

**2014 REMEDIAL ACTION PLAN UPDATE
FOR THE
LOWER MENOMINEE RIVER AREA OF CONCERN**



May, 2015

**Wisconsin Department of Natural Resources
Office of the Great Lakes**

**Michigan Department of Environmental Quality
Office of the Great Lakes**

Cover Photo:

Arsenic-contaminated sediment is dredged in the South Channel, courtesy Wisconsin Department of Natural Resources (WDNR).

Disclaimer

The Great Lakes Water Quality Agreement (GLWQA) (GLWQA, 1987) is a non-regulatory agreement between the United States and Canada which describes the commitment of each country to restore and maintain the chemical, physical, and biological integrity of the Waters of the Great Lakes and their intention to prevent further pollution and degradation of the Great Lakes Basin Ecosystem (GLWQA,2013). The actions identified in this document are needed to meet beneficial use impairment (BUI) removal targets leading to the delisting of the Lower Menominee Area of Concern. These actions are not subject to enforcement or regulatory actions. Implementation of the recommendations described within should result in water quality and habitat benefits.

The actions identified in this 2014 Remedial Action Plan (RAP) Update do not constitute a list of preapproved projects, nor is it a list of projects simply related to BUIs or generally to improve the environment. Actions identified in this document are directly related to removing a BUI and are needed to delist the Area of Concern (AOC).

Acknowledgments

We, the WDNR and the Michigan Department of Environmental Quality (MDEQ), would like to acknowledge the many contributions of members of the Lower Menominee River AOC Citizen's Advisory Committee (CAC) and Technical Advisory Committee (TAC) in the development of this 2014 RAP Update, development of the Fish and Wildlife Population and Habitat Management Plan, previous RAPs, and development of public outreach materials and activities. CAC and TAC collaboration with state and federal agencies has resulted in materials and activities which reflect local issues and concerns.

**2014 Remedial Action Plan Update
for the
Lower Menominee River Area of Concern**

AUTHOR RECOGNITION

This document was compiled by Laurel Last, the WDNR and Sharon Baker, MDEQ with input and assistance from the Citizens Advisory Committee members:

Mark Erickson, Michigan Committee Co-chair
Keith West, Wisconsin Committee Co-chair
Gail Clark, M&M Great Lakes Sport Fishermen
John Clark, M&M Great Lakes Sport Fishermen
Jim Cox, Tyco International
Nancy Douglas, Menominee Business Development Corporation
John Groleau, Resolute Forest Products
Stephen Kellner, Northern Anglers Fishing Club
Jon Kukuk, Nest Egg Marine
Trygve Rhude, Chappée Rapids Audubon Society
Steve Zander, Past Wisconsin Committee Co-chair

and Technical Advisory Committee members:

Bureau of Land Management (BLM):
Derek Strohl
Chappée Rapids Audubon Society:
Trygve Rhude
Eagle Creek Renewable Energy (ECRE), formerly North American Hydro Holdings
(NAH):
Rory Alsberg
Lloyd Flanders:
Mark Erickson
MDEQ:
Sharon Baker, Joe Bohr, Ryan McCone
Michigan Department of Natural Resources (MDNR):
Craig Albright, Patrick Hanchin, Jessica Mistak
U.S. Environmental Protection Agency (USEPA):
Mike Bryant
U.S. Fish and Wildlife Service (USFWS):
Steve Choy, Betsy Galbraith, Nick Utrup
University of Wisconsin Extension:
Chad Cook
University of Wisconsin-Marinette:
Wendel Johnson, Keith West
WDNR:
Kendra Axness, Cheryl Bougie, Donalea Dinsmore, Mike Donofrio, Andrew Fayram,
David Halfmann, John Huff, Laurel Last, Tammie Paoli, Vic Pappas, Ben Uvaas

EXECUTIVE SUMMARY

The Lower Menominee River became an AOC because of concerns related to contaminated sediments. The most important milestone ever reached in the Lower Menominee River AOC was the 2014 completion of dredging of all known contaminated sediments. These removals were to acceptable levels set by the negotiated settlements between the responsible parties and the relevant federal and state agency programs. Once the sand cover for the Great Lakes Legacy Act (GLLA) betterment project is placed (summer 2015) and the Rio Vista Slough sediment investigation confirms that no remediation is needed there (draft report spring 2015), this important milestone allows the AOC to begin removal of BUIs, starting with the “degradation of benthos” BUI. The “restrictions on dredging” BUI can then be proposed for removal once the Dredge Management Plan (DMP) is completed. The DMP will ensure that dredged or capped dredge areas are protected from disturbance. The other BUI that could potentially be proposed for removal in 2015 is the “restrictions on fish consumption” BUI, depending on the results of the assessment currently underway.

To remove all impairments, activities beyond the remediation of contaminated sediment sites are also required. The *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update* (WDNR and MDEQ, 2013a) is the principal document guiding the removal of the “degradation of fish and wildlife populations” and “loss of fish and wildlife habitat” impairments. At this time, none of the five overarching restoration goals contained in the *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update* have been achieved. However, two of the objectives were achieved in 2014, and many activities contributing toward the achievement of the objectives have either been completed or are in progress (see Appendix A and Appendix C).

Significant milestones likely to be reached in 2015:

- Completion of Ansul/Tyco arsenic site GLLA betterment action, including sand cover placement
- Results from the Rio Vista Slough sediment characterization finalized
- Wisconsin Public Service Corporation (WPS) coal tar site sand cover monitoring results available
- Work on Dredge Management Plan started
- Results from fish consumption advisory assessment available; possible BUI removal
- Completion of Menekaunee Harbor habitat restoration project
- Completion of Park Mill Dam downstream fish passage and Menominee Dam upstream sturgeon passage facilities
- Completion of design for safe downstream passage at Menominee Dam
- Removal of debris and excess riprap in South Channel below Ogden Street Bridge
- Completion of design and start of implementation for South Channel habitat restoration project
- Final year of monitoring for fish populations in the AOC and reference sites; decision on whether target fish species in lower river are meeting objectives
- Larval lake whitefish monitoring project completed
- Progress on island rookery habitat restoration
- Achievement of long-term habitat protection goal through requests to land owners by CAC/TAC
- Decision by TAC on whether additional monitoring is needed to confirm mussel recruitment objective

The Lower Menominee River AOC is on track to complete all management actions in 2016. The states intend to begin proposing BUIs for removal in 2015, and the AOC could potentially be delisted in 2018. Continued progress has only been possible with the help of many partners who have put a lot of effort into restoring the Lower Menominee River. Great Lakes Restoration Initiative (GLRI) funding has also been a critical component of this effort.

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List of Acronyms and Initialisms

[As]	Arsenic concentration
AOC	Area of Concern
BLM	Bureau of Land Management of the United States Department of the Interior
BUI	Beneficial Use Impairment
CAC	Citizen's Advisory Committee
CSO	Combined Sewer Overflow
DMU	Dredge Management Unit
ECRE	Eagle Creek Renewable Energy
FERC	Federal Energy Regulatory Commission
GLLA	Great Lakes Legacy Act
GLNPO	Great Lakes National Program Office
GLRI	Great Lakes Restoration Initiative
GLWQA	Great Lakes Water Quality Agreement
LAMP	Lakewide Action and Management Plan
MDCH	Michigan Department of Community Health
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
NAH	North American Hydro Holdings
NAPL	non-aqueous phase liquid
NOAA	National Oceanic and Atmospheric Administration
PAC	Public Advisory Council
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyls
PECS	Possible Effects Concentrations
ppm	parts per million
QAPP	Quality Assurance Project Plan
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
SPMD	Semi-permeable membrane device
TAC	Technical Advisory Committee
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDHS	Wisconsin Department of Health Services
WDNR	Wisconsin Department of Natural Resources
WPS	Wisconsin Public Service Corporation

DEFINITIONS

Activity - A specific action or project that will contribute toward the achievement of one or more objectives upon completion. Details regarding who will do the work, how it will be done, costs, location, and timeframe should also be included. Activities are listed in Table 2.

Area of Concern (AOC) - Defined by Annex 2 of the 1987 Protocol to the U.S.-Canada Great Lakes Water Quality Agreement (GLWQA, 1987) as “geographic areas that fail to meet the general or specific objectives of the Agreement where such failure has caused or is likely to cause impairment of beneficial use or of the area’s ability to support aquatic life.” These areas are, or were, the “most contaminated” areas of the Great Lakes, and the purpose of the AOC program is to bring these areas to a point at which they are not environmentally degraded more than other comparable areas of the Great Lakes. When that point has been reached, the AOC can be removed from the list of AOCs in the Annex, or “delisted.” The GLWQA can be found at <http://www.ijc.org/rel/agree/quality.html>

Beneficial Use Impairment (BUI) - Defined by the GLWQA as a reduction in the chemical, physical, or biological integrity of the waters of the Great Lakes sufficient to cause impairment to a designated use (GLWQA, 2013). The Lower Menominee River AOC has five BUIs remaining including: restrictions on fish and wildlife consumption; restrictions on dredging activities; degradation of benthos; degradation of fish and wildlife populations; and loss of fish and wildlife habitat.

Beneficial use(s) are ways that a water body can improve the quality of life for people or for fish and wildlife. For example, providing habitat for fish and wildlife is a beneficial use of a water body. If a beneficial use is suppressed or unavailable due to environmental problems, like loss of habitat, then that beneficial use is considered impaired. The International Joint Commission provided a list of 14 possible beneficial use impairments in the 1987 amendments to the GLWQA.

Colonial Waterbirds - A term referring to a wide variety of birds that gather in large assemblies called colonies or rookeries during the nesting season and are dependent on the water for food (fish or aquatic invertebrates). Examples include terns, gulls, pelicans, herons, and egrets.

Fish Consumption Advisory - Some fish from certain waterbodies contain harmful chemicals. These chemicals build up in the fish over time, and can build up in people when they eat the fish. The WDNR and the MDEQ routinely test fish and issue recommendations typically to “eat no more than” or “eat up to,” on how much fish a person could eat based on protecting human health from contaminants which may be found in fish. Current Wisconsin and Michigan fish consumption advisories are available online at <http://dnr.wi.gov/topic/fishing/consumption/> and www.michigan.gov/eatsafefish.

Great Lakes Restoration Initiative (GLRI) - A federal program that provides unprecedented funding for protection and restoration efforts on the five Great Lakes. State and local governments and non-profit organizations are eligible to receive grants from the U.S. Environmental Protection Agency (USEPA) for projects addressing toxic substances, invasive species, non-point source pollution, habitat protection and restoration or accountability, monitoring, evaluation, communication, and partnership building.

Goal - Goals are broad ideas that may take a long time to achieve. They usually don't change significantly over the life of a project. An example goal statement is, "*Nesting populations of a diverse array of wetland-dependent and riparian-associated birds are consistently present within the AOC.*" The delisting targets for the impairments may also be considered the goal statements (in some cases they may be objectives).

Lakewide Action and Management Plan (LAMP) - A LAMP is a plan of action to assess, restore, protect, and monitor the ecosystem health of a Great Lake. It is used to coordinate the work of all the government, tribal, and non-government partners working to improve the Lake's ecosystem. A public consultation process is used to ensure that the LAMP is addressing the public's concerns.

Natural Areas - A "natural area" is an area that currently has value as fish and wildlife habitat or has the potential to be restored so that it has value as fish and wildlife habitat. Natural areas can be publically or privately held, and can include wetlands or riparian lands within the AOC. Natural areas are not necessarily formally designated State Natural Areas.

Objective - Objectives are the detailed and quantitative components of a goal. They are important because they provide a means of measuring progress toward achieving a goal. Objectives should be SMART: Specific, Measurable, Achievable, Realistic, Time-Constrained. An example objective is, "Invasive, non-native species comprise no more than 33% of the vegetation community in protected natural areas of the AOC." Objectives are listed in Appendix C.

Polychlorinated Biphenyls (PCBs) - A group of more than 200 compounds, PCBs have been manufactured since 1929 for uses including electrical insulation, hydraulics, fluorescent lights, and carbonless paper to name a few. In 1979, PCBs were banned because of their persistence in the environment and tendency to magnify up the food chain. They have been linked to reproductive problems in wildlife and are suspected of causing developmental problems in human infants.

Polycyclic Aromatic Hydrocarbons (PAHs) - Chemicals commonly associated with oils, greases, and other components derived from petroleum. Some PAH compounds have been identified as cancer or mutation causing.

Potamodromous - Truly migratory fish whose migrations occur wholly in freshwater.

Protected - A parcel may be considered "protected" by any agreement, ordinance, easement, or management which significantly limits the degradation of that parcel's value as fish or wildlife habitat for an approved length of time.

Remedial Action Plan (RAP) - A RAP is developed for each AOC to identify the status of BUIs and their sources, document restoration targets, and list actions needed to reach those targets. RAPs are updated periodically to report progress toward achieving the restoration targets. This Plan, along with the most current RAP Update for the Lower Menominee River AOC, constitutes a complete strategy for removing all BUIs in the Lower Menominee River AOC.

Restoration Target - Specific goals and objectives established to track restoration progress of beneficial use impairments. Once targets have been met, the beneficial use is no longer considered impaired. Targets should be locally derived. Working with the Lower Menominee AOC Citizens Advisory Committee, delisting targets were developed in partnership with the

WDNR and the MDEQ. Wisconsin and Michigan use different criteria when assessing BUIs. The agencies and CAC agreed to implement the most restrictive criteria from either state when developing the Menominee AOC specific delisting targets.

Semi-Permeable Membrane Device (SPMD) - A passive sampling device used to measure concentrations of lipophilic (mixing more easily with oils than water) environmental pollutants like PCBs. SPMDs consist of “lay-flat” low-density polyethylene tubing containing a thin film of a pure, high molecular weight lipid. The tubing allows for the selective diffusion of the target compounds through the membrane which are then sequestered in the lipid. The compounds are extracted from the membrane and analyzed for components. SPMDs are used to mimic the uptake of toxicants suspended in the water column by fish.



Figure A. The Lower Menominee River AOC as delineated by the USEPA. Green Island, which was included in the AOC in the 1996 RAP, is not visible on this map, and is located approximately 5 miles east from Seagull Bar. The watershed inset includes the drainage area of major Menominee River tributaries including the Paint, Brule, Michigamme, Pine, and Sturgeon Rivers.

