Review Plan
09 June 2023

1. Project Summary

Study Name: Great Lakes Coastal Resiliency Study (GLCRS)
Location: Great Lakes Region
P2 Number: 464027
Decision and Environmental Compliance Document Type: Watershed Study

Congressional Authorization Required: No

Project Purpose(s): Coastal Storm Risk Management

Non-Federal Sponsors: Illinois Department of Natural Resources, Indiana Department of Natural Resources, Michigan Department of Natural Resources, Minnesota Department of Natural Resources, New York Department of State, Ohio Department of Natural Resources, Pennsylvania Department of Environmental Protection, Wisconsin Division of Intergovernmental Relations.

Points of Public Contact for Questions/Comments on Review Plan:

District: Chicago District
District Contact: Project Manager

Major Subordinate Command (MSC): Great Lakes and Ohio River Division
MSC Contact: District Support Team Lead

Review Management Organization (RMO): PCX-CSRM
RMO Contact: PCX-CSRM Review Manager

Key Review Plan Dates

Date of RMO Endorsement of Review Plan	Pending
Date of MSC Approval of Review Plan	Pending
Date of IEPR Exclusion Approval	N/A
Has the Review Plan changed since RMO Endorsement?	No
Date of Last Review Plan Revision	None
Date of Review Plan Web Posting	Pending

Milestone Schedule and Other Dates

Action	Date -Scheduled	Date – Actual	Status – Complete?
Agreement Signed	28 Sept 2022	28 Sept 2022	Yes
Shared Vision Milestone	15 Dec 2023	TBD	No
Recommendations Milestone	10 Dec 2025	TBD	No
Report Milestone	15 June 2026	TBD	No
Approval of Final Watershed Plan	15 Sept 2026	TBD	No

2. References

(i) Engineer Regulation 1165-2-217 – Water Resources Policies and Authorities – Civil Works Review Policy, 1 May 2021.

(ii) Engineer Circular 1105-2-412 – Planning – Assuring Quality of Planning Models, 31 March 2011.

(iii) Planning Bulletin 2013-02, Subject: Assuring Quality of Planning Models (EC 1105-2-412), 31 March 2013.

(iv) Office of Management and Budget, Final Information Quality Bulletin for Peer Review, Federal Register Vol. 70, No. 10, January 14, 2005, pp 2664-267

(v) Implementation Guidance for Section 211 of the Water Resources Development Act of 2020, Great Lakes Coastal Resiliency Study

(vi) Engineering Regulation (ER) 1105-2-100 (Planning Guidance Notebook

(vii) ER 1105-2-102 Watershed Studies (Reference D).

(viii) Engineering and Construction Bulletin (ECB) 2016-16 (Updated USACE Mega Projects Guidance) (26 May 2016).

The online USACE Planning Community Toolbox provides more review reference information at: https://planning.erdc.dren.mil/toolbox/current.cfm?Title=Peer%20Review&ThisPage=Peer&Side=No.

3. Review Execution Plan

The general plan for executing all required independent reviews is outlined in the following two tables.

Table 1 lists each study product to be reviewed. The table provides the schedules and costs for the anticipated reviews. Teams also determine whether a site visit will be needed to support each review. The decisions about site visits are documented in the table. As the review plan is updated the team will note each review that has been completed.

Table 1: Schedule and Costs of Reviews

Task #	Product to undergo Review	Review Level	Site Visit	Start Date	End Date	Cost	Comp-lete
	PMP	LRD Review & Approve PMP/RP	No	TBD	TBD	N/A	No
	Vertical Team Alignment Memorandum	USACE DQC of Vertical Team Alignment Memorandum	No	TBD	TBD	$3,000	No
	Vertical Team Alignment Memorandum	LRD Review of Vertical Team Alignment Memorandum	No	TBD	TBD	N/A	No
3.4	Basin-wide Analysis - GLRI Framework Post Processing	ATR - Wave Surge Results - Lake Ontario	No	TBD	TBD	$2,000	No
		ATR- Wave Surge Results - Lake Superior	No	TBD	TBD	$2,000	No
		ATR - Wave Surge Results - Lake Michigan	No	TBD	TBD	$2,000	No
		ATR - Wave Surge Results - Lake Huron	No	TBD	TBD	$2,000	No
		ATR - Wave Surge Results - Lake Erie	No	TBD	TBD	$2,000	No
3.6	Basin-wide Analysis - Technical Review	ATR - Review of Vulnerability Analysis - Lake Ontario	No	TBD	TBD	$10,.000	No
		LRD Climate Policy Review - Vulnerability Analysis - Lake Ontario	No	TBD	TBD	N/A	No
		ATR - Review of Vulnerability Analysis - Lake Superior	No	TBD	TBD	$10,.000	No
		LRD Climate Policy Review - Vulnerability Analysis – Lake Superior	No	TBD	TBD	N/A	No
		ATR - Review of Vulnerability Analysis - Lake Michigan	No	TBD	TBD	$5,000	No
		LRD Climate Policy Review - Vulnerability Analysis - Lake Michigan	No	TBD	TBD	N/A	No
		ATR - Review of Vulnerability Analysis - Lake Huron	No	TBD	TBD	$5,000	No
		LRD Climate Policy Review - Vulnerability Analysis - Lake Huron	No	TBD	TBD	N/A	No

Task #	Product to undergo Review	Review Level	Site Visit	Start Date	End Date	Cost	Comp-lete
		ATR - Review of Vulnerability Analysis - Lake Erie	No	TBD	TBD	$5,000	No
		LRD Climate Policy Review - Vulnerability Analysis - Lake Erie	No	TBD	TBD	N/A	No
3.7	Basin-wide Analysis - Documentation	USACE DQC & NFS Review of Geospatial Appendix and GIS - Lake Ontario	No	TBD	TBD	$2,000	No
		USACE DQC & NFS Review of Geospatial Appendix and GIS - Lake Superior	No	TBD	TBD	$2,000	No
		USACE DQC & NFS Review of Geospatial Appendix and GIS - Lake Michigan	No	TBD	TBD	$2,000	No
		USACE DQC & NFS Review of Geospatial Appendix and GIS - Lake Huron	No	TBD	TBD	$2,000	No
		USACE DQC & NFS Review of Geospatial Appendix and GIS - Lake Erie	No	TBD	TBD	$2,000	No
4	Focused Evaluations	LRD Climate Policy Review - Workshop Methodology	No	TBD	TBD	N/A	No
4.1.1	Focused Evaluations - Select Focused Areas	USACE DQC & NFS review of Draft Memo (NY- Lake Ontario)	No	TBD	TBD	$1,000	No
4.1.2		USACE DQC & NFS review of Draft Memo (MN-WI-MI- Lake Superior)	No	TBD	TBD	$1,000	No
4.1.3		USACE DQC & NFS review of Draft Memo (WI-IL-IL-IN-MI- Lake Michigan)	No	TBD	TBD	$1,000	No
4.1.4		USACE DQC & NFS review of Draft Memo (MI- Lake Huron)	No	TBD	TBD	$1,000	No
4.1.5		USACE DQC & NFS review of Draft Memo (OH-OH-PA-NY- Lake Erie)	No	TBD	TBD	$1,000	No
		USACE DQC & NFS Review of Workshop Materials - Lake Ontario	No	TBD	TBD	$8,000	No
		USACE DQC & NFS Review of Workshop Materials - Lake Superior	No	TBD	TBD	$8,000	No
		USACE DQC & NFS Review of Workshop Materials - Lake Michigan	No	TBD	TBD	$8,000	No

