REMEDIAL ACTION PLAN UPDATE

for the

SHEBOYGAN RIVER AREA OF CONCERN

December 2016

Wisconsin Department of Natural Resources
Office of Great Waters - Mississippi River, Lake Superior & Lake Michigan

Remedial Action Plan Update
for the
Sheboygan River Area of Concern
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Cover photo: Sheboygan River taken from Esslingen Park, one of seven habitat restoration areas within the AOC. Photo taken by Eric Evensen.

Disclaimer

The Great Lakes Water Quality Agreement is a non-regulatory agreement between the U.S. and Canada, and criteria developed under its auspices are non-regulatory. The actions identified in this document as needed to meet beneficial use impairment (BUI) delisting targets are not subject to enforcement or regulatory actions.

The actions identified in this Remedial Action Plan 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.

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PURPOSE STATEMENT

This Remedial Action Plan (RAP), which updates the 2015 RAP, documents and communicates progress made in the Area of Concern (AOC) in the last year and shares the path forward with our partners and stakeholders. The RAP includes a concise summary of beneficial use impairment (BUI) status and tracks progress on specific actions that are important for reaching the delisting targets. These “actions” may include on-the-ground restoration projects, monitoring and assessment projects, and stakeholder engagement processes. As the primary agency with the responsibility to develop and implement the RAP, the Wisconsin Department of Natural Resources and the Office of Great Waters is committed to making progress in remediating and restoring Wisconsin’s Areas of Concern. In order to be lasting and effective, the AOC program must continuously improve, evaluating its course as new information and technology become available. Subsequent RAP updates will be produced as needed to incorporate new information.

Remedial Action Plans are required by Annex 1 of the Great Lakes Water Quality Protocol of 2012 (which replaced the 1987 Protocol amending the Revised Great Lakes Water Quality Agreement of 1978). The 2012 Protocol indicates that Remedial Action Plans must include the following elements:

1. Identification of BUIs and causes;
2. Criteria for the restoration of beneficial uses that take into account local conditions and established in consultation with the local community;
3. Remedial measures to be taken, including identification of entities responsible for implementing these measures;
4. A summary of the implementation of remedial measures taken and the status of the beneficial use; and
5. A description of surveillance and monitoring processes to track the effectiveness of remedial measures and confirm restoration of beneficial uses.

2016 PROGRESS SUMMARY

The Wisconsin Department of Natural Resources (WDNR) and partners are continuing to work towards a cleaner, healthier Sheboygan River. During the past year progress has been made in a number of areas within the Sheboygan River AOC including verification monitoring, habitat project maintenance, and various other assessments. All monitoring and assessment work has generated information on BUI status and will support decision making moving forward.

This year (2016)
In 2016, WDNR and its partners implemented the following actions in the Sheboygan River AOC to continue to achieve AOC goals:

- ✓ Final draft of the Fish and Wildlife Restoration Plan which will document actions taken, measures of success, future monitoring, and other habitat work that could complement the AOC Tier 1 priority actions. This plan will help address the "Degradation of Fish and Wildlife Populations" and "Loss of Fish and Wildlife Habitat" BUIs.
- ✓ Completed a three year verification monitoring project for fish communities, benthic macroinvertebrate communities and fish habitat surveys to address the "Degradation of Fish and Wildlife Populations" and "Loss of Fish and Wildlife Habitat" BUIs.
    - o Verification monitoring for mink will continue in some fashion since tracking and trapping have had mixed results thus far. Not only will continued monitoring address the "Degradation of Fish and Wildlife Habitat" BUI but if we are able to capture a mink for blood analysis it will assist in determining the "Bird and Animal Deformities or Reproduction Problems" BUI status.
- ✓ Completed repeat verification monitoring studies of herptile, breeding bird, bat, and mussel populations to address the "Degradation of Fish and Wildlife Populations" and "Loss of Fish and Wildlife Habitat" BUIs.
- ✓ Completed the final year of maintenance and monitoring of the seven habitat restoration projects as a cooperative effort between WDNR, City of Sheboygan, and the habitat project contractors.
- ✓ Completed the invasive species project within the Sheboygan River AOC.
- ✓ Completed the first year of water column toxicity testing for plankton to help address the "Degradation of Phytoplankton and Zooplankton Populations" BUI.
- ✓ A fourth year of citizen based monitoring was completed by Camp Y-Koda. Monitoring included surveys for bats, birds, mussels, frogs and toads which will be used as supporting evidence for the "Degradation of Fish and Wildlife Populations" and "Loss of Fish and Wildlife Habitat" BUIs.
- ✓ The U.S. Geological Survey (USGS) completed a final interpretive report on the 2012 plankton and benthos sampling in July, and a report for the 2014 sampling is a final draft awaiting publication. The studies will be used to help make a determination on the status of the "Degradation of Benthos" and "Degradation of Phytoplankton and Zooplankton Populations" BUIs.
- ✓ USGS also published some results from their tree swallow studies in AOCs which includes the Sheboygan River to inform the status of the "Degradation of Fish and Wildlife Populations" and "Bird or Animal Deformities or Reproduction Problems" BUIs.

