations observed at the sites to literature-based effects levels and concluded that concentrations in 2011 were not great enough to adversely impact fish embryos. No summary report was written.

3.2.7 Recreational Lost Use

Nearly immediately after the Enbridge Line 6B Oil Discharges began in July 2010, county health agencies closed public access to 39 miles of the river system to protect public health and safety. On April 18, 2012, a three-mile portion was opened from Perrin Dam in Marshall to Saylor's Landing near 15 Mile Road and the Kalamazoo River. On June 21, 2012, the remainder of the river was opened for public use, although certain areas remained buoyed to exclude the public from active work areas posing a safety risk. In addition, the Michigan Department of Community Health issued a Fish Consumption Advisory and a Swimming Advisory on July 27, 2010, both of which were lifted on June 28, 2012 (Michigan Department of Community Health, 2012).

In March of 2013, U.S. EPA ordered Enbridge to dredge several areas of the river in 2013 to remove additional submerged oil. As a result, starting on August 16, 2013, a section of the river from Historic Bridge Park to where the Battle Creek River joins the Kalamazoo River was closed in preparation for dredging near the Battle Creek Mill Ponds. This section covers about 5 miles of the river and was closed until May 23, 2014. A second section of the Kalamazoo River, from Saylor's Landing to Ceresco Dam, was closed Tuesday, July 24, 2013, to prepare for dredging and reopened on October 7, 2014. This section covers about 3 miles of the river. An additional section of river from the Galesburg Community Park Public Access to the MDNR Access on Morrow Lake was also closed from July 25, 2013 through July 3, 2014.

Within days after the Enbridge Line 6B Oil Discharges, the Trustees and Enbridge informally assessed human activity and recreational use/access locations along the impacted portion of the river. The Trustees also gathered and compiled readily available information on pre-spill recreational use along the affected portion of the river, including information on angling, park use, and shoreline use. The NHBP conducted preliminary interviews with tribal elders to evaluate whether further study of cultural use losses was warranted.

The Trustees worked with Enbridge to develop a sampling plan for telephone interviews and onsite counts and interviews of river users. Enbridge participated in the plan development, but declined to participate in sampling; thus the Trustees conducted the sampling independently. The Trustees sampled 16 sites for boating use and 22 sites for shoreline use (e.g. fishing, picnicking, exercising) from April 27, 2012 to July 31, 2012. Trustees conducted the telephone interviews from September 11, 2012 to October 31, 2012.

3.2.8 Non-Recreational Lost Use to Tribes

The Kalamazoo River is the core of the home territory of the Match-E-Be-Nash-She-Wish Band of Pottawatomi and Nottawaseppi Huron Band of the Potawatomi (the Tribes), historically both known as the Bodewadmi. The River and River Corridor are integral to the life (uses) of these two Tribes, providing them with water travel, subsistence, medicinal, economic, educational, and ceremonial services, past, present and future. The two Tribes have used such resources and lived here for thousands of years. Investigations, confidential to the Tribes, show that members of both Tribes find the area significant and important to their uses. Natural resources of significance to the Tribes' and their members include fish, mussels, turtles, mammals, birds, insects, plants, and other biological resources and water resources. The oil spill resulted in losses of tribal uses.

3.3 Injury Assessment, Methods and Results

Based on the results of the studies described in Section 3.2, the Trustees assessed both recreational use losses and ecological injuries. The ecological injuries were

assessed on a habitat basis for both injuries resulting directly from the oil itself and those resulting from response actions. For the recreational use losses, the Trustees developed a site-specific recreational demand model to estimate the number of user days lost and used benefits transfer to estimate the reduction in the recreational value of the river due to the Enbridge Line 6B Oil Discharges and subsequent environmental degradation. This is described in more detail in Section 3.3.1. For the ecological losses assessed on a habitat basis, the Trustees used a Habitat Equivalency Analysis (HEA) approach to quantify injury to in-stream habitats, floodplain wetland habitats, and upland habitats. The three HEAs are described in more detail in Sections 3.3.2 and 3.3.3.

HEA is a tool commonly used in NRDA. HEA is based on the concept that habitat provides ecological services (e.g. food and shelter for organisms). Contamination and physical disturbance reduce the ecological services, but restoration of the same or similar type of habitat would replace the ecological services and thus compensate for the losses. To conduct a HEA, the Trustees quantify the duration and severity of injury in terms of the percent of the services that are lost. The injury is modeled over time, using a discount factor to bring all values into present terms. The results are measured in units of Discounted Service Acre Years (DSAYs), representing the number of acres impacted, the level of impact in terms of the percent loss of ecological services, the duration of the injury, and the discounting of all years of injury into present value terms.

3.3.1 Assessment of Recreational Losses

For the recreational use losses, the Trustees used the information developed in the surveys described in Section 3.2.7 to develop a site-specific recreational demand model to estimate the number of user days lost and used benefits transfer to estimate the reduction in the recreational value of the river due to the Enbridge Line 6B Oil Discharges and subsequent environmental degradation. Results of the sampling in 2012 produced an estimate of approximately 8,600 baseline boating trips and 64,800 baseline shoreline trips to the affected area between April and October. Closures and cleanup activities related to the Enbridge Line 6B Oil Discharges caused a 100% loss of boating trips from the date of the Enbridge Line 6B Oil Discharges through October 2011. It was assumed that as the river re-opened and the quality of the site improved, boating trips gradually returned through the summer of 2012 (losses beginning at 70% in April and ending at 30% in October). The analysis resulted in approximately 13,300 lost boating trips as a result of the Enbridge Line 6B Oil Discharges.

Shoreline use followed a similar pattern, with spill related closures and cleanup activities causing a 100% loss of shoreline trips from the date of the Enbridge Line 6B Oil Discharges and dropping to an 80% loss by October 2010. Losses throughout 2011 (April through October) were assumed to be at 75% of baseline with a modest recovery occurring in 2012 (October 2012 ending at a 7% loss). The analysis resulted in approximately 86,600 lost shoreline trips as a result of the Enbridge Line 6B Oil Discharges.

3.3.2 Assessment of Injury to In-Stream Habitats

Relying on the geographic information system produced by the MDEQ, the Trustees assessed injuries to 1,560 acres of in-stream habitats that were oiled and/or impacted by cleanup actions. In-stream habitats include the main stem of the Kalamazoo River as well as the affected portions of Morrow Lake. Poling data were used to identify areas with "heavy" and "moderate" submerged oil; these comprised 385 acres. Spill responders used "heavy" and "moderate" submerged oil to determine areas that were actionable for cleanup, thus the poling data were considered to be a good indicator of the level of oiling injury and the level of physical disturbance from cleanup work. The Trustees assumed that the remaining in-stream areas had a lesser level of oiling and cleanup activity.

The affected area of the Kalamazoo River was divided into four reaches based on geomorphic differences (e.g. channel width, straightness), differences in initial oiling, and barriers to fish passage that divide the river into different fish communities. The division points that the Trustees used were the Ceresco Dam, the downstream end of the Mill Ponds in Battle Creek, Custer Road in Kalamazoo County, and 35th Street in Kalamazoo County, upstream of Morrow Lake. Morrow Lake and the delta formed as the Kalamazoo River enters the lake are considered as a fifth reach.

The Trustees assigned injury levels and recovery rates on a reach-by-reach basis, since impacts from dredging, agitation, and sedimentation spread downstream within the reach and because fish travel throughout a reach. Also, intense boat traffic and helicopter overflights caused disturbances throughout reaches, not just in the immediate area where work was being conducted. Initial injury levels ranged from 50% in the areas with less oiling and less active remediation to 90% in areas where heavy oiling and intense and intrusive remediation activities, such as dredging, occurred. Projected recovery timeframes were approximately 15 years in sensitive habitats such as the Mill Pond (a high quality wetland with many large, diverse types of plants providing a productive fish nursery and habitat for herons and swans) and approximately 5 years in other areas. Physical disturbances of sediment and aquatic vegetation and the removal of habitat structure (e.g. removal of oiled wood snags that provide habitat) were some of the factors considered in estimating recovery times.

The HEA results indicated that 5,790 DSAYS were lost in in-stream habitats as a result of the Enbridge Line 6B Oil Discharges.

3.3.3 Assessment of Injury to Floodplain Wetlands and Uplands

Again relying on the MDEQ geographic information system, at the time of the Enbridge Line 6B Oil Discharges, 2,887 acres of floodplain wetlands and uplands were inundated because of flooding along Talmadge Creek and the Kalamazoo River. After the floodwaters receded, areas with residual oil totaled 299 acres. The Trustees assigned 70% initial injury to the areas with residual oil. This injury level was then adjusted based on the type of response action taken, as described below. Response actions may result in greater initial injury but a faster recovery time than if the oil were to be left in place. The remainder of the inundated area (i.e. areas that were exposed to oil during the flood) was

assigned a temporary injury of 100% for one week following the Enbridge Line 6B Oil Discharges, because oil on the surface of the water and fumes in the air eliminated the ecological services (e.g. drinking water for wildlife, hatching area for insects, use of the water surface by air-breathing aquatic organisms). Starting one week after the Enbridge Line 6B Oil Discharges, the Trustees assigned no additional injury in areas where residual oil was not observed and response work was not conducted.

Response actions ranged from natural attenuation (no active cleanup) to excavation. In addition, some areas that were not oiled were affected by the cleanup work, e.g. construction of access roads, dredging pads, etc. Excavation causes significant physical disturbance to the habitat by removing all habitat structure and function. Soil scraping, high pressure flushing, and agitation of submerged sediment to release oil remove significant structure and function. Removal of woody debris and live vegetation has a lesser but still significant impact. Other actions such as placement of absorbent materials, vacuuming oil, and flushing with low pressure hoses all cause some impacts, such as soil compaction. Also, the presence of responders and the noise created by the response actions acted as deterrents to wildlife use of the areas. If multiple response activities took place in the same location, the Trustees assigned the higher injury level. Initial injury levels ranged from 70% to 100%.

The Trustees divided the habitat into the following types: uplands, emergent wetlands (including ponds, aquatic beds, and scrub-shrub wetlands), forested wetlands, and rare and unique wetlands. Recovery timeframes for these habitat types differ: emergent wetlands are expected to recover in three to seven years, based on the rate of plant regrowth, while forested wetlands would take five to 50 years if trees are cut down and excavation removes the hydric soils needed for wetland plants to grow. Rare and unique wetlands, such as those near Talmadge Creek, are not expected to fully recover if excavation changes the hydrology or if removal of vegetation allows invasive species to crowd out the rare and unique species.

The HEA results indicated that 2,320 DSAYS were lost in wetland and upland habitats as a result of the Enbridge Line 6B Oil Discharges.

3.4 Injury Quantification and Scaling

3.4.1 Recreational Use Quantification and Scaling

The Trustees used benefits transfer techniques to evaluate the dollar value losses resulting to recreational users as a result of the Enbridge Line 6B Oil Discharges. When recreational users of environmental resources are faced with a diminution in site quality, they often either substitute to another site, take a trip to the same site but derive less value from their trip, or cancel their trip altogether. Each of these behavioral changes results in a decrease in value. Published values of lost fishing, boating, and shoreline trips from environmental economics literature were evaluated for appropriateness of application to users of the Kalamazoo River. The Trustees used values of $23.9 and $14.4 for a lost boating and shoreline trip, respectively. As described above in Section 3.3.1, the Trustees estimated the number of lost trips at 13,300 lost boating trips and 86,600 lost

shoreline trips as a result of the Enbridge Line 6B Oil Discharges. The values of these losses were discounted to present value using a 3% discount rate. Additional simulations were performed to evaluate several other scenarios, specifically supposing that 1) the estimate of baseline used was depressed due to ongoing impacts from the Enbridge Line 6B Oil Discharges, 2) losses continued into the summer of 2013, and 3) trips that took place during the spill period were trips of diminished value. The sum present value of recreational losses was estimated to be in the range of $1.7 million to $2.6 million. The Trustees believe that these losses will be addressed as the result of a combination of the public uses of the restored areas and the recreational use projects described in Table 1.2.

3.4.2 Ecological Injury Quantification and Scaling

To complete the quantification of injuries to habitats, the Trustees identified general types of habitat restoration projects and assessed the DSAYs they would provide. The total damages are given by the number of acres of those restoration projects required to match the DSAYs calculated in the injury assessment. Compensatory restoration alternatives must be scaled to ensure that the size or quantity of the project reflects the magnitude of the injuries from the discharges. The Trustees relied on the OPA regulations to select the scaling approach for compensatory restoration actions.

