Programmatic Environmental Assessment
for

Implementation of Section 128 of the Water Resources Development Act of 2020

Harmful Algal Bloom Demonstration Program

Office of the Assistant Secretary of the Army for Civil Works

July 2023

1 PURPOSE AND NEED

The proposed action is necessary to implement the Harmful Algal Bloom Demonstration Program as authorized by Section 128 of the Water Resources Development Act (WRDA) of 2020. The US Army Corps of Engineers (USACE), Engineer Research and Development Center (ERDC) prepared a draft programmatic environmental assessment (PEA) to describe the potential impacts to the human environment from implementing the Harmful Algal Bloom Demonstration Program. The PEA describes the methodology implementing the demonstration program and for evaluating Statements of Interest (SOIs) and the potential impacts to the human environment if the demonstration program is implemented.

2 AUTHORITY

Section 128 of WRDA 2020 (henceforth simply Section 128, see Appendix A) directs the Secretary of the Army to implement a demonstration program to determine the causes of, and implement measures to effectively detect, prevent, treat, and eliminate, harmful algal blooms (HAB) associated with water resources development projects. Section 128 requires the Secretary to consult with and leverage data from Federal and state agencies, and leverage activities of the Secretary carried out through the ERDC pursuant to Section 1109 of the Water Resources Development Act of 2018 (33 U.S.C. 610 note). Additionally, Section 128 authorizes up to $25 million (Federal) to be appropriated to carry out the demonstration program.

3 AFFECTED AREA

The authority, as amended directs the Secretary to undertake program activities in the Great Lakes; tidal and inland waters of New Jersey, to include Lake Hopatcong, New Jersey; coastal and tidal waters of Louisiana; waterways of the counties that compromise the Sacramento-San Joaquin Delta, California; Allegheny Reservoir Watershed in New York; Lake Okeechobee, Florida; Caloosahatchee and St. Lucie Rivers, Florida, Lake Sidney Lanier; the Rio Grande River Basin, New Mexico and Texas; lakes and reservoirs in the State of Ohio; Upper Mississippi River and Tributaries; Detroit Lake, Oregon; and the coastal waters of the United States Virgin Islands. Section 128 directs the Secretary to undertake program activities related to HABs at any Federal reservoir located in the Upper Missouri River Basin or the North Platte River Basin, at the request and expense of another Federal agency. Preference will be given to these watersheds, but demonstration projects may occur outside these identified watersheds.

4 BACKGROUND

Cyanobacteria, also called blue-green algae, cause the vast majority of HABs in these fresh water and estuarine systems and are therefore the phytoplankton of interest for this program. Cyanobacteria can produce and release potent neurotoxins, hepatotoxins, cytotoxins, and/or gastrointestinal toxins [1], which directly impact human and wildlife health. Though not all HABs produce toxins, all algal blooms degrade aquatic ecosystems by shading out submerged vegetation, and/or disrupting the aquatic food web. Decay of HAB biomass can cause prolonged decreased in dissolved oxygen

(hypoxia), which can cause fish kills and harm benthic macro invertebrate communities [2, 3]. These effects can have negative implications for the USACE water resources development projects and the Nation. In Fiscal Year 2022 (FY22), $4M was appropriated to implement this program.

This PEA has been developed to analyze the effects to the human environment under the NEPA resulting from funding demonstration projects as authorized in Section 128 of WRDA 2020.

5 ALTERNATIVES CONSIDERED AND SCREENING CRITERIA

This section discusses the types of demonstration projects, screening and evaluation criteria, and alternatives developed for this PEA. NEPA regulations require Federal agencies to consider the No Action alternative and a reasonable array of alternatives including the proposed action. The alternatives are discussed in Section 2.4 below.

5.1 Types of Demonstration Projects

The term demonstration project means implementation of a HAB prevention, detection, or management technology with the primary objective of evaluating and gathering detailed technology cost and performance data that could guide technology use and support technology transfer to field practitioners. The following sections define each demonstration focus area (HAB detection, prevention, and management) and provide examples of technologies and types of demonstrations that may be conducted to provide a basis for assessing potential environmental effects of the program.

5.1.1 Detection Technology

HAB detection includes identification of the type and abundance of cyanobacteria cells present in a water body as well as the type and concentration of associated toxins. Water managers may employ a phased detection approach, utilizing visual or remote sensing-based assessments of water quality indicators (e.g. chlorophyll-a) at the waterbody-scale, followed by discreet water sampling and analysis for cyanobacteria and toxins if a HAB is suspected. The state of the science for early HAB detection [4, 5], remote sensing [6, 7] and toxin analysis [8] continues to advance with support from Federal, state and other research investment. In general, HAB detection technology demonstrations conducted under Section 128 could involve collection and analysis of data within a watershed for the purpose of detection and prediction. Example projects could include use of remote sensing, environmental monitoring, and advanced computer models to generate watershed-scale HAB assessments and predictions; analysis of water samples via rapid, field-based sensors to identify and quantify HAB-causing cyanobacteria and toxins in water samples; and possible deployment of *in situ* sensors capable of real-time analysis and telemetry. Detection technologies typically do not affect water chemistry, sediments, or introduce biological or chemical agents in the water.

5.1.2 Management Technology

HAB management includes chemical-, physical-, and biological-based means to remove, destroy, or neutralize cyanobacteria cells and the toxins they produce. Each management approach has its advantages and disadvantages [9]. Chemical approaches such as algaecides reduce the abundance of cyanobacteria cells but not always their toxins, dependent on bloom intensity, water quality, treatment dosage rates, sunlight intensity, treatment contact time, etc. [10]. Other chemical oxidation-based treatments include UV light exposure, e.g. on boat mounted and screen-protected chambers [11]; ozone, which can be delivered into waterways via microbubbles [12] or nanobubbles [13]; and reusable materials impregnated with photoreactive catalysts like TiO_2, which has potential to neutralize cyanobacteria cells and toxin when activated by natural or artificial UV light [14, 15] or ultrasound [16].