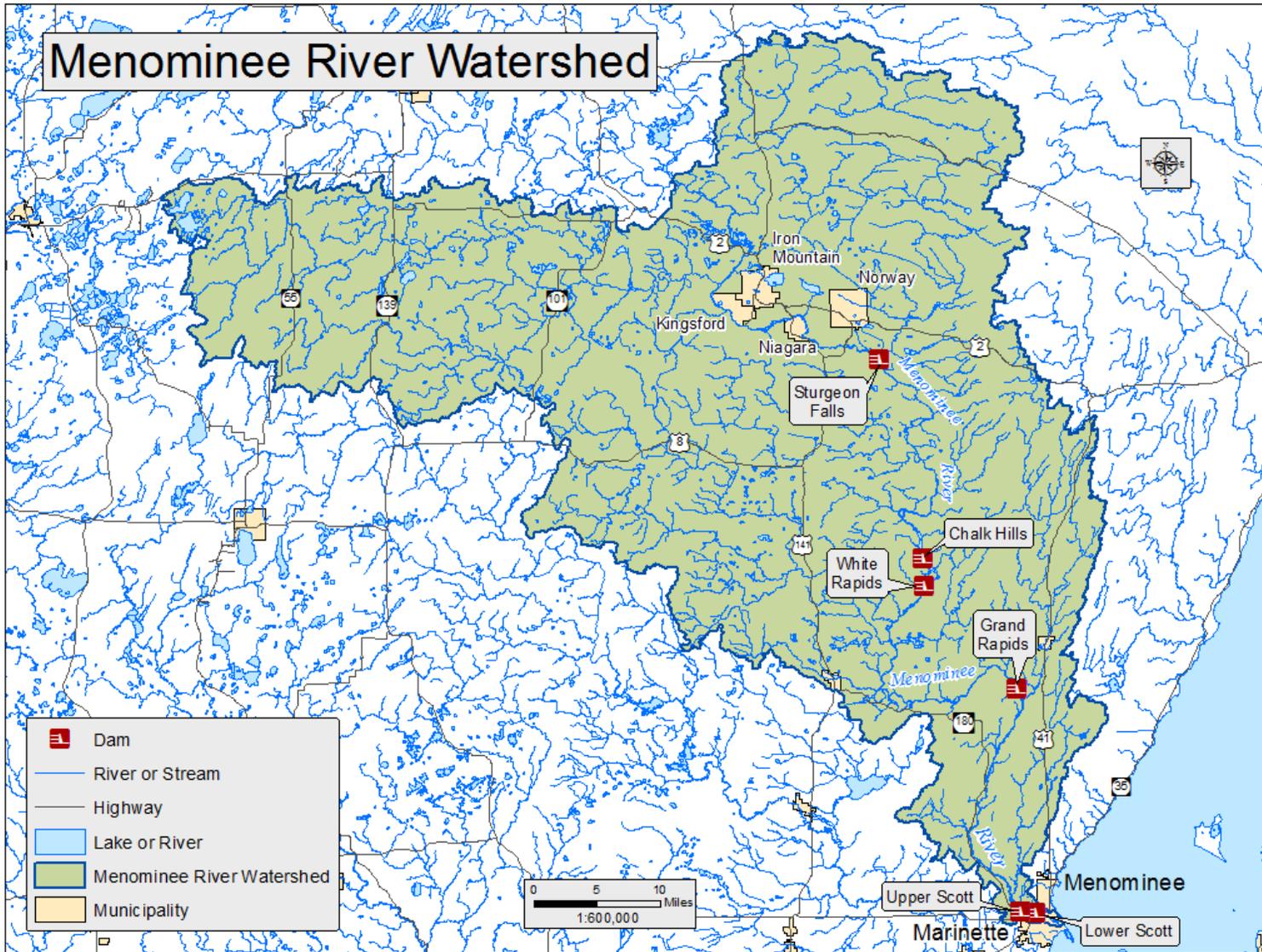


Figure B. Menominee River Watershed including tributaries and dams as they pertain to the Fish Passage Project. The Upper and Lower Scott Dams are commonly referred to as the Park Mill Dam and Menominee or Bridge Street Dam, respectively.

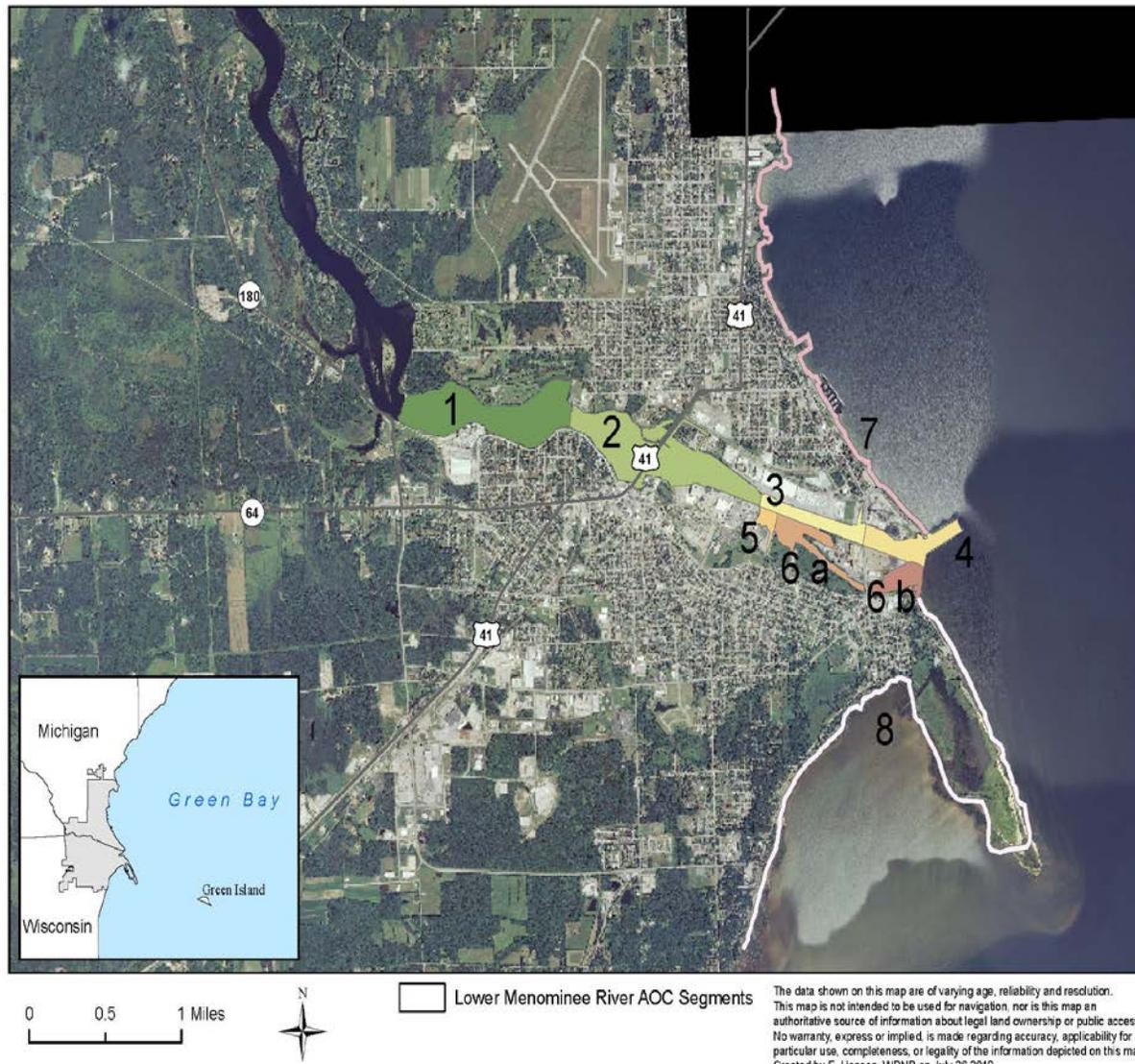


Figure C. Segments of the Lower Menominee River AOC. Throughout this Plan, segment numbers are used to describe the general location of a place within the AOC. Green Island, seen in the map inlay, has not been assigned a segment number.

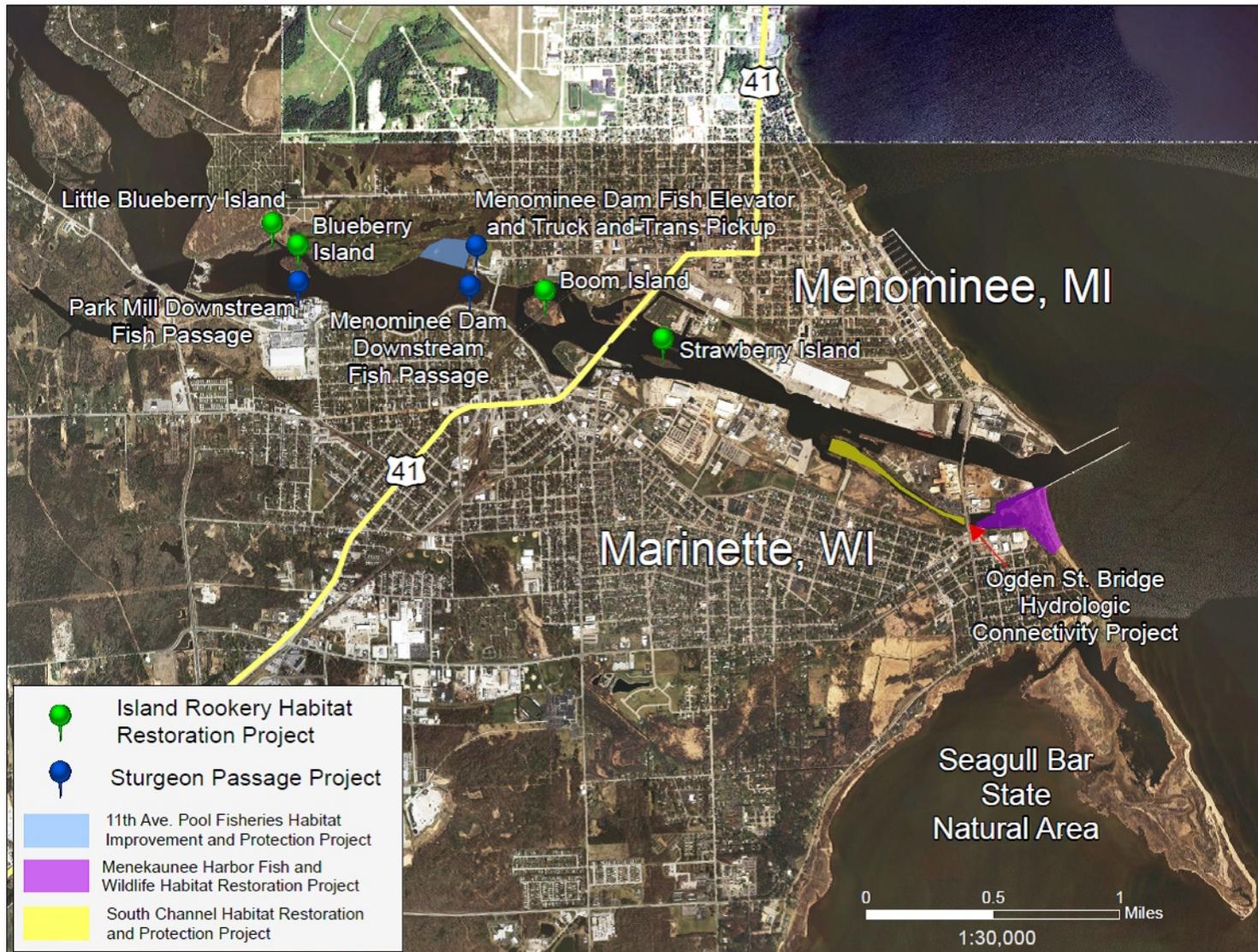


Figure D. Map of the habitat restoration and protection projects in the AOC. Note that the 11th Avenue Pool Project has been removed from the “must-do” list for BUI removal, since sediment sampling results have shown that remediation will not be needed there.

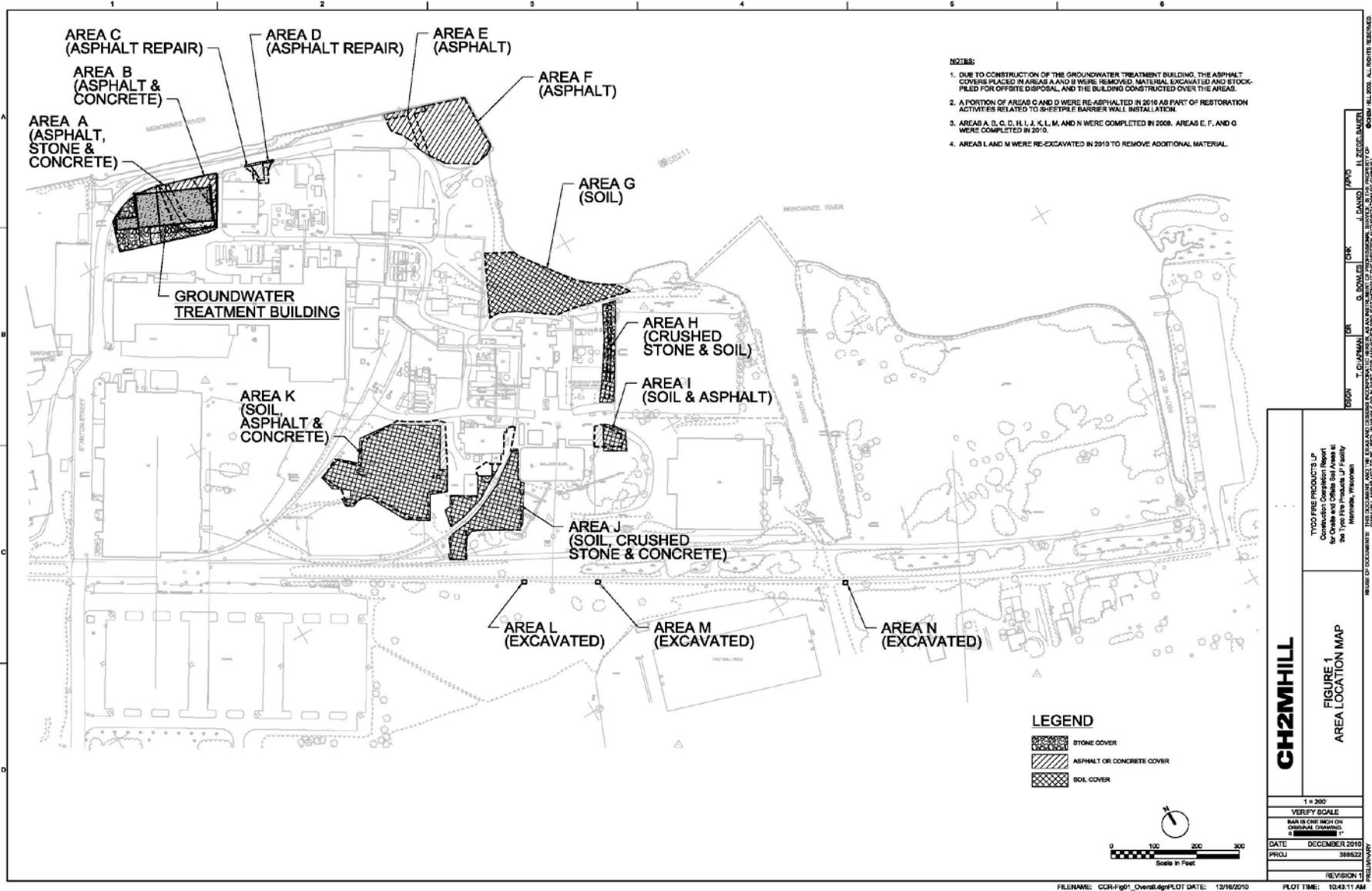


Figure E. Ansul arsenic site, locations of upland soil remedies.



Figure F. Page 1. Ansul arsenic site, current status of the removal of Menominee River arsenic contaminated sediment delineated by dredge management unit (DMU).