The Trustees considered wetland creation, benthic (riverbed) habitat creation, wild rice planting, and grassland prairie/oak savanna restoration. The Trustees assumed that each of these general restoration types would be initiated in the summer of 2014[6] and would provide increasing ecological services over time: forested wetlands would take 50 years to reach full function, emergent/scrub-shrub wetlands would take 15 years, benthic habitat would take five years, and wild rice planting would take three years.

Benthic habitat improvements, wild rice planting, and invasive species control projects in inland lakes were both scaled against the in-stream injuries identified in Section 3.3.2, and the Trustees determined that 216 acres of benthic habitat, 5 acres of wild rice planting, and 350 acres of invasive species control projects will together compensate for the injury to the in-stream habitats in Talmadge Creek, the Kalamazoo River, and Morrow Lake. The removal of Ceresco Dam and restoration of the river channel in the area of the dam, as required by the State Settlement, is connecting 199 acres of benthic habitat with the downstream stretch of river. Therefore, the Trustees sought projects that will address the difference, i.e. 5 acres of wild rice planting, 350 acres of aquatic invasive species control projects, and 17 acres of benthic habitat. The Trustees selected restoration projects on Pigeon Creek, Rice Creek, inland lakes in the Fort Custer State Recreation Area, and the Kalamazoo River that will provide the additional required ecological service improvements. These projects are described in greater detail in Chapter 4.

New wetlands were scaled against the injury identified in Section 3.3.3, and the Trustees determined that 300 acres of a combination of forested, scrub-shrub, and

[6] Based on the timing of the Final DARP/EA, projects are now expected to be initiated in 2016, but this does not significantly affect the amount of habitat restoration estimated to be necessary.

emergent wetlands must be created to compensate for the injury. This restoration is expected to be achieved with the wetland projects that Enbridge will complete under the direction of the State of Michigan, in consultation with the Trustees, as described above in Table 1.2.

The Trustees used oak savanna and adjoining woodlands restoration to scale restoration to the injury resulting from use of upland areas for response activities including construction of access roads and staging areas. Based on this analysis, the Trustees determined that three years of invasive species control on 130 acres of oak savanna and adjoining woodlands will compensate for the interim losses in the upland areas used for the response.

4.0 RESTORATION ALTERNATIVES

4.1 Restoration Strategy

The goal of restoration under OPA is to compensate the public for injuries to natural resources and services from an oil spill. OPA requires that this goal be achieved by returning injured natural resources to their baseline condition, and, if possible, by compensating for any interim losses of natural resources and services during the period of recovery to baseline.

Restoration actions under the OPA regulations are either primary or compensatory. Primary restoration is action(s) taken to return injured natural resources and services to baseline on an accelerated time frame. The OPA regulations require that the Trustees consider natural recovery under primary restoration. The Trustees may select natural recovery under three conditions: (1) if feasible, (2) if cost-effective primary restoration is not available, or (3) if injured resources will recover quickly to baseline without human intervention. Alternative primary restoration activities can range from natural recovery, to actions that prevent interference with natural recovery, to more intensive actions expected to return injured natural resources and services to baseline faster or with greater certainty as compared to natural recovery.

Compensatory restoration is action(s) taken to compensate for the interim losses of natural resources and/or services pending recovery. The type and scale of compensatory restoration may depend on the nature of the primary restoration action and the level and rate of recovery of the injured natural resources and/or services given the primary restoration action. When identifying the compensatory restoration components of the restoration alternatives, the Trustees must first consider compensatory restoration actions that provide services of the same type and quality and of comparable value to those lost. If compensatory actions of the same type and quality and of comparable value cannot provide a reasonable range of alternatives, the Trustees then consider other compensatory restoration actions that will provide services of at least comparable type and quality as those lost.

In considering restoration for injuries resulting from the Enbridge Line 6B Oil Discharges, the Trustees first evaluated possible restoration for each injury and then considered on-site work that has been or is being conducted by Enbridge under the direction of U.S. EPA and MDEQ. Based on that analysis, the Trustees determined that no additional primary restoration, other than natural recovery, was appropriate. Thus, with the exception of the natural recovery alternative, only compensatory restoration projects to be implemented under the direction and control of the Trustees pursuant to the Final DARP/EA are presented below.

Several of the restoration alternatives included in this section are based on designs that may require additional detailed engineering design work or operational plans. Therefore, details of specific projects may require additional refinements or adjustments

to reflect site conditions or other factors. If a selected project becomes infeasible for some reason, the Trustees will consider substituting a similar project and evaluate whether this decision requires additional public review under OPA or NEPA.

4.2 Restoration Project Selection Criteria

NRDA regulations under OPA require consideration of six criteria when evaluating restoration options (15 C.F.R. § 990.54(a) and (b)). The Trustees are using these criteria with additional considerations that the Trustees have adopted to focus and maximize the value of restoration efforts toward recovery of natural resource injuries and service losses that occurred as a result of the Enbridge Line 6B Oil Discharges (U.S. Fish and Wildlife Service et al., 2012). Within these criteria, restoration projects and project locations that reflect the geographic area affected by the Enbridge Line 6B Oil Discharges and which address the diversity of resource injuries that resulted from it are preferred.

1. Relation to natural resource injuries and services losses
This criterion is used to judge the degree to which a project helps to return injured natural resources and services to at least baseline conditions that were present prior to the Enbridge Line 6B Oil Discharges or compensate for interim service loss. Projects should demonstrate a clear relationship to the resources and services injured. Projects located within the area affected by the Enbridge Line 6B Oil Discharges are preferred, but projects located within the Kalamazoo River watershed that provide benefit to the resources injured in the affected area will also be considered. The Trustees will aim for a diverse set of restoration projects and project locations, addressing an array of resource injuries.

2. Avoidance of Adverse Impact
Projects will be evaluated for the extent to which they prevent future injury as a result of the Enbridge Line 6B Oil Discharges and avoid collateral injury as a result of implementing the alternative. All projects shall be lawful and likely to receive any necessary permits or other approvals prior to implementation.

3. Project cost and cost effectiveness
The cost of a project, both initial cost and long term maintenance, will be considered against the relative benefits of a project to natural resources and service losses. Projects that return the greatest and longest lasting benefits for the cost will be preferred. The Trustees will also consider the time necessary before project benefits are achieved, and the sustainability of those benefits. Projects will be reviewed for their public acceptance and support, and consideration given to projects that leverage the financial resources of partner organizations.

4. Likelihood of Success
This criterion considers the technical feasibility of achieving the restoration project goals and will take into account the risk of failure or uncertainty that project goals can be met and sustained. This criterion will also consider the availability and ease of implementing corrective measures in the event that the

restoration project fails or does not initially meet its goals, to ensure project benefits are achieved. The Trustees will generally not support projects or techniques that are unproven or projects that are designed primarily to test or demonstrate unproven technology.

5. Multiple Resource and Service Benefits
Projects that provide benefits that address multiple resource injuries or service losses, or that provide ancillary benefits to other resources or resource uses are preferred. Restoration projects should not substitute for legally mandated requirements and restoration projects that would otherwise occur.

6. Public Health and Safety
This criterion is used to ensure that the project will not pose an unacceptable risk to public health and safety.

Information supporting the Trustees' selections of restoration alternatives is provided throughout the remainder of this chapter.

NEPA also applies to restoration actions taken or directed by the federal Trustees. To reduce transaction costs and avoid delays in restoration, the OPA regulations encourage the Trustees to conduct the NEPA process concurrently with the development of the restoration plan.

To comply with the requirements of NEPA, the Trustees analyzed the effects of each alternative that they would be implementing on the quality of the human environment. NEPA's implementing regulations direct federal agencies to evaluate the potential significance of proposed actions by considering both context and intensity. For most of the actions selected in this Final RP/EA, the appropriate context for considering potential significance of the actions is local, as opposed to national or worldwide. More information on the Trustee's analysis of the proposed actions relative to NEPA is provided in Chapter 5.

With respect to evaluating the intensity of the impacts of a proposed action, the NEPA regulations (40 C.F.R. 1508.27) require the consideration of ten factors:

1. Likely impacts of the proposed project.

2. Likely effects of the project on public health and safety.

3. Unique characteristics of the geographic area in which the project is to be implemented.

4. Controversial aspects of the project or its likely effects on the human environment.

5. Degree to which possible effects of implementing the project are highly uncertain or involve unknown risks.

6. Effect of the project on future actions that may significantly affect the human environment.

7. Possible significance of cumulative impacts from implementing this and other similar projects.

8. Effects of the project on National Historic Places, or likely impacts to significant cultural, scientific, or historic resources.

9. Degree to which the project may adversely affect endangered or threatened species or their critical habitat.

10. Likely violations of environmental protection laws.

Using the above criteria, the Trustees evaluated a range of restoration alternatives which would compensate the public for losses caused by the Enbridge Line 6B Oil Discharges. The Trustees reviewed existing watershed plans and other restoration planning documents for potential projects (e.g. Calhoun County Conservation District, 2003; Kalamazoo River Watershed Council, 2011; Michigan Department of Environmental Quality, 2005; Stratus Consulting, 2013). The Trustees also spoke with the public about their restoration criteria at the June 19, 2012 meeting of the Cooperating and Assisting Agencies Group convened by MDEQ and sought input in 2013 from representatives from the Calhoun County Conservation District, Kalamazoo River Watershed Council, and Fort Custer Recreation Area on potential projects. Potential restoration projects identified included culvert replacements, streambank restoration, prairie and oak savanna uplands restoration, invasive species management, shoreline softening and others. In the following sections, the selected restoration alternatives to be implemented by the Trustees under this Final DARP/EA for the affected natural resources and natural resource services and the non-preferred restoration alternatives are presented and discussed.

4.3 Evaluation of Restoration Alternative 1: No-Action/Natural Recovery

NEPA requires the Trustees to evaluate an alternative in which no actions are taken by a federal agency. Here, the no-action alternative would mean that the Trustees would take no direct action to restore injured natural resources or to compensate for lost services pending natural recovery. Instead, the Trustees would rely solely on natural recovery for the achievement of restoration goals beyond what would be achieved in the State Settlement. While the Trustees believe that natural recovery will occur over varying time scales for the resources exposed to and/or injured by the Enbridge Line 6B Oil Discharges, the interim losses suffered would not be fully compensated under a no-action alternative.

The principal advantages of this approach are the ease of implementation and lack of costs because natural processes rather than humans determine the trajectory of the system. This approach, more so than any of the others, recognizes the capacity of

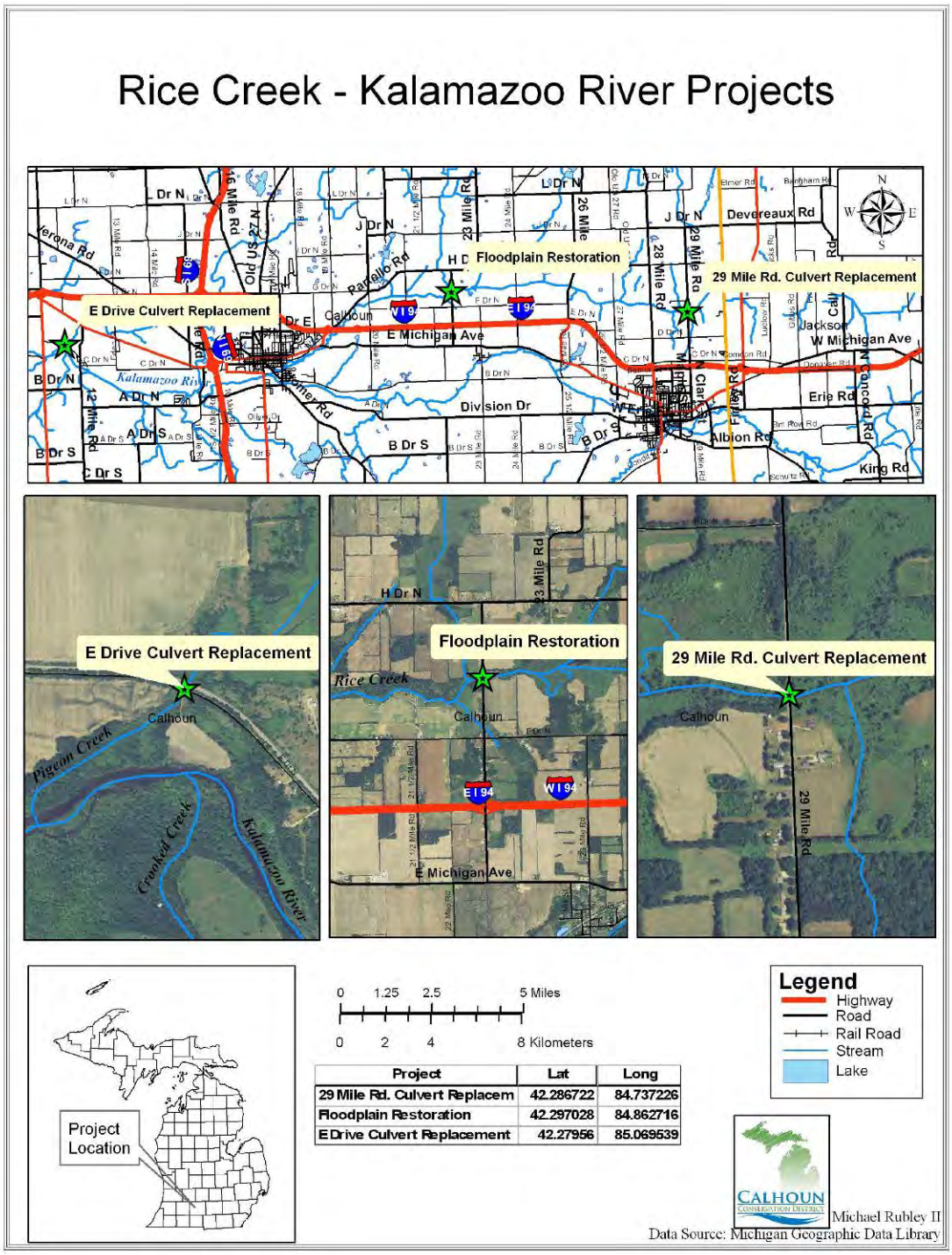
dynamic river systems and entire watersheds for self-healing over time and does not directly alter existing habitats.

