RECORD OF DECISION

BLUESTONE DAM SAFETY MODIFICATION
HINTON, WEST VIRGINIA

The Supplemental Final Environmental Impact Statement (SFEIS) dated June 2017, for the Supplemental Bluestone Dam Safety Modification Report (DSMR), addresses objectives and purpose and need for agency action. The DSMR is a supplement to the Dam Safety Assurance Report and Environmental Impact Statement that were completed in 1998. The Record of Decision (ROD) for that EIS was signed in September 1999. The objective of the DSMR is to reduce incremental risk associated with dam failure to a level below the U.S. Army Corps of Engineers' (USACE) tolerable risk guidelines in order to provide public safety to communities downstream of the dam and to allow the dam to function as originally intended and authorized. Based on these reports, the reviews by other Federal, state and local agencies, Tribes, input of the public, and the review by my staff, I find the Recommended Plan identified by the District and Division Dam Safety Officers to be technically feasible and reduce incremental risks associated with dam failure, in accordance with environmental statutes and the public interest.

The final DSMR and SFEIS evaluated various alternatives to meet the project objectives and purpose and need for agency action. The recommended plan is to implement modifications to the existing stilling basin to prevent scour that could result in spillway monolith instability, resulting in dam breach or failure, during extreme flood events.

In order to develop a final array of actionable alternatives to reduce risk for Bluestone Dam, a number of risk management measures were initially considered, screened, and formulated into the following array of alternative plans which were ultimately evaluated and compared against the No Action plan and then against each other. Each of these plans includes continued risk communication with the potentially impacted communities and users about potential risk, which is a non-structural measure. There were eight reasonable alternative plans which included:

- Remove Dam
- Replace Dam
- Modified Stilling Basin with Supercavitating Baffles (14-foot Parapet Wall)
- Modified Stilling Basin with Concrete Overlay
- Downstream Conventional Stilling Basin
- Transitional Flip Stilling Basin
- Modified Stilling Basin with Supercavitating Baffles (also known as the Hydraulic Jump Basin)
- No Action

After multiple screenings, two alternatives were retained to be considered in a more detailed evaluation in the SFEIS. The following is a summary of the two alternatives evaluated:

Alternative 1: Hydraulic Jump Basin with Supercavitating Baffles – This alternative is the recommended plan and includes the modification of the existing stilling basin system with a protective concrete apron overlay and larger baffles among other features described in the SFEIS. Modification to the dam would occur over an eight to ten year period. Alternative 1 would also include a remotely controlled crest gate operating system, as well as other non-structural risk management measures for improved risk communication. This alternative assumes completion of the Phase 3 (completed February 2017) and Phase 4 (currently ongoing) of the 1998 Dam Safety Assurance Study (DSAS) approved project features. This alternative reduces life safety risk to tolerable levels.

Alternative 2: No Action Alternative – No modifications to address the risk assessment-identified safety concerns would be implemented. This alternative also assumes the completion of Phases 3 (completed February 2017) and Phase 4 (currently ongoing) of the 1998 DSAS approved project features. The installation of an additional 66 monolith multi-strand anchors which were not originally included in the Phase 4 construction contract would be completed as part of the No Action Alternative. The No Action Alternative would also include non-structural risk management measures.

Alternative 1 was identified as the recommended plan and is also the environmentally preferred plan.

All practical means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. The recommended plan will result in unavoidable impacts to nine (9) habitat units of aquatic habitat. To mitigate for these unavoidable impacts, the USACE will implement appropriate mitigation measures.

Implementation of the aquatic mitigation and associated monitoring plan and adaptive management plan will be required. Construction of aquatic mitigation will occur prior to and/or concurrent with the initial phases of project construction. Monitoring will continue until the mitigation is determined to be successful based on the identified criteria within the monitoring plan and if needed, adaptive management plan. Monitoring shall begin once aquatic mitigation has been constructed, which will run concurrent with project construction. Monitoring is expected to last no more than 10 years.

