INDEPENDENT EXTERNAL PEER REVIEW PANEL

for the

Great Lakes and Mississippi River Interbasin Study (GLMRIS) at Brandon Road Lock and Dam, Joliet, Illinois

The U.S. Army Corps of Engineers submits the following information per requirements in the Water Resources Reform and Development Act of 2014, Section 1044(c)(4)(B).

Entity Conducting the Review	
Outside Eligible Organization:	Battelle 505 King Avenue Columbus, OH 43201
Dates of Review	
Review Initiation:	18 September 2017
Anticipated Type I IEPR Final Report Submittal:	6 December 2017
Reviewer Names and Qualifications	
Chris Yoder	**Environmental**
Mr. Yoder is the Research Director at the Midwest Biodiversity Institute (MBI), Center for Applied Bioassessment and Biocriteria, in Hilliard, Ohio. He has a M.A. in zoology from DePauw University and more than 40 years of experience in the taxonomy, distribution, and life history of Eastern and Midwestern U.S. stream and riverine fish species. He has more than 25 years of experience directly related to water resources environmental evaluation and review, as well as with the National Environmental Policy Act (NEPA) process and analysis through his most recent work at MBI and during his 25 years at the Ohio Environmental Protection Agency (EPA). In addition, he is a certified trainer for fish assemblage, habitat, and chemical sampling under the Ohio Credible Data Law (OCDL) (2009); a Tier II Certified Fisheries Scientist (1986); a Level 3 Qualified Data Collector for fish, habitat, and water sampling under the OCDL; and trained by the U.S. Fish and Wildlife Service (USFWS) in Principles of Electrofishing. While working for the Ohio EPA (1976-2001) and the Midwest Biodiversity Institute (2001-present), Mr. Yoder gained extensive expertise related to Midwestern aquatic resources. Most of his work was conducted in the upper Ohio River, upper Mississippi River (UMR), and the Great Lakes basins. He has been conducting fish assemblage assessments of Ohio rivers and streams since 1980, has conducted nearshore and tributary fish assemblage assessments in the Great Lakes for more than 20 years, and has recent experience with assemblage assessments of large Midwestern river fish throughout the Upper Mississippi and Ohio River basins. Mr. Yoder has also been involved in studies of	

aquatic nuisance species, including Asian carp, other invasive species in the Midwest U.S., and invasive/introduced fish species in New England. In surveys on the Illinois River Basin, he documented the presence of Asian carp, and he is currently examining restoration options for the DuPage River-Salt Creek and Des Plaines River watersheds where Asian carp is a risk in re-establishing connectivity with the lower Des Plaines River. Having worked in multiple states and gaining technical experience at both the Ohio EPA and MBI, Mr. Yoder is familiar with the socioeconomic factors and cultural resources that may be affected by the project alternatives both locally and in the region.

Mr. Yoder is familiar with environmental impact analysis and mitigation. He started his career at Wittenberg University conducting data collection, analysis, and reporting for an environmental impact statement to evaluate the effect of a reservoir on Buck Creek, Ohio, and has continued in this field to the present at MBI, where he provides direct technical assistance to Federal, regional, state, and local government and non-government organizations with monitoring and assessment design and bioassessment and biocriteria implementation issues and topics. As manager of the Ecological Assessment Section at Ohio EPA (1990-2001), he conducted research and development on methods and procedures for incorporating ecoregions, biological, chemical, and physical data in water quality management policy and programs.

Mr. Yoder has experience with the USFWS Habitat Evaluation Procedures (HEP) (USFWS, 1980), Clean Water Act (CWA), Endangered Species Act, National Historic Preservation Act, and Ohio Qualitative Habitat Evaluation Index procedures. Mr. Yoder was the primary author of the Implementation Guidance Document, “Improving Water Quality Standards and Assessment Approaches for the Upper Mississippi River: UMR Clean Water Act Biological Assessment Implementation Guidance” (2011). This document provides methods and data for integrating biological assessment into CWA programs for the interstate and Minnesota portions of the UMR. He was also a reviewer of the Endangered Fish section of the Ohio Department of Natural Resources (DNR) Strategic Plan and served on the Ohio DNR Interagency ad hoc workgroup on endangered fish and fish population data from 1986 to 1989.