Task #	Product to undergo Review	Review Level	Site Visit	Start Date	End Date	Cost	Comp-lete
		USACE DQC & NFS Review of Workshop Materials - Lake Huron	No	TBD	TBD	$8,000	No
		USACE DQC & NFS Review of Workshop Materials - Lake Erie	No	TBD	TBD	$8,000	No
4.4.1	Focused Evaluations - Conduct Focus Area Workshops - Lake Ontario	USACE DQC & NFS Review of Meeting Documentation (NY- Lake Ontario)	No	TBD	TBD	$1,500	No
4.4.2	Focused Evaluations - Conduct Focus Area Workshops- Lake Superior	USACE DQC & NFS Review of Meeting Documentation (MN- Lake Superior)	No	TBD	TBD	$1,500	No
		USACE DQC & NFS Review of Meeting Documentation (WI- Lake Superior)	No	TBD	TBD	$1,500	No
		USACE DQC & NFS Review of Meeting Documentation (MI- Lake Superior)	No	TBD	TBD	$1,500	No
4.4.3	Focused Evaluations - Conduct Focus Area Workshops - Lake Michigan	USACE DQC & NFS Review of Meeting Documentation (WI- Lake Michigan)	No	TBD	TBD	$1,500	No
		USACE DQC & NFS Review of Meeting Documentation (IL Area 1- Lake Michigan)	No	TBD	TBD	$1,500	No
		USACE DQC & NFS Review of Meeting Documentation (IL Area 2- Lake Michigan)	No	TBD	TBD	$1,500	No
		USACE DQC & NFS Review of Meeting Documentation (IN- Lake Michigan)	No	TBD	TBD	$1,500	No
		USACE DQC & NFS Review of Meeting Documentation (MI- Lake Michigan)	No	TBD	TBD	$1,500	No
4.4.4	Focused Evaluations Conduct Focus Area Workshops - Lake Huron	USACE DQC & NFS Review of Meeting Documentation (MI- Lake Huron)	No	TBD	TBD	$1,500	No
4.4.5	Focused Evaluations Conduct Focus Area Workshops - Lake Erie	USACE DQC & NFS Review of Meeting Documentation (OH Area 1- Lake Erie)	No	TBD	TBD	$1,500	No
		USACE DQC & NFS Review of Meeting Documentation (OH Area 2- Lake Erie)	No	TBD	TBD	$1,500	No

Task #	Product to undergo Review	Review Level	Site Visit	Start Date	End Date	Cost	Comp-lete
		USACE DQC & NFS Review of Meeting Documentation (OH Area 2- Lake Erie)	No	TBD	TBD	$1,500	No
		USACE DQC & NFS Review of Meeting Documentation (NY- Lake Erie)	No	TBD	TBD	$1,500	No
4.5	Focused Evaluations Documentations - Lake Ontario	USACE DQC, NFS & Expert Review of Focused Evaluation Workshop Report (NY-Lake Ontario)	No	TBD	TBD	$5,000	No
	Focused Evaluations Documentations- Lake Superior	USACE DQC, NFS & Expert Review of Focused Evaluation Workshop Report (MN-Lake Superior)	No	TBD	TBD	$5,000	No
		USACE DQC, NFS & Expert Review of Focused Evaluation Workshop Report (WI-Lake Superior)	No	TBD	TBD	$5,000	No
		USACE DQC, NFS & Expert Review of Focused Evaluation Workshop Report (MI-Lake Superior)	No	TBD	TBD	$5,000	No
	Focused Evaluations Documentations - Lake Michigan	USACE DQC, NFS & Expert Review of Focused Evaluation Workshop Report (WI-Lake Michigan)	No	TBD	TBD	$5,000	No
		USACE DQC, NFS & Expert Review of Focused Evaluation Workshop Report (IL Area 1- Lake Michigan)	No	TBD	TBD	$5,000	No
		USACE DQC, NFS & Expert Review of Focused Evaluation Workshop Report (IL Area 2- Lake Michigan)	No	TBD	TBD	$5,000	No
		USACE DQC, NFS & Expert Review of Focused Evaluation Workshop Report (IN-Lake Michigan)	No	TBD	TBD	$5,000	No
		USACE DQC, NFS & Expert Review of Focused Evaluation Workshop Report (MI-Lake Michigan)	No	TBD	TBD	$5,000	No

Task #	Product to undergo Review	Review Level	Site Visit	Start Date	End Date	Cost	Comp-lete
	Focused Evaluations Documentations - Lake Huron	USACE DQC, NFS & Expert Review of Focused Evaluation Workshop Report (MI-Lake Huron)	No	TBD	TBD	$5,000	No
	Focused Evaluations Documentations - Lake Erie	USACE DQC, NFS & Expert Review of Focused Evaluation Workshop Report (OH Area 1- Lake Erie)	No	TBD	TBD	$5,000	No
		USACE DQC, NFS & Expert Review of Focused Evaluation Workshop Report (OH Area 2- Lake Erie)	No	TBD	TBD	$5,000	No
		USACE DQC, NFS & Expert Review of Focused Evaluation Workshop Report (PA-Lake Erie)	No	TBD	TBD	$5,000	No
		USACE DQC, NFS & Expert Review of Focused Evaluation Workshop Report (NY-Lake Erie)	No	TBD	TBD	$5,000	No
5.3	Risk-Informed Decision Framework - Technical Review	LRD Climate Policy Review - Risk-Informed Decisions Framework Document & Story Map	No	TBD	TBD	N/A	No
		ATR - Risk-Informed Decisions Framework Document & Story Map	No	TBD	TBD	$28,000	No
5.4	Risk-Informed Decision Framework - Documentation	District and NFS Review of Risk-informed Decision Framework Report	No	TBD	TBD	$50,000	No
6.1	Watershed Assessment - Establish Watershed Shared Vision	USACE DQC and NFS Review of Shared Vision Milestone Submittal	No	TBD	TBD	$25,000	No
6.3	Watershed Assessment - Identify Tentative Recommendations	USACE DQC and NFS Review of Draft Watershed Plan and 8 State Appendices	No	TBD	TBD	$75,000	No
6.4	Watershed Assessment - Technical Review	ATR - Draft Watershed Plan and 8 State Appendices	No	TBD	TBD	$140,000	No

