UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
PROGRAM PLANNING AND INTEGRATION
Silver Spring, Maryland 20910

NOV 10 2009

To All Interested Government Agencies and Public Groups:

Under the National Environmental Policy Act (NEPA), an environmental review has been performed on the following action.

TITLE: Environmental Assessment for the Muskegon Lake Area of Concern Habitat Restoration Project

LOCATION: Muskegon, Michigan

SUMMARY: The purpose of this project is to restore fish and wildlife habitat and degraded benthos Beneficial Use Impairments (BUIs) in the Muskegon Lake Great Lakes Area of Concern (AOC). This proposed project will be funded through the American Recovery and Reinvestment Act and NOAA's Great Lakes Habitat Restoration Program.

RESPONSIBLE OFFICIAL: Patricia A. Montanio
Director, Office of Habitat Conservation
National Oceanic and Atmospheric Administration
1315 East-West Highway
Silver Spring, MD 20910

The environmental review process led us to conclude that this action will not have a significant effect on the human environment. Therefore, an environmental impact statement will not be prepared. A copy of the finding of no significant impact (FONSI) including the supporting environmental assessment (EA) is enclosed for your information.

Although NOAA is not soliciting comments on this completed EA/FONSI we will consider any comments submitted that would assist us in preparing future NEPA documents. Please submit any written comments to the responsible official named above.

Sincerely,

Paul N. Doremus, Ph.D.
NOAA NEPA Coordinator

Enclosure

Environmental Assessment for the Muskegon Lake Area of Concern Habitat Restoration Project

Prepared by:
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of Habitat Conservation
October 2009

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The Project is designed to address restoration targets established for several beneficial use impairments (BUIs) associated with Muskegon Lake, including the Loss of Fish and Wildlife Habitat, Degraded Fish and Wildlife Populations, Degraded Benthos, and Degraded Aesthetics. The primary goal of this Project is to restore and to protect fisheries and wildlife habitat through the restoration of natural resources and native vegetation to the shoreline and restoring emergent and open-water wetlands.

In addition to improving existing ecological resources, the proposed Project will enhance social and economic benefits for the surrounding communities. As part of its overall goals, the Project is intended to help improve public access; create and retain jobs through promoting tourism and recreation; increase property values; and achieve long-term socioeconomic benefits related to improved habitat for fish and wildlife populations in Muskegon Lake, the Muskegon River, and Lake Michigan.

The Project consists of restoration actions at twelve Sites along the southern and eastern shoreline of Muskegon Lake and along the South Branch of the Muskegon River.

The Proposed Action consists of four initial activities. These activities include the following:

a) Softening of approximately 15,962 feet of hardened shoreline;

b) Restoring 16.1 acres of emergent wetlands and adjacent upland areas;

c) Restoring 18.7 acres of open water wetland; and

d) Removing or improving 33.6 acres of unnatural lake fill.

The Project responds specifically to restoration goals established for the Muskegon Lake AOC and, when implemented, will achieve approximately 40 percent of the restoration actions needed to meet those goals.

An alternative to the Proposed Action includes a No Action alternative. Under the No Action Alternative, the Project will not be constructed, and no shoreline restoration or benthic monitoring will occur. As a result, the shoreline and lake littoral zone within the Project area will continue in its current degraded state. Of the two alternatives analyzed, the Proposed Action is found to best meet the purpose and need for action.

As part of this analysis, the environmental impacts of each alternative were addressed. The following table provides a summary of these impacts for both alternatives:

Resource Area	**Impacts**	
	Proposed Action	**No Action Alternative**
Geology and Soils	- Will reduce potential exposure hazards posed by contaminated material through the removal of impacted soils and sediments and the placement of clean surface soils - Will not create permeable channels in native soils - May result in minor off-site soil erosion and sedimentation of nearby surface water which will be controlled	- No impact; however, will result in continued exposure hazards, potential erosion and sedimentation, disturbance/re-suspension of contaminated soils, and leaching of toxic materials
Land Use and Recreation	- Will not interfere with proposed development and will allow for more consistency with improvement plans for the shoreline and natural habitat -Will result in temporary minor increases in noise, dust, and traffic, along with a disruption of views	- No impact; however, will not promote sustainable development as outlined in existing plans
Water Quality and Resources	- Will filter pollutants and excess nutrients from storm water runoff - Will reduce potential erosion of impacted material and re-suspension of sediments into Muskegon Lake - Will reduce potential leaching of contaminants to groundwater and surface water	- No impact; however, will result in continued impairment
Wetlands and Floodplains	- Will result in re-establishment of near-shore ecotone, open water wetland, and emergent wetland - Will result in increased flood water storage capacity	- No impact; however, will result in no improvement to wetland habitat or floodplain storage

Resource Area	Impacts	
	Proposed Action	**No Action Alternative**
Aquatic Biology	-Will provide for more natural sediment horizons to form through fluvial processes to benefit rooting process and stability of plants - Will partially reduce the potential for future uptake of contamination into the food web - Will physically remove some portion of the benthic populations in areas where fill is removed - Will increase juvenile survivorship in species that are only dependent on vegetation as nursery habitat -May negatively affect water quality over the short term through increased turbidity and re-suspension of potentially contaminated sediments	- No impact; however, impaired benthos and fish habitat will continue and will not make progress toward delisting of Muskegon Lake as an AOC
Terrestrial Wildlife	- Will result in temporary disturbance activities and habitat alterations at the potential restoration Sites - Will provide for permanently improved near shore wildlife habitat	- No impact; however, will not result in improvement to the current wildlife habitat
Vegetation	- Will provide more suitable growing mediums for native plants - Will create new habitat for wetland plants - Will temporarily disturb growing substrate utilized by plants due to removal of rip-rap and fill - Will lead to direct mortality of individual plants, possibly including trees	- No impact; however, will not result in improvements to the current plant habitat
Cultural and Historic	- Not expected to impact known existing archaeological sites - May impact unknown resources not yet identified through ground disturbing activities - May temporarily alter physical views either from or to historic properties	- No impact
Visual Quality and Aesthetics	- Will alter the physical landscape - Will create a temporary, direct interruption to everyday operations and visual appeal from construction equipment and associated activities - Will help to eliminate urban blight areas - Will provide an overall visual improvement to the shoreline area	- No impact; however, will not result in improvements to the visual quality and aesthetics of the shoreline
Transportation	- Will result in nominal increases in the use of the Lakeshore Trail and roads along the southern shoreline of Muskegon Lake - May result in minor, temporary closures of roadways, lanes, and non-motorized trails	- No impact
Air Quality	- Will result in minor, temporary increased emissions from construction vehicles and fugitive dust - No long term impacts	- No impact
Noise	- Will generate temporarily increased noise levels from equipment during construction	- No impact

Resource Area	Impacts	
	Proposed Action	**No Action Alternative**
Human Health and Safety	- Will reduce the potential direct contact hazard posed by contaminated soils in the areas where removal and/or placement of clean cover soil is performed - Will remove public safety hazards posed by submerged debris, concrete debris, and degrading seawalls - Will, to a limited extent, reduce impacts to fish populations and persons consuming fish from the lake	- No impact; however, will not result in improvements to human health and safety
Socioeconomic and Environmental Justice	- Will create 125 temporary construction jobs - Will result in long-term economic benefits from enhanced tourism, recreation, and property values - Will not adversely impact low-income and minority populations	- No impact
Cumulative Impacts	- Will primarily result in reduction of BUIs	- No additional impact

Conclusions

The significance of the Proposed Action is analyzed based on the NAO 216-6 criteria and Council on Environmental Quality's (CEQ's) context and intensity criteria. The Proposed Action is not reasonably expected to cause significant adverse impact to the Muskegon Lake shoreline and habitat with regard to the various resource areas evaluated as part of this assessment.

The Proposed Action is expected to contribute to the delisting of the Muskegon Lake AOC. The primary goal of the Project is to restore and to protect fisheries and wildlife habitat through the restoration of aquatic natural resources and native vegetation to the shoreline and by restoring emergent and open-water wetlands.

As shown by the information and analysis presented in the Environmental Assessment prepared for the Muskegon AOC Habitat Restoration Project, the fish and wildlife restoration activities will not significantly impact the quality of the human and natural environment. All beneficial and adverse impacts of the Proposed Action have been addressed to reach the conclusion of no significant impacts. Therefore, preparation of an environmental impact statement (EIS) for this action is not necessary.

FINDING OF NO SIGNIFICANT IMPACT FOR THE MUSKEGON LAKE AREA OF CONCERN HABITAT RESTORATION PROJECT

In compliance with the National Environmental Policy Act (NEPA), a Finding of No Significant Impact (FONSI) has been prepared for the Muskegon Lake Area of Concern Habitat Restoration Project (Project). The NOAA's proposed action is funding of the Project (NOAA Award # NA09NMF4630294) in the amount of $10,000,000.

National Oceanic and Atmospheric Administration Administrative Order 216-6 (May 20, 1999) contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality regulations at 40 C.F.R. 1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." Each criterion listed below is relevant to making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ's context and intensity criteria. These criteria are discussed below.

1) Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in FMPs?

The proposed action is not reasonably expected to cause substantial damage to the Muskegon Lake habitat or coastal habitat in the area. The proposed action is expected to result in restoration of wetland and aquatic habitats and in beneficial impacts for fish habitats. As part of the Project, the habitat will be modified through removal of industrial debris, bioengineering of the shoreline, removal of invasive plants, and seeding with native plant mixes. Removal of contaminated fill and soil will reduce potential leaching of contaminants, improving the quality of groundwater and surface water.

2) Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?

The proposed action is expected to have beneficial impact on biodiversity and ecosystem function in the area. Restoration activities such as bioengineering of the shoreline, placement of clean top soil, removal of invasive plants, and seeding with native plant mixes will restore wetland quantity and quality and improve wetland functions. Functional improvements will include increased pollution and erosion control, greater floodplain capacity, and improved fish and wildlife habitat. Restored habitat will promote native plant growth and will be able to support greater diversity and abundance of plants, while the abundance of invasive plants will be reduced. The more favorable habitat is expected to support greater diversity of waterfowl, migrant birds, and small mammals.

Local fish species will benefit from improved spawning and feeding habitats resulting from removal of slab wood and other industrial debris and expansion of aquatic plant habitats. Increased survivorship and greater abundance could be observed for such species as northern pike, largemouth bass, most of the sunfishes, spotted gar, pirate perch, and central mudminnow. In addition, beneficial effects on benthic species are expected as the current trends of re-establishment of pollution intolerant species in the lake and development of a more natural species composition will continue and possibly accelerate as a result of the Project. The potential exists for some negative fishery-related effects as well. Increased fish abundance could create greater competition for resources, potentially resulting in smaller adult fish, as detailed in Section 3.5 of the Environmental Assessment (EA). However, the overall effects to fish species will be substantially beneficial.

The proposed action will also have beneficial effects on surface water and groundwater quality. Softening and bioengineering of shoreline, emergent wetland restoration, and proposed runoff seepage basins will contribute to improvements in local water quality as pollutants and excess nutrients from storm water will be filtered before discharging into Muskegon Lake. Removal of impacted fill and soil will also reduce potential leaching of contaminants to groundwater and surface water.

3) Can the proposed action reasonably be expected to have a substantial adverse impact on public health or safety?

The proposed action will have no significant adverse effect on public health or safety. The proposed action will have no significant adverse effect on air quality. During restoration activities, the proposed action will generate vehicle air emissions, fugitive dust, and possibly other air pollutants. However, air impacts will be minor, relatively localized, and temporary in nature. Implementation of the proposed action will include measures to control potential human health hazards that could result from direct contact with contaminated material, inhalation of impacted particulates/dust, and spreading of contaminated material during construction. Excavated soils and sediments will be tested and contaminated material will be properly disposed of at a licensed landfill.

Beneficial impacts will result from removal of potential safety hazards currently posed to recreational users of Muskegon Lake from contaminated soils, submerged debris, concrete debris, and dilapidated seawalls. Removal of contaminated sediments will also reduce health impacts to fish populations and persons consuming fish from the lake.

4) Can the proposed action reasonably be expected to adversely affect endangered or threatened species, their critical habitat, marine mammals, or other non-target species?

The proposed action will not have adverse effects on aquatic or terrestrial species and their habitat but rather will result in beneficial effects on aquatic and terrestrial wildlife and vegetation. Lake sturgeon is the only aquatic state-threatened species

found in Muskegon Lake. Two state special concern species, pugnose shiner and spotted gar are found in the Muskegon Lake watershed, although it is unclear whether they occur in Muskegon Lake itself. Overall improvements in the aquatic habitat will benefit these three species, potentially leading to increased numbers in Muskegon Lake. Any adverse effects to these species from the Project will be temporary.

Short-term adverse effects of the Project on aquatic habitat can occur as a result of artificial fill removal. Restoration activities will disturb the existing sediments and aquatic plants and may negatively affect water quality through increased turbidity and re-suspension of potentially contaminated sediments. However, these impacts will be minor and temporary in nature, and turbidity curtains will be used at the Sites to contain disturbed sediments to the immediate project areas. Over time, a more natural sediment profile will be able to become re-established, promoting aquatic plant expansion and growth. Local fish species will benefit from improved spawning and feeding habitats, resulting in increased survivorship and greater abundance.

No threatened or endangered terrestrial wildlife or vegetation species have been identified in the Project area, although listed species have been identified in Muskegon County, as detailed in Sections 3.6 and 3.7 of the EA. Habitat improvements will likely benefit any species present and can encourage future habitat use. Restored Sites will provide improved wildlife habitat and will create corridors that allow for greater movement of wildlife between formerly isolated patches. Temporary disturbances to wildlife will occur from the construction activities, including increased noise levels and increased human presence in the Project area. However, affected individuals will likely habituate to the temporary conditions or will limit their use of the habitat while restoration activities are ongoing, utilizing other available habitats in the area. Restoration activities will cause temporary negative effects to the local vegetation. Minor adverse effects will be reduced by limiting the extent of disturbed areas, storing equipment and materials on previously disturbed areas, and prompt seeding of disturbed areas immediately after earth change activities are completed. Habitat improvements will likely benefit any species present, the great majority of which require habitat protection and are vulnerable to filling and other disturbance activities.

5) Are significant social or economic impacts interrelated with natural or physical environmental effects?

The proposed action will have a beneficial effect on the socioeconomics of the communities in the Project area. Improvements in the natural conditions of Muskegon Lake will promote local tourism and outdoor recreational opportunities as they relate to activities such as fishing, hunting and wildlife watching. Increases in recreational users will benefit local businesses and will have a positive effect in indirect job creation and new business opportunities related to the increased outdoor recreational opportunities. In addition, restoration activities will create a more desirable, natural shoreline that will add direct value to the local shoreline properties. As a result, the shoreline improvements will lead to an increase in the number of businesses and residents desiring to relocate there. The Project will

have no disproportionate adverse environmental or human health effects on the minority populations residing in the City of Muskegon or Muskegon County.

6) Are the effects on the quality of the human environment likely to be highly controversial?

The proposed action will not result in highly controversial effects on the quality of the human environment. Restoration activities will affect the human environment through temporarily increased noise levels and visual impacts from the presence and movement of construction personnel and construction equipment, and from stockpiling of excavated materials. These impacts will last only for the duration of Project construction activities and are not expected to be controversial.

The proposed action will temporarily generate elevated noise levels from earth moving machinery such as excavators and haul trucks. Typical noise from construction equipment will range from 70 to 95 decibels (dBA). To minimize the impact of noise, construction related activities will be limited to weekdays and daytime hours between 7:00 AM and 6:00 PM, as required by the City of Muskegon's noise ordinance.

Once the Project is complete, the landscape will be permanently altered through the removal of existing fill materials and creation of more natural physical characteristics of the shoreline and associated vegetation. These results will be considered an improvement in the quality of environment as compared to the existing conditions.

7) Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers, essential fish habitat, or ecologically critical areas?

The proposed action will have no significant adverse effect to unique areas. Although there are historic resources present in or near the Project area, the disturbance of vegetation and the presence of workers, equipment, and materials will be expected to cause only temporary adverse impact to the historic sites.

Unique natural areas such as wetlands and Ruddiman Creek outlet will improve in quality as a result of contaminated sediments removal and native plant seeding. The sensitive remnants of Pigeon Hill dune habitat will experience only indirect effects of construction activities, such as increased noise levels in the vicinity of the dune, and will not be adversely affected.

The proposed action will have no significant adverse effect on geology in the Project area. Effects to soils will be beneficial. The Project will result in removal of soils, sediments, and other waste material from the proposed restoration areas. The removal of fill soil will not disturb critical native geologic features such as the subsurface clay layers that protect underlying aquifers.

As part of the permitting process, a Soil Erosion and Sedimentation Control Plan will be implemented to prevent off-site soil erosion and sedimentation of surface water. Project plans include protective measures such as sediment curtains, erosion control blankets, wattles, geo web and vegetative seeding and plantings. Permits acquired from the USACE and MDEQ will also contain protective conditions.

8) Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

The proposed action does not include highly uncertain effects on the human environment or unique or unknown risks. Restoration activities will be performed using conventional, proven methods and techniques. The Project is expected to result only in temporary, minor, and predictable impacts such as increased traffic, increased noise levels, dust generation, and alterations in visual landscape.

9) Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

The proposed action is related to the overall effort to restore and remove beneficial use impairments from the Muskegon Lake Area of Concern and to remove the lake from the list of Great Lakes AOCs. Cumulative impacts undertaken as part of the delisting effort are expected to have beneficial effects on the Muskegon Lake environment. The proposed action is not related to other actions that would result in cumulatively significant adverse impacts.

10) Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources?

The proposed action is not likely to have adverse effects on districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places nor is it expected to cause loss or destruction of significant scientific, cultural, or historical resources.

Based on a review of the Michigan State Historic Preservation Office (SHPO) records, an archaeological site related to the former Pigeon Hill Dune appears to be in close proximity to Project Site A, while the other known archaeological sites are located outside of and away from the Project and its associated work areas. Restoration activities at Site A will only directly affect the hardened water's edge and will not affect the Pigeon Hill Dune. The Project will require ground disturbing activities that may potentially impact resources that have not yet been identified. There is potential to locate new archaeological or historic resource as a result. In the event that any archaeological sites, human remains, funerary items, or associated artifacts are discovered during restoration and removal of fill, activities will cease immediately and the SHPO and if necessary, interested federally recognized tribes will be notified. Additional measures may be needed if unanticipated archeological resources are located within the other Project sites.

A consultation with the (SHPO) was initiated on September 22, 2009 to concur that the proposed action will have no detrimental effects on historic properties or cultural resources. The SHPO issued a no adverse effect letter on October 16, 2009 for the proposed action, stating that no historic properties that are listed or eligible for listing would be affected.

11) Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species?

The proposed action is not expected to result in introduction or spread of non-native species. Nonindigenous plant species currently present in the area include the common reed, narrow leaf cattail, Japanese knotweed, tartarian honeysuckle, purple loosestrife, and glossy buckthorn. Aquatic species include zebra mussels and quagga mussels. Restoration activities at some of the sites are directly targeted at removal of non-native species and re-vegetation with native plants. To further prevent spread of non-native plants, adverse effects will be controlled by limiting the extent of disturbed areas as practicable, storing equipment and materials on previously disturbed areas, and prompt seeding of disturbed areas immediately after earth change activities are completed.

12) Is the proposed action likely to establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration?

The proposed action is not expected to establish a precedent for future actions or represent a decision in principle about a future consideration. Restoration activities performed as part of this proposed action follow well established guidelines and draw from past restoration activities.

The proposed action will have beneficial effects on land use in the Project area. The Project will not interfere with any proposed development in the county, as future land use categorization will not be affected. On the contrary, the proposed action will assist in the redevelopment of former industrial areas for uses that are more consistent with current plans for improving the shoreline area and restoring natural vegetation and habitat. It will also assist the city and county with infill development by creating improvements to existing areas rather than acquiring additional land for new construction.

13) Can the proposed action reasonably be expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment?

The proposed action is not expected to threaten a violation of Federal, State, or local laws or requirements imposed for the protection of the environment. The proposed action will result in improved environmental protection of Muskegon Lake and its shoreline.

14) Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

The proposed action is not expected to result in cumulative adverse effects on the species found within the Project area. It is expected that cumulative effects from the restoration activities will be beneficial.

DETERMINATION

In view of the information presented in this document and the analysis contained in the supporting Environmental Assessment prepared for the Muskegon Area of Concern Habitat Restoration Project, it is hereby determined that the fish and wildlife restoration activities will not significantly impact the quality of the human environment as described above and in the Environmental Assessment. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an EIS for this action is not necessary.

_____ _____

Patricia A. Montanio Date
Director, Office of Habitat Conservation

1.0 INTRODUCTION

National Oceanic and Atmospheric Administration (NOAA) Fisheries Community Restoration Program (CRP) proposes to release funding to the Great Lakes Commission (GLC) and the West Michigan Shoreline Regional Development Commission (WMSRDC) under the American Recovery and Reinvestment Act of 2009 (ARRA) to conduct restoration activities intended to implement a comprehensive fish and wildlife habitat restoration project in the Muskegon Lake Area of Concern (AOC) (hereafter referred to as the "Project").

The Muskegon Lake Watershed Partnership (MLWP) is recognized by the State of Michigan and the United States Environmental Protection Agency (USEPA) as the local Public Advisory Council (PAC) for the Muskegon Lake AOC. The MLWP works in partnership with the agencies to establish targets to restore and remove beneficial use impairments (BUI) from the Muskegon Lake AOC, and to remove the AOC from the list of Great Lakes AOCs.

The Project is designed to address restoration targets established for several BUIs associated with Muskegon Lake, including the Loss of Fish and Wildlife Habitat, Degraded Fish and Wildlife Populations, Degraded Benthos, and Degraded Aesthetics. The Project consists of restoration actions at twelve Sites along the southern and eastern shoreline of Muskegon Lake and along the South Branch of the Muskegon River, and related benthos monitoring and sampling.

