

**HANDBOOK FOR REVISION OF WATER CONTROL PLANS TO IMPROVE
ENVIRONMENTAL FLOWS BELOW DAMS OPERATED BY THE U.S. ARMY
CORPS OF ENGINEERS
and
GUIDE TO THE CORPS GUIDANCE**

For the Sustainable River Project of the Nature Conservancy

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I. INTRODUCTION

This handbook offers a set of basic strategies for The Nature Conservancy's effective participation in the revision of Water Control Plans for Corps dams to improve environmental flows, and in the real-time operation of such dams to that end. These strategies are based on a careful and current review of the Corps extensive written guidance (totaling several linear feet) and the Conservancy's experience with the revision of the operations and Water Control Plans for Corps dams on the Green River in Kentucky and the Roanoke River in North Carolina. Much of the review of the Corps written guidance is organized into appendices on the Corps management structure, authorized purposes, substantive content of a Water Control Plan, real-time operations, bases and procedures for ordinary revision of a Water Control Plan, the process for revising a Water Control Plan as a major modification of a Corps project, and Corps reporting on dam operations. Two more appendices consist of a key step by the Conservancy in the application of this approach to the revision of the Water Control Plan for the Kerr dam on the Roanoke River, and of the environmental assessment of an actual plan revision for the Green River dam that the Conservancy helped to develop.

A. Management Controls

1. Chain of Command

The Corps has a chain of command. The chain involves very substantial delegation from Headquarters to District. Thus, real-time operation of a project is the responsibility of a District, subject to limited oversight of Division, and is rarely referred to Headquarters for any review or approval. Other decisions, such as a District's recommendation to substantially modify the authorized design of a project, require sequential review and approval of Division and Headquarters. The Corps management structure and controls are discussed in *Appendix A*.

2. Written Guidance

The extensive written guidance that governs the operation of dams, reservoirs, locks, and associated levees by all levels of the Corps consists of: Engineer Circulars (EC), Engineer Directives (ED), Engineer Manuals (EM), Engineer Pamphlets (EP), and Engineer Regulations (ER).¹ The Corps adopts and implements a Water Control Plan for each dam and reservoir,² lock,³ and associated levee⁴ which it owns and operates.

¹ All of these documents are available at: <http://www.usace.army.mil/pubtypes.html>.

² Flood Control Act of 1944, P.L. 78-534 (58 Stat. 887), 33 U.S.C. § 709. See ER 1110-2-240, ¶ 4.a and ¶ 6.a.

³ ER 1110-2-240, ¶6.a.

⁴ EM 1110-2-3600, ¶ 2-2.f - 2.2.g.

B. Water Control Plan

A Water Control Plan governs the storage and release of flow at each project to achieve flood protection and other authorized purposes for a given project.⁵ Each Corps dam is authorized by a specific statute, subject only to a limited exception under the 1965 Flood Control Act whereby the Chief may provide administrative authorization for a small project of \$15 million or less.⁶ An authorizing statute establishes the purposes of Corps project, at a minimum including flood control or navigation. It may also describe generally the physical design and operation, by reference to a pre-construction feasibility or other report from the Corps.⁷

The Corps now deems water quality, protection of fish and wildlife, and recreation to be purposes for each of its projects, even if the original authorizing statute did not specify those purposes. This is because the 1972 Clean Water Act, 1958 Fish and Wildlife Coordination Act, and other federal laws establish these as purposes generally applicable to all federal facilities.⁸ All authorized purposes of Corps dams are discussed in *Appendix B*.

A Water Control Plan is intended to achieve the “optimum” benefits for all project purposes, within legal and physical constraints.⁹ The Corps manages water resources “to balance the environmental and developmental needs of the Nation,” in accordance with general laws as well as the authorizing statute for a project.¹⁰ The preparation and substantive content of a Water Control Plan is addressed in *Appendix C* and real-time dam operations are addressed in *Appendix D*. The following aspects of Water Control Plans in *Appendix C* may warrant extra attention: Compliance with the National Environmental Policy Act (Section B.2.); Flood Protection (Section C.2.); Hydropower (Section C.4.); Protection of Environmental Quality (C.5.)

⁵ ER 1110-2-240, ¶ 5.a. A Water Control Plan is implemented through a Water Control Manual, which states the functional requirements for operation. EM 1110-2-3600, ¶ 9-4.a(2), (3); ER 1110-2-230, ¶ 9.a.

⁶ EP 1165-2-1, ¶ 2-1.b.

⁷ EP 1165-2-1, ¶ 2-1.b.