Task #	Product to undergo Review	Review Level	Site Visit	Start Date	End Date	Cost	Comp-lete
		LRD Policy and Legal Compliance Review of Draft Watershed Plan and 8 State Appendices	No	TBD	TBD	N/A	No
6.5	Watershed Assessment - Public and Agency Review/ Draft Report	Public, Tribal Nations, and Federal Agency Review	No	TBD	TBD	N/A	No
6.6	Watershed Assessment - Final Report Documentation	Final USACE District Legal Review	No	TBD	TBD	$10,000	No
		USACE DQC and NFS - Review of Final Watershed Plan and 8 State Appendices	No	TBD	TBD	$90,000	No
		ATR - Final Watershed Plan and 8 State Appendices	No	TBD	TBD	$195,000	No
		USACE LRD Policy and Legal Compliance and Final Policy Guidance Memorandum	No	TBD	TBD	N/A	No

Table 2 identifies the specific expertise and role required for the members of each review team. The table identifies the technical disciplines and expertise required for members of review teams. In most cases the team members will be senior professionals in their respective fields. In general, the technical disciplines identified for a District Quality Control (DQC) team will be needed for an Agency Technical Review (ATR) team. Each ATR team member will be certified to conduct ATR by their community of practice. The table is set up to concisely identify common types of expertise that may be applicable to one or more of the reviews needed for a study.

Table 2: Review Teams - Disciplines and Expertise

Discipline / Role	Expertise	DQC	ATR
DQC Team Lead	Extensive experience preparing Civil Works decision documents and leading DQC. The lead may serve as a DQC reviewer for a specific discipline (planning, economics, environmental, etc.).	Yes	No
ATR Team Lead	Professional with extensive experience preparing Civil Works decision documents and conducting ATR. Skills to manage a virtual team through an ATR. The lead may serve on the ATR team for a specific discipline (such as planning, economics, or environmental work).	No	Yes
Planning	Skilled water resources planner knowledgeable in complex coastal planning investigations and the application of SMART principle to problem solving.	Yes	Yes
Environmental Resources	Experience with environmental evaluation and compliance requirements, national environmental laws and statutes, applicable Executive Orders, and other planning requirements.	Yes	Yes

Discipline / Role	Expertise	DQC	ATR
Cultural Resources	Experience with cultural resource survey methods, area of potential effects, National Historic Preservation Act Section 106, and state and federal laws pertaining to American Indian Tribes.	Yes	Yes
Hydrology	Engineer with experience applying hydrologic principles and technical tools to project planning, design, construction, and operation.	Yes	Yes
Coastal and Hydraulic Engineering	Engineer with experience applying coastal and hydraulic engineering principles and analytic tools to project planning, design, construction, and operation.	Yes	Yes
Cost Engineering	Experience using cost estimation software; working knowledge of water resource project construction; capable of making professional determinations using experience.	Yes	Yes
Civil Engineering	The Civil Engineering reviewer will be a senior civil/cost engineer familiar with structural and nonstructural coastal flood risk management measures.	Yes	Yes
Climate Preparedness and Resilience	A member of the Climate Preparedness and Resiliency Community of Practice knowledgeable of inland / coastal hydrology climate change assessment policy and practice.	Yes	Yes
GIS/Geospatial Specialist	The GIS Geospatial reviewer will be a senior cartographer, geographer, or engineer with experience completing various geospatial applications in support of USACE large-scale coastal watershed studies using ESRI ArcGIS software products. The reviewer will have experience managing extensive geodatabases and combining various spatial data from various sources to store in personal geodatabase format. The reviewer will also have experience creating rasters or grids from vector format as well as raster analyses associated with 3D and spatial analyst tools.	Yes	Yes
Risk and Uncertainty	An expert on multi-discipline flood risk analysis and other water resource risks to ensure consistent and appropriate identification, analysis, and written communication of risk and uncertainty.	Yes	Yes

4. Documentation of Reviews

Documentation of DQC. Quality Control will be performed continuously. A specific certification of DQC completion will be prepared at the base conditions (existing and future), draft and final report stages. Documentation of DQC will follow the Chicago District Quality Manual and the MSC Quality Management Plan. Buffalo and Detroit Districts and ERDC will perform DQC according to their specific policies, but documentation will comply with Chicago District requirements. DrChecks will be used for documentation of DQC comments. An example DQC Certification statement is provided in ER 1165-2-217, Appendix D. Documentation of completed DQC, to include the DQC checklist, will be provided to the MSC, RMO and the ATR Team leader. The ATR team will examine DQC records and comment in the ATR report on the adequacy of the DQC effort.

Documentation of ATR. DrChecks will be used to document all ATR comments, responses, and resolutions. Comments should be limited to those needed to ensure product adequacy. All members of the ATR team will use the four-part comment structure (see ER 1165-2-217, Section 5). If a concern cannot be resolved by the ATR team and PDT, it will be elevated to the vertical team to resolve using the issue resolution process in ER 1165-2-217, Section 5.9. Unresolved concerns will be closed in DrChecks by noting the concern has been elevated. ATR documentation will include an assessment by the ATR team of the effectiveness of DQC. The ATR Lead will prepare a Statement of Technical Review (see ER 1165-2-217, Section 5.11, and Appendix D), for the draft and final reports, certifying that review issues have been resolved or elevated. ATR will be certified when all concerns are resolved or referred to the vertical team and the ATR documentation is complete.

Documentation of Model Review. Planning models require compliance with EC 1105-2-412. Models developed by the Corps of Engineers are certified and models developed by others are approved. Certifications or approvals may be specific to a single study, a regional application or for nationwide application. Completion of a model review is documented in a memorandum from the Director of a Planning Center of Expertise for Coastal Storm Risk Management and should accompany reporting packages for study decisions.

5. Supporting Information

Study or Project Background

Study Authority

Section 211(a) of the Water Resources Development Act (WRDA) of 2020 provides direction to the Secretary in carrying out the comprehensive assessment of water resources needs for the Great Lakes System under Section 729 of WRDA 1986 (33 U.S.C. 2267a), as required by Section 1219 of WRDA 2018.

Study or Project Area

Paragraph 6 of the Implementation Guidance for Section 211 of WRDA 2020 (ref. v) states "The geographic area of the assessment could include the drainage basins of the Great Lakes and tributaries including historically connected tributaries within the eight Great Lakes States." The study will focus efforts in coastal areas within Great Lakes States (Minnesota, Wisconsin, Michigan, Illinois, Indiana, Ohio, Pennsylvania, and New York) where the Framework for Resilient Great Lakes Restoration

Initiative (GLRI) Investments (GLRI Framework) of future possible climate scenarios identifies inundation and low water levels.