1.1 BACKGROUND

Due to filling, development, and pollution, Great Lakes wetlands are listed by the U.S. Fish and Wildlife Service (USFWS) as "Imperiled Ecosystems." Lake Muskegon is part of this overall system. In 1987, this lake was designated as a Great Lakes AOC (WMSRDC, 2009).

Since the late nineteenth century, sawmill, industrial, and commercial demolition material has filled 798 acres of shallow water and wetlands in Muskegon Lake. As a result, approximately 74 percent of the southern shoreline has been hardened with broken concrete, foundry slag, sheet metal, slab wood, sawdust, and other materials. The consequences of these activities include the loss, isolation, and fragmentation of shallow water and wetland habitats and their protective buffer zones. Fish, benthic, and wildlife populations also have been degraded and lakeshore aesthetics have been impaired as a result of these past activities (WMSRDC, 2009).

As part of the Great Lakes Water Quality Agreement, fourteen BUIs were identified within the Great Lakes AOCs. Nine BUIs were identified for the Muskegon Lake AOC. The *Muskegon Lake, Ruddiman Creek, and Nearby Shoreline Ecological Restoration Plan* includes a description of these nine BUIs:

- Restrictions on human consumption of fish and wildlife
- Loss of fish and wildlife habitat
- Degradation of fish and wildlife populations
- Degradation of benthos (bottom dwelling organisms)
- Restrictions on dredging
- Degradation of aesthetics
- Beach closings (health advisories)
- Eutrophication or undesirable algae
- Restrictions on drinking water consumption (groundwater) (USEPA, 2008).

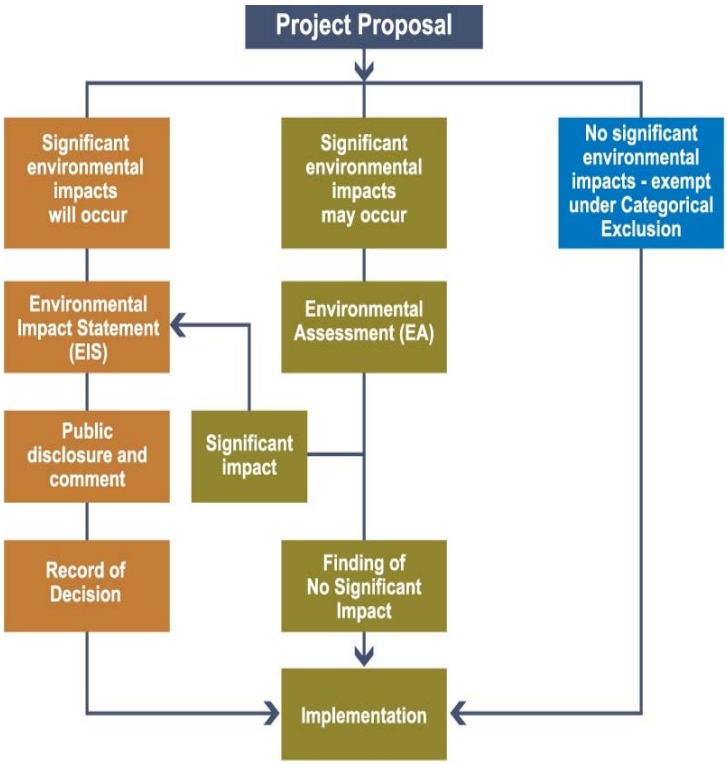
In 2002, the Great Lakes Legacy Act (GLLA) was signed into law to provide funding for remediation of contaminated sediment in AOCs. The USEPA coordinates the implementation of the Legacy Act through the Great Lakes National Program Office (GLNPO).

The proposed Project seeks to address several BUIs identified for the Muskegon Lake AOC, including the Loss of Fish and Wildlife Habitat, Degraded Fish and Wildlife Populations, Degraded Benthos, and Degraded Aesthetics. The Project provides for improvements at multiple Sites along the Muskegon Lake south shoreline within stream tributaries and the Muskegon River mouth.

1.2 NATIONAL ENVIRONMENTAL POLICY ACT

Major actions that have the potential to affect the human environment and that involve federal funding, require a permit, or other authorization from a federal agency, are subject to the requirements of the *National Environmental Policy Act of 1969* (NEPA; 42 USC § 4321 et seq.). The proposed Project is subject to the requirements of NEPA since NOAA is funding the Project under a cooperative agreement with the GLC, and the Project requires federal permits pursuant to Section 404 of the Federal Clean Water Act, among others.

While each NEPA project is unique, there are three primary paths for NEPA compliance depending on the degree of the project's environmental impact, as depicted in the figure below.



Each federal agency has its own implementing regulations for NEPA. NOAA Administrative Order (NAO) 216-6 *Environmental Review Procedures for Implementing the National Environmental Policy Act* describes NOAA's policies, requirements, and procedures for complying with NEPA, including the determination of significance which defines the requirements for NEPA compliance (i.e., when categorical exclusions, environmental assessments (EA), and environmental impact statements (EIS) are appropriate, as depicted in the above figure). An Environmental Assessment is normally required to evaluate whether a proposed project will have significant environmental impacts.

This Environmental Assessment has been prepared in accordance with the Council on Environmental Quality regulations (40 CFR Parts 1500-1508) and NAO 216-6, which describes NOAA policies, requirements, and procedures for implementing NEPA.

1.3 PROPOSED ACTION

The Project consists of restoration actions at twelve Sites along the southern and eastern shoreline of Muskegon Lake and along the South Branch of the Muskegon River, as well as related benthic sampling and monitoring. The

action to meet the purpose and need for BUI improvements consists of the following initial activities:

a) Softening of approximately 15,962 feet of hardened shoreline;

b) Restoring 16.1 acres of emergent wetlands and adjacent upland areas;

c) Restoring 18.7 acres of open water wetland; and

d) Removing or improving 33.6 acres of unnatural lake fill.

The twelve Sites were selected as priority locations for the restoration of fish and wildlife habitat in conjunction with the MLWP and landowner commitment (WMSRDC, 2009).

1.4 PURPOSE AND NEED FOR PROPOSED ACTION

The purpose and need of the Muskegon Lake AOC Habitat Restoration Project is to restore fish and wildlife habitat and degraded benthos in portions of the Muskegon Lake AOC. Through restoration of multiple sites along the Muskegon Lake south shoreline and within stream tributaries and the Muskegon River mouth, coupled with scientific monitoring, the Project will lead to substantial progress toward delisting the Loss of Fish and Wildlife Habitat, Degraded Fish and Wildlife Populations, Degraded Benthos, and Degraded Aesthetics BUIs. The Sites and required actions to achieve BUI delisting are described in the *Muskegon Lake Area of Concern Fish and Wildlife Habitat Restoration and Beneficial Use Impairment Removal Strategy* (December 2008). This document was funded by USEPA-Great Lakes National Program Office and prepared by the MLWP, the public advisory council for the Muskegon Lake AOC, in partnership with USEPA and the Michigan Department of Environmental Quality (MDEQ). Several public meetings were held during the development and review of the document. In addition, USEPA supported development of a Ruddiman Creek and Nearby Shoreline Ecological Restoration Master Plan, which was also the focus of public meetings. Both plans were reviewed and approved by USEPA, MDEQ and MLWP. The Muskegon Lake restoration targets comply with guidance prepared by both USEPA and MDEQ on development of delisting targets for AOCs. They also are consistent with regional, state, and watershed-specific plans for fish and wildlife restoration established by the Michigan Department of Natural Resources (MDNR) and the USFWS.

The Project responds specifically to restoration goals established for the Muskegon Lake AOC and, when implemented, will achieve approximately 40 percent of the restoration actions needed to meet those goals.

Industrial and commercial demolition materials have filled approximately 798 acres of shallow water and wetlands in Muskegon Lake. In addition, nearly 74 percent of the shoreline has been hardened with broken concrete, foundry slag, sheet metal, slab wood, sawdust, and other industrial and commercial materials. As a result of previous activities, the loss, isolation, and fragmentation of shallow water, wetland habitats, and their protective buffer zones have occurred, along with the degradation of fish and wildlife populations.

The primary goal of this Project is to restore and to protect fisheries and wildlife habitat. The proposed Project has been designed to contribute to delisting the Muskegon Lake AOC. This will be accomplished by restoring aquatic natural resources and native vegetation to the shoreline and restoring emergent and open-water wetlands. These activities will contribute progress toward removing the Loss of Fish and Wildlife Habitat BUI, ensuring that the target for the Degraded Fish and Wildlife Populations and Degraded Benthos BUIs are met, and reducing the Degraded Aesthetics BUI.

Indirect benefits associated with Muskegon Lake, such as public access to recreation and visual aesthetics, have been reduced as a consequence of previous commercial and industrial activities. In addition to improving existing ecological resources, the proposed Project will enhance social and economic benefits for the surrounding communities. As part of its overall goals, the Project is intended to help improve public access; create and retain jobs through promoting tourism and recreation; increase property values; and achieve long-term socioeconomic benefits related to improved habitat for fish and wildlife populations in Muskegon Lake, the Muskegon River, and Lake Michigan.

1.5 APPLICABLE REGULATORY REQUIREMENTS AND COORDINATION

The Environmental Assessment is used to analyze the environmental impacts of a proposed Federal action, as well as to provide sufficient evidence to determine the level of significance of the impacts. An EA will result in one of the following two determinations:

a. An EIS is required; or

b. A Finding of No Significant Impact (FONSI) (40 CFR 1508.9).

If there were potential for significant impacts, then an EIS will need to be prepared. If the impacts of an action were not expected to be significant, a FONSI will be prepared. A FONSI must be supported by the EA, and must

include, summarize, attach, or incorporate by reference the EA (40 CFR 1508.13) (NOAA, 2009).

Clearance from the NOAA NEPA Coordinator in Program Planning and Integration (PPI) is required for all EAs, as well as concurrence on the FONSI, prior to implementing the action (NAO, 1999).

1.5.1 Permitting

As part of the proposed Project, the WMSRDC is acting as the Agent on behalf of the project landowners in the application for the Michigan Department of Environmental Quality (MDEQ)/United States Army Corp of Engineers (USACE) Joint Permit. The permit application process has been initiated with both MDEQ and USACE by WMSRDC for all restoration Sites (GLC and WMSRDC, 2009).

The Joint Permit Application process provides coverage for the following state and federal permit programs:

- Sand (Critical) Dunes Protection and Management Permit (Part 353 of Michigan's Natural Resources and Environmental Protection Act [NREPA])
- Dam Safety (repairs/construction) Permit (Part 315 of NREPA)
- Floodplain Permit (Part 31 of NREPA)
- Great Lakes Submerged Lands Permit (Part 325 of NREPA)
- Inland Lakes and Streams Permit (Part 301 of NREPA)
- Shorelands Protection and Management Permit - High Risk Erosion (Part 323 of NREPA)
- Wetlands Protection Permits (Part 303 of NREPA)
- Section 404 of the Clean Water Act
- Section 10 of the Rivers and Harbors Act

In addition, the Joint Permit process includes coordination with a number of other federal, state, and local regulatory agencies, if required. Table 1.5-1 provides a listing of permits potentially required and/or possible coordination. The MDEQ/USACE permit and other environmental permits will include a number of requirements to ensure environmental protection during construction in accordance with project designs. Among other conditions, these permit requirements will include the use of turbidity curtains, stabilization matting, silt fencing, vegetative seeding and planting, and sediment sampling for disposal. All permits will be obtained as required prior to the commencement of restoration activities.

Table 1.5-1 Potential Permits and Consultations for the Project

Agency[1]	Permit/Consultation Potentially Required
U.S. Department of Interior – Fish and Wildlife Service (USFWS)	Endangered Species Act; Section 7 Consultation
U.S. Environmental Protection Agency (USEPA)	Spill Prevention, Control, and Countermeasure (SPCC) Plan
Michigan Department of Natural Resources (MDNR) – Natural Heritage Program, Wildlife Division	Threatened and Endangered Species Consultation
Michigan Department of Environmental Quality (MDEQ), Land and Water Division and the US Army Corps of Engineers (USACE)	Joint Permit for Wetlands Permit, Floodplain Permit, Inland Lakes and Streams Permit, Critical Dunes; Section 401 Water Quality Certification
MDEQ, Water Bureau	Storm Water Discharges from Small/Large Construction Activity, National Pollutant Discharge Elimination System (NPDES) Notice of Coverage
Michigan Department of History, Arts, and Libraries, Michigan State Historic Preservation Office Environmental Review Office	Section 106 Consultation
Muskegon County Soil Erosion Control (Department of Public Works)	Soil Erosion and Sediment Control Permit

[1]Additional agency permits or approvals may be required beyond those identified here.

1.6 DOCUMENT ORGANIZATION

This EA has been prepared in compliance with NEPA and other relevant federal and state laws and regulations. It provides a discussion of the direct, indirect, and cumulative environmental impacts that will result from the proposed action.

The document is organized into the following seven parts:

- Executive Summary
- Finding of No Significant Impact (FONSI): This section provides the overall findings of the Environmental Assessment.
- Introduction: This section includes information on the background of the Project proposal, the regulatory requirements of NEPA, the purpose of and need for the Project, the proposed action alternative for achieving that purpose and need, and the applicable regulatory requirements and coordination efforts.
- Description of the Proposed Action Alternative and No Action Alternative.
- Affected Environment and Environmental Consequences: This section describes the environmental effects of implementing the Proposed Action. This analysis is organized by resource area. Under each

resource, the affected environment is described first, followed by the effects of the Proposed Action Alternative, which is compared to the No Action Alternative.

- List of Preparers and Agency Consultations: This section provides a list of preparers and agencies consulted during the development of the Environmental Assessment.
- Abbreviations and Acronyms: This section provides a listing of abbreviations and acronyms used within this Environmental Assessment.
- References: This section provides a listing of the literature cited within this Environmental Assessment.

2.0 DESCRIPTION OF PROPOSED ACTION AND NO ACTION ALTERNATIVE

2.1 PROPOSED ACTION ALTERNATIVE

Muskegon Lake is a 4,149-acre drowned river-mouth lake connected to Lake Michigan by a navigational channel. The Muskegon River flows into Muskegon Lake and then through a harbor channel to Lake Michigan. Muskegon Lake is part of one of the world's largest assemblages of sand dunes within a freshwater system. The lake provides habitat for fish and wildlife that reside in Lake Michigan and the Muskegon River.

All of Muskegon Lake was designated as a Great Lakes AOC in 1987 due to historic filling activities, including wetland environments and open water, and which led to pollutant discharges that impacted lake sediments. It is one of 14 AOCs in Michigan.

Various industries currently and formerly resided along the lake's southern shore including a pulp and paper mill, foundries, chemical facilities, and others. Due to the altering, filling, and hardening of the lake's shallow zones, wetlands, and riparian corridors, aquatic and terrestrial wildlife habitats were eliminated. This resulted in polluted storm water runoff and degraded benthos, and fish and wildlife populations. Furthermore, nearshore habitat was lost, and remaining habitats were fragmented and isolated.

Since the 1980s, the lakefront has seen a shift in land use from industrial to those more accommodating to the general public, including recreational, commercial, and residential uses. Significant progress has been made in improving the Muskegon Lake AOC including the recent dredging and cleanup of Ruddiman Lagoon through the GLLA.

The GLC has partnered with the WMSRDC and the MLWP to implement a comprehensive fish and wildlife habitat restoration project in the Muskegon Lake AOC. The Project is designed to address restoration targets established for the Loss of Fish and Wildlife Habitat, Degraded Fish and Wildlife Populations, Degraded Benthos, and Degraded Aesthetics BUIs. In addition, the Project is intended to help improve public access; create and retain jobs; and achieve long-term socioeconomic benefits associated with improved habitat for fish and wildlife populations in Muskegon Lake, the Muskegon River, and Lake Michigan.

The Project consists of restoration actions at twelve Sites in addition to sampling and monitoring of benthos along the southern and eastern shoreline of Muskegon Lake and along the South Branch of the Muskegon

River. The Sites were selected as priority locations for the restoration of fish and wildlife habitat in conjunction with landowner commitment. Habitats proposed for restoration include shoreline ecotone (the transition area between water and land), near-shore littoral zone, emergent marsh, and White Pine/White Oak protective zones along stream corridors. These activities will accomplish approximately 40 percent of the remaining restoration work needed to remove the Loss of Fish and Wildlife Habitat BUI and ensure that the target for the Degraded Benthos BUI is met within the Project period (WMSRDC, 2009).

The locations were divided into four focus areas, as identified and described in the *Muskegon Lake Area of Concern Fish and Wildlife Habitat Restoration and Beneficial Use Impairment Removal Strategy*. Focus Area 1 contains the Southwest Muskegon Lake Shoreline; Focus Area 2 is located within the Ruddiman/Lakeside area; Focus Area 3 includes the downtown shoreline and Ryerson Creek; and Focus Area 4 is located at the Muskegon Lake East and River Mouth (Figure 1). The following provides a more detailed description of each focus area:

2.1.1 Focus Area 1

The loss of fish and wildlife habitat and the degradation of fish and wildlife populations located along the Muskegon Lake southwest shoreline are a result of the historic filling of open lake, littoral zone, emergent wetland, protective riparian buffer, and terrestrial critical function zone habitats. These areas were filled with sawmill slab wood, sawdust, and foundry waste, which includes sand, slag, and broken concrete. Pigeon Hill, which is a massive coastal, freshwater sand dune, was mined resulting in the loss, degradation, and isolation of its habitats (MLWP, 2008).

A relatively undisturbed littoral zone exists between the paper mill and condominiums in this area and when connected with the property to the west of these areas, it will serve as a restored reptile and amphibian habitat. A portion of the Grand Trunk property is owned by the MDNR and is a proposed location for fill removal, shoreline softening and restoration of open water wetland habitat (MLWP, 2008).

- Site A: Edgewater – This Site consists of approximately 0.1 acres and is 110 feet in length. The proposed restoration activities for this Site involve softening the Site with broken concrete fill removal and native plant bioengineering (GLC and WMSRDC, 2009).
- Site B: Grand Trunk, Muskegon Lake Shoreline – This Site consists of approximately 7.3 acres and is 1,742 feet in length. The proposed restoration activities for this Site include the removal of Muskegon Lake Shoreline Foundry fill, broken concrete, and marine debris/slab

wood and restoration of open water and emergent wetland (GLC and WMSRDC, 2009).

2.1.2 Focus Area 2

As with Focus Area 1, the loss of fish and wildlife habitat and the degradation of fish and wildlife populations located in the Ruddiman/Lakeside area are a result of the historic filling of open lake, littoral zone, emergent wetland, protective riparian buffer, and terrestrial critical function zone habitats. The shoreline habitats were filled with sawmill waste, slab wood, and foundry waste, including sand and slag. As a result, most of the shoreline was rip-rapped with large chunks of broken concrete to prevent erosion (MLWP, 2008).

The banks of Ruddiman Creek also were lined with broken concrete and fill. A former oil tank farm is located immediately east of the Ruddiman Creek mouth. This area has been filled and contains polluted groundwater, surface water, soils, and a degraded wetland habitat. A current groundwater clean-up at the filled wetland site is preventing the plume from migrating to surface waters. In addition, a large concrete wall continues to isolate the wetland from the lakeshore and the creek, which restricts fish and wildlife movement and access to critical habitats (MLWP, 2008).

To the east of the former tank farm, a linear littoral zone and shoreline wetland fringe is present. This was degraded by historic slab wood fill and railroad operations. Enhancing and preserving this wetland fringe will connect fragmented habitat along the Lakeshore Trail (bike path) between the former tank farm and Lakeshore Yacht Club/Coles Marina (MLWP, 2008).

- Site C: Great Lakes Dock & Materials/Lake Express Ferry Site – This Site consists of approximately one acre and is 930 feet in length. The proposed restoration activities for this Site include the softening of the shoreline with broken concrete removal and native vegetative buffer planting (GLC and WMSRDC, 2009).
- Site D: Mouth of Ruddiman Creek - This Site consists of approximately 7.5 acres and is 1,471 feet in length. The proposed restoration for this Site includes the removal of broken concrete along the shoreline and the softening of the shoreline. Native vegetation will be planted as a buffer. In addition, slab wood and sawdust is to be removed along with the enhancement of the aquatic habitat in the submerged zone (GLC and WMSRDC, 2009).
- Site E: Former Amoco Tank Farm (Peninsula Area) – This Site consists of approximately one acre and is 914 feet in length. The proposed

restoration for this Site includes the removal of broken concrete, foundry fill, and a dilapidated seawall along with the restoration of the Muskegon Lake Open Water Wetland, emergent wetland, and shoreline softening/bioengineering (GLC and WMSRDC, 2009).

- Site F: Kirksey Peninsula and Shoreline – This Site consists of approximately one acre and is 1,200 feet in length. The proposed restoration for this Site includes the removal of foundry sand, slag, and broken concrete. In addition, a replacement of the existing materials will utilize clean soil. An additional activity will involve the inclusion of a native, vegetation buffer and wetland restoration (GLC and WMSRDC, 2009).
- Site G: Hartshorn Peninsula – This Site consists of approximately three acres and is 2,075 feet in length. As part of the proposed restoration, foundry fill will be removed, along with conducting shoreline softening/bioengineering. For this Site, the Project may be coordinated with the Great Lakes Legacy Act contaminated sediment remediation project (GLC and WMSRDC, 2009).

2.1.3 Focus Area 3

As with other focus areas, historic filling of several habitat types has resulted in loss of fish and wildlife habitat and the resulting degradation of populations along the Muskegon Lake shoreline in the downtown development area (MLWP, 2008).

This focus area is located between the Michigan Steel and the former Teledyne Continental Motors, which was the most heavily industrialized, deep water port area along the shoreline. Beginning in the 1980s, industry began to leave the shoreline area, and new developments arrived including public-friendly uses, such as the Heritage Landing, a county-owned park, and later the Grand Valley State University (GVSU) Annis Water Resources Institute and the Michigan Alternative and Renewable Energy Center. Due to the historic impacts of heavy industry, sediments in this area are contaminated with mercury, oil, grease, and other materials (MLWP, 2008).

