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US Army Corps of Engineers
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Global Changes
CIVIL WORKS GUIDE TO
SUSTAINABLE INFRASTRUCTURE REQUIREMENTS

1. Purpose. The U.S. Army Corps of Engineers (USACE) Environmental Operating Principles (EOP) encourage staff to "create mutually supporting economic and environmentally sustainable solutions" (Refs. 4.a., 4.b.). Civil Works (CW) infrastructure projects must meet many requirements, some of which directly contribute to environmental, economic, and/or social sustainability. This pamphlet identifies existing USACE requirements that have the greatest positive impact on an infrastructure project's sustainability. Ensuring projects meet these requirements during planning, design, and construction helps CW deliver sustainable solutions.

2. Applicability. This pamphlet applies to all USACE elements with CW responsibilities associated with the planning, design, and construction of new and existing infrastructure.

3. Distribution Statement. Approved for public release. Distribution is unlimited.

4. References.

a. Engineer Regulation (ER) 200-1-5, Policy for Implementation and Integrated Application of the USACE EOP and Doctrine;
https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_200-1-5.pdf

b. CECW-CP Memorandum, Subject: Reissuance of the USACE EOP;
https://usace.contentdm.oclc.org/utils/getfile/collection/p16021coll11/id/4196

c. Engineer Pamphlet (EP) 1100-1-3, USACE Sustainability: Definition and Concepts Guide;
https://www.publications.usace.army.mil/Portals/76/Users/227/19/2019/EP_1100-1-3.pdf

d. Engineer Pamphlet (EP) 1100-2-2, Civil Works Sustainable Infrastructure Practices Guidebook;
https://www.publications.usace.army.mil/Portals/76/Users/182/86/2486/ep%201100-2-2.pdf

5. Records Management (Record Keeping) Requirements. Records management requirements for all record numbers, associated forms and reports required by this regulation are included in the Army's Records Retention Schedule – Army (RRS-A). Detailed information for all record numbers, forms, and reports associated with this regulation are located in the RRS-A at https://www.arims.army.mil.

6. Background and Overview.

a. USACE defines "sustainable solutions" as solutions that balance environmental, economic, and social benefits and impacts to meet present needs without sacrificing the ability of future generations to meet their needs (Ref. 4.c.).

b. The CW Guide to Sustainable Infrastructure Requirements serves as a reference for Project Delivery Teams (PDT) to help ensure that major sustainability requirements are met. The pamphlet includes a comprehensive inventory of more than 36 USACE documents. For each document, key sustainability requirements are identified and discussed, including their applicability to different types of projects and any exceptions. An optional form is also provided to assist PDTs and facilitate project reviews.

c. Additional information on sustainable infrastructure practices can be found in the Civil Works Sustainable Infrastructure Practices Guidebook (Ref. 4.d.). The Guidebook identifies hundreds of actions that may be considered by PDTs seeking to improve the sustainability of their projects. Industry references and related federal mandates, policies, and programs are also identified.

d. This pamphlet demonstrates USACE's commitment and leadership in promoting sustainability and innovation in all its activities. The pamphlet was prepared by the HQUSACE Engineering and Construction Division in coordination with the USACE Sustainability Activities Steering Committee.

FOR THE COMMANDER:

RAFAEL F. PAZOS
COL, EN
Chief of Staff

CIVIL WORKS
GUIDE TO SUSTAINABLE INFRASTRUCTURE REQUIREMENTS

US Army Corps of Engineers

Cover photographs: Chesapeake and Delaware Canal and Chesapeake City Bridge; Wolf Creek Dam; Dredge Currituck; and Ice Harbor Lock and Dam

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1. Introduction

The Civil Works Guide to Sustainable Infrastructure Requirements helps ensure that major requirements applicable to the sustainability of new and existing CW infrastructure are met. The Guide includes an inventory of USACE documents relevant to sustainability during planning, design, and construction. Requirements related to the operations and maintenance of existing infrastructure are included to the extent that they impact the planning, design, and construction of major modifications. The requirements are outlined in Section 2 of this Guide. Section 3 includes an optional form to assist teams during project implementation and reviews, including guidance on how the form is applied during different project phases.

Background

USACE CW infrastructure projects must meet many requirements related to sustainability, including regulations, codes, standards, policies, procedures, and other requirements. These requirements were reviewed to identify those having the greatest impact on a project's sustainability. More than 36 requirements documents are discussed in this Guide, along with descriptions of the requirements, their applicability, and any exceptions.

The requirements identified in this Guide do not supersede or replace existing regulations, policies, or other requirements (e.g., National Environmental Policy Act [NEPA] requirements). The Guide supports sustainability by highlighting major USACE requirements already mandated by existing policy or guidance. Sustainability practices that go beyond these requirements can potentially be integrated into CW projects and can be found in other guidance, including the *Civil Works Sustainable Infrastructure Practices Guidebook, EP 1100-2-2*.

Definitions

The *USACE Sustainability: Definition and Concepts Guide, EP 1100-1-3*, defines *sustainable solutions* as solutions that balance environmental, economic, and social benefits and impacts to meet present needs without sacrificing the ability of future generations to meet their needs. EP 1100-1-3 identifies up to five sets of characteristics that sustainable practices exemplify.

1. Taking a life cycle view and recognizing risks;
2. Conserving resources, promoting efficiency, and extending mission capability;
3. Addressing the complexities of natural resources systems and management;
4. Seeking opportunities to innovate and improve quality; and
5. Partnering and collaborating to maximize value.

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2. Inventory of Sustainable Infrastructure Requirements

This section identifies major sustainability requirements relevant to Civil Works infrastructure projects. The requirements are applicable toward the planning, design and construction of new infrastructure, as well as the rehabilitation and replacement of existing infrastructure. The requirements are summarized in this section, and details can be found in existing USACE publications, which are referenced throughout this section.