Next Year (2017)
In the next year the AOC Coordinator and WDNR staff will continue to make progress on many fronts in the Sheboygan River AOC. The following activities are planned for 2017:

- o Conduct an overall evaluation of the seven habitat restoration projects and invasive species treatment to determine if they meet criteria stated in the Fish and Wildlife Plan.
- o Complete a second year of water column toxicity testing and work with USGS on additional sampling of the river zooplankton community. These efforts will provide supporting evidence to the "Degradation of Phytoplankton and Zooplankton Populations" BUI.

- Conduct a fish tumor assessment on white suckers (*Catostomus commersoni*) to address the "Fish Tumors or Other Deformities" BUI with assistance from West Virginia University and USGS.
- Perform a wildlife consumption assessment on mallard, scaup and Canada geese which have current consumption advisories listed in the annual Wisconsin Migratory Bird Regulations. This assessment will help address the "Restrictions on Fish and Wildlife Consumption" BUI.
- Continue to work with Camp Y-Koda to conduct citizen-based monitoring of the AOC biological communities which will provide supporting evidence to multiple BUIs.
- Conduct another year of mink verification monitoring to address the "Degradation of Fish and Wildlife Populations," "Loss of Fish and Wildlife Habitat," and "Bird or Animal Deformities or Reproduction Problems" BUIs.
- Participate with the U.S. Environmental Protection Agency (USEPA) and/or USGS on any contaminated sediment assessment work that may occur in the Sheboygan River AOC.

Figure 1. The boundaries of the Sheboygan River Area of Concern.
For additional information about the history of the AOC and a narrative description of the AOC boundary, please refer to previous RAP documents which are available online: http://dnr.wi.gov Search "Sheboygan River AOC"; RAP documents are stored on the "AOC Plans" tab. A listing of previous RAPs, RAP Updates, and important historical documents is included in the References section.

Table 1. Current Status of Beneficial Use Impairments in the Sheboygan River AOC (Refer to Appendix C for more detail).

Beneficial Use Impairment	Beneficial Use Remains Impaired	Summary Status
Fish tumors or other deformities	Yes	A 2012 fish tumor study confirmed the impairment. USGS and West Virginia University will repeat the study within the Sheboygan River AOC in 2017. The results of the study will assist in evaluating BUI status in 2018.
Bird or animal deformities or reproductive problems	Yes	The tree swallow study conducted by the USGS has been published and we will consider the results in evaluating BUI status. Mink rafts were deployed in 2014-2016 to track footprints and trap live mink for obtaining blood samples, but no live mink were trapped. The mink study will be continued through 2017. BUI status will be evaluated again in 2018.
Restrictions on fish and wildlife consumption	Yes	WDNR will be reassessing wildlife consumption advisories over a three year period beginning in 2017. WDNR recommends reassessing fish consumption advisories again in 2020. BUI status will be evaluated again in 2020 following the fish consumption advisory assessment.
Restrictions on dredging activities	No	BUI was removed in August 2015.
Degradation of benthos	Yes	Final results from the USGS benthos and plankton studies on all Lake Michigan AOCs are pending. The USGS also collected sediment toxicity samples from two sites in the Sheboygan River in 2016. Verification monitoring of the benthic community was completed in 2016 with results available in 2017. BUI status will be evaluated in 2017.
Degradation of phytoplankton and zooplankton populations	Yes	Final results from the USGS benthos and plankton studies are pending. Water column toxicity monitoring was conducted in 2016 and will be again in 2017. BUI status will be evaluated in 2018.
Loss of fish and wildlife habitat	Yes	The seven Tier 1 habitat restoration projects outlined in the Fish and Wildlife Plan were completed in 2012 and maintenance and monitoring of those projects continued through 2016. Additional three year studies of aquatic habitat and aquatic macrophytes were completed in 2016 with results available in 2017. A habitat assessment will be performed in 2017 and if habitat sites have been documented to be successfully established, the BUI may be proposed for removal in 2017 or 2018.
Degradation of fish and wildlife populations	Yes	Three year verification monitoring studies of fish, macroinvertebrates, and mink were completed in 2016. The repeat verification monitoring surveys for birds, bats, mussels, and herptiles were also completed in 2016. All monitoring data will be available in 2017. BUI status will be evaluated again in 2018.
Eutrophication or undesirable algae	No	BUI was removed in November 2015.