- Site H: YMCA/Rotary Park – This Site consists of approximately 2.2 acres and is 1,860 feet in length. The proposed restoration activities include the removal of foundry fill, the restoration of Muskegon Lake emergent wetland, and shoreline softening/bioengineering. For this Site, the Project may be coordinated with the Great Lakes Legacy Act contaminated sediment remediation project (GLC and WMSRDC, 2009).
- Site I: Heritage Landing – This Site consists of approximately 1.4 acres and is 750 feet in length. Proposed restoration activities for this Site

include the removal of marine debris, including foundry fill and metal scrap, the restoration of the lake bottom with clean soil and native vegetation, and the removal of broken concrete with the vegetative softening of shoreline along the east side (GLC and WMSRDC, 2009).

2.1.4 Focus Area 4

Similar to the other focus areas, this area has suffered from the loss of fish and wildlife habitat and degradation of its populations. This focus area is located at the east end of Muskegon Lake within the mouths of the Muskegon River North Branch, Middle Branch, and South Branch. The extensive filling of open water and wetlands with commercial, industrial, and municipal waste has eliminated aquatic habitats and altered natural stream channels and flows (MLWP, 2008).

- Site J: Fisherman's Landing – This Site includes up to approximately 1.4 acres and up to 610 feet in length. The proposed restoration activities include the enhancement of degraded/filled wetland and the removal of broken concrete fill (GLC and WMSRDC, 2009).
- Site K: South Branch, Muskegon River Mouth – This Site includes approximately four acres and is 4,300 feet in length. Proposed restoration activities for this Site include the removal of hardened shoreline broken concrete and fill along the river and above the Muskegon River Mouth, the restoration of emergent wetland, and the softening of the riparian corridor with bioengineering (GLC and WMSRDC, 2009).
- Site L: Muskegon Lake Nature Preserve – This Site includes approximately 3.6 acres. The proposed restoration activity includes wetland enhancement, along with phragmites management on the native wetland and foundry fill wetland soils (GLC and WMSRDC, 2009).

The initial phase of this Project includes the following four activities:

a) Softening of approximately 15,962 feet of hardened shoreline;

b) Restoring 16.1 acres of emergent wetlands and adjacent upland areas;

c) Restoring 18.7 acres of open water wetland; and

d) Removing or improving 33.6 acres of unnatural lake fill.

2.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Project will not be constructed, and no shoreline restoration or benthic monitoring will occur. The shoreline

and lake littoral zone within the Project area will continue in its current degraded state. In this degraded state, BUIs and the Area of Concern designation will remain in place. The environmental, social, and economic benefits associated with the Project will not be realized, nor will the Project's minor adverse impacts.

Additional description regarding the effects of the No Action Alternative is provided in Section 3.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 GEOLOGY AND SOILS

3.1.1 Affected Environment

Glacial processes shaped Muskegon County during the last glacial period, called the Wisconsin Era. As the glaciers retreated between eight and ten thousand years ago, they left a glacial deposit, 150 to 400 feet in thickness, on the surface of Muskegon County (USDA, 1968). Aquifers in this region are usually unconfined at or near the surface and generally consist of interbedded aquifers, aquacludes, and aquitards at depth in the Glacial Drift. These aquifers are considered "unprotected" since the first usable aquifer is not protected by impervious material from surface contaminants. Lower Mississippian Marshall Sandstone underlies the Glacial Drift at an elevation of approximately 350 to 400 feet above mean sea level. The maximum thickness of the Marshall unit is 330 feet (WMU, 1981).

The United States Department of Agriculture (USDA) Soil Survey of Muskegon County documents native surficial soil types on the northeastern and southwestern portions of the Project (USDA, 1968). The survey indicates soils are characterized as Dune Land near Site A, Roscommon and Au Gres Sands near Site B, Saranac Loam and Marsh near Sites J and K, and Tawas and Carlisle Mucks near Site L. The Roscommon and Au Gres Sands, Saranac Loam, and Tawas and Carlisle Mucks are characterized as poorly to very poorly drained. Soil types on the other Sites in the Project area are not defined in the USDA soil survey; however, soil types were evaluated during a study of fill material along the south shore of Muskegon Lake, as described below.

Wetlands and marshes that once existed along the shorelines of Muskegon Lake and the Muskegon River were drastically changed during lumbering activities in the 1800s through construction of saw mills and filling of much of the littoral zone with sawdust, wood chips, timber wastes, and bark. The lumbering era was followed in the 1900s by an era of industrial expansion related to foundries, metal finishing facilities, petrochemical production, and shipping. Local dunes were extensively mined for foundry sand. Waste foundry sand and slag were subsequently placed in large quantities in the remaining littoral zone along the lake (GVSU, 2002).

Non-native fill along the southern shoreline of Muskegon Lake was surveyed as part of the City of Muskegon's Area Wide Assessment of Historic Fill (ERM, 2008). This study included performance of approximately 169 soil borings along the southern shore of Muskegon Lake

and adjacent upland areas. The borings document the presence of fill material along much of the southern shore of Muskegon Lake. Fill materials generally consist of industrial fill (containing dark-colored foundry sands, slag, core sands, coal, cinders, etc.) or construction fill (containing glass, concrete, wood, metal, etc.). Apparently, native soils were generally indicated by orangish-brown sand below either the industrial fill layer, wood debris associated with former lumbering activities, or a peat layer potentially indicative of former wetlands/surface waters. Prior environmental investigations on the Teledyne site (located between Sites I and J) indicate a clay layer below the upper fill and native sand at a depth ranging from 35 to 50 feet below grade (FTC&H, 2002).

Laboratory testing of soil samples from the Area Wide borings indicate the fill material is often contaminated with heavy metals, polynuclear aromatic hydrocarbons (PAHs), and to a lesser extent, formaldehyde. Laboratory analysis of groundwater samples collected from within the fill area indicates manganese is the only contaminant present at concentrations of concern (i.e., concentrations exceeding Part 201 drinking water cleanup criteria). A summary of findings from the Area Wide study and other investigations in the Project area is presented in Table 3.1-1.

Table 3.1-1 Summary of Existing Environmental Sampling Information

Site	Soil	Groundwater	Sediment
Site A: Edgewater	No data for Project area	No data for Project area	No data for Project area[1]
Site B: Grand Trunk, Muskegon Lake Shoreline	Metals and/or PAH impact was found in the vicinity of the Project area. (Dell, 1997)	Metals impact (manganese) is documented in groundwater adjacent to the "Site A" excavation area (ERM 2008). Silver impact also documented in groundwater near the Project area. (Dell, 1997)	Metals impact was documented in sediments near the Project area. (Dell, 1997)
Site C: Great Lakes Dock / Lake Express	No data for Project area	No data for Project area	No data for Project area[1]
Site D: Mouth of Ruddiman Creek	No data for Project area	No data for Project area	Sediments in this area may be impacted by heavy metals from Ruddiman Creek discharges (GVSU, 2002)
Site E: Former Amoco Tank Farm (Peninsula Area)	Sampling data from 2003 indicates petroleum impact in one sample near the upland excavation area; several other samples were not impacted by petroleum constituents. (Delta, 1997)	Sampling data from 2007 does not indicate groundwater impact adjacent to the upland excavation area; petroleum impact is present in the central portion of the site. (Delta, 1997)	No data for Project area[1]
Site F: Kirksey Peninsula and Shoreline	No data for Project area	No data for Project area	No data for Project area[1]
Site G: Hartshorn Peninsula	No data for Project area	Petroleum impact associated with former USTs may remain in groundwater to the southeast of the Project area. Metals impact (manganese) is documented in groundwater. (ERM, 2008)	Impact to lake sediments is documented adjacent to the proposed open water wetland/excavation area (Weston, 2009) ERM sediment testing at this site in 2000 indicated some metals impact to sediments; however, the results are no longer applicable since dredging was conducted and sediments were removed
Site H: YMCA / Rotary Park	No data for Project area	No data for Project area	Impact to lake sediments is documented adjacent to the proposed shoreline softening area. (Weston, 2009) Sediments in the vicinity of the Project area are classified as "Impact Highly

Site	Soil	Groundwater	Sediment
			Likely"; contaminant induced degradation of sediment dwelling organisms evident. (GVSU, 2002)
Site I: Heritage Landing	No recent data for Project area	No recent data for Project area	Sediment samples collected in the proposed marine debris removal area indicate no exceedances (Weston, 2009)
Site J: Fisherman's Landing	Metals impact is documented in soil adjacent to the proposed emergent wetland area and walking trail (direct contact exceedances). (ERM, 2008)	Metals impact (manganese) is documented in groundwater. (ERM, 2008)	Sediments in the vicinity of the Project area are classified as "Impact Highly Unlikely"; contaminant degradation of sediment dwelling organisms not likely (GVSU, 2002)
Site K: South Branch, Muskegon River Mouth	No recent data for Project area	No recent data for Project area	Sediments in the vicinity of the Project area are classified as "Impact Highly Unlikely"; contaminant degradation of sediment dwelling organisms not likely (GVSU, 2002)
Site L: Muskegon Lake Nature Preserve	No data for Project area	No data for Project area	No data for Project area[1]

Notes: 1Although sediment data may be available for Muskegon Lake near the Project area, the results are not discussed above if the proposed work involves only shoreline softening.

3.1.2 Environmental Consequences

3.1.2.1 Proposed Action Alternative

Soils, sediments, and other waste material (e.g., concrete, industrial fill, construction fill, wood, sawdust, etc.) will be removed as part of the Project and properly managed for off-site disposal. Removal of impacted soils and sediments and placement of clean surface soil will reduce potential exposure hazards posed by contaminated material. Aquatic life and human health exposure considerations are further discussed in Sections 3.5 and 3.13, respectively.

The proposed removal of fill soil will not disturb critical native geologic features (such as the clay layer identified between Sites I and J); therefore, no permeable channels in native soils will be created that can allow a more direct groundwater discharge route to surface waters or deeper aquifers. Based on available groundwater sampling information, it does not appear that the proposed removal of fill material will exacerbate venting of impacted groundwater to surface waters.

The extensive ground disturbance associated with the Project can result in an adverse impact of off-site soil erosion and subsequent sedimentation of nearby surface water. As part of the permitting process, a Soil Erosion and Sedimentation Control Plan that includes protective measures will need to be developed and approved by the County. In addition, permits acquired from the USACE and MDEQ will contain protective conditions. Project plans call for the use of control measures such as erosion control blankets, wattles, geo web, and vegetative seeding and plantings.

3.1.2.2 No Action Alternative

The No Action Alternative will not result in any change to the existing geologic/soil conditions. This may result in continued erosion of impacted shoreline fill/soil, disturbance/re-suspension of contaminated sediments, and leaching of toxic materials from contaminated soils to groundwater and/or surface water.

3.2 LAND USE AND RECREATION

3.2.1 Affected Environment

The Project is located in the City of Muskegon, Muskegon County, Michigan.

Muskegon County is located on the western side of Michigan, along the shoreline of Lake Michigan, midway up the state's Lower Peninsula. The county contains sixteen townships, four villages, and seven cities. The county seat is Muskegon, which also is the largest city in the county (Muskegon County, 2004).

Muskegon County contains a total of 337,088 acres of land. Table 3.2-1 provides a summary of the land uses within Muskegon County and the City of Muskegon.

Table 3.2-1 Land Use within Muskegon County and the City of Muskegon

	Muskegon County		City of Muskegon	
	Acreage	**Percentage of Total Acreage**	**Acreage**	**Percentage of Total Acreage**
Agricultural	87,643	26	-	-
Commercial/Office	6,742	2	525	4.4
Forest	97,756	29	-	-
Industrial	3371	1	789	6.6
Marinas	-	-	94	0.8
Public	64,047	19	1,784	14.9
Residential	43,821	13	2,414	20.2
Utilities/Right of Way	13,483	4	2,050	17.2
Vacant	-	-	1,824	15.3
Water	13,483	4	2,453	20.6
Wetland	6,742	2	-	-
Total	337,088	100	11,933	100

Source: WMSDRC, 2006

As shown in the table, forest and agricultural uses account for more than 50 percent of the total land acreage. This is followed by public and residential uses. Within the county, these urban land uses are concentrated near Muskegon Lake, Mona Lake, and White Lake (WMSDRC, 2006).

Recreational opportunities within Muskegon County account for 25,000 acres of land, or approximately 7.4 percent. State parks provide more than 2,600 acres of land alone, while county parks comprise more than 700 acres. Municipalities within the county contribute an additional 1,100 acres to the overall total, and townships provide 300 acres of recreational space. One of the primary areas for recreation is along the western Lake Michigan shoreline. Muskegon County has 27 miles of Lake Michigan shoreline, along with 400 miles of rivers, and 11,400 acres of inland lakes (Muskegon County, 2004).

Recreation is an important component of the Muskegon County economy. Numerous jobs are created due to tourist activity. In addition, the county

collects a hotel/motel accommodations tax that adds to the overall county budget (Muskegon County, 2004).

Like many communities across the country, the population in Muskegon County has been shifting away from the central cities and into more rural areas and townships. Development patterns in Muskegon County currently are dominated by low-density single-use residential, business, and commercial development, most of which occurs on prime agricultural lands. The various communities throughout Muskegon County tend to utilize personal vehicles as their primary transportation in these types of settings. Consequently, the major challenges for the county include finding ways to effectively manage agricultural and undeveloped land, to protect the natural environment, and to coordinate urban redevelopment and infill opportunities and efforts among the various jurisdictions within the county (WMSDRC, 2006).

In addition, one of the primary goals of the county is to preserve open space, farmland, natural beauty, and critical environmental areas. The intent of this goal is to ensure that open spaces and natural areas are available for the public. The county intends to limit adverse environmental impacts through redevelopment of areas within the county. As part of this goal, Muskegon County intends to link natural resource protection with development to reduce the loss of important natural resources and open spaces in urban and rural areas (Muskegon County, 2004). Specific to recreation, the county intends to improve access to facilities and to encourage opportunities for a safe recreational experience, while also promoting tourism and maintaining existing infrastructure (Muskegon County, 2006).

The primary authority for land use and zoning lies at the township and municipal level in the state of Michigan. Within Muskegon County, all 27 local units of government have an active Land Use/Master Plan and Zoning Ordinance in place as allowed by Michigan Law (Muskegon County, 2004 and 2006).

The four Focus Areas are located within the City of Muskegon. Land use within the city is directed by the 1997 City of Muskegon Master Land Use Plan. This plan is comprised of three components, the overall Master Land use Plan, a focused downtown/lakeshore redevelopment plan, and a geographic information system (GIS). Similar to the county, land use within the city consists of residential, commercial and office, industrial, institutional, and recreational uses (City of Muskegon, 1997).

As shown in Table 3.2-1, the City of Muskegon contains 11,933 acres. Of the total acreage, a significant amount is devoted to water uses. Surface

water accounts for 2,453 acres, and the city has 8.6 miles of Muskegon Lake shoreline. Within the city, 94 acres, or 0.8 percent, are dedicated to marinas. The remaining 2,050 acres, or 17 percent, within the city is located along roadway right-of-ways. Special designations for zoning are present along the lakefront (City of Muskegon, 1997 and 1999).

According to the existing land use map, the most predominant land uses along the shore of Muskegon Lake are industrial, public parks, recreation, and commercial. Single and two-family residential uses are also located within close proximity of the shoreline along Lakeshore Drive. Within the four Focus Areas, land use consists of the following (See Figure 2):

- Focus Area 1: Industrial, outdoor recreation, beaches/sand, herbaceous rangeland, shrub/scrub wetland, and residential land uses are included. Site A is located within a residential area, while Site B is within an industrial area.
- Focus Area 2: This area contains herbaceous rangeland, industrial and residential uses, shrub rangeland, central hardwood, emergent wetland, and outdoor recreation. Sites C, D, E, and F are located within industrial sites, while Site G is located within outdoor recreational land.
- Focus Area 3: This area contains a significant amount of the downtown, including industrial and residential uses, outdoor recreational space, shrub rangeland, herbaceous rangeland, cemeteries, and shrub/scrub wetland. Site H is located within outdoor recreational areas, and Site I is within an industrial area.
- Focus Area 4: This area contains industrial and residential uses, outdoor recreational space, emergent wetland, herbaceous rangeland, and shrub/scrub wetland. Site J is located within an outdoor recreational area, Site K is within an herbaceous rangeland, and Site L is within an emergent wetland.

As part of the master planning efforts within the City of Muskegon, several areas also have been identified as part of the city's natural features inventory. These areas are often used for recreational purposes and include the following:

- Muskegon State Park, north of the channel – this area is characterized as a high quality dune area.
- Former Pigeon Hill area, south and east of Harbour Towne Condominiums and Marina – this area is characterized as a Foredune Complex. It contains isolated wetland areas.

- Cottage Grove Public Access Area – this area is characterized as shrub willow/isolated marsh complex. It is a natural, shoreline/littoral zone.
- Ruddiman Lagoon Outlet – this area is characterized as a scrub-shrub community, which provides some wildlife habitat.
- Shoreline, Northeast of former Amoco Oil tank farm – this area is characterized as shrub willow/isolated marsh complex.
- Western Avenue – this area was used for industrial manufacturing and shipping.
- Large field and marsh, northeast of Fisherman's Landing – this area is characterized as old field/woodlot. It is where the former wastewater treatment plant property was located.
- Southwest side of causeway, south of the North Channel of the Muskegon River – this area is near the Veterans Memorial Park and is characterized by shrub/old field/marsh community (City of Muskegon, 1997).

As part of the City land use plan, opportunities for improvement of the natural habitat along the Muskegon Lake shoreline are presented. The Muskegon Lake area also provides for important recreational opportunities within the city. Land along the Muskegon Lake shoreline formerly devoted to industrial land uses presents a range of opportunities for waterfront residential, commercial, and recreational development. For example, one development is the Muskegon Lakeshore Trail, which provides for a 14.1 mile non-motorized multi-use trailway (City of Muskegon, 1997).

By 2025, the City of Muskegon has presented for itself a goal to create a vibrant downtown and adjoining lakefront area that provides a mix of land uses. Part of this goal allows for the promotion of sustainable principles and the use of green infrastructure within new development. The future land use along the lakeshore is anticipated to become a mix of neighborhood uses, recreational space, guest and conference services, multiple family residential uses, and maritime mixed uses (City of Muskegon, 2008).

In response to its goals, the City of Muskegon has recognized issues of concern. One primary concern of the City of Muskegon is access to the shoreline, since many existing areas are off limits to the general public both physically and visually. In locations where public access is allowed, a general lack of landscaping and signage makes them difficult to find and/or are visually uninviting. In addition, the lakefront parks and public

access points are not connected physically to other recreation spaces located throughout the city. Environmental concerns related to the loss of natural habitat and the presence of obtrusive industrial facilities located in residential and recreational areas also pose significant problems related to access and enjoyment of the lakeshore (City of Muskegon, 1999).

3.2.2 Environmental Consequences

3.2.2.1 Proposed Action Alternative

The Proposed Action Alternative is consistent with existing county and municipal land use and recreation plans. The proposed Project will assist Muskegon County and the City of Muskegon in attaining goals to improve the Muskegon Lake shoreline for both natural area preservation and recreational uses.

Furthermore, this Project will not interfere with any proposed development in the county, as future land use categorization will not be affected. This Project will assist in the redevelopment of former industrial areas for uses that are more consistent with current plans for improving the shoreline area and restoring natural vegetation and habitat. It also assists the city and county with infill development by creating improvements to existing areas rather than acquiring additional land for new construction.

However, the Project will indirectly affect existing uses for a temporary period during the implementation of the Project activities. During the construction of the Project, increased noise, dust, and vehicular traffic will indirectly impact existing residential and commercial areas. Residents and visitors to these areas may be temporarily inconvenienced due to the additional vehicles and workers along the shoreline. Since the amount of construction will be limited, additional vehicular traffic to the shoreline for activities associated with the Project will not alter existing land uses (see Section 3.10 Transportation for additional details regarding transportation-related effects).

Views to Muskegon Lake may be temporarily impacted while construction activities will occur. Upon completion of the Project, these views will be restored with minor changes to vegetation and the local habitat. Other recreational activities, such as, but not limited to, fishing, swimming, boating, biking, and hiking, also will be temporarily impacted by the Project activities. Access to locations used for these types of recreation may be limited during the Project in order to allow for the movement of equipment and personnel. Once the Project is complete, additional opportunities for passive and active recreational activities are anticipated,

which will allow for long-term benefits through an increase in the number of facilities available to the public.

Due to the lack of significant potential impacts to the overall land use patterns within the city and county, no land use or recreation mitigation is anticipated.

3.2.2.2 No Action Alternative

The No Action Alternative will not impact existing land uses directly or indirectly. This alternative will be compatible with local land uses and zoning, because it will allow for the existing conditions and proposed future land uses to remain as they currently are. However, it will neither advance the county planning goals to preserve open space and critical environmental areas nor encourage additional opportunities for recreational activities. This alternative also will not promote sustainable principles of development as outlined within the City of Muskegon plans. Planned development will continue as proposed in existing land use plans assuming no modifications to the existing shoreline occur.

3.3 WATER QUALITY AND RESOURCES

3.3.1 Affected Environment

Muskegon Lake is a 4,150-acre inland coastal lake that is part of the Muskegon River Watershed draining approximately 130 square miles. The Muskegon River feeds into Muskegon Lake, which ultimately empties into Lake Michigan through a navigation channel. Other waterways that discharge directly into Muskegon Lake include Ruddiman Creek, Ryerson Creek, Green Creek, and the Bear Lake Channel.

Historic industrial activity has impacted the water and sediment of Muskegon Lake. During the lumbering activity of the 19th century, slabwood and sawdust waste were placed in the lake; other fill from subsequent industrial activity included coal ash, demolition wastes, and industrial wastes such as foundry sand, slag, and metal scrap (MLWP, 2008). Prior to 1973, industrial and municipal wastes were directly discharged into the waters of Muskegon Lake. These discharges included effluents from petrochemical, organic chemical, metal finishing, and manufactured gas facilities. These discharges to the lake were reduced or eliminated in 1973, when a municipal wastewater treatment facility was constructed. Prior to the 1973 wastewater diversion, nuisance algal blooms, fish tainting problems, excessive macrophyte growth, winter fish kills, and oxygen depletion in the hypolimnion were common in the lake.