Mr. Yoder has authored more than 70 publications and more than 200 technical reports relevant to his field of expertise, and has served as a manuscript reviewer for numerous peer-reviewed journals and technical reports such as the North American Journal of Fisheries Management, Journal of Environmental Monitoring and Assessment, and the U.S. EPA Ecological Report Series. A recipient of the North American Benthological Society Environmental Stewardship Award in 2009, Mr. Yoder is a member of the American Fisheries Society, the Ohio Academy of Science, and the Society for Freshwater Science.

Steven R. Cone **Economics**

An independent consultant, Mr. Cone retired from USACE in 2007. He has more than 40 years of experience in policy, planning, and economics, of which 18 years were spent at HQUSACE and five years at IWR (2007-2012). Mr. Cone’s primary experience has been as a senior economist and policy advisor. He has experience working directly for and with

USACE in applying Principles and Guidelines (P&G) to Civil Works project evaluations. At HQUSACE, Mr. Cone prepared and interpreted planning and policy guidance, led policy review teams for feasibility and post authorization reports, and prepared reports of the Chief of Engineers for new and modified project authorizations. Mr. Cone is a widely recognized expert in various aspects of Civil Works policy, planning and economic analysis, including navigation and ecosystem restoration.

He has more than 40 years of demonstrated experience in all aspects of water resource planning studies. He is very familiar with USACE procedures and standards for National Economic Development (NED) and National Ecosystem Restoration (NER) water resource management projects and studies. While at HQUSACE, Mr. Cone was extensively involved with IWR and other HQ elements in development of policy and guidance for the application of cost effectiveness and incremental cost analysis (CE/ICA) for environmental mitigation and ecosystem restoration.

At IWR, he served as a senior economist providing planning support for economic benefit analysis for a project to deepen the harbor at Savannah, Georgia. He was part of a team that developed new methodologies for economic benefit evaluation of containerized commodities that established the foundation for the development of the HarborSym Deepening Model and Containership Loading Tools. He reviewed model testing results and model documentation, but was not part of HarborSym development or its creation.

Mr. Cone is familiar with USACE plan formulation processes, procedures, and standards and has demonstrated experience in plan formulation and evaluation of alternative plans for flood damage reduction, water supply, hydropower, navigation, recreation, and ecosystem restoration studies and projects. He has provided guidance and review to such ecosystem restoration project studies as South/Central Florida Ecosystem Restoration, Louisiana Coastal, and the Upper Mississippi Environmental Management Plan Mr. Cone also has experience in guidance development and review of, studies involving NED and NER trade-off analysis and risk assessment. Mr. Cone has participated in the development of policies and guidance for risk-informed approached to decision making management and decision making, and provided instructions at courses on risk analysis, models and evaluation scenarios involving economic and non-economic impacts of water resource decisions and projects. Mr. Cone has also performed policy and technical reviews on numerous Corps decision documents involving risk analysis.

Peter A. Fischer, P.E. (Retired) **Civil Engineering**

Mr. Fischer is a senior water resource engineer with 63 years of experience practicing in the fields of civil and water resources engineering, with river engineering experience on navigable waterways. He was a registered P.E. in Minnesota, North Dakota, Wisconsin and Iowa and received his B.S. and M.S. degrees from the University of Minnesota-Minneapolis. For more than 31 of those years, Mr. Fischer was with the USACE St. Paul District. His assignments included engineering management, project management, technical supervision, hydraulic design, and hydrologic engineering of a wide variety of projects in ecosystem restoration, storm water management, flood control, navigation, and

water resources development. His work also included field inspections and reporting of dams, embankments, levees, rivers, and channels.

Mr. Fisher has experience in design and construction of ecosystem restoration projects and navigation features on rivers. As an example, Mr. Fischer worked on studies and design for providing chutes to backwater areas for habitat restoration. He participated in the study and design of placing islands in large backwater areas to reduce scour and erosion from wind-driven waves, thus improving habitat for waterfowl. Additionally, Mr. Fischer has worked on and managed hydraulic navigation channel design for more than 10 years on projects along the Mississippi River and tributaries, and has been involved with projects that required the design of wing dams, rock dikes, and riprap bank protection where the navigation channel was eroding its banks, diversion dikes, channel closure structures, gated inlet structures, groynes, gated diversion structures, weirs, revetments, and dredging and low overflow spillways. He has worked on several studies and rehabilitation projects on the Mississippi River and its tributaries, including the Mississippi River Locks and Dams 1 to 10 Rehabilitation projects, and projects to repair erosion downstream from Mississippi River Locks and Dams. He prepared hydraulic studies for the extension of the Mississippi River Navigation channel upstream from Lock and Dam 1, concentrating on the location of dredged material disposal areas to limit channel velocities to navigable rates. Mr. Fischer has worked on small harbors of refuge projects on Lake Superior where design and layout must consider protection of existing wildlife habitat