The USACE CW Sustainable Infrastructure Requirements Matrix is provided on the following pages. The matrix identifies USACE documents and provides document descriptions, lists of key requirements, applicabilities, and any exceptions. A website link for each publication is also provided.

The publications identified in the Requirements Matrix are grouped into the following categories for ease in identifying relevant documents:

1. General – includes requirements applicable to all CW business lines
2. Navigation
3. Flood and Coastal Storm Risk Management
4. Ecosystem Restoration
5. Environmental Stewardship
6. Hydropower
7. Recreation
8. Water Supply
9. Multiple Business Lines – includes requirements applicable to multiple business lines

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USACE Civil Works
Sustainable Infrastructure Requirements Matrix

ID	Title / Description	Key Sustainability Requirement(s)	Applicability / Exceptions	Phase			
				Planning	Design	Cosntruction	O&M
I. General							
1	**ER 1105-2-100** **Planning Guidance Notebook** Provides overall direction for formulation, evaluation, and selection of project alternatives, and description of policies applicable to each CW mission and program https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/er_1105-2-100.pdf	Chapter 2 lays out the process that must be followed for water resource implementation studies to be consistent with the 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G). Appendix B provides requirements for public involvement, collaboration and coordination. Appendix C provides requirements for environmental evaluation and compliance. Appendix D provides economic and social considerations, other than procedures for estimating National Economic Development benefits. Appendix E lays out the evaluation procedures for different types of Civil Works projects (e.g., Navigation, Flood Damage Reduction, etc.). Appendix F provides requirements for planning, design, and construction of Continuing Authorities projects. Appendix G provides guidance and procedures for the management and conduct of feasibility and reevaluation studies, reallocation studies, flood insurance studies, and planning assistance to the states studies. Appendix H lists the requirements for study report submittal and approval and includes a checklist of sensitive policy areas that may require vertical team coordination during planning.	Applicability: All CW projects requiring planning, formulation and planning or reevaluation reports, and planning and implementation phases for continuing authorities projects Exceptions: None	•	•	•	•

USACE Civil Works
Sustainable Infrastructure Requirements Matrix

ID	Title / Description	Key Sustainability Requirement(s)	Applicability / Exceptions	Phase			
				Planning	Design	Cosntruction	O&M
2	**ER 1110-2-1150** **Engineering and Design for Civil Works Projects** Defines engineering responsibilities, requirements, and procedures during planning, design, construction, and operations https://www.publications.usace.army.mil/portals/76/publications/engineerregulations/er_1110-2-1150.pdf	Paragraph 13.6.8 requires adverse environmental impacts to be avoided in project design. Paragraph 13.8 requires development of detailed OMRR&R plan with cost estimates be developed during feasibility phase. Paragraph 15 requires development of operation and maintenance (O&M) manuals and emergency action plans during construction phase. Paragraph 16 requires engineering support for maintenance activities that require P&S and for major rehabilitation projects. Appendix C provides requirements for content of engineering products, including the Engineering Appendix to the Feasibility Study, DDR, EDR, Engineering Considerations and Instructions to Field Personnel. Appendix H provides a management control evaluation checklist for engineering products.	Applicability: All CW projects requiring new project design, modification of existing projects, and support for other agencies Exceptions: None	•	•	•	•
3	**ER 1110-2-1302** **Civil Works Cost Engineering** Provides policy, guidance, and procedures for cost engineering https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/er_1110-2-1302.pdf	Paragraph 8.d requires development of an estimate for OMRR&R in support of construction estimates and economic calculations.	Applicability: All CW projects that require cost engineering for budget estimates or IGEs Exceptions: None	•	•	•	•

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				Planning	Design	Cosntruction	O&M
4	**ER 1110-2-8159** **Life Cycle Design and Performance** Defines engineering policies for systems, components, and materials for projects based on their long-term performance https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1110-2-8159.pdf	Paragraph 6 (Policy) requires design engineers to consider life cycle as the basis for selecting project elements, and to use risk-based assessment to evaluate alternatives for component selection. It establishes a minimum service life of 100 years for major infrastructure projects. Paragraph 8 provides requirements during planning and design phases, including that measures that will be needed for project maintenance, repair, and rehabilitation needed to achieve project's service life to be identified in the Engineering Appendix.	Applicability: All CW projects Exceptions: None	•	•	•	•
5	**Directorate of Contracting (DOC) Policy Alert 18-006** **Sustainable Acquisition Guidance** Provides guidance for complying with Federal Acquisition Regulation (FAR) sustainable acquisition requirements. https://cops.usace.army.mil/sites/CT/P/Policy%20Alerts/Sustainable%20Acquisition%20Guidance.pdf	Table 1 lists the FAR sustainability provisions and clauses that must be included in contracts when applicable. The requirements relate to energy conservation, waste reduction, recycled content of materials, bio-based products, and other considerations. Table 2 identifies which clauses typically apply to different types of contracts (e.g., infrastructure, landscaping, vehicles) and which specifications to include in the contracts.	Applicability: All USACE projects with contracting requirements Exceptions: Specific exceptions are provided in the Policy Alert for each FAR provision/clause	•	•	•	•