BENEFICIAL USE IMPAIRMENT UPDATES

FISH TUMORS OR OTHER DEFORMITIES

Target	Status
All known sources of PAHs and chlorinated organic compounds within the AOC and tributary watershed have been controlled through issuance of the appropriate regulatory control document or eliminated.	Complete
The Superfund PCB cleanup and Manufactured Gas Plant cleanup have been implemented.	Complete
There have been no reports of external Deformities, Lesions, and Tumors (DLTs) or internal organ/system impacts that have been verified by qualified WDNR personnel to have been caused by chemical contaminants for a period of five years.	In progress
A fish health survey of resident benthic fish species such as white suckers finds incidences of tumors or other deformities at an incidence rate of less than 5 percent.	In progress
OR, in cases where any tumors have been reported a comparison study of resident benthic fish (e.g., brown bullhead or white suckers) of comparable age and at maturity (3 years), or of fish species which have historically been associated with this BUI, in the AOC and a non-impacted control site indicates that there is no statistically significant difference (with a 95% confidence interval) in the incidence of liver tumors or deformities.	In progress

Status
A fish tumor BUI evaluation study within the Sheboygan River AOC was conducted in 2012 by USGS and West Virginia University. At that time, data showed that the target of 5% incidence rate was not met. Therefore, the study is being repeated in 2017, allowing for more recovery time following sediment remediation work. BUI status will be evaluated again 2018.

Management actions

- ✓ All sources of contaminants have been identified and controlled or eliminated within the Sheboygan River AOC.
- o USGS and West Virginia University are contracted to conduct a fish tumor assessment within the Sheboygan River AOC in 2017. Results of this assessment will be available in 2018.

BIRD OR ANIMAL DEFORMITIES OR REPRODUCTION PROBLEMS

Target	Status
Superfund and RCRA sediment and floodplain remedial actions have been implemented.	Complete
Studies conducted in the AOC indicate that the beneficial use should not be considered impaired; or	In progress
If studies conducted in the AOC determine that this use is impaired, then two approaches can be considered for delisting:	
Approach 1 – Observational Data and Direct Measurements of Birds and other Wildlife • Evaluate observational data of bird and other animal deformities for a minimum of two successive monitoring cycles in indicator species identified in the initial studies as exhibiting deformities or reproductive problems. If deformity or reproductive problem rates are not statistically different from those at minimally impacted reference sites (at a 95% confidence interval), or no reproductive or deformity problems are identified during the two successive monitoring cycles, then the BUI can be delisted. If the rates are statistically different from the reference site, it may indicate a source from either within or outside the AOC. Therefore, if the rates are statistically different or the data are insufficient for analysis, then • Evaluate tissue contaminant levels in egg, young and/or adult wildlife. If contaminant levels are lower than the Lowest Observable Effect Level (LOEL) for that species for a particular contaminant and are not statistically different from those at minimally impacted reference sites (at a 95% confidence interval).	In progress
Where data from direct observation of wildlife and wildlife tissue data are not available, the following approach should be used:	
Approach 2 – Fish Tissue Contaminant Levels as an Indicator of Deformities or Reproductive Problems • If fish tissue concentrations of contaminants of concern identified in the AOC are at or lower than the LOEL known to cause reproductive or developmental problems in fish eating birds and mammals, the BUI can be delisted, or • If fish tissue concentrations of contaminants of concern identified in the AOC are not statistically different from those found in Lake Michigan (at 95% confidence interval), then the BUI can be delisted. Fish of a size and species considered prey for the wildlife species under consideration must be used for the tissue data.	Not Complete

Status

The tree swallow study conducted by the USGS has been published and the results will be considered when evaluating the status of this BUI. Initial findings indicate that contaminants were indeed present in tree swallow eggs at elevated levels; however, they were below the lower limit at which egg hatching begins to be negatively affected (Custer 2016). Mink rafts were deployed in 2014-2016 to track footprints and trap a live specimen to obtain blood samples, but no live mink were trapped. With the help of wildlife staff, mink monitoring efforts will continue in 2017 in hopes of trapping a live mink for blood analysis. BUI status will be evaluated again in 2018.

Management actions

- ✓ All sources of contaminants have been identified and controlled or eliminated within the Sheboygan River AOC.
- ✓ USGS published results from their tree swallow studies in AOCs which includes the Sheboygan River.
- o Mink abundance and polychlorinated biphenyl (PCB) concentration assessment completed its third year in 2016. This assessment will continue in 2017 since tracking and trapping have had mixed results thus far and a specimen has not been captured for blood analysis.