Although the water quality has improved considerably since 1973, contaminated sediments remain in the lake. In addition, diffuse sources of contamination continue to enter the lake from tributaries, local runoff, and impacted groundwater plumes (GVSU, 2002).

The West Michigan Shoreline Regional Development Commission inventoried known and potential contamination sources for Muskegon Lake (WMSRDC, 1978). This study identified Ruddiman Creek, the Division Street storm water outfall, former MichCon/Lakey Foundry area, Ryerson Creek area, and Muskegon River (north and south branches) as potential source areas. Contaminant sources associated with these areas may include historic industrial effluent discharges, venting of contaminated groundwater, coal storage, rail yards, dredging and disposal related to the maintenance of commercial shipping ports, foundry fill, and wastewater treatment plant discharges (most recently, an April 1999 sewer break resulted in the release of over 60 million gallons of raw sewage into the lake).

A recent benthos study investigated the water quality of Muskegon Lake, Ruddiman and Ryerson Creeks in 2006 (GVSU, 2009). The study included collection of water quality samples from Muskegon Lake, Ryerson Creek, and Ruddiman Creek. Water samples were analyzed for pH, redox potential, chlorophyll, dissolved oxygen, temperature, total dissolved solids, turbidity, specific conductance, phosphorus, nitrate-N, and ammonia-N, and/or alkalinity. Sampling results indicated that increases in stream discharge flow as a result of storm events led to a dilution of specific conductance, total dissolved solids, chloride, sulfate, and nitrate-N, in comparison to base flow conditions in both Ryerson and Ruddiman Creeks. This finding suggests that these parameters were not introduced via storm water runoff to a substantial degree during the study timeframe. Phosphorus concentrations were greater during storm events indicating that this nutrient was introduced into surface water via eroded sediment or surface runoff. Despite the increases in phosphorus concentrations during storm flows, chemical parameters did not exceed State or Federal water quality standards.

A key storm drain outfall in the Project area is the Division Street Outfall (located at Site H). An area of sediment contamination has been identified in the lake near the Division Street Outfall (Weston, 2009). This outfall discharges storm water from a number of industrial facilities and was subject to historic discharges of untreated wastes. Sampling in this area suggests that the sediments at this location may be mobile and subject to re-suspension. Sediment contaminants include heavy metals and polynuclear aromatic hydrocarbons (PAHs).

A Watershed Management Plan for the Muskegon Lake Watershed prepared by Fishbeck Thompson, Carr & Huber (FTC&H, 2005) describes testing of storm water discharges in the urbanized areas of the Muskegon Lake watershed through summer 2003. Within the watershed, four outfalls were found that were suspected of discharging pollutants (locations not specified). Three outfalls showed elevated conductivity levels, and two of these outfalls also had elevated fecal coliforms. The fourth outfall was not found to be discharging pollutants, but was historically a source of pollution. The small number of illicit discharges found in the watershed suggests that Municipal Separate Storm Sewer Systems (MS4s) are not a significant contributor to the water quality problems in Muskegon Lake and that non point sources (i.e., the diffuse runoff from upland and impervious areas) are the most significant contributor of pollution to the surface waters.

3.3.2 Environmental Consequences

3.3.2.1 Proposed Action Alternative

The Proposed Action Alternative will contribute to the improvement of surface water quality in Muskegon Lake, particularly in localized areas immediately at and adjacent to the Project Sites. Several elements of the proposed Project, including shoreline softening, bioengineering, emergent wetland restoration throughout the Project area, and proposed runoff seepage basins at Site G (Hartshorn Marina), will filter pollutants and excess nutrients from storm water runoff before reaching Muskegon Lake resulting in improved water quality. Removal of submerged debris and industrial fill from the shoreline (in shoreline softening areas) and placement of clean fill and native vegetation will reduce potential erosion of impacted material and re-suspension of sediments into Muskegon Lake. Removal of impacted fill and soil will also reduce potential leaching of contaminants to groundwater and surface water.

Although sediments may become suspended during performance of the Project, use of measures such as sediment curtains will reduce potential negative impacts to water resources. Water resources will also be protected through development and implementation of a spill response plan (e.g., to address potential fuel, hydraulic fluid, or other petroleum product spills that may occur from construction equipment and service vehicles), fugitive dust management plan (to reduce deposition of potential impacted dust in surface waters/storm water runoff areas), and a soil erosion and sedimentation control plan (see Section 3.1).

3.3.2.2 No Action Alternative

The No Action Alternative will result in the continued impairment of water resources through the persistence of submerged debris, impacted sediments, and potential ongoing erosion of impacted shoreline fill/soil.

3.4 WETLANDS AND FLOODPLAINS

3.4.1 Affected Environment

3.4.1.1 Wetlands

Wetlands in Michigan are regulated under federal and state laws, including Section 404 of the Federal Clean Water Act and Part 303 of Michigan's Natural Resources and Environmental Protection Act (P.A. 451 of 1994, as amended). Existing wetlands within the Project area fall under the jurisdiction of both the USACE and the MDEQ.

The Land Cover Map circa 1800 showing Muskegon Lake and its surrounding vegetative cover (Figure 3) indicates that prior to the industrial settlement of the shorelines of Muskegon Lake, white pine – white oak forests dominated the southern shore of Muskegon Lake. The eastern shore was dominated by shrub swamp and emergent marsh with areas of hardwood swamp located near Sites J and K and east of the Muskegon River mouth. The Muskegon River mouth was located east of the existing mouth and most of the Sites are now located in areas that were historically part of Muskegon Lake. Over the years sedimentation from natural and human causes and the act of filling in the lake and adjacent wetlands has changed the shoreline of Muskegon Lake to its present-day configuration (City of Muskegon, 1998).

The majority of the pre-settlement wetland communities were likely classified as open water wetlands and/or Great Lakes Marsh with a morphometric type classification of Riverine-Lacustrine Estuary (Albert, D. A. 2001). Remnants of these marshes still exist, especially on the eastern shore of Muskegon Lake near Sites K and L. Typical vegetative characteristics of Great Lakes Marshes are listed in Table 3.4-1.

Table 3.4-1 Vegetative Characteristics of Great Lakes Marsh-Riverine-Lacustrine Estuary

Emergent Zone Vegetation	Herbaceous Zone Vegetation	Shrub/ Tree Zone Vegetation
Nuphar advena (yellow pond-lily)	*Calamagrostis Canadensis* (blue-joint reed grass)	*Alnus rugosa* (speckled alder)
Peltandra virginica (arrow-arum)	*Impatiens capensis* (spotted touch-me-not)	*Cornus stolonifera* (red-osier dogwood)
	Rorippa palustris (yellow cress)	*Fraxinus pennsylvanica* (green ash)
	Polygonum lapathifolium (nodding smartweed)	*Osmunda regalis* (royal fern)
	Leersia Oryzoides (cut grass)	

Reference: Great Lakes Marsh-Community Abstract, Michigan Natural Features Inventory, Lansing, MI 2009.

Michigan's Final Wetland Inventory Map of Muskegon Lake indicates hydric soils (Figure 4) or wetlands (Figure 5) on or near all Sites. The hydric soil types and the wetland classification types for the Sites are presented in Table 3.4-2 below.

All of the wetlands located in the Project area are impacted by historical human interaction and are presently classified as low quality wetlands where wetland plant species diversity is low and invasive species such as purple loosestrife (*Lythrum salicaria*), reed canary grass (*Phalaris arundinacea*), and common reed (*Phragmites* australis) are dominant. Some of the Sites exhibit scrub-shrub wetland characteristics where the terrestrial vegetation is dominated by sandbar willow (*Salix exigua*), pussy willow (*Salix discolor*), and eastern cottonwood (*Populus deltoides*). Other Sites exhibit emergent wetland characteristics where the terrestrial vegetation is dominated by broad leaf and fine leaf cattail (*Typha latifolia* and *T. angustifolia*), common reed, and/or purple loosestrife. All of the Sites exhibit open water wetland characteristics where the presence of emergent vegetation is scattered or absent due to the debris filled lake bottom. Additionally, due to the hardening of the shoreline, many of the wetland vegetation characteristics are ambiguous due to the inclusion of upland plant species, including white sweet clover (*Melilotus alba*), staghorn sumac (*Rhus typhina*), and autumn olive (*Elaeagnus umbellata*) in and amongst the concrete and debris filled shoreline. The wetlands in these areas are defined by the near shore ecotone where the water's edge meets the shoreline.

Due to the disturbed state of all shoreline areas surrounding each Site from filling, dumping, and shoreline hardening, much of the natural wetlands that were present are now struggling to maintain natural

vegetative, soil, and hydrological characteristics and likely will never fully recover without restoration.

Some wetlands restoration activity has already been initiated in the Project area. For example, beginning in 2002, Muskegon River Watershed Assembly (MRWA) and the USFWS Coastal Program began efforts to reestablish the state-threatened wild rice (*Zizania palustris)* in Muskegon Lake by successfully planting several sites in the lake with this and other wetland plants (GLC and WMSRDC, 2009).

Table 3.4-2 Existing Wetland Characteristics by Site

Site	Shoreline Length (Linear Feet)	Dominant Wetland Community Type	Vegetative Diversity/ Integrity	Overall Wetland Quality	Michigan's Final Wetland Inventory Wetlands Associated with Site	National Wetland Inventory (NWI) Wetland Classification	Hydric Soils Associated with each Site
A	110	Disturbed Isolated and/or Interdunal/ Open Water	Low	Low	Yes	- -	Du – Dune Land
B	1,742	Disturbed Scrub-Shrub/ Emergent/ Open Water	Low	Low	Yes	- -	Ra – Roscommon and Au Gres sands
C	930	Disturbed Scrub-Shrub/ Open Water	Low	Low	Yes	- -	- -
D	1,471	Disturbed Emergent/Scrub-Shrub/ Open Water	Low	Low	Yes	- -	- -
E	914	Disturbed Open Water	Low	Low	Yes	- -	- -
F	1,200	Disturbed Emergent/ Scrub-Shrub /Open Water	Low	Low	Yes	- -	- -
G	2,075	Disturbed Scrub-Shrub/ Open Water	Low	Low	Yes	- -	- -
H	1,860	Disturbed Scrub-Shrub/ Open Water	Low	Low	Yes	- -	- -
I	750	Disturbed Emergent/ Open Water	Low	Low	Yes	- -	- -
J	610	Disturbed Emergent/ Open Water	Low	Low	Yes	- -	Ma - Marsh
K	4,300	Disturbed Emergent/ Open Water	Low	Low	Yes	PSS1C/ PEMC/PUBGx	Ma - Marsh
L	- -	Disturbed Emergent/ Open Water	Low	Low	Yes	PSS1C	Tc – Tawas and Carlisle mucks

Note: NWI Classification: PSS1C = palustrine, scrub-shrub, broad-leaved deciduous, seasonally flooded; PEMC = palustrine, emergent, seasonally flooded; PUBGx = palustrine, unconsolidated bottom, intermittently exposed, excavated

3.4.1.2 Floodplains

Water bodies surrounding the Project area include Lake Michigan to the west, Muskegon Lake, and the Muskegon River to the east. The Project is located within the Muskegon River Watershed.

Federal Emergency Management Agency (FEMA) Q3 Floodplain maps indicate that the Project Sites are located in FEMA classified AE flood zones (100 year floodplain) and X500 (500 year floodplain) as described in Table 3.4-3 and mapped in Figure 6.

Table 3.4-3 FEMA Designated Floodplains by Site

Site	Shoreline Length (Linear Feet)	FEMA Classification	100 Year Floodplain	500 Year Floodplain
A	110	Flood Zone X500		X
B	1,742	Flood Zone AE and X500	X	X
C	930	Flood Zone AE	X	
D	1,471	Flood Zone AE	X	
E	914	Flood Zone AE	X	
F	1,200	Flood Zone AE	X	
G	2,075	Flood Zone AE	X	
H	1,860	Flood Zone AE and X500	X	X
I	750	Flood Zone AE	X	
J	610	Flood Zone AE	X	
K	4,300	Flood Zone AE and X500	X	X
L	- -	Flood Zone AE	X	

3.4.2 Environmental Consequences

3.4.2.1 Wetlands

Proposed Restoration Methods

The proposed Project will result in the restoration of near shore wetlands over a total shore length of 15,962 feet. A total of 18.7 acres of open water wetlands and 16.1 acres of emergent and scrub-shrub wetlands will be restored.

The proposed excavation and fill for the Project at each Site will be completed using dredges, hydro hoes, and/or loaders. Temporary adverse effects to existing wetlands will occur due to disruption and the potential for soil erosion and sedimentation. Soil erosion control techniques, including the use of sediment curtains in open waters, silt fencing, and

erosion control matting will be used to prevent sedimentation of the restored wetland and open water environments. The spoils will be temporarily placed in a specified upland location on each Site and properly disposed of off site. Clean topsoil fill (and rock in some locations) will be placed and graded to an elevation to support wetland hydrology. Soil erosion controls placed on disturbed slopes immediately following final grading will include bioengineered geotextile techniques, including geo web and/or coconut fiber erosion control blankets with vegetative planting. Native wetland and mesic-upland seed mixes and plugs will be used to restore each wetland and ecotone (Table 3.4-4).

Table 3.4-4 Common Native Seed Mixes and Plugs

Vegetation – Scientific Name	**Vegetation – Common Name**	**Seed or Plug**	**Wetland/Upland Classification**
Nuphar advena	Yellow pond lily	Plug	OBL
Nymphaea tuberosa	White water lily	Plug	OBL
Pontederia cordata	Pickerel weed	Plug	OBL
Asclepias incarnata	Swamp milk weed	Seed	OBL
Avena sativa	Seed oats	Seed	UPL
Bidens cernuus	Nodding beggar-ticks	Seed	OBL
Calamagrostis canadensis	Canada blue-joint grass	Seed	OBL
Carex comosa	Bearded sedge	Seed	OBL
Carex hystericina	Porcupine sedge	Seed	OBL
Carex stipata	Common fox sedge	Seed	OBL
Carex vulpinoidea	Brown fox sedge	Seed	OBL
Iris virginica shrevei	Blue flag iris	Seed	OBL
Juncus effusus	Soft rush	Seed	OBL
Leersia oryzoides	Rice cut grass	Seed	OBL
Liatris spicata	Marsh blazing star	Seed	OBL
Lolium multiflorum	Annual rye grass	Seed	UPL
Mimulus ringens	Monkey flower	Seed	OBL
Sagittaria latifolia	Common arrowhead	Seed	OBL
Scirpus acutus	Hard- stemmed bulrush	Seed	OBL
Scirpus atrovirens	Dark green bulrush	Seed	OBL
Scirpus cyperinus	Wool grass	Seed	OBL
Scirpus fluviatilis	River bulrush	Seed	OBL
Scirpus americanus or Schoenoplectus pungens	Three-square bulrush	Seed	OBL
Scirpus validus creber	Great bulrush	Seed	OBL
Sparganium eurycarpum	Giant burreed	Seed	OBL
Spartina pectinata	Prairie cordgrass	Seed	OBL
Verbena hastata	Blue vervain	Seed	FACW

Note: Wetland/ Upland designation based on standardized classifications; OBL=obligate wetland, FACW=facultative wetland, FAC=facultative, FACU= facultative upland, UPL= upland.

Proposed Site-Specific Restoration

Specific restoration activities in the wetlands and near shore ecotone at each Site are described in the USACE/MDEQ Joint Permit Applications, which were submitted in April 2009 by the WMSRDC. Restoration specifics are summarized below. Restoration activities at the 12 Sites will result in re-establishment of approximately 12,692 feet of near-shore ecotone, 17.0 acres of open water wetland, and 14.6 acres of emergent wetland (Table 3.4-5).

Table 3.4-5 Proposed Wetland Restoration by Site

Site	Restoration Activity	Near Shore Ecotone Restoration Length (Linear Feet)	Open Water Wetland Area Restored (acres)	Emergent Wetland Restored (acres)
A	Excavation/fill; debris removal; bioengineered shoreline	110	- -	0.1
B	Excavation/fill; debris removal; bioengineered shoreline	1,742	5.9	2.7
C	Excavation/fill; debris removal; bioengineered shoreline	930	0.0	1.0
D	Excavation/fill; debris removal; bioengineered shoreline	1,471	7.5	0.0
E	Excavation/fill; debris removal; bioengineered shoreline and rip-rap	914	0.7	0.3
F	Excavation/fill; debris removal; bioengineered shoreline	1,200	1.0	0.0
G	Excavation/fill; debris removal; bioengineered shoreline	2,075	1.0	2.0
H	Excavation/fill; debris removal; bioengineered shoreline	1,860	0.0	2.2
I	Excavation/fill; debris removal; bioengineered shoreline	750	0.7	0.7
J	Excavation/fill; debris removal; bioengineered shoreline	610	0.4	1.0
K	Excavation/fill; debris removal; bioengineered shoreline	4,300	1.5	2.5
L	*Phragmites australis* (Common Reed) removal	- -	- -	3.6
	Total	15,962	18.7	16.1

Site-specific wetland restoration activities are described below:

- Site A: Edgewater – The proposed activities at this Site will involve excavating approximately 110 linear feet of shore line with a width of approximately 15 feet from the waters edge and a depth of approximately four inches (20.4 cubic yards). Rock, clean top-soil fill, and bioengineered geo web will be used to soften the entire excavated shoreline. Native seed mixes and plugs will be planted in the near

shore and littoral zone to restore approximately 0.1 acres of emergent wetland.

- Site B: Grand Trunk, Muskegon Lake Shoreline – Site B will involve five different restoration locations: Grand Trunk Site A, B, C, D, and E. Restoration techniques will affect an estimated 1,742 linear feet of wetland and ecotone at the five total Grand Trunk Sites. A total of 5.9 acres of open water wetlands and 2.7 acres of emergent wetlands will be restored among the five Sites.
    - Grand Trunk Site A is located on the eastern base of the peninsula at the northwestern edge of the Grand Trunk Boat Launch. The proposed restoration will include excavating debris and replacing it with clean top-soil fill, which will be graded and reseeded with native vegetation seed mix. Emergent wetland will be created in this area.
    - Grand Trunk Site B is located on the western side of the peninsula at Site B and will include excavating the hardened shoreline area at or below the ordinary high water mark (OHWM). Additionally, debris will be excavated above the OHWM. Clean topsoil fill, mixed with native wetland seed mix, will be wrapped in an erosion control blanket and anchored in the area located along the shoreline and slightly below the OHWM. Emergent wetland will be restored at this Site.
    - Grand Trunk Site C is located northwest of the power lines at the McCracken and Lakeshore Drive intersection. Debris will be removed from an existing wetland floodplain area and fill or topsoil will not be replaced at this Site; however, with the debris removed, this area will have added floodplain storage and will potentially revert back to an emergent wetland.
    - Grand Trunk Site D is located in a open water habitat directly west and offshore of Grand Trunk Site B. The proposed restoration will include excavating old logs and residual debris from historic sawmill operations to restore the bottom to its native state.
    - Grand Trunk Site E is located on the eastern base of the peninsula at the southeastern edge of the Grand Trunk Boat Launch. The proposed restoration will include excavating debris from the wetland and near shore ecotone and below the OHWM. Clean top-soil fill will replace the debris, and native seed mixes and plugs will be planted in the near shore and littoral zones to restore emergent wetland.
- Site C: Great Lakes Dock & Materials/Lake Express Ferry Site – The proposed restoration area is located on the western peninsula to the north of the Lake Express Ferry dock. An area estimated to be 930 feet

long by approximately 50 feet wide by approximately 5 feet deep will be excavated from the existing peninsula and below the water's edge. Approximately 8,611 cubic yards of debris and dredged material will be removed, with approximately 5,769 cubic yards originating below the OHWM. Clean topsoil fill and rock will be gently sloped and covered with geo web to restore the lakeshore to a softened state, and native seed mixes and plugs will be planted in the near shore and littoral zones to restore approximately 1.0 acres of emergent wetlands.

- Site D: Mouth of Ruddiman Creek – The proposed near shore open water and terrestrial wetland restoration includes excavating an approximately 1,471-foot by 30-foot wide section of shoreline (including 2 feet extending below the water's edge) that will start approximately 100 feet north of the Ruddiman Creek bike bridge and extend to the peninsula at Site E. This excavation will restore approximately 7.5 acres of open water wetland. Sawdust and slab wood debris will be excavated from the lake bottom, which will allow for approximately 7.5 acres of open water wetland restoration.
- Site E: Former Amoco Tank Farm (Peninsula Area) – The proposed restoration area is located east of Site D and along the eastern shore of the former Amoco Tank Farm Peninsula where a dilapidated seawall exists. The proposed restoration will include excavating approximately 914 linear feet of shoreline by approximately 75 feet wide. Part of the excavation will include removing the existing seawall and restoring the peninsula with top soil and rip rap to restore approximately 0.3 acres of emergent wetland and 0.7 acres of open water wetland. A draft Seawall Evaluation report prepared by the Sidock Group, Inc. for the City of Muskegon (Sidock Group, 2009) has indicated various options regarding seawall removal during restoration, including no removal, partial removal, and total removal of the seawall.
- Site F: Kirksey Peninsula and Shoreline – The proposed restoration is located on the Kirksy Peninsula, located approximately 0.4 miles northwest of the West Avenue dead end street and approximately 0.1 miles west of Site G. The proposed restoration will include excavating approximately 1,200 feet of linear, hardened shoreline by approximately 30 feet wide and approximately 2.5 feet deep (8,611 cubic yards). Approximately 1,333 cubic yards of clean topsoil and geo web will gently slope and soften the shoreline. Native seed mixes and plugs will be used to reestablish vegetation along the shoreline and restore approximately 1.0 acres of open water wetlands.
- Site G: Hartshorn Peninsula – The proposed restoration is located on Hartshorn Peninsula and will include excavating 52,354 cubic yards of fill and debris from the near shore and shoreline areas surrounding the

peninsula. Approximately 2,075 linear feet of shoreline will be affected, and the entire one acre point of the peninsula will be excavated to create an open water wetland. The western shore of the peninsula will restore wetland by excavating approximately 800 feet of shoreline and softening with geo web, topsoil, and native seed mixes. The eastern shoreline of the peninsula will be secured using limestone rip-rap and topsoil. Approximately 1.0 acres of open water wetlands and 2.0 acres of emergent wetlands will be restored.