USACE Civil Works
Sustainable Infrastructure Requirements Matrix

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				Planning	Design	Cosntruction	O&M
6	**ECB 2020-6** **Implementation of Resilience Principles in the Engineering & Construction (E&C) Community of Practice** Provides policy for applying principles of resilience: Prepare, Absorb, Recover, and Adapt (PARA) https://www.wbdg.org/FFC/ARMYCOE/COEECB/ecb_2020_6.pdf	Paragraph 5 requires "resilience thinking" in E&C practices and in new and updated standards and criteria. Paragraph 6 recommends an evaluation be performed using PARA principles during project design. The result of such evaluation may include recommendations for consideration by the project team for measures that improve resilience.	Applicability: All CW projects with design or construction activities Exceptions: None	•	•	•	•
II. Navigation							
7	**ER 1110-2-1404** **Hydraulic Design of Deep-Draft Navigation Projects** Prescribes design procedures for deep draft navigation projects https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1110-2-1404.pdf?ver=2013-09-08-233421-293	Paragraph 5 requires that design must result in a safe, efficient, reliable, and cost effective project that includes environmental and social considerations.	Applicability: All CW deep draft navigation projects Exceptions: None	•	•	•	•

USACE Civil Works
Sustainable Infrastructure Requirements Matrix

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8	**ER 1110-2-1457** **Hydraulic Design of Small Boat Navigation Projects** Prescribes design procedures for small boat navigation projects https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1110-2-1457.pdf?ver=2013-09-08-233424-463	Paragraph 4 requires that design must result in a safe, efficient, reliable, and cost effective project that includes environmental and social considerations. Paragraph 6.w. establishes period of analysis of 50 years for most small boat navigation projects. It also requires a degree of protection during this period that is selected by an optimization process that considers the frequency and extent of damages when various design conditions (waves, currents, etc.) are exceeded.	Applicability: All CW small boat navigation projects Exceptions: None	•	•	•	•
9	**ER 1110-2-1458** **Hydraulic Design of Shallow Draft Navigation Projects** Prescribes policy and design procedures for new or replacement shallow draft navigation projects https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1110-2-1458.pdf?ver=2013-09-08-233424-637	Paragraph 5 requires that design must result in safe, efficient, reliable and cost effective project that includes environmental and social considerations.	Applicability: All CW shallow draft navigation projects Exceptions: None	•	•	•	•

USACE Civil Works
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				Planning	Design	Cosntruction	O&M
10	**EM 1110-2-2602** **Planning and Design of Navigation Locks** Provides guidance for planning, engineering, and design of navigation locks on inland waterways https://planning.erdc.dren.mil/toolbox/library/EMs/em1110.2.2602.pdf	Chapter 2 requires consideration of environmental, socio-economic, safety, efficiency, reliability, and cost effectiveness issues in project planning and design. Chapter 12 requires life cycle considerations for lock operation, safety, and maintenance during design and selection of materials.	Applicability: All CW inland navigation projects Exceptions: None	•	•	•	•
11	**EM 1110-2-2607** **Planning and Design of Navigation Dams** Provides guidance for planning, engineering, and design of navigation dams and appurtenant structures on inland waterways https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_1110-2-2607.pdf	Chapter 2 requires consideration of environmental, legal, social, and operational issues during project planning and design. Chapter 4 requires non-navigation considerations during planning and design, including impacts on flooding and drainage, environment, water supply, water quality, hydropower, and invasive species.	Applicability: All CW inland navigation projects Exceptions: None	•	•	•	•
12	**EM 1110-2-5026** **Beneficial Uses of Dredged Material** Provides guidance for planning, designing, and managing dredged material for beneficial uses https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_1110-2-5026.pdf	Paragraph 1 provides descriptions of ten broad categories of projects where dredged material can be used for beneficial purposes to incorporate environmental, social, and economic benefits into project design. These categories include: beach renourishment; aquaculture; parks and recreation; agriculture, forestry, and horticulture; strip mine reclamation and solid waste management; shoreline stabilization and erosion control; construction and industrial use; material transfer; and multiple purpose.	Applicability: All CW coastal and inland navigation/dredging projects Exceptions: None	•	•	•	•

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Sustainable Infrastructure Requirements Matrix

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				Planning	Design	Cosntruction	O&M
III. Flood and Coastal Storm Risk Management							
13	**ER 1105-2-101** **Risk Assessment for Flood Risk Management Studies** Provides risk assessment requirements for flood management studies including feasibility studies, dam and levee safety studies, post-authorization and reevaluation studies, and major rehabilitation studies https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/er_1105-2-101.pdf	Paragraph 8 requires that all flood risk management studies will use a risk framework approach that includes an evaluation of the performance of the plan over the life cycle of the project.	Applicability: All CW flood risk management studies for feasibility, post authorization change and reevaluation studies, dam and levee safety studies and major rehabilitation Exceptions: None	•	•	•	•
14	**ER 1110-2-1156** **Safety of Dams – Policy and Procedures** Describes principles, policy, organization, responsibility, and procedures for a risk-informed dam safety program https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/er_1110-2-1156.pdf	Paragraph 1.11 provides guiding principles for planning, design, construction, and O&M of dams. Chapter 10 provides requirements for risk communication and stakeholder engagement.	Applicability: All CW projects involving planning, design, construction or O&M of dams and appurtenant structures Exceptions: None	•	•	•	•