RESTRICTIONS ON FISH AND WILDLIFE CONSUMPTION

Target	Status
Fish Consumption	
The Superfund PCB cleanup and Manufactured Gas Plant cleanup have been implemented.	Complete
All other known sources of bioaccumulative contaminants of concern (PCBs, mercury, pesticides, and PAHs) have been identified and controlled or eliminated.	Complete
Waters within the Sheboygan River AOC are no longer listed as impaired due to PCB fish consumption advisories in the most recent Impaired Waters (303(d)) list.	Not Complete
Wildlife Consumption	
The floodplain cleanup action that is part of the Superfund Cleanup is implemented.	Complete
All other known sources of bioaccumulative contaminants of concern (PCBs, mercury, pesticides, and PAHs) have been identified and controlled or eliminated.	Complete
Waters within the Sheboygan River AOC are no longer listed as impaired due to wildlife consumption advisories listed in the annual Wisconsin Migratory Bird Regulations.	Not Complete

Status
This BUI remains impaired for both Fish and Wildlife. WDNR Fisheries Management samples waterbodies every 5 years in order to assess fish consumption advisories. The Sheboygan River was assessed in 2015 and no changes were made to consumption advisories meaning, the lower 14 miles of the Sheboygan River are still under a do not eat restriction. Fish consumption advisories will be assessed again in 2020.

The results from the *Contaminant Concentrations in Waterfowl from the Sheboygan River Area of Concern* final report suggested that contaminants in waterfowl from 2011-2012 were at levels that were too high to pursue a change in consumption advice and as such additional collection efforts were suspended for 2013 (Strom 2013). Waterfowl consumption advisories will be assessed again beginning in 2017.

Management actions

- ✓ All sources of contaminants have been identified and controlled or eliminated within the Sheboygan River AOC.
- o Waterfowl consumption advisory assessment. Waterfowl consumption advisories are assessed on a 5 year rotation. The Sheboygan River AOC is scheduled to begin another 3 year assessment beginning in 2017.
- o Fish consumption advisory assessment. Fish consumption advisories are assessed on a 5 year rotation as well. The Sheboygan River will be assessed again in 2020 for fish consumption advisories.

RESTRICTIONS ON DREDGING ACTIVITIES

Target	Status
1) All remediation actions for contaminated sediments are completed and 2) Monitored according to the approved remediation plans.	Complete
A dredging alternatives plan is developed that includes an evaluation of the following: • Restrictions that must remain in place to protect human health and the environment • Restrictions that must remain in place due to Superfund or RCRA requirements that are based upon state and federal law • Priority areas for navigational use • Priority areas where dredging is needed for other purposes (i.e., utilities) • Costs associated with removing dredging restrictions in priority areas • Funding available to address removing dredging restrictions in priority areas	Complete

Status

A final removal package was sent to USEPA in July, 2015 and with the concurrence of USEPA, the BUI was formally removed in August, 2015. The final BUI removal document can be found on WDNR's Sheboygan River AOC web page under the "Impairments" tab. Complete details regarding sediment removal projects can be found in Table 4 of the 2014 RAP Update (RAP Update; WDNR, 2014).

Management actions

No further actions are necessary for this BUI.

DEGRADATION OF BENTHOS

Target	Status
Known contaminant sources contributing to sediment contamination and degraded benthos have been identified and control measures implemented.	Complete
All remediation actions for contaminated sediments are completed and monitored according to the approved plan with consideration to using consensus based sediment quality guidelines and equilibrium partitioning sediment benchmarks.	Complete
The benthic community within the site being evaluated is statistically similar to a reference site with similar habitat and minimal sediment contamination.	In progress

Status

The status of this impairment is currently being assessed. USGS was contracted to assess both the planktonic and benthic communities of the Lake Michigan AOCs and reference rivers. Sampling was completed in 2012 and 2014. The 2012 final report is complete and a draft of the 2014 report was received in late 2016. Review of the draft is currently underway. Benthic community verification monitoring done by WDNR staff completed its third and final year in 2016. Verification monitoring assessed benthic communities within the AOC as well as tributaries which lie outside of the AOC boundaries. Results should be available in 2017. When the reports and the conclusions are fully evaluated, next steps for this BUI will be determined.

Management actions

- ✓ All sources of contaminants have been identified and controlled or eliminated within the Sheboygan River AOC.
- o WDNR AOC staff is currently reviewing a draft of the final report from the benthos and plankton assessment that was conducted by USGS in 2012 and 2014 on all Lake Michigan AOCs. The final report and results should be available in 2017.
- o Verification monitoring for the benthic community finished its third and final year in 2016. We are awaiting the final year's results.
- o Sediment toxicity was assessed by USGS at two sites in the Lower Sheboygan River in 2016. Results should be available in 2017.

DEGRADATION OF PHYTOPLANKTON AND ZOOPLANKTON POPULATIONS

Target	Status
Sources causing nutrient enrichment to the Outer Harbor and near shore waters are identified and controlled if nutrients are the main contributor; OR Sources resulting in ambient water toxicity in the Outer Harbor and near shore waters are identified and controlled if toxicity is the main contributor.	Complete
Phytoplankton or zooplankton bioassays confirm no toxicity in ambient waters and the community structure is diverse and contains species indicative of clean water.	In progress
The phytoplankton and zooplankton communities within the site being evaluated are statistically similar to a reference site with similar habitat and minimal sediment contamination.	In progress

Status

The status of this impairment is currently being assessed. USGS was contracted to assess both the planktonic and benthic communities of the Lake Michigan AOCs and reference rivers. Sampling was completed in 2012 and 2014. The 2012 final report is complete and a draft of the 2014 report was received in late 2016. Review of the draft is currently underway. Preliminary results of the 2012 USGS studies indicated a potential zooplankton diversity impairment, therefore the water column toxicity is being evaluated as a precautionary measure as required by the target. Water column toxicity was assessed in 2016. The results were inconclusive because one sample collected in August was slightly toxic to *ceriodaphnia dubia* reproduction and therefore the water column toxicity will again be assessed in 2017. When the reports and the conclusions are fully evaluated, next steps for this BUI will be determined.