- Site H: YMCA/Rotary Park – The proposed restoration is located at the shoreline surrounding the Muskegon YMCA, 900 West Western Avenue, and includes excavating approximately 8,700 cubic yards of fill and debris in and along the water's edge. The excavated area will include approximately 1,860 linear feet of shoreline by approximately 50 feet wide. Bioengineered shoreline, using geo web, rock, topsoil, and native seed mixes will be placed along approximately 570 feet of shoreline immediately adjacent to the YMCA. The remaining shoreline will be filled with top soil, gently sloped, and revegetated with native seed mixes. Approximately 2.2 acres of emergent wetland will be restored.
- Site I: Heritage Landing – The proposed restoration is located along the shoreline of Heritage Landing off of South Shore Drive and includes excavating approximately 5,647 cubic yards of fill and debris from the shoreline, water's edge, and shallow bottomlands of a one-acre bay. Approximately 600 feet of shoreline will be gently sloped, filled with topsoil, and reseeded with native seed mixes. In addition, approximately 150 feet of shoreline will be softened using geo web, topsoil, and native seed mixes. Approximately 0.7 acres of open water wetland and 0.7 acres of emergent wetland will be restored.
- Site J: Fisherman's Landing – The proposed restoration is located at Fisherman's Landing, 538 East Western Avenue, and includes excavating approximately 5,698 cubic yards of fill and debris from an approximate 610-foot by 100-foot area in and along the water's edge. An approximately 30-foot wide area below the water's edge will be filled with clean sand to restore approximately 0.4 acres of open water wetland. An area of approximately 610 feet by 70 feet will be softened using geo web, clean top soil, and native seed mixes to restore approximately 1.0 acre of emergent wetland.
- Site K: South Branch, Muskegon River Mouth – The proposed restoration will start at the mouth of the south branch of the Muskegon River and run approximately 3,000 feet upstream. Excavated fill and debris will be removed and softened with bioengineered shoreline and top soil along the north side of the river which will affect a maximum of approximately 3,000 linear feet of shoreline along the Consumer's

Energy property. Native seed mixes will be planted to restore approximately 1.5 acres of emergent wetland. In addition, 1.0 acres of open water wetlands will be restored. Additionally, the invasive honeysuckle species (*Lonicera* spp.) will be removed along the north shore via the cut stump method and replaced with native shrub species including silky and red-osier dogwood (*Cornus amomum* and *C. stolonifera*), spicebush (*Lindera benzoin*), and arrow-wood (*Viburnum dentatum*).

On the south side of the river, along the VerPlank property, approximately 1,300 feet of shoreline will be excavated to remove fill and debris. An approximately 10-foot width of shoreline and wetland ecotone will be affected along this stretch of river. The excavated fill and debris will be replaced with clean top soil fill. A portion of the shoreline will be softened with clean top soil and bioengineered shoreline, and the remaining shoreline will be filled and gently sloped to allow wetland restoration. Approximately 1.0 acres of emergent wetland and 0.5 acres of open water wetlands will be restored along this reach of the river.

Upstream from the VerPlank property at Richard's Park, an approximately 280-foot by 20-foot area will be excavated to remove approximately 570 cubic yards of fill and debris. Bioengineered shoreline, clean top soil, and native seed mixes will be used to restore emergent wetland. Additionally, honeysuckle species located in Richard's Park will be removed with the cut stump method and replaced with white pine (*Pinus strobus*), swamp white oak (*Quercus bicolor*), red maple (*Acer rubrum*), and pin oak (*Quercus palustris*) saplings.

- Site L: Muskegon Lake Nature Preserve – The proposed restoration will be located near the river mouth of the north branch of the Muskegon River, at the Muskegon Lake Nature preserve, where approximately 3.6 acres of emergent wetland will be restored by removing the stands of the emergent invasive common reed (*Phragmites australis*). Native seed mixes will be planted after the Phragmites removal.

The finished restoration effort at all Sites should result in a stabilized, gently sloped shoreline and restored wetland complex that will provide substantial wetland functions and values including increased pollution control, erosion control, and floodplain capacity. Increasing the amount of wetland on these Sites will also provide important fish and wildlife habitat, resulting in increased fish and wildlife populations and diversity. The creation of additional wetland habitat and removal of degraded

bottomlands will address the Loss of Fish and Wildlife Habitat and the Degradation of Benthos BUIs.

3.4.2.2 Floodplains

The main effects of the proposed restoration to floodplains at each Site will be increased water storage capacity due to the proposed net removal of debris. More debris will be excavated from the Sites than will be filled, resulting in a net gain of floodplain storage capacity of 114,741 cubic yards, as summarized in Table 3.4-6.

Table 3.4-6 Effects of Restoration Activities on Floodplain Storage

Site	Cut (cubic yards)	Fill (cubic yards)	Net Gain (+)/ Loss (-) (cubic yards)
A	250	207	+ 43
B	21,724	2,628	+ 19,096
C	8,611	2,174	+ 6,437
D	N/A	N/A	N/A
E	31,249	1,257	+ 29,992
F	8,611	1,333	+ 7,278
G	52,354	13,170	+ 39,184
H	8,700	3,011	+ 5,689
I	N/A	N/A	N/A
J	5,698	2,176	+ 3,522
K	4,854	1,354	+ 3,500
L	N/A	N/A	N/A
		Total	+ 114,741

1) N/A = not applicable

2) All calculations include cut and fill above and below OHWM

3.4.3 No Action Alternative

The No Action Alternative will not affect wetlands and floodplains directly or indirectly. It will allow for existing conditions to remain in their current impaired state, and there will be no improvement to the wetland habitats or floodplain storage.

3.5 AQUATIC BIOLOGY

3.5.1 Affected Environment

3.5.1.1 Habitat

Aquatic habitat in the Project area consists of mostly open water. Shallows are limited to a very narrow littoral zone across much of the Project area. Depths less than 10 feet are particularly rare in Focus Area 1. More

shallows occur in the central and eastern portions of the Project area, particularly west of the Grand Trunk Terminal Dock, offshore of the CSX Transportation Site, and between the Amoco Terminal and Foundry Park. Moderately deep water (10-20 ft) is located adjacent to hardened shorelines in Focus Area 3 from Foundry Park to Fishermen's Landing. Focus Area 4 contains gradually sloping bathymetry surrounding the mouth of the South Branch, and shallow flats at the mouth of the North Branch of the Muskegon River.

Substrates across much of the Project area are poorly sorted mixtures of fill, rubble, and industrial waste distributed throughout a matrix of finer-grained sediments. Wood, sawdust, slag, and concrete comprise much of the fill material in the Project area (MLWP, 2008). Much of the finer-grained matrix is silt, but organic debris, sand, peat, and clay also occur.

Some of the fill is contaminated with metals, hydrocarbons, and various other pollutants, particularly in Focus Area 3 (see Section 3.1). Sediment contamination has very likely negatively impacted the macroinvertebrate community within Focus Area 3, particularly between Foundry Park and Grand Valley State University (Rediske et al., 2002), although conditions appear to be improving (Rediske et al., 2009). Contamination is present but poses a somewhat lower risk of biological impairment elsewhere in the Project area. Fill and channelization are also likely factors in biological impairment throughout Focus Area 3 and at one Site off the Grand Trunk Terminal Dock in Focus Area 1 (Rediske et al., 2002).

3.5.1.2 Macroinvertebrates

The benthic population in Muskegon Lake has historically been indicative of severely degraded conditions. Over the last three decades the health of the benthic community has steadily improved, as indicated by increasing diversity and abundance of pollution-intolerant taxa. In 2006, at least forty-seven species of macroinvertebrates were present in Muskegon Lake. These included intolerant taxa such as Hex mayflies (sometimes called Green Bay flies) (*Hexagenia sp.)* (Rediske et al., 2009), which is widely considered a qualitative indicator of good or improving water quality in the Great Lakes Region. The macroinvertebrate community also includes at least two well-known invasive species, zebra mussels (*Dreissenna polymorpha*) and quagga mussels (*D. rostriformis*). Zebra mussels are well-established in the eastern half of the Project area and likely occur throughout the lake; quagga mussels are much less common but have been documented offshore between the YMCA and Heritage Landing sites (Rediske et al., 2009).

3.5.1.3 *Aquatic Vegetation*

Aquatic vegetation is patchily distributed across the Project area (Luttenton, 2000). The easternmost significant area of aquatic vegetation is located west of the SAPPI Fine Paper site, and consists of various hornwort *(Ceratophyllum sp)* and eelgrass (*Vallisneria sp)*. Aquatic vegetation, primarily naiad (*Najas sp*.) also occurs in Focus Area 1 between SAPPI Fine Paper and Grand Trunk. Vegetated areas occur on the southeast side of the former Amoco Tank Farm, and southeast of the Michigan Bay Steel and Foundry site. These areas consist mostly of eelgrass, but include naiad and Richard's pondweed *(Potamogeton richarsonii)* as well. In Focus Area 3 the only mapped vegetation is a very small area of mudplantain *(Heteranthera sp.)* offshore of Heritage Landing. Focus Area 4's aquatic vegetation is limited to a narrow strip of eelgrass located offshore of Fisherman's Landing and CMS (Luttenton, unpublished data). Most of the aquatic plants present in the Project area are native, although some species of mudplantain in the lake may be invasive (University of Florida, 2008).

3.5.1.4 *Fisheries*

Over 60 species of fish occur in Muskegon Lake, including over 20 species of gamefish, one state threatened species, and possibly two special concern species (Hanchin et al., 2007, O'Neal, 1997). It is likely that all species found in the lake occur in the Project area, but some may be more common in certain areas due to their particular habitat requirements. Most of the sunfishes (*Lepomis spp*.), black crappie (*Pomoxis nigromaculatus*), northern pike (*Esox lucius*), Great Lakes muskellunge *(Esox masquinongy masquinongy)*, yellow perch (*Perca flavescens*), and largemouth bass (*Micropterus salmoides*) are strongly associated with vegetated areas or woody debris as juveniles and adults. Chinook and coho salmon (*Oncorhynchus tshawytscha* and *O. kisutch*, respectively), rainbow trout (*O. mykiss)*, brown trout (*Salmo trutta*), and walleye (*Stizostedion vitreum*) are found in deeper open areas of the lake as adults, but prefer to spawn in shallow areas with abundant coarse substrate and current, such as the North and South Branches of the Muskegon River. White bass (*Morone chrysops*) and smallmouth bass (*Micropterus dolomieui*) use shallow areas as nursery habitat, but tend to favor ledges and channel edges in open water as adults. The catfishes, particularly the larger species such as flathead catfish (*Pylodictis olivaris*) and channel catfishes (*Ictalurus punctatus*), generally prefer deep areas as adults but may be found in a variety of habitats, particularly as juveniles. Irrespective of their warm-weather habitat preferences, most game species seek deep water in winter.

The Muskegon Lake fishery as a whole is an important recreational resource. Muskegon Lake receives intense fishing pressure, but maintains

the highest catch rate per unit area of any lake studied in the Michigan DNR's Large Lake Program (Hanchin et al., 2007). Panfish, primarily sunfish and yellow perch, are by far the most commonly captured gamefish and account for over 90% of the lake's total annual fish harvest (Hanchin et al., 2007). Largemouth and smallmouth bass, northern pike, and walleye are also highly sought by recreational anglers, as are Chinook and coho salmon and brown trout.

The lake's non-game species are mostly fairly common darters or minnows, although the non-game fish community also contains some unique species such as lampreys, trout perch, pirate perch, and freshwater drum. Non-game species are distributed fairly evenly throughout the nearshore areas of the lake, including the Project area. A few species, such as grass pickerel, central mudminnow, and pirate perch are particularly adapted to heavily vegetated backwaters. Most non-game species tend to favor shallow habitats, but exceptions including brook silversides, alewives, gizzard shad, and ciscoes are all common in open water. The suckers, darters, madtoms, and some of the lampreys are exclusively demersal, whereas killifish, silversides, and some of the shiners tend to be found most often near the surface.

Several fish species in the Project area, including some of the recreationally important gamefish, are not native to Muskegon Lake. None of these fish species are considered high priority invasive species by the MDNR (MDNR, 2009b). The potential exists for several invasive fish species such as round gobies (*Neogobius melanostomus*) and at least four species of Asian carp to be introduced to Muskegon Lake in the future via its connection to Lake Michigan (MDNR, 2009b), but none of these species are currently known to occur in Muskegon Lake.

3.5.1.5 Threatened and Endangered Species

The state-threatened lake sturgeon (*Acipenser fulvescens*) occurs in Muskegon Lake. Lake sturgeon prefer large shallow lakes and rivers, and are also found in the nearshore areas of the Great Lakes. They require silt-free coarse substrate such as gravel and cobble bars to spawn, and lake populations tend to ascend tributaries to spawn, but other times of the year they may be found feeding on macroinvertebrates over a variety of substrates (MDNR, 2009c).

Two state special concern species, pugnose shiner (*Notropis anogenus*) and spotted gar (*Lepisosteus oculatus*) may occur in the Project area, but the available information on these species' distributions is contradictory, and it is difficult to determine with certainty whether these species exist in Muskegon Lake. O'Neal (1997) states that both species are found in the

Muslegon River watershed. He also indicates that pugnose shiners are found in lakes in the watershed, and spotted gar occur in Muskegon Lake, however; he omits both species from the distribution maps in the watershed assessment. The Michigan Natural Features Inventory (MNFI) contradicts O'Neal's claims regarding both species' distributions (MNFI 2009a and 2002). MNFI (2009a) claims that pugnose shiners have not been found in the Muskegon River watershed in the last 20 years. MNFI (2002) suggests that spotted gar was not historically present in the Muskegon River watershed and indicates that recent sightings of the species have been limited to the Kalamazoo and St. Joseph Rivers, but the MNFI's spotted gar distribution map indicates that this species is present in Muskegon County. Both species are associated with dense vegetative growth and pugnose shiners are sensitive to turbidity, so if they occur in the lake they will be patchily distributed through the Project area (MNFI, 2009a and 2002).

3.5.2 Environmental Consequences

3.5.2.1 Proposed Action Alternative

The most significant positive effect of the Project on aquatic resources will be the direct effect on littoral habitat. The Project will restore approximately 23.6 acres of natural nearshore lake bottom and approximately 10,007 linear feet of naturally vegetated shoreline, and create or restore approximately 11.6 acres of emergent wetland and approximately 15.6 acres of open water wetland (WMSRDC, 2009). The restoration activities will substantially advance progress toward achieving restoration goals for three BUIs identified for the Project area: Loss of Fish and Wildlife Habitat, Degraded Fish and Wildlife Populations, and Degraded Benthos. The restoration of the fish and wildlife habitat and the removal of the BUIs will ultimately lead to the delisting of Muskegon Lake as an AOC. Long-term effects of the Project on aquatic habitat will be positive, but temporary adverse impacts can occur over the short term. Restoration of the nearshore zone will entail removing artificial fill, which will disturb the existing sedimentary profile within the footprint of the areas to be restored and may negatively affect water quality over the short term through increased turbidity and re-suspension of potentially contaminated sediments (see Sections 3.1 and 3.3). These impacts will be minor and temporary; however, over the long term, the Project will provide the opportunity for more natural sediment horizons to form through fluvial processes. This benefit will take time to be fully realized, but will probably be evident within a few years of the Project being undertaken. The Muskegon River is the most significant fluvial source of sediment to the lake, so recovery of natural sediment horizons will begin in

the eastern part of lake close to the mouth of the river and progress in a westerly direction across the lake bottom.

Sediment conditions are an important factor in the distribution of aquatic vegetation because sediment characteristics directly influence the rooting process and the stability of the plants once they become rooted. Re-establishing a more natural sediment profile will thus indirectly benefit native aquatic vegetation by promoting aquatic plant expansion and growth. Removing artificial fill from the Project area will also partially reduce the potential for future uptake of contamination into the food web, which will benefit the entire ecosystem. The ecological benefits will be noticeable first in the macroinvertebrate community, as the current trends of re-establishment of pollution intolerant species in the lake and development of a more natural species composition will continue and possibly accelerate as a result of the Project. The Project will physically remove some portion of the benthic populations in areas where fill is removed. This will impact native species and invasive mussels alike, but the impacted populations will be expected to recover quickly.

The effects of restoration on fish will be mixed and will take several years to be fully realized. Restoration of the shoreline to a more natural condition and especially the re-establishment of native aquatic vegetation will improve spawning conditions for several species and promote the survivorship of young fish in general. Positive effects will be most noticeable in species with a strong affinity for vegetated shallows throughout their lives, such as northern pike, largemouth bass, most of the sunfishes, spotted gar, pirate perch, and central mudminnow. Sunfishes account for the bulk of the recreational catch in Muskegon Lake, so the direct positive effects of the Project on sunfishes will be expected to have indirect positive effects on recreational fisheries, both in terms of the number and size of fish caught.

In addition to having positive effects on all life stages of species that occur in vegetated areas as juveniles and adults, the Project will increase juvenile survivorship in species that are only dependent on vegetation as nursery habitat. However, the potential exists for some negative fishery-related effects, as well. Beyond temporary negative effects of increased turbidity on sediment-intolerant species and on fishing in general, the quality of some gamefish in Muskegon Lake may change permanently. The scarcity of natural littoral nursery habitat in Muskegon Lake currently increases competition in young fish, effectively acting as a bottleneck to maturation and allowing only the most vigorous competitors to survive to adulthood. Competition among adults in species that move out of the littoral zone as adults (such as smallmouth bass and white bass) is therefore somewhat reduced, so adults of these species may currently be somewhat uncommon

in the lake, but have the potential to grow to a large size because they have little competition for resources once they reach adulthood. Restoration activities may reduce this bottleneck, thereby increasing competition for resources in adults and creating downward pressure on adult vigor as more adults compete for limited habitat and forage resources.

In summary, the Project will have several positive effects on most species of fish including most recreationally important species. Most recreational anglers can reasonably expect to catch more and larger fish in the future as a result of the Project, particularly if they target species that inhabit vegetated shallows as adults. Gamefish that rear in vegetated areas but move into open water as adults may also become more abundant in the future, however there may be fewer exceptionally large individuals of these species in the future as a result of the Project.

3.5.2.2 No Action Alternative

The No Action Alternative will not affect aquatic biological resources directly or indirectly. It will allow for existing habitat conditions to remain in their current impaired state, and there will be no improvement to current habitat or conditions. Furthermore, the No Action Alternative will not result in the delisting of Muskegon Lake as an AOC.

3.6 TERRESTRIAL WILDLIFE

3.6.1 Affected Environment

3.6.1.1 Wildlife Habitat

Muskegon Lake and the associated habitats of dunes, wetlands, river/streams, and woodlands provide breeding, migratory, and wintering habitat for a variety of terrestrial wildlife species.

Focus Area 1 provides a mix of dune habitat and fragmented wetland habitat. The eastern portion of Focus Area 1 provides few narrow strips of wetland habitat intermixed with industrial areas. The western portion of Focus Area 1 was once occupied by a large dune known as Pigeon Hill, which was removed and leveled during sand mining activities. Part of the former dune area is currently developed as Harbour Towne Condominiums and Marina, while remaining undeveloped land reestablished itself as natural area. Although degraded from its original condition, native dune vegetation and isolated interdunal wetlands within the area provide valuable habitat for amphibians; reptiles, such as hognose snakes; mammals, such as white-tailed deer, muskrats, and raccoons; and

waterfowl and shore birds (City of Muskegon, 1997). According to the MDNR's Endangered Species Assessment tool, the area has "potential for endangered, threatened, or special concern species, high quality natural communities, or other unique natural features to occur" (MDNR, 2009a). According to the 1995 Wildlife Habitat Assessment, no threatened or endangered species were found in the former dune area (Day & Associates, 1995). There was a recorded occurrence of piping plover, an endangered species, in 1972 in the Muskegon State Park located across the channel and north of Focus Area 1 (Day & Associates, 1995).

Focus Areas 2 and 3 are heavily developed shoreline areas. Extensive filling of lake and wetlands with industrial waste and hardening of the shoreline resulted in isolated, narrow patches of wetland and riparian wildlife habitat dispersed throughout the focus areas (MLWP, 2007). The western bank of the Ruddiman Creek outlet into Lake Muskegon, located in Focus Area 2, provides a scrub-shrub wetland habitat mostly utilized by song birds, small mammals, and reptiles. The wetland vegetation near the shoreline may be utilized as a nesting area by waterfowl. The shoreline northeast of the former Amoco Oil tank property provides shrub willow/isolated marsh habitat. Although it is one of the longest sections of undeveloped shoreline, it is isolated and narrow and thus is considered a marginal wildlife habitat. The area at the western end of the peninsula by Western Avenue provides habitat characterized as an old field community, which is a transitional environment occurring on abandoned fields and pasturelands (City of Muskegon, 1997).

Focus Area 4 encompasses Muskegon River outlets (North, Middle, and South branch) and the associated wetland habitats of isolated marshes and macrophyte beds. In addition, the area comprises the Richard's Park habitat area, an adjacent power plant habitat management area, and a large field and marsh located northeast of Fisherman's Landing (Day & Associates 1995, City of Muskegon 1997). The habitat patches in Focus Area 4 are large enough to support bigger mammals such as white-tailed deer and red fox, as well as small mammals, song birds, reptiles, amphibians, and water fowl. Movement of mammals in and out of the area is restricted by the causeway that serves as a high-traffic barrier to the otherwise favorable habitat (Day & Associates, 1995).