Mr. Fischer has a thorough understanding of the physical effect of river training structures on river bathymetry, velocities, and water surfaces; river data collection; and river geomorphology. This is demonstrated by his work on navigation channels on the Mississippi, Minnesota, St. Croix, and Red River of the North. He has a thorough understanding of design culverts and channel improvements in urban settings. While working for SEH, he provided guidance and technical review for the storm water master plan for Grand Forks, North Dakota, which included large interceptor pipe, channels, culverts, and structures. He also worked on the interior drainage system for East Grand Forks, Minnesota, which included pipe outlets, storm water pipes, channels, culverts, and structures.

For the past 28 years, as a member of SEH's Water Resources Division, Mr. Fischer has been involved in the hands-on design of water resources projects. His work included preparing concept and preliminary designs, providing hydraulic and hydrologic engineering advice to project designers, providing peer and quality review of hydrology and hydraulic modeling, and design reports, and preparing and coordinating the preparation of design and environmental reports. He has recently participated in independent reviews of design and feasibility reports for levees, canals, and other water control facilities for USACE. He served as a member of an IEPR team for two projects within the New Orleans Hurricane and Storm Damage Risk Reduction System. Mr. Fischer is an active member of the American Society of Civil Engineers; the U.S. Committee on Large Dams; and the U.S. Committee on Irrigation, Drainage and Flood Control.

Steven Bartell	**Risk Methods and Expert Elicitation**

Dr. Bartell is Senior Aquatic Ecosystem Modeler at the Oneida Total Integrated Enterprises (OTIE) in Oak Ridge, Tennessee. He earned a Ph.D. in limnology and oceanography from the University of Wisconsin, Madison, in 1978. He has 20+ years of experience in expert elicitation processes and their use to manage uncertainties related to environmental investment decisions. Concurrent with his part-time technical support to OTIE, Bartell also serves as Principal and Practice Lead in Ecological Modeling with Cardno, Inc., Greenback, Tennessee. He is also an adjunct faculty member in the Department of Ecology and Evolutionary Biology at the University of Tennessee, Knoxville and serves on the advisory board of the University of Tennessee Center for Water Resources Research. Prior to a career in private consulting, Dr. Bartell was a senior environmental scientist and group leader (1980-1992) in the Environmental Sciences Division at the Oak Ridge National Laboratory.

Dr. Bartell has extensive experience and technical skills in quantitative ecosystem analysis and ecological modeling. He has applied these skills in assessing ecological risks posed by a variety of physical, chemical, and biological environmental stressors. He has also developed complex aquatic ecosystem models in support of ecosystem management and restoration, primarily for the U.S. Army Corps of Engineers. In support of the Upper Mississippi River and Illinois Waterway Navigation Feasibility Study (1994-2004), Dr. Bartell was responsible for the development of ecological models for assessing risks posed by increased commercial navigation on fish, submerged aquatic vegetation, and freshwater mussels. These ecological models were developed within a Monte Carlo methodology to facilitate probabilistic assessments and sensitivity and uncertainty analysis.

Dr. Bartell has demonstrated experience in the application and analysis of methods of expert elicitation in relation to ecological risk assessment. He has taught short courses on the use of expert elicitation and characterization of associated uncertainties as they influence the overall risk assessment process. He has hands-on experience in the use of @RISK, Crystal Ball, and other Monte Carlo frameworks for quantifying the impacts of parameter uncertainty on risk estimates. He is well-versed in the application of numerical methods for sensitivity and uncertainty analysis of models used in risk estimation.

Dr. Bartell managed and technically participated in the development, application, and analysis of a probabilistic model to characterize the risks of zebra and quagga mussel invasion and establishment throughout the St. Croix Watershed for USACE St. Paul District. He also developed a probabilistic model of the USACE ICA methodology that was used to estimate the probable outcomes of engineering planning alternatives designed to reduce risks to human safety and damage to private wetlands for the USACE Lock and Dam 3 Renovation (St. Paul District). Dr. Bartell also developed a probabilistic framework and model to assess risks of invasive species (e.g., Asian long-horned beetle) establishment throughout the United States for the US Department of Agriculture. These projects included the characterization of uncertain model parameters estimated using data and expert elicitation on the resulting risks, as well as accompanying sensitivity and

uncertainty analyses that described the impacts of uncertain expert elicitation on model performance and risk estimation.