However, OPA clearly establishes the Trustees' responsibility to seek compensation for interim losses pending recovery of the natural resources. This responsibility cannot be completely addressed through a no-action alternative. The Trustees have determined that natural recovery can be appropriate as part of primary restoration but that the no-action alternative is not sufficient for compensatory restoration. Losses were, and continue to be, suffered during the period of recovery from this spill and technically feasible and cost-effective alternatives exist to compensate for these losses beyond what is expected to be achieved by the State Settlement.

4.4 Evaluation of Restoration Alternative 2: Riverine (selected)

Several projects that benefit in-stream habitats and associated aquatic natural resources have been identified and developed by the Calhoun County Conservation District (CCCD). The Trustees selected three of these to address in-stream injuries by improving water quality, aquatic connectivity, and in-stream habitat. The three projects are located in Pigeon Creek and Rice Creek, both tributaries to the Kalamazoo River near Marshall, Michigan (Figure 4.1).

Figure 4.1. In-stream Restoration Projects



4.4.1 Pigeon Creek, E Drive Crossing Replacement

Project Description

The E Drive road crossing on Pigeon Creek is an undersized and perched culvert system located on E Drive N in Emmett Township (Figure 4.2). A perched culvert is one in which the downstream end is significantly higher than the normal stream elevation. Because of this, the water drop may be too high for fish to jump up into the culvert, the water in the culvert may be too shallow, and the velocity in the culvert may be too great for fish to swim upstream. Mussels rely on fish of certain species to carry their young (the glochidia life stage of mussels encysts on fish gill tissue without harming the fish), so mussel reproduction and distribution is also impacted when the movement of their host fish is limited.

Pigeon Creek is a tributary to the Kalamazoo River, similar to the impacted Talmadge Creek, that enters it about one mile downstream of Ceresco Dam. The road stream crossing inventory and stream morphological assessment conducted at the crossing by the CCCD revealed concerns from sedimentation, nutrient loading, hydrologic flow, salt, road and culvert washouts, perched culverts, inadequate culvert system design, stream bed siltation, and bank undercutting. When culverts are undersized like this, excess water pressure upstream and downstream of this "pinch point" leads to erosion. As part of this erosion, soil particles and nutrients are washed into the stream. Soil particles in the stream eventually settle to the bottom as sediment, and excess sediment reduces the availability of important sand, gravel, and cobble habitats for benthic invertebrates and fish eggs and larvae. Excess nutrients entrained with soil particles can result in an overgrowth of algae in the stream.

The crossing is in an area with significant numbers of mussels and water quality in this stream also affects water quality in the Kalamazoo River downstream. The project will replace the five existing culverts with one bottomless culvert designed to accommodate flood flows from the 7.2 square mile drainage area above this crossing. (Figure 4.3; Figure 4.4)

Figure 4.2. Existing culvert system at E Drive on Pigeon Creek



Figure 4.3. Example of an open bottom structure, along with general guidance for road stream crossings (Massachusetts Department of Fish and Game, 2005)



Figure 4.4. Example of a simple open box culvert (Massachusetts Department of Fish and Game, 2005)



Restoration Objectives

This project is intended to provide compensatory restoration for the in-stream habitats and aquatic natural resources (like mussels and fish) that were injured as a result of the Enbridge Line 6B Oil Discharges by increasing the aquatic functions and values of this tributary to the Kalamazoo River. Pigeon Creek is similar to Talmadge Creek and is a tributary to the Kalamazoo River within the impacted section of the river. Completion of the project will reduce the impacts from erosion, sedimentation and nutrient loading in Pigeon Creek and downstream to the Kalamazoo River and will allow fish passage where the perched culverts currently prevent it.

Probability of Success and Monitoring

Replacing stream crossings using the technologies and design contemplated here is an established process. The Trustees believe, therefore, that this project will have a high likelihood of success. Some of the settlement funds ($4,800) will be used to manage and monitor this project for a two-year period to ensure that the appropriate hydrology has been established and that native vegetation becomes established where soils are disturbed during construction activities.

Environmental and Socio-Economic Impacts

No long-term adverse environmental or socio-economic impacts are expected from this project. It is expected that the restored stream crossing will provide improved water quality and habitat for freshwater mussels, other benthic invertebrates and fish. This will in turn provide benefits to aquatic-dependent migratory birds like green herons and mammals like muskrats, as well as provide increased opportunities for local residents that fish and observe wildlife. The new stream crossing will also reduce upstream flooding and reduce costs to maintain the road over the stream crossing. Minor short-term increases in turbidity and sedimentation would be expected to occur during construction. Turbidity will be minimized by the use of a temporary structure to divert water from the work area (e.g. coffer dam) and silt fences to control erosion until vegetation is re-

established. Heavy machinery used for this project could cause minor impact to site use, noise and disruption.

Cost

The Trustees will assist in implementing this project by providing $153,800 from the settlement with the RP to the CCCD. The CCCD will assume responsibility for final design, permitting, and implementation of the project; for coordinating the work with the county road commission; and for the evaluation of the project's success.

Evaluation

The Pigeon Creek restoration site was not directly impacted by the Enbridge Line 6B Oil Discharges, but is a tributary to an impacted section of the Kalamazoo River. The project will provide improved aquatic habitat, stream connectivity and water quality for common aquatic species found in the Kalamazoo River watershed. The CCCD will coordinate the road stream crossing work with the county road commission and use the project as an example of how to use stream morphologic assessments to improve culvert sizing and further minimize impacts to stream function by the use of bottomless culverts.

Although there will be some negative short-term impacts to natural resources as a result of the construction activities, the Trustees have determined that the project's overall environmental impacts are positive. The permitting terms and conditions and other best management practices will ensure that there are minimal disturbances to the existing resources during project construction. The improved aquatic habitat and water quality will have long-term benefits for mussel, fish and wildlife species as well as local members of the public that were injured by the Enbridge Line 6B Oil Discharges.

4.4.2 Rice Creek, 29 Mile Road Crossing Replacement

Project Description

The 29 Mile Road crossing replacement on the South Branch of Rice Creek is an undersized culvert system located on 29 Mile Road approximately two miles north of Albion, Michigan, in Sheridan Township (Figure 4.5). Rice Creek is a tributary to the Kalamazoo River that enters it in Marshall, Michigan, downstream of the dam for the Marshall Impoundment and upstream of the confluence of Talmadge Creek with the Kalamazoo River. The road stream crossing inventory and stream morphological assessment conducted at the crossing by the CCCD demonstrated that the existing 14' wide culvert system is inadequate to accommodate bankfull stream flow and is responsible for flooding and erosion upstream, impaired fish passage and water quality, and stream channelization downstream of the culvert (Figure 4.6). Water quality in this stream also affects water quality in the Kalamazoo River downstream. The project will replace the existing 14' diameter culvert system with a 19'10" wide bottomless arch or box culvert able to accommodate bankfull stream flow.

Figure 4.5. Outlet of 29 Mile Road culvert (Calhoun County Conservation District)



Figure 4.6. Flooding at 30 Mile Road because of flow being impounded at 29 Mile Road crossing (Calhoun County Conservation District)



Restoration Objectives

This project is intended to provide compensatory restoration for the in-stream habitats and aquatic natural resources (like mussels and fish) that were injured as a result of the Enbridge Line 6B Oil Discharges by increasing the aquatic functions and values of this tributary to the Kalamazoo River. The South Branch of Rice Creek has a somewhat larger drainage area than Talmadge Creek and joins with the North Branch of Rice Creek prior to entering the Kalamazoo River just upstream of Talmadge Creek. Completion of the project will directly address erosion along approximately two miles of the stream as well as reduce the impacts from erosion, sedimentation, and nutrient loading in Rice Creek and downstream to the Kalamazoo River; restore fish and wildlife passage in the South Branch of Rice Creek; improve in-stream habitat; and reduce temperature increases and flooding caused when flows exceed the existing culvert capacity.

Probability of Success and Monitoring

Replacing stream crossings using the technologies and design contemplated here is an established process. CCCD has already completed a Rosgen level II geomorphic assessment to determine channel slope, lateral stream bank erosion, stream bed aggradation / degradation, stream bed material, and bankfull characteristics. They have also had soil borings analyzed and the geotechnical work completed. The Trustees believe, therefore, that this project will have a high likelihood of success. The project management budget of $28,000 includes monitoring based on the existing pre-project geomorphic assessment to ensure that the appropriate hydrology has been established and that native vegetation becomes established where bank area soil is disturbed by construction activities.

Environmental and Socio-Economic Impacts

No long-term adverse environmental or socio-economic impacts are expected from this project. It is expected that the restored stream crossing will provide improved water quality and habitat for freshwater mussels, other benthic invertebrates and fish. This will in turn provide benefits to aquatic-dependent migratory birds like green herons and mammals like muskrats, as well as provide increased opportunities for local residents that fish and observe wildlife. The new stream crossing will also reduce upstream flooding. Minor short-term increases in turbidity would be expected to occur during construction. Turbidity will be minimized by the use of a temporary structure to divert water from the work area (e.g. coffer dam) and silt fences to control erosion until vegetation is re-established. Heavy machinery used for this project could cause minor impact to site use, noise and disruption.

Cost

The Trustees will assist in implementing this project by providing $249,000 from the settlement with the RP to the CCCD. The CCCD will assume responsibility for final design, permitting and implementation of the project; for coordinating the work with

partners; and for the evaluation of the project's success. This project is expected to be a partnership among the CCCD, the Calhoun County Road Commission, the Calhoun County Drain Commissioner, the Jackson County Drain Commissioner, the MDNR, the MDEQ, and landowners adjacent to the project location.

Evaluation

The Rice Creek restoration site was not directly impacted by the Enbridge Line 6B Oil Discharges, but is just upstream from an impacted section of the Kalamazoo River. The project will provide improved aquatic habitat, stream connectivity and water quality for common aquatic species found in the Kalamazoo River watershed. The CCCD will be coordinating the road stream crossing work with partners and will use the project as an example of how to use stream morphologic assessments and other aspects of modern culvert design to minimize impacts of road crossings on stream functions while ensuring long-term stability of the crossings.

Although there will be some negative short-term impacts to natural resources as a result of the construction activities, the Trustees have determined that the project's overall environmental impacts are positive. Permitting terms and conditions and other best management practices will ensure that there are minimal disturbances to the existing resources during project construction. The improved aquatic habitat and water quality will have long-term benefits for mussel, fish and wildlife species as well as the local members of the public that were injured by the Enbridge Line 6B Oil Discharges.

4.4.3 Rice Creek, Vansickle Berm Lowering

Project Description

The Vansickle berm lowering project will be located on the private property of a willing landowner adjacent to 22 ½ Mile Road along the bank and in the floodplain of Rice Creek in Marengo Township, Michigan (Figure 4.7). Rice Creek is a tributary to the Kalamazoo River that enters it in Marshall, Michigan, downstream of the dam for the Marshall Impoundment and upstream of the confluence of Talmadge Creek with the Kalamazoo River. This section of Rice Creek was dredged in the past and dredge spoils were mounded along the banks, creating long berms that disconnected the stream from its floodplain. Reconnecting the stream and floodplain allows flood flows to spread out into the floodplain. This reduces water volumes and pressures that could erode stream banks and the bed downstream and allows sediment transported during high flows to settle naturally in the floodplain. The floodplain also provides an area of lower flow rates during floods and can be used by fish and other organisms as a refuge from fast, turbulent flows in the main channel.