⁸ EM 1110-2-3600, ¶ 3-3.b(3)(a). As general policy, the Corps gives “...appropriate consideration to all applicable Congressional Acts relating to operation of Federal facilities, i.e., Fish and Wildlife Coordination Act (P.L. 85-624), Federal Water Project Recreation Act-Uniform Policies P.L. 89-72), National Environmental Policy Act of 1969 (P.L. 91-190), and Clean Water Act of 1977 (P.L. 95-217).” ER 1110-2-240, ¶ 6.a.

⁹ ER 1110-2-240, ¶ 6.a.

¹⁰ EP 1165-2-1, ¶ 3-1.

II. ORDINARY REVISIONS OF WATER CONTROL PLAN

The Corps has a fundamental responsibility to manage each project to serve the public interest. This confers a "...broad authority for making, as part of its operations and maintenance efforts, reasonable changes and additions to project facilities within the project boundaries as may be needed to properly operate the project or minimize maintenance."¹¹

The Corps will take "necessary actions" to keep each Water Control Plan (and Manual) up-to-date.¹² Specifically, the plan will be "...revised as necessary to conform with changing requirements resulting from developments in the project area and downstream, improvements in technology, new legislation and other relevant factors, provided such revisions comply with existing Federal regulations and established Corps of Engineers policy."¹³ "The Corps is responsible for insuring the maximum sustained public benefits from each of its projects for all desirable purposes, including power, as integral parts of comprehensive plans for the regulation, control, conservation and utilization of water resources. Consistent with project authorizations, this is a continuing responsibility throughout the planning, design, construction and operation phases."¹⁴

The District uses long-term forecasts and modeling to evaluate whether standard operations (as provided in a Water Control Plan) should be modified to better achieve the project objectives in unusual circumstances.¹⁵ Indeed, "...there is a need to re-evaluate the current regulation as conditions change from those contained in the water control studies, in order to reflect the effects of the current operating experience on future regulation."¹⁶ By maintaining "continuity and surveillance of system regulation, long-term analyses provide the water manager with the ability to anticipate future conditions that may be adverse to meeting the overall water management goals and to take appropriate corrective action in time to be effective."¹⁷ The specific bases and procedures for ordinary revision of a Water Control Plan are discussed in *Appendix E*.

The Corps recognizes that Districts do not consistently or timely revise Water Control Plans:

¹¹ ER 1165-2-119, ¶ 8.a.

¹² ER 1110-2-240, ¶ 6.b.

¹³ ER 1110-2-240, ¶ 6.c.

¹⁴ EP 1165-2-1, ¶ 16-1.

¹⁵ EM 1110-2-3600, ¶ 6-6.d(1).

¹⁶ EM 1110-2-3600, ¶ 6-6.a(1).

¹⁷ EM 1110-2-3600, ¶ 6-6.d(1).

“[D]elays in revision often result from budget and manpower constraints, and the high proficiency of water control managers in performing their duties; i.e., management often decides it can get by without updating the documents and, consequently, assigns this task a very low priority. Continual vigilance by responsible water control managers is required to overcome this unfortunate dilemma.”¹⁸

III. MAJOR MODIFICATION OF PROJECT DESIGN OR OPERATION

Most revisions of a Water Control Plan do not require new authorization and may be lawfully accomplished through the procedures detailed in *Appendix E*. “Further Congressional authorization is not required to add municipal and industrial water supply, water quality, and recreation and fish and wildlife purposes if the related provisions in regulation would not significantly affect operation of the project for the original project purposes.”¹⁹ That means that the District, subject to the ordinary oversight of its Division, has authority to revise a Water Control Plan to implement such general purposes in a manner not inconsistent with the original or other specific project purposes.

Because authorized purposes are now so broad, the Corps can usually revise a Water Control Plan through the standard procedures described in *Appendix E*. “Significant modifications” to a completed project require further authorization from Congress,²⁰ however, unless covered by the Continuing Authorities Program (CAP).²¹ Such modifications include: addition of certain new project purposes, designation of new beneficiaries in areas not previously included within the authorization, construction of a new facility, and acquisition of new real property, including easements and similar interests therein.²² The Corps may undertake a study, under authority of Section 216 of the 1970 Flood Control Act, to recommend such modifications. The process for revising a Water Control Plan that is considered a significant modification of a project’s authorized purposes is described in *Appendix F*.

¹⁸ EM 1110-2-3600, ¶ 3-6.a.

¹⁹ ER 1165-2-119, ¶ 8.c.

²⁰ ER 1165-2-119, ¶ 5.

²¹ There are ten continuing authorities: Section 14, Flood Control Act of 1946; Section 103, River and Harbor Act of 1962; Section 107, River and Harbor Act of 1960; Section 107, River and Harbor Act of 1968; Section 145, Water Resources Development Act of 1976; Section 204, Water Resources Act of 1992; Section 206, Water Resources Development Act of 1996; Section 208, Flood Control Act of 1954; and Section 1135, Water Resources Development Act of 1986. ER 1105-2-100, Appendix F, Table 2-F.