Physical approaches involve addition of flocculants to sink cyanobacteria cells out of productive water column depths [17] or use of floating booms or curtains to restrict cyanobacteria migration toward protected areas or to facilitate skimming and removal of cyanobacteria from water. For example, the USACE-developed HAB Interception Treatment and Transformation Systems (HABITATS) collects and treats HAB-impacted water, concentrates the HAB biomass, then transforms the biomass into biofuel via hydrothermal liquefaction [18, 19]. Another approach involves use of buoy-deployed ultrasonic devices, which can release soundwaves tuned to disrupt cyanobacteria cells [20].

Biological HAB management approaches vary widely in their mechanism and maturity level. Controlling predatory fish populations to increase abundance of large-bodied Daphnia, which feed on cyanobacteria, has shown promise for suppressing some but not all HAB-forming cyanobacteria populations in eutrophic lakes [21]. Other biomanipulation methods (aquatic ecosystem restoration, addition of non-harmful competitors, etc.) have been applied for HAB management as well [22]. Less mature technologies include gene silencing agents, which are compounds that bind to specific cyanobacteria genes to disrupt growth and activity [23], and use of cyanophage, which are cyanobacteria-specific viruses capable of infecting and weakening cells and potentially preventing blooms [24]. Bioremediation involves use of bacteria capable of degrading toxins [25, 26] as well as use of their free enzymes, which are capable of transforming cyanotoxins and reducing their toxicity [27]. Example projects conducted under Section 128 could feature use of technologies described above, either alone or in combination, for the purposes of HAB management. Biological management approaches may require assessment in supplemental environmental compliance documentation to include NEPA if selected as a demonstration project.

5.1.3 Prevention Technology

HAB prevention can include optimizing hydraulic conditions (in managed waterbodies) and limiting nutrient availability to prevent onset of HAB-favorable conditions or even preventative cyanobacteria treatments. Water managers may in some cases have flexibility to modify operations to minimize HAB-favorable conditions while still meeting operational discharge requirements; the USACE-ERDC developed "Operational Dashboard" could support operations decision making to this end [23]. Nutrient influx during large rainfall events, followed by periods of drought, high temperatures, and low water levels with associated increased residence times and sunlight penetration depth, create ideal conditions for cyanobacteria HAB formation. Excellent ongoing nutrient reduction- and nutrient retention-focused programs led by partner agencies (e.g. Ohio Environmental Protection Agency, U.S. Department of Agriculture, others) could reduce new nutrient inputs to waterbodies; however, legacy nutrients in sediment can potentially fuel cyanobacteria HABs for decades after new inputs have been controlled. Binding agents (e.g. Phoslock®) may effectively limit nutrient availability long after application [28] but can be costly depending on scale and potential need for repeated application. Preventative HAB treatments can involve application of technology described in Section 4.1.2 but early and prior to formation of high cyanobacteria cell densities and associated HAB scums. USACE-ERDC is investigating algaecide treatment of cyanobacteria cells that overwinter in sediment to reduce their abundance in sediment and thereby reduce their likelihood of "seeding" subsequent HAB events [29]. Other HAB prevention approaches include floating wetlands for nutrient removal, application of barley straw, and circulation or other means to prevent onset of HAB-favorable conditions [30]. Example projects conducted under Section 128 could feature use of technologies described above, either alone or in combination for the purposes of HAB prevention.

6 SELECTION PROCESS

This section discusses the proposed implementation plan and process and the screening and evaluation criteria.

6.1 Proposed Action

Demonstration projects would be chosen to receive funding based upon information provided under Section 6.1.2 below and Paragraphs 4.b(2) through 4.b(4) of the Implementation Guidance for Section 128 of WRDA 2020, Harmful Algal Bloom Demonstration Program (Appendix B). Projects that feature scalable technology and do not exceed a $5M per project limit will have preferential weighted scores though larger projects will also be considered based on the merits provided in Sections 6.2. Proposed demonstration projects should provide data that could be applied, and expanded at a larger scale, at multiple water resources development projects or federally constructed reservoirs. Technology developed by the U.S. Army Corps of Engineers under Section 1109 of WRDA 2018, Freshwater Harmful Algal Bloom Research and Development Initiative or other viable technology with legal authority and ability to be permitted and applied under appropriate Federal laws.

6.1.1 Selection Team

The Director of ERDC would establish a HAB Demonstration Project Review Team to evaluate Statements of Interest (SOIs) and select the demonstration projects. The Review Team would consist of personnel from the following areas:

- Members of the USACE Invasive Species Leadership Team.
- USACE personnel with expertise in the implementation of environmental scientific principles including invasive and nuisance species science and management.
- Members from the HAB and Hypoxia Research and Control Act Interagency Working Group.
- ERDC, Civil Works Office of the Technical Director for Environmental Sciences and Engineering who execute the Aquatic Nuisance Species Research Program.

6.1.2 Selection Consideration

Projects would be selected for funding based on the following considerations:

- Potential to significantly reduce the frequency and effects of HABs associated with water resources development projects.
- Utilization of new, innovative methods, tools, or technology being developed under the WRDA 2018, Section 1109-authorized HAB Technology Demonstration Program.
- Degree to which the project leverages existing Federal and state data and ongoing programs and activities of said agencies.
- Preference will be given to projects that address HAB with a water resources development project within one of the priority watersheds identified in Section 3.

6.1.3 Selection Assumptions

Utilization of the above considerations in combination with the below assumptions would provide for environmental protection considerations in funding and installation of the demonstration projects. HABs can cause environmental impacts to the aquatic environment including water quality standards, aquatic flora and fauna, as well as negative effects to human health and safety. Exploration of the proposed demonstration projects will provide data to employ HAB prevention technologies at a larger scale. The assumptions below may provide environmental protection as they require the demonstration project to coordinate with local, state, and Federal entities for deployment of the projects and

- Demonstration projects would be able to obtain all appropriate state and local permits.
- Demonstration projects would take measures to avoid and minimize effects to fish, wildlife, threatened and endangered species and associated habitats.
- Demonstration projects would not take listed species or permanently modify protected habitats.

- Demonstration projects are expected to be temporary in duration and limited in scale so as to minimize potential effects to the environment.
- Demonstration projects that have one or more impact(s) to the environment which were not considered in this document, such as biological management technologies, would include a project specific environmental compliance analysis, to include supplemental NEPA document to further explore potential environmental effects.