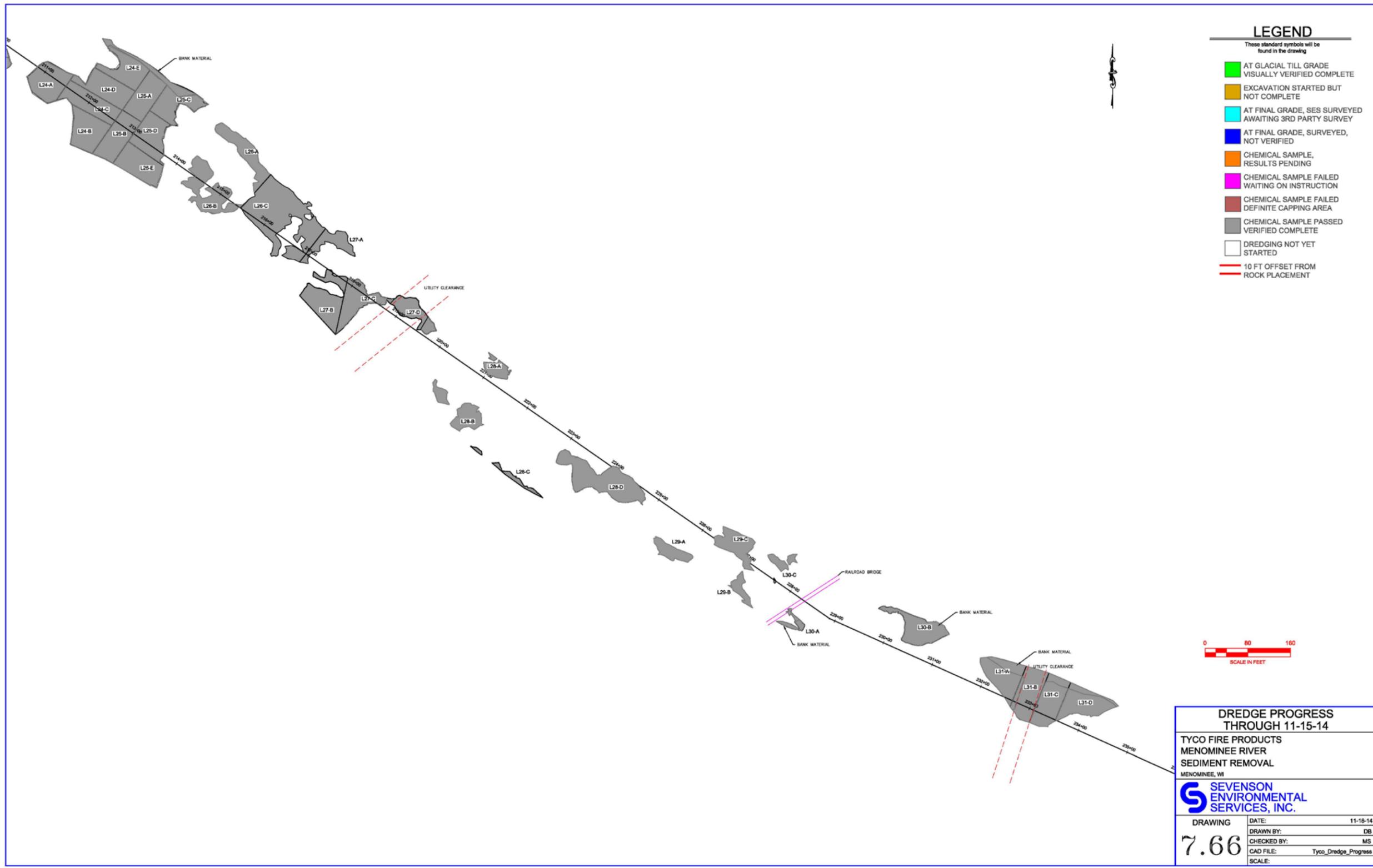


Figure G. Page 2. Ansul arsenic site, current status of the removal of Menominee River arsenic contaminated sediment delineated by dredge management unit (DMU).

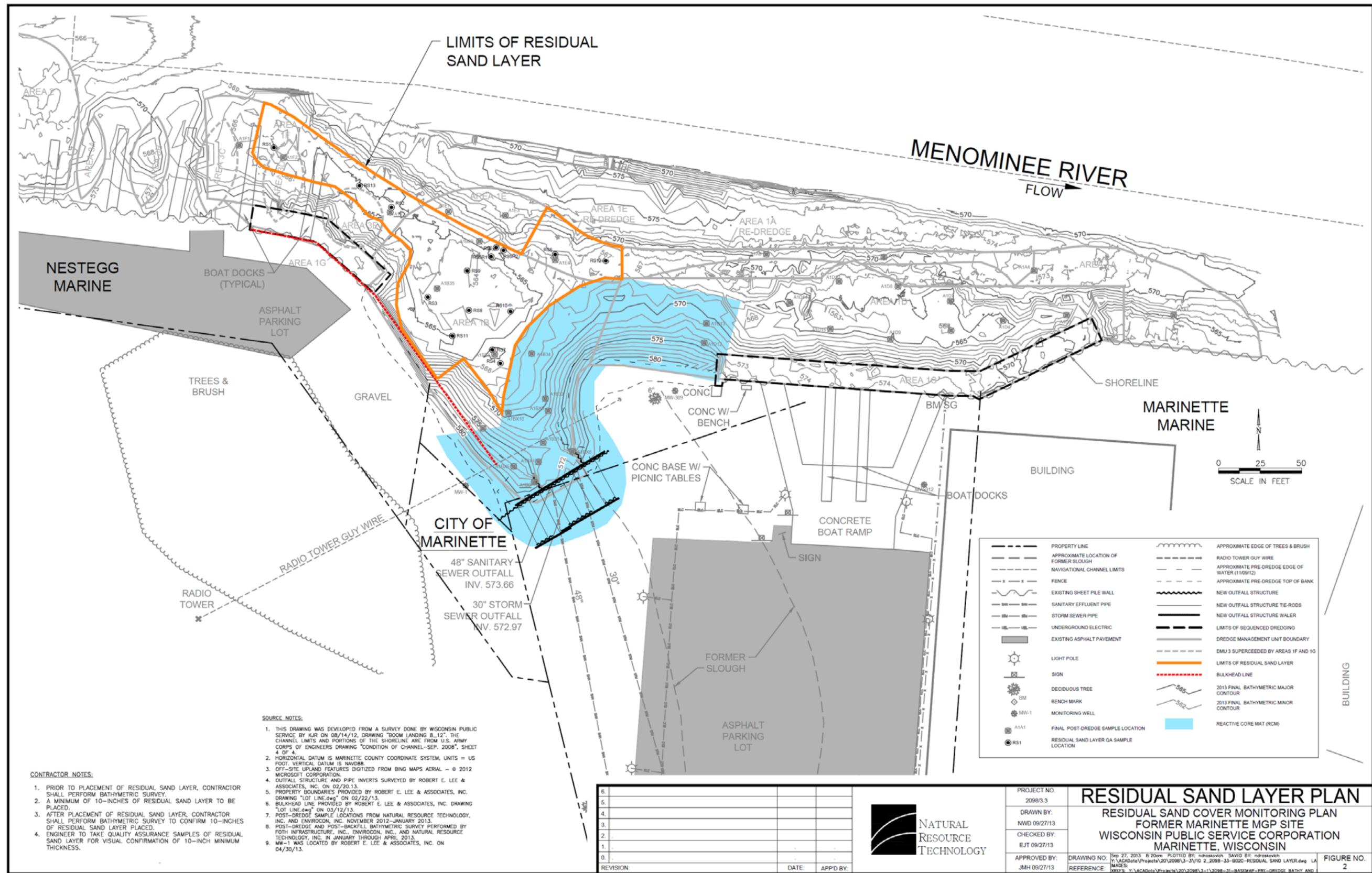


Figure H. The WPS coal tar site including the reactive core matting and sand cover limits.

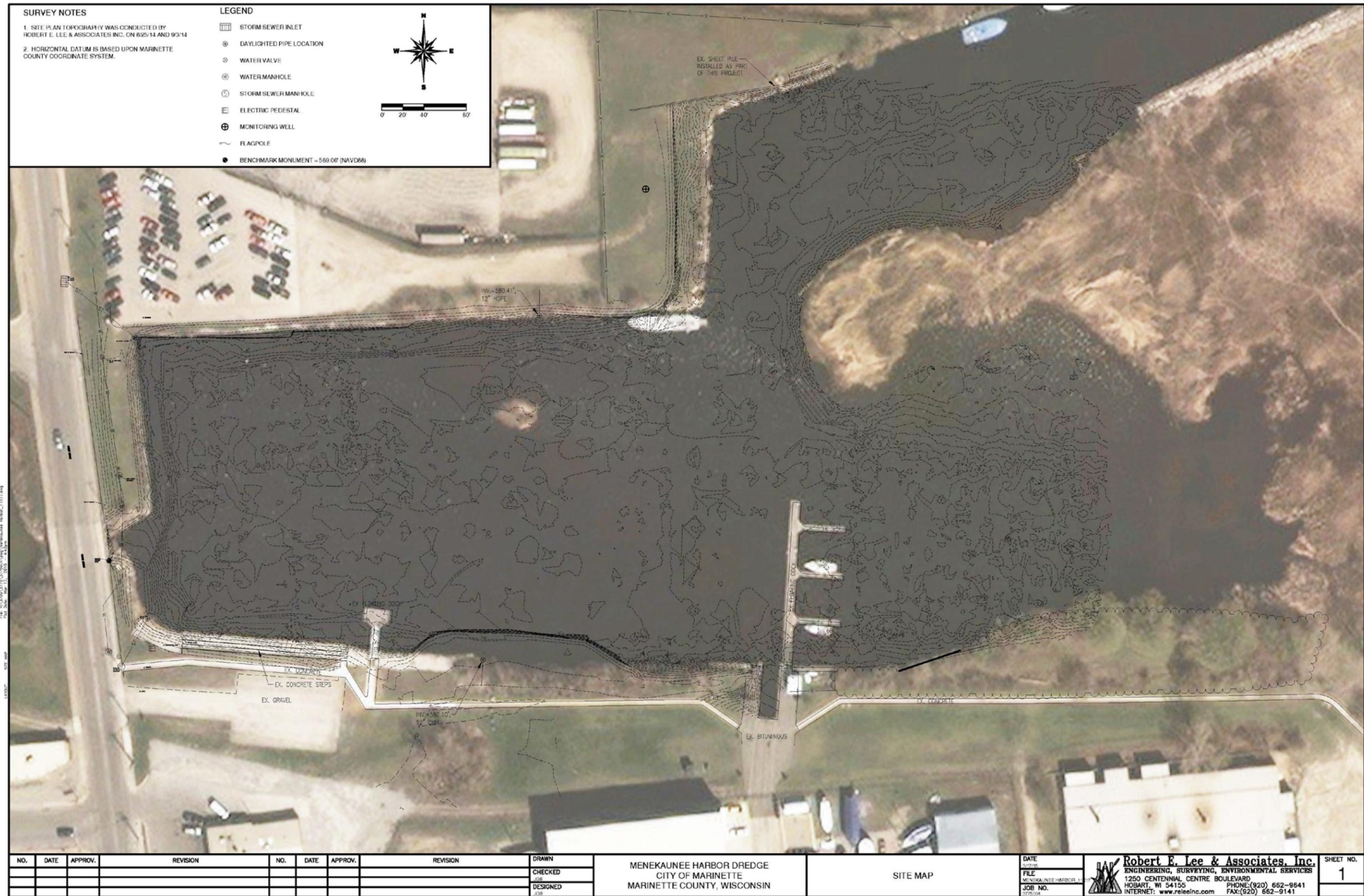


Figure I. Menekaunee Harbor status after 2014 dredging.

INTRODUCTION

The WDNR and the MDEQ share oversight of the Lower Menominee River AOC. The purpose of the AOC Program in both Wisconsin and Michigan and at the federal level in the U.S. Environmental Protection Agency Great Lakes National Program Office (GLNPO) is to help the Lower Menominee River and other AOCs become similar to other areas found within the Great Lakes Basin.

AOCs are severely degraded geographic areas within the Great Lakes. These areas, originally 43 within the Great Lakes region, were designated as AOCs primarily due to contamination of lake, reservoir, river, or harbor sediments by toxic pollutants (sometimes referred to as “legacy” pollutants due to the historical industrial development that often was the source of the pollution). The sources of the pollution may be known yet uncontrolled or ongoing; in other cases, the source may be unknown. Cleaning up these severely degraded areas is a first step toward restoring the chemical, physical, and biological integrity of these waters as required by the Great Lakes Water Quality Agreement (GLWQA, 1987). When AOCs have been cleaned up to the point where they are not more degraded than other comparable non-AOC areas, they are “delisted” or considered restored from the perspective of the AOC program. Former AOCs are then considered to be part of the LAMP program, a “whole lake” program that is also set forth in the GLWQA. The Agreement provides the framework for the U.S. and Canada to work together to restore the chemical, physical, and biological integrity of the Great Lakes.

Based on the existing environmental conditions and fish consumption advisories in the late 1980’s, six of the potential fourteen BUIs described under the 1987 Amendment to Great Lakes Water Quality Agreement (GLWQA, 1987) were identified for the Lower Menominee River when it was designated as an AOC. These BUIs included the following: “restrictions on fish and wildlife consumption,” “restrictions on dredging,” “degraded benthos,” “degraded fish and wildlife populations,” “loss of fish and wildlife habitat,” and “restrictions on recreational contact” (beach closings). Significant upgrades to the City of Marinette’s and City of Menominee’s wastewater treatment plants resulted in removal of the “restrictions on recreational contact” BUI, leaving only five impairments to be addressed (WDNR and MDEQ, 2011).

Most of the impairments are influenced by the presence of contaminated sediment (Table 1). Arsenic, paint sludge, and coal tars were identified as the three most significant contaminants, although other more minor sediment contaminants exist. Log driving, urbanization, invasive species, habitat fragmentation, and stormwater discharges also contributed to these impairments. The cause or causes of the “restrictions on fish consumption” BUI is unknown and currently under investigation. Prior to combined sewer separation and wastewater treatment plant upgrades, the Menominee River received high loads of bacteria during combined sewer overflow (CSO) events (WDNR and MDNR, 1990). An extensive wetland complex near the mouth of the river was destroyed by log driving activities in the 1800s. Afterwards, wetlands and near-shore areas surrounding the mouth of the River were filled for industrial expansion, and the shorelines hardened to prevent erosion or provide cargo vessel docking facilities. Remaining quality habitat and wetlands are threatened by encroaching invasive plants, and access to spawning and juvenile habitat for potamodromous fish, like lake sturgeon, has been severely limited due to the lack of a safe passage beyond several dams (Figure B). The loss of historic wetlands has contributed to the “degradation of fish and wildlife populations” and the “loss of fish and wildlife habitat” impairment. There are additional unidentified toxic sources within or upstream of the AOC, as elevated levels of PCBs and mercury can be detected in fish with no access to Lake Michigan as described in the fish consumption advisories provided to the public through their respective state agencies Michigan Department of Community Health (MDCH) (MDCH, 2014) and WDNR (WDNR, 2014a).

The *1990 Lower Menominee River Remedial Action Plan* (RAP; WDNR and MDNR, 1990) and the *1996 Lower Menominee River RAP Update* (WDNR, 1996) describe the historical activities that led to AOC designation, identify the beneficial use impairments BUIs for the AOC, summarize the status of those impairments, and offer recommendations for meeting environmental cleanup goals. The *2011 Lower Menominee River Stage 2 RAP* (WDNR and MDEQ, 2011) outlines a strategic plan for the removal of remaining BUIs, and is the primary tool needed to delist the AOC. The purpose of subsequent RAP updates (WDNR and MDEQ, 2013b; WDNR and MDEQ, 2014), including this current update, is to document progress made on the remaining BUIs since the previous RAP document and to describe their current status. This 2014 RAP Update documents the status of the AOC as of December 31st, 2014. Please see the References Section for links to access the RAP documents online.