A previous project removed some of the berm of dredge material from the Vansickle property, but subsequent monitoring has shown that another 6" of berm should be removed to allow the stream to fully reconnect with the floodplain. Water quality in

this stream also affects water quality in the Kalamazoo River downstream. This project will remove an additional 6" of berm along 470' of Rice Creek.

Figure 4.7. Vansickle berm needs to be lower to allow spring high flows to distribute into the floodplain (Calhoun County Conservation District)



Restoration Objectives

This project is intended to provide compensatory restoration for the in-stream habitats and aquatic natural resources (like mussels and fish) that were injured as a result of the Enbridge Line 6B Oil Discharges by increasing the aquatic functions and values of this tributary to the Kalamazoo River. Rice Creek has a larger drainage area than Talmadge Creek and enters the Kalamazoo River just upstream of Talmadge Creek. Completion of the project will reduce the impacts from channelization, erosion, sedimentation, and nutrient loading in Rice Creek and downstream in the Kalamazoo River. The bermed area is upstream of high quality trout habitat that may also be enhanced by this project.

Probability of Success and Monitoring

This project will utilize the engineering work already completed for this site and will use established techniques for reconnecting the stream to its floodplain. The CCCD has already completed a Rosgen level III multi-year geomorphic assessment study to

evaluate sediment loads, bank erosion rates, and understand geomorphic conditions needed to restore connectivity of the stream and its wetlands on Rice Creek. The Trustees believe, therefore, that this project will have a high likelihood of success. The project management budget of $10,500 includes monitoring based on the existing pre-project geomorphic assessment to ensure that the appropriate hydrology has been established and that native vegetation becomes established where soils are disturbed by construction activities.

Environmental and Socio-Economic Impacts

No long-term adverse environmental or socio-economic impacts are expected from this project. It is expected that the restored floodplain will reduce flooding and other impacts of stream channelization, thus providing improved water quality and habitat for freshwater mussels, other benthic invertebrates, and fish. This will in turn provide benefits to aquatic-dependent migratory birds like green herons and mammals like muskrats, as well as provide increased opportunities for local residents that fish and observe wildlife. Minor short-term increases in turbidity would be expected to occur during the physical construction work. Turbidity will be minimized by the use of silt fences and other erosion control measures to control erosion until vegetation is re-established.

Cost

The Trustees will assist in implementing this project by providing $36,650 from the settlement with the RP to the CCCD. In return, the CCCD will assume responsibility for final design, permitting, and implementation of the project; for coordinating the work with the landowner; and for the evaluation of the project's success.

Evaluation

The Rice Creek restoration site was not directly impacted by the Enbridge Line 6B Oil Discharges, but is just upstream from an impacted section of the Kalamazoo River. The project will provide improved aquatic habitat and water quality for common aquatic species found in the Kalamazoo River watershed. The CCCD will coordinate this work with the landowner and will continue to use the project as an example of the benefits of reconnecting streams with their floodplains.

Although there will be some negative short-term impacts to natural resources as a result of the construction activities, the Trustees have determined that the project's overall environmental impacts are positive. Permitting terms and conditions and other best management practices will ensure that there are minimal disturbances to the existing resources during project construction. The improved aquatic habitat and water quality will have long-term benefits for mussel, fish, and wildlife species as well as local members of the public that were injured by the Enbridge Line 6B Oil Discharges.

4.5 Evaluation of Restoration Alternative 3: Lake (selected)

4.5.1 Fort Custer Lake Enhancements

Project Description

The project site consists of three inland lakes in Fort Custer Recreation Area (FCRA) in Kalamazoo County near Augusta, Michigan: Eagle Lake (200 acres), Whitford and Lawler Lake (72 acres) and Jackson Hole Lake (62 acres). These lakes support warmwater fish species. All three are accessible to the public from the shoreline and Eagle Lake and Whitford and Lawler Lake have boat access with no boat wakes allowed. The aquatic community and fishing and boating opportunities on these lakes are impaired by aquatic invasive species, primarily Eurasian watermilfoil. Starry stonewort, Carolina fanwort and other aquatic invasive plants may also be present. This project will consist of combining control of these invasive species with aquatic herbicide and enhancing populations of the native aquatic weevil *Euhrychiopsis lecontei* with a prevention program to deter the spread of invasive plants from these lakes to others in the area and the introduction of new invasive species into these three lakes. Eurasian watermilfoil is typically treated by applying selective herbicides (e.g. 2,4-D, triclopyr), enhancing populations of the native aquatic weevil *Euhrychiopsis lecontei* (Dietz) that acts as a biological control, or some combination of the two. For this project, the Trustees will work with MDNR Fisheries, MDEQ permitting staff, and resource managers at FCRA to design an aquatic invasive plant control program optimized specifically for these lakes. The prevention program will consist of educational signage and a boat washing facility.

Restoration Objectives

This project is intended to provide compensatory restoration for the impounded areas of the Kalamazoo River that were impacted by the Enbridge Line 6B Oil Discharges by restoring the aquatic functions and values in nearby lakes. The three lakes in FCRA are currently impaired by excessive populations of invasive aquatic vegetation which limits the growth of native aquatic vegetation and the population of warm water fish species in these lakes, as well as recreational use of the lakes. This project will actively control invasive species for three years over the 334 acres of these three lakes, and benefits will continue beyond that if a self-sustaining population of aquatic weevils is established and preventative measures provided by signage and boat cleaning stations are successful.

Probability of Success and Monitoring

Controlling invasive aquatic vegetation with herbicides using the technologies and design outlined here is an established process. The Trustees believe, therefore, that this project will have a high likelihood of success over the three years of active control anticipated with the funding provided. The degree of success in the years following herbicide application is less certain based on the variability in success observed for introductions of native aquatic weevils as biocontrols for Eurasian milfoil and for boater

education efforts. As part of the active control program, lake managers will monitor the success of the control efforts from previous years (e.g. percent cover of milfoil, presence of a population of aquatic weevils) when planning the treatment strategy for the upcoming year.

Environmental and Socio-Economic Impacts

No long-term adverse environmental or socio-economic impacts are expected from the lake improvement project in FCRA. The Trustees expect that this project will provide ecological benefits and improved recreational use of the lakes for swimming, boating, and fishing. The selection and application rates for herbicide use will be designed to maximize control of the invasive species and minimize harm to native vegetation, but some short-term harm to native aquatic plant species may occur. Also, the decay of the invasive plant species may cause some short-term reductions in dissolved oxygen in the water and odors on and near the lake.

Cost

The Trustees will provide $343,714 to MDNR for improvements at the three lakes in FCRA. They expect that this will provide active control of invasive aquatic plant species for at least three years, along with educational signage on invasive species and one or more boat cleaning stations or mobile boat cleaning equipment. If MDNR is able to partner with others or use some of this funding as match, additional benefits may be possible.

Evaluation

The three lakes in FCRA were not directly impacted by the Enbridge Line 6B Oil Discharges. However, the lakes are located in close proximity to Morrow Lake and the Ceresco Impoundment that have similar fisheries and recreational uses that were impacted by the Enbridge Line 6B Oil Discharges. In addition, these lakes are located in Kalamazoo County, whereas all of the recreational sites that Enbridge developed or enhanced are located in Calhoun County (see Table 1.2). Although there may be some negative short-term impacts to natural resources as a result of herbicide use, the Trustees have determined that the project's overall environmental impacts are positive. The herbicide application plan and permitting terms and conditions and other best management practices will ensure that these short-term impacts are minimized. Overall, this project will provide benefits to 334 acres of lake habitat for more than three years and thus address interim losses to similar habitats that occurred because of the Enbridge Line 6B Oil Discharges.

4.6 Evaluation of Restoration Alternative 4: Uplands (selected)

4.6.1 Fort Custer Oak Savanna Enhancement

Project Description

The project site consists of approximately 175 acres of existing oak savanna and adjoining woodland habitat within the Fort Custer Recreation Area (FCRA). This restoration project will enhance this area through the control of invasive woody plants using a combination of mechanical cutting followed by herbicide application to stumps and foliar spraying of smaller plants over three years.

Restoration Objectives

This project is intended to provide compensatory restoration for the upland habitats that were injured by the Enbridge Line 6B Oil Discharges and spill response actions by enhancing already existing oak savanna and adjoining woodland habitats that have suffered from a loss in quality because of the growth of invasive woody vegetation. The Trustees' analysis indicated that 130 acres of improved habitat over 10 years will provide sufficient compensation, but working on the 175 acre project site in FCRA is similarly cost-effective because of the scale at which the reintroduction of invasive species from adjacent parcels can occur. The objective is to enhance the ecological services provided by these specific habitats by 10% per year for the three years of active control activities with continuing benefits for seven additional years.

Probability of Success and Monitoring

The control of the woody invasive plant species present at FCRA is an established process. The Trustees believe therefore that this project will have a high likelihood of success. For monitoring, FCRA project managers will take photographs from multiple set points each year, inspecting contractor work for immediate success and any non-target damage, and assessing the success of previous treatments before starting additional treatments in subsequent years. They will do this by walking the site, noting whether woody vegetation is re-sprouting after specific treatments, and determining percent cover of different types of vegetation. They couldthen adjust their planned treatments accordingly.

Environmental and Socio-Economic Impacts

No long-term adverse environmental or socio-economic impacts are expected from these habitat enhancement activities. Impacts to non-target trees and shrubs will be minimized by applying herbicide to cut stumps and limiting foliar spraying to smaller plants. It is expected that controlling invasive plant species in this area will provide improved habitat for rare plants such as downy sunflower, false boneset, and lead plant. Wildlife species such as red-headed woodpecker should also benefit from the savanna enhancement, while forest-dwelling birds such as cerulean warbler and Eastern box turtles should benefit from invasive plant control in the oak woodlands.

Cost

The Trustees will fully fund this project, at $25,000 per year for three years, for a total amount of $75,000.

Evaluation

The oak savanna habitats at FCRA were not directly impacted by the Enbridge Line 6B Oil Discharges. However, the site is located in close proximity to the areas impacted by the Enbridge Line 6B Oil Discharges and spill response. In addition, the acreage of savanna habitat to be enhanced is similar in size and scope as the upland habitats impacted from the Enbridge Line 6B Oil Discharges.

4.7 Evaluation of Restoration Alternative 5: Turtles (selected)

4.7.1 Turtle Nest Protection Program

Project Description

The turtle nest protection program will be conducted at the Fort Custer Recreation Area (FCRA) in Kalamazoo County near Augusta, Michigan and on other properties along the Kalamazoo River between Marshall, MI, and Morrow Lake to which researchers are able to obtain access. This project will consist of capturing female turtles, using radio telemetry to track them until they dig nests and lay eggs, enclosing the nest to exclude predators, and returning to the nest to determine hatching success and release hatchlings. Because all turtles that were rehabilitated and released as part of oil spill response operations were marked with individual internal tags or shell notch patterns, researchers will be able to determine if female turtles that they capture and track were rehabilitated and be able to access details as to where and when they were captured and released and what their condition was when captured initially, cleaned, and treated for oiling. For this project, the Trustees will request detailed project proposals from qualified wildlife researchers who could combine a nest protection program with other efforts to maximize the information that could potentially be gained by examining turtle survival and reproductive success following these kind of discharges.

Restoration Objectives

This project is intended to provide benefits to turtle species that were impacted by the Enbridge Line 6B Oil Discharges by significantly improving reproductive success by eliminating predation for approximately 30 turtle clutches per year over two or possibly three years. In southern Michigan, predation, primarily by raccoons, skunks and foxes, has been shown to be responsible for the loss of 42 to 90% of Blanding's turtle nests (Congdon et al. 1983), 30 to 100% of snapping turtle nests (Congdon et al. 1987) and 22% of painted turtle nests (Tinkle et al., 1981). Human activity and landscape changes contribute to these predation losses by supporting larger populations of raccoons than would be present in less developed areas. In addition to direct nest protection, because some of the females captured are expected to be ones that were oiled, rehabilitated, and released, the observations on hatching success could provide information as to whether the rehabilitated turtles are able to reproduce successfully in the wild.

Probability of Success and Monitoring

Nest protection programs for turtles have been shown to be effective at significantly reducing nest predation and providing information for turtle conservation. A nest protection program has been made a part of the recovery plan for Blanding's turtles in Nova Scotia (Standing et al., 2000). These types of programs are less controversial than predator removal programs, and nest protection programs provide a direct measurement of their own success when hatchlings are counted and post-hatch nests excavated, as is detailed for this program.