6.2 Eligibility Criteria

A Section 128 demonstration project may be implemented anywhere in the nation to address a HAB issue associated with a water resources development project. Preference will be given to projects located in the focus areas listed in Section 3. and additional focus areas should they be added in future amendments to Section 128. The proposed project must be for the purpose of determining the causes of, and/or applying technologies to effectively detect, prevent, manage, or eliminate, HABs associated with a water resources development project. The project must include the gathering and evaluation of technology cost and performance data that would guide use and support technology transfer. The proposed project should also leverage existing Federal and state data and ongoing programs and activities of Federal and state agencies to the maximum extent possible. The proposed demonstration project should provide data that could be applied, and expanded at a larger scale, at multiple water resources development projects. Technology developed by the USACE under Section 1109 of the WRDA 2018 (Freshwater Harmful Algal Bloom Research and Development Initiative) or viable technology with legal authority and ability to be permitted and applied under appropriate Federal laws is also appropriate.

7 ALTERNATIVES INCLUDING THE PROPOSED ACTION

7.1 Alternative 1: No Action

The no action alternative would result in no HAB demonstration projects being approved or implemented as authorized in Section 128 of WRDA 2020. Research and other HAB related projects would continue as authorized and funded through other authorities. The no action alternative is not feasible due to the legislative requirements of Section 128 of WRDA 2020.

7.2 Alternative 2: Selection of Projects (Proposed Action)

The proposed action would be the solicitation of statements of interests, evaluations of the SOIs, as discussed above, approval of demonstration projects, and then implementation of approved demonstration projects, subject to the availability of funding. The proposed action is the proposed alternative as it meets the legislative requirements of Section 128. Full environmental compliance would be completed, as appropriate, for the individual demonstration projects approved for funding prior to implementation

7.3 Alternative Considered but Screened Out

Selection of proposed projects outside the scope of the legislation would require additional authorization prior to being federally fund for implementation as well as additional project-specific environmental compliance analyses. This alternative, while possible, would not meet the intent of the statute nor does the USACE have the authority to fund a HAB demonstration project which does not meet the criteria. This alternative is screened out from further discussion in the programmatic environmental assessment.

8 AFFECTED ENVIRONMENT

This section describes the environment of the area that could be affected by the alternatives under consideration. The factors of the human environment that are typically assessed under the NEPA include but are not limited to: land use, Tribal Nations, historic properties, environmental justice, aesthetics, noise, public infrastructure, socioeconomics, recreation, navigation, floodplains, hydrology, soils, air quality, invasive species, threatened and endangered species, climate change, greenhouse gases, and hazardous, toxic, and radioactive waste. The above factors were considered in the development of this document, but many are not discussed in detail due to negligible effects amongst all alternatives. For example, land use and related characteristics (historic properties, aesthetics, noise, public infrastructure, socioeconomics) would not be expected to be impacted as the demonstration project activities would occur with limited and temporary land-based activity to include water access and equipment staging. Impacts to authorized water resources development project purposes (recreation, navigation) would be avoided or minimized through coordination with the hosting USACE District or a Federal partner. Other effects on the environment (floodplains, hydrology, soils, air quality, invasive species) would be minimal as projects would be temporary, would not involve land improvements, and would be conducted in compliance with applicable Federal environmental regulations and policies. Projects would not involve or be conducted at sites featuring hazardous, toxic, and radioactive wastes. The following subsections describe those resources (fish and wildlife sources including threatened and endangered species habitat, aquatic resources including aesthetics and recreation, and environmental justice) that could be temporarily affected by the proposed action.

8.1 AQUATIC RESOURCES

The HAB demonstration projects could potentially affect both freshwater and estuarine aquatic habitats under the USACE area of responsibility. The USACE manages vast freshwater resources and waterways that provide a variety of services including navigation, flood risk management, hydropower, recreation, fish and wildlife management, as well as potable water supply to the Nation. HABs occur throughout the Nation in both freshwater and estuarine habitats across scales (e.g. small waterbodies to river reaches), ecoregions (e.g. subtropical Florida to temperate Ohio and New York), and system types (e.g. reservoirs, riverine, lakes, estuaries). HABs negatively affect the aesthetics of aquatic resources due to coloration of the water, smell, and potential to cause fish kills as described earlier (Section 4.). HABs can impact completed USACE Water Resources Development Projects across the Nation at any of the 400 lakes and river projects in 43 states

managed by the USACE. Many of these projects provide a diverse range of recreational opportunities such as swimming, fishing, and boating as well as fish and wildlife management and potable water supply.

Potential health concerns associated with HABs could be increased by transfers of water from reservoirs and riverine systems when HABs are occurring in freshwater systems by transferring blooms to the estuaries; or, when HABs are occurring in the estuaries, by increasing nutrient loads and contributing to optimal salinity conditions for blooms to flourish. The transfers of water from reservoirs to riverine or estuarine systems are generally governed by the operations manual for each specific project and are dependent upon the project purpose (e.g. hydropower, flood risk management, water supply, etc.).

Algal blooms, including HABs, are affected by environmental factors including physical and chemical categories [31]. Physical properties of reservoirs and freshwater systems within the USACE area of responsibility are influenced by factors such as residence time, stratification, shading, and temperature [32]. These factors are different in rivers, natural lakes, and reservoirs due to the geomorphological characteristics of each ecosystem. Stratification occurs most noticeably in lakes and reservoirs due to their moderate to high mean depths. Residence time of water is greater in lakes and reservoirs over riverine systems. Turbidity is generally greater at this transition between the riverine system and the reservoir, with sediments and nutrient loads generally dropping out of the water column due to decreased water velocities. Algal blooms are more likely to occur in systems with longer residence time due to algal growth occurring at a rate greater than the water is moving through the system. Flushing, or the movement of water, in an aquatic ecosystem can help prevent the accumulation of nutrients, algal growth, and sediments within the aquatic habitat – but flushing can also transfer nutrient-laden water downstream and/or transport phytoplankton upstream to downstream. Releasing freshwater (with potential algal mass) to estuaries during a HAB can result in transport of phytoplankton to the estuaries where blooms can increase with suitable salinities. Thermal stratification of water allows for algal growth as the phytoplankton can adjust their buoyancy to move within the water column utilizing nutrients and sunlight to maintain optimal growth. Shading of the water body can limit algal growth.