²² ER 1165-2-119, ¶ 5.

IV. RECOMMENDED STRATEGIES

A. Transparency

For any Corps dam of interest, The Conservancy should ask the District, and specifically its Water Management Center, to provide: the Water Control Plan, including Manual, Standing Instructions, and any revisions, as described in *Appendix C*; Annual Water Management Plan described in *Appendix D*, Section B; the nature and composition of any standing committee, as also described in *Appendix D*, Section E; and recent annual and other reports listed in *Appendix G*. Collectively, these documents are the most accurate written description how the Corps operates the project. In turn, this disclosure will alert The Conservancy if the District has not published one or more of these required documents.

The Conservancy should also examine the full congressional history of any project authorization and discuss with the Corps the extent to which the improvement of environmental flows downstream of any Corps dam is consistent with the optimization of all authorized project purposes. One starting point is the Corps' catalog of authorized purposes for all of its dams as of 1994; see *Appendix B*. Such a review of the congressional history and project documentation is exemplified by an October 4, 2007 memorandum to Sam Pearsall (Director of Conservation Science, North Carolina Chapter, The Nature Conservancy, sampearsall@tnc.org) on the Revision of the Water Control Plan for the John K. Kerr dam. See *Appendix H*.

B. Coordination

The Conservancy may conclude that the Water Control Plan, as written or implemented, may be improved for environmental or other purposes. The Conservancy should approach the District to discuss specific concerns and offer to contribute technical expertise. Such expertise may take the form of: modeling alternative operations, or sharing the gaging or other monitoring results for your properties affected by project operations.

The Conservancy may also request that the District consult on real-time operations or plan revision. If you have the support of other stakeholders, you may also ask the District to form a standing committee for this purpose. This positive approach, which is a form of quiet diplomacy, is critical motivation to a District and its staff to consider changes to their status quo.

C. Advocacy

The Conservancy may file a letter with the District Commander, or undertake more formal advocacy, if the District has not revised the Water Control Plan as required, prepared annual or other reports, or otherwise timely and adequately responded to quiet diplomacy. Options for escalating a policy dispute include:

A written request that the District refer the policy dispute to Headquarters' Division of Policy and Policy Compliance, for a Guidance Letter, as described in *Appendix A*, Section C.1;

A request that the District include the dispute, including your recommendations, in the appropriate reports to Division and Headquarters, as described in *Appendix G*; and

Participation in the rate proceeding before the Power Marketing Administration (PMA) or Federal Energy Regulatory Commission, as appropriate, if the dispute involves the PMA's efforts to maximize power generation at the expense of other project functions, as discussed in *Appendix C*, Section D.4(a).

D. Section 216 Study

We recommend against use of a Section 216 study to revise a Water Control Plan, other than exceptional circumstances. Because such a study is funded outside of District's ordinary budget request, the study will likely be delayed as a result of inadequate funding. Further, this special procedure is unnecessary to modify a plan for the purpose of ecological sustainability, provided the recommended operations do not impair flood control, navigation, or other project purposes. The Conservancy was able to obtain an ordinary revision of a Water Supply Plan for the Green River dam to improve environmental flows without a Section 216 study.²³ See *Appendix I*.

V. CONCLUSIONS

Under the Corps own written guidance, project operations must comply with water quality standards and otherwise contribute to ecological sustainability, in addition to achieving the original purposes such as flood protection or navigation. Each District and Division must prepare and disclose a Water Control Plan, along with implementing and reporting documents for each project. The Conservancy should systematically use the opportunities provided by these internal rules to assist the Corps in the revision of Water Control Plans and operations to improve environmental flows.

²³ The reference in the Environmental Assessment to revising this Water Control Plan pursuant to Section 216 of the 1970 Flood Control Act is a misnomer.

APPENDIX A: MANAGEMENT STRUCTURE AND CONTROLS

The Corps is a Major Command within the U.S. Army. It has military and civilian directorates. Of course, domestic projects are under the civilian directorate.