The Lower Menominee River AOC includes the lower three miles of the river from the Park Mill Dam (Upper Scott Dam) to the river's mouth (Figure A). The AOC Boundary extends approximately three miles north of the river mouth to John Henes Park and approximately three miles south of the river mouth past Seagull Bar along Green Bay. Seagull Bar is considered to be a part of the AOC. Green Island in Green Bay is also part of the AOC because of its strong habitat value and biological link to Seagull Bar State Natural Area. There are six islands in the river within the AOC boundary. The AOC includes portions of Marinette County in Wisconsin and Menominee County in Michigan. Figure A shows the AOC boundaries and Figure B shows the entire Menominee River watershed.

Additional Lower Menominee River AOC information, including reports, fact sheets, photos, and videos, can be found online at the following links:

WDNR AOC Web site: <http://dnr.wi.gov/topic/greatlakes/menominee.html>

UW-Extension AOC website: <http://fyi.uwex.edu/aocs/menominee/>

MDEQ AOC Web site: http://www.michigan.gov/deq/0,1607,7-135-3313_3677_15430_57388---,00.html

The USEPA AOC Web site: <http://www.epa.gov/grtlakes/aoc/menominee/index.html>

Significant progress was made toward restoring the Lower Menominee River AOC in 2014. The "RECENT PROGRESS" section provides an overview of ongoing or recently completed projects.

Table 1: Sources of Beneficial Use Impairments for the Lower Menominee River AOC.

Beneficial Use Impairments	Contaminated Sediments	Combined Sewer Overflow	Loss of Historic Wetlands	Loss of Historic Submerged Aquatic Vegetation	Loss of Historic Emergent Aquatic Vegetation	Unidentified Toxic Sources	Loss of Shoreline Habitat
Restrictions on Dredging Activities	X						
Restrictions on Fish Consumption						X	
Degradation of Benthos	X						
Degradation of Fish and Wildlife Populations	X		X	X	X		X
Loss of Fish and Wildlife Habitat	X		X	X	X		X
Restrictions on Recreational Contact		X					

There may be additional unidentified toxic sources within or upstream of the AOC, as elevated levels of PCBs and mercury can be detected in fish upstream of the Menominee Dam. These sources are probably contaminated sediment. PCBs found in fish below the Menominee Dam likely result as fish freely travel between the Menominee River and the Green Bay/Fox River watershed. The Fox River is heavily contaminated with PCBs. Lost historic wetlands included emergent, submergent, and riparian varieties. Also note that the “restrictions on recreational contact” BUI was removed in 2011 (WDNR and MDEQ, 2011).

RECENT PROGRESS

The most important milestone ever reached in the Lower Menominee River AOC was the 2014 completion of removal of all known contaminated sediment sites to acceptable levels set by the negotiated settlements between the responsible parties and the relevant federal and state programs.

The status of individual beneficial use impairments are briefly summarized in Table 2. Table 3 contains a summary of studies relevant to BUI status. For a more thorough review of the status assessments for each impairment, see Appendix A. Background information and recent progress for specific areas of interest are described below.

Ansul Arsenic Site

Tyco International, owners of Ansul Incorporated, completed implementation of the USEPA approved work plan to remediate arsenic contaminated sediments to 50 ppm in 2013. Arsenic salts were produced as a byproduct of herbicide manufacturing between 1957 and 1977 and stored next to or discharged directly to the river (WDNR, 1996). The site includes segments 5 and 6a from Figure C. In 2009, Tyco signed an Administrative Order on Consent with the USEPA to remediate the site (USEPA, 2009). The administrative order requires Tyco to implement the remedy selected in the USEPA's 2008 Statement of Basis and Final Decision Document for Ansul Inc. (USEPA, 2009). Many remedial activities were conducted before the Administrative Order on Consent was signed. See previous RAPs or the USEPA web page <http://www.epa.gov/region5/cleanup/rcra/ansul/index.html> for additional information.

Components of the selected remedy are summarized and listed below (USEPA, 2008), and include an informal status.

- Construct and maintain an impermeable below-ground barrier wall to control the flow of groundwater to the maximum extent practicable (Figure E).
 - Status: Complete with ongoing maintenance and monitoring as needed.
- Cap surface soils on-site with arsenic concentrations equal to or above 32 ppm (Figure E).
 - Status: Complete with ongoing maintenance and monitoring as needed.
- Remove surface soils near the railroads tracks with arsenic concentrations equal to or above 16 ppm (Figure E).
 - Status: Complete.
- Collect and treat shallow groundwater on-site. Utilize trees cultivated for high rates of evapotranspiration to further suppress the water table. Conduct a technical review of the latest science for treating groundwater containing large quantities of arsenic every five years.
 - Status: Complete with ongoing activities as prescribed. The first five year review was due in December 2013.
- Remove and properly dispose of all Menominee River soft sediments with arsenic concentrations equal to or greater than 50 ppm (Figure F).
 - Status: Completed in 2013. See additional details below.
- Remove and properly dispose of all Menominee River semi-consolidated silts and clays with arsenic concentrations equal to or greater than 50 ppm (Figure F) or, if removal is technically or economically impractical, provide an alternative to removal that protects human health and the environment, is legally implementable, and achieves arsenic concentrations of 20 ppm or less by November 1, 2023.
 - Status: Complete.

- Removal began in July, 2012. Soft and semi-consolidated sediment containing total arsenic concentrations greater than or equal to 50 ppm were mechanically dredged using an environmental clamshell bucket and stabilized onsite (CH2MHILL, 2012). Stabilization was accomplished through the addition of a drying agent and chemical reagent (ferric sulfate and Portland cement). The stabilized soft sediment was then transported for disposal at an offsite nonhazardous landfill. Wastewater produced as part of this process was treated by a series of filters and reverse osmosis to reduce arsenic concentrations, and then discharged to the river in accordance with the limits set forth in the WDNR wastewater discharge permit. If arsenic concentrations in wastewater could not be reduced to acceptable levels, reject wastewater was properly disposed of at an offsite hazardous waste facility. Tyco hoped to remove approximately 100,000 cubic yards of contaminated sediment in 2012, but when dredging ceased for the season, only 26,913 cubic yards of material had been removed from the River (Foth, 2012). Greater than expected amounts of large woody debris were encountered during dredging, which slowed progress and required additional screening/grinding steps during sediment processing. Dredging was halted for approximately 30 days while sediment stabilization protocols were modified to comply with the leachable arsenic (less than 5 ppm), free water, and shear strength requirements (CH2MHILL, 2012). The turning basin is also used by local shipping and ship building industries. Anytime it needed to be used, dredging had to cease while turbidity control measures were moved.
- Mechanical dredging resumed in May, 2013. The quantity and size of equipment used has increased significantly since 2012. Larger pug mills were utilized to increase sediment treatment capacity and processing rates. An on-site shredder mitigated problems with wood debris. Dry ferric sulfate was substituted as the stabilizing reagent when treating soft sediment, reducing the amount of sediment that needed to be retreated in order to meet the leachable arsenic requirement. A mobile lab was brought in to increase sediment stabilization efficiency and reduce wait times for treatment results. Dredging and treatment was completed December 7. A total of, 232,133 cubic yards of contaminated sediment was removed from the river in 2013 (Foth, 2013). Confirmation sampling determined that the remedial action goals for 2013 were reached (Foth, 2013).

A GLLA Betterment Agreement between TYCO, the EPA, and the DNR was signed in May 2014. The agreement calls for additional dredging of all soft and semi-consolidated sediments that have arsenic concentrations greater than 20 ppm remaining after the 2013 completion of the Resource Conservation and Recovery Act (RCRA) component of the project. This agreement acts to speed recovery of the aquatic ecosystem and delisting of the Menominee River AOC by an estimated 5 years, because the required time for natural recovery of the sediment surface from 50 ppm to 20 ppm arsenic will no longer be required due to the active removal of contaminated material.

Dredging for the Betterment Action began in late August 2014, with sediment processing, treatment, and disposal methods remaining the same as those used for the Resource Conservation and Recovery Act (RCRA) activities. Dredging was completed in mid-November 2014, with 42,000 additional yards of arsenic contaminated sediments removed from the river. When processed, the material resulted in 73,000 tons of non-hazardous waste, which was hauled to Michigan for conventional landfilling. Of this waste, 556 tons was scrap debris, including lumber wood waste and old construction concrete.

Water treatment was again the most critical component of the project. All the water from sediment dewatering and from spray-cleaning of equipment and trucks had to be sent through the modified reverse-osmosis treatment system. A total of 2,173,000 gallons of water were treated. Of this amount, 397,000 gallons did not pass the required effluent limits for arsenic, and so could not be returned to the Menominee River but instead were shipped via tanker truck for out-of-state hazardous

waste disposal. Site decontamination and demobilization began at the end of 2014, and will continue through early summer 2015.

Post-dredge confirmation sampling will continue to ensure the project goal of 20 ppm or less of arsenic in remaining surface sediments. In those deep-water areas where excavation activities have exposed glacial till, a covering of carbon-enhanced sand will be layered on top of any till areas having >20 ppm arsenic. This cover will be 12 inches thick and will serve to physically and chemically attenuate any remaining arsenic that might migrate vertically through the till to the water column. Because the majority of exposed till is found within the bounds of the federal navigation channel, the action must be approved through U.S. Code Title 33, sec. 408 permitting by the Army Corps of Engineers. That permit approval is expected by March 2015, with cover placement occurring during the summer construction season.

WPS Coal Tar Site

The site was first identified when the Marinette Waste Water Treatment Plant was expanded in 1989. During this expansion surveyors discovered soils contaminated with coal tar and PAHs (WDNR and MDNR, 1990). Site investigations from 1994 to 2002 discovered approximately 4 acres of contaminated soil, and 1.3 acres of contaminated sediment in the nearby Menominee River. The source was determined to be a manufactured gas plant which operated up to 1960. The WPS was found to be responsible for the remediation of contaminated soils and sediments. In August of 2012 the WPS signed an Administrative Settlement Agreement and Order on Consent with the USEPA to complete non-time critical removal action for this site (USEPA, 2012).

The cleanup goal for this site was to remove oil-coated sediments [non-aqueous phase liquid, (NAPL)] and sediments with concentrations of PAHs greater than 22.8 ppm. A total of 14,799 cubic yards of sediment was mechanically removed from the Menominee River, processed and delivered to Waste Management Landfill in Menominee, Michigan for disposal (NRT, 2013). Confirmation sampling found some residual contamination to be irretrievably intermingled with the uneven bedrock surface. To protect benthic organisms, ten inches of clean sand cover was placed over these areas (Figure G). Reactive core matting was installed around the outfall structure and former slough to the river (Figure G). The matting was installed to keep upland contamination that was unable to be removed from migrating into the river (NRT, 2013). Upland source contamination will be further investigated and potentially remediated in the future. A long-term monitoring plan for the sand cover was developed and will be implemented until a decision can be made as to whether the sediment cleanup criteria have been met. More information on the WPS coal tar site remediation is found in previous RAPs and the USEPA Web page <http://www.epa.gov/region5/cleanup/marinette/>.

Menekaunee Harbor Restoration

Sediment quality and fish and wildlife habitat in the Harbor is degraded as a result of many years of industrial and urban activities. Contamination is not as high as other segments of the AOC, but elevated concentrations of metals, PAHs, and nutrients had been reported (Weston Solutions, 2008). Menekaunee Harbor is an important component of the environmental corridor, as a midpoint between the South Channel and Seagull Bar State Natural Area (Figure C, segment 6b and Figure D). Habitat improvements here would improve the connectivity between all three sites and the overall habitat value to fish and wildlife.

The WDNR and the City of Marinette began work with the City's engineering consultant to develop plans to remove contaminated sediment, improve navigational and recreational opportunities, and restore fish and wildlife habitat in Menekaunee Harbor in 2014 and 2015. This effort formally started in 2011 when the partners entered into an intergovernmental agreement for this work (WDNR, 2011). The WDNR and the city are fully funding plan development, estimated to cost \$422,000, and have

requested and received \$5,105,988 in GLRI funding from the USEPA to implement the plans in 2014 and 2015. The WDNR and City of Marinette will also contribute approximately \$860,000 and \$460,000, respectively, toward construction.

Dredging at Menekaunee Harbor (see Figure H) commenced August 21, 2014, with 59,021 cubic yards (CY) of material removed from the harbor. Environmental dredge materials (27,129 CY) were sent to the Waste Management Landfill in Menominee, Michigan, and navigational dredge materials (31,892 CY) were placed at the City-owned Lot 24. Additional clean granular material (7,742 CY) from within the harbor was hydraulically pumped to the beneficial reuse area located in the southeast quadrant of the harbor to restore shallow water depths for habitat restoration. Additional material is still needed, and the team is evaluating cost and options. This portion of the project will be completed in 2015. In addition, 8,405 square yards of rip rap and bedding has been incorporated as part of the new shoreline, replacing the old 1930's seawall. Sheet pile wall was installed in preparation for a future boat launch on the northeast section of the harbor.

Habitat Restoration Plans are in draft and will be final March 2015, with an anticipated date for bid announcement in March 2015, and implementation construction season 2015. Monitoring for plant establishment and invasive species control is to be conducted by Keith West, PhD UW-Marinette and students over the next five years to ensure the habitat restoration is successful. Note that the "degradation of fish and wildlife populations" and the "loss of fish and wildlife habitat" impairments can be removed after three years of monitoring (in 2018) if the vegetation objectives are being met.

Lower Scott Flowage Sediment Characterization

Prior to 2013, the Lower Scott Flowage (Figure C, segment 1) had not been comprehensively sampled for environmental contaminants in the sediment. In 2012, the MDEQ conducted a semi-permeable membrane device study on the Menominee River Watershed, and some net uptake of PCBs was observed just downstream of the Menominee Dam, indicating that sediments in either the Lower or Upper Scott Flowage, the Menominee River watershed, or some combination, are a relatively small source of PCBs (MDEQ, 2013). A sediment study completed for Eagle Creek Renewable Energy (ECRE) as part of the Federal Energy Regulatory Commission (FERC) relicensing process indicated some metal contamination exists within the flowage (North American Hydro Holdings (NAH), 2013). The WDNR and the MDEQ publish a fish consumption advisory for the Lower Scott Flowage for mercury based on fish tissue analysis (MDCH, 2014 and WDNR, 2014a).

The WDNR formally requested that the USEPA GLNPO characterize flowage sediment through the GLLA. The request was accepted and sampling was conducted in November 2013. Thirty-one surface grab samples and eight depth core samples were collected, including samples taken from the Upper Scott Flowage for comparison. Parameters analyzed included PCBs, PAHs, pesticides, metals, and sediment physical properties.