Chemical factors influencing HAB development include pH of the water body, nitrogen and phosphorus loads and inputs, salinity, and trace metal inputs [32]. For many freshwater HABs, nitrogen and phosphorus loading dominate algal growth, such as in Lake Okeechobee, Florida. Nitrogen and phosphorus concentrations within the aquatic system influence the growth and distribution of cyanobacteria species. Phosphorus is generally the limiting factor in lakes [33, 34] and loading of this nutrient can have the greatest effect on algal blooms as it is typically the least abundant macronutrient in the system.

Some USACE water resource development projects connect to estuarine systems such as the tidal and inland waters of New Jersey, coastal and tidal waters of Louisiana, waterways of Sacramento-San Joaquin Delta in California, and the Caloosahatchee and St. Lucie estuaries from Lake Okeechobee. Estuarine habitats

provide recreation, fishing, and aesthetic values as well. The estuarine habitat is the connection between the freshwater ecosystem (rivers and streams) and marine environment and includes unique plant and animal species that have acclimated to the mixing of fresh and salt water and are generally very productive ecosystems.

The use of USEPA-registered algaecides per label instructions and as prescribed in application-specific permit documentation, and the use of any molecules or active ingredients as approved under Experimental Use Permit (EUP) or a 24c 'special local needs' label, have minimal temporary effects to no effects on the aquatic habit at the application site.

Physical approaches which introduce flocculants and collect resultant material are expected to have minor effects to the aquatic habitat as discussed in Section 4 of this PEA. Physical approaches which do not collect or retain resultant material may be assessed in a supplemental environmental compliance analysis to include a NEPA document if selected as a demonstration project, when appropriate.

Prevention approaches that do not involve addition of reactive agents are expected to have minor effects to the aquatic habitat. Prevention approaches that do involve addition of reactive reagents would be assessed in a supplemental environmental compliance analysis to include a NEPA document if selected as a demonstration project, when appropriate.

8.2 FISH AND WILDLIFE

Water resource development project areas include many different species of fish, aquatic invertebrates, and other wildlife such as birds, reptiles, and mammals. Due to varied environments in which HABs occur throughout the Nation, a general description of the potential habitat types is included here, an individual description of all possible fish and wildlife resources is not included in this PEA. Suitable habitat for the species of interest includes riverine systems, lakes and reservoirs, downstream estuaries, and the upland areas adjacent to the aquatic habitats. There is suitable habitat for threatened and endangered species throughout the Nations water resource development projects. The occurrence of threatened and endangered species within and adjacent to water resource development projects is expected. Information on the most up to date threatened and endangered species lists by state can be found at the following location: https://ecos.fws.gov/ecp/report/species-listings-by-state-totals?statusCategory=Listed. Species and critical habitat information available at this website is incorporated by reference into this document.

8.3 ENVIRONMENTAL JUSTICE

The minority and low-income populations within the USACE area of responsibility of interest in the project are those located along waterways and adjacent to reservoirs, often in urban areas. Population specific information can be found https://www.epa.gov/ejscreen for areas adjacent to specific water resource development projects. In addition, the Climate and Economic Justice Screening

Tool can be used to identify environmental and climate challenges and realities that communities are experiencing as part of the Federal decision-making process. This tool can be found at the following link: https://screeningtool.geoplatform.gov/en/#3/33.47/-97.5. Information available at both of these websites is incorporated by reference into this document.

9 ENVIRONMENTAL CONSEQUENCES

This section forms the scientific and analytic basis for the comparison of alternatives, including the proposed action and the significance of those impacts to the factors described in Section 8. Detection demonstration projects are expected to have no effects to the resources identified as these would generally include use of remote sensing, environmental monitoring, and advanced computer models. Further, the demonstration projects implemented under this program would be limited in size, duration, and are temporary. Potential affects from the projects are also expected to be limited and temporary in line with the duration described in the selected projects.

9.2 AQUATIC RESOURCES

9.2.1 Alternative 1: No Action

Implementation of the No Action Alternative would continue to affect the aquatic environment as described in Section 8.1. Conditions would be expected to remain the same moving forward with HABs continuing to occur in water resources development projects and downstream estuaries but could be impacted as a result of research or projects conducted under other authorities. Negative effects to water resource development project uses (recreation, aesthetics, potable water supply, etc.) would continue due to HABs, likely worsening due to climate change (e.g., increased rainfall intensity, general warming) influx of nutrients from adjacent lands. Current state and local efforts for HAB detection, management, and prevention would occur consistent with state and local guidance and commensurate with state and local funding, but no additional Federal action for HAB detection, management, and prevention would occur under the Section 128 of WRDA 2020 authority. Implementation of the No Action alternative would have no direct, indirect, or cumulative impacts on the human environment.

9.2.2 Alternative 2: Selection of Projects (Proposed Action)

Projects funded for implementation could provide temporary benefits to the aquatic environment by reducing HABs within the demonstration project footprint. Implementation of the HAB demonstration projects would allow for evaluation and gathering of detailed technology cost and performance data that could guide future technology use and support technology transfer to field practitioners to provide benefits to the human environment with future reductions in HABs. Management of water resource development projects could integrate these tools to reduce the potential for HABs and subsequent effects to project users. Though public access to the demonstration areas may be limited for the duration of the HAB demonstration projects, these effects would be short term in nature.

Selection for Federal funding of a demonstration project would require compliance by the grantee of all appropriate Federal laws, to include the Clean Water Act (CWA) (Sections 401, 402, and 404 as well as the Safe Drinking Water Act (SDWA)) (e.g. grantee would acquire appropriate Federal permits). Implementation of the proposed Action alternative would have minor and temporary impacts to aquatic resources.