Study Area Map

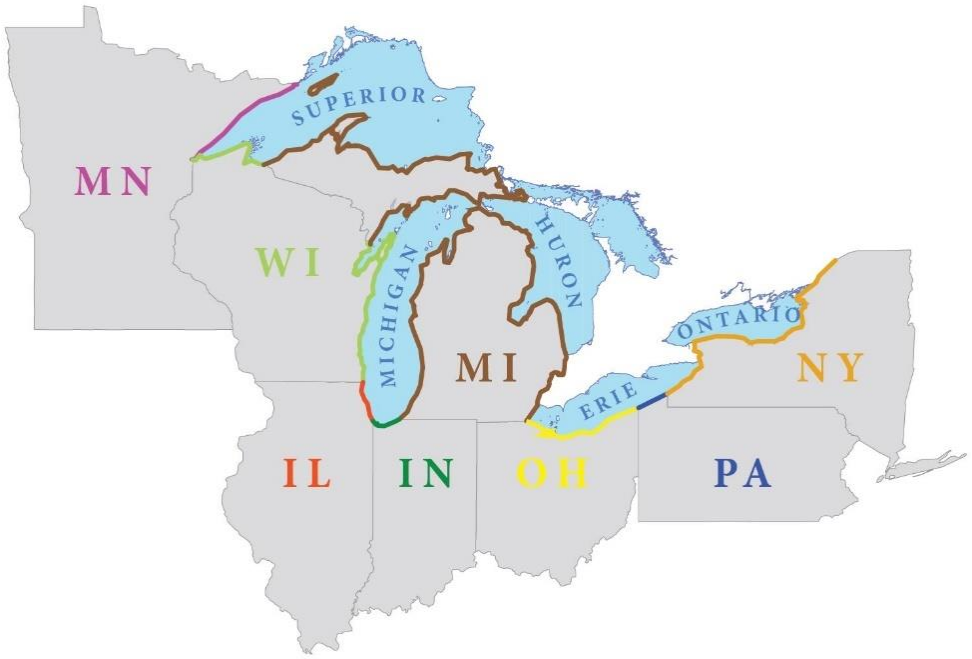

Figure 1 – Study Area Map.

Problem Statement

The Great Lakes experienced near record lows in the mid-2000s through mid-2010s and record/near-record highs in 2019-2020, causing inundation, flood, erosion, and accretion. There is uncertainty regarding potential climate change impacts on water levels and ice conditions in the Great Lakes and the resulting impacts on populated areas, socially vulnerability populations, areas of concentrated economic development, and areas with vulnerable environmental, historic, and cultural resources.

Goals and Objectives

The watershed study will be conducted in accordance with Implementation Guidance for Section 211 of the Water Resources Development Act of 2020, Great Lakes Coastal Resiliency Study (Reference F); Engineering Regulation (ER) 1105-2-100 (Planning Guidance Notebook (Reference H); and ER 1105-2-102 Watershed Studies (Reference D).

ER 1105-2-102 (Watershed Studies) outlines the planning procedures for watershed studies. The milestones are as follows:

i) Shared Vision milestone. The purpose of the Shared Vision milestone is to define the overall shared vision for the watershed, water, and related resources as developed by the partners and stakeholders involved in the watershed study and to present the

coordinated Study Framework and associated activities that clearly support the shared vision.

ii) Recommendations milestone. The purpose of the Recommendations milestone is to ensure vertical team concurrence on the recommended strategies that meet the study goals and objectives, and shared vision.

iii) Report milestone. The purpose of the Report milestone is to ensure that the draft and final watershed plan has undergone the required 30-day minimum concurrent public, Agency Technical Review (ATR), policy, and legal compliance review periods and to request approval of the final watershed plan from the MSC Planning and Policy Chief.

A minimum of one In-Progress Review (IPR) is required to be convened in each calendar year that does not contain a major milestone meeting. The project delivery team will work with the vertical team to hold IPRs as needed on an ongoing basis.

ER 1105-2-102 also outlines a modified six-step planning process that is specific to watershed planning studies; given the significant size of the study area, these six steps will be broadly applied to the entire study area.

The GLCRS was classified as a "mega-study" by HQUSACE executive leadership, Reference A. The watershed study will be conducted in accordance with Engineering and Construction Bulletin (ECB) 2016-16 (Updated USACE Mega Projects Guidance) (26 May 2016). The mega-study designation requires the PDT to follow 12 tenets that include enhanced management controls, vertical team engagement, and PDT composition. A mega-project quarterly IPR will be provided to HQUSACE.

Future Without Project Conditions

Uncertainty will remain regarding the impact of lake level variability and ice conditions on coastal resources and vulnerabilities may be identified in the future. Without the Watershed Study, Great Lakes Coastal Managers will lack a basin-wide plan/strategy to address vulnerabilities.

Types of Measures/Alternatives Being Considered

The Watershed Study will identify three categories of recommendations informed by the basin-wide analysis and focused evaluation workshops: monitor; monitor plus study for action; and study for action. Recommendations may also be considered for federal or non-federal policies or programs.

Estimated Cost/Range of Costs

There will be no project specific recommendations from this study and therefore, no costs.

6. Models to be Used in the Study

EC 1105-2-412 mandates the use of certified or approved models for all planning activities to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. Planning models are any models and analytical tools used to define water resources management problems and opportunities, to formulate potential alternatives to address the problems and take advantage of the opportunities, to evaluate potential effects of alternatives and to support decision making.

Due to the nature of the Watershed Study, no planning models are anticipated to be used.

EC 1105-2-412 does not cover engineering models used in planning. The responsible use of well-known and proven USACE developed and commercial engineering software will continue. The professional practice of documenting the application of the software and modeling results will be followed. The USACE Scientific and Engineering Technology Initiative has identified many engineering models as preferred or acceptable for use in studies. These models should be used when appropriate. For example, HH&C models need to comply with the requirements of HH&C CoP Enterprise Standard 08101.

The study scope does not include using engineering models. The Watershed Study will utilize results from the foundational interagency Framework for Resilient Great Lakes Restoration Initiative (GLRI) Investments study that is being completed for the U.S. Environmental Protection Agency (USEPA) under the GLRI Focus Area 5 program. The GLRI Framework modeling is being completed by an interagency team from USACE, National Oceanic and Atmospheric Administration (NOAA), U.S. Geological Survey (USGS), and Cornell University. These models will undergo quality control/quality assurance reviews in accordance with USACE, NOAA and USGS internal agency policies and an independent review by a panel of Great Lakes researchers. The review plan for the GLRI Framework is attached as Appendix G.

7. Factors Affecting Level and Scope of Review

All planning products are subject to the conduct and completion of District Quality Control. Most planning products are subject to Agency Technical Review and a smaller sub-set of products may be subject to Independent External Peer Review and/or Safety Assurance Review. Information in this section helps in the scoping of reviews through the considerations of various potential risks.

Objectives of the Reviews

Teams should perform a critical analysis of the intended outcome of reviews with particular attention to key technical considerations and associated risks likely to be encountered during the study and/or in later phases of the project. The PCX-CSRM is adept at facilitating these types of outcome-based discussions and in capturing study-specific statements characterizing risks and the relevance of those risks to the objectives of various reviews. Teams are encouraged to collaborate with the appropriate planning center in conducting and documenting these risk assessments. Document the objectives of the reviews in this section.

Assessing the Need for IEPR

As the GLCRS is an 'other work product' and not a decision document, Type I IEPR is not required. Study recommendations will not involve design or construction, therefore Type II IEPR is not required

Assessing Other Risk Considerations

- Will the study likely be challenging? If so, describe how?