Muskegon County is known habitat for several threatened and endangered terrestrial wildlife species. Indiana bat, piping plover, and Karner blue butterfly are all federally listed endangered species found in Muskegon County while Eastern massasauga rattlesnake is a federal candidate species. State listed endangered species found in Muskegon County include Henslow's sparrow, piping plover, prairie warbler, peregrine falcon, and Kirtland's snake. State listed threatened species include red-

shouldered hawk, least bittern, Cerulean warbler, yellow-throated warbler, Louisiana water thrush, Persius dusky wing, frosted elfin, Karner blue, and spotted turtle (MNFI, 2009b). There were no threatened or endangered species identified in the Muskegon Lake area during the habitat assessment performed by Day & Associates (1995). Table 3.6-1 presents wildlife species identified during wildlife habitat assessment (list is limited to the wildlife found in the Focus Areas). Table 3.6-2 shows types of wildlife likely impaired by the loss of habitat in the Muskegon Lake area (MLWP, 2008). Many of the likely-impaired wildlife species have not been identified in the area during habitat assessment by Day & Associates and they are not listed by MNFI as occurring in the Muskegon County.

Table 3.6-1 Wildlife Species Identified during 1995 Wildlife Habitat Assessment

Urban birds	**Nesting Waterfowl**	**Shorebirds**	**Migrating waterfowl**	**Mammals**	**Amphibians**	**Reptiles**
Blue jay	Canada goose	Blue heron	Common merganser	Brown bat	American toad	Eastern garter snake
Cardinal	Mallard duck	Herring gull	Buffle-head	Chipmunk	Bull frog	Northern water snake
House sparrow	Mallard-domestic duck hybrid	Kill deer	Golden-eye	Cottontail rabbit	Northern leopard frog	Painted turtle
House wren	Mute swan	Kingfisher		Mole		Snapping turtle
Pigeon	Wood duck	Ring-billed gull		Muskrat		
Robin		Spotted sandpiper		Norway rat		
Starling		Swallow		Opossum		
				Raccoon		
				Shrew		
				Skunk		
				Squirrel		

Table 3.6-2 Wildlife Types Likely Impaired by the Loss of Habitat in the Muskegon Lake Area

Amphibians	Waterfowl	Marsh Birds	Mammals	Reptiles
American toad	Bald eagle*	American bittern* +	Fox	Blanding's turtle* +
Bull frog	Blue-winged teal	American coot	Mink	Eastern box turtle* +
Green frog	Canada goose	Belted kingfisher	Muskrat	Map turtle
Northern leopard frog #	Canvasbacks	Black tern* + #	Otter	Musk turtle
Salamanders	Common nighthawk	Black-crowned night heron* +	Other fish-eating mammals	Painted turtle
Skinks	Hooded merganser	Caspian tern**		Red-eared slider
Spring peepers	Lesser scaup	Common moorhen** +		Snakes
Wood frog	Mallard	Common tern #		Snapping turtle
	Merlin**	Great blue heron		Spiny soft-shell turtle
	Osprey*	Green heron		Spotted turtle***
	Peregrine falcon***	Least bittern		Wood turtle * +
	Trumpeter swan**	Marsh wren*		
	Wood duck	Sedge wren* +		
		Spotted sandpiper		

Michigan: *Special Concern, **Threatened Species, *** Endangered Species (MNFI, 2009b) Federal: # Species of Concern, + Rare/Declining (USFWS, 2009)

3.6.2 Environmental Consequences

3.6.2.2 Proposed Action Alternative

The Proposed Action Alternative will result in temporary disturbance activities and habitat alterations at the potential restoration Sites. However, the Proposed Action will have beneficial effects on terrestrial wildlife and once restoration activities are complete, these Sites will provide increased amounts of wildlife habitat and will create corridors that allow for greater movement of wildlife between formerly isolated patches. Although no federally or state listed threatened or endangered species have been identified in the Project area, habitat improvements will likely benefit any species present and can encourage future habitat use.

Restored or newly created wetlands will be able to support greater and more diverse numbers of migratory and resident waterfowl, potentially serving as nesting areas to species not currently able to utilize the degraded habitat. Removal of riprap along the shore will open up new

habitat for shorebirds and will allow easier water access for amphibians, which depend on both land and water to complete their life cycle.

Adverse terrestrial wildlife impacts due to temporary disturbance at Sites B, C, G, H, and I will be minimal as those Sites are not adjacent to high-quality wildlife habitats. Removal of riprap in those areas may temporarily disturb or destroy the habitats of small rodents and reptiles and may limit the use of the area by urban bird species and shorebirds. Once restoration activities are complete, these Sites will offer better wildlife habitats with diverse native plant assemblages.

Restoration activities at Sites A, D, E, F, J, K and L will temporarily impact greater numbers of wildlife species as those areas are in a close proximity to current wildlife areas. Potential impacts at these Sites are detailed below:

- Site A - impacts at the Site itself will be minimal due to the small size of the proposed restoration area. However, performance of restoration activities and increased noise levels in the vicinity of the former Pigeon Dune area may temporarily limit the use of the former dune area by wildlife species. The area may potentially be used by wildlife populations found within the nearby State Park.
- Site D - increased activity and construction in the vicinity of Ruddiman Creek habitat may temporarily limit use of the habitat by nesting birds or may lead to abandonment of eggs, if activities are carried out once nests have been established. Increased noise and activity may also render the habitat temporarily unfavorable for small mammals and reptiles. However, affected wildlife will have access to inland habitat along Ruddiman Creek for the duration of restoration activities.
- Site E - temporary disturbance may occur to shorebirds using the shoreline habitat northeast of former Amoco Tank Farm. Once finished, Site D and E will create a link between Ruddiman Creek and the shoreline habitat, resulting in more favorable wildlife corridor.
- Site F - temporary disturbance may occur to wildlife using the Western Avenue old field area due to increased noise and activity level.
- Site J and K - temporary disturbances may occur to wildlife using the old field area north of Fisherman's Landing due to increased noise and activity level.
- Site L- restoration activities may limit the use of the wetlands by nesting waterfowl or may lead to abandonment of eggs, if activities are carried out once nests have been established. However, the removal of invasive plants and subsequent revegetation with native species will create a more diverse habitat suitable for a wide range of waterfowl.

Restoration activities and revegetation of the Sites will address several BUIs, particularly Wildlife Habitat Restoration and Loss of Fish and Wildlife Habitat.

3.6.2.1 No Action Alternative

The No Action Alternative will not affect terrestrial wildlife directly or indirectly. It will allow for existing habitat conditions to remain in their current impaired states, and there will be no improvement to current wildlife habitat.

3.7 VEGETATION

3.7.1 Affected Environment

Historically, the Project area has been dominated by white pine-white oak forests, with hardwood swamps and marshes present along the river channels (City of Muskegon, 1997). Modifications and development of the shoreline have resulted in current conditions of small patches of wetland, grassland, and shrub habitat intermixed with industrial and residential land development. Vegetation along the shoreline consists mainly of grasses and sedges, shrub willow, cottonwood, red-osier dogwood, and goldenrod growing amongst the rip-rap. Vacant industrial areas have been colonized by old field community species, a stage of plant growth between bare ground and forest that occurs on abandoned fields and pasturelands (ODNR, 2009). Vegetation in those areas includes cottonwood, spotted knapweed, milkweed, sumac, and honeysuckle (Day & Associates, 1995).

The remnants of Pigeon Dune habitat, found in Focus Area 1, provide a mix of dunes and interdunal wetland habitat colonized by diverse vegetation that includes grasses, sedges, shrubs, and trees such as Jack pine (*Pinus banksiana*), sand cherry (*Prunus pumila*), and cottonwood (*Populus balsamifera*). The area is suitable habitat for the federally and state listed threatened Pitcher's thistle (*Cirsium pitcheri*); however, none were found during a 1995 habitat assessment (Day & Associates). Focus Area 1 also contains isolated habitat patches characterized as shrub willow/isolated marsh complex (City of Muskegon, 1997). Please refer to Figure 7 for land cover in the Project area.

Focus Area 2 contains the Ruddiman Creek outlet with scrub-shrub wetland vegetation consisting of willow, shrub dogwood, and eastern cottonwood saplings. Upland lakeshore areas contain willow, shrub dogwood, viburnum, and sumac vegetation, as well as white birch (*Betula papyrifera),* cottonwood, black locust (*Robinia pseudoacacia*), and oak trees.

The Western Avenue peninsula contains a natural area characterized as an old field community and containing such species as cottonwood, spotted knapweed (*Centaurea maculosa*), staghorn sumac (*Rhus typhina*), and tartarian honeysuckle (*Lonicera tatarica*). Prevalent invasive species in the Focus Area include common reed (*Phragmites australis*) and narrow-leaf cattail, which are present in the wetlands between the former Amoco Tank Farm and the Yacht Club. Other invasive plants in Focus Area 2 include Japanese knotweed (*Fallopia japonica*), tartarian honeysuckle, purple loosestrife (*Lythrum salicaria*), and glossy buckthorn (*Frangula alnus*). Due to the amount of invasive plants in the area, portions of the upstream Ruddiman Creek and the shoreline between the Amoco Tank Farm and the Yacht Club have been designated as key invasive management areas by the Ecological Restoration Master Plan (Biohabitats, 2008).

Downtown Focus Area 3 is heavily developed along the shore and contains only few patches of habitat. Landscaped areas around the YMCA/Rotary Park contain a variety of tree species. Grasses, sedges, and herbaceous plants are present among the rip-rap hardening the shore (Day & Associates, 1995).

Focus Area 4 encompasses wetland habitat around the mouth of Muskegon River and an old field/woodlot community, located northeast of Fisherman's landing. Trees in this area include box elder (*Acer negundo)*, cottonwood, black willow (*Salix nigra*), and shrub willow. Old field community plants include grasses and sedges, spotted knapweed, cottonwood, sumac, honeysuckle, and Queen Anne's Lace (*Daucus carota*), among others. Cattail, spotted jewelweed (*Impatiens capensis*), and red-osier dogwood (*Cornus sericea*) are present in the marshes (Day & Associates, 1995). The invasive common reed is present in the woody wetlands north of the North Branch of the Muskegon River (GLC and WMSRDC, 2009).

Pitcher's thistle is the only federally listed threatened plant species in Muskegon County, last recorded in 2006. There are no federally listed endangered plant species present in Muskegon County (USFWS, 2009). State listed threatened plant species found in Muskegon County include Pitcher's thistle, bastard pennyroyal (*Trichostema dichotomum*), tall green milkweed (*Asclepias hirtella*), ginseng (*Panax quinquefolius*), nodding pogonia (*Triphora trianthophora*), umbrella grass (*Cyperus alternifolius*), Atlantic blue-eyed grass (*Sisyrinchium atlanticum*), tinted spurge (*Euphorbia commutata*), prairie smoke (*Geum triflorum*), Northern prostrate clubmoss (*Lycopodiella margueritae*), lake cress (*Armoracia lacustris*), Virginia water-horehound (*Lycopus virginicus*), scirpus-like rush (*Juncus scirpoides*), bald-rush (*Rhynchospora scirpoides*), Hall's bulrush (*Schoenoplectus hallii*), bladderwort (*Utricularia* sp.), and wild rice (*Zizania aquatica*). The only

state listed endangered plant in Muskegon County is the purple spike rush (*Eleocharis atropurpurea*) (MNFI, 2009b). None of the state listed threatened or endangered plants were identified in the habitat assessment performed in 1995 (Day & Associates).

Beginning in 2002, MRWA and the USFWS Coastal Program have undertaken efforts to control non-native invasive plants and to reestablish the state-threatened wild rice in the Muskegon Lake by successfully planting several sites in the lake with wild rice and other wetland plants (GLC and WMSRDC, 2009). The planting of the wild rice is a habitat improvement benefit by restoring natural habitat for cover for wildlife and fish and provides sustenance for wildlife species. These efforts help to address the BUI Wildlife Habitat Restoration.

3.7.2 Environmental Consequences

3.7.2.1 Proposed Action Alternative

The Proposed Action Alternative will directly and beneficially affect plant habitat at the 12 restoration Sites. Activities such as softening of the shoreline will provide a more suitable growing medium for many of the native plants. Revegetation with native plant species as part of the restoration activities will prevent establishment of invasive plants in disturbed areas and will increase the diversity of plant communities present at those sites. Once re-vegetated, the native plant communities will serve as a source for natural propagation of species throughout the nearby areas and will serve to stabilize the soil, protecting the habitat for future vegetation. Establishment of new wetland areas will create new habitat for wetland plants, as discussed in Section 3.4. Removal of invasive plants from the restoration areas will open up available habitat for native plant species, which have been outcompeted by the fast growing invasive plants. The revegetation of native plants to the 12 Sites will address several BUIs, particularly Wildlife Habitat Restoration and Loss of Fish and Wildlife Habitat.

Although no federally or state listed threatened or endangered species have been identified in the Project area to date, some listed species may be present. Habitat improvements will likely benefit any species present, the great majority of which require habitat protection and are vulnerable to filling and other disturbance activities. One species, bastard pennyroyal, may thrive in recently disturbed areas, but it prefers dry oak savannah habitat and is unlikely to occur at the Project Sites.

Adverse impacts from restoration activities will vary depending on the habitat present at the restoration Site. Removal of rip-rap and fill material

will disturb the growing substrate utilized by plants and therefore lead to the direct mortality of individual plants, potentially including trees, at the restoration Sites. In addition, small plants will be affected by movement of equipment, on-site storage of materials, and increased foot traffic at and around the restoration Sites. Proximity of invasive plants in the area can lead to colonization of restored Sites and nearby areas disturbed by construction by non-native plant communities. Adverse effects shall be reduced by limiting the extent of disturbed areas as practicable, storing equipment and materials on previously disturbed areas, and prompt seeding of disturbed areas immediately after earth change activities are completed.

3.7.2.2 No Action Alternative

The No Action Alternative will not affect vegetation directly or indirectly. It will allow for existing habitat conditions to remain in their current impaired state, and there will be no improvement to current plant habitat.

3.8 CULTURAL AND HISTORIC RESOURCES

3.8.1 Affected Environment

Cultural resources within Muskegon County and the City of Muskegon can encompass archaeological and historic resources, including but not necessarily limited to buildings, structures, objects, districts, and sites. These resources represent a variety of periods ranging from the prehistoric to the present day.

3.8.1.1 Archaeological and Historic Resources

Muskegon County is located in southwestern Michigan along Lake Michigan. The county was named after the Ottawa term "Maquigon," which meant the "marshy river" or "swamp." The earliest known resident of the county was Edward Fitzgerald, a fur trader and trapper who resided in the Muskegon area in 1748 (Yakes, 2006). His trade relationships helped establish a reputation for the area for its natural resources.

Settlement of Muskegon began in 1837, when Muskegon Township was organized as a subdivision of Ottawa County.[i] The era of settlement coincided with the beginning of the exploitation of the area's timber resources. At the end of the nineteenth century, lumbering was pushed aside for the development of large industrial complexes (Yakes, 2006).

[i] Muskegon County became its own entity in 1859 (Yakes, 2006).

The City of Muskegon's history includes a link to the lake and river. The city grew as a transportation hub for lumber as it provided a link between the inland cities to Lake Michigan. However, few of the city's historic buildings are located directly on the lakefront. Most of these properties are located in the downtown, or in the several designated historic districts contiguous with it (City of Muskegon, 1999).

Archaeological and historic resources in the City of Muskegon include 13 archaeological sites (10 historic sites and 3 prehistoric sites) and 23 National Register of Historic Places (NRHP) listings, State Register listings, and National Historic Landmarks (NHL). Two of the 23 listings are located on the water. These include the S.S. Milwaukee Clipper and the USS Silversides. Both of these properties are listed on the NRHP and as NHL properties (MHAL, 2006).

The majority of the 13 archaeological sites are located along the coastline throughout all four Focus Areas. One archaeological site appears to be in close proximity to the Site A, while the remaining archaeological sites do not appear to be located near any of the proposed Project Sites. Of the 23 historic properties within the City of Muskegon, one is located on the southern border of Focus Area 1. This property is located within a 1,500-foot radius of Site B. Two historic properties are located within Focus Area 2. One of the properties is within a 1,000-foot radius of Site E, and one is within a 1,000-foot radius of Site G. Within Focus Area 3, 17 properties are present. These sites are located to the east of the railroad tracks, which are approximately 1,300 feet from the nearest Site location. None of the properties are located within Focus Area 4, and three of the properties identified within the city are not located within any of the Focus Areas (Figure 8 Historic Properties). The figure shows a portion of the historic properties with the City of Muskegon and does not contain the archaeological sites.

Like other cities within the United States, the City of Muskegon has an active historic preservation program and a considerable number of interested citizens. The city has developed the *Muskegon Homeowners' and Citizens' Guide for Historic Preservation* (2003). This document outlines existing architectural styles, remodeling techniques, in-fill development, and historic embellishments. The guidelines typically follow the Secretary of the Interior's Standards for Rehabilitation (City of Muskegon, 2003).

3.8.2 Environmental Consequences

3.8.2.2 Proposed Action Alternative

The proposed Project will have both direct and indirect impacts on archaeological and historic resources. However, there will be no significant adverse effect on these resources. The majority of the archaeological sites are located along the coastline throughout the Project area and 20 historic sites are located in or near the Project area. Based on review of SHPO records, one archaeological site appears to be in close proximity to the Site A, and the other 12 archaeological sites are located outside of Sites B-L and their associated work areas. The Project will require ground disturbing activities as part of the restoration and removal of fill. These types of activities may directly impact one existing archaeological site, as well as resources that have not yet been identified. As a result, the potential information that can be gathered from these sites will be lost.

Within the State of Michigan, information on archaeological and historic resources is maintained by the Michigan State Historic Preservation Office (SHPO). The environmental review activities of SHPO are designed to protect historic properties. These actions occur through a review of actions of other agencies or through participation in Section 106 of the National Historic Preservation Act (NHPA) of 1966.[ii] In these reviews, the SHPO advises the agency if the action will have a detrimental effect on historic properties and suggests alternatives to reduce adverse impacts (MHAL, 2009). As part of the review and implementation of this Project, consultation with SHPO was performed. A letter of no adverse effect, dated October 16, 2009, was received from the SHPO and is attached.

The potential for locating new archaeological and historic resources in the Project area is high due to their location along the water and the noted presence of historic activities, including, but not limited to, industrial and shipping ventures. The primary effect will be the potential for increased erosion or exposure of sites for those with intact buried components, once fill is removed.

In the event that any archaeological sites, human remains, funerary items, or associated artifacts are discovered during restoration and removal of fill, activities will need to cease immediately. The SHPO and other relevant

[ii] The Section 106 review process is separate from but is often coordinated with NEPA review. Both Section 106 and the NEPA review processes are intended as analytical tools so that issues concerning both the natural and built environments receive reasonable and fair consideration (MSHPO, n.d.).

officials will be notified, and if necessary, interested federally recognized tribes. Additional mitigation efforts may be needed.

In addition, indirect effects are expected to result from the proposed activities. These effects are associated with views both from and to historic properties. The industrial facilities within the Project area have co-existed with other historic structures for a number of years and in some ways have helped to shape the physical landscape. A change in the vegetation and material composition of the shoreline will alter the physical views that people will have either from or to a historic property. The presence of workers and equipment also will be temporarily included within these views, while site activities were occurring.

Some of the historic properties are located within 1,000 feet of a Site location. The disturbance of vegetation and the presence of workers, equipment, and materials typically will be understood as a temporary adverse impact. The removal of fill material and debris, and its replacement with natural vegetation, will result in a permanent, beneficial effect on historic property views. Mitigation for indirect impacts will not be necessary.

3.8.2.1 No Action Alternative

The No Action Alternative will not impact existing cultural resources either directly or indirectly. This alternative will allow for existing conditions to remain as they currently are. Archaeological and historic resources will neither be preserved in another manner nor damaged under the No-Action Alternative.

3.9 VISUAL QUALITY AND AESTHETICS

3.9.1 Affected Environment

The Muskegon Lake shoreline includes a mixture of industrial, commercial, residential, and recreational land uses. Of these uses, the industrial landscape has left the greatest mark on the visual and aesthetic quality of the shoreline. Numerous industrial facilities have been situated in this vicinity since the late nineteenth century. In this manner, the physical landscape has been shaped primarily by its industrial activities.

Over the past several decades, bulk shipping on the Great Lakes has concentrated in fewer ports and in reduced tonnage primarily due to the interstate highway system. As a result, much of the industrial shoreline

along Muskegon Lake has been reclaimed for public uses, including natural and recreational areas (See Figure 2) (City of Muskegon, 1999).

However, some of the land contained within the twelve Site locations still has physical remnants of these industrial uses. For example, although Site B contains a significant amount of vegetation, a clear, pristine view of the lake is interrupted by fragments from industrial uses, such as chain link fences and floating debris. In addition, the northeastern view from Site I includes a tank farm and industrial buildings. Other Sites within the Focus Areas contain similar views.

The degradation of the aesthetic appeal of Muskegon Lake is considered to be one of the BUIs, as many people consider unmaintained industrial landscapes to be remnants of urban blight. Examples of this include dock and marine facilities in poor repair and scrapped or obsolete equipment along the coast. Unmaintained seawalls and docks, along with broken concrete, detract from the natural visual beauty of the coastline. The presence of these qualities creates a poor image for the City of Muskegon (City of Muskegon, 1997) (USEPA, 2008). Residents within Muskegon identified the need to change the identity of the area from an industrial area to a viable community with a diversity of business, residential, and commercial opportunities (Muskegon County, 2004).

As part of the 1999 waterfront redevelopment plan, the City of Muskegon provided for a visual link between the land and water in order to improve the relationship between the downtown and waterfront uses. The City recognized the lake's important aesthetic value, as well as its ability to provoke a sense of community pride. At the time the plan was written, numerous physical and visual barriers to the water's edge were present. Long stretches of shoreline were off limits to the public both physically and visually. As a result, a primary recommendation within the plan was to preserve development patterns that contained streets running directly to the water's edge (City of Muskegon, 1999). This will result in direct sight lines to the water.