A. Structure

The Directorate of Civil Works has subordinate Headquarters offices responsible for engineering and construction, security, operations, and policy.²⁴

1. Divisions

The Civil Works Directorate has Divisions, also known as Major Subordinate Commands, throughout the nation. These have jurisdiction over specified geographical areas, usually based on watershed boundaries. Their function is “oversight of district programs, to ensure that district programs are producing quality products on time and within budget, and to support policy compliance.” They do not conduct technical reviews.²⁵

2. Districts

Each Division has Districts, also known as District Commands. These are responsible for project design, construction, operation and maintenance. They ensure that projects are “...execute[d] on schedule, within budget, and in compliance with law and policy.” They conduct technical reviews, including development and revision of Water Control Plans. They “...focus on establishing effective and continuous interface with customers to ensure that the customers' requirements and expectations are met or exceeded.”²⁶

3. Laboratories

Through its Directorate of Research and Development, the Corps has specialized laboratories which undertake applied research relevant to the Corps’ mission, including flood protection and related purposes. These include:

Water Resources Support Center, which provides advice and guidance regarding data collection, monitoring, and remote sensing; and which manages and performs special studies regarding national water resources needs and objectives;²⁷

²⁴ EP 1165-2-1, ¶ 4-2.a, Figure 4-1, 4-2. See www.hq.usace.army.mil/hqorg/CECW.htm for the most current chart.

²⁵ EP 1165-2-1, ¶ 4-2.c(1).

²⁶ EP 1165-2-1, ¶ 4-2.c(2).

²⁷ EP 1165-2-1, ¶ 4-2.e(1).

Waterways Experiment Station, which accomplishes model studies for site-specific Division and District design problems;²⁸ and the

Topographic Engineering Center, which undertakes research into topographic sciences.²⁹

“All USACE organizations regularly review their present and future [Civil Works] missions and business program to identify managerial, operational, and engineering problems that could be solved or improved through research and development.”³⁰ The Directorate of Research and Development then assigns tasks to the laboratories based on these requests.

B. Management Controls

The Corps has a system of management controls applicable to activities, including construction, operation, and maintenance of projects.

1. Written Guidance

“Management is founded on issuance, for the uniform observance by all internal Corps offices, of guidance on all aspects of Corps activities....”³¹ These include the Engineer Circulars, Directives, Manuals, Pamphlets, and Regulations.

2. Chain of Command

The Corps has a chain of command. The chain involves very substantial delegation from Headquarters to District. “Decentralization through delegation of authority is a basic tenet of the Corps organization and structure. Managers at each level should have sufficient authority to discharge their missions.”³² Thus, real-time operations of a project, as discussed in Appendix D, is the responsibility of a District, subject to limited oversight of Division, and is rarely referred to Headquarters for any review or approval. Other decisions, such as a District’s recommendation to substantially modify the authorized design of a project, require sequential review and approval of Division and Headquarters. The written guidance specifies the ultimate responsibility for each decision.

²⁸ EP 1165-2-1, ¶ 4-2.e(2).

²⁹ EP 1165-2-1, ¶ 4-2.e(5).

³⁰ EP 1165-2-1, ¶ 23-1.

³¹ EP 1165-2-1, ¶ 4-4.a.

³² EP 1165-2-1, ¶ 4-1.

Notwithstanding the ordinary responsibility for a given decision, the Corps treats its vertical structure as an integrated unit. A District may request the involvement of Division, or a R&D laboratory, to solve a particular problem. "Each USACE activity is expected to conduct business in accordance with these [geographic and functional responsibilities to ensure customers receive the best corporate response to their needs and expectations], and to be open and flexible in entering into voluntary arrangement with each other to jointly satisfy a customer's needs when it is in the best interest of the customer and the corps to do so." This is known as brokering.³³

3. Program and Project Management Business Process

The Program and Project Management Business Process (PMBP) is a set of principles intended to assure that the Corps functions in a business-like manner. PMBP "...focuses attention on the end results -- execution of projects and programs, and customer satisfaction."³⁴ It requires a clear and consistent definition of each project, the assignment of a project manager, and a management plan.³⁵ It "...embodies leadership, systematic and coordinated management, teamwork, partnering, effective balancing of competing demands, and primary accountability for the life-cycle ... of a project."³⁶

C. Quality Control for Policy and Science

The Corps has procedures and other requirements for quality control for policy decisions and scientific analysis related to a Water Control Plan.

1. Policy Review

The District makes most decisions related to a Water Control Plan, or project operations, on its own and without referral to the Division or Headquarters. However, even given the extensive written guidance documents (totaling many linear feet), some decisions apply policy in ways not clearly resolved by the guidance. The guidance to "optimize project benefits" does not explain how to resolve the conflict between an extra increment of hydropower generation and enhancement of environmental quality. The District may request a policy conference with Division or Headquarters on "...unusual or particularly complicated problem solutions."³⁷ "In

³³ EP 1165-2-1, ¶ 4-1.f.

³⁴ EP 1165-2-1, ¶ 4-4.b.

³⁵ EP 1165-2-1, ¶ 4-4.b(1).