9.3 FISH AND WILDLIFE

9.3.1 Alternative 1: No Action

Implementation of the No Action Alternative would continue to effect fish and wildlife described in Section **8**.2. Conditions would remain the same moving forward with HABs continuing to occur in water resources development project areas and downstream estuaries but could be impacted as a result of research or projects conducted under other authorities. Negative effects to fish and wildlife and their habitat would continue due to HABs, likely worsening due to climate change (e.g., increased rainfall intensity, general warming) leading to influx of nutrients from adjacent lands. Current HAB detection, management, and prevention would occur consistent with state and local guidance and commensurate with state and local funding, but no Federal action for HAB detection, management, and prevention as authorized in Section 128 of WRDA 2020 would occur. Implementation of the No Action alternative would have no direct, indirect, or cumulative impacts on the human environment.

9.3.2 Alternative 2: Selection of Projects (Proposed Action)

Implementation of the HAB demonstration projects would allow for evaluation and gathering of detailed technology cost and performance data that could guide technology use and support technology transfer to field practitioners to provide benefits to the human environment with a likely reduction in HABs. It is expected projects funded for implementation would have minimal and temporary effects to fish and wildlife due to the selection criteria used to screen and select, as well as the requirement to comply with the CWA and SDWA. Use of chemicals or other technologies discussed in Sections 5.1.2 and 5.1.3 are expected to have minimal effects to the environment at the scales they would be implemented (limited in geographic extent and temporary). Implementation of the proposed action alternative would have minor and temporary direct and indirect impacts on the human environment.

9.4 ENVIRONMENTAL JUSTICE

9.4.1 Alternative 1: No Action

Implementation of the No Action Alternative would not directly affect low income or minority populations as no demonstration projects would be funded to detect, manage, or prevent HABs in water resource development projects. Conditions would remain the same moving forward with HABs continuing to occur in water resources development projects and downstream estuaries and populations could suffer increased exposure to HABs through fishing, boating, and use of waters in which there is a HABs. Negative effects would continue due to HABs,

likely worsening due to climate change (e.g., increased rainfall intensity, general warming) leading to erosion and influx of nutrients from adjacent lands. Low income and minority populations are often less mobile due to lower income than higher income populations; therefore, as HABs continue, these populations could be more affected by HABs than higher income populations. Current HAB detection, management, and prevention would occur consistent with state and local guidance and commensurate with state and local funding, but no Federal action for HAB detection, management, and prevention under the Section 128 of WRDA 2020 authority would occur. Implementation of the No Action alternative would have no direct, indirect, or cumulative impacts on the human environment.

9.4.2 Alternative 2: Selection of Projects (Proposed Action)

Implementation of the HAB demonstration projects would allow for evaluation and gathering of detailed technology cost and performance data that could guide technology use and support technology transfer to field practitioners to provide benefits to the human environment with a likely reduction in HABs. Selection and funding of the demonstration projects would require compliance by the grantee with all appropriate Federal laws to include the CWA (Sections 401, 402, and 404 as appropriate) as well as the SDWA. Implementation of the proposed Action alternative would have minor and temporary direct, indirect, and cumulative impacts on the human environment. The information learned from the execution of demonstration projects could result in projects that provide positive benefits to environmental justice communities in the future.

10 ENVIRONMENAL COMPLIANCE

This PEA provides for compliance with the NEPA for projects selected as documented by the Proposed Action (Alternative 2, Section 7.1.2). Further, the projects funded by Section 128 of WRDA 2020 could require compliance with other Federal environmental laws such as the Clean Water Act, including Sections 401, 402, and 404, as well as supplemental NEPA analysis, as appropriate prior to implementation. Demonstration projects would have negligible effects to the human environment, as noted in Section 9, and therefore would have no effect to species listed under the Endangered Species Act. Projects selected for funding as documented by the Proposed Action (Alternative 2, Section 7.1.2) are required to be in compliance with other laws and Executive Orders (EO) including but not limited to the Magnuson-Stevens Fishery Conservation and Management Act, National Historic Preservation Act, and EO 12898.

11 LIST OF PREPARERS

- Angela Dunn, USACE Jacksonville District
- Mandy Michalsen, USACE Engineer Research and Development Center.
- Gib Owen, U.S. Army, Office of the Assistant Secretary of the Army, Civil Works

Literature Cited

1. Chorus, I., et al., *Health risks caused by freshwater cyanobacteria in recreational waters.* Journal of Toxicology and Environmental Health-Part B-Critical Reviews, 2000. **3**(4): p. 323-347.
2. Paerl, H.W., et al., *Harmful freshwater algal blooms, with an emphasis on cyanobacteria.* TheScientificWorldJournal, 2001. **1**: p. 76-113.
3. Havens, K.E., *Cyanobacteria blooms: effects on aquatic ecosystems.* Cyanobacterial harmful algal blooms: state of the science and research needs, 2008: p. 733-747.
4. Almuhtaram, H., et al., *State of knowledge on early warning tools for cyanobacteria detection.* Ecological Indicators, 2021. 133.
5. Chuong, J., et al., *Harmful Microalgae Detection: Biosensors versus Some Conventional Methods.* Sensors, 2022. 22(9).
6. Pokrzywinski, K., et al., *Remote sensing of the cyanobacteria life cycle: A mesocosm temporal assessment of a Microcystis sp. bloom using coincident unmanned aircraft system (UAS) hyperspectral imagery and ground sampling efforts.* Harmful Algae, 2022. 117.
7. Legleiter, C.J., et al., *Spectral mixture analysis for surveillance of harmful algal blooms (SMASH): A field-, laboratory-, and satellite-based approach to identifying cyanobacteria genera from remotely sensed data.* Remote Sensing of Environment, 2022. 279.
8. Massey, I.Y., et al., *A Mini-Review on Detection Methods of Microcystins.* Toxins, 2020. 12(10).
9. Kibuye, F.A., A. Zamyadi, and E.C. Wert, *A critical review on operation and performance of source water control strategies for cyanobacterial blooms: Part II-mechanical and biological control methods.* Harmful Algae, 2021. **109**.
10. Pokrzywinski, K.L., et al., *Evaluation of a Peroxide-Based Algaecide for Cyanobacteria Control: A Mesocosm Trial in Lake Okeechobee, FL, USA.* Water, 2022. 14(2).
11. Li, S., et al., *UV-C irradiation for harmful algal blooms control: A literature review on effectiveness, mechanisms, influencing factors and facilities.* Science of the Total Environment, 2020. 723.
12. Nam, G., et al., *Toxicity Reduction of Microcystis Aeruginosa Using Microbubble Ozonation.* Ozone-Science & Engineering.
13. Stanislawczyk, K., et al., *Nanobubble ozone treatment effects on cyanobacterial biomass and cyanotoxins in a small eutrophic lake.* 2022.
14. Wang, X., et al., *Surface modified TiO2 floating photocatalyst with PDDA for efficient adsorption and photocatalytic inactivation of Microcystis aeruginosa.* Water Research, 2018. 131: p. 320-333.
15. Menezes, I., et al., *Comparison of UV-A photolytic and UV/TiO2 photocatalytic effects on Microcystis aeruginosa PCC7813 and four microcystin analogues: A pilot scale study.* Journal of Environmental Management, 2021. 298.
16. Wang, J.J., W.S. Li, and X.G. Wu, *Microcystis aeruginosa removal by the combination of ultrasound and TiO2/biochar.* Rsc Advances, 2021. **11**(40): p. 24985-24990.