Environmental and Socio-Economic Impacts

No adverse environmental or socio-economic impacts are expected from the turtle nest protection program. The only disturbances to the environment will be the presence of the observers and the temporary placement of fencing to exclude predators from the area in which turtles have dug their nests.

Cost

The Trustees will provide up to $300,000 to qualified wildlife researchers that submit a detailed study plan that both provides direct benefits to turtles as well as produces information that benefits turtle conservation over the longer term. Researchers will also be encouraged to work with local volunteers to educate them on turtle conservation techniques. The Trustees expect that this amount of funding will provide for two or possibly three years of direct nest protection and monitoring. This program may also provide the basis for a continuing volunteer effort to place exclosures in and monitor identified turtle nesting areas along the Kalamazoo River.

Evaluation

Overall, turtles were one of the species groups most impacted by the Enbridge Line 6B Oil Discharges, given that every turtle that surfaced to breathe during the early days of the discharges got oiled and some also appeared to have become oiled by coming into contact with submerged oil that persisted over the months and years following the initial Enbridge Line 6B Oil Discharges. Approximately 3,800 oiled turtles were captured and cleaned, and 99% of those survived to be released. This still resulted in the documented death of over 100 individual turtles, including those that were found dead and those that died during attempts to clean and rehabilitate them. The long term effects on turtles that were oiled, cleaned, and released are uncertain. While other restoration projects being performed by Enbridge will also benefit turtles by restoring their in-stream and riparian habitats, this project will provide additional benefits to turtles to offset the losses to this group of species that is particularly long-lived and has low reproductive rates.

4.8 Evaluation of Restoration Alternative 6: Tribal (selected)

4.8.1 Wild Rice Restoration

Project Description

A survey by Huron Potawatomi Staff identified several areas conducive to rice habitat restoration along the Kalamazoo River. Wild river rice (Mnomen) is a state threatened plant species and is a cultural keystone species to the Tribes, important as a subsistence food and as a way for today's members to maintain a connection to important traditional tribal activities related to the rice. The Tribes will collect Mnomen seeds from locations along the Kalamazoo River main stem and reintroduce them to areas that currently lack the species but show promise as acceptable habitat. Phase 1 will include genetic sampling of the seeds to ensure the desired species is targeted and will also identify the exact restoration site locations. Phase 2 will involve planting the rice and monitoring the locations for several years in order to evaluate the success of the project.

Environmental and Socio-Economic Impacts

No long-term adverse environmental or socio-economic impacts will be expected from this project. It is expected that the restored rice sites will provide improved habitat for native aquatic species. Minor short-term increases in turbidity would be expected to occur during the physical excavation and planting work. Turbidity impacts will be minimized by conducting excavation and planting work in accordance with all permit terms and conditions.

Cost

The Trustees will implement this project by providing $275,011 from the settlement with the Responsible Party. The estimated cost to fund this project over five years is $306,293, including one year of research and planning, three years of restoration implementation with monitoring and then a final year of monitoring. The Tribes anticipate being able to obtain matching funds to pay for the difference between the estimated budget and amount to be provided from the settlement. The Tribes will assume responsibility for final design, permitting, and implementation of the project and coordinate with Trustees to evaluate the success of the project.

Evaluation

Wild rice restoration sites identified by Huron Potawatomi Staff on the Kalamazoo River main stem were directly impacted by the Enbridge Line 6B Oil Discharges. This project will improve the habitat quality of the restoration sites and result in positive tribal service flows. The final design of the project will be developed to prevent unacceptable turbidity impacts during planting. The project plan will also include a long term monitoring plan.

Although there may be some negative short-term impacts to natural resources as a result of the construction activities, the Trustees have determined that the project's overall environmental impacts will be positive. Permitting terms and conditions and other best management practices will ensure that there will be minimal disturbances to the existing resources during project construction. The creation of a functioning wild rice habitat will have long-term benefits for a number of fish and wildlife species that were injured by the Enbridge Line 6B Oil Discharges.

4.8.2 Non-recreational Use Analysis and Restoration (selected)

Project Description

The focus of this project will be an analysis to help appropriately tailor approaches to restoration of lost services and the restoration of lost service flows to the Gun Lake Tribe and the NHBP. These federally-recognized Tribes for whom the Kalamazoo River is the core of their home territory were historically both known as the Bodewadmi. The River and River Corridor is integral to the life (uses) of these two Tribes, providing them with water travel, subsistence, medicinal, economic, educational, and ceremonial services, past, present and future. The two Tribes have used such resources and lived here for thousands of years. Natural resources are important to tribal members, both as discrete elements (i.e., specific types of natural resources), as well as for their contribution to the natural environment as a whole and, in turn, for their contribution to the identity and livelihood of tribal members. Tribal members may utilize natural resources in ways that are distinct from the general population.

This project will be undertaken using the framework outlined below in order to allow the Tribes to document ecological knowledge of the biological, water, geological, habitat, and other aspects of the River and River Corridor resource service flows, and their significance in travel, subsistence, medicinal, economic, educational, and ceremonial life, communication between generations, community building, passing on traditional knowledge, ties to native language and place names, as well as to fully understand the scope of the uses lost by their members and subsequently implement a program to improve and expand the available opportunities for traditional resource use along the river.

Bodewadmi Lost Services Analysis and Education Program Implementation:

- Develop a more detailed understanding of the ways in which both the release of oil and clean-up activities have impacted natural resources of importance to the Tribes.
- Review data on oiling and toxic effects to form a base of information for interviews, including streamlined analysis of available data on vegetation, habitat, and other resources.
- Collect existing documentary data from the two Tribes in the form of programmatic planning documents for projects truncated by the spill.

- Review recorded oral histories and other documents collected in the recent past (last 25 years) about both past River resource service flows to the Bodewadmi as well as anticipated and continued tribal use of the River and River Corridor.
- Conduct interviews with tribal staff resource specialists regarding tribally important resources and their uses and potential injuries due to the oil spill.
- Conduct small group or one-on-one interviews with tribal members, including elders practicing traditional ways, to determine how impacts to natural resources from the oil spill may have affected tribal members' current use, future use or perception of the impacted resources.
- Conduct a community survey focused on tribal use of the Kalamazoo River and Corridor to provide baseline information about service flows provided to the Tribes by natural resources prior to and following the spill.
- Based on the results of the research, interviews, and community survey, design and implement a tribal education program designed to help tribal members learn about stewarding the river and the traditional ways of using the resources found there.

Environmental and Socio-Economic Impacts

No long-term adverse environmental or socio-economic impacts would be expected from this project. It is expected that the information gathered through research, interviews, and the community survey will provide the basis for understanding historical and current traditional/cultural uses of the site and its resources, which is considered a positive social impact. Implementation of the education program addressing restoration projects and associated river activities will be expected to deliver a greater sense of stewardship of the river to tribal members, resulting in positive environmental and social impacts. Positive economic impacts will be expected during research and implementation as tribal members are hired to perform some of the necessary tasks.

Cost

The Trustees will implement this project by providing $270,000 from the settlement with the RP which is equal to the estimated cost to fund this project through research, community surveys, and implementation of the education program. The Tribes will assume responsibility for final design, planning, and implementation of the project and for the evaluation of the success of the project.

Evaluation

This project will improve the Tribes' knowledge base regarding their traditional uses of natural resources, as well as which of those uses have been curtailed because of impacts of the oil spill. There are no anticipated negative short-term or long-term impacts to natural resources as a result of this project. The Trustees have determined that the project's overall environmental impacts will be positive. The creation of an effective tribal education program is expected to have long-term benefits for the river environment,

including improved stewardship of fish, turtles, freshwater mussels, wildlife, and plant species that were injured by the Enbridge Line 6B Oil Discharges.

4.9 Non-Preferred Alternatives Discussion

4.9.1 Non-Preferred Riverine Alternatives

Kalamazoo River Battle Creek Concrete Channel Restoration

In the City of Battle Creek, the Kalamazoo River flows through a concrete channel for approximately 4,000'. Restoring a more natural river corridor here would provide a significant increase in benefits to aquatic and riparian natural resources in an area that would be accessible to the urban public. However, the Trustees believe that designing and implementing the replacement of the concrete channel with a more natural river corridor would be challenging in this location and would not be the most cost-effective way to improve in-stream and riparian habitat in the Kalamazoo River. A channel and corridor 150' wide and 4,000' long would produce direct benefits in approximately 14 acres, but the drop in elevation required over this distance may still result in velocities that impair fish passage without also creating meanders or significant pool and riffle structures. Costs for land acquisition and moving existing infrastructure to allow for a more natural riparian corridor would be significant, and implementation of the project would potentially alter flooding patterns in this urban location. Shoreline softening projects in less complex situations in Michigan have cost approximately $1,000 per foot of bank. In the Draft DARP/EA, the Trustees used this unit cost estimate and a project length of 4,800 feet to estimate that this project would cost significantly more than $9,600,000 (4,800' * 2 banks * $1,000/bank foot). Based on additional information provided by the Water Resources Commissioner of Calhoun County, the project length is estimated at 4,000 feet; the project will require a full hydrology study costing an estimated $100,000 to $300,000 as part of a feasibility planning process; and the project may require $30 million to $50 million for full restoration that would likely create meanders and/or riffles and pools and instream habitat for fish use and passage. Based on this review of potential costs, risks, and benefits, compared to other available projects, this project was not selected by the Trustees for this NRDA.

Merrill Park Streambank Restoration

This project would consist of repairing and restoring approximately 700 feet of shoreline adjacent to the Kalamazoo River at Comstock Township's Merrill Park. Currently, the shoreline consists of mowed turf grass down to the waterline. The project would have repaired existing erosion and then replanted the area with a native plant buffer. Anticipated benefits would have included habitat creation and improvements in water quality. As the project location was at a park, it would have also provided natural resource based recreational benefits just downstream of the affected area. The total cost to implement this project was estimated at $100,000. The benefits of this project, when

expressed as number of acres improved, were deemed to be less than those of the other riverine projects. In addition, the cost of this project was greater on a per acre basis. Therefore, this project was not selected.

4.9.2 Non-Preferred Lake Alternatives

Gull Lake Spawning Reef

This project would entail creating a spawning reef in Gull Lake in northern Kalamazoo County. The spawning reef would benefit primarily deepwater fish species and anglers that seek these species. Based on similar projects, the Trustees estimated that designing, creating, and monitoring the success of such a spawning reef would cost approximately $550,000. The fisheries benefits expected from this project would be less similar to those lost in the relatively shallow impounded areas of the Kalamazoo River than those that would be produced by enhancing fish habitat in the smaller lakes in FCRA. The smaller lakes in the FCRA are also closer to the Kalamazoo River and its anglers than Gull Lake is. In addition, recreational fishing in Gull Lake is accessible to the general public primarily through a boat ramp at the northern end of the lake that charges a fee. Fishing access at FCRA lakes is free to the public and includes angling opportunities from both boats and the shoreline.

4.9.3 Non-Preferred Upland Alternatives

The Trustees examined other restoration projects that could enhance functions and values to upland habitats to compensate for those lost from the Enbridge Line 6B Oil Discharges. The Trustees identified four non-preferred upland restoration projects, all located within the FCRA. Although these were all good projects, they were not chosen because their acreages and benefits did not match the impacted areas as well as the oak savanna habitat enhancement.

Fencerow removal

This project would entail the removal of fencerows between current agricultural fields that are in the process of being converted to native prairie. This project would have improved connectivity within about 200 acres of current and future prairie, benefiting grassland-dependent birds, such as Henslow's and grasshopper sparrows that prefer larger unfragmented blocks of grassland. It would also help achieve the FCRA's goal of restoring a significant block of the historic Coguaiak Prairie immediately east of the Kalamazoo River. The total cost to implement this project was estimated at $50,000.

Invasive plant control in recently-planted prairie

This project would entail the control of invasive plants within 147 acres of a recently-planted prairie in a mile-long corridor parallel to and east of the Kalamazoo River. This project would have benefited grassland-dependent birds, such as Henslow's and grasshopper sparrows, that historically nested in close proximity to the restored

prairie. It would also help protect the plant diversity within the prairie by allowing native forbs to flourish instead of being outcompeted by invasive species. The total cost to implement this project was estimated at $45,000.