³⁶ EP 1165-2-1, ¶ 4-4.b(3)

³⁷ EP 1165-2-1, ¶ 4-4.a.

special circumstances, less formal 'guidance letters' (e.g., Policy Guidance Letters (PCLs) are addressed directly to the MSCs and DCs."³⁸

2. Scientific Analysis

The study of a project, including the development or revision of a Water Control Plan, depends on scientific information to evaluate the benefits, costs, and other impacts of an alternative plan of operation. The scientific disciplines include: engineering, hydrology, geomorphology, biology and other sciences relevant to the beneficial use of the affected waters and other resources. The methods include modeling and analysis of monitoring data.

a. Independent Technical Review

A District undertaking such a study uses Independent Technical Review (IRT) of the scientific information. Specifically, each decision document that may be approved by a District Commander "will undergo ITR that will 'ensure the quality and credibility o the government's scientific information' in accordance with the quality assurance and quality control procedures of each major subordinate command."³⁹

"ITR is a critical examination by a qualified person or team that was not involved in the day-to-day technical work that supports a decision document. ITR is intended to confirm that such work was done in accordance with clearly established professional procedures, practices, codes and criteria."⁴⁰ ITR is undertaken by Corps employees who have appropriate expertise and are not routinely involved in the project or its study.

b. External Peer Review

In addition, the Corps now uses External Peer Review (EPR) for a decision document which, in the judgment of a vertical team including District and Division, "...is novel, is controversial, is precedent setting, has significant interagency interest, or has significant economic, environmental and social effects to the nation."⁴¹ Such peer review, which is undertaken by experts outside of the Corps, is appropriate "...in special cases where the risk and magnitude of the proposed project are such that a critical examination by a qualified person or team outside of the Corps and not involved in the day-to-day production of a technical product is necessary."⁴²

³⁸ EP 1165-2-1, ¶ 4-4.a.

³⁹ EC 1105-2-408, ¶ 2.b(2).

⁴⁰ EC 1195-2-408, ¶ 4.a.

⁴¹ EC 1105-2-408, ¶ 9.a.

⁴² EC 1105-2-408, ¶ 4.b.

c. Planning Models Improvement Program

The Planning Models Improvement Program (PMIP) is a "...process to review, improve, and validate analytical tools and models for Corps Civil Works business programs."⁴³ The Directorate of Research and Development manages this program.

D. Financial Controls

The Corps has a system of financial controls for all activities, including project construction, operation, and maintenance.

1. Cost Allocation

The costs of construction, operation, and maintenance for a given project are divided among authorized functions (flood protection, power, and so on) using the Separable Costs-Remaining Benefits (SCRB) method.⁴⁴ The *Principles and Guidelines* (EP 1165-2-1, Chapter 5) describe the allocation formulas, which are elaborate. As a general matter, the District allocates capital costs by function before construction and then periodically adjusts them to reflect modifications or repairs. O&M costs are allocated periodically based on actual operating experience.

2. Cost Sharing

Federal law also requires that local sponsors and other beneficiaries share in certain capital and operational costs of a project. Cost sharing seeks to "...maintain a reasonable balance between the responsibilities assumed by the Federal Government and those left with the States and other non-Federal entities."⁴⁵ Again, the *Principles and Guidelines* (EP 1165-2-1, Chapter 6) establish elaborate formulas for determining such shares, by function. The District typically enters into a Cost-Sharing Agreement before construction. Revenues are then credited against the relevant share, by function. Thus, as discussed in Appendix C, Section C.4., a federal Power Marketing Authority (PMA) markets all generating capacity and power for a project, and the revenues (net of the PMA's costs for such marketing) are then credited against the net investment in the power function.

⁴³ EC 1105-2-409, ¶ 4.c(9).

⁴⁴ EP 1165-2-1, ¶ 16-3.

⁴⁵ EP 1165-2-1, ¶ 6-1.

APPENDIX B: AUTHORIZED PURPOSES

In a Congressionally directed review of the authorized purposes of all its projects, the Corps explained these categories of purposes.