Management actions

- ✓ All sources of contaminants have been identified and controlled or eliminated within the Sheboygan River AOC.
- o WDNR AOC staff is currently reviewing a draft of the final report from the benthos and plankton assessment that was conducted by USGS in 2012 and 2014 on all Lake Michigan AOCs. The final report and results should be available in 2017.
- o Water column toxicity was assessed by the Wisconsin State Lab of Hygiene in 2016. Results from 2016 were inconclusive so the assessment will be repeated in 2017.
- o USGS resampled the zooplankton community in 2016 for further assessment. Results of this effort should be available in late 2017.

LOSS OF FISH AND WILDLIFE HABITAT

Target	Status
A local fish and wildlife habitat management and restoration/rehabilitation plan has been developed for the entire AOC that accomplishes the following: • Defines the causes of all habitat impairments within the AOC. • Establishes site-specific habitat and population targets for fish and wildlife species within the AOC. • Identifies primary and secondary habitat restoration goals, management activities, and projects that would adequately restore or rehabilitate fish and wildlife habitat within the Sheboygan River AOC.	Complete
All primary habitat restoration goals, management activities, and projects identified in the fish and wildlife management and restoration plan are implemented, and modified as needed to ensure continual improvement.	In progress
Waters within the Sheboygan River AOC are not listed as impaired due to aquatic toxicity in the most recent Clean Water Act 303(d) and 305(b) Wisconsin Water Quality Report to Congress (submitted to USEPA every two years).	In progress

Status

The status of this BUI is currently being assessed. The Sheboygan River AOC Fish and Wildlife Restoration Plan is in the final draft stage and should be finalized in early 2017. The seven Tier 1 habitat restoration projects outlined in the Fish and Wildlife Restoration Plan were completed in 2012 and maintenance and monitoring of those projects continued through 2016. A three year verification monitoring assessment for fish communities, benthic macroinvertebrate communities, aquatic habitat and aquatic macrophytes was completed in 2016. Repeat verification monitoring assessments of herptile, breeding bird, bat, and mussel populations were also completed in 2016. Results from both monitoring efforts should be available in 2017. Water column toxicity was assessed in 2016. The results were inconclusive because one sample collected in August was slightly toxic to *ceriodaphnia dubia* reproduction and therefore the water column toxicity will again be assessed in 2017. A habitat assessment will be performed in 2017 and if habitat sites have been documented to be successfully established, the BUI may be proposed for removal in 2017 or 2018.

Management actions

- ✓ All sources of contaminants have been identified and controlled or eliminated within the Sheboygan River AOC.
- ✓ A Fish and Wildlife Restoration Plan has been written and is currently being reviewed by the Sheboygan River AOC technical advisory committee. Plan should be finalized in early 2017.
- o Seven habitat projects have been completed and the last year of maintenance and monitoring took place in 2016. A habitat remediation project evaluation is scheduled for 2017 to document achievement of project goals.
- o Water column toxicity was assessed by the Wisconsin State Lab of Hygiene in 2016. Results from 2016 were inconclusive so the assessment will be repeated in 2017.
- o A three year verification monitoring assessment for fish communities, benthic macroinvertebrate communities, aquatic habitat and aquatic macrophytes was completed in 2016. Results from this monitoring should be available in 2017.
- o Repeat verification monitoring assessments of herptile, breeding bird, bat, and mussel populations were also completed in 2016. Results from this monitoring should be available in 2017.

DEGRADATION OF FISH AND WILDLIFE POPULATIONS

Target	Status
Approved remedial actions (Superfund and RCRA) for contaminated sediment and floodplains have been fully implemented; and	Complete
A local fish and wildlife management and restoration plan has been developed for the entire AOC that • Defines the causes of all population impairments within the AOC. • Establishes site specific local population targets for native indicator fish and wildlife species within the AOC. • Identifies all fish and wildlife population restoration programs/activities within the AOC and establishes a mechanism to assure coordination among all these programs/activities including identification of lead and coordinative agencies. • Establishes a time table, funding mechanism, and lead agency responsibility for all fish and wildlife population restoration activities needed within the AOC.	In progress
The programs necessary to accomplish the recommendations of the fish and wildlife management and restoration plan are implemented.	In progress
Populations of native indicator fish/wildlife species are statistically similar to populations in reference sites with similar habitat but little to no contamination.	In progress