The study will be challenging due factors such as potential difficulty in reaching consensus at key study points with eight nonfederal sponsors; varied landscapes, hazards, populations, and coastal resources located with the large geographic scope of the study; novel nature of the scoped basin-wide analysis

and focused evaluation risk assessments in the Great Lakes; and the sequential nature of major study tasks. Refer to the Risk Register for risks specific to each of the study tasks scoped in the Project Management Plan (PMP).

- Provide a preliminary assessment of where the project risks are likely to occur and assess the magnitude of those risks.

Cost and schedule risk has been evaluated for each of the major study tasks scoped in the PMP. Refer to the Risk Register for risks specific to each of the study tasks scoped in the PMP.

High study risks are associated with the overall nature of this complex study that is competing with the priorities and unique priorities of eight nonfederal sponsors. It may be difficult to reach consensus at key decision points with eight nonfederal sponsors. Scheduling meetings and workshops to accommodate many non-USACE entities over large geographies may be challenging. Another area of high risk is the study's reliance upon the GLRI Framework's future conditions analyses. If study results are delayed, either the Watershed Study's schedule will be impacted, or the scope may need to be reworked.

- Is the project likely to be justified by life safety or is the study or project likely to involve significant life safety issues? Briefly describe the life risk, including the District Chief of Engineering's assessment as to whether there is a significant threat to human life associated with aspects of the study or failure of the project or proposed projects.

The project is not likely to involve significant life safety issues. The Watershed Study will not result in a Recommended Plan that would allow for life safety assessments associated with specific actions.

- Is the information in the decision document or anticipated project design likely to be based on novel methods, involve innovative materials or techniques, present complex challenges for interpretation, contain precedent-setting methods or models, or present conclusions that are likely to change prevailing practices? If so, how?

No

- Does the project design require redundancy, resiliency, and/or robustness, unique construction sequencing, or a reduced or overlapping design/construction schedule? If so, how?

No

- Is the project expected to have more than negligible adverse impacts on scarce or unique tribal, cultural, or historic resources? If so, what are the anticipated impacts?

No

- Is the project expected to have substantial adverse impacts on fish and wildlife species and their habitat prior to the implementation of mitigation measures? If so, describe the impacts?

No

- Is the project expected to have, before mitigation measures, more than a negligible adverse impact on an endangered or threatened species or their designated critical habitat? If so, what are the anticipated impacts?

No

8. Risk Informed Decisions on Level and Scope of Review

Targeted ATR. Will a targeted ATR be conducted for the study? No. Targeted ATR may be needed for the spin off studies from this watershed study, but the general nature of the watershed study does not call for Targeted ATR.

IEPR Decision. As the GLCRS is an 'other work product' and not a decision document, IEPR is not required.

Safety Assurance Review. Safety Assurance Reviews are managed outside of the USACE and are conducted on design and construction products for hurricane, storm and flood risk management projects, or other projects where existing and potential hazards pose a significant threat to human life. In some cases, significant life safety considerations may be relevant to planning decisions. These cases may warrant the development of relevant charge questions for consideration during reviews such as ATR or IEPR. In addition, if the characteristics of the recommended plan warrant a Safety Assurance Review, a panel will be convened to review the design and construction activities on a regular schedule before construction begins and until construction activities are completed.

Decision on Safety Assurance Review. Study recommendations will not involve design or construction; therefore, Safety Assurance Review is not required.

9. Policy and Legal Compliance Review

Policy and legal compliance review of draft and final planning decision documents is delegated to the MSC (see Director's Policy Memorandum 2019-01).

(i) Policy Review.

The policy review team is identified through the collaboration of the MSC Chief of Planning and Policy and the HQUSACE Chief of the Office of Water Project Review. The makeup of the Policy Review team will be drawn from Headquarters (HQUSACE), the MSC, the Planning Centers of Expertise, and other review resources as needed.

- The Policy Review Team will be invited to participate in key meetings during the development of decision documents as well as SMART Planning Milestone meetings. These engagements may include In-Progress Reviews, Issue Resolution Conferences or other vertical team meetings plus the milestone events.

- The input from the Policy Review team should be documented in a Memorandum for the Record (MFR) produced for each engagement with the team. The MFR should be distributed to all meeting participants.

- Teams may choose to capture some of the policy review input in a risk register if appropriate. These items should be highlighted at future meetings until the issues are resolved. Any key decisions on how to address risk or other considerations should be documented in an MFR.

(ii) Legal Review.

Representatives from the Office of Counsel will be assigned to participate in reviews. Members may participate from the District, MSC and HQUSACE. The MSC Chief of Planning and Policy will coordinate membership and participation with the office chiefs.

- In some cases, legal review input may be captured in the MFR for the particular meeting or milestone. In other cases, a separate legal memorandum may be used to document the input from the Office of Counsel.

Each participating Office of Counsel will determine how to document legal review input.

10. Public Comment

This Review Plan will be posted on the District's website. Public comments on the scope of reviews, technical disciplines involved, schedules and other considerations may be submitted to the District for consideration. If the comments result in a change to the Review Plan, an updated plan will be posted on the District's website.

11. Documents Distributed Outside the Government

For information distributed for review to non-governmental organizations, the following disclaimer shall be placed on documents:

"This information is distributed solely for the purpose of pre-dissemination review under applicable information quality guidelines. It has not been formally disseminated by USACE. It does not represent and should not be construed to represent any agency determination or policy."

Appendix A - Brief Description of Each Type of Review

This section describes each level of review to be conducted. Based upon the factors discussed in Section 1, this study will undergo the following types of reviews:

District Quality Control. All decision documents and accompanying components will undergo DQC. This internal review covers basic science and engineering work products. It fulfils the project quality requirements of the PMP. The DQC team will read all reports and appendices. The review must evaluate the correct application of methods, validity of assumptions, adequacy of basic data, correctness of calculations (error-free), completeness of documentation, and compliance with guidance and standards. Districts are required to check all computations and graphics by having the reviewer place a highlight (e.g., place a "red dot") on each annotation and/or number indicating concurrence with the correctness of the information shown.

Agency Technical Review. ATR will be performed by a qualified team from outside the home district that is not involved in the day-to-day production of the project/product. These teams will be comprised of certified USACE personnel. The ATR team lead will be from outside the home MSC.

Cost Engineering Review. All decision documents will be coordinated with the Cost Engineering Mandatory Center of Expertise (MCX). The MCX assisted in determining the expertise needed on the ATR and IEPR teams. The MCX will provide the Cost Engineering certification. The RMO is responsible for coordinating with the MCX for the reviews. These reviews occur as part of ATR.

Model Review and Approval/Certification. The use of certified or approved planning models for all planning work is required to ensure the models are technically and theoretically sound, compliant with policy, computationally accurate, and based on reasonable assumptions. Engineering models must comply with standards set by the appropriate Engineering Community of Practice.

Policy and Legal Compliance Review. These reviews culminate in determinations that report recommendations and the supporting analyses and coordination comply with law and policy, and warrant approval or further recommendation to higher authority by the home MSC Commander.