“The purposes that a reservoir is to serve are given in laws that may be grouped into three categories: (1) laws initially authorizing construction of the project; (2) laws specific to the project passed subsequent to its construction; and (3) laws that apply generally to all Corps reservoirs. In the latter category, the following laws have the greatest relevance to Corps reservoirs:

PL 78-534, Flood Control Act of 1944 (provides authority to add recreation as a purpose and to contract for use of surplus water for domestic purposes)

PL 85-500, Title III, Water Supply Act of 1958 (provides authority to include storage for municipal and industrial supply)

PL 85-624, Fish and Wildlife Coordination Act of 1958 (provides authority to modify projects to conserve fish and wildlife)

PL 92-500, Federal Water Pollution Act Amendments of 1972 (establishes goal to restore and maintain the quality of the Nation’s waters)

PL 93-93-205, Endangered Species Act of 1973 (provides authority for operating projects to protect threatened and endangered fish/wildlife)

Project specific authorizations (categories 1 and 2 above) are found in a variety of public laws but most commonly in a series of River and Harbor and Flood Control acts passed by Congress since 1870. Recent project authorizations have been contained in a series of Water Resources Development acts. Commonly the purposes of a reservoir are not identified directly in the authorizing law but instead are contained in reports of the Secretary of the Army, Chief of Engineer Board of Engineers for Rivers and Harbors, or others referred in the law. Purposes may be added or deleted by laws passed subsequent to construction.” W.K. Johnson and R. J. DiBuono, U.S. Army Corps of Engineers, Hydrologic Engineering Center, *Authorized and Operation Purposes of Corps of Engineers Reservoirs* (1994), p. 8.

The term “original purposes” therefore refers to those purposes found in the statute originally authorizing any Corps project. For example, the 1944 Flood Control Act (P.L. 78-534) authorized John H. Kerr Dam in North Carolina “...for flood control and other purposes recommended by the Chief of Engineers in House Document Numbered 860...,” which in turn listed navigation and power as other original purposes. “Other specific purposes,” refers to other purposes added by statutory amendment for that same project. “General purposes,” means those purposes applicable to all federal facilities, including Corps projects, under general laws such as the Clean Water Act. “Project purposes” refers collectively to all such authorized purposes for a given project.

APPENDIX C: SUBSTANTIVE CONTENT OF A WATER CONTROL PLAN

A. Applicability

The Corps adopts and implements a Water Control Plan for each dam and reservoir,⁴⁶ lock,⁴⁷ and associated levee⁴⁸ which it owns and operates.

The Corps also regulates flood protection and navigation at projects which are constructed or operated by certain other entities. These include: water supply projects of the U.S. Bureau of Reclamation, and hydropower projects of non-federal entities licensed by the Federal Energy Regulatory Commission. Such regulation occurs through a Water Control Plan, as well.⁴⁹

A Water Control Plan (including Manual) establishes the "...plan of regulation" to achieve "all water management goals" for the project, as well as the "techniques, organizations, systems, and facilities" involved in such regulation.⁵⁰

B. Preparation of Water Control Plan

The Corps District prepares the Water Control Plan (and Manual) for each project within its boundaries, subject to approval by its Division.⁵¹

1. Schedule

The District prepares an Interim Plan while the project is under construction; a Preliminary Plan when full-scale operation begins; and a Final Plan within 1 year after operation begins.⁵² It prepares a Master Manual if the Corps operates several projects in a basin.⁵³ The

⁴⁶ Flood Control Act of 1944, P.L. 78-534 (58 Stat. 887), 33 U.S.C. § 709. *See* ER 1110-2-240, ¶ 4.a and ¶ 6.a.

⁴⁷ ER 1110-2-240, ¶6.a.

⁴⁸ EM 1110-2-3600, ¶ 2-2.f - 2.2.g.

⁴⁹ ER 1110-2-240, ¶ 4.b.

⁵⁰ EM 1110-2-3600, § 3-2.a(1).

⁵¹ ER 1110-2-240, ¶ 7.a, ¶ 7.c.

⁵² EM 1110-2-3600, ¶ 9-3.a.

⁵³ ER 1110-2-240, ¶ 9.b.

District revises the plan periodically thereafter in response to changed information or circumstances.⁵⁴

2. Compliance with the National Environmental Policy Act

The Corps, like every federal agency, complies with the National Environmental Policy Act (NEPA),⁵⁵ which requires the “[u]se [of] all practicable means, consistent with the requirements of the Act and other essential considerations of national policy, to restore and enhance the quality of the human environment and avoid or minimize any possible adverse effects of their actions upon the quality of the human environment.”⁵⁶ Under that statute, a federal agency prepares an Environmental Assessment (EA) or Impact Statement (EIS) for any discretionary action which may have a significant impact on environmental quality.⁵⁷

That general obligation is subject to categorical exclusions for actions which individually and cumulatively are considered not to have significant impacts.⁵⁸ The Corps has categorical exclusions for “activities at completed Corps projects which carry out the authorized project purposes,”⁵⁹ and for all “general plans.”⁶⁰ As a matter of practice, the Corps does not prepare an EA or EIS to prepare or revise a Water Control Plan. It evaluates project impacts on environmental quality under legal authorities other than NEPA, including its own authorizing statutes, Clean Water Act, and Endangered Species Act.