In cooperation with resource agencies, opportunities have been identified to fully achieve mitigation goals needed to offset significant aquatic and downstream recreational effects. Relative to the mitigation planning guidance in ER 1105-2-100, the project team has conducted mitigation planning commensurate with the level of detail of the construction design features of the recommended plan. Concurrent with further refinement of the design of the recommended plan during the preconstruction engineering and design (PED) phase, refinement of the mitigation plan and its components will also take place. Design refinement may likely lead to reduction of impact where conservative design assumptions were made for the feasibility level analysis. As these details are developed, the PDT will continue to identify further

avoidance and minimization measures while maintaining close coordination with resource agencies as details are developed. The mitigation plan details shall be fully developed and updated at this time and with refined project effects and further refinement of the benefits of the sites to appropriately compensate for the Habitat Units. Utilizing a tiered approach, it is anticipated supplemental National Environmental Policy Act documents would be prepared to fully document the mitigation site(s) and potential changes in effects which may result from further design refinement. In addition, due to significant downstream impacts to recreational resources, the USACE will develop detailed mitigation plans to replace lost recreational uses as discussed in the SFEIS to include both downstream and upstream river access which will be in place prior to the initiation of construction and other features. All mitigation measures and commitments are outlined in Chapter 7 of the SFEIS.

Compliance with applicable environmental review and consultation requirements has been accomplished through the SFEIS process. The project is in compliance with the Fish and Wildlife Service Coordination Act, Clean Air Act, Comprehensive Environmental Resource Compensation and Liability Act, Resource Conservation and Recovery Act, Toxic Substance Control Act, Endangered Species Act, Farmland Protection Policy Act, Protection of Wetlands (Executive Order 11990), National Environmental Policy Act, National Historic Preservation Act, and Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations (Executive Order 12898).

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, the U.S. Army Corps of Engineers determined that historic properties may be adversely affected by the recommended plan. The Corps and the West Virginia State Historic Preservation Office entered into a memorandum of agreement dated September 7, 2000. All terms and conditions resulting from the agreement shall be implemented in order to mitigate for adverse impacts to historic properties.

Water Quality Certification pursuant to section 401 of the Clean Water Act will be obtained from the West Virginia Department of Environmental Protection (WVDEP) prior to commencement of construction. WVDEP concurs with this approach as documented in written correspondence. A Section 404 (b)(1) evaluation was prepared and is included as an appendix to the SFEIS.

Public review of the Supplemental Draft Environmental Impact Statement (SDEIS) was completed on November 23, 2016. All comments submitted during the initial public comment period were responded to in the SFEIS. A 30-day public, state agency, and Federal agency review of the SFEIS was completed on June 12, 2017. Comments from the final public, state agency, and Federal agency review resulted in minimal changes to the SFEIS.

Technical, environmental, and economic criteria used in the formulation of alternative plans were those specified in the Water Resources Council's 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. All applicable laws, executive orders, regulations, and local government plans were considered in evaluation of alternatives. Based on the review of these evaluations, I find that life safety benefits of the recommended plan outweigh the costs and any adverse effects. This Record of Decision completes the National Environmental Policy Act process.

19 Sep 17
Date

JAMES C. DALTON, PE, SES
Dam Safety Officer
Headquarters USACE

28 SEP 1999

RECORD OF DECISION
BLUESTONE DAM SAFETY ASSURANCE PROJECT
HINTON, WEST VIRGINIA

SYNOPSIS

Section 1203 of the Water Resources Development Act of 1986 (P.L. 99-662), authorized the U.S. Army Corps of Engineers (USACE) to review and modify its projects for dam safety. The Dam Safety Assurance Program provides for modification of completed USACE dams and related facilities, when deemed necessary for safety purposes due to new hydrologic or seismic data or changes in the state-of-the-art design or construction criteria. The Bluestone Dam is eligible for modification in accordance with the policy presented in Engineering Regulation 1110-2-1155, Dam Safety Assurance Program.

The proposed action is to modify the Bluestone Dam so that it would withstand the Probable Maximum Flood (PMF). Modifications made to the dam will mitigate downstream consequences of potential dam failure. The dam would be strengthened to improve its stability through installation of anchors in the dam itself and the upper stilling basin. Thrust blocks, discharge augmentation and modifications to the dam height were also considered among the feasible alternatives. After construction is completed, the USACE plans no changes from current day-to-day operations.