Status

The status of this BUI is currently being assessed. The Sheboygan River AOC Fish and Wildlife Restoration Plan is in the final draft stage and should be finalized in early 2017. The tree swallow study conducted by the USGS has been published and the results will be considered when evaluating the status of this BUI. Initial findings indicate that contaminants were indeed present in tree swallow eggs at elevated levels; however, they were below the lower limit at which egg hatching begins to be negatively affected (Custer 2016). Three year verification monitoring studies of fish, macroinvertebrates, and mink were completed in 2016. The repeat verification monitoring surveys for birds, bats, mussels, and herptiles were also completed in 2016. All monitoring data will be available in 2017. Our partnership with Camp Y-Koda continued in 2016 as they coordinated a citizen based monitoring project to provide supporting evidence to this BUI. All monitoring was completed using WDNR citizen based monitoring protocols with data being submitted to WDNR staff. We hope to continue the citizen based monitoring in 2017. BUI status will be evaluated again in 2018.

Management actions

- ✓ All sources of contaminants have been identified and controlled or eliminated within the Sheboygan River AOC.
- ✓ A Fish and Wildlife Restoration Plan has been written and is currently being reviewed by the Sheboygan River AOC technical advisory committee. Plan should be finalized in early 2017.
- ✓ USGS published results from their tree swallow studies in AOCs which includes the Sheboygan River.
- o A three year verification monitoring assessment for fish communities, benthic macroinvertebrate communities, aquatic habitat and aquatic macrophytes was completed in 2016. Results from this monitoring should be available in 2017.
- o Repeat verification monitoring assessments of herptile, breeding bird, bat, and mussel populations was also completed in 2016. Results from this monitoring should be available in 2017.

- Citizen based monitoring (CBM) assessments of birds, bats, mussels, frogs and toads coordinated by Camp Y-Koda were completed in 2016. We hope to continue this project in 2017.
- Mink abundance and PCB concentration assessment completed its third year in 2016. This assessment will continue in 2017 since tracking and trapping have had mixed results thus far.

EUTROPHICATION OR UNDESIRABLE ALGAE

Target	Status
In-river total phosphorus concentrations meet Wisconsin AOC target criteria with a 95% level of confidence; and	Complete
There are no violations of the minimum dissolved oxygen concentrations established in NR 102 within the AOC due to excessive sediment deposition or algae growth; and	Complete
The Wisconsin AOC target criteria will be considered to have been met when the sample population does not exceed nutrient targets or evidence indicates the lack of biological impairment (as determined by fish and macroinvertebrate Indicators of Biological Integrity, or IBIs).	Complete

Status
A final removal package was sent to USEPA in September, 2015 and with the concurrence of USEPA, the BUI was officially removed in November, 2015. The final BUI removal document can be found on WDNR's Sheboygan River AOC web page under the "Impairments" tab.

Management actions
No further actions are necessary for this BUI.

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APPENDICES

Appendix A List of Acronyms
Appendix B Definitions
Appendix C BUI Tracking Matrix

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Appendix A

List of Acronyms

AOC	Area of Concern
BUI	Beneficial Use Impairment
LOEL	Lowest observable effect level
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WDNR	Wisconsin Department of Natural Resources

Appendix B

Definitions

Area of Concern (AOC)
Defined by Annex 2 of the 1987 Protocol to the U.S.-Canada Great Lakes Water Quality Agreement 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 of the area's ability to support aquatic life." These areas are the "most contaminated" areas of the Great Lakes, and the goal 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, or "delisted."

Beneficial Use Impairment (BUI)
A "beneficial use" is any way that a water body can improve the quality of life for humans or for fish and wildlife (for example, providing fish that are safe to eat). If the beneficial use is unavailable due to environmental problems (for example if it is unsafe to eat the fish because of contamination) then that use is impaired. The International Joint Commission provided a list of 14 possible beneficial use impairments in the 1987 Great Lakes Water Quality Agreement amendment.

Bioaccumulative
An adjective that describes a substance that builds up within the tissues of organisms.

Delisting Target
Specific goals and objectives established for beneficial use impairments, with measurable indicators to track progress and determine when BUI removal can occur. Targets should be locally derived.

Remedial Action Plan (RAP)
According to the 1987 Protocol to the U.S.-Canada Great Lakes Water Quality Agreement, a RAP is a document that provides "a systematic and comprehensive ecosystem approach to restoring and protecting beneficial uses in Areas of Concern…" RAPs were required to be submitted to the International Joint Commission at three stages:

- Stage 1: Problem definition
- Stage 2: When remedial and regulatory measures are selected
- Stage 3: When monitoring indicates that identified beneficial uses have been restored

Note that a renegotiated Great Lakes Water Quality Agreement was signed in 2012 by the U.S. and Canada which removed the "stage" terminology from the AOC Annex, and simply requires Remedial Action Plans to be "developed, periodically updated, and implemented for each AOC."