Despite the problems identified in the city plans, numerous bluffs and plateaus offer many panoramic views of Muskegon Lake and surrounding dunes. Existing wetlands also provide a visual amenity through their provision of habitat for wildlife species and a variety of plants (City of Muskegon, 1997). In addition, some people enjoy the man-made scenic views, which include the marinas, ships, and shipping operations. As a result, the City of Muskegon has begun to take advantage of these resources through the development of Shoreline Drive, the Lakeshore Trail, and the dedication of waterfront parks, such as Heritage Landing (a former scrap-yard) and Fisherman's Landing. The city also has ongoing and

future plans for the clean-up of industrial site locations, such as the Amoco Tank Farm (City of Muskegon, 1999 and 2008).

Muskegon Lake also provides an opportunity for the City of Muskegon, and the county, to promote educational and civic activities. Enthusiasm for a place often can result from casual interaction with it, thus improving its overall aesthetic appeal. Existing organizations, such as Grand Valley State University, Muskegon Community College, and the Great Lakes Coastal Wetlands Consortium, utilize the waters and shorelines of Lake Muskegon for collecting samples and conducting aquatic research. These activities provide a connection between the lakeshore and surrounding areas through personal interactions (USEPA, 2008).

3.9.2 Environmental Consequences

3.9.2.1 Proposed Action Alternative

The Proposed Action Alternative will alter the physical landscape through the removal of existing vegetation and fill materials associated with the existing and former industrial uses. Both direct and indirect effects to the visual and aesthetic quality will occur as a result of the proposed Project.

A temporary, direct interruption to the everyday operations and visual appeal will result from the movement of construction equipment and associated activities, including temporary stockpiling of excavated material. The current view will be altered so as to include additional activity not associated with existing industrial, commercial, residential, and parkland uses. Instead, the view will be of moving equipment, materials, and personnel. The movement of these materials and activities will last only as long as the Project activities will occur.

Another direct impact will consist in a permanent change in the physical landscape. As part of the Project activities, industrial fill will be removed, and the shoreline will be softened in some locations. These activities will alter the existing view directly by creating new physical characteristics of the shoreline and associated vegetation.

These alterations will be most noticed by users of the Sites. The view that they typically associate with the existing lakeshore will no longer contain some of the debris and industrial materials associated with the current conditions, and the existing vegetation may appear different, as well. This result will be considered a visual improvement as compared to the existing conditions.

The Lakeshore Trail and parks along the Muskegon lakeshore will be impacted indirectly by the Project. As indicated within Section 3.2 Land Use and Recreation and Section 3.10 Transportation, access to these resources will be temporarily restricted on a site-specific basis to allow for the movement of materials and workers. The visual and aesthetic quality that currently is felt by existing users will be impacted along open portions of these recreational spaces as users will be subject to the views of these activities, which will be quite unlike the typical views anticipated within a trail or park setting. These settings often provide a sense of calm and serenity, as well as an association with nature. These sentiments may be interrupted by the presence of heavy machinery and workers, although for only a short time during the duration of construction.

However, the restoration and removal of fill also will provide indirect benefits for the residents and visitors to Muskegon County and surrounding areas. As previously indicated, industrial fill materials and debris will be removed from the shoreline. This will help eliminate some of the urban blight areas identified in the 1997 Master Plan for the City of Muskegon and will provide an overall visual improvement to the Muskegon Lake shoreline area to help address the Degraded Aesthetics BUI. Additional opportunities for community involvement and educational programming will be present during the restoration and removal activities, as well as when the Project will be completed, further improving by indirect means the aesthetic attraction of the shoreline.

3.9.2.2 No Action Alternative

The No Action Alternative will not impact the existing visual quality and aesthetic appeal either directly or indirectly. This alternative will allow for the existing conditions to remain as they currently are. Thus, the visual and aesthetic quality of the lake will not be further degraded or improved.

3.10 TRANSPORTATION

3.10.1 Affected Environment

3.10.1.1 Transportation Network

State of Michigan

Within the State of Michigan, the transportation network consists of roadways, rail lines, ports, and airports. The primary mode of

transportation for people and goods is via roads, although other transportation modes are used as well.

The four Focus Areas contained within this Project are located along Muskegon Lake. Regional access into this area of the state is provided by state roadways under the jurisdiction of the Michigan Department of Transportation (MDOT). These roadways include U.S. 31, which is the primary north-south road for communities along the coast of Lake Michigan; Seaway Drive (Business 31), which provides the most direct route to the downtown center of Muskegon; Apple Avenue (M-46), which is a state highway providing access to townships and communities to the east; and M-120, which begins in the City of North Muskegon and terminates in Hesperia on the Oceana and Newaygo county line at M-20 (Muskegon County, 2004). County and local roadways then provide immediate access into the four Focus Areas.

Muskegon County

Muskegon County is well-served by a series of freeways, state highways, major roads, and local roads. In addition to MDOT, the Muskegon County Road Commission is responsible for a total of 693 miles of roads within the county (Muskegon County, 2004).

Similar to the rest of the State, within Muskegon County, the primary means of transportation is the personal motor vehicle. Alternate modes of transportation are being considered in order to reduce auto dependency and to promote high air quality. Transportation within this county is directed by plans implemented by the WMSRDC (Muskegon County, 2004).

Transportation in Muskegon County not only includes vehicular traffic but also non-motorized transportation. Non-motorized transportation within the area includes the Hart-Montague Trail, the Musketawa Trail, the White Lake Pathway, and the Lakeshore Trail. The Lakeshore Trail is within the Project area and includes approximately 10 miles of trail along Muskegon Lake.

The County also is served by the CSX Transportation and Michigan Shoreline Railroad, a CSX partner. Freight services are available from Muskegon to Muskegon Heights (Muskegon County, 2004). Existing railroad tracks follow Lakeshore Drive and Western Avenue along the shoreline through all four Focus Areas.

The Port of Muskegon is the primary commercial port on Lake Michigan serving Muskegon County and the surrounding area. Eight local marinas

also are available for commercial use within the county; non-commercial marinas also are present. The Lake Express provides high speed ferry service across Lake Michigan for residents and visitors. This service connects Milwaukee, Wisconsin with Muskegon (Muskegon County, 2004).

The Lake Express dock is located at 1918 Lakeshore Drive within the city of Muskegon. This location is within the southwest corner of Focus Area 2. Five marinas are located within Focus Area 1. These include, from west to east, the Harbour Towne, Pigeon Key, Bluffton Bay, Torreson Marine, and Balcom Marinas. The Great Lakes Marina and Storage and Lake Shore Yacht Harbour are located in Focus Area 2, while the Hartshorn and Terrace Point Marinas are located in Focus Area 3.

Air service is available at the Muskegon County Airport, which is located in Norton Shores approximately 4 miles south of the Project area. Commercial airlines provide regional services at this location. Corporate and private aircraft also utilize this airport (Muskegon County, 2004).

City of Muskegon

Similar to Muskegon County, the City of Muskegon's roadway system consists of freeways, state highways, major roads, and local roads (see Figure 9). Internally, the City of Muskegon is served by a network of north-south and east-west roadways.

Within the City of Muskegon, traffic moving east and west typically travels along Apple, Laketon, and Sherman roads, using Henry, Getty and Seaway Drive to travel north and south (City of Muskegon, 1997). Average daily traffic along these roadways varies from a low of 2,978 (on Lakeshore northeasterly of Laketon) to a high of 32,800 (on Seaway from Laketon to Sherman). Lakeshore Drive and Shoreline Drive will provide the primary access to the 12 Site locations once within the City of Muskegon.

The City of Muskegon recently began programs to equalize the use of streets, among motorists, pedestrians, and bicyclists. For instance, the city has expanded facilities to accommodate bicyclists in the downtown area with the installation of bike racks and the implementation of the Lakeshore Trail (City of Muskegon, 2008).

3.10.1.2 Transport of Materials

State and county roadways have use restrictions placed on them by MDOT and the Muskegon County Road Commission for commercial motor vehicles. Restrictions are based on vehicle size, weight, and the time of

year for travel (MDOT, 2009). Temporary seasonal weight restrictions are typically placed on county roads each spring.

3.10.2 Environmental Consequences

3.10.2.1 Proposed Action Alternative

The proposed Project will have no significant impact on transportation within the communities in the Project area once the Project was complete. Nominal increases in the use of the Lakeshore Trail and roads along the southern shoreline of Muskegon Lake (such as Lakeshore Drive and Shoreline Drive) may occur particularly during warmer months due to increases in tourism encouraged by the Project.

However, during construction, residents, workers, and visitors will experience both direct and indirect impacts. The potential transportation impacts associated with the Project are temporary and mainly limited to the immediate surroundings of the 12 Site locations.

Direct impacts for transportation will be associated with the temporary closure of roadways, road lanes, and the non-motorized Lakeshore Trail. Intermittently over the duration of the Project construction activities, access may be limited to specific site locations while work is being completed. Once the Project is completed, public access to the shoreline will be improved over the current conditions, as additional opportunities will be available for non-motorized trails and paths and public easements to the lakeshore. The Project activities will allow for the removal of industrial fill, concrete, and other materials that have isolated the natural resources found along the lakeshore and prevented safe access to Muskegon Lake.

Indirect impacts will be minor in nature and consist of additional construction traffic and re-routing of traffic. Equipment used for the restoration activities and the removal of fill will need to be delivered to the individual sites and eventually removed. Likewise, fill and waste materials will need to be disposed of and transported off-site. During the construction period, additional localized traffic will result due to these activities, along with the generation of additional noise and dust from the movement of the vehicles and equipment. These impacts will not be experienced by local residents, visitors, or workers once the Project is completed.

The proposed Project also is expected to generate or retain approximately 125 jobs. This will contribute to additional traffic on city roadways. However, the amount of additional traffic will be negligible.

While few impacts are expected, the proposed Project may require the use of vehicle permits for the delivery and removal of construction materials. For any construction vehicles operating with overweight loads, proper permitting will be required. Detailed routes may be required to meet load restrictions on bridges and particular local roads, and construction scheduling may need to accommodate seasonal weight restrictions.

3.10.2.2 No Action Alternative

The No Action Alternative will not impact the existing transportation network or associated traffic directly or indirectly. This alternative will be compatible with transportation plans and programs, because it will allow for the existing conditions and proposed improvements to remain as they currently are.

3.11 AIR QUALITY

3.11.1 Affected Environment

Air quality data for USEPA criteria pollutants measured from air monitoring sites for the state of Michigan are published annually by the MDEQ. The most recent summary of annual air quality data is reported in the *MDEQ 2007 Annual Air Quality Report for Michigan* (MDEQ, June 2009). Through 2007, the criteria pollutants CO (carbon monoxide), Pb (lead), NO_2 (nitrogen dioxide), and SO_2 (sulfur dioxides), continue to remain in attainment of the National Ambient Air Quality Standards (NAAQS) over the entire state of Michigan, including Muskegon County. For O_3 (ozone), on May 16, 2007, USEPA accepted MDEQ's petition and re-designated Muskegon County (and 15 other Michigan counties) as attainment for 8-hour ozone. EPA also approved a State Implementation Plan (SIP) for Muskegon County that lays out a maintenance plan for the state to ensure that the county continues to remain in attainment. On October 16, 2006, a new standard for criteria pollutant particulate matter (PM) was put in place which requires an area to be in compliance based on particle size (i.e., fine particulates). For daily PM_{10} (particulate matter smaller than 10 microns) and annual and daily $PM_{2.5}$ (particulate matter smaller than 2.5 microns), Muskegon County and the surrounding counties are currently considered to be in attainment.

3.11.2 Environmental Consequences

3.11.2.2 Proposed Action Alternative

This proposed Project alternative will result in air emissions from earth moving vehicles during construction. Reductions in air quality resulting from these impacts, however, will be minor, relatively localized, and temporary in nature.

In addition, excavation and earth moving activities can cause re-entrainment of dust particulates and possibly other pollutants into the atmosphere due to removal of sawdust, dirt, slag, wood debris, and other materials. This effect will also be temporary and primarily local in nature, although some transport of minor amounts of airborne pollutants to downwind nearby locations within or outside the focus areas of the proposed Project can occur.

No significant long-term air quality related impacts are expected under the proposed Project. Minor increases in air emissions can result from increased vehicle and boat traffic associated with enhanced tourism generated by the Project, but these effects are expected to be negligible.

3.11.2.1 No Action Alternative

The No Action Alternative will have no affect on existing air quality conditions. Under the No Action alternative, ground disturbing impacts from restoration related activities under the proposed Project will not occur. Thus, air quality impacts from material re-entrained into the ambient air and transported or deposited downwind will be avoided.

3.12 NOISE

3.12.1 Affected Environment

Noise is typically defined as "unwanted sound." It may be as mild as a general nuisance, such as a noise causing distraction or masking desired sounds, or severe enough to impede communication, affect behavior, and cause temporary or permanent hearing loss.

Noise is measured in units of decibels (dB) on a logarithmic scale. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies are given more "weight." The A-weighted decibel (dBA) scale corresponds to the sensitivity range for human hearing. A noise level change of 3 dBA is barely perceptible to average human hearing. A 5 dBA

change (either an increase or a decrease) in noise levels, however, is clearly noticeable. A 10 dBA change in noise levels is perceived as a doubling (if it is an increase in noise levels) or halving (if it is a decrease) of noise loudness.

The Project area contains a wide variety of outdoor sound environments, from industrial facilities to well traveled city streets to parks. Sound sources in parks typically originate from recreational activities and can result in decibel levels in the 60-70 dBA range, but can be higher depending on the activity. Noise levels from car and truck traffic on city streets within the focus areas will usually be higher, in the range of 70-90 db. For locations near the various industrial sites, sound can be in the 80-90 dBA range, but can have short duration decibel spikes above 100 dBA, depending on the type of process occurring. By way of comparison, typical indoor environments usually maintain sound levels in the 50-60 dBA range (USDOT, 1977).

3.12.2 Environmental Consequences

3.12.2.1 Proposed Action Alternative

Noise generated by construction equipment as a result of the Project activity is likely to constitute the greatest increased noise impact above existing conditions. It is anticipated that earth moving machinery such as bulldozers, backhoes, and dredges, or supporting transport equipment like heavy trucks and barges, will be utilized in the restoration activities. These sources of sound can cause temporarily elevated noise levels within and near the Project area. Table 3.12-1 provides the range of noise levels experienced for typical construction equipment approximately 50 feet from the source of the noise.

Table 3.12-1 Typical Noise from Construction Equipment (dBA)

Sound Pressure Level (dBA)	Typical Sources
70-80	Pump
75-85	Backhoe
80-90	Heavy Truck
80-85	Mobile Crane
80-95	Bulldozers
80-90	Graders
80-95	Front Loaders

Source: FHWA, 1977

These noise levels are comparable to the range of noise found in typical industrial and city street settings, but are higher than what is typically experienced in parks. All of the Sites are located adjacent to or nearby

industrial areas and/or city streets; however, for those Sites furthest removed from developed areas, temporary increases in noise levels will be most evident. To minimize the impact of temporary construction-related noise, the City of Muskegon has a local noise ordinance that limits the hours for construction activities to weekdays and daytime hours between 7:00 AM and 6:00 PM.

Minor permanent noise impacts can also result from the Project once restoration of the sites is complete. Noise associated with the expected growth of recreational activities such as power boating may occur. Other recreational activities that may be enhanced as a result of the Project, such as fishing, sailing, kayaking, swimming, and hiking, will have no appreciable noise impact.

3.12.2.2 No Action Alternative

The No Action Alternative will not be expected to affect existing noise levels in the Project area. The No Action Alternative will avoid the temporary increase in noise levels during restoration due to earth removal and remediation activities under the proposed Project.

3.13 HUMAN HEALTH AND SAFETY

3.13.1 Affected Environment

Prior environmental investigations in the Project area have documented contamination posing a potential human health hazard. A summary of prior investigation findings for Sites within the Project area is presented in Table 3.1-1. These prior investigations indicate contamination in the Project area may pose a human health direct contact hazard based on a comparison of laboratory analytical results to generic residential cleanup criteria established under Part 201. Although groundwater in the study area may also be contaminated above drinking water criteria (e.g., heavy metals, petroleum constituents), this exposure pathway is not applicable since groundwater is not consumed. PAHs, formaldehyde, and heavy metals other than manganese associated with the historic industrial fill in the Project area do not appear to be leaching to groundwater on a widespread basis (ERM, 2008).

The Part 201 generic residential direct contact cleanup criteria consider both child and adult exposures. Therefore, the exceedances of direct contact criteria can pose exposure concerns to both adults and children who come in contact with site soils.

Submerged debris, concrete debris, and dilapidated seawalls are present in much of the Project area. These items may pose shoreline access, swimming, and boating safety concerns.

The Michigan Department of Community Health has issued a fish advisory for Muskegon Lake. Chemicals of concern in fish from the lake include polychlorinated biphenyls (PCBs), chlordane, and mercury.

3.13.2 Environmental Consequences

3.13.2.1 Proposed Action Alternative

The Proposed Action Alternative will reduce the potential direct contact hazard posed by contaminated soils in the areas where removal and/or placement of clean cover soil is performed (for both adult and child populations). Removal of submerged debris, concrete debris, and dilapidated seawalls will address safety concerns to recreational users (e.g., fishing, swimming, boating) in the Project area. Furthermore, removal of impacted shoreline fill and sediments will, to a limited extent, reduce impacts to fish populations and persons consuming fish from the lake.

Implementation of the Proposed Action Alternative will include measures to control potential human health hazards through direct contact with impacted material, inhalation of impacted particulates/dust, and spreading of impacted material (e.g., through erosion/sedimentation, improper stockpiling/soil movement, tracking on vehicle tires, spills, etc.). The measures discussed below will protect both workers and the general public (both adult and child populations).

Environmental health and safety concerns associated with the Project will be addressed in a site-specific Health and Safety Plan (HASP) prepared in accordance with 20 Code of Federal Regulations (CFR) 1910.120 and applicable state and local regulations governing worker protection and health and safety. The HASP will be implemented before breaking ground. The HASP will identify known or suspected hazards associated with contaminants and include emergency contact information. The plan will also include guidance for excavation, spill prevention, confined space entry, hearing and respiratory protection, and emergency response. Prior to commencing with the Project, local emergency services such as the Muskegon Fire Department and Police Department will be contacted to discuss an emergency plan and familiarize the departments with the construction activities, schedule, and potential hazards. The emergency plan will include a list of local establishments that will be notified and instructed in the event of an accidental release or other emergency requiring public notification.

Preparation of a spill response plan will be completed in advance of construction. Spill response equipment will be maintained on-site during construction for response to fuel, hydraulic fluid, or other petroleum product spills that may occur from construction equipment and service vehicles.

Appropriate state and local construction permits related to air emissions (fugitive dust) and storm water runoff/sedimentation control will be obtained. The Project will have an erosion and sedimentation control plan in place during construction to reduce potential impacts associated with runoff of storm water or sediment from excavated materials. A plan will be prepared to reduce potential impacts associated with disturbing impacted sediments during construction of the Project (e.g., sediment curtains).

Additional precautions to be taken to reduce potential exacerbation and unacceptable exposures during construction include: worker protection precautions (e.g., appropriate eating/smoking areas, personal protective equipment, handling of soiled clothing, etc.), track-out minimization (e.g., brush-off excess soils, rinse equipment/tires, install gravel pad to allow release of soil on tires, etc.), dust control, preventing spreading and unacceptable relocation of excavated materials (manage in landfill, utilize plastic sheeting beneath and to cover stockpiles), proper handling and management of abandoned containers/piping encountered during excavation, and utilization of fencing to restrict public access to construction zones.

3.13.2.2 No Action Alternative

The No Action Alternative will result in the continued presence of contamination posing a potential direct contact hazard. Shoreline access, swimming, and boating safety concerns posed by submerged debris, concrete debris and dilapidated seawalls will remain with the No Action Alternative. Construction-related safety concerns will not arise with the No Action Alternative.

3.14 SOCIOECONOMIC AND ENVIRONMENTAL JUSTICE

3.14.1 Affected Environment

The Project area is located in the City of Muskegon, Muskegon County, Michigan. Data for the following discussion primarily were obtained from the 2000 U.S. Decennial Census, prepared by the US Census Bureau

(USCB). When available, 2007 estimates are provided for Muskegon County and the City of Muskegon.

In 2007, Muskegon County was estimated to have a population of 174,386 (USCB, 2007). The county population grew by 0.3 percent from the 1999 population of 170,200 (USCB, 2000a). The county's residents were comprised of 81.3 percent Caucasian, 14.2 percent African-American, and 3.5 percent Hispanic or Latino ethnic origin. Distribution of ethnicities was segregated, with Muskegon County ranked as the fourth most segregated community in the state of Michigan (MCHD, 2005).

In 1999, Muskegon County had 68,556 housing units, out of which 5,226 or 7.6 percent were unoccupied. The majority of the unoccupied units, 3,847 or 5.6 percent of all units, were year-round units (USCB, 2000a).

Muskegon County had 128,751 residents who were 16 years old or older in 1999, with 76,788 residents or 59.6 percent employed in the civilian labor force. That same year 5.4 percent of residents in the civilian labor force were unemployed. The top three employment industries in Muskegon County were manufacturing (30.5 percent), educational, health and social services (18.2 percent), and retail trade (13.3 percent). The mean household income for Muskegon County was $47,505 and 11.4 percent of individuals lived below poverty level (USCB, 2000b). Current unemployment levels are significantly higher than in 1999 and have been estimated at 16.9 percent as of July 2009 (USDL, 2009).

In 2007, the City of Muskegon was estimated to have a population of 39,402 (Library of Michigan, 2008). Population in the city decreased by 0.2 percent from the 1999 population of 40,105. The majority of the population was Caucasian (60.6 percent), while the minority populations included 31.7 percent African-American and 6.4 percent Hispanic or Latino.

The City of Muskegon had 15,999 total housing units in 1999; of this amount, 1,430 units or 8.9 percent were unoccupied. Most of the unoccupied units were year-round; only a small fraction of these units were seasonal vacation homes (USCB, 2000a).