The final results for the sediment characterization came out in August of 2014 (CH2MHill, 2014). No sample sites were found to have PCBs, pesticides, dioxin, or mercury above the WDNR's sediment quality guidelines probable effect concentrations (PECs). PAHs and copper were the only compounds detected at concentrations exceeding PECs within the flowage, and the two samples were located within an isolated sediment pocket downstream of culverts discharging in the vicinity of a former paper mill. The estimated volume of contaminated sediment is small, and it seems to be an ongoing discharge. The WDNR will be looking into this, but no sediment remediation is planned. Since dredging will not be needed in the flowage, this indicates a potentially shorter timeframe for being able to consider removing the "restrictions on dredging" and "degradation of benthos" BUIs. Note that carrying out the 11th Avenue Pool restoration project was contingent upon sediment remediation occurring in the area. Since no remediation is planned, that restoration project has been taken off the

list of required actions for removal of the “degradation of fish and wildlife populations” and “loss of fish and wildlife habitat” BUIs. These results are also important to the “restrictions on fish consumption” BUI, since no source of contaminants was found for the fish consumption advisories.

Rio Vista Slough Sediment Characterization

Michigan DEQ staff recognized local stakeholder concerns that sediments found in Rio Vista Slough might be an ongoing source of contaminants contributing adverse effects to BUIs within the lower portion of the AOC. The MDEQ staff conducted a characterization study of those sediments in 2014. The initial review of the lab data for the sediment characterization did not show any PCBs or adverse contamination though the data did show low levels of PAHs. Based on that initial data, it is not anticipated that Rio Vista Slough will require sediment dredging. The draft MDEQ sediment data analysis report is expected in early 2015, and results will be discussed in the next RAP Update. If sediment remedial activities are recommended, they will be discussed immediately with all stakeholders including CAC, TAC, USEPA, and states.

Fish Consumption Advisory Assessment

In 2011 the MDCH received grant funding from the USEPA through the GLRI to assess the status of the “restrictions on fish consumption” BUI in several Michigan AOCs. The assessment will compare the concentrations of key contaminants in common carp (*Cyprinus carpio*) and smallmouth bass (*Micropterus dolomieu*) collected from two areas within the AOC and from Little Bay de Noc, the selected reference site. All tissue samples will be analyzed for mercury, total PCBs, and the standard suite of contaminants normally measured for the MDEQ fish contaminant monitoring program. Samples of one species of fish from the Lower Scott Flowage and from below the Menominee Dam will be analyzed for dioxin, furan, and dioxin-like PCB congeners. A sampling plan for the Lower Menominee River AOC was developed with feedback from WDNR and other stakeholders that contains the rationale for selecting target fish species and reference sites (MDEQ, 2012).

Fish collections to study contaminant levels in fish tissue were conducted in 2012 and 2013 in the AOC in conjunction with other planned WDNR activities for preparation and analysis by the MDEQ and the MDCH. Data will be shared with the WDNR. Inadequate numbers of common carp, which are critically important as they represent a “worst case scenario” in regards to PCB contamination (MDEQ, 2012), were available for collection in the Lower Scott Flowage. The WDNR fisheries staff conducted a targeted collection in the summer of 2014, and was able to collect the number needed for the assessment. Now that all the fish required for the study have been collected, analysis is underway and data results and the associated report should be available in early 2015.

Eagle Creek Renewable Energy (ECRE) Dam Relicensing and Sturgeon Passage

ECRE, formerly North American Hydro, is the owner/operator of two hydroelectric dams within the AOC. Both dams, Park Mill (Upper Scott) and Menominee (Lower Scott or Bridge Street), have licenses from the FERC, which are set to expire in 2015. As a condition of relicensing, ECRE has funded assessments of the fisheries community, fish tissue contaminant burden, sediment contamination, native mussel community, riparian and aquatic vegetation, wetlands, archeological resources, endangered resources, erosion, and water quality within their areas of responsibility. The results of these studies are included as appendices in their license application to the FERC (NAH, 2013). Through the relicensing process, ECRE is working with State and Federal Agencies to facilitate lake sturgeon passage above the Menominee Dam to points upstream of the Park Mill Dam (Figure B and Figure D) and downstream passage at both dams for all fish species. Safe upstream adult lake sturgeon passage and safe downstream passage of adult and juvenile lake sturgeon directly impact the Lake Michigan lake sturgeon population.

Upstream sturgeon passage will be accomplished by building a fish elevator into one of the existing empty turbine bays of the Menominee Dam to lift and sort adult lake sturgeon (USFWS, 2012). As the sturgeon are sorted, biologists will check for fish health and disease, take biological measurements, collect physical samples as needed, and remove any invasive species such as sea lamprey. Sturgeon approved to be passed upstream will be loaded into a tanker truck or truck with trailer for transport to a release point above the Park Mill Dam. Downstream fish passage will involve the use of surface bypasses and fish guidance systems at each dam, effectively allowing both juvenile and adult fishes to pass safely downstream of the dams. While the surface bypass is all that is needed for passage of adult fish, safe and effective downstream passage of juvenile fish requires modification to the powerhouse intake racks. Downstream fish passage at Park Mill Dam will be accomplished by installing an angled fish guidance rack in front of the turbine intake to redirect fish moving downstream from the Upper Scott Flowage into a surface bypass leading to the tailrace below. Downstream passage of adult fish at Menominee Dam will also be accomplished by a surface bypass, and the turbine intake will be modified by reducing trash rack spacing to provide safe downstream passage of juvenile fish.

Over \$7.7 million in funding from the GLRI, U.S. Army Corps of Engineers (USACE), and ECRE contributions have been dedicated to the project. Design work was completed by the USACE for downstream fish passage at the Menominee Dam in 2013. Construction was scheduled to begin during the summer of 2013, but was postponed while liability and long term maintenance issues were resolved. A Settlement Agreement was signed by all parties in July of 2013 that resolved issues related to the liability, funding, operation, and maintenance of fish passage at the two dams.

Construction for the downstream passage at Park Mill Dam began in June 2014, and is expected to be completed in early 2015. Construction on the fish lift for the upstream passage at Menominee Dam also began in June 2014, and is expected to be completed by April 2015. The Implementation Team was working on the specifications for a custom transport trailer to carry the sturgeon upstream, but has decided to put that project on hold for now and use existing equipment in 2015. Downstream passage at Menominee Dam has been funded with \$3 million provided by a GLRI grant through the USFWS. The next steps will be to hire an engineering firm to go from the 30% drawings provided by the USACE to complete 100% design drawings, and then to implement them. The WDNR has requested that the team review the results of a WDNR study to estimate turbine passage survival of fingerling and yearling lake sturgeon at the Shawano Hydroelectric Project on the Wolf River, Wisconsin, before moving forward with the final design. The final report for the sturgeon passage survival study will be available by spring 2015. Construction of the downstream passage should be completed by September of 2016.

Green Island

Green Island is an approximately 80 acre, privately owned island located 5 miles east of Seagull Bar State Natural Area (Figure C). Green Island was identified as critical wildlife habitat in the 1990 RAP, and included within the boundaries of the AOC to facilitate bird population recoveries. The CAC and TAC support public acquisition of the island for conservation purposes. Public acquisition of Green Island, or other conservation easements, is not required to achieve the removal of any impairment to the AOC. In 2011, a plan to fully develop the Island as vacation housing and a resort was proposed by the island's owner. In December 2014, the Island's owner and their consulting firm contacted the WDNR, indicating that they wish to move forward with this development and asking for a letter summarizing what is still needed from them for "next steps" permitting. These "next steps" involve permits for constructing a transmission line and a marina to attain access to the currently undeveloped island. Future permits will be needed for construction of a drinking water well and wastewater treatment system. In addition, an updated review of threatened and endangered resources will be needed.

Island Rookery Habitat Restoration

The Great Lakes Commission and the MDEQ hired NES Ecological Services to mechanically and chemically control invasive, non-native buckthorn (*Rhamnus* spp.), honeysuckle (*Lonicera* spp.), and wild grape vine (*Vitis* spp.) on islands within the AOC. Work under this contract was to cover the first year of a three year effort to control aggressive invasive plant species to enhance colonial bird nesting habitat in the AOC. Strawberry Island, Blueberry Island, Little Blueberry Island and Boom Island were included in the effort (Figure D). Property owners and other stakeholders assisted with project scoping and development. Work was completed during October and November, 2013. While carrying out the project, the contractor realized that they had grossly underestimated the time required, and could not complete the work for the amount of the grant. They did not conduct any work on Little Blueberry Island.

Due to the problems encountered the first year of the project, an alternative method was sought in 2014 to complete habitat restoration on the islands. In September 2014, USACE awarded a contract for \$498,973 to Ecology and Environment, Inc. (funded by GLRI) for invasive species management on the four Lower Menominee islands. The focus of this three-year project is on controlling invasive plants, restoring native plant communities, and supporting colonial nesting bird populations. It is also a demonstration project that will emphasize adaptive management techniques. The USACE and their contractors are working with the property owners-ECRE (Blueberry Islands), the U.S. Bureau of Land Management (Strawberry Island), the City of Marinette (Boom Island), and the AOC advisory groups to involve local stakeholders and assure that AOC goals are being met. In November 2014, Ecology and Environment, Inc. scientists met with the CAC and TAC to discuss the project and conducted vegetation surveys on all four islands. Next steps for early 2015 include completing a contractor scope of work to send out for bids and a draft Invasive Species Control and Management Plan.

South Channel

The South Channel habitat restoration project (see Figure D) has evolved somewhat due to uncertainty around the Tyco (formerly Ansul) Arsenic Site cleanup. The *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update* (WDNR and MDEQ, 2013a) listed three required activities related to the South Channel:

- Complete a habitat restoration and protection project in the South Channel for increased fish and wildlife habitat.
- Increase the hydrologic connection between South Channel and Menekaunee Harbor by removing debris and excess riprap under the Ogden Street Bridge.
- Conduct biological monitoring of the South Channel (segment 6a) to document ecological recovery.

Completion of the habitat restoration project would first require arsenic levels in the sediment to be reduced to 20 ppm or below. At the time the update was written, it was unknown whether Tyco would be leaving the sediment with arsenic concentrations between 50 and 20 ppm in place and monitoring its natural recovery to a concentration of 20 ppm arsenic, or whether the 20 ppm arsenic concentration would be reached earlier by additional sediment removal through a GLLA Betterment Project. Once the Betterment Project Agreement was signed in May 2014, planning could proceed for the habitat restoration project in the South Channel. The GLLA Betterment Dredging Project was completed in 2014, with construction restoration activities to be completed in 2015 (see "Ansul Arsenic Site" summary). The USFWS GLRI funding earmarked for the project was then focused on design of the habitat project rather than monitoring of the natural recovery.

The USFWS hired Anderson Engineering to complete the South Channel habitat design and held a project kick-off meeting in September 2014. In 2014, Anderson Engineering and Interfluve gathered

and analyzed preliminary data and began work on concept designs. The USACE began modeling current and future conditions for flow and scour. Regular meetings and conference calls between the project partners and interested local stakeholders have ensured that the project progresses smoothly and AOC goals are being met. Project partners have decided to accelerate the timeline, allowing for earlier implementation of the project. The current plan is for the final design to be complete in June 2015, rather than August. This should allow time for invasive plant species treatment and in-stream work in fall/winter 2015, with native plantings to occur in spring 2016. Funding for implementation of the habitat restoration project will be requested by the WDNR from the USEPA through the noncompetitive GLRI grant process. It is anticipated that the cost will be \$500,000 or less. Note that an additional \$100,000 available from the GLLA Betterment Project for habitat restoration will be focused on invasive Phragmites treatment in the South Channel area.

A long-term AOC priority is to increase the hydrologic connection and fish passage under Ogden Street Bridge between the South Channel and Menekaunee Harbor. This includes removing debris and excess riprap that was placed there before the arsenic cleanup to keep contaminated sediment from moving downstream to Menekaunee Harbor. Part of that material was moved in October 2014, leaving a depth of about one foot under the bridge. Plans are underway to remove additional material in 2015.

Fisheries Data Roundup

In 2012, a team of fisheries experts from the MDNR, WDNR, and the USFWS were assembled to review existing fisheries data for the AOC. The project team selected metrics to assess recruitment, and then set recruitment goals based on the evaluation metrics (WDNR, 2013). When existing data were not available, inadequate, or otherwise not comparable, the team recommended the collection of additional fisheries data. In 2013, additional data were collected for the Lower Scott Flowage, lower river section (Figure C segments 2-6b), and two reference sites, the Escanaba River in Michigan and the Peshtigo River in Wisconsin.

The project team concluded that the Lower Scott Flowage target species populations are currently meeting their restoration targets (WDNR, 2014b). However, they would not consider the target achieved until the results of the Lower Scott Flowage sediment characterization work had been obtained. If sediment remediation activities were required in the 11th Avenue Pool area, post-remedial habitat restoration would then be required before this target would be considered achieved. The results of the Lower Scott sediment characterization (CH2MHill, 2014), indicate that no remediation will be required at the 11th Avenue Pool. We can consider the target met for the Lower Scott Flowage. This is one of two fish recruitment objectives of the *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update* (WDNR and MDEQ, 2013a). The Goals and Activities Table from that document has also been included in this update as Appendix C.

Additional data was collected for the selected reference sites and the lower river in 2014, and this will be repeated in 2015. The project team will meet and discuss these results, and the Wisconsin AOC Coordinator will write a final report to summarize the results and conclusions by the project team. Project results will be used to assess the status of the fish population objectives, including the one for target fish species in the lower river (see Appendix C).

Table 2: Lower Menominee River Beneficial Use Impairment Status Summary (refer to Appendix A and Appendix C for more detail).

Beneficial Use Impairment	Is BUI Considered Impaired?	Summary of Status and Next Steps
Restrictions on Dredging	Yes	Sediment cleanups have been completed for the Lloyd-Flanders Paint Sludge site (1995) and the WPS Coal Tar Site (2013). Dredging has been completed at the Tyco-Ansul Arsenic site (2014), with the placement of the sand cover planned for 2015. Contaminated sediment was removed at the Menekaunee Harbor site (2014), and the placement of beneficial reuse material in the SE Quadrant will be completed in 2015. Sediment sampling by GLNPO in the Lower Scott Flowage found contamination levels below recommended risk criteria, except one area that indicated low levels of sediment contamination near a stormwater outfall, which will be addressed by appropriate WDNR programs. This is not considered an AOC issue. A surficial sediment investigation was completed in Rio Vista Slough in 2014 (report early 2015). Preliminary data analysis indicates surficial contamination levels below recommended risk criteria. Development of a dredge management plan delineating restrictions that must remain in place to protect contaminated sediment remedial actions is required to remove this BUI. This BUI could be removed as early as 2015 or early 2016.
Degradation of Benthos	Yes	The delisting target for this BUI is the same as that for the “restrictions on dredging” BUI above, except that a dredge management plan is not required. This BUI could be removed as early as 2015.
Restrictions on Fish Consumption	Yes	The MDCH and the MDEQ are conducting a statewide fish consumption advisory assessment that will compare fish tissue contaminant levels in Michigan AOCs, including the Menominee River, to non-AOC reference sites. The MDCH, MDEQ, and the WDNR will review fish tissue assessment results to determine impairment status when the study is complete in 2015. This BUI could be removed as early as 2015.

<p>Degradation of Fish and Wildlife Populations and Loss of Fish and Wildlife Habitat</p>	<p>Yes</p>	<p>Final restoration goals, objectives, and activities are contained in the <i>2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update</i>. Many field studies have been completed and habitat restoration and protection projects are in progress (WDNR and MDEQ, 2013a). The assessment of the status of the fish populations requires a minimum of three consecutive years of fish population data from the Menominee River and control sites. The assessment began in 2013 and will be completed in 2015. With completion of all habitat projects and confirmation monitoring, this BUI could be removed as early as 2018.</p>
<p>Restrictions on Recreational Contact</p>	<p>No</p>	<p>Source control was achieved. Recommendation to remove impaired status approved by GLNPO in March 2011 (WDNR and MDEQ, 2011).</p>

Table 3: A summary of environmental studies relevant to the Lower Menominee River AOC, excluding studies from known contaminated sediment sites.