Enhancement of diversity in planted prairies

This project would consist of the collection of native, local genotype seed of a diverse array of prairie forbs (including rare species) from within the FCRA and immediate vicinity. Forbs would have been propagated to increase the number of plants that can successfully establish from a limited quantity of available seed. Finally, these forbs would have been installed into field propagation plots (to serve as a continual source for additional seed) and/or directly into recently-planted prairie to enhance the diversity of the prairie. Expected benefits from this project would have included improvements to plant diversity within the prairie by increasing the number of species and quantity of native forbs. It was estimated that up to 400 acres could be enhanced with these species over time. The cost to collect, propagate, and install the forbs was estimated at $20,000.

Prairie edge expansion and invasive plant control

This project would consist of the clearing or selective removal of invasive plants such as black locust in targeted areas around the perimeter of existing planted prairies. This would partially reconnect the Kalamazoo River floodplain to the recently-planted prairie. It was anticipated that removing the most problematic source populations of invasive plants would improve the ability to manage and maintain prairie habitats at FCRA into the future. Approximately 50 acres would have been directly restored or enhanced, which would improve the ability to manage the existing 147 acres of planted prairie. The total cost to implement this project was estimated at $70,000.

4.9.4 Non-Preferred Projects to Specifically Benefit Migratory Birds and Aquatic Mammals

The Trustees considered proposing projects that would specifically benefit migratory birds and aquatic mammals based on an assessment of mortality and lost future generations resulting from the spill. Such projects might include habitat enhancements, providing artificial nesting structures, or planting favored food plants. Because the migratory birds and aquatic mammals known to have been impacted by the spill were nearly all relatively common species in the area (e.g. mallard, Canada goose, muskrat), they will benefit from on-site restoration and compensatory wetland restoration described in Table 1.2, above as well as from the additional compensatory restoration projects referred to in Sections 4.4, 4.5 and 4.8, above. No special types of restoration are required for these species. Losses of migratory birds and aquatic mammals were thus considered in the Trustees' estimates of losses in the HEAs and the Trustees did not do a separate additional analysis for these losses because the restoration to offset them would have overlapped with other required restoration.

4.10 Summary of Selected Restoration Alternatives and Costs

The Trustees have selected compensatory restoration projects which they believe will enhance the natural recovery of resources injured by the Enbridge Line 6B Oil Discharges, and/or will provide additional resource services to compensate the public for interim losses pending response and remedial actions, restoration required by the State Settlement and natural recovery. Additional NEPA analysis of the potential impacts of the selected alternatives to be implemented by Trustees is provided in Chapter 5. The Trustees believe that the suite of selected projects and the projects from the State Settlement described in Table 1.2 will adequately address the injuries and interim service losses resulting from the Enbridge Line 6B Oil Discharges. In addition to the costs of implementing the selected restoration projects, the Trustees are also recovering the costs associated with restoration monitoring and past assessment costs not previously reimbursed by Enbridge (Table 4.1).

Table 4.1[7]

Summary of the Selected Restoration Projects to be Implemented by Trustees and Associated Costs for Trustee Activities

Resource/Service	Selected Restoration Project	Cost to be Funded from NRDA Settlement with RP
Riverine Habitats	Pigeon Creek, E Drive Crossing Replacement	$153,800
Riverine Habitats	Rice Creek, 29 Mile Road Crossing Replacement	$249,000
Riverine Habitats	Rice Creek, Vansickle Berm Lowering	$36,650
Lake Habitats	Fort Custer Lake Enhancements	$343,713
Upland Habitats	Fort Custer Oak Savanna Restoration	$75,000
Turtles	Turtle Nest Protection Program	$300,000
Non-recreational Use by Tribal Members	Wild Rice Restoration	$275,011
Non-recreational Use by Tribal Members	Non-Recreation Use Analysis and Restoration	$270,000
Total Estimated Cost of NRDA Settlement Restoration Projects		**$1,703,174**
Reimbursement of Trustee Past Costs[8]		$1,634,952
Trustee Future Costs [9]		$561,874
Total NRDA Payment by RP to Trustees		**$3,900,000**

[7] This table is set forth in Chapter 1 as Table 1.3; it is repeated here for the convenience of the reader.

[8] Trustee past assessment costs listed here do not include partial reimbursements that Enbridge previously made to USFWS and the full reimbursement made to the State.

[9] Trustee future costs include federal and tribal assessment costs incurred after dates that past costs were calculated for each Trustee and estimated costs for project planning, oversight and monitoring, as well as review and consultation on restoration actions being directed by the State under the State Settlement. If the Trustees determine that additional monitoring is not necessary at some point, then the Trustees could instead use the funds for additional restoration.

5.0 ENVIRONMENTAL IMPACT OF UNDERTAKING THE SELECTED RESTORATION ALTERNATIVE – DETERMINATIONS UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT

This section addresses the potential overall impacts and other factors to be considered under the National Environmental Policy Act (NEPA) regulations (42 U.S.C. § 4321; 40 C.F.R. Parts 1500-1508). Some of the specific potential impacts were listed within each project description above in Chapter 4, but this Chapter 5 addresses the impacts and factors systematically by category under NEPA. NEPA requires that the environmental impacts of a proposed federal action be considered before implementation. Generally, when it is uncertain whether an action would have a significant impact, federal agencies would begin the NEPA planning process by preparing an environmental assessment (EA). Federal agencies may then review public comments prior to making a final determination. Depending on whether an impact is considered significant, an environmental impact statement (EIS) or a Finding of No Significant Impact (FONSI) would be issued.

In undertaking their NEPA analysis, the Trustees evaluated the potential significance of proposed actions, considering both context and intensity. For the actions considered in this Final DARP/EA, the appropriate context for considering potential significance of the action is at the local or regional level, as opposed to national, or worldwide. This Final DARP/EA, in its entirety, is intended to accomplish NEPA compliance by summarizing the current environmental setting of the selected restoration, describing the purpose and need for restoration action, identifying alternative actions, assessing the selected actions' environmental consequences, and summarizing public participation in the decision process. This chapter focuses specifically on the Trustees' consideration of ten factors required in NEPA regulations (40 C.F.R. 1508.27) in determining significance of a proposed action before it can be selected:

1. Likely impacts of the proposed project.
2. Likely effects of the project on public health and safety.
3. Unique characteristics of the geographic area in which the project is to be implemented.
4. Controversial aspects of the project or its likely effects on the human environment.
5. Degree to which possible effects of implementing the project are highly uncertain or involve unknown risks.
6. Effect of the project on future actions that may significantly affect the human environment.
7. Possible significance of cumulative impacts from implementing this and other similar projects.
8. Effects of the project on National Historic Places, or likely impacts to significant cultural, scientific, or historic resources.
9. Degree to which the project may adversely affect endangered or threatened species or their critical habitat.
10. Likely violations of environmental protection laws.

After considering NEPA requirements, the Trustees believe that the selected projects described in this Final DARP/EA will not cause significant negative impacts to the environment, or to natural resources or the services they provide. None of the selected projects to be implemented by the Trustees is controversial, has highly uncertain impacts or risks or is likely to violate any environmental protection laws. Further, the Trustees do not believe the selected projects will adversely affect the quality of the human environment or pose any significant adverse environmental impacts. Instead, habitat restoration will benefit aquatic species by restoring natural habitat functions. Likewise, the selected restoration actions will provide positive benefits for human recreational use and non-recreational use by tribal members. As no new information was made available during the public review process that affected the evaluations made in the Draft DARP/EA, the Trustees made a Finding of No Significant Impact for the suite of selected projects described in Sections 4.4 – 4.8. A summary of the Trustees' analysis is located below.

5.1 Direct/Indirect Impacts Considered by Trustees

Overall, the selected restoration alternatives included in this Final DARP/EA will enhance the functionality of the ecosystem by improving aquatic connectivity and water quality, restoring native species, and providing protection for turtle reproduction. There could be some short-term and localized negative impacts, though not significant, from the selected restoration projects, as described below.

5.1.1 Construction, Sound and Air Pollution

Machinery and equipment used during construction and other restoration activities could generate sound that could temporarily negatively disturb wildlife and humans near the construction activity. Also, as discussed in more detail in the previous sections, there could be short-term negative impacts on fish and wildlife species as a result of construction activities. In accordance with State and Federal permit conditions, in-water work will be timed and conducted in a manner to minimize impacts to fish and other aquatic life. Impacts on mobile species (e.g., birds, mammals) are expected to be minor, consisting of short-term displacement. Overall, the construction of the aquatic habitat projects as part of the selected alternatives will provide long-term benefits to fish and wildlife species dependent on these types of habitat.

5.1.2 Federally Threatened, Endangered, and Candidate Species

According to informal consultation under the Endangered Species Act (16 U.S.C. 1531 et seq.) with the USFWS, the counties in which these selected projects will occur, Calhoun and Kalamazoo, support the following Federally-listed species: Indiana bat (endangered), northern long-eared bat (threatened), Eastern massasauga rattlesnake (candidate), Northern copperbelly watersnake (threatened), and Mitchell's satyr butterfly (endangered). The projects described in the Selected Alternatives are not likely to adversely affect these species based on the following analysis and provisions:

- For Indiana bat and northern long-eared bat, all aquatic habitat restoration work will be conducted from existing access roads, so no potential maternity roost trees will be felled. These species of bats may benefit from improvements in riparian corridor habitats and increased prey availability once restorations are completed. The upland oak savanna restoration project will include removal of early successional shrubs and small trees that would not be suitable maternity roost trees. Nonetheless, this project area will be surveyed for potential roost trees and any found will either not be cut as part of the project or will be cut during the winter when bats are not present. For Eastern massasauga rattlesnake and Northern copperbelly water snake, the restoration work along Pigeon and Rice Creeks and the wild rice restoration projects might occur within suitable habitats, but only the Van Sickle berm lowering project will be conducted with heavy equipment operating in potential habitat rather than from existing roads or manually, with workers and volunteers. The Trustees will work with the CCCD to ensure that the area of the berm lowering is surveyed for snakes prior to construction and workers and volunteers on all projects understand the value of any snakes found during the project and report any sightings to the Service. The snake species may benefit from improvements in riparian corridor habitats and increased habitat and prey availability once restorations are completed.
- Mitchell's satyr butterflies are dependent on fen habitats. Because the restoration projects do not include such areas of suitable habitat, these projects will not affect this species.

Completion of endangered and threatened species coordination with state programs will occur as part of the project-specific planning processes, including applications for permits under state regulatory processes for implementing the selected restoration alternatives.

No Essential Fish Habitats as described in 50 C.F.R. 600 have been designated in Michigan.

5.1.3 Water and Sediment Quality

There could be temporary and localized adverse impacts as a result of increases in erosion, turbidity and sedimentation related to construction activities associated with certain restoration projects. However, the use of best management practices along with other avoidance and mitigation measures required by the regulatory agencies will be employed to minimize any adverse water quality and sedimentation impacts. For example, silt fences or coffer dams will be used whenever it is determined that restoration work might increase erosion and turbidity. The selection and application rates for herbicide use for invasive species control will be designed to maximize control of the invasive species and minimize harm to native vegetation, but some short-term harm to native aquatic plant species may occur. Also, the decay of the invasive plant species may cause some short-term reductions in dissolved oxygen in the water and odors on and near the lake.

5.1.4 Visual

There may be temporary and localized adverse visual impacts during implementation of the preferred restoration projects associated with construction activities. Once the projects are completed, however, users of these areas are expected to perceive the project areas as having improved aesthetics.

5.1.5 Public Access/Recreation

Public access could be temporarily restricted during proposed construction activities, but since the selected projects are not located in heavily used recreation areas, any adverse effects will be minimal. In addition, implementation time for these projects will be relatively short and any negative impact on recreational activities will be slight and temporary. Restoration will likely not restrict future development.

5.1.6 Archaeological and Cultural Resources

Because the selected projects occur in a river or stream, do not newly disturb soils, or occur in existing road right-of-ways, the Trustees do not believe that there are any known archaeological sites or sites of cultural significance present. The Trustees will work with project managers during the permitting process to ensure that they consult with the State Office of Archeology and Historical Preservation (SHPO) to confirm that there are no known sites within the project area. If sites are discovered, the Trustees will work with the project manager to redesign projects so as to minimize or not adversely affect any known archaeological sites or sites of cultural significance, or a similar project in a different location in the watershed will be substituted. The wild rice restoration project is expected to provide additional cultural uses of the area by tribal members.

5.1.7 Other (e.g., economic, historical, land use, transportation)

No significant adverse effects are anticipated to soil, geologic conditions, energy consumption, wetlands, or floodplains. The selected restoration projects will have no adverse social or economic impacts on local neighborhoods or communities. The Trustees expect that all of these projects will provide ecological benefits and some will also improve recreational use for swimming, boating, fishing, hunting, and wildlife observation, in addition to increasing gathering of plants and other cultural uses by tribal members. The improved road stream crossings are expected to improve local transportation and locally decrease long-term road maintenance costs.