Public Review. The District will post the Review Plan and approval memo on the District's internet site. Public comment on the adequacy of the Review Plans will be accepted and considered. Additional public review will occur when the report and environmental compliance document(s) are released for public and agency comment.

Appendix B – Team Rosters

(Delete this appendix before posting the Review Plan on the District web page.)

PROJECT DELIVERY TEAM		
Name	**Office**	**Position**
	CELRB-PML	LRB Chief, Planning Branch
	CELRB-PML-P	LRB Chief, Plan Formulation Section
	CELRB-PML-P	LRB Lead Planner
	CELRB-PML-E	LRB Tribal Liaison
	CELRB-PML-P	LRB Risk-Informed Decision Framework Lead
	CELRB-PML-P	LRB Focused Eval Workshop Lead
		LRB Focused Eval Workshop Breakout
		LRB Logistics Planner for Workshops
		LRB State Appendix Author / Reviewer
		LRB Coastal Engineer
		LRB GIS Specialist
	CELRC-PDP-D	Mega Study Project Manager
		LRC Chief, Planning Branch
	CELRC-PDL-F	LRC Chief, Plan Formulation Section
	CELRC-PDL-F	LRC Lead Planner / LRD Regional Technical Specialist
	CELRC-PDL-E	LRC Environmental Planner / LRD Regional Technical Specialist
	CELRC-PDL-E	LRC Tribal Liaison
	CELRC-PDL-F	LRC Lead Planner
	CELRC-PDL-F	LRC Planner
		LRC Logistics Planner for Workshops

	CELRC-ECE-H	LRC State Appendix Author / Reviewer
	CELRC-ECE-H	LRC Coastal Engineer
	CELRC-ECE-S	LRC GIS Lead
	CELRC-PDP-P	LRC Program Analyst
	CELRC-GAC	LRC Office of Counsel
		LRC Contracting Specialist
	CELRE-PL	LRE Chief, Planning Branch
	CELRE-PLP	LRE Chief, Plan Formulation Section/Climate Preparedness and Resiliency
	CELRE-PLP	LRE Lead Planner
	CELRE-PLE	LRE Tribal Liaison / LRD Regional Technical Specialist for Tribal Nations
		LRE Focused Evaluation Workshop Lead
		LRE Focused Evaluation Workshop Breakout Lead
		LRE Logistics Planner for Workshops
		LRE State Appendix Author / Reviewer
	CELRE-HH	LRE Coastal Engineer / LRD Regional Technical Specialist
		LRE Hydraulic Engineer
		LRE GIS Lead
	CEERD-EPW	ERDC-EL Focus Evaluation Expert/ Climate Preparedness and Resiliency
	CEERD-EPW	ERDC-EL Focus Evaluation Expert
	CEERD-HNC	ERDC-CHL GIS Lead
	CESAM-OP-J	Mobile District GIS Specialist
	CEERD-HNC	ERDC-CHL GIS Specialist

	CEERD-HNC	ERDC-CHL GIS Specialist
	CEERD-EEC	ERDC-CHL GIS Specialist
		ERDC-CHL Wave/Surge
		District Quality Control/Agency Technical Reviewers
		Illinois team member(s)
		Indiana team member(s)
		Michigan team member(s)
		Minnesota team member(s)
		New York team member(s)
		Ohio team member(s)
		Pennsylvania team member(s)
		Wisconsin team member(s)

DISTRICT QUALITY CONTROL		
Name	**Position**	**Experience/Role**
	LRC Chief, Plan Formulation Section	LRC Chief, Plan Formulation Section
	LRC GIS Lead	LRC GIS Lead plus Geospatial
	Environmental	Environmental and Cultural
	LRC H&H Coastal	LRC H&H Coastal, Climate Preparedness, Risk and Uncertainty
	LRC Geotech. Section Chief	LRC Geotech. Section Chief
	LRC Civil and Cost Section Chief	LRC Civil Section Chief

AGENCY TECHNICAL REVIEW		
Name	**Position**	**Experience**
	ATR Team Lead	
	Planning	
	Environmental Resources	

	Cultural Resources	
	Hydrology	
	Coastal and Hydraulic Engineering	
	Cost Engineering	
	Civil Engineering	
	Climate Preparedness and Resilience	
	GIS/Geospatial Specialist	
	Risk and Uncertainty	

POLICY AND LEGAL COMPLIANCE REVIEW TEAM		
Name	**Office**	**Position**
	CECW-PC	Review Manager/Biologist
	PM-PL-F	Senior Economist
	CECW-PC	Water Resources Planner
	CELRD-PDP	Risk Analysis Coordinator
	CECC-LRD	Assistant Division Council
	CELRD-PDP	Climate Preparedness and Resilience
	CELRD-RB-W	Lead Hydraulic Engineer
	CELRD-RBE	Senior Regional Engineer
	CELRD-RBE	Civil Engineer

Appendix C – Checklist – District Quality Control

DQC Checklist	Response	Initials	Comments
General Issues			
1. Has a PDT Review been completed?			
2. Was the allotted time for DQC in the review plan adhered to?			
3. Has the DQC Team verified the information presented in the current study issue checklist (Pre-AMM, Pre-TSP, Final Report) is accurate?			
4. Is the identified problem well understood and are the risks and uncertainties properly characterized?			
5. Has an appropriate array of alternatives been considered that could solve the problem?			
6. Does the Tentatively Selected Plan (TSP) solve the problem needs and have implementation risks been appropriately considered?			
7. Are the proposed construction methods appropriate?			
8. Are the schedules and cost estimates reliable (comprehensive, well-documented, accurate, and credible)?			
9. What is the risk of potential cost and schedule growth?			
10. Are there lessons learned that need to be considered?			
11. Does the product comply with USACE criteria and policy requirements including environmental compliance requirements?			
12. Have life-safety risks been appropriately assessed?			
13. Are the methods used to develop analyses and conclusions clearly and fully presented to ensure transparency if applicable?			
Items for Verification			
14. Are the assumptions, methods, procedures, computations (including quantities), and materials used in the analyses consistent with the project purpose or decisions being made?			
15. Are the array of alternatives considered comprehensive?			
16. Are the methods used to develop analyses and conclusions clearly and fully presented?			
17. Are the data, level of data, assumptions, and safety risk based on deterministic criteria and RIDM information is appropriate?			
18. Are the results compared to project purpose in compliance with applicable laws and USACE policies reasonable?			