Study	Data Gathering	Data Review	Potential Data Uses	BUI Removal Effort Benefited	Results Available
FERC Required Sediment Sampling	NAH	WDNR MDEQ NAH	Detect metals, mercury, PCBs, and PAHs.	Restrictions on dredging activities, restrictions on fish consumption, degradation of benthos.	(NAH, 2013)
Lower Scott Flowage Sediment Characterization	USEPA	USEPA WDNR	Detect metals, mercury, PCBs, and PAHs.	Restrictions on dredging activities, restrictions on fish consumption, degradation of benthos.	(CH2MHill, 2014)
Rio Vista Slough Sediment Characterization	MDEQ	MDEQ	Evaluate sediments to determine if source of contaminants to AOC.	Restrictions on dredging activities, restrictions on fish consumption, degradation of benthos.	2015
Semi-permeable Membrane Device Study	MDEQ	MDEQ WDNR	Detect PCBs, pesticides found in water column.	Restrictions on dredging activities, restrictions on fish consumption, degradation of benthos.	(MDEQ, 2012b)
U.S. Geological Survey (USGS) Benthos and Plankton Assessment	USGS	USGS WDNR	Assess benthic conditions.	Degradation of benthos.	(Scudder Eikenberry et al., 2014) (more to come)
USGS Swallow Study	USGS	USGS WDNR MDEQ	Evaluate reproductive success rates and tissue contaminant concentrations.	Degradation of fish and wildlife populations, degradation of benthos.	Unpublished
Fish Consumption Advisory Assessment	MDCH MDNR WDNR	MDCH MDEQ WDNR	Compare mercury, metals, pesticides, and PCBs in AOC caught fish tissue to those at a reference site.	Restrictions on fish consumption.	2015
National Oceanic and Atmospheric Administration (NOAA) Mussel Watch Program	NOAA	NOAA WDNR MDEQ	Detect contaminants in mussel tissue and sediment.	Restrictions on fish consumption.	Unpublished
Aquatic Vegetation Survey	WDNR, MDEQ	WDNR MDEQ,	Determine the extent and diversity of aquatic flora in the AOC.	Loss of fish and wildlife habitat.	(Onterra, 2010)
eBird Data Assessment	WDNR	WDNR	Evaluate relative status of bird density and diversity in the AOC.	Degradation of fish and wildlife populations.	Unpublished

Study	Data Gathering	Data Review	Potential Data Uses	BUI Removal Effort Benefited	Results Available
Fisheries Data Roundup	WDNR	WDNR MDEQ	Evaluate evidence of recruitment for appropriate fish species.	Degradation of fish and wildlife populations.	(WDNR, 2013b)
Fisheries Data Roundup – New Monitoring	WDNR MDNR	WDNR MDEQ	Evaluate evidence of recruitment for appropriate fish species.	Degradation of fish and wildlife populations.	2015
Invasive Species Control and Management Plan	Ecology and Environment, Inc.	USACE	Determine the extent of aggressive invasive vegetation control needed on riverine islands and guide development of management and restoration plan.	Loss of fish and wildlife habitat.	2015
Mussel Survey	NAH	WDNR MDEQ	Qualitatively determine the extent and diversity of native mussels in the AOC.	Degradation of fish and wildlife populations.	(WDNR, 2012)
Riparian Vegetation Survey	WDNR	WDNR MDEQ	Determine the extent and diversity of terrestrial flora in the AOC.	Loss of fish and wildlife habitat.	(NES, 2012)

STAKEHOLDER ENGAGEMENT AND OUTREACH

The Citizens Advisory Committee (CAC) was formed as a means of incorporating stakeholder feedback into the RAP documents and to serve as ambassadors on AOC issues to the Marinette and Menominee communities. CAC members help the agencies by identifying local issues, developing local targets and goals, serving as a resource for historical information, and assisting in project implementation when possible. The CAC developed governing bylaws in June of 2011 to ensure the committee's long term viability and balanced representation of the community. As of December 2014, there are eleven membership positions filled of a possible twenty-six. Dozens more individuals have attended monthly meetings and currently receive meeting minutes and AOC updates through e-mail. The WDNR and the MDEQ strongly prefer that requests to remove the impaired designation of a BUI be agreed to by the CAC. The CAC has included a letter of support for this document as Appendix B.

The CAC holds regular meetings on the UW-Marinette campus open to all interested parties. Meetings are advertised through the WDNR Open Meeting Calendar, CAC/TAC list serve, and other means. Ten meetings of the CAC were held in 2014, including an open house in June. Participation in meetings is the primary way members of the CAC stay informed and provide input on AOC activities. In addition to attending CAC meetings, the CAC members have been active in the AOC in the following ways: participated in on-site tours for the sturgeon passage project, the Ansul arsenic site, the Menekaunee Harbor restoration site, and the WPS coal tar site; reviewed documents and provided letters of support for AOC related projects; provided local representation or feedback at various state and federal AOC workshops, trainings, and meetings; and participated in state and federal AOC related conference calls.

The informed CAC plays a critical role in conducting community outreach. Table 4 lists community outreach activities ongoing or completed in 2014. Members of the CAC actively manage and present the AOC foldout educational display at community events including the Menominee Waterfront Festival and Audubon Society's International Migratory Bird Day. In August, the Lake Michigan Stakeholders provided a forum for the display at their Lake Michigan Day. Print copies of the display travel between UW-Marinette, local public libraries, and governmental buildings. Four CAC members in 2013 and one member in 2014 provided interviews for short videos on the Menominee River AOC. Short videos on AOC related topics are seen as a way to efficiently reach a large, broad audience. Videos can easily be distributed online through agency Web sites, and shared through social media outlets. New videos will be pursued to cover additional topics in the AOC as needed. Existing videos pertaining to the Lower Menominee River AOC are available below as examples:

- [Lower Menominee River AOC Video](#)
- [Menominee River Sturgeon Passage](#)
- [USGS Swallow Contaminant Study](#)
- [Controlling Phragmites along the Lake Michigan Shoreline](#)

Table 4: Community outreach activities ongoing or completed in 2014 to help keep the local community, businesses, and tourists updated and supportive of projects, and aware of needed actions on their part.

MEDIA	TARGET AUDIENCE	MESSAGES	ACTIVITY LEAD	COLLABORATORS	FUNDED BY
Traveling Educational Display and Outreach Materials	General public, tourists, people attending Marinette/Menominee community events	The Lower Menominee River is an AOC. Details on major restoration and cleanup projects. The CAC and how they can be involved.	CAC	WDNR, UW-Extension, MDEQ, Marinette County Land Water Conservation Division	2011 MDEQ capacity grant, display and accessories 2012 WDNR CAC capacity grant, design printing of updated panels
Lower Menominee River AOC Videos	General public, internet users	Many partners have put a lot of effort into restoring the Lower Menominee River, restoration is nearly complete.	WDNR	CAC, City of Marinette, Harbor Town Marine, ECRE, Tyco, USFWS, USEPA, UW-Extension	2013 and 2014 WDNR CAC capacity grants
June 2014 Open House	General public	The Lower Menominee River is an AOC. Details on major restoration and cleanup projects. The CAC and how they can be involved.	CAC	WDNR, UW-Extension, UW-Marquette, MDEQ	

Next action(s) needed

CAC/PAC capacity grant funding will be sought in 2015 from the MDEQ and WDNR to continue to build community understanding, interest, and involvement in the AOC through the delisting process and promote ongoing citizen-led stewardship to help this area achieve its full potential. Priorities for 2015 include updating the Menekaunee Harbor sign, boat launch signs, and traveling educational display; conducting an AOC-focused volunteer river/waterfront cleanup; holding another AOC public open house event (or two); and continuing work on short AOC videos for Web-based distribution. Agencies and the CAC should continue to invite members of the press to CAC meetings and encourage local media coverage of progress in the AOC.

Award of a Michigan PAC (Public Advisory Council) Support Grant to the Menominee County Conservation District is anticipated to provide fiduciary and secretariat support to the CAC. The District will help the CAC and states with meeting agendas and provide minutes. They will also help develop outreach materials to make local stakeholders aware of AOC activities and provide coordination on how they can volunteer or help.

BENEFICIAL USE IMPAIRMENT UPDATES

The following pages summarize the current status of each Beneficial Use Impairment using the format below. An explanation of each section is provided below after the heading.

Restoration Target and Status

Beneficial Use Impairment Name	Status
The 2008 Lower Menominee River AOC Beneficial Use Impairment Restoration Targets (WDNR and MDEQ, 2008) are listed here as separate target components on each row to clearly show the status of each part of the target.	May be: <ul style="list-style-type: none"> • “Complete” • “Assessment in progress” • “Incomplete” • “Incomplete, in progress”

Target Concerns

This section may discuss one or more of the following:

- potential concerns about the target, particularly if the target is not specific enough to define a measurable endpoint for the BUI
- if revisions are anticipated and how such changes might be approached including responsible party and timeline
- if the 2008 target was modified and details of any changes

PLEASE NOTE: Prior to reinvigorating the CAC, the MDEQ and the WDNR, in discussions with the EPA-GLNPO, agreed to use the most restrictive parameters or criteria from either state when developing the BUI removal criteria for this shared AOC.

Rationale for Listing

The section briefly summarizes the reason the BUI was known or suspected at the time of listing. If sources contributing to the impairment have been identified since listing, those are included in this section as well.

Summary of key remedial actions since the last RAP Update and current status

“Key remedial actions” are those that directly contributed to the current known status of that BUI. A table may be included as an appendix, or reference made to the “RECENT PROGRESS” section to capture a detailed list of past projects. The narrative here explains and leads to the “Next action(s) needed.”

Next action(s) needed

This section is a narrative listing of assessments, on-the-ground projects, and stakeholder engagement processes that are clearly delineated and directly address the specific BUI. Plans for verifying achievement of delisting targets are listed here if known.

Issues (challenges, risks) affecting progress on this BUI

This section lists project contingencies (i.e., one thing has to happen before another can occur), funding obstacles, and any other considerations that could affect the timeline for delisting.

RESTRICTIONS ON DREDGING ACTIVITIES

Restoration Target and Status

Restrictions on Dredging Activities	Status
All remediation actions for known contaminated sediment sources are completed and monitored according to the approved remediation plans and the remedial action goals have been achieved; and	Incomplete, in progress
An AOC dredge management plan is developed by the communities and agencies that includes an evaluation of: <ul style="list-style-type: none"> ○ Restrictions that must remain in place to protect human health and the environment ○ Restrictions that must remain in place due to RCRA requirements that are based upon state and federal law ○ Priority areas for navigational use ○ Priority areas for utility dredging, e.g., utility crossings ○ Identify costs and funding options for removing dredging restrictions in priority areas 	Incomplete

Target Concerns

The MDEQ and the WDNR agreed when developing this AOC’s BUI removal criteria to use the most restrictive parameters or criteria from either state. In this case, the MDEQ normally considers only federally designated navigational channels when assessing this impairment (WDNR and MDEQ 2008), while the WDNR considers dredging impairments throughout the AOC. The entire AOC will be considered per interstate agreement above.

Rationale for Listing

Any location within the AOC where the presence of contaminated sediment increases dredging costs and limits dredge spoil disposal options contributes to the listing of this impairment. The Lower Menominee River is classified as a federal navigable harbor, a harbor of refuge, and is used as a diversified cargo port and shipyard. Dredging activities are restricted due to the presence of toxic contaminants in the river’s sediments. Their presence increases dredging costs and limits dredge spoil disposal options. The shipping channel in the Lower Menominee River and Harbor has been regularly dredged since 1982. Dredged spoils have been deposited into the open waters of Lake Michigan in Michigan’s waters. However, the turning basin was not dredged beginning at that time because of increased costs and limited dredge spoil disposal options from the arsenic contamination. The contamination was so severe that sediments from this portion of the river could have been classified as a hazardous waste if an attempt were made to remove them via dredging (WDNR, 1996). Sites that at one time contributed towards the listing of this impairment include the Ansul arsenic site, the WPS coal tar site, Lloyd Flanders paint sludge site, and Menekaunee Harbor. The Lower Scott Flowage and Rio Vista Slough were investigated to determine if they also contribute to this impairment.

Summary of key remedial actions since the last RAP Update and current status

Sediment cleanups have been completed for the Lloyd-Flanders Paint Sludge site (1995) and the WPS Coal Tar Site (2013). Dredging has been completed at the Tyco-Ansul Arsenic site (2014) and the Menekaunee Harbor site (2014). The EPA report on the 2013 sediment sampling efforts in the Lower Scott Flowage was completed in 2014. Results show that sediment remediation is not needed in the flowage (CH2MHill, 2014). A surficial sediment investigation was completed in Rio Vista Slough in 2014 by the MDEQ-Water Resources Division (report 2015). Preliminary data review found no PCBs and indicated low levels of PAHs.

See the “RECENT PROGRESS” section for a detailed account of the status of these activities.

Next action(s) needed

- Placement of sand cover through the GLLA betterment project at Tyco (spring-summer 2015)
- Verify sand cover thickness for GLLA project at Tyco (spring-summer 2015)
- Complete placement of beneficial reuse material in the SE Quadrant of Menekaunee Harbor as part of habitat restoration (summer-fall 2015)
- Please note the City of Marinette may perform confirmation sampling in the beneficial use area, but this is not a requirement of the Quality Assurance Project Plan (QAPP) and not contingent for removing BUI's (summer 2015)
- Complete sand cover monitoring at the WPSC former MGP site to ensure goal of 22.8 ppm Total PAH's is met (spring-summer 2015)
- Review results of sediment characterization work in Rio Vista Slough, and determine if further action is needed (draft report spring 2015)
- Develop an AOC dredge management plan in partnership with TAC, CAC, local units of government, and property owners (see target for details; complete in late 2015 or early 2016). The dredge management plan should focus on protecting the completed sediment remedial actions, with identification of priority areas for future dredging and areas where dredging restrictions must remain in place
- Remove this BUI after the dredge management plan has been developed and approved by state and federal agencies charged with oversight related to completed contaminated sediment removals including paintball recovery and sediment capping

Issues (challenges, risks) affecting progress on this BUI

- If the sediment investigation in Rio Vista Slough indicates significant contamination, this area would need to be remediated prior to removal of this impairment (not expected at this time).
- State governments need to agree about components necessary to prepare an “approved” dredge management plan for protection of the remediated contaminated sediment sites within the AOC. Agencies need to identify local stakeholders, local units of government, and property owners necessary for implementation of the protections of dredged areas preserving effectiveness of remedial actions. Protections need to be long-term.

DEGRADATION OF BENTHOS

Restoration Target and Status

Degradation of Benthos	Status
All remediation actions for known contaminated sediment sources are completed and monitored according to the approved plan and have met their remedial action goal.	Incomplete, in progress

Target Concerns

Some concerns have arisen because restoration targets for this BUI do not include monitoring efforts to document the recovery of the benthic community. Sites not impacted by contaminated sediments within the AOC show a relatively healthy benthic community. It's assumed that these communities will re-colonize former degraded areas once contaminated sediment sites have met their remedial goals.