Appendix C

BUI Tracking Matrix

Appendix C

Note that projects listed in the table below are the next clearly delineated action steps that have been identified by WDNR in collaboration with AOC partners and stakeholders to make progress toward delisting the AOC. This list does not necessarily reflect all actions that will ultimately be needed to remove impairments, and will be updated as more information is collected and as actions are completed.

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Project Title/Name	BUI Addressed	Project Type	Action Type	Action Modifier	Project Status	Project Start Date	Project End Date	Project Cost	Primary Funding Source	Project Lead Organization
Assessment of Benthos and Plankton in Wisconsin's Lake Michigan Areas of Concern	BUI 6	Fish and Wildlife	Assessment	Reporting	In Progress	2013	2016	$414,300	USGS [GLRI]	USGS
Benthos & Plankton BUIs Evaluation in Wisconsin's Lake Michigan Areas of Concern	BUI 6	Fish and Wildlife	Assessment	Completed	COMPLETED	2011	2015	$451,500	USGS [GLRI]	USGS
Camp Marina Superfund Alternative Dredging	BUI 1, BUI 3, BUI 4, BUI 5, BUI 6, BUI 7, BUI 14	Sediment	Remediation	Completed	COMPLETED	2011	2011	$10,000,000	Responsible Party [Non-GLRI]	USEPA
Dredging Technical Memo		Sediment	Remediation	Completed	COMPLETED	2012	2014	$0	Great Lakes Legacy Act [GLRI]	CH2M Hill
Education and Outreach UW-Extension	BUI 1, BUI 3, BUI 4, BUI 5, BUI 6, BUI 7, BUI 8, BUI 13, BUI 14	Community Involvement	Education	Completed	COMPLETED	2011	2013	$83,000	USEPA [GLRI]	UW-Extension
Evaluation Eutrophication BUI	BUI 8	Nonpoint	Assessment	Completed	COMPLETED	2013	2015	$0	WDNR [Non-GLRI]	WDNR
Evaluation of Fish Tumors or Other Deformities	BUI 4	Fish and Wildlife	Assessment	Completed	COMPLETED	2012	2013	$139,485	USEPA [GLRI]	WDNR
Evaluation of Waterfowl Consumption Advisories within the AOC	BUI 1	Fish and Wildlife	Assessment	Completed	COMPLETED	2011	2013	$66,437	USEPA [GLRI]	WDNR
Exposure to PCBs of tree swallows nesting along the Sheboygan River, WI	BUI 3, BUI 5	Fish and Wildlife	Assessment	Reporting	In Progress	2012	2015	$18,920	USEPA [GLRI]	USGS
Fish & Wildlife Habitat Restoration and Management Plan	BUI 3, BUI 14	Fish and Wildlife	Assessment	Implementation	In Progress	2012	2016	$0	WDNR [Non-GLRI]	WDNR
Fish Contaminant Monitoring and Advisory Program	BUI 1	Fish and Wildlife	Assessment	Implementation	In Progress	1980		$0	WDNR [Non-GLRI]	WDNR
In-Stream Habitat Improvements	BUI 3 BUI 14	Fish and Wildlife	Restoration	Completed	COMPLETED	2011	2012	$144,083	USEPA [GLRI]	WDNR
Kiwanis Park Shoreline Restoration	BUI 3, BUI 14	Fish and Wildlife	Restoration	Confirmation Monitoring & Reporting	In Progress	2011	2016	$2,115,000	USEPA [GLRI]	WDNR
Plankton Verification/Bioassays	BUI 13	Fish and Wildlife	Assessment	Implementation	In Progress	2015	TBD	$0	WDNR [Non-GLRI]	WDNR
Raising Community and CAC Awareness through "Explore and Restore the Sheboygan River" Initiative	BUI 1, BUI 3, BUI 4, BUI 5, BUI 6, BUI 7, BUI 8, BUI 13, BUI 14	Community Involvement	Education	Completed	COMPLETED	2011	2014	$51,689	USEPA [GLRI]	Camp Y-Koda
Schuchardt Property Conservation Planning	BUI 3, BUI 14	Fish and Wildlife	Assessment	Completed	COMPLETED	2011	2012	$40,000	USEPA [GLRI]	WDNR
Schuchardt Property Invasive Species Mngt Planning	BUI 3, BUI 14	Fish and Wildlife	Restoration	Completed	COMPLETED	2011	2012	$85,000	U.S. Army Corps of Engineers [GLRI]	USACE
Sheboygan AOC Pathway to Delisting Habitat BUI's-Survey and Assessmnet-actually 11 projects	BUI 3, BUI 14	Fish and Wildlife	Assessment	Completed	COMPLETED	2010	2012	$202,181	USEPA [GLRI]	WDNR
Sheboygan Harbor Navigational Improvement Dredging	BUI 7	Sediment	Navigational Dredging	Completed	COMPLETED	2012	2012	$20,797,000	USEPA [GLRI]	USEPA
Sheboygan River & Harbor Superfund Dredging-Lower River Dredging	BUI 1, BUI 3, BUI 4, BUI 5, BUI 6, BUI 7, BUI 14	Sediment	Remediation	Completed	COMPLETED	2011	2012	$13,500,000	Responsible Party [Non-GLRI]	USEPA