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				Planning	Design	Cosntruction	O&M
15	**ER 1110-2-1405** **Hydraulic Design for Local Flood Protection Projects** Prescribes design procedures for hydraulic design of local flood risk management channel projects https://www.publications.usace.army.mil/portals/76/publications/engineerregulations/er_1110-2-1405.pdf	Paragraph 4 requires that project design must result in safe, efficient, reliable, and cost effective project that includes environmental and social considerations. Paragraph 5 requires developing hydraulic information related to project O&M, including O&M costs, surveillance requirements such as benchmarks/staff gages, and real estate needs.	Applicability: All CW flood risk management projects Exceptions: None	•	•		
16	**ER 1110-2-1407** **Hydraulic Design for Coastal Shore Protection Projects** Defines requirements for design, construction, and O&M of coastal shore protection projects and nourishment of coastal storm damage reduction beach fill projects https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1110-2-1407.pdf	Paragraph 7 requires that design must result in safe, efficient, reliable, and cost effective project that includes environmental and social considerations. Paragraph 9 requires development of life cycle annual costs and an O&M and periodic nourishment plan.	Applicability: All CW coastal shore protection and coastal storm damage reduction and beach fill nourishment projects Exceptions: None	•	•	•	•
17	**ER 1110-8-2(FR)** **Inflow Design Floods for Dams and Reservoirs** Describes hydrology requirements to prevent creating threat of loss of life or property damage, and defines dam design standards https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1110-8-2_FR.pdf	Paragraph 10 requires evaluations and cost analyses during project design to minimize life cycle cost and avoid excessive damage or loss of life during flood storage.	Applicability: All CW projects with dams or reservoirs Exceptions: None	•	•	•	•

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				Planning	Design	Cosntruction	O&M
18	**EM 1110-2-1913** **Design and Construction of Levees** Provides guidance for the design and construction of earthern levees https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_1110-2-1913.pdf	Chapter 1-5.a lists general steps in levee design that can be used to develop more specific procedures for particular projects. Chapters 2 through 6 provide further details related to these steps, including field investigations, laboratory testing, borrow areas, seepage control, and slope design and settlement. Chapter 7 provides guidelines on construction methods for both foundations and embankments. Chapter 8 provides additional considerations, including utilities, access roads and ramps, levee enlargement, junctions with concrete closure structures, ditches located close to the landside levee toe, and vegetation. Appendix A identifies required and related publications relevant to levee design and construction.	Applicability: All CW earthen levee projects Exceptions: None	•	•	•	
IV. Ecosystem Restoration							
19	**ER 1165-2-501** **Civil Works Ecosystem Restoration Policy** Provides policy on USACE involvement in ecosystem restoration and protection https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1165-2-501.pdf	Paragraph 5 identifies the authorities applicable to CW ecosystem restoration activities. Paragraph 6 identifies the purpose of restoration activities, to restore function, structure, and dynamic processes of ecosystems that have been degraded (e.g., wetlands, riparian and other floodplain and aquatic systems). Paragraph 11 encourages coordination with other entities and public involvement.	Applicability: All CW projects that include ecosystem restoration Exceptions: None	•	•	•	•

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				Planning	Design	Cosntruction	O&M
V. Environmental Stewardship							
20	**ER 1130-2-540** **Environmental Stewardship Operations and Maintenance Guidance and Procedures** Establishes land management policies for USACE-administered land and water https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1130-2-540.pdf	Paragraph 2-2 requires that natural resources on USACE–administered land and water be managed in line with ecosystem management principles, and requires development of Project Master Plans and Operational Master Plans that define natural resource management objectives.	Applicability: All CW projects with an environmental stewardship component Exceptions: None				•
VI. Hydropower							
21	**ER 1130-2-510** **Hydroelectric Power Operations and Maintenance Policies** Establishes O&M policy of USACE hydroelectric power generation facilities and related structures https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1130-2-510.pdf?ver=2013-09-08-233436-370	Chapter 4 requires that standard operating procedures be developed and periodic operational exercises be conducted for emergency situations.	Applicability: All CW hydropower projects Exceptions: None				•

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				Planning	Design	Cosntruction	O&M
22	**ER 1130-2-551** **Hydropower Operations and Maintenance Policy** **Bulk Power System Reliability Compliance Program** Establishes requirement for compliance with applicable FERC Bulk Power System Reliability standards https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1130-2-551.pdf?ver=2013-09-08-233438-900	Paragraph 6 requires districts to integrate the guidance in the USACE Corporate Compliance Program (ACE-CME) into their hydropower O&M business processes and SOPs.	Applicability: All CW hydropower projects Exceptions: None				•
	VII. Recreation						
23	**ER 1110-2-400** **Design of Recreation Sites, Areas, and Facilities** Establishes policy and guidance for design of recreation facilities https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1110-2-400.pdf	Paragraph 5 requires that recreation facility designs meet four objectives: cost effectiveness, design standardization, health and safety of the general public, and access for handicapped persons. Paragraph 6 requires that designers visit the site/facility after it has been in operation for six months to evaluate its operation.	Applicability: All CW projects with recreational components Exceptions: None	•	•	•	•
24	**ER 1130-2-550** **Recreation Operations and Maintenance Policies** Establishes policy for managing recreation programs and O&M of recreation facilities at water resource projects https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1130-2-550.pdf?ver=2014-05-06-112352-670	Paragraph 2.2 requires that recreational facilities meet goals of environmental stewardship, protection, compliance, and restoration, and safety and public recreational opportunities. Chapter 3 requires development of project and operational master plans that address natural, cultural, and recreational resources throughout the project life cycle.	Applicability: All CW projects with recreational components Exceptions: None	•	•	•	•

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Sustainable Infrastructure Requirements Matrix