The Lower Menominee River AOC was included in a GLRI-funded study, initiated by the WDNR and carried out by the USGS, to characterize benthic invertebrate and planktonic communities in Wisconsin's Lake Michigan AOCs and six reference sites (Table 3). The Lower Menominee AOC site was included to increase the statistical power of the study. Although the BUI removal target does not require such data, it may be useful for gaining a better understanding of benthic conditions in the AOC. The results of the 2012 sampling are available online (Scudder Eikenberry et al., 2014). An interpretive report is in progress.

Another GLRI-funded USGS study that could be useful in understanding benthic conditions in the AOC is GLRI Project 80, "Birds as Indicators of Contaminant Exposure in the Great Lakes." This study uses the tree swallow (*Tachycienta bicolor*), an insectivorous bird residing alongside waterbodies, to study historic and newly emerging contaminants in food chains around the Great Lakes. More information is available online at http://www.umesc.usgs.gov/wildlife_toxicology/glri_project80.html.

Rationale for Listing

The 1990 RAP attributes degradation of the benthos in otherwise suitable habitat to toxic conditions caused by contaminated sediment (WDNR and MDNR, 1990). A WDNR Menominee River Survey conducted in August 1957 sampled just below the Ansul Chemical Company, found few bottom-dwelling organisms at this point and populations were composed of known pollution tolerant varieties. Letter, Committee on Water Pollution, Theodore F. Wisniewski, Director, Division of Water Pollution Control. Studies conducted in the area over a period between 1974 and 1989 found degraded benthic communities in and around the turning basin (Figure C, segment 5) and some studies determined there was an absence of benthic organisms. Elevated levels of arsenic, cadmium, and mercury were detected in subsequent benthic organism tissue analyses. Benthic impairments were due to a variety of causes, but heavy arsenic pollution was identified by the USEPA as the likely cause since there were adequate substrate and nutrients available to support a diverse benthic population (WDNR and MDNR, 1990).

Summary of key remedial actions since the last RAP Update and current status

Remedial actions completed for this BUI are the same as those for the "restrictions on dredging" BUI. Please see that section and the "RECENT PROGRESS" section for a detailed account of the status of these activities.

Next action(s) needed

- Placement of sand cover through the GLLA betterment project at Tyco (spring-summer 2015)
- Verify sand cover thickness for GLLA project at Tyco (spring-summer 2015)
- Complete placement of beneficial use material in the SE Quadrant of Menekaunee Harbor as part of habitat restoration (summer-fall 2015)
- Please note the City of Marinette may perform confirmation sampling in the beneficial use area, but this is not a requirement of the QAPP and not contingent for removing BUI's (summer 2015)
- Complete sand cover monitoring at the WPSC (Wisconsin Public Service Corporation) former MGP (Manufactured Gas Plant) site to ensure goal of 22.8 ppm Total PAH's is met (spring-summer 2015)
- Review results of sediment characterization work in Rio Vista Slough, and determine if further action is needed (draft report spring 2015)

Issues (challenges, risks) affecting progress on this BUI

If sediment investigation in Rio Vista Slough indicates significant contamination, this area would need to be remediated prior to removal of this impairment (not expected at this time).

RESTRICTIONS ON FISH CONSUMPTION

Restoration Target and Status

Restrictions on Fish Consumption	Status
Sources of PCBs, mercury, and dioxins within the AOC have been controlled or eliminated; and	Incomplete, in progress
Waters within the Lower Menominee River AOC are no longer listed as impaired due to PCB or dioxin fish consumption advisories in the most recent Impaired Waters (303(d)) list for either state; or	Incomplete
Fish tissue contaminants causing advisories in the AOC are the same or lower than those in the associated Great Lake or appropriate control site.	Assessment in progress

Target Concerns

Fish from the waters of Green Bay and the Lower Fox River have access to all segments of the AOC except in the Lower Scott Flowage between the Menominee and Park Mill Dams (see segment 1 in Figure C). The fish found below the Menominee Dam are known to have elevated levels of PCBs in their tissue. To be protective of human health, the fish consumption advisories from both states for these segments are the same as advisories for Green Bay. It's unlikely that all fish consumption advisories in AOC waters will be lifted due to the presence of Green Bay and Lake Michigan fish. BUI removal could occur if studies indicate that fish are not impacted by contamination found within the AOC, even though fish consumption advisories will likely remain in place.

Rationale for Listing

This beneficial use is considered impaired because of elevated levels of mercury and PCBs found in fish tissue that do not meet Wisconsin Department of Health Services (WDHS), U.S. Food and Drug Association, and/or the MDCH's health advisory limits (WDNR and MDNR, 1990). Fish from the waters of Green Bay have access to all segments of the AOC except between the Menominee and Park Mill Dams (see segment 1 Figure C) and may carry contamination in their tissues originating outside of the AOC. These fish are known to have elevated levels of PCBs and mercury in their tissue. There is potential for unidentified toxic sources within or upstream of the AOC, as elevated levels of PCBs and mercury can be detected in fish upstream of the Menominee Dam (MDCH, 2014 and WDNR, 2014a).

Michigan issues fish consumption advisories for Green Bay and Little Bay de Noc, including the Menominee River below the Menominee Dam, for PCBs and mercury (MDCH, 2014). Michigan also issues advisories for the Menominee River between the Park Mill and Menominee Dams (Lower Scott Flowage) for mercury and for the Menominee River between the Twin Falls Dam and the Park Mill Dam for mercury and PCBs (MDCH, 2014). Wisconsin issues fish consumption advisories for Green Bay and its tributaries, including the Menominee River up to the first dam, for PCBs (WDNR, 2014a). Wisconsin also issues advisories for the Lower Scott Flowage for Mercury and for the Menominee River from Pier's Gorge, near Quinnesec, downstream to the Park Mill Dam for PCBs and mercury (WDNR, 2014a).

Summary of key remedial actions since the last RAP Update and current status

See the *Fish Consumption Advisory Assessment*, *Lower Scott Flowage Sediment Characterization*, and *Rio Vista Slough Sediment Characterization* reports in the "RECENT PROGRESS" section.

Both states update fish consumption guidance based on the most current fish tissue monitoring data and state and federal guidance. Current Michigan and Wisconsin fish consumption advice may be found online at www.michigan.gov/eatsafefish, and <http://dnr.wi.gov/topic/fishing/consumption/index.html>, respectively.

Next action(s) needed

- The MDCH completes fish tissue analysis and report (spring-summer 2015)
- Review results of tissue analysis for the AOC and Little Bay de Noc to determine if further action is needed (spring-summer 2015)
- Review results of sediment characterization work in Rio Vista Slough, and determine if further action is needed (spring 2015)

Issues (challenges, risks) affecting progress on this BUI

- It is important to note that current contaminated sediment remediation efforts do not significantly affect the removal of this beneficial use impairment. There are no advisories at this time for consuming fish contaminated with arsenic or PAHs in the AOC because these contaminants rarely reach levels of concern in fish fillets.
- If tissue analysis records contaminant levels the same as or lower than background levels found in Little Bay de Noc or the Lake Michigan/Green Bay Watershed, BUI removal can proceed. If levels are significantly higher than controls, the BUI removal would be delayed to determine if contaminants are from a source within the AOC and that source has been identified and remediated where possible. If identified sources fall under authorities of a separate program, discussions will take place between state and federal partners to determine if actions under that program will meet the “all management actions complete” under the guidance provided under the Great Lakes Water Quality Agreement.
- If Rio Vista Slough sediment investigation detects significant sources of mercury, PCBs, or dioxins, additional sediment remediation would be required prior to the removal of this BUI (not expected at this time).

DEGRADATION OF FISH AND WILDLIFE POPULATIONS and LOSS OF FISH AND WILDLIFE HABITAT

Restoration Target and Status

Degradation of Fish and Wildlife Populations and Loss of Fish and Wildlife Habitat	Status
<p>A local fish and wildlife habitat management and restoration plan has been developed and implemented for the Lower Menominee River AOC that:</p> <ul style="list-style-type: none"> ○ Defines the causes of fish and wildlife population and habitat impairments within the AOC ○ Establishes site specific habitat and population objectives for fish and wildlife species within the AOC ○ Identifies fish and wildlife population restoration programs and activities within the AOC and establishes a mechanism to assure coordination among states and programs for assessment monitoring, implementation activities and associated monitoring; and 	<p>Development complete, implementation in progress</p>
<ul style="list-style-type: none"> ○ The programs and actions necessary to accomplish the recommendations are identified in the fish and wildlife management and restoration plan are implemented; and 	<p>Incomplete, in progress</p>
<ul style="list-style-type: none"> ○ Monitoring conducted according to the Fish and Wildlife Plan shows consistent improvement in the quality and quantity of habitat or populations identified in the plan 	<p>Incomplete, in progress</p>
<p>Please note:</p> <ul style="list-style-type: none"> ○ Removal of this BUI will be based on achievement of implementation of actions in the steps above, including monitoring conducted according to site plans and showing consistent improvement in quantity or quality of habitat or populations addressed in the criteria. ○ Habitat values and populations need not be fully restored prior to delisting, as some may take many years to recover after actions are complete. ○ Actions already implemented in AOCs may be reported and evaluated as long as the reports contain all the elements above. 	

Target Concerns

These BUIs are interdependent and are discussed and addressed together. Removal of these BUIs will take place concurrently through implementation of the 2013 *Fish and Wildlife Population and Habitat Management and Restoration Plan Update*.

Rationale for Listing

The “degradation of fish and wildlife populations” and “loss of fish and wildlife habitat” BUIs were listed because of the loss of historic wetlands and localized toxicity caused by contaminated sediment. An extensive wetland complex dominated by wild rice near the mouth of the river was destroyed by log driving and milling activities in the 1800s. Afterwards, land near the mouth of the river was filled for industrial and municipal expansion and the shorelines hardened to prevent erosion. Remaining quality habitat and wetlands are threatened by encroaching invasive plants. Access to spawning and juvenile habitat for potamodromous fish like lake sturgeon has been severely limited due to the lack of safe passage beyond several dams (Figure B).

Sediment contaminated with arsenic, PAHs, and other heavy metals including cadmium, chromium, copper, lead, mercury, nickel, and zinc have impacted fish populations throughout the AOC (WDNR and MDNR, 1990). Sediment was contaminated through industrial activities, municipal waste water treatment practices, and stormwater discharges that took place throughout the 1900s.

Summary of remedial actions since the last RAP Update and current status

The *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update* (WDNR and MDEQ, 2013a) was approved by the WDNR and the MDEQ and is the principal document used by state and federal agencies to identify projects needed to achieve the removal of the “degradation of fish and wildlife populations” BUI and the “loss of fish and wildlife habitat” BUI. Progress towards that end will be reported in annual RAP updates.

At this time, none of the five overarching restoration goals contained in the *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update* (Plan) have been achieved. See Appendix C for the Goals and Objectives Table from the Plan. However, two of the ten objectives are now considered to be achieved (see below). Also, many activities contributing towards the achievement of objectives have either been completed or are in progress. Following are some examples of activities that are either recently achieved or in progress:

- TAC and CAC agreed in 2014 that Ben Uvaas’ and Andy Fayram’s eBird data analysis (unpublished) fulfills the “Monitor the rookery activity of known and prospective rookeries” objective
- Fish population surveys are in progress in the AOC and in reference sites, to be complete in 2015; results so far show that the “There is evidence of recruitment in segment 1...” (Lower Scott Flowage) objective has been achieved, and final results will be used to determine whether the lower river (segments 2-8) objective has also been achieved
- Since results of the sediment characterization in the Lower Scott Flowage (Figure C, segment 1) available in 2014 showed that remediation will not be needed there (CH2MHill, 2014), the 11th Avenue Pool restoration project has been removed from the “must-do” list for BUI removal
- Safe downstream fish passage around Park Mill Dam is in progress, to be completed in early 2015
- Upstream sturgeon passage around Menominee and Park Mill Dams is in progress, to be completed by spring 2015
- Safe downstream fish passage around Menominee Dam planning and design work is in progress, to be implemented by September 2016
- Vegetation improvements on Strawberry, Boom, Blueberry, and Little Blueberry Islands are in progress, to be substantially completed in 2016
- CAC sent letter to City of Marinette Plan Commission in support of zoning ordinances as a means to protect natural areas where habitat restoration has taken place (supports long-term protection goal)
- Removal of debris and excess riprap in South Channel below Ogden Street Bridge is in progress, to be completed by 2015
- South Channel habitat restoration project is in design phase, with implementation planned for 2015 and 2016
- Menekaunee Harbor habitat restoration project is in design phase, and implementation is planned for 2015, with invasive plant monitoring and treatment to follow
- Larval lake whitefish monitoring could not be completed in 2014 due to high flows, but will be carried out in 2015

See the “ECRE Dam Relicensing and Sturgeon Passage,” “Menekaunee Harbor Restoration,” “Island Rookery Habitat Restoration,” “South Channel,” and “Fisheries Data Roundup” topics in the “RECENT PROGRESS” section for details on specific ongoing activities.

Next action(s) needed

In general, implementation of the *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update* (Plan) is needed to continue making progress in removing these BUIs. The Goals and Objectives Table (Table 1 from the Plan) is included in Appendix C. The activities listed in the Activities Table (Table 2 from the Plan) have been included in the BUI Tracking Matrix in Appendix A, along with all of the other actions needed to remove BUIs and delist this AOC. The BUI Tracking matrix includes updated details on project status, management, cost estimates, and other necessary information. The WDNR, MDEQ, CAC, and TAC agree that only activities listed in this table are required to achieve restoration targets. Many activities have been completed, and many more are currently in progress.

The majority of the activities listed in the Plan and Appendix A have now been funded. One exception is the implementation of the South Channel habitat restoration project, which we hope to begin in late 2015. The WDNR will submit a proposal to USEPA for consideration of GLRI AOC funds. It is anticipated that the cost will be \$500,000 or less.

Issues (challenges, risks) affecting progress on these BUIs

- If fish population surveys in the AOC and reference sites show that any target fish species are not meeting their objectives, then the WDNR, MDEQ, TAC, and CAC will need to decide on next steps. Possible options include the following:
 - Remove BUI without further action (assuming all other objectives are met)
 - Do additional work in AOC to improve habitat for those species
 - Repeat surveys to reassess after x years; remove BUI once achieve objective
- The GLRI has been identified as the sole or a contributing funding source for nearly all activities requiring federal funding. Future GLRI funding is considered critical to remove these BUIs and delist the Lower Menominee River AOC.

RESTRICTIONS ON RECREATIONAL CONTACT (BEACH CLOSINGS)

Restoration Target and Status

Restrictions on Recreational Contact	Status
No waterbodies within the AOC are included on the list of non-attaining waters due to contamination with pathogens <i>from combined sewer overflows</i> in the most recent Clean Water Act Water Quality and Pollution Control in either states: Section 303(d) and 305(b) Integrated Report (Integrated Report), which are submitted to the USEPA every two years; or	
In cases where the waterbodies within the AOC are on the list of non-attaining waters due to the presence of Combined Sewer Overflows (CSOs) or are impacted by upstream CSOs, this BUI will be considered restored when CSOs have been eliminated or are being treated; or	Completed
<p>In cases where CSOs still exist and significant progress has been made towards their elimination or treatment, this BUI will be considered restored when:</p> <ol style="list-style-type: none"> 1. All known sources of bacterial contamination to the AOC originating in the AOC and tributary watersheds have been controlled or treated to reduce exposures; and 2. No unpermitted sanitary sewer overflows have occurred within the AOC during the previous five year period as a result of a less than 25-year precipitation event or snow/ice melt conditions; and 3. Marinette, WI and Menominee, MI have adopted and are implementing storm water reduction programs, including an illicit discharge elimination program. 	Completed using the option 3

Target Concerns

The restoration target set in 2008 was modified to identify combined sewer overflows as the primary reason for this impairment, (WDNR and MDEQ, 2011).