5.2 Cumulative Impacts

Cumulative environmental impacts are those combined effects on the quality of the human environment that result from the incremental impact of the alternative when added to other past, present, and reasonably foreseeable future actions (40 C.F.R. 1508.7, 1508.25(a) and 1508.25(c)). As the selected projects are intended to achieve recovery of injured natural resources, the cumulative environmental consequences will be largely

beneficial for birds and wildlife habitat. All the anticipated adverse impacts will be short-term and localized, will occur during project construction, and will be minimized by using mitigation described in the Final DARP/EA. Any unanticipated negative cumulative adverse effect identified prior to project implementation will result in reconsideration of the project by the Trustees.

Overall, selected projects will result in a long-term net improvement in fish and wildlife habitat, the restoration of ecological balance in areas where human-caused disturbances have led to adverse impacts on sensitive native species, and improvement in the human use and non-use services provided by fish and wildlife in the region. The culvert removal and berm lowering projects on Pigeon and Rice Creek are far enough apart from each other that no cumulative effects of disturbance or turbidity during construction are expected. Local effects will be minimized by silt fencing and other erosion control techniques. The other projects are different enough in kind and location that no cumulative adverse effects are anticipated. The permit process required for this and similar work in streams, rivers, floodplains, and wetlands will also ensure that these projects are reviewed in the context of any similar projects that might be implemented in the area, including those by county conservation districts, drain or road commissioners, Michigan Department of Transportation, developers, or others.

Any active habitat restoration or land transactions will be conducted with willing landowners and will not displace or negatively affect any underserved, minority, or low-income populations. The overall quality of life for the surrounding communities will improve somewhat with these restoration alternatives, through increased economic and recreational opportunities, especially through improved opportunities for fishing and wildlife viewing in creek, river and lake settings in Calhoun and Kalamazoo Counties. The cumulative impact of these projects on tribal members is expected to be positive with an increase in wild rice and other natural resources as well as in knowledge and opportunities for using and enjoying these resources.

5.3 NEPA Comparison of All Restoration Alternatives Considered by Trustees

To assist with review of this document, Table 5.1 (below) is provided to outline a comparison of the direct, indirect and cumulative impacts anticipated for each of the restoration alternatives considered by the Trustees, including both the no-action alternative and the suite of selected project alternatives that would be implemented by the Trustees.

Table 5.1. Summary of Direct, Indirect and Cumulative Impacts

Alternative	Direct / Indirect Impacts	Cumulative Impacts
No Action	No immediate change in status quo, resulting in few, if any, direct and indirect impacts.	Because no work is proposed under the "no-action" alternative, the cumulative benefit would be limited.
Pigeon Creek, E Drive Crossing	Direct/Indirect impacts could include some increase in turbidity	Cumulative benefit to water quality for all aquatic

Replacement	and sedimentation, due to removal of culvert, though best management practices to control this will be put in place. Heavy machinery used for this project could cause minor impact to site use, noise and disruption. The site will be closed for public use during culvert replacement, assuring safety to passersby. Once completed, will reduce upstream flooding and costs to maintain this road crossing.	organisms in Pigeon Creek. Will allow fish to move up and downstream and reduce genetic isolation for fish and the mussels that depend on fish to serve as a host for their early lifestage as glochidia temporarily attached to fish gills. Project is too far from other projects for turbidity, noise, or disturbance across projects to be cumulative. Project will provide additional resiliency to erosion from extreme weather events that may become more frequent with climate change.
Rice Creek, 29 Mile Road Crossing Replacement	Direct/Indirect impacts could include some increase in turbidity and sedimentation, due to removal of culvert, though best management practices to control this will be put in place. Heavy machinery used for this project could cause minor impact to site use, noise and disruption. The site will be closed for public use during culvert replacement, assuring safety to passersby. Once completed, will reduce upstream flooding.	Cumulative benefit to water quality for all aquatic organisms in Rice Creek along with other habitat improvement projects recently completed and planned along it. Will allow fish to move up and downstream and reduce genetic isolation for fish and the mussels that depend on fish to serve as a host for their early lifestage as glochidia temporarily attached to fish gills. Project is too far from other projects for turbidity, noise, or disturbance across projects to be cumulative. Project will provide additional resiliency to erosion from extreme weather events that may become more frequent with climate change.
Rice Creek, Vansickle Berm Lowering	Minor short-term increases in turbidity will be expected to occur during the physical construction work, though best management practices to control this will be put in place. Turbidity will be minimized by the use of silt fences	No long-term adverse environmental or socio-economic impacts are expected from this project. It is expected that the restored floodplain will reduce flooding and other impacts of

	and other erosion control measures to control erosion until vegetation is re-established. The site is on private property, so no disruptions to public use are expected.	stream channelization, thus providing improved water quality and habitat for freshwater mussels, other benthic invertebrates and fish. Project is too far from other projects for turbidity, noise, or disturbance across projects to be cumulative. Project will provide additional resiliency to erosion from extreme weather events that may become more frequent with climate change.
Fort Custer Lake Enhancements	Some short-term harm to native aquatic plant species may occur, but the selection and application rates for herbicide use will be designed to maximize control of the invasive species and minimize harm to native vegetation. The decay of the invasive plants may cause some short-term reductions in dissolved oxygen in the water and odors on and near the lake.	Combined with other efforts by the MDNR, this project will provide ecological benefits and improved recreational use of the lakes for swimming, boating, and fishing.
Fort Custer Oak Savanna Enhancement	Some short-term disturbance will occur during tree and shrub removal. Impacts to non-target trees and shrubs will be minimized by applying herbicide to cut stumps and limiting foliar spraying to smaller plants.	Improvements in this 175 acre parcel will provide benefits to the larger landscape that is being managed for a diversity of habitat types, including oak savanna, woodlands and hardwood forest. Cumulatively, this provides habitat for birds like red-headed woodpeckers and cerulean warblers whose populations have been declining.
Turtle Nest Protection Program	The only disturbances to the environment will be the presence of the observers and the temporary placement of fencing to exclude predators from the area in which turtles have dug their nests.	Nest protection programs for turtles have been shown to be effective at significantly reducing nest predation and providing information for turtle conservation that can be applied elsewhere.
Wild Rice	Minor short-term increases in	The restored rice sites will

Restoration	turbidity will be expected to occur during the physical excavation and planting work. Turbidity impacts will be minimized by conducting excavation and planting work in accordance with all permit terms and conditions.	provide improved habitat for native aquatic species and result in cultural uses for tribal members. Project is too far from other projects for turbidity, noise, or disturbance across projects to be cumulative.
Non-recreational Use Analysis and Restoration	Positive economic impacts will be expected during research and implementation as tribal members are hired to perform some of the necessary tasks.	It is expected that the information gathered will provide the basis for understanding traditional, cultural uses of the site and its resources, which is considered a positive social impact. Implementation of the education program will be expected to deliver a greater sense of stewardship of the river to tribal members, resulting in positive environmental and social impacts.

6.0 PREPARERS, AGENCIES, AND PERSONS CONSULTED

6.1 Preparers

Lisa L. Williams, U.S. Fish and Wildlife Service, East Lansing, MI
Stephanie D. Millsap, U.S. Fish and Wildlife Service, East Lansing, MI

6.2 Agencies and Persons Consulted

Federal Agencies
U.S. Fish and Wildlife Service, East Lansing, MI
National Oceanic and Atmospheric Administration, Ann Arbor, MI
U.S. Geological Survey, Columbia, MO
U.S. Environmental Protection Agency, Traverse City, MI and Grosse Ile, MI
U.S. Coast Guard, National Pollution Fund Center, Arlington, VA

State Agencies
Michigan Department of Environmental Quality
Michigan Department of Natural Resources
Michigan Department of Attorney General

Local Agencies
Calhoun County Conservation District
Kalamazoo River Watershed Council
Kalamazoo Nature Center

Tribes
Nottawaseppi Huron Band of the Potawatomi Tribe
Match-E-Be-Nash-She-Wish Band of the Pottawatomi Indians

7.0 COMPLIANCE WITH OTHER AUTHORITIES

The following federal, state, and local laws, regulations, and policies may affect completion of the restoration projects. All project sponsors that receive natural resource damage funding will be responsible for obtaining necessary permits and complying with relevant local, state, and federal laws, policies, and ordinances.

7.1 Laws

7.1.1 Federal Laws

National Environmental Policy Act (NEPA; 42 U.S.C. § 4321 *et seq.*)

Preparation of an Environmental Assessment signifies partial compliance with NEPA. Full compliance shall be noted at the time of Finding of No Significant Impact or Record of Decision is issued. The Trustees have integrated this Damage Assessment and Restoration Plan with the NEPA process to comply, in part, with those requirements. This integrated process allows the Trustees to meet the public involvement requirements of OPA and NEPA concurrently. This Final DARP/EA accomplishes compliance by summarizing the current environmental setting, describing the purpose and need for the restoration actions, identifying alternative actions, assessing the selected actions' environmental consequences, and summarizing opportunities for public participation in the decision process.

Federal Water Pollution Control Act, 33 U.S.C. § 1251 *et seq*. (also known as the Clean Water Act or CWA)

The CWA is intended to protect surface water quality, and regulates discharges of pollutants into waters of the United States. All selected projects will comply with CWA requirements, including obtaining any necessary permits for proposed restoration actions. Restoration projects that move material in or out of waterways and wetlands, or result in alterations to a stream channel, typically require CWA Section 404 permits. Dam removal actions also require 404 permits. Project sponsors will be required to obtain the appropriate permits before restoration work begins.

As part of the Section 404 permitting process, consultation under the Fish and Wildlife Coordination Act, 16 U.S.C. § 661 *et seq*. generally occurs. This act requires that federal agencies consult with the USFWS, the National Marine Fisheries Service (NMFS), and state wildlife agencies to minimize the adverse impacts of stream modifications on fish and wildlife habitat and resources. Consultation with NMFS is not applicable to this DARP for an inland watershed in Michigan.

Compliance with the Rivers and Harbors Act, 33 U.S.C. § 401 *et seq*., generally occurs as part of the Section 404 permitting process. The Rivers and Harbors Act prohibits unauthorized obstruction or alteration of navigable waters. Any required permits under

the Rivers and Harbors Act are generally included with the Section 404 permitting process.

Clean Air Act (CAA) of 1970, as amended, 42 U.S.C. § 7401 *et seq*.

The CAA regulates air emissions from stationary and mobile sources to protect human health and the environment. Any activities associated with the restoration projects that result in air emissions (such as construction projects) will be in compliance with the CAA and any local air quality ordinances.

Federal Endangered Species Act (ESA) of 1973, as amended, 16 U.S.C. §§ 1531 *et seq*.

The federal ESA was designed to protect species that are threatened with extinction. It provides for the conservation of ecosystems upon which these species depend and provides a program for identification and conservation of these species. Federal agencies are required to ensure that any actions are not likely to jeopardize the continued existence of a threatened or endangered species. Federally listed endangered, threatened, and candidate species in the counties in which these selected projects will occur, Calhoun and Kalamazoo, are listed in Section 4.10 along with a discussion of how the selected projects might affect them. Coordination with the USFWS will be completed pursuant to Section 7 of the ESA. Consultation is also incorporated into the CWA Section 404 and 401 permitting process noted above.

Fish and Wildlife Conservation Act, 16 U.S.C. § 2901 *et seq*.

The Fish and Wildlife Conservation Act authorizes financial and technical assistance to state governments to develop, revise, and implement conservation plans and programs for nongame fish and wildlife. The Trustees will seek to coordinate their restoration efforts with relevant conservation plans and programs in the State of Michigan.

Fish and Wildlife Coordination Act, 16 U.S.C. § 661 *et seq*.

The Fish and Wildlife Coordination Act authorizes the involvement of the USFWS in evaluating impacts to fish and wildlife from proposed water resource development projects. Federal agencies that construct, license, or permit water resource development projects are required to consult with the USFWS, and in some instances with NMFS, concerning the impacts of a project on fish and wildlife resources and potential measures to mitigate these impacts. The Trustees will engage in coordination if relevant to any of their projects.

Information Quality Act of 2001 (guidelines issued pursuant to Public Law 106-554)

As the lead federal natural resources Trustee for this document, USFWS confirms that this information product meets its Information Quality Act guidelines, which are consistent with those of the DOI and the Office of Management and Budget.

Magnuson-Stevens Act Fishery Conservation and Management Act, as amended, 16 U.S.C. 1801 et seq.

Coordination with the National Marine Fisheries Service and preparation of an Essential Fish Habitat (EFH) Assessment signifies compliance with the EFH provisions of the Magnuson-Stevens Act. This consultation does not apply to this Final DARP for an inland watershed in Michigan.