19. Correctness of calculations – before this is checked yes, the DQC reviewer must have highlighted (placed a red-dot) on each annotation, computation, and model input parameter indicating concurrence with the correctness of the information. By checking yes, the reviewer is assuming the same level of responsibility as the author.			
a. H&H			
b. Economics			
c. Environmental			
d. Climate Change			
e. Geotechnical			
f. GIS			
g. Civil			
h. Real Estate			
20. Correctness, accuracy, and clarity of graphic/plan presentation – before this is checked the DQC reviewer must have highlighted (placed a red-dot) critical graphic/plan elements (e.g., dimension/elevation, note, or reference) showing concurrence with the correctness of the information shown. By checking yes, the reviewer is assuming the same level of responsibility as the author.			
a. H&H			
b. Economics			
c. Environmental			
d. Climate Change			
e. Geotechnical			
f. GIS			
g. Civil			
h. Real Estate			

Concurrence

District Planning Chief _____Date: _____

DQC Lead _____Date: _____

Appendix D – Cost of Reviews – Backup Information

The PMP includes cost tables with costs of reviews.

Appendix E – Sensitive Information

Appendix F – Review Plan Change Log

Revision Date	Description of Change	Page / Paragraph Number

Appendix G – Framework for Resilient Great Lakes Restoration Initiative (GLRI) Investments Review Plan

a. Purpose. This review plan defines levels and scopes of review to be completed for the study process and output products.

b. Authority. 10 U.S. Code § 2358 Research and Development Projects

c. Study Description. This project brings national interagency climate experts together to create a model framework, including a weather generator, to identify a range of total water levels under a range of possible future climate conditions. The climate conditions will be based on best available climate science and projections, including Global Circulation Models (GCMs). Proven lake level and wave models, possible future ice conditions derived from these models, and statistical methods will be used to develop probability distributions of future static and total lake levels under the range of climate scenarios.

Study products and activities to be reviewed are summarized in Table 1 and expanded in Tables 2a – 2e.

Table 1. List of Products to Be Prepared and Reviewed

Product	Prepared By	Models/Activities Used	Type of Review to be Performed		
			Peer Review	Chief Review	External Review
Forcings for Static Lake Level Models	Cornell University	Stochastic Weather Generator			
Distribution of Total Water Levels	USACE ERDC-CHL	Storm Selection			
		OCEANMESH2D			
		Coupled ADCIRC-SWAN			
Check Models	NOAA GLERL CIGLR	WRF-Hydro			
		FVOM-CICE			
Static Lake Level Models	NOAA GLERL USACE Detroit	Clausius–Clapeyron (CC) Code Routine			
		Large Basin Runoff Model (LBRM)			
		Large Lake Thermodynamic Model (LLTM)			
		Coordinated Great Lakes Regulation & Routing Model			
Coastal Change Likelihood Index	USGS Woods Hole CMSC	Environment Fabric and Hazard Databases			
		CCL Outcomes			

d. Products/Activities to Undergo Review.

Table 2a. Stochastic Weather Generator Models/Activities	
Name	**Description**
Stochastic Weather Generator	This statistical algorithm simulates long series of daily weather data by bootstrapping historical data and then post-processing that data to reflect climate change scenarios. Data inputs include: 1) historical daily time series of temperature and precipitation across Great Lakes watersheds and each of the Great Lakes and 2) reanalysis-based daily time series of upper-level atmospheric pressure, cloud cover, dew point, and wind speed. The output (daily precipitation, temperature, wind speed, dew point, and cloud cover) will be used by USACE to drive the Great Lakes runoff, evaporation, and net basin supply models.

Table 2b. Static Lake Level Models/Activities	
Name	**Description**
Large Basin Runoff Model (LBRM)	This model is a lumped conceptual rainfall runoff model that propagates subbasin areal average precipitation and temperature to lateral tributary runoff for 121 Great Lakes subbasins. It was developed by NOAA GLERL and is run operationally by US Army Corps of Engineers Detroit District as an informational tool to provide insight into the components (runoff) of the Net Basin Supply. For details see Croley and He (2002) and Lofgren and Rouhana (2016). Croley, T. E. II and C. He. 2002. “Great lakes large basin runoff model.” In Proc., 2nd Federal Interagency Hydrologic Modeling Conference: Subcommittee on Hydrology, edited by G. Leavesley. Las Vegas, NV: Subcommittee on Hydrology of the Interagency Advisory on Water Data. Lofgren, B. M. and J. Rouhana (2016). "Physically Plausible Methods for Projecting Changes in Great Lakes Water Levels under Climate Change Scenarios." Journal of Hydrometeorology 17(8): 2209-2223.
Large Lake Thermodynamic Model (LLTM)	This model is a 1D lake thermodynamic model that simulates evaporation using air temperature, wind speed, cloud cover, and dew point. It was developed by NOAA GLERL and is run operationally by USACE-Detroit as an informational tool to provide insight into the components (runoff) of the Net Basin Supply. An intermediate output from LLTM is average ice cover per lake. For details see Croley (1989). Croley II, T. E. (1989). “Verifiable Evaporation Modeling on the Laurentian Great Lakes.” Water Resources Research 25(5).
Coordinated Great Lakes Regulation & Routing Model	This model translates net basin supply to changes in Great Lakes water levels and outflows by incorporating regulation rules and logic as well as lake to lake routing. This model is a product of the Coordinating Committee for Great Lakes Basic Hydraulic and Hydrologic Data (for details, see Gronewold et al. 2018). Gronewold, A. D., et al. (2018). "Resolving Hydrometeorological Data Discontinuities along an International Border." Bulletin of the American Meteorological Society 99(5): 899-910.

Table 2c. GLERL CIGLR Models/Activities	
Name	**Description**
WRF-Hydro	This model performs distributed hydrological modeling (land surface and routing). It will be used to evaluate and inform the use of more computationally efficient modeling approaches being used by external partners in the interagency team.
FVCOM-CICE	This model performs hydrodynamic simulations using an unstructured grid. It will be used to evaluate and inform the use of more computationally efficient modeling approaches being used by external partners in the interagency team.
Net Basin Supply (NBS) as modeled by LBRM-CC and LLTM and overlake precipitation	This product is the result of propagating forcings (baseline and scenario) through the Large Basin Runoff Model that approximates evapotranspiration using the Clausius-Clapeyron method (LBRM-CC), the Large Lake Thermodynamic Model (LBRM), and precipitation provided directly by the Weather Generator.