Rationale for Listing

Elevated levels of bacteria exceeding water quality standards had been documented in the Menominee River (WDNR and MDNR, 1990). These exceedances were associated with wet weather events causing combined sewer overflows.

Summary of remedial actions since the last RAP Update and current status

This BUI has been removed; therefore, no further actions are needed.

SUMMARY AND CONCLUSIONS

The most important milestone ever reached in the Lower Menominee River AOC was the 2014 completion of dredging of all known contaminated sediment sites to acceptable levels. Once the sand cover for the GLLA betterment project is placed (summer 2015) and Rio Vista Slough sediment investigation confirms that no remediation is needed there (draft report spring 2015), this step will allow removal of the “degradation of benthos” BUI to proceed and will facilitate removal of the “restrictions on dredging” BUI once the Dredge Management Plan (DMP) is completed. The DMP will ensure that dredged or capped dredge areas are protected from disturbance.

The MDCH and the MDEQ are conducting a statewide fish consumption advisory assessment that will compare fish tissue contaminant levels in Michigan AOCs, including the Menominee River, to non-AOC reference sites. The MDCH, MDEQ, and the WDNR will review fish tissue assessment results to determine impairment status when the study is complete in spring or summer 2015. The “restrictions on fish consumption” BUI could be removed in 2015.

To remove all impairments, activities beyond the remediation of contaminated sediment sites are also required. Staff from the WDNR and the MDEQ completed an update to the existing fish and wildlife plan, titled the *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update* (WDNR and MDEQ, 2013a). This plan is the principal document guiding the removal of the “degradation of fish and wildlife populations” and “loss of fish and wildlife habitat” impairments. At this time, none of the five overarching restoration goals contained in the *2013 Fish and Wildlife Population and Habitat Management and Restoration Plan Update* have been achieved. However, two of the objectives were achieved in 2014, and many activities contributing toward the achievement of the objectives have either been completed or are in progress (see Appendix A and Appendix C).

Significant milestones likely to be reached in 2015:

- Completion of Ansul/Tyco arsenic site GLLA betterment action, including sand cover placement
- Results from Rio Vista Slough sediment characterization finalized
- WPS coal tar site sand cover monitoring results available
- Work on dredge management plan started
- Results from fish consumption advisory assessment available
- Completion of Menekaunee Harbor habitat restoration project
- Completion of Park Mill Dam downstream fish passage and Menominee Dam upstream sturgeon passage facilities
- Completion of design for safe downstream passage at Menominee Dam
- Removal of debris and excess riprap in South Channel below Ogden Street Bridge
- Completion of design and start of implementation for South Channel habitat restoration project
- Final year of monitoring for fish populations in the AOC and reference sites; decision on whether target fish species in lower river are meeting objectives
- Larval lake whitefish monitoring project completed
- Progress on island rookery habitat restoration
- Achievement of long-term habitat protection goal through requests to land owners by CAC/TAC
- Decision by TAC on whether additional monitoring is needed to confirm mussel recruitment objective

Some potential hurdles exist that could delay or complicate reaching restoration targets:

- If the sediment investigation in Rio Vista Slough indicates significant contamination, this area would need to be remediated prior to removal of the “restrictions on dredging” and “degradation

of benthos” BUIs, and (depending on the contaminant) possibly the “restrictions on fish consumption” BUI (not expected at this time).

- State governments need to agree about the process and components necessary to prepare an “approved” dredge management plan for protection of the remediated contaminated sediment sites within the AOC. Protections need to be long-term.
- If fish tissue analysis indicates contaminant levels significantly higher than background levels found in Little Bay de Noc or the Lake Michigan/Green Bay Watershed, removal of the “restrictions on fish consumption” BUI would be delayed to determine if contaminants are from a source within the AOC and that source has been identified and remediated where possible.
- If fish population surveys in the AOC and reference sites show that any target fish species are not meeting their objectives, then the WDNR, MDEQ, TAC, and CAC will need to decide on next steps.
- Implementation of the South Channel habitat restoration project, which we hope to begin in late 2015, still requires funding. The WDNR will be requesting funding from the USEPA through the noncompetitive GLRI grant process. It is anticipated that the cost will be \$500,000 or less.
- The GLRI has been identified as the sole or a contributing funding source for nearly all activities requiring federal funding. Future GLRI funding is considered critical to remove these BUIs and delist the Lower Menominee River AOC.

The Lower Menominee River AOC is on track to complete all management actions in 2016. The states intend to begin proposing to remove BUIs in 2015, and the AOC could potentially be delisted in 2018. Continued progress has only been possible with the help of many partners who have put a lot of effort into restoring the Lower Menominee River. GLRI funding has also been a critical component of this effort.

Updates of the RAP will continue to be produced on an as-needed basis to effectively communicate progress to the public as well as to local, state, and federal agencies.

REFERENCES

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APPENDICES

- Appendix A Lower Menominee River AOC Beneficial Use Impairment Tracking Matrix
- Appendix B Letter of Support for the 2014 RAP Update from the Citizen's Advisory Committee
- Appendix C Goals and Objectives Table (Table 1) from the 2013 Fish and Wildlife Population and Habitat Management and Restoration Plan

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Appendix A

Lower Menominee River AOC Beneficial Use Impairment Tracking Matrix

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Lower Menominee River AOC BUI Tracking Matrix 2014

Project Name	BUI Addressed	Project Type	Action Types	Project Status	Project Start Date	Project End Date	Project Cost	Primary Funding Source	Project Lead Organization
Aquatic Vegetation Survey	BUI 14, BUI 3	Fish and Wildlife	Assessment	Completed	2010	2010	\$15,690	Wisconsin (GLRI)	Wisconsin DNR
Fish Consumption Advisory Assessment	BUI 1	Fish and Wildlife	Assessment	In Progress	2011	2015	\$500,000	Michigan (GLRI)	Michigan DEQ
Fisheries Data Roundup	BUI 3, BUI 14	Fish and Wildlife	Assessment	Completed	2012	2013	\$5,000	Wisconsin (GLRI)	Wisconsin DNR
Fisheries Data Roundup - Reference Site Monitoring	BUI 3, BUI 14	Fish and Wildlife	Assessment	In Progress	2013	2016	\$6,000	Wisconsin (GLRI)	Wisconsin DNR
Increase the hydrologic connection between South Channel and Menekaunee Harbor	BUI 3, BUI 14	Fish and Wildlife	Restoration	In Progress	2014	2015	\$1,000	Marinette City of	Marinette City of
Island Rookery Habitat Improvement	BUI 3, BUI 14	Fish and Wildlife	Restoration	In Progress	2014	2016	\$498,973	USACE (GLRI)	USACE
Menekaunee Harbor Restoration	BUI 3, BUI 6, BUI 7, BUI 14	Fish and Wildlife	Restoration	In Progress	2014	2015	\$6,851,988	USEPA (GLRI)	Wisconsin DNR
Menominee Dam, Downstream Fish Passage	BUI 3, BUI 14	Fish and Wildlife	Restoration	In Progress	2014	2016	\$3,000,000	USEPA (GLRI)	USFWS
Menominee Dam, Upstream Fish Passage	BUI 3, BUI 14	Fish and Wildlife	Restoration	In Progress	2013	2015	\$2,600,000	USEPA (GLRI), ECRE	USFWS
Menominee Dam, Upstream Fish Passage Truck and Transfer	BUI 3, BUI 14	Fish and Wildlife	Restoration	In Progress	2014	2016	\$20,000	Eagle Creek Renewable Energy	USFWS
Monitor for Larval Lake Whitefish	BUI 3, BUI 14	Fish and Wildlife	Assessment	In Progress	2014	2015	\$43,646	Great Lakes Protection Fund	Wisconsin DNR
Monitor Rookery Activity	BUI 3, BUI 14	Fish and Wildlife	Assessment	Completed	2013	2014	\$0	Wisconsin	Wisconsin DNR

Lower Menominee River AOC BUI Tracking Matrix 2014

Project Name	BUI Addressed	Project Type	Action Types	Project Status	Project Start Date	Project End Date	Project Cost	Primary Funding Source	Project Lead Organization
Mussel Survey	BUI 3, BUI 14	Fish and Wildlife	Assessment	Completed	2011	2012	\$6,093	Wisconsin (GLRI)	Wisconsin DNR
Park Mill Dam, Downstream Fish Passage	BUI 3, BUI 14	Fish and Wildlife	Assessment	In Progress	2013	2015	\$2,163,000	USEPA (GLRI), ECRE	USFWS
Riparian Vegetation Survey	BUI 14, BUI 3	Fish and Wildlife	Assessment	Completed	2011	2012	\$16,500	Wisconsin (GLRI)	Wisconsin DNR
South Channel Restoration	BUI 3, BUI 14	Fish and Wildlife	Restoration	In Progress	2013	2016	\$500,000	USEPA (GLRI)	USFWS
Repeat Fish, Mussel, and Vegetation Surveys after Restoration Projects Completed (as needed)	BUI 3, BUI 14	Fish and Wildlife	Assessment	In Development	2015	2018	Unknown	TBD	TBD
Ansul Arsenic Site Remediation	BUI 6, BUI 7, BUI 3, BUI 14	Sediment	Remediation	In Progress	2009	2015		Great Lakes Legacy Act	USEPA
Dredge Management Planning	BUI 7	Sediment	Remediation	Not Started	2015	2016		TBD	Wisconsin DNR
Lloyd Flanders Paint Sludge Site Remediation	BUI 6, BUI 7	Sediment	Remediation	Completed	1995	1995		Responsible Party	Michigan DEQ
Lower Scott Flowage Sediment Characterization	BUI 1, BUI 6, BUI 7, BUI 3, BUI 14	Sediment	Remediation	Completed	2012	2014		Great Lakes Legacy Act	USEPA
Rio Vista Slough Sediment Characterization	BUI 1, BUI 6, BUI 7	Sediment	Remediation	In Progress	2014	2015		Michigan (GLRI)	Michigan DEQ
SPMD Study	BUI 1, BUI 6, BUI 7, BUI 3, BUI 14	Sediment	Remediation	Completed	2011	2012	\$70,000	Michigan (GLRI)	Michigan DEQ
WPS Coal Tar Site Remediation	BUI 3, BUI 6, BUI 7, BUI 14	Sediment	Remediation	Completed	2012	2013		Responsible Party	USEPA

BUI Number Key for Lower Menominee River AOC BUI Tracking Matrix 2014

BUI #	BUI Name
BUI 1	Restrictions on Fish and Wildlife Consumption
BUI 3	Degraded Fish and Wildlife Populations
BUI 6	Degradation of Benthos
BUI 7	Restrictions on Dredging Activities
BUI 14	Loss of Fish and Wildlife Habitat

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Appendix B

Letter of Support for the 2014 RAP Update from the Lower Menominee River Citizen's Advisory Committee

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Lower Menominee River Remedial Action Plan Citizens Advisory Committee

The Lower Menominee River: A Great Lakes Area of Concern

May 28, 2015

Michigan Department of Environmental Quality
Office of the Great Lakes
Richard Hobrla, AOC Program Manager
Constitution Hall 6 Floor, South Tower
525 West Allegan Street
Lansing, Michigan 48909-7973

Wisconsin Department of Natural Resources
Office of the Great Lakes
Kendra Axness, LAMP and AOC Coordinator
PO Box 7921
101 S Webster Street
Madison, WI 53703-7921

Dear Mr. Hobrla and Mrs. Axness,

The members of the Citizens Advisory Committee for the Lower Menominee River Area of Concern are writing to express our support for the *2014 Remedial Action Plan Update for the Lower Menominee River Area of Concern*. The Lower Menominee River Citizens Advisory Committee has been involved in development and review of the document and we consent to its findings and statements. We request your review and concurrence of this document.

The CAC is composed of local concerned citizens, industry leaders, and governmental representatives representing a balanced viewpoint of Marinette, WI & Menominee, MI. We are tasked with assisting resource agencies with removing designated BUIs in the Lower Menominee River AOC. The CAC has provided local perspective and feedback into the development of this plan. We understand that the RAP is the primary document that will be used to track progress on BUI restoration, assessment, and removal, as well as describing the path for delisting the AOC.

If you have any questions please contact Mark Erickson Michigan CAC Co-Chair at 906-863-1954, or Keith West Wisconsin CAC Co-Chair at 715-735-4300 x4352.

Sincerely,

Mark Erickson, Michigan Co-chair

Keith West, Wisconsin Co-chair

C.C. Stephen Galarneau, WDNR
Victor Pappas, WDNR

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Appendix C

Goals and Objectives Table (Table 1) from the 2013 Fish and Wildlife Population and Habitat Management and Restoration Plan

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Table 1: Goals and objectives of the 2013 *Fish and Wildlife Population and Habitat Management and Restoration Plan Update* for the Lower Menominee River AOC. The achievement of goals is dependent on achieving corresponding objectives. The achievement of all goals is the restoration target for the “degradation of fish and wildlife populations” and the “loss of fish and wildlife habitat” BUIs. Objectives quantify the goals, making assessment possible.

GOALS				
<i>Long-term protection is in place for natural areas and wetlands within the AOC, including Seagull Bar and riverine islands.</i>	<i>Nesting populations of a diverse array of wetland-dependent and riparian-associated birds are consistently present within the AOC.</i>	<i>The lake sturgeon population is enhanced.</i>	<i>Diverse and functional native fish and mussel assemblages are present in the AOC that sustain natural recruitment.</i>	<i>A healthy and diverse native vegetation community has been restored.</i>
OBJECTIVES				
<i>Long-term protections deemed acceptable by the WDNR, MDEQ, TAC, and CAC have been established for all natural areas where habitat improvement work has taken place and contributes to achieving one or more BUI removal objectives.</i>	<i>Maintain or enhance habitat conducive to colonial waterbird rookery activity on known or prospective rookeries.</i>	<i>Provide additional spawning and juvenile rearing habitat for lake sturgeon by providing passage upstream of both Menominee and Park Mill Dams (USFWS, 2012).</i>	<i>There is evidence of recruitment within segments 2-8 for the following fish species: lake sturgeon walleye, yellow perch, muskellunge, smallmouth bass, largemouth bass, and northern pike.</i>	<i>Invasive, non-native species comprise no more than 33% of the vegetation community in protected natural areas of the AOC.</i>
			<i>There is evidence of recruitment in segment 1 for the following fish species: walleye, rock bass, bluegill smallmouth bass, largemouth bass, and northern pike.</i>	
	<i>Monitor the rookery activity of known or prospective rookeries.</i>	<i>Provide a means for fish to pass safely downstream of both Menominee and Park Mill Dams (USFWS, 2012).</i>	<i>There is evidence of recruitment within the AOC for native mussel species.</i>	
			<i>Monitor for larval lake whitefish to determine necessity of future habitat improvements.</i>	