17. Arruda, R.S., et al., *'Floc and Sink' Technique Removes Cyanobacteria and Microcystins from Tropical Reservoir Water.* Toxins, 2021. 13(6).
18. Page, M., et al., *Harmful Algal Bloom Interception, Treatment, and Transformation System, HABITATS: Pilot Research Study Phase I Summer 2019*. 2020, ERDC Construction Engineering Research Laboratory Champaign United States.
19. Page, M.A., et al., *Optimizing the Harmful Algal Bloom Interception, Treatment, and Transformation System (HABITATS)*. 2021, Engineer Research and Development Center (US).
20. Wu, X.G., E.M. Joyce, and T.J. Mason, *The effects of ultrasound on cyanobacteria.* Harmful Algae, 2011. 10(6): p. 738-743.
21. Urrutia-Cordero, P., M.K. Ekvall, and L.A. Hansson, *Controlling Harmful Cyanobacteria: Taxa-Specific Responses of Cyanobacteria to Grazing by Large-Bodied Daphnia in a Biomanipulation Scenario.* Plos One, 2016. 11(4).
22. Triest, L., I. Stiers, and S. Van Onsem, *Biomanipulation as a nature-based solution to reduce cyanobacterial blooms.* Aquatic Ecology, 2016. 50(3): p. 461-483.
23. Pokrzywinski, K.L., C.R. Grasso, and T.E. Rycroft, *Cyanobacteria harmful algal blooms (HABs) and US Army Engineer Research and Development Center (ERDC): research and services.* 2021.
24. Grasso, C.R., et al., *A Review of Cyanophage-Host Relationships: Highlighting Cyanophages as a Potential Cyanobacteria Control Strategy.* Toxins, 2022. 14(6).
25. Gagala, I. and J. Mankiewicz-Boczek, *The Natural Degradation of Microcystins (Cyanobacterial Hepatotoxins) in Fresh Water - the Future of Modern Treatment Systems and Water Quality Improvement.* Polish Journal of Environmental Studies, 2012. 21(5): p. 1125-1139.
26. Dziga, D., et al., *Microbial Degradation of Microcystins.* Chemical Research in Toxicology, 2013. 26(6): p. 841-852.
27. Wu, X., et al., *Effect of the immobilized microcystin-LR-degrading enzyme MlrA on nodularin degradation and its immunotoxicity study.* Environmental Pollution, 2020. 258.
28. Lurling, M. and F. van Oosterhout, *Controlling eutrophication by combined bloom precipitation and sediment phosphorus inactivation.* Water Research, 2013. 47(17): p. 6527-6537.
29. Calomeni, A.J., et al., *Identification and preventative treatment of overwintering cyanobacteria in sediments: a literature review.* 2022.
30. USEPA, *Preventative Measures for Cyanobacterial HABs in Surface Water" webpage accessed August 2022; URL: https://www.epa.gov/cyanohabs/preventative-measures-cyanobacterial-habs-surface-water.*
31. Linkov, I., et al., *The impact of harmful algal blooms on USACE operations*. 2009, ENGINEER RESEARCH AND DEVELOPMENT CENTER VICKSBURG MS.
32. Paerl, H., *A comparison of cyanobacterial bloom dynamics in freshwater, estuarine and marine environments.* Phycologia 1996. 35 (Supplement): p. 25-35.

33. Moss, B., et al., *Nitrogen, macrophytes, shallow lakes and nutrient limitation: resolution of a current controversy?* Hydrobiologia, 2013. 710(1): p. 3-21.
34. Howarth, R.W., et al., *Role of external inputs of nutrients to aquatic ecosystems in determining prevalence of nitrogen vs. phosphorus limitation of net primary productivity.* Biogeochemistry, 2021. 154(2): p. 293-306.

Water Resources Development Act of 2020
Section 128, Harmful Algal Bloom Demonstration Program

a) IN GENERAL. The Secretary shall carry out a demonstration program to determine the causes of, and implement measures to effectively detect, prevent, treat, and eliminate, harmful algal blooms associated with water resources development projects.

(b) CONSULTATION; USE OF EXISTING DATA AND PROGRAM AUTHORITIES. In carrying out the demonstration program under subsection (a), the Secretary shall
(1) consult with the heads of appropriate Federal and State agencies; and
(2) make maximum use of existing Federal and State data and ongoing programs and activities of Federal and State agencies, including the activities of the Secretary carried out through the Engineer Research and Development Center pursuant to section 1109 of the Water Resources Development Act of 2018 (33 U.S.C. 610 note).

(c) FOCUS AREAS. In carrying out the demonstration program under subsection (a), the Secretary shall undertake program activities related to harmful algal blooms in the Great Lakes, the tidal and inland waters of the State of New Jersey, the coastal and tidal waters of the State of Louisiana, the waterways of the counties that comprise the Sacramento-San Joaquin Delta, California, the Allegheny Reservoir Watershed, New York, and Lake Okeechobee, Florida.