ID	Title / Description	Key Sustainability Requirement(s)	Applicability / Exceptions	Phase			
				Planning	Design	Cosntruction	O&M
VIII. Water Supply							
25	**ER 1110-2-1941** **Drought Contingency Plans** Directs water managers to continually review operating plans and manuals in response to changing watershed conditions https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1110-2-1941.pdf	Paragraphs 5 and 6 require recurring reviews and updates to water control manuals in response to changing watershed conditions and coordinating plans for drought conditions with state and nonfederal stakeholders. Paragraph 7 requires integration of climate change considerations. Paragraphs 8–11 provide the requirements for developing a drought contingency plan as part of the Water Control Manual.	Applicability: Projects with controlled reservoir storage operated and maintained by USACE Exceptions: None	•	•		•
IX. Multiple Business Lines							
26	**ER 11-1-321** **Army Programs: Value Engineering** Establishes procedures for value engineering https://www.usace.army.mil/Portals/2/docs/Value%20Engineering/ER_11-1-321-Change1_Army_Program-VE.pdf	Value engineering (VE) provides an opportunity to evaluate sustainable alternatives and materials that improve functionality and/or cost. Paragraph 7 requires VE for feasibility, reevaluation, and reauthorization reports, and plans and specifications.	Applicability: Projects <$1 million, or <$2 million for construction or environmental projects Exceptions: Waivers allowed for projects <$10 million	•	•	•	•

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27	**ER 200-2-2** **Procedures for Implementing NEPA** Provides guidance for implementing NEPA supplementing CEQ regulations 40 CFR 1500-1508 and 40 CFR 1507.3 https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_200-2-2.pdf?ver=2013-09-08-233208-440	Document provides requirements for preparing and processing EIS and EA, Record of Decision, mitigation and monitoring, environmental review and consultation, and review of EIS from other agencies.	Applicability: All CW projects Exceptions: None	•	•	•	•
28	**ER 200-2-3** **Environmental Compliance Policies** Establishes policy for managing environmental compliance activities during O&M of USACE facilities https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_200-2-3.pdf	Chapter 2 mandates that all activities be conducted in compliance with environmental requirements. Chapter 3 defines responsibilities of environmental compliance coordinators. Chapter 4 provides environmental compliance requirements and requirements for performance measurement. Chapter 5 requires informal day-to-day and formal internal and external environmental compliance assessments. Chapters 7–9 present requirements for managing hazardous materials, petroleum, oil and lubricants, and other waste.	Applicability: All USACE operated CW projects Exceptions: None	•	•	•	•

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29	**ER 415-1-11** **Biddability, Constructability, Operability, Environmental and Sustainability (BCOES) Reviews** Establishes policy and procedures for conducting BCOES reviews https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_415-1-11.pdf	Paragraph 5 defines sustainability as applicable to BCOES reviews. Paragraph 6 specifies requirements for conducting BCOES reviews during planning, design, and preconstruction and certifying that review comments have been resolved. Paragraph 7.e defines sustainability review requirements.	Applicability: All CW project planning, design, and construction projects Exceptions: Waivers available for small projects (<$150K)	•	•	•	•
30	**ER 1110-2-1806** **Earthquake Design and Evaluation for Civil Works Projects** Provides guidance for seismic design, analysis, and evaluation of projects; Establishes design earthquakes and performance requirements and seismic design standards for buildings and bridges https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1110-2-1806.pdf	Paragraph 5 requires that seismic design be incorporated into the design of new structures and the evaluation/reevaluation of existing structures. ER specifies design for earthquakes and identifies minimum seismic standards.	Applicability: All CW projects and modifications to existing projects with potential to malfunction or fail or cause hazardous conditions due to seismic events Exceptions: None	•	•	•	•

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				Planning	Design	Cosntruction	O&M
31	**ER 1110-2-8153** **Sedimentation Investigations** Describes procedures for conducting sedimentation investigations for hydrologic analysis, hydraulic design, and environmental impact analyses https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1110-2-8153.pdf?ver=2013-09-08-233428-213	Paragraph 5 requires consideration of five factors during design: safety, efficiency, reliability, cost effectiveness, and environmental and social aspects. Paragraph 7 requires that the sediment study work plan include care of water during construction and O&M requirements.	Applicability: All CW projects with a sedimentation component Exceptions: None	•	•	•	•
32	**ER 1110-2-8160** **Policies for Referencing Project Elevation Grades to Nationwide Vertical Datums** Establishes policies for referencing project elevation grades to nationwide vertical datums established and maintained by the U.S. Department of Commerce (DOC). https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1110-2-8160.pdf	Paragraph 5 requires that projects be evaluated to ensure designed and constructed grades are adequately connected and referenced to the National Spatial Reference System or the National Water Level Observation Network. Paragraph 6 requires older, superceded datums to be related to current DOC frameworks and kept current, especially in high-subsidence areas. Paragraph 7 requires special consideration of datums for projects subject to high subsidence rates, both during Pre-Construction Engineering and Design and after construction. Paragraph 8 requires relative accuracies and uncertainties of reference datums to be assessed for input into risk-based analysis studies.	Applicability: All USACE commands with responsibility for flood risk management and coastal storm damage reduction, hurricane protection, multi-purpose water supply/control and hydropower, ecosystem restoration, and navigation projects. Exceptions: None	•	•	•	•

USACE Civil Works
Sustainable Infrastructure Requirements Matrix

ID	Title / Description	Key Sustainability Requirement(s)	Applicability / Exceptions	Phase			
				Planning	Design	Cosntruction	O&M
33	**ER 1100-2-8162** **Incorporating Sea Level Change in Civil Works Programs** Provides guidance for incorporating effects of projected sea level changes across project life cycle https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1100-2-8162.pdf	Paragraph 6 requires that all planning and design projects evaluate alternatives for future sea level changes and identify design and O&M measures that can be implemented to minimize adverse consequences.	Applicability: All coastal CW projects Exceptions: Non-coastal projects	•	•	•	•
34	**ER 1180-1-6** **Construction Quality Management** Provides general policy and guidance for quality management procedures for construction contracts https://www.publications.usace.army.mil/portals/76/publications/engineerregulations/er_1180-1-6.pdf	Paragraph 6 (Contractor Responsibility): Paragraph specifies requirements for construction contractors to ensure quality construction. Paragraph 7 (Government Responsibilities): Paragraph specifies the government's responsibilities for providing quality assurance prior to and during construction.	Applicability: All USACE construction projects Exceptions: ER includes limited exceptions for construction contracts <$1 million or if obtained through an international government agreement		•	•	•