In 1999, the City of Muskegon had 30,779 residents who were 16 years old or older, with 15,136 residents or 49.2 percent employed. That same year, 7.1 percent of the civilian labor force was unemployed. Manufacturing is the major source of income, with 29.3 percent of the working force employed in manufacturing industry. Other major employment sectors include educational, health and social services (17.9 percent), and retail trade (11.4 percent) (USCB, 2000b). As with the county, current

unemployment levels in the city are significantly higher than 10 years ago and have been estimated at 21.4 percent for July 2009 (USDL, 2009).

The mean household income for the residents of City of Muskegon was $35,434 in 1999. The poverty level was high, as 20.5 percent of individuals lived below the poverty level. For comparison, Michigan's mean household income was $57,926, and 10.5 percent of individuals lived below the poverty level (USCB, 2000b).

3.14.2 Environmental Consequences

3.14.2.1 Proposed Action Alternative

The Proposed Action Alternative is estimated to cost $30 million to implement the Project activities. Economic activities linked to the Project, such as those generated by contractors and their employees, will result in approximately $53-89 million in short-term economic benefits. In addition, approximately 125 temporary jobs will be created or retained in connection to the restoration activities at the 12 Sites (WMSRDC and GLC, 2009). As stated previously, the July 2009 unemployment rate for the City of Muskegon was 21.4 percent, and the rate for Muskegon County was 16.9 percent. Although the creation of 125 temporary jobs will have a minor effect on the overall unemployment rate or socioeconomic conditions within the greater Muskegon area, these jobs will provide or secure additional income to a discernible portion of the local workforce.

It is expected that local labor will be used for the Project, and no increased housing needs are anticipated. If a non-local labor force will be used, the city and the county will have enough available housing options to provide temporary housing for workers.

It is estimated that the restoration of aquatic and wetland habitats will increase the economic value of ecosystem services provided by these environments by $65,000 to $200,000 a year (WMSRDC and GLC, 2009). Improvements in the natural conditions of Muskegon Lake will promote local tourism and provide for enhanced recreational opportunities, such as fishing, hiking, and wildlife viewing (see Section 3.2). An increase in recreational users will benefit local businesses and will have a positive effect by indirect creating jobs and new business opportunities, supporting greater diversification in the economic sector.

As discussed in Section 3.9, restoration activities will create a more desirable, natural shoreline that will add direct value to the local shoreline properties. In addition, the Project will contribute in delisting Muskegon

Lake from the AOC list, resulting in $27 million in economic benefits for the Muskegon Lake area (WMSRDC and GLC, 2009).

The Project will have no disproportionate adverse environmental or human health effects on the minority populations residing in the City of Muskegon or Muskegon County. The need for temporary construction workers and future, permanent recreational service providers will provide opportunities to hire low income and minority workers, and the overall positive impact of the Project will be realized by minority and low-income populations, as well as other segments of the general population.

3.14.2.2 No Action Alternative

The No Action Alternative will not directly or indirectly impact the socioeconomic conditions in the four Focus Areas. This alternative will allow for the conditions to remain as they currently are.

3.15 CUMULATIVE IMPACTS

The Council of Environmental Quality regulations for implementing NEPA define cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR Section 1508.7)."

Past activities have resulted in significant deterioration of the southern shore and adjacent littoral areas of Muskegon Lake. Historic fill from foundry, lumbering, and other industrial activities along the shoreline throughout the 20th century have resulted in the loss of wetlands, lake bottoms, degradation of water quality, reduction in fish and wildlife habitat, and the resulting impairment of fish and benthic populations. The impact of these past projects is reflected in the affected environment as described in this EA.

The proposed Project will result in numerous significant beneficial effects, as indicated by the projected progress toward attaining Beneficial Use Impairment restoration goals achieved by the Project. BUI restoration goals advanced will include Loss of Fish and Wildlife Habitat, Degraded Fish and Wildlife Populations, and the Degraded Benthos BUIs. Beyond direct ecological benefits, the proposed Project will provide recreational, aesthetic, and economic improvements of varying degree.

Many of the recently past and planned future projects on or near the southern shore of Muskegon Lake are similarly associated with addressing the Muskegon Lake AOC through restoration of the lakeshore area or more broadly in brownfield redevelopment. These projects include:

Great Lakes Legacy Act Ruddiman Creek contaminated sediment removal (2005-06), which resulted in the removal of approximately 90,000 cubic yards of contaminated sediment

Muskegon Lake Area of Concern Fish and Wildlife Habitat Restoration and Beneficial Use Impairment Removal Strategy (December 2008), which lays out a strategy for removal of two of nine BUIs for the Muskegon Lake AOC, and of which the proposed Project is a significant part. This strategy in turn is part of an overall Remedial Action Plan to delist Muskegon Lake as an AOC.

The City of Muskegon Lakeshore Trail, completed in 2006, consists of nearly 10 miles of paved multi-use trail, which provides additional shoreline recreational opportunities

The proposed Rotary Park development project is located just west of Heritage Landing, which is the focal point for public recreation activities along the southern shore of Muskegon Lake. Rotary Park will be an expansion of recreational activities at Heritage Landing with surficial development including bike paths, parking areas, recreational fields, small structures such as shelters and gazebos, and a tie-in to the footbridge at Heritage Landing. A Michigan Natural Resource Trust Fund grant application has been submitted for land acquisition. Development will occur in 2010 and 2011.

As part of the Great Lakes Legacy Act funding to address contaminated sediments, testing and feasibility studies have been undertaken in the vicinity of the Division Street Outfall (between Hartshorn Marina and east to LaFarge). Dredging, Disposal, and Enhanced Natural Recovery was the preferred technology to address sediments contaminated with mercury, polycyclic aromatic hydrocarbons, and oil & grease. If non-federal matching funds are committed for remediation, this technology will be implemented through the existing USEPA/MDEQ Great Lakes Legacy Act project.

Habitat restoration projects under the Great Lakes Legacy Act are planned for Hartshorn Marina (access trail, fishing pier, boat launch wave protection structure, small boat basin improvements, and construction of open water wetlands), Heritage Landing (rubble/scrap removal from lake),

Rotary Park (debris/fill removal, clean soil replacement, shallow water, and wetland habitat restoration).

Remediation of sites of environmental contamination by private parties includes the Former Amoco Terminal (one of the proposed Sites) and the former MichCon coal gasification site in the downtown area where groundwater remediation activities continue.

Other future projects that may result in impacts within the Project area include:

- Kirksey Peninsula and Shoreline marina development
- VerPlank dock facility
- Division Street Outfall remediation by dredging contaminated sediments in the general vicinity of Hartshorn Marina and the YMCA
- Continued mixed use development at the Edison Landing site on Muskegon Lake in the downtown area
- Closure of the SAPPI paper plant, which is located on the southern shore of Muskegon Lake in Focus Area 1, will result in decreased air and water discharges, but adverse economic impacts

The cumulative effects of these recent and planned projects, including the proposed Project, will primarily be beneficial with limited adverse impacts. Beneficial effects of redevelopment and restoration projects will include restoring fish and wildlife habitat, increasing the quantity and quality of shoreline wetlands, enhancing recreational uses, and improving water quality. Some limited adverse impacts will result, although these will mainly be temporary and minor in nature. The overall net environmental effect of all projects will be positive in the Project area.

4.0 LIST OF PREPARERS AND AGENCIES CONSULTED

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Agencies Consulted[iii]

Michigan Department of Environmental Quality

Michigan Department of Natural Resources

Michigan State Historic Preservation Office

US Army Corps of Engineers

US Fish and Wildlife Service

[iii] Agency consultation was initiated during the Environmental Assessment preparation and permitting processes and is ongoing.

5.0 ABBREVIATIONS AND ACRONYMS

AOC	Area of Concern
ARRA	American Recovery and Reinvestment Act
BUI	Beneficial Use Impairment
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CRP	Community Restoration Program
CO	Carbon monoxide
dB	Decibels
dBA	A-weighted decibel
EA	Environmental Assessment
EIS	Environmental Impact Statement
FAC	Facultative
FACU	Facultative Upland
FACW	Facultative Wetland
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
GIS	Geographic information System
GLC	Great Lakes Commission
GLLA	Great Lakes Legacy Act
GLNPO	Great Lakes National Program Office
GVSU	Grand Valley State University
HASP	Health and Safety Plan
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MDOT	Michigan Department of Transportation
MLWP	Muskegon Lake Watershed Partnership
MNFI	Michigan Natural Features Inventory
MRWA	Muskegon River Watershed Assembly
MS4s	Municipal Separate Storm Sewer Systems
NAAQS	National Ambient Air Quality Standards
NAO	NOAA Administrative Order
NEPA	National Environmental Policy Act
NHL	National Historic Landmarks
NHPA	National Historic Preservation Act
NO_2	Nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NREPA	Natural Resources and Environmental Protection Act
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O_3	Ozone
OBL	Obligate Wetland

OHWM	Ordinary High Water Mark
PAC	Public Advisory Council
PAH	Polynuclear Aromatic Hydrocarbons
Pb	Lead
PCB	Polychlorinated Biphenyls
PEMC	Palustrine, emergent, seasonally flooded
PM	Particulate Matter
PM_{10}	Particulate matter smaller than 10 microns
$PM_{2.5}$	Particulate matter smaller than 2.5 microns
PPI	Program Planning and Integration
PSS1C	Palustrine, scrub-shrub, broad-leaved deciduous, seasonally flooded
PUBGx	Palustrine, unconsolidated bottom, intermittently exposed, excavated
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SO_2	Sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasure
UPL	Obligate Upland
USACE	U.S. Army Corps of Engineers
USCB	United States Census Bureau
USDA	United States Department of Agriculture
USEPA	Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WMSRDC	West Michigan Shoreline Regional Development Commission

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FINDING OF NO SIGNIFICANT IMPACT FOR THE MUSKEGON LAKE AREA OF CONCERN HABITAT RESTORATION PROJECT

In compliance with the National Environmental Policy Act (NEPA), a Finding of No Significant Impact (FONSI) has been prepared for the Muskegon Lake Area of Concern Habitat Restoration Project (Project). The NOAA's proposed action is funding of the Project (NOAA Award # NA09NMF4630294) in the amount of $10,000,000.

National Oceanic and Atmospheric Administration Administrative Order 216-6 (May 20, 1999) contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality regulations at 40 C.F.R. 1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." Each criterion listed below is relevant to making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ's context and intensity criteria. These criteria are discussed below.

1) Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in FMPs?

The proposed action is not reasonably expected to cause substantial damage to the Muskegon Lake habitat or coastal habitat in the area. The proposed action is expected to result in restoration of wetland and aquatic habitats and in beneficial impacts for fish habitats. As part of the Project, the habitat will be modified through removal of industrial debris, bioengineering of the shoreline, removal of invasive plants, and seeding with native plant mixes. Removal of contaminated fill and soil will reduce potential leaching of contaminants, improving the quality of groundwater and surface water.

2) Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?

The proposed action is expected to have beneficial impact on biodiversity and ecosystem function in the area. Restoration activities such as bioengineering of the shoreline, placement of clean top soil, removal of invasive plants, and seeding with native plant mixes will restore wetland quantity and quality and improve wetland functions. Functional improvements will include increased pollution and erosion control, greater floodplain capacity, and improved fish and wildlife habitat. Restored habitat will promote native plant growth and will be able to support greater diversity and abundance of plants, while the abundance of invasive plants will be reduced. The more favorable habitat is expected to support greater diversity of waterfowl, migrant birds, and small mammals.

Local fish species will benefit from improved spawning and feeding habitats resulting from removal of slab wood and other industrial debris and expansion of aquatic plant habitats. Increased survivorship and greater abundance could be observed for such species as northern pike, largemouth bass, most of the sunfishes, spotted gar, pirate perch, and central mudminnow. In addition, beneficial effects on benthic species are expected as the current trends of re-establishment of pollution intolerant species in the lake and development of a more natural species composition will continue and possibly accelerate as a result of the Project. The potential exists for some negative fishery-related effects as well. Increased fish abundance could create greater competition for resources, potentially resulting in smaller adult fish, as detailed in Section 3.5 of the Environmental Assessment (EA). However, the overall effects to fish species will be substantially beneficial.

The proposed action will also have beneficial effects on surface water and groundwater quality. Softening and bioengineering of shoreline, emergent wetland restoration, and proposed runoff seepage basins will contribute to improvements in local water quality as pollutants and excess nutrients from storm water will be filtered before discharging into Muskegon Lake. Removal of impacted fill and soil will also reduce potential leaching of contaminants to groundwater and surface water.

3) Can the proposed action reasonably be expected to have a substantial adverse impact on public health or safety?

The proposed action will have no significant adverse effect on public health or safety. The proposed action will have no significant adverse effect on air quality. During restoration activities, the proposed action will generate vehicle air emissions, fugitive dust, and possibly other air pollutants. However, air impacts will be minor, relatively localized, and temporary in nature. Implementation of the proposed action will include measures to control potential human health hazards that could result from direct contact with contaminated material, inhalation of impacted particulates/dust, and spreading of contaminated material during construction. Excavated soils and sediments will be tested and contaminated material will be properly disposed of at a licensed landfill.

Beneficial impacts will result from removal of potential safety hazards currently posed to recreational users of Muskegon Lake from contaminated soils, submerged debris, concrete debris, and dilapidated seawalls. Removal of contaminated sediments will also reduce health impacts to fish populations and persons consuming fish from the lake.

4) Can the proposed action reasonably be expected to adversely affect endangered or threatened species, their critical habitat, marine mammals, or other non-target species?

The proposed action will not have adverse effects on aquatic or terrestrial species and their habitat but rather will result in beneficial effects on aquatic and terrestrial wildlife and vegetation. Lake sturgeon is the only aquatic state-threatened species

found in Muskegon Lake. Two state special concern species, pugnose shiner and spotted gar are found in the Muskegon Lake watershed, although it is unclear whether they occur in Muskegon Lake itself. Overall improvements in the aquatic habitat will benefit these three species, potentially leading to increased numbers in Muskegon Lake. Any adverse effects to these species from the Project will be temporary.

Short-term adverse effects of the Project on aquatic habitat can occur as a result of artificial fill removal. Restoration activities will disturb the existing sediments and aquatic plants and may negatively affect water quality through increased turbidity and re-suspension of potentially contaminated sediments. However, these impacts will be minor and temporary in nature, and turbidity curtains will be used at the Sites to contain disturbed sediments to the immediate project areas. Over time, a more natural sediment profile will be able to become re-established, promoting aquatic plant expansion and growth. Local fish species will benefit from improved spawning and feeding habitats, resulting in increased survivorship and greater abundance.

No threatened or endangered terrestrial wildlife or vegetation species have been identified in the Project area, although listed species have been identified in Muskegon County, as detailed in Sections 3.6 and 3.7 of the EA. Habitat improvements will likely benefit any species present and can encourage future habitat use. Restored Sites will provide improved wildlife habitat and will create corridors that allow for greater movement of wildlife between formerly isolated patches. Temporary disturbances to wildlife will occur from the construction activities, including increased noise levels and increased human presence in the Project area. However, affected individuals will likely habituate to the temporary conditions or will limit their use of the habitat while restoration activities are ongoing, utilizing other available habitats in the area. Restoration activities will cause temporary negative effects to the local vegetation. Minor adverse effects will be reduced by limiting the extent of disturbed areas, storing equipment and materials on previously disturbed areas, and prompt seeding of disturbed areas immediately after earth change activities are completed. Habitat improvements will likely benefit any species present, the great majority of which require habitat protection and are vulnerable to filling and other disturbance activities.

5) Are significant social or economic impacts interrelated with natural or physical environmental effects?

The proposed action will have a beneficial effect on the socioeconomics of the communities in the Project area. Improvements in the natural conditions of Muskegon Lake will promote local tourism and outdoor recreational opportunities as they relate to activities such as fishing, hunting and wildlife watching. Increases in recreational users will benefit local businesses and will have a positive effect in indirect job creation and new business opportunities related to the increased outdoor recreational opportunities. In addition, restoration activities will create a more desirable, natural shoreline that will add direct value to the local shoreline properties. As a result, the shoreline improvements will lead to an increase in the number of businesses and residents desiring to relocate there. The Project will

have no disproportionate adverse environmental or human health effects on the minority populations residing in the City of Muskegon or Muskegon County.

6) Are the effects on the quality of the human environment likely to be highly controversial?

The proposed action will not result in highly controversial effects on the quality of the human environment. Restoration activities will affect the human environment through temporarily increased noise levels and visual impacts from the presence and movement of construction personnel and construction equipment, and from stockpiling of excavated materials. These impacts will last only for the duration of Project construction activities and are not expected to be controversial.

The proposed action will temporarily generate elevated noise levels from earth moving machinery such as excavators and haul trucks. Typical noise from construction equipment will range from 70 to 95 decibels (dBA). To minimize the impact of noise, construction related activities will be limited to weekdays and daytime hours between 7:00 AM and 6:00 PM, as required by the City of Muskegon's noise ordinance.

Once the Project is complete, the landscape will be permanently altered through the removal of existing fill materials and creation of more natural physical characteristics of the shoreline and associated vegetation. These results will be considered an improvement in the quality of environment as compared to the existing conditions.

7) Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers, essential fish habitat, or ecologically critical areas?

The proposed action will have no significant adverse effect to unique areas. Although there are historic resources present in or near the Project area, the disturbance of vegetation and the presence of workers, equipment, and materials will be expected to cause only temporary adverse impact to the historic sites.

Unique natural areas such as wetlands and Ruddiman Creek outlet will improve in quality as a result of contaminated sediments removal and native plant seeding. The sensitive remnants of Pigeon Hill dune habitat will experience only indirect effects of construction activities, such as increased noise levels in the vicinity of the dune, and will not be adversely affected.

The proposed action will have no significant adverse effect on geology in the Project area. Effects to soils will be beneficial. The Project will result in removal of soils, sediments, and other waste material from the proposed restoration areas. The removal of fill soil will not disturb critical native geologic features such as the subsurface clay layers that protect underlying aquifers.

As part of the permitting process, a Soil Erosion and Sedimentation Control Plan will be implemented to prevent off-site soil erosion and sedimentation of surface water. Project plans include protective measures such as sediment curtains, erosion control blankets, wattles, geo web and vegetative seeding and plantings. Permits acquired from the USACE and MDEQ will also contain protective conditions.

8) Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

The proposed action does not include highly uncertain effects on the human environment or unique or unknown risks. Restoration activities will be performed using conventional, proven methods and techniques. The Project is expected to result only in temporary, minor, and predictable impacts such as increased traffic, increased noise levels, dust generation, and alterations in visual landscape.

9) Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

The proposed action is related to the overall effort to restore and remove beneficial use impairments from the Muskegon Lake Area of Concern and to remove the lake from the list of Great Lakes AOCs. Cumulative impacts undertaken as part of the delisting effort are expected to have beneficial effects on the Muskegon Lake environment. The proposed action is not related to other actions that would result in cumulatively significant adverse impacts.

10) Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources?

The proposed action is not likely to have adverse effects on districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places nor is it expected to cause loss or destruction of significant scientific, cultural, or historical resources.

Based on a review of the Michigan State Historic Preservation Office (SHPO) records, an archaeological site related to the former Pigeon Hill Dune appears to be in close proximity to Project Site A, while the other known archaeological sites are located outside of and away from the Project and its associated work areas. Restoration activities at Site A will only directly affect the hardened water's edge and will not affect the Pigeon Hill Dune. The Project will require ground disturbing activities that may potentially impact resources that have not yet been identified. There is potential to locate new archaeological or historic resource as a result. In the event that any archaeological sites, human remains, funerary items, or associated artifacts are discovered during restoration and removal of fill, activities will cease immediately and the SHPO and if necessary, interested federally recognized tribes will be notified. Additional measures may be needed if unanticipated archeological resources are located within the other Project sites.

A consultation with the (SHPO) was initiated on September 22, 2009 to concur that the proposed action will have no detrimental effects on historic properties or cultural resources. The SHPO issued a no adverse effect letter on October 16, 2009 for the proposed action, stating that no historic properties that are listed or eligible for listing would be affected.

11) Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species?

The proposed action is not expected to result in introduction or spread of non-native species. Nonindigenous plant species currently present in the area include the common reed, narrow leaf cattail, Japanese knotweed, tartarian honeysuckle, purple loosestrife, and glossy buckthorn. Aquatic species include zebra mussels and quagga mussels. Restoration activities at some of the sites are directly targeted at removal of non-native species and re-vegetation with native plants. To further prevent spread of non-native plants, adverse effects will be controlled by limiting the extent of disturbed areas as practicable, storing equipment and materials on previously disturbed areas, and prompt seeding of disturbed areas immediately after earth change activities are completed.

12) Is the proposed action likely to establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration?

The proposed action is not expected to establish a precedent for future actions or represent a decision in principle about a future consideration. Restoration activities performed as part of this proposed action follow well established guidelines and draw from past restoration activities.

The proposed action will have beneficial effects on land use in the Project area. The Project will not interfere with any proposed development in the county, as future land use categorization will not be affected. On the contrary, the proposed action will assist in the redevelopment of former industrial areas for uses that are more consistent with current plans for improving the shoreline area and restoring natural vegetation and habitat. It will also assist the city and county with infill development by creating improvements to existing areas rather than acquiring additional land for new construction.

13) Can the proposed action reasonably be expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment?

The proposed action is not expected to threaten a violation of Federal, State, or local laws or requirements imposed for the protection of the environment. The proposed action will result in improved environmental protection of Muskegon Lake and its shoreline.

14) Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

The proposed action is not expected to result in cumulative adverse effects on the species found within the Project area. It is expected that cumulative effects from the restoration activities will be beneficial.

DETERMINATION

In view of the information presented in this document and the analysis contained in the supporting Environmental Assessment prepared for the Muskegon Area of Concern Habitat Restoration Project, it is hereby determined that the fish and wildlife restoration activities will not significantly impact the quality of the human environment as described above and in the Environmental Assessment. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an EIS for this action is not necessary.

Patricia A. Montanio
Director, Office of Habitat Conservation

11/10/09
Date