DECISION

It is my decision that the Bluestone Dam Safety Assurance Project should be implemented as soon as practicable as a means to reduce risk to human populations, infrastructure and the natural environment below the Bluestone Dam at Hinton, West Virginia in the event of catastrophic flood events. Authority to implement the project is provided by Section 1203 of the Water Resources Development Act of 1986 (P.L.99-662).

FINDINGS ON THE FINAL DAM SAFETY ASSURANCE EVALUATION REPORT AND FINAL ENVIRONMENTAL IMPACT STATEMENT

1. The alternatives outlined in the Final Dam Safety Assurance Evaluation Report and the Final Environmental Impact Statement provide a suitable framework for the selection of measures to modify Bluestone Dam thereby significantly reducing risk to downstream resources in the event of extreme flooding.

2. Any significant deviations from the plan that subsequently may be determined to be necessary and advisable must be assessed to determine potential environmental, social and economic impacts by application of the National Environmental Policy Act process.

COMPARISON OF ALTERNATIVE PLANS

Three structural alternatives and a "no-action" alternative were considered in the pursuit of reduced risk at Bluestone Dam. The following is a summary:

Alternative 1 — Raise the Dam: This alternative involves raising the dam to prevent overtopping and stabilizing the structure to withstand a higher maximum pool.

Alternative 2 — Auxiliary Spillway (environmentally preferred): This alternative involves an increased discharge capacity via a new auxiliary spillway and stabilizing the structure to withstand a small increase in the maximum pool elevation. This alternative presents the least potential for negative environmental impacts. The auxiliary spillway modification would result in upstream inundation nearly equivalent to the baseline condition. Also, dam failure under this scheme would produce a floodwave similar to the baseline in the unlikely event of subsequent dam failure. Without failure, downstream impacts would be slightly greater than that for the other structural alternatives, but orders of magnitude less than the baseline in terms of environmental and economic damages.

Alternative 3 — Raise the Dam, utilize Penstocks (recommended plan): This alternative involves increased discharge capacity via the hydropower penstocks and stabilizing the structure to withstand an increased maximum pool elevation. The low cost discharge capacity available for this alternative, the completely mitigable construction

impacts, and the remote nature of impacts associated with a PMF event lends preference to this approach. For the reasons explained herein, I have selected this alternative for implementation.

No-Action – Normal Operation and Maintenance Continued: This alternative would involve no changes to the dam, either physically or operationally. The dam would not withstand the PMF. It is highly probable the dam would fail at pool elevation above 1,532 feet contributing a higher crest "wave" below the dam. This flood "wave" would be accompanied by greater velocities and flood extent, increasing potential economic and environmental damage and loss of life below Bluestone Dam.

The proposed alternatives were similar in their potential to create significant adverse effects on the environment. The three alternatives evaluated in the decision-making process were also similar in their ability to reduce risk to downstream resources in the event of catastrophic flooding. The three structural alternatives differ in their effects upon four classes of potential adverse impacts. These include: 1) upstream inundation, 2) downstream damages in the unlikely event of subsequent dam failure, 3) downstream damages in the likely event that the modified dam withstood the PMF, and 4) impacts from fill and concrete requirements for construction. Downstream damages and construction-related effects are tangible and perhaps most useful for comparison of the alternatives. The following is a brief synopsis patterned after the categories numbered above:

1) Upstream Inundation- All three alternatives were expected to result in the potential for additional upstream inundation in the event of the PMF. Alternatives 1 and 3 however, are the only alternatives to produce potentially significant impacts.

2) Downstream Damages with Failure- While the likelihood of dam failure after a remedial fix would be less than 1% over the life of the structure, the potential damages downstream were considered. Economic, environmental, and cultural resources would be significantly impacted by dam failure under either Alternative 1 or 3.

3) Downstream Damages without Failure- All three structural alternatives allow for significantly lower downstream damages over the existing condition (dam failure at elevation 1532 feet). Alternatives 1 and 3 result in lower downstream inundation than Alternative 2. This reduced damage would accompany an incrementally higher

maximum pool elevation and additional "slow-water" inundation upstream of the dam.

4) Fill and Concrete Requirements- Construction activities related to fill acquisition and hauling hold great potential for negative environmental impacts. In this category, Alternative 1 was expected to hold the greatest potential for negative impacts, requiring nearly double the fill of Alternative 3. Alternative 2 requires no additional fill.