Sheboygan River AOC BUI Tracking Matrix 2016

Project Title/Name	BUI Addressed	Project Type	Action Type	Action Modifier	Project Status	Project Start Date	Project End Date	Project Cost	Primary Funding Source	Project Lead Organization
Sheboygan River & Harbor Superfund Dredging-Upper River Dredging	BUI 1, BUI 3, BUI 4, BUI 5, BUI 6, BUI 7, BUI 14	Sediment	Remediation	Completed	COMPLETED	2006	2007	$9,000,000	Responsible Party [Non-GLRI]	USEPA
Sheboygan River Great Lakes Legacy Act Project	BUI 1, BUI 3, BUI 4, BUI 5, BUI 6, BUI 7, BUI 14	Sediment	Remediation	Completed	COMPLETED	2011	2012	$32,776,000	USEPA [GLRI]	USEPA
Shoreline Stabilization in Problem Areas	BUI 3, BUI 14	Fish and Wildlife	Restoration	Confirmation Monitoring & Reporting	In Progress	2011	2016	$292,000	USEPA [GLRI]	WDNR
Small Mammal Contaminant Monitoring in the Sheboygan River AOC	BUI 3, BUI 5	Fish and Wildlife	Assessment	Completed	COMPLETED	2011	2012	$16,768	USEPA [GLRI]	WDNR
Supporting & Developing A Sheboygan AOC Community Advisory Committee	BUI 1, BUI 3, BUI 4, BUI 5, BUI 6, BUI 7, BUI 8, BUI 13, BUI 14	Community Involvement	Capacity	Completed	COMPLETED	2011	2012	$28,655	USEPA [GLRI]	Sheboygan River Basin Partnership
Targeted Invasive Species Control	BUI 3, BUI 14	Fish and Wildlife	Restoration	Confirmation Monitoring & Reporting	In Progress	2011	2016	$132,500	USEPA [GLRI]	WDNR
Taylor Dr & Indiana Ave Riparian Area and Wetland Restoration	BUI 3, BUI 14	Fish and Wildlife	Restoration	Confirmation Monitoring & Reporting	In Progress	2011	2016	$795,000	USEPA [GLRI]	WDNR
Verification Monitoring - Benthic & aquatic community	BUI 3, BUI 14	Fish and Wildlife	Assessment	Reporting	In Progress	2014	2016	$27,882	USEPA [GLRI]	USGS
Verification Monitoring - Bird, bat, mussel, and herptiles study	BUI 3, BUI 14	Fish and Wildlife	Assessment	Reporting	In Progress	2016	2017	$50,000	USEPA [GLRI]	WDNR
Verification Monitoring - Fish Community Assessment	BUI 3, BUI 14	Fish and Wildlife	Assessment	Implementation	In Progress	2014	2016	$120,000	USEPA [GLRI]	WDNR
Verification Monitoring - Macroinvertebrates and Fish Habitat Assessment	BUI 3, BUI 14	Fish and Wildlife	Assessment	Implementation	In Progress	2015	2016	$27,882	USEPA [GLRI]	WDNR
Verification Monitoring - Mink Survey and Contaminant Monitoring	BUI 3, BUI 5	Fish and Wildlife	Assessment	Implementation	In Progress	2014	2016	$127,500	USEPA [GLRI]	WDNR
Wildwood Island Area Restoration	BUI 3, BUI 14	Fish and Wildlife	Restoration	Confirmation Monitoring & Reporting	In Progress	2011	2016	$790,000	USEPA [GLRI]	WDNR

BUI Number Key

BUI #	BUI Name	BUI#	BUI Name
BUI 1	Restrictions on Fish and Wildlife Consumption	BUI 8	Eutrophication or Undesirable Algae or Excessive Loading of Sediments and Nutrients
BUI 2	Tainting of Fish and Wildlife Flavor	BUI 9	Restrictions on Drinking Water Consumption or Taste and Odor Problems
BUI 3	Degraded Fish and Wildlife Populations	BUI 10	Beach Closings and Body Contact Restrictions
BUI 4	Fish Tumors and Other Deformities	BUI 11	Degradation of Aesthetics
BUI 5	Bird or Animal Deformities or Reproductive Problems	BUI 12	Added Costs to Agriculture or Industry
BUI 6	Degradation of Benthos	BUI 13	Degradation of Phytoplankton and Zooplankton Populations
BUI 7	Restrictions on Dredging Activities	BUI 14	Loss of Fish and Wildlife Habitat