Table 2d. ERDC-CHL Wave Surge Models/Activities	
Name	**Description**
Storm selection based on historical water level measurements, wave and mean daily ice concentration estimates.	The analysis/evaluation will use FEMA extreme storm lists for storms prior to 2009 and will be supplemented by measurements and model estimates (water-level, wave conditions and mean daily ice estimates) for the period of record from 2009 to the present; evaluation of sub meso-scale summer events (during high static water levels). A Peaks-Over-Threshold (JPM-OS) approach is used to generate a new set of extreme storm events unique for each Great Lake to be used as a baseline for subsequent model evaluation
Revised extreme storm event list for the Great Lakes	Extreme storm event lists to be used to mine wind, pressure and ice fields for baseline model test and evaluations
New ADCIRC/SWAN unstructured meshes developed with OCEANMESH2D.	New ADCIRC/SWAN unstructured meshes will be constructed for each Great Lake, with Michigan and Huron being a combined single mesh. The OCEANMESH2D software will generate the meshes using the most recent LIDAR surveys. Meshes will have consistent design parameters for each of the lakes in order to provide uniformity to the model accuracies across each lake.
COUPLED ADCIRC-SWAN (CSTORM MS) (Coastal Storm Modeling System)	CSTORM-MS: Modeling system that fully couples storm surge (ADCIRC-hydrodynamic model) and waves (SWAN), forced by winds, pressure fields and modified by mean daily ice concentration fields. The modeling system will be run using newly generated unstructured grids.
Model Estimates for Baseline Simulations using real static water levels, mean daily ice concentration fields, forced by wind and pressure fields for each extreme storm event.	Results will be evaluated to point source water level and wave measurements found in the Great Lakes for a set of baseline extreme events, used to tune the two models for improved estimates over the entire set of storms. The results will also serve as a basis for results generated using future static water level and percent ice coverage provided by the LBRM and LLTM.
Simulations to generate the expected range of future Great Lakes water levels, wave heights and ice conditions	Using CSTORM-MS (same unstructured grid meshes, tuned models from baseline simulations) and historical wind and pressure fields for the list of extreme storm events, simulations are performed for a finite number of static lake levels and percent ice coverage for each lake provided by LBRM and LLTM.
Population of the Coastal Hazards System (CHS) with updated Great Lakes Data	The Coastal Hazards System (CHS) database and web tools will be updated to include the CSTORM ADCIRC/SWAN model results at up to 20,000 save points per lake. Data included will be time series of water levels, currents, wave heights, wave period, and wave direction along with wind speed/direction, atmospheric pressure and ice concentration for each of the simulated events. The CHS will also include the extreme statistics generated from GPD.

Table 2e. USGS Models/Activities	
Name	**Description**
Environment Fabric and Hazard Database	Two geospatial databases and affiliated metadata constructed from existing landcover, elevation, and landscape-specific datasets (e.g. dune height and wetland health indices) that the describe the landscape (fabric) and the hazards that impact it. Hazard datasets will include Great Lakes water-levels, wave height, ice cover conditions, storm frequency (recurrence interval), seiches, and erosion rates.
CCL Outcomes	Derived product with affiliated metadata that uses a supervised machine learning framework to synthesize fabric and hazards datasets (described above) to map the lakeshore coastal zone between +10 and -10 m (relative to mean lake level) in terms of degrees of higher and lower likelihood of coastal change occurring in the coming decade.

1. INTERNAL REVIEW

a. Types of Review. The components of the study will be reviewed in accordance with the standards of the agency performing the study. The review processes per each component are described below in order: (1) stochastic weather generator, (2) National Oceanic and Atmospheric Administration's Great Lakes Environmental Research Laboratory and Cooperative Institute for Great Lakes Research Science Team, (3) US Army Corps of Engineers Engineering Research and Development Center's Coastal and Hydraulics Laboratory, (4) United States Geologic Survey Woods Hole Coastal and Marine Science Center.

(1) The Stochastic Weather Generator. Personnel from Cornell University are processing atmospheric data used to create the baseline and climate change scenarios used to simulate future conditions of the Great Lakes. Review of data will be conducted during the vetting of weather generator manuscripts for consideration by scholarly journal(s).

(2) National Oceanic and Atmospheric Administration's Great Lakes Environmental Research Laboratory (NOAA GLERL-CIGLR Science Team): GLERL-CIGLR Science Team procedures will be performed and formally documented for all study products, including supporting documents.

- Internal reviews will take place in accordance with the NOAA-GLERL Quality Assurance Project Plan (QAPP)
- QC will be documented with intermediate and final reports.
- The IPEMF Branch and CIGLR associates include members within each area of responsibility. Personnel performing QC shall have the necessary expertise.
- Each peer-level QC reviewer will have no production role in the study/project and will have the necessary expertise/experience to thoroughly review the study products.

(3) US Army Corps of Engineers, Detroit District (LRE) and Engineering Research and Development Center's Coastal and Hydraulics Laboratory (ERDC-CHL). Formally documented Work Product QC will, at a minimum, be completed for an expected range of future Great Lakes water levels, wave heights and ice conditions.

- QC will be documented with a summary report/certification.
- Supervisors within each area of responsibility will assign appropriate, qualified staff to perform QC on their respective products. Personnel performing QC shall have the necessary expertise.
- Each peer-level QC reviewer will have no production role in the study/project and will have the necessary expertise/experience to thoroughly review the study products.

(4) United States Geologic Survey – Woods Hole Coastal and Marine Science Center (USGS-Woods Hole CMSC). Formally documented Work Product QC will be completed for the Coastal Change Likelihood (CCL) Index.

- Peer Review will be completed in accordance with the Fundamental Science Practices (FSP) requirements outlined at https://www.usgs.gov/survey-manual/5023-fundamental-science-practices-peer-review

2. EXTERNAL REVIEW

a. Reviewer Biographies.
TBD once bios received

b. Review Charge Questions.

1. Does it appear that the QA/QC of the products were adequately performed and documented?
2. Was the selection of models appropriate for use in the evaluations?
3. Was the application of data within those models appropriate?
4. Was the interpretation of and conclusions drawn from model results reasonable?
5. Are the sources, amounts, and levels of detail of the data used in the analysis appropriate for the complexity of the project?
6. Are residual risks adequately described?

c. Review Milestones.

The total estimated time per reviewer is 40 hours.

- Model Framework and workflow
- Interim data
    - Weather Generator
    - Static Lake Levels
    - Wave/Surge Statistics
    - Coastal Change Likelihood
- Final study documentation

ATTACHMENT 1 – Contacts

PROJECT DELIVERY TEAM			
Function/Discipline	Name (Last, First)	Phone	Office
Project Manager (Lead)			USACE-Chicago
Planner			USACE-Chicago
Planner			USACE-Chicago
Planner			USACE-Chicago
Hydraulic Engineer			USACE-Detroit
Physical Scientist			USACE-Detroit
Hydraulic Engineer			USACE-Detroit
Senior Researcher			USACE-CEERD-EL
Research Hydraulic Engineer			USACE-ERDC-CHL
Research Hydraulic Engineer			USACE-ERDC-CHL
Research Mathematician			USACE-ERDC-CHL
Research Civil Engineer			USACE-ERDC-CHL
Research Physical Scientist			USACE-ERDC-CHL
Hydraulic Engineer			USACE-Buffalo
Geologist			USGS- Woods Hole CMSC
Research Geologist			USGS- Woods Hole CMSC
Physical Scientist			NOAA-GLERL
Physical Scientist			NOAA-GLERL
Supervisory Physical Scientist			NOAA-GLERL
Ice Climatologist			NOAA-GLERL
Assistant Professor			Cornell University
Postdoctoral Associate			Cornell University
Assistant Research Scientist			University of Michigan
Associate Professor			University of Michigan
Research Associate			University of Michigan
Postdoctoral Research Fellow			University of Michigan
Postdoctoral Research Fellow			University of Michigan

EXTERNAL REVIEW TEAM			
Function/Discipline	Name (Last, First)	Phone	Office

ATTACHMENT 2 – Review Comments and Responses