3. Public Involvement

The District develops a Water Control Plan (or any revision) “...in concert with all basin interests which are or could be impacted by or have an influence on project regulation.”⁶¹ At a minimum, this requires “close coordination” with all other public agencies with jurisdiction over the affected resources.⁶² In addition, the District holds one or more public meetings, subject to

⁵⁴ ER 1110-2-240, ¶ 6.b.

⁵⁵ 42 U.S.C. §§ 4321 *et seq.*

⁵⁶ 40 C.F.R. § 1500.2(f).

⁵⁷ See definitions in 40 C.F.R. §§ 1508.9 (environmental assessment), 1508.11 (environmental impact statement), 1508.18 (major action), and 1508.27 (significantly).

⁵⁸ See definition in 40 C.F.R. § 1508.4 (categorical exclusion)..

⁵⁹ ER 200-2-2, ¶ 9.a.

⁶⁰ ER 200-2-2, ¶ 9.d.

⁶¹ ER 1110-2-240, ¶ 6.i.

⁶² ER 1110-2-240, ¶ 6.i.

30 days advance notice, to receive public comment on any revision that may result in a substantive revision of a plan.⁶³

4. Review of Decision Document

The Corps has detailed requirements for internal review of a decision document, including a Water Control Plan, for policy and technical adequacy. This memo addresses those requirements in the context of plan revisions, in Appendices E and F below.

C. Substantive Content of a Water Control Plan

1. Plan of Operations

The plan of operations established by the Water Control Plan is “comprehensive” and is intended to “best meet”⁶⁴ project purposes such as flood protection and navigation,⁶⁵ as well as the protection of environmental quality in the reservoir, immediate tailwaters, and downstream watershed.⁶⁶

a. Hydrologic and other Environmental Baseline

A Water Control Plan includes an analysis of pre-project conditions for hydrology (including flow exceedance curves; land uses, particularly along the reservoir shoreline and downstream in the areas intended for flood protection; and water quality, including physical, chemical, and biological measurements.⁶⁷ This baseline analysis is necessary for predictions of future conditions and thus the selection of operating requirements which will best meet the project purposes in those conditions.⁶⁸

b. Guide Curves

⁶³ ER 1110-2-240, ¶ 7.c.

⁶⁴ EM 1110-2-3600, ¶ 3-2.b(5).

⁶⁵ ER 1110-2-240, ¶ 6.a.

⁶⁶ EM 1110-2-3600, ¶ 3-2.b(5).

⁶⁷ EM 1110-2-3600, ¶ 3-2.b(2).

⁶⁸ EM 1110-2-3600, ¶ 3-2.b(2).

The Water Control Plan includes water control diagrams, commonly known as guide curves, which are tables that govern the storage and release to meet all project functions.⁶⁹ These curves typically relate storage or inflow to release, by function and by year-type, month, or season.⁷⁰ They are the “means for balancing the relative use of storage space in reservoirs when conflicting multipurpose functions occur and for achieving a compromise as may be necessary to meet the project's functional commitments.”⁷¹

The guide curves are just that: guides to the project operators. Each Water Control Plan also reserves the discretion of the District to modify operations on a real-time basis.

“The water control diagrams are an important element of the water control plan in that they provide the technical guidance and specific rules of regulation that are mandated as the result of studies and the review and approval process in the planning and design phases as well as in the operational phase. However, the diagrams are only a part of the overall water control plan, which provides for adjusting project regulation on the basis of other factors that may develop in actual operation as the result of unique hydrometeorological conditions, changing water control requirements, and other factors which may influence current project regulation.”⁷²

c. Standing Instructions

The Water Control Plan includes “Standing Instructions to Project Operators for Water Control.”⁷³ These instructions specify the step-by-step actions by damtenders, power plan superintendents, lock masters, and other employees who operate a dam or other water control facility.

2. Flood Protection

Each Water Control Plan for a project which includes flood protection as an authorized purpose will specify the requirements for storage and release. These requirements are typically expressed as: storage reserved for flood protection, and increments of flow release depending upon the extent of encroachment into the reserved storage.

Those requirements reflect the Congressional policy, established in the 1936 Flood Control Act, that “...flood control (e.g., flood damage reduction) on navigable waters and their

⁶⁹ EM 1110-2-3600, ¶ 3-3.a(1).

⁷⁰ EM 1110-2-3600, ¶ 3-3.a(1).

⁷¹ EM 1110-2-3600, ¶ 3-3.d(2)(c).

⁷² EM 1110-2-3600, ¶ 3-3.a(2).