In summary, the No-Action Alternative would present little potential for environmental impacts in the short term. However, the No-Action Alternative offers nothing to mitigate the high potential for loss of life, population at risk or incremental downstream damages in the event of dam failure during extreme flooding. Alternative 2—Auxiliary Spillway presents the least potential for negative environmental impacts, and is the environmentally preferred alternative. Alternatives 1 and 3 would be expected to create similar impacts though of a lower magnitude for Alternative 3.

ALTERNATIVE SELECTION CONSIDERATIONS

As part of the project selection process, the environmental impacts of three modification alternatives and a No Action Alternative were considered. The alternative selection process also involved a comparison of the cost-effectiveness and the environmental-social-economic balance of the three alternatives that were found to be comparable in reducing potential flood damages resulting from catastrophic flooding. Modifications made to the dam would mitigate downstream consequences of potential dam failure. The nighttime population at risk attributable to potential dam failure alone is estimated at over 13,000 persons, and estimated incremental downstream damages are $1.7 billion. The cost to modify the dam to withstand the PMF ranges from $97.5 million for Alternative 1, to $166.3 million for Alternative 2, to $91 million for Alternative 3. The Corps has demonstrated cost savings through design and refined analysis techniques applicable to all three alternatives. Test application of these techniques to Alternative 3 has produced savings approaching 3% compared to the conventional design. The techniques used in this trial will be used for the design of the selected alternative. Additionally, the District will perform finite element structural analysis, hydraulic model testing, and a comprehensive Value Engineering Study to further reduce the cost of the selected

alternative during detailed design. Under the three proposed cost regimes, the damages associated with dam failure far exceed the costs of the modifications required.

ENVIRONMENTAL CONSIDERATIONS IN THE DAM SAFETY ASSURANCE EVALUATION REPORT AND FINAL ENVIRONMENTAL IMPACT STATEMENT

Compliance with applicable environmental review and consultation requirements has been accomplished through the Dam Safety Evaluation Report and Final Environmental Impact Statement processes. The project is in compliance with the Fish and Wildlife Service Coordination Act, the Clean Water Act, Clean Air Act, Comprehensive Environmental Resource Compensation and Liability Act, Resource Conservation and Recovery Act, Toxic Substance Control Act, Endangered Species Act, Farmland Protection Policy Act, Floodplain Management (Executive Order 11988), National Environmental Policy Act, National Historic Preservation Act, and Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations (Executive Order 12898).

In addition to the Final Environmental Impact Statement prepared for the selected plan, a Section 401 Water Quality Certification will be obtained from the West Virginia Department of Environmental Protection. This certification will be obtained 120 days prior to initiation of construction. A Section 404 (b)(1) evaluation was prepared during the consideration given under NEPA and included as an appendix to the Final Environmental Impact Statement. Archaeological and historical considerations have been addressed and a memorandum of agreement will be negotiated between the Corps and the West Virginia State Historic Preservation Office prior to alterations recommended for Bluestone Dam.

In regard to Fish and Wildlife impacts, the Huntington District has coordinated with the U. S. Fish and Wildlife Service and the West Virginia Division of Natural Resources in the development of a mutually acceptable mitigation/compensation plan. In addition, compliance with applicable provisions of Executive Order 11990, Protection of Wetlands, and Executive Order 11988, Floodplain Management, has been achieved. All practicable means to avoid or minimize environmental harm from the selected alternative have been adopted.

CONCLUSIONS

I have reviewed and evaluated all documents concerning the Huntington District Engineer's recommendation, including the views of other interested agencies and the general public, and I have considered prevailing administrative policies and procedures. Based upon these factors, I find Alternative 3-Utilize Penstocks as contained in the Dam Safety Assurance Evaluation Report and Final Environmental Impact Statement, is suitable for use as a plan for implementation of remedial modifications to Bluestone Dam, Hinton, West Virginia. I further conclude that the Bluestone Dam Safety Assurance project should be implemented as soon as practicable.

Based on the conditions set forth in the Huntington District Engineer's findings and the added conditions set forth herein, I conclude that the public interest is best served by the decisions as set forth herein.

CARL F. ENSON, P.E.
Chief, Engineering & Construction Division
Directorate of Civil Works