USACE Civil Works
Sustainable Infrastructure Requirements Matrix

ID	Title / Description	Key Sustainability Requirement(s)	Applicability / Exceptions	Phase			
				Planning	Design	Cosntruction	O&M
35	**EM 1110-2-1100** **Coastal Engineering Manual** Provides basic principles of coastal processes, methods for computing coastal planning and design parameters and guidance on formulation; Divided into six parts: Parts I-IV are science-based, Parts V-VI are engineering-based https://www.publications.usace.army.mil/USACE-Publications/Engineer-Manuals/u43544q/636F617374616C20656E67696E656572696E67206D616E75616C/	Part V presents guidance for coastal project planning and design. Paragraph V-1-2 requires that risk-based analyses for coastal projects include evaluations of resistance to damage, functional performance, and environmental, aesthetic, social, and political factors.	Applicability: All CW coastal flood studies, shore protection, beach erosion, hurricane and storm protection, navigation, and ecosystem restoration projects Exceptions: None	•	•	•	•
36	**EM 1110-2-5025** **Dredging and Dredged Material Management** Provides guidance on planning, design, construction, operation and management of environmentally acceptable dredged material placement areas and for beneficial use of dredged material https://www.publications.usace.army.mil/portals/76/publications/engineermanuals/em_1110-2-5025.pdf	Paragraph 1.6 requires that dredging be conducted in an efficient, cost effective, and environmentally acceptable manner. Chapter 5 provides guidance on beneficial use of dredged material for various types of projects.	Applicability: All CW inland and coastal navigation projects and ecosystem restoration projects using dredged material Exceptions: Projects with no dredging requirements	•	•	•	•

USACE Civil Works
Sustainable Infrastructure Requirements Matrix

ID	Title / Description	Key Sustainability Requirement(s)	Applicability / Exceptions	Phase			
				Planning	Design	Cosntruction	O&M
37	**Office of Management and Budget (OMB) Sustainability Scorecard to Support Executive Order 13834: Efficient Federal Operations; Op Order 2016-21** Directs federal agencies to manage buildings, vehicles, and operations to optimize energy and environmental performance, reduce waste, and reduce costs https://www.sustainability.gov/usace.html	Defines standards of success for reducing emissions and energy and water use, reducing fleet petroleum use, and for increasing usage of renewable energy and implementing federal principles for high performance and sustainable buildings.	Applicability: CW projects operated and maintained by USACE Exceptions: None	•	•	•	•
38	**Commanding General Policy Memorandum: Non-Hazardous Solid Waste Diversion and Materials Management Policy** Establishes policy and guidance for meeting federal requirements for diverting from landfills non-hazardous solid waste and construction and demolition (C&D) debris https://team.usace.army.mil/sites/HQ/PDT/ecs/Sustainability/	Paragraph 4.a. specifies the required USACE-wide diversion from landfills annually: >50-percent of non-hazardous solid waste and >60-percent of non-hazardous C&D materials and debris. Paragraph 4.e. requires maximizing recovery of recyclable materials from municipal solid waste and C&D waste streams, and diverting these materials through reuse, donation, transfer, or sale. Paragraph 4.h. requires waste minimization to be promoted through the acquisition process.	Applicability: All CW projects Exceptions: None	•	•	•	•

3. Sustainable Infrastructure Requirements Form

A standardized form is provided in this section which may be used by PDTs and others to track sustainability requirements associated with their projects. The form is used in conjunction with the requirements matrix included in Section 2 of this Guide (Inventory of Sustainable Infrastructure Requirements).

The CW Sustainable Infrastructure Requirements Form can be found on the following pages. An electronic editable version of the form may be obtained through the USACE Knowledge Management Civil Works portal at https://usace.dps.mil/sites/KMP-CW/SitePages/Civil-Works-Sustainability.aspx.

Project team members can determine how to use the form on a case-by-case basis. Use of the form is optional but recommended for projects with a total project cost of greater than $1 million. Suggestions are provided below on how the form may be applied during planning, design, construction, and operations, including for both new infrastructure and rehabilitation.

1. **Planning**

   Planning includes but is not limited to feasibility, watershed, and post authorization studies, including limited and general re-evaluation studies. During project planning, the form can be introduced at the project kick-off meeting to ensure that each PDT member understands sustainability guidance potentially relevant to the project. The form can then be completed by the PDT in tandem with the Agency Technical Review (ATR) process to ensure that all applicable guidance has been incorporated into the development and analysis of the selected project alternative.

2. **Design**

   The form can be discussed by the PDT during the design kick-off meeting for each design component of the project. Sustainability concepts incorporated as part of project planning can be reviewed. The listing of sustainability guidance in the form helps PDT members incorporate sustainability into the project design. The form would be reviewed at the time of the design ATR, and then be updated and completed by the PDT in conjunction with the BCOES review process.

3. **Construction**

   The form can be discussed at the preconstruction meeting to ensure that the Contracting Officer's representative and contractor are familiar with all sustainability requirements incorporated into the project's contract documents. The form would be updated as necessary and completed by the PDT during the Pre-Final Inspection review.

4. **Operations and Maintenance**

   The form includes sustainability-related guidance on operations and maintenance activities. It can be used for operation and maintenance projects that involve full rehabilitation or replacement of existing infrastructure. The form would not be applied toward common or routine operations and maintenance work. Consideration may be

given for adapting the form for operations and maintenance activities on an annual basis at the project level to increase awareness of sustainable infrastructure requirements as part of day-to-day business at these locations.