Marine Mammal Protection Act, 16 U.S.C. 1361-1326, 1371-1384 note, 1386-1389, 1401-1407, 1411-1418, 1421-1421h.

Activities associated with these projects will not have an adverse effect on marine mammals. This consultation does not apply to this Final DARP for an inland watershed in Michigan.

Migratory Bird Treaty Act of 1918, as amended, 16 U.S.C. §§ 703–712

The Migratory Bird Treaty Act protects all migratory birds and their eggs, nests, and feathers and prohibits the taking, killing, or possession of migratory birds. The selected restoration actions will not result in the taking, killing, or possession of any migratory birds.

Migratory Bird Conservation Act, 16 U.S.C. § 715 *et seq*.

The Migratory Bird Conservation Act established a commission and conservation fund to promote the conservation of migratory waterfowl and offset or prevent serious loss of important wetlands and other waterfowl habitat. The Migratory Bird Conservation Fund could potentially provide a source of additional funding to expand on Trustee efforts to conserve or restore migratory waterfowl habitat.

National Historic Preservation Act (NHPA) of 1966, as amended, 16 U.S.C. §§ 470 *et seq*.

NHPA is intended to preserve historical and archaeological sites. Compliance with the NHPA will be undertaken through consultation with the Michigan State Historic Preservation Office. If an eligible historic property is within the area of the selected restoration project, then an analysis will be made to determine whether the project will have an adverse effect on this historic property. If the project will have an adverse effect on historic properties, then the agency proposing the restoration project will consult with the State Historic Preservation Office to minimize the adverse effect.

Occupational Safety and Health Act (OSHA) of 1970, as amended, 29 U.S.C. §§ 651 *et seq*.

OSHA governs the health and safety of employees from exposure to recognized hazards, such as exposure to toxic chemicals, excessive noise, mechanical dangers, and unsanitary conditions. All work conducted on the selected restoration actions will comply with OSHA requirements.

Oil Pollution Act of 1990 (OPA), 33 U.S.C. 2701-2706, et. seq., 15 C.F.R. Part 990

OPA establishes a liability regime for oil spills that injure or are likely to injure natural resources and/or the services that those resources provide to the ecosystem or humans. OPA provides a framework for conducting sound natural resource damage assessments that achieve restoration. The process emphasizes both public involvement and participation by the Responsible Parties. The Trustees have conducted this assessment in accordance with OPA regulations.

Watershed Protection and Flood Prevention Act as amended, 16 U.S.C. 1001 et seq.

Floodplain impacts were considered prior to project selection and are expected to be positive. As required for permits, final project design plans will be submitted to state and federal regulators (e.g. NREPA Parts 301 and 303, below).

7.1.2 State Laws

The Natural Resources and Environmental Protection Act (NREPA), 1994, Public Act 451, as amended

Michigan's environmental protection and natural resource management authorities have been codified in NREPA. Several parts of NREPA will be applicable to restoration work undertaken by the Trustees. The most significant parts are described below. Permits, where required, are administered by the MDEQ, and permit application and review requirements will be consolidated whenever possible. All restoration actions undertaken by the Trustees will comply with relevant provisions of this Act and applicable rules promulgated under the Act.

Part 31, Water Resources Protection, requires that a permit be obtained prior to any alteration or occupation of the streambed, channel, or floodplain of a river, stream, or drain. Part 31 also governs discharges to waters of the State, including wetlands and groundwater and provides for the recovery of natural resource damages attributable to discharges that are injurious to designated uses of waters of the State.

Part 55, Air Pollution Control, provides authority to the MDEQ to engage in a variety of activities to protect air quality, including the regulation of fugitive dust sources and emissions, in accordance with the provisions of M.C.L. 324.5524.

Part 91, Soil Erosion and Sedimentation Control, requires that a permit be obtained to protect against the loss of soil to surface waters including wetlands. A permit is generally required for any Earth change that disturbs one or more acres or is within 500 feet of a lake or stream. Counties have the primary responsibility for issuing permits. In some cases, cities, villages, and townships have assumed permitting responsibility within their jurisdictions. Permit applications can be obtained from the respective county or municipal agencies.

Part 115, Solid Waste Management, regulates companies and businesses that dispose of solid waste. The solid waste program performs inspection, evaluation, permitting, and

licensing of solid waste disposal areas in the state, including evaluation of groundwater monitoring data and corrective actions associated with releases from solid waste landfills.

Part 201, Environmental Remediation, provides legislative authority for Michigan's cleanup program for hazardous waste sites. The purpose of this authority is "to provide for appropriate response activity to eliminate unacceptable risks to public health, safety, or welfare, or to the environment from environmental contamination at facilities within the state" (M.C.L. 324.20102). The authority also includes "additional administrative and judicial remedies to supplement existing statutory and common law remedies" (M.C.L. 324.20102), including making claims against liable parties for "the full value of injury to, destruction of, or loss of natural resources, including the reasonable costs of assessing the injury, destruction, or loss resulting from the release" (M.C.L. 324.20126a).

Part 301, Inland Lakes and Streams, requires a permit for certain construction activities on inland lakes and streams. The Inland Lakes and Streams Program is responsible for the protection of the natural resources and public trust waters of the inland lakes and streams of the state. The program oversees the following activities: dredging, filling, constructing, or placing a structure on bottomlands; constructing or operating a marina; interfering with the natural flow of water; and connecting a ditch or canal to an inland lake or stream. Several selected projects may require permits under Part 301, but the final design plans for the projects will be developed so as to meet permit requirements.

Part 303, Wetlands Protection, requires that a person obtain a permit to perform certain activities in a wetland (Table 7.1).

Table 7.1. Examples of Types of Activities that Require a Wetlands Protection Permit

Activity	Example (partial list only)
Deposit or permit the placing of fill material	Bulldozing, grading, dumping
Dredge, remove, or permit the removal of soil or minerals	Removing tree stumps, bulldozing, digging a pond
Construct, operate, or maintain any use or development	Constructing buildings, structures, boardwalks; mining peat, treating water
Drain surface water	Diverting water to another area via ditch, pump, or drain

The programs in MDEQ that administer these parts have the objective of protecting human health and the environment in Michigan.

A joint state and federal permit process has been established between the MDEQ and the U.S. Army Corps of Engineers for projects in wetland areas that have both state and federal jurisdiction. None of the selected projects are expected to require state or federal wetland permits, but this will be reviewed again during the development of the final design plans for the projects and permit requirements will be met wherever applicable.

Part 365, Endangered Species Protection, requires that people not take or harm any endangered or threatened fish, plants or wildlife. MDNR is responsible for issuing

permits and enforcement relative to the take of endangered and threatened species. Project reviews are performed by the Michigan State University Extension Service, Michigan Natural Features Inventory (MNFI). This review will be completed as part of the project-specific planning processes and projects will be modified as necessary to avoid adverse effects on state listed species.

Michigan Occupational Safety and Health Act, 1975, Public Act 154

The Michigan OSHA (Public Act 154 of 1974) is an act to prescribe and regulate working conditions, and places and conditions of employment to provide for occupational health and safety. The Departments of Labor and Public Health are responsible for implementing the provisions of this act. All activities conducted under this DARP/EA will comply with provisions of this act.

7.1.3 Local Laws

As appropriate, restoration actions will consider and comply with local plans and ordinances. Relevant local plans could include shoreline and growth management plans. Relevant ordinances could include, but not be limited to, zoning, construction, noise, and wetlands.

7.2 Policies and Directives

7.2.1 Federal Policies and Directives

The following federal policies and Presidential Executive Orders may be relevant to the selected restoration projects in the proposed alternative:

USFWS Mitigation Policy (Fish and Wildlife Service Manual, 501 FW 2)

> This policy of the USFWS seeks to ensure "no net loss" of fish and wildlife habitat as a result of USFWS actions. The Trustees do not anticipate that any of the selected projects will result in adverse impacts to habitat.

Executive Order 11514 – Protection and Enhancement of Environmental Quality, as Amended by Executive Order 11911 Relating to Protection and Enhancement of Environmental Quality

> These Executive Orders require federal agencies to monitor, evaluate, and control their activities to protect and enhance the quality of the Nation's environment. These Executive Orders also require agencies to inform the public about these activities and to share data on environmental problems or control methods, as well as to cooperate with other governmental agencies. The actions described in this RP/EA address the intent of these Executive Orders.

Executive Order 11593 - Protection and Enhancement of the Cultural Environment

Coordination with the State Historic Officer will signify compliance. Consultation is incorporated into the CWA Section 404 and 401 permitting process.

Executive Order 11988, 24 May 1977 amended by Executive Order 12148, 20 July 1979 – Floodplain Management

This Executive Order directs federal agencies to avoid the occupancy, modification, and development of floodplains, when there is a practical alternative. For all projects, the Trustees will work to ensure that any floodplain impacts are minimized. Public notice of the availability of this report or public review fulfills the requirements of Executive Order 11988, Section 2(a) (2). Consultation is incorporated into the CWA Section 404 and 401 permitting process.

Executive Order 11990 – Protection of Wetlands

This Executive Order instructs federal agencies to avoid adverse impacts associated with destruction or modification of wetlands. The Trustees will work to ensure that projects minimize any wetlands impacts. Public notice of the availability of this report for public review fulfills the requirements of Executive Order 11990, Section 2 (b). Consultation is incorporated into Sec. 404 and 401 permitting process.

Executive Order 12898 – Environmental Justice

This Executive Order instructs federal agencies to assess whether minority or low-income populations will be disproportionately impacted by agency actions. The selected projects are not expected to adversely affect the environment or human health for any environmental justice populations in the vicinity of the selected projects.

Executive Order 12962 – Aquatic Systems and Recreational Fisheries

This Executive Order requires that federal agencies, where practicable and permitted by law, work cooperatively to improve the quantity, function, sustainable productivity, and distribution of aquatic resources for increased recreational fishing opportunities. The Trustee agencies worked cooperatively to identify potential projects that will benefit aquatic resources and recreational fishing opportunities, in compliance with the intent of this Executive Order.

Executive Order 13007 - Accommodation of Sacred Sites

This Executive Order is not applicable unless on Federal lands, then agencies must accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, and avoid adversely affecting the physical integrity of such sacred sites.

Executive Order 13045 - Protection of Children from Environmental Health Risks and Safety Risks

The selected projects in this Final DARP will not create a disproportionate environmental health or safety risk for children.

Executive Order 13112 – Invasive Species

This Executive Order requires that federal agencies, where practicable and permitted by law, should identify any actions that may affect the status of invasive species and take actions to address the problem within their authorities and budgets. Agencies also are required not to authorize, fund, or carry out actions that they believe are likely to cause or promote the introduction or spread of invasive species, unless a determination is made that the benefits of actions outweigh potential harms and measures are taken to minimize harm. None of the selected restoration projects will promote the introduction or spread of invasive species and several will reduce invasive species.

Executive Order 13186 – Protection of Migratory Birds

This Executive Order requires federal agencies to evaluate the effects of their actions on migratory birds, to take actions to avoid or minimize the impacts of their actions on migratory birds, and to help promote conservation of migratory birds if actions are likely to have a measurable negative effect on migratory bird populations. None of the projects selected are expected to have a negative effect on migratory bird populations.

Executive Memorandum on the Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing NEPA (11 August, 1980)

Not applicable since the selected projects do not involve or impact agricultural lands.

DOI Departmental Manual, Parts 517 and 609 – Pesticides and Weed Control

Implementation of any of the projects described in this RP/EA will be consistent with DOI policy to use integrated pest management strategies for control of insect and weed pests. Pesticides or herbicides will only be used after a full consideration of other control alternatives; the material selected and method of application will be the least hazardous of available options.

DOI Departmental Manual, Part 518 – Waste Management

If implementation of any alternatives generates waste, the Trustees will comply with all relevant DOI directives and policies.

DOI Departmental Manual, Part 602 – Land Acquisition, Exchange, and Disposal

If the federal government acquires any real property through implementation of these restoration projects, appropriate pre-acquisition standards – particularly the American Society for Testing and Materials standard for Environmental Site Assessments for Commercial Real Estate – will be complied with. No land acquisition is anticipated.

7.2.2 State and Local Policies

Selected restoration projects will consider and comply with other relevant state and local policies and directives.

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9.0 ADMINISTRATIVE RECORD

The Administrative Record for this document consists of the references cited above (Chapter 8) along with the Administrative Record for the Enbridge Line 6B NRDA case as a whole that is described in Section 1.3.5 and available at http://www.fws.gov/midwest/es/ec/nrda/MichiganEnbridge/adminrecord.html.