(d) ADDITIONAL FOCUS AREAS. In addition to the areas described in subsection (c), in carrying out the demonstration program under subsection (a), the Secretary shall undertake program activities related to harmful algal blooms at any Federal reservoir located in the Upper Missouri River Basin or the North Platte River Basin, at the request and expense of another Federal agency.

(e) AUTHORIZATION OF APPROPRIATIONS. There is authorized to be appropriated to the Secretary $25,000,000 to carry out this section. Such sums shall remain available until expended.

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
CIVIL WORKS
108 ARMY PENTAGON
WASHINGTON, DC 20310-0108

SACW

11 January 2022

MEMORANDUM FOR COMMANDING GENERAL, U.S. ARMY CORPS OF ENGINEERS

SUBJECT: Implementation Guidance for Section 128 of the Water Resources Development Act of 2020, Harmful Algal Bloom Demonstration Program

1. Section 128 of the Water Resources Development Act (WRDA) of 2020 directs the Secretary to implement a demonstration program to determine the causes of, and implement measures to effectively detect, prevent, treat, and eliminate, harmful algal blooms associated with water resources development projects. Section 128 requires the Secretary to consult with and leverage data from Federal and State agencies, and leverage activities of the Secretary carried out through the Engineer Research and Development Center (ERDC) pursuant to Section 1109 of the Water Resources Development Act of 2018 (33 U.S.C. 610 note). Additionally, Section 128 authorizes $25 million to be appropriated to carry out the demonstration program. The authority directs the Secretary to undertake program activities in the Great Lakes, tidal and inland waters of New Jersey, coastal and tidal waters of Louisiana, waterways of Sacramento-San Joaquin Delta in California, Allegheny Reservoir Watershed in New York, and Lake Okeechobee, Florida. Section 128 directs the Secretary to undertake program activities related to harmful algal blooms at any Federal reservoir located in the Upper Missouri River Basin or the North Platte River Basin, at the request and expense of another Federal agency.

2. This Section is applicable to the Engineer Research and Development Center (ERDC), Headquarters and all Divisions, Districts, and Field Offices of the U.S. Army Corps of Engineers (Corps) with Civil Works responsibilities.

3. The following definitions apply to the Section 128 demonstration program:

a. The term “harmful algal bloom” (HAB) means marine and freshwater phytoplankton that proliferate to high concentrations, resulting in nuisance conditions or harmful impacts on marine and aquatic ecosystems, coastal communities, and human health through the production of toxic compounds or other biological, chemical and physical impacts of the algae outbreak. A HAB is “associated with a water resources development project” if the HAB has the potential to

(1) be caused or exacerbated by operation of the project; or

(2) adversely impact the project’s functioning for its authorized purposes.

b. The term “demonstration project” means implementation of a HAB prevention, detection, or management technology project, with the primary objective of evaluating and gathering detailed technology cost and performance data that will guide technology use and support technology transfer to field practitioners.

c. The term “water resources development project” means a project constructed by the Corps, or by a non-Federal interest in partnership with the Corps, for purposes of navigation, flood or coastal storm risk management, water supply, or ecosystem restoration. A water resources development project may be operated by the Corps or by a non-Federal interest. The term does not include projects constructed under Environmental Infrastructure authorities.

d. The term “non-Federal interest” is defined in Section 221(b) of the Flood Control Act of 1970 (42 U.S.C. 1962d-5b(b)).

4. The following policies and requirements apply to demonstration projects to address HABs associated with water resources development projects:
a. Eligible applicants. Non-Federal interests are eligible to submit Statements of Interest (SOI) to implement a demonstration project to address a HAB associated with a water resources development project. Other non-Federal entities, that do not meet the definition of non-Federal interest and are interested in a demonstration project should contact ERDC at HABDemoPrgm@usace.army.mil for more information. The ERDC counsel will prepare a legal opinion on whether participation is authorized and if a deviation to the process within this guidance is required for partnering with such entity. This legal opinion must be coordinated with Corps Headquarters counsel. In the case of a demonstration project to address a HAB associated with a water resources development project operated by a non-Federal interest, the written consent of the non-Federal interest is required when the proponent of the demonstration project is not the non-Federal interest.

b. Eligibility Criteria. To be eligible for consideration under the demonstration program, a project must meet the following criteria:

(1) A demonstration project under Section 128 may be implemented anywhere in the nation to address a HAB associated with a water resources development project. Preference will be given to projects located in the six focus areas: the Great Lakes, tidal and inland waters of New Jersey, coastal and tidal waters of Louisiana, waterways of Sacramento-San Joaquin Delta in California, Allegheny Reservoir Watershed in New York, and Lake Okeechobee, Florida.

(2) The proposed project must be for the purpose of determining the causes of, and/or applying technologies to effectively detect, prevent, manage, or eliminate, HAB associated with a water resources development project. The project must

include the gathering and evaluation of technology cost and performance data that will guide technology use and support technology transfer.

(3) The proposed project should provide data that could be applied at multiple water resources development projects or federally constructed reservoirs in the Upper Missouri River Basin or the North Platte River Basin and could be expanded at a larger scale than the proposed demonstration.

(4) The applicants may propose to use technology developed by the Corps under Section 1109 of WRDA 2018 (i.e., the Freshwater Harmful Algal Bloom Research and Development Initiative) or viable technology with legal authority and ability to be permitted and applied under appropriate federal laws.

(5) Demonstration projects will be chosen based upon information provided under paragraph 4.b.(2) through 4.b.(4). Projects that provide scalability and do not exceed a $5M per project limit will have preferential weighted scores. However, larger projects will be considered based on the merits provided in paragraph 4.b.(2) through 4.b.(4).

c. Cost. A demonstration project implemented at a water resources development project will be carried out at 100 percent Federal expense.

d. Funding mechanisms. Subject to available authorities, the Corps may use a Federal contract, or a grant or cooperative agreement with a non-Federal interest to implement a demonstration project at a water resources development project. For a demonstration project implemented through a Federal contract at a water resources development project operated by a non-Federal interest, the Corps will execute a Memorandum of Agreement (MOA) with the non-Federal interest prior to implementing the demonstration project.

e. Funding Source. Funds to carry out demonstration projects to address HABs associated with water resources development projects will be requested in the Aquatic Nuisance Control Research remaining item in the Operation and Maintenance account.

f. Selection Considerations. Projects will be selected for funding based on the following considerations:

(1) The project's potential to significantly reduce the frequency and effects of HABs associated with water resources development projects.