Form Instructions

The form contains three sections: Project Summary, Project Requirements, and Overall Project Sustainability Benefits and Impact. Each section is described below.

1. **Project Summary.** The summary includes the Project Name, Project Phase (i.e., Planning, Design, Construction), USACE District, and Business Lines (e.g., Navigation, Hydropower).

2. **Project Requirements.** This section lists the USACE publications included in the Requirements Matrix in the previous section. In the left-most columns, there are two selections for each publication:

   - Met: Indicates the applicable requirements have been met.

   - Not Applicable: Indicates either the requirement does not apply to the project or does not apply to the current phase of the project. All publications are to be assessed prior to completing final design plans and specifications.

   The "Notes/Justification" column is used to document key project highlights or details justifying how requirements are met or explain why requirements do not apply.

3. **Overall Project Sustainability Benefits and Impact.** In this section, a brief high-level description of the project's overall value with respect to economic, environmental, and/or social sustainability is to be provided. This may include key project highlights relevant to sustainability and/or any considerations not fully characterized by the list of requirements provided. Example writeups of sustainability benefits and impact for major business lines are provided below:

   - **Flood Risk Management Example:** St. Paul District, Rochester, MN, Flood Control project. Project includes over 9 miles of channel modifications, reconstruction of a low-head dam, 1.3 miles of levees, grade control structures, and replacement of roadway, railroad, and pedestrian bridges to reduce risk to over 2,200 homes, 200 downtown businesses, including Mayo Clinic buildings, and 21 industries from flooding, all in a community of over 100,000 people. In addition to providing minor mitigation for impacts on channel fisheries, the project incorporates numerous features to reduce aesthetic, recreational, and other environmental impacts. These include replacing riprap channels with decorative concrete retaining walls and grass-covered slopes, using

innovative design for grade control structures to improve safety and physical appearance, including a low flow channel to concentrate flows for fish during low flow periods, replacing a storm sewer outlet with an architectural water feature, and incorporating over nine miles of recreational trails. These features result in reduced costs for materials, hauling, and placement while integrating the channel improvements into the existing urban and park environment.

- **Navigation Example:** St. Paul District, Lower Pool 5 Channel Maintenance/Weaver Bottoms Rehabilitation Project, MN. The project, located adjacent to the Mississippi River shipping channel, uses dredged material to construct islands separating backwater areas of the river from the main shipping channel and to modify side channels to reduce wind and wave action that had caused deterioration of marsh vegetation, and support re-establishment of wetland vegetation and habitat. The project is also intended to reduce maintenance dredging requirements in the navigation channel and to provide long-term dredged material storage by its use for construction of two 16-acre islands. The project design included collaboration from multiple state, federal, and local agencies in Minnesota and Wisconsin.

- **Ecosystem Restoration Example:** Albuquerque District, Las Cruces Dam Environmental Restoration Project, Section 1135, NM. The project creates permanent and seasonal wetlands for bird and wildlife habitat and improves water quality within the flood pool of the Las Cruces Dam, which was completed by USACE in 1975 to reduce flood damages from the Las Cruces and Alameda Arroyos. Project features include ¾ acre of permanent wetland and ¾ acre seasonal wetland that use reclaimed water from the City of Las Cruces. The wetlands provide migratory bird habitat along the Central flyway and improve water quality by acting as a natural filter. The project also includes 3.6 acres of playa habitat, 72 acres of arroyo riparian habitat, and 6.3 acres of tree/shrub habitat.

- **Hydropower Example:** Walla Walla District, Ice Harbor Dam, WA. Replacement of 1960-era hydropower turbine runners at Ice Harbor Lock and Dam on the Snake River near Pasco, WA, were designed using state-of-the-art technology to improve fish passage and increase the survival of salmon and steelhead that pass through the turbines. The design and installation of the runner replacements was accomplished in collaboration with USACE, the National Marine Fisheries Service, Bonneville Power Administration, and the contractor. The new design includes improvements to hydraulic conditions to reduce injury to juvenile salmon during passage through the turbines. The new design also uses stainless steel blades that resist pitting and corrosion and should help reduce maintenance costs.

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USACE CIVIL WORKS
SUSTAINABLE INFRASTRUCTURE REQUIREMENTS FORM

The Civil Works (CW) Sustainable Infrastructure Requirements Form evaluates the sustainability of major new and existing CW infrastructure projects. The form is used in conjunction with the CW Sustainable Infrastructure Requirements Matrix, which describes key sustainability requirements in existing USACE publications. The form allows Project Delivery Teams (PDTs) and others to ensure the sustainability performance of their projects. It is used for major new CW projects and for O&M projects that involve full rehabilitation or replacement of existing infrastructure, having a total project cost of greater than $1 million. It is not used for common or routine O&M, Interagency and International Support missions, or Remaining Items projects. An electronic editable version of this form may be obtained through the USACE Knowledge Management Civil Works portal at https://usace.dps.mil/sites/KMP-CW/SitePages/Civil-Works-Sustainability.aspx.

The form builds upon EP 1100-1-3, *USACE Sustainability: Definition and Concepts Guide*, categories of sustainable solutions: 1) Taking a life cycle view and recognizing risks; 2) Conserving resources, promoting efficiency, and extending mission capability; 3) Addressing the complexities of natural resources systems and management; 4) Seeking opportunities to innovate and improve quality; and 5) Partnering and collaborating to maximize value.