⁷³ EM 1110-2-3600, ¶ 9-2.a.

tributaries is in the interest of the general public welfare and is therefore a proper activity of the Federal Government....”⁷⁴ Since that date, the general management objective for each such project is to “...reduce flood damages to the extent possible with available facilities.”⁷⁵ The plan to achieve this objective is a function of location and types of damages to be prevented; location and amount of storage capacity; flood volumes, durations, and frequencies; and the extent of the uncontrolled drainage area.⁷⁶

a. Basis for Operating Requirements

In the Water Control Plan, a District bases the operational requirements for flood protection on a pre-construction study of alternative methods of operation of a given project.

That study has three fundamental elements. First, “it is the policy of the Corps to consider in the planning process all practicable and relevant alternatives applicable to flood damage reduction.”⁷⁷ “Nonstructural measures are defined as those which reduce or avoid flood damages, without significant alternating the nature or extent of flooding, by changing the use made of flood plains or accommodating existing uses to the flood hazard.”⁷⁸ “A complete description of the [recommended] plan includes all structural, nonstructural, legal and institutional features, both existing and proposed, that contribute to the intended flood control outputs.”⁷⁹

Second, the Corps uses design flood criteria, which describe the maximum volume and frequency of flood flow which the project is designed to control.⁸⁰ The District evaluates the reliability and performance of the project “...as the protection for a target percent chance exceedance flood with a specified reliability. For example, the proposed project is expected to contain the one-half percent change exceedance flood, should it occur, with a ninety percent reliability...To fully define how a project is expected to function requires describing project impacts at several flood levels and locations.”⁸¹

⁷⁴ EP 1165-2-1, ¶ 13-1.

⁷⁵ EM 1110-2-3600, ¶ 3-3.c(1)(a).

⁷⁶ EM 1110-2-3600, ¶ 3-3.c(1)(a).

⁷⁷ EP 1165-2-1, ¶ 13-3.

⁷⁸ EP 1165-2-1, ¶ 13-7.

⁷⁹ EP 1165-2-1, ¶ 13-8.

⁸⁰ EP 1165-2-1, ¶ 13-4.

⁸¹ EP 1165-2-1, ¶ 13-4.f.

Third, the Corps evaluates the comparative effectiveness of three alternative methods of flow regulation. The plan of regulation in the Water Control Plan will be based on one of them. Method A makes maximum beneficial use of available storage during each flood event. Method B uses storage to control the project design flood. Method C is a combination.⁸² The Corps recognizes that each general method has “inherent strengths and weaknesses.”⁸³ For example, the Corps recognizes that releases of stored floodwaters may “increas[e] the duration of flooding during flood recessions.”⁸⁴ The District uses its study of hydrology and other watershed conditions to determine the “optimum plan” for a given project.⁸⁵

b. Floodplain Management

The non-federal sponsor for a given project which provides flood protection is “...required to comply with Federal floodplain management and flood insurance programs (e.g., the National Flood Insurance Program which requires the adoption of land use control measures to prevent construction in the floodway, or construction of permanent structures in the balance of the floodplain with first floors below the 100-year flood level.”⁸⁶ “Within one year after the date of signing a [Project Coast Allocation Agreement] for construction of a project to which the aforementioned requirement applies, the non-Federal interest is required to prepare a flood management plan (FPMP) designed to reduce the impacts of future flood events in the project area, and to implement such FPMP not later than one year after completion of construction of the project.”⁸⁷ In effect, the plan of operation in the Water Control Plan assumes floodplain management by the non-federal sponsor.

3. Drought

The Water Control Plan includes a Drought Contingency Plan.⁸⁸ Relying on "system studies" of historic droughts and other low-flow conditions, the plan seeks to meet all project functions in a “complimentary” manner during a drought.⁸⁹ It includes tentative priorities and strategies based on a systems analysis of how best to optimize project functions during low

⁸² EM 1110-2-3600, ¶ 3-3.c(2)(b) - (d).

⁸³ EM 1110-2-3600, ¶ 3-3.c(2)(d).

⁸⁴ EM 1110-2-3600, ¶ 3-3.c(2)(d).

⁸⁵ EM 1110-2-3600, ¶ 3-3.c(2)(d).

⁸⁶ EP 1165-2-1, ¶ 13-10.d.

⁸⁷ EP 1165-2-1, ¶ 13-10.d.

⁸⁸ EM 1110-2-3600, ¶ 7-7.

⁸⁹ EM 1110-2-3600, ¶ 3-2.e(2).

flows.⁹⁰ It also includes a plan for coordination with affected river users, including the establishment of a standing Drought Advisory Committee.⁹¹

4. Hydropower

Many Corps dams include powerplants. For any powerplant which is federally owned,⁹² the Water Control Plan establishes the appropriate storage and release for operation, while U.S. Department of Energy markets the capacity and