(2) The project's utilization of new, innovative methods or tools, or technology being developed under the Freshwater Harmful Algal Bloom Research and Development Initiative.

(3) The degree to which the project leverages existing Federal and State data and ongoing programs and activities of Federal and State agencies.

(4) As stated in Paragraph 4.b(1), preference will be given to projects that address a HAB issue associated with a water resources development project in one of the six focus areas identified.

g. Statements of Interest (SOI). The Director of ERDC or a respective designee will publish a public notice soliciting SOI from interested parties. A SOI must contain sufficient information to demonstrate eligibility under Paragraph 4.(b) and to address the selection considerations in subparagraph 4f. All information provided in a SOI is public information. Therefore, information that is confidential business information, information that should not be disclosed because of statutory restrictions, or other information that a project proponent would not want to appear publicly should not be included in the submittal.

5. The following procedures apply to demonstration projects to address HABs associated with water resources development projects:

a. Upon the appropriation of funds sufficient to initiate the demonstration project program, the HAB Demonstration Program Review Team formed by the Director of ERDC will review and rank all proposals received.

b. The Director of ERDC will establish a HAB Demonstration Program Review Team to evaluate and select demonstration projects. The team may consist of the following:

(1) Members of the Invasive Species Leadership Team.

(2) Corps personnel with expertise in the implementation of environmental scientific principles including invasive and nuisance species science and management.

(3) Members from the Harmful Algal Bloom and Hypoxia Research and Control Act Interagency Working Group.

(4) Personnel from the ERDC, Civil Works office of the Technical Director for Environmental Sciences and Engineering who execute the Aquatic Nuisance Species Research Program.

6. The following policies and requirements apply to demonstration projects at Federal reservoirs under the jurisdiction of another Federal agency in the Upper Missouri River or North Platte River Basins:

a. At any time a Federal agency responsible for operating a Federal reservoir in the Upper Missouri River or North Platte River Basins may request a demonstration project by contacting the Director of ERDC. All requests will be reviewed by the HAB Demonstration Program Review Team.

b. A demonstration project implemented at a Federal reservoir will be carried out at the full expense of the Federal agency responsible for operating the reservoir. A General Terms & Conditions (GT&C) Agreement and order consistent with the guidance in Engineer Regulation (ER) 1140-2-211, Support for Others: Reimbursable Services, must be executed prior to implementing a demonstration project for another Federal agency. The Federal agency requesting the demonstration project may provide the required funding on a reimbursable basis.

c. A request for a demonstration project at a Federal reservoir may be accepted if the Director of ERDC determines that there are sufficient resources and the capability to perform the work without adversely affecting activities for which the Corps receives appropriations or preexisting obligations to Federal and non-Federal partners.

d. Funds provided by other Federal agencies for a demonstration project at a Federal reservoir in the Upper Missouri River or North Platte River Basins will not accrue toward the authorized program limit and will not be subject to the evaluation criteria in paragraph 4.b. and 4.f.

8. A draft environmental compliance analysis, to include a draft programmatic National Environmental Policy Act document, will be submitted to the Assistant Secretary of the Army for Civil Works (ASA(CW)) for action prior to the acceptance of any solicitation of proposed projects or proposals from other Federal agencies under this demonstration program. Environmental compliance will analyze the impacts to the human environment of the demonstration program as authorized in Section 128.

9. Under no circumstances shall this policy be modified, supplemented, amended, or rescinded, directly or indirectly, nor shall the Corps take action not in accordance with the direction herein, without the express written approval from the (ASA(CW)). This guidance shall be transmitted to the appropriate Corps Division and District Commanders and posted to the Corps' WRDA website within five business days of receipt (written or electronic) from this office. Guidance shall be transmitted and posted as is and without additional guidance attached.

10. Questions regarding this implementation guidance should be directed to Gib Owen, Office of the ASA(CW), at gib.a.owen.civ@army.mil or 703-695-4641.

Encl

MICHAEL L. CONNOR
Assistant Secretary of the Army
(Civil Works)

SUBJECT: Implementation Guidance for Section 128 of the Water Resources Development Act of 2020, Harmful Algal Bloom Demonstration Program

CF:
DCG-CEO
DCW

SUBJECT: Implementation Guidance for Section 128 of the Water Resources Development Act of 2020, Harmful Algal Bloom Demonstration Program

Section 128, Harmful Algal Bloom Demonstration Program

a) IN GENERAL. The Secretary shall carry out a demonstration program to determine the causes of, and implement measures to effectively detect, prevent, treat, and eliminate, harmful algal blooms associated with water resources development projects.

(b) CONSULTATION; USE OF EXISTING DATA AND PROGRAM AUTHORITIES. In carrying out the demonstration program under subsection (a), the Secretary shall
(1) consult with the heads of appropriate Federal and State agencies; and
(2) make maximum use of existing Federal and State data and ongoing programs and activities of Federal and State agencies, including the activities of the Secretary carried out through the Engineer Research and Development Center pursuant to section 1109 of the Water Resources Development Act of 2018 (33 U.S.C. 610 note).

(c) FOCUS AREAS. In carrying out the demonstration program under subsection (a), the Secretary shall undertake program activities related to harmful algal blooms in the Great Lakes, the tidal and inland waters of the State of New Jersey, the coastal and tidal waters of the State of Louisiana, the waterways of the counties that comprise the Sacramento-San Joaquin Delta, California, the Allegheny Reservoir Watershed, New York, and Lake Okeechobee, Florida.

(d) ADDITIONAL FOCUS AREAS. In addition to the areas described in subsection (c), in carrying out the demonstration program under subsection (a), the Secretary shall undertake program activities related to harmful algal blooms at any Federal reservoir located in the Upper Missouri River Basin or the North Platte River Basin, at the request and expense of another Federal agency.

(e) AUTHORIZATION OF APPROPRIATIONS. There is authorized to be appropriated to the Secretary $25,000,000 to carry out this section. Such sums shall remain available until expended.