Project Summary	
Project Name:	
Project Phase: Planning; Design; Construction	
USACE District:	
Business Line(s): Navigation; Flood and Coastal Storm Risk Management; Ecosystem Restoration; Environmental Stewardship; Hydropower; Recreation; Water Supply	

Project Requirements
Review the key sustainability requirements in the documents listed below and note their applicability and whether the requirements are currently being met. For each document, refer to the CW Sustainable Infrastructure Requirements Matrix for a summary of the key requirements, applicability, exceptions, and weblink. For each document, select either **Met** or **Not Applicable (N/A)**. Select N/A if the key sustainability requirements do not apply to the project or cannot yet be evaluated but may be evaluated at a later time. The "Notes/Justification" column is used to document aspects of the project justifying the selection.

Met	N/A	ID	Title	Phase				Notes / Justification
				Planning	Design	Construction	O&M	
I. General								
○	○	1	ER 1105-2-100, Planning Guidance Notebook	•	•	•	•	
○	○	2	ER 1110-2-1150, Engineering and Design for CW Projects	•	•	•	•	
○	○	3	ER 1110-2-1302, Civil Works Cost Engineering	•	•	•	•	
○	○	4	ER 1110-2-8159, Life Cycle Design and Performance	•	•	•	•	
○	○	5	DOC Policy Alert 18-006 Sustainable Acquisition Guidance	•	•	•	•	
○	○	6	ECB 2020-6, Implementation of Resilience Principles in the E&C Community of Practice	•	•	•	•	
II. Navigation								
○	○	7	ER 1110-2-1404, Hydraulic Design of Deep-Draft Navigation Projects	•	•	•	•	
○	○	8	ER 1110-2-1457, Hydraulic Design of Small Boat Navigation Projects	•	•	•	•	
○	○	9	ER 1110-2-1458, Hydraulic Design of Shallow Draft Navigation Projects	•	•	•	•	
○	○	10	EM 1110-2-2602, Planning and Design of Navigation Locks	•	•	•	•	
○	○	11	EM 1110-2-2607, Planning and Design of Navigation Dams	•	•	•	•	
○	○	12	EM 1110-2-5026, Beneficial Uses of Dredged Material	•	•	•	•	
III. Flood and Coastal Storm Risk Management								
○	○	13	ER 1105-2-101, Risk Assessment for Flood Risk Management Studies	•	•	•	•	
○	○	14	ER 1110-2-1156, Safety of Dams – Policy and Procedures	•	•	•	•	
○	○	15	ER 1110-2-1405, Hydraulic Design for Local Flood Protection Projects	•	•			
○	○	16	ER 1110-2-1407, Hydraulic Design for Coastal Shore Protection Projects	•	•	•	•	
○	○	17	ER 1110-8-2(FR), Inflow Design Floods for Dams and Reservoirs	•	•	•	•	
○	○	18	EM 1110-2-1913, Design and Construction of Levees	•	•	•		
IV. Ecosystem Restoration								
○	○	19	ER 1165-2-501, Civil Works Ecosystem Restoration Policy	•	•	•	•	

Met	N/A	ID	Title	Phase				Notes / Justification
				Planning	Design	Construction	O&M	
V. Environmental Stewardship								
○	○	20	ER 1130-2-540, Environmental Stewardship O&M Guidance and Procedures				•	
VI. Hydropower								
○	○	21	ER 1130-2-510, Hydroelectric Power O&M Policies				•	
○	○	22	ER 1130-2-551, Hydropower O&M Policy Bulk Power System Reliability Compliance Program				•	
VII. Recreation								
○	○	23	ER 1110-2-400, Design of Recreation Sites, Areas, and Facilities	•	•	•	•	
○	○	24	ER 1130-2-550, Recreation O&M Policies	•	•	•	•	
VIII. Water Supply								
○	○	25	ER 1110-2-1941, Drought Contingency Plans	•	•		•	
IX. Multiple Business Lines								
○	○	26	ER 11-1-321, Army Programs: Value Engineering	•	•	•	•	
○	○	27	ER 200-2-2, Procedures for Implementing NEPA	•	•	•	•	
○	○	28	ER 200-2-3, Environmental Compliance Policies	•	•	•	•	
○	○	29	ER 415-1-11, BCOES Reviews	•	•	•	•	
○	○	30	ER 1110-2-1806, Earthquake Design and Evaluation for CW Projects	•	•	•	•	
○	○	31	ER 1110-2-8153, Sedimentation Investigations	•	•	•	•	
○	○	32	ER 1110-2-8160, Policies for Referencing Project Elevation Grades to Nationwide Vertical Datums	•	•	•	•	
○	○	33	ER 1100-2-8162, Incorporating Sea Level Change in CW Programs	•	•	•	•	
○	○	34	ER 1180-1-6, Construction Quality Management		•	•	•	
○	○	35	EM 1110-2-1100, Coastal Engineering Manual	•	•	•	•	
○	○	36	EM 1110-2-5025, Dredging and Dredged Material Management	•	•	•	•	

Met	N/A	ID	Title	Phase				Notes / Justification
				Planning	Design	Construction	O&M	
○	○	37	Op Order 2016-21, OMB Sustainability Scorecard to Support Executive Order 13834: Efficient Federal Operations	•	•	•	•	
○	○	38	CG Policy Memorandum: Non-Hazardous Solid Waste Diversion and Materials Management Policy	•	•	•	•	

Overall Project Sustainability Benefits and Impacts

Provide a high-level description of the project's overall sustainability value. This should be in terms of economic, environmental, and/or social considerations, and should include positive benefits as well as any significant negative impacts. Description should relate to the five categories of sustainable solutions outlined in EP 1100-1-3, USACE Sustainability: Definition and Concepts Guide.

Certification

I have completed the USACE CW Sustainable Infrastructure Requirements Form for this phase of the project.

Signature: _____

Name and Title: _____

Date: _____ Office Code: _____

Phone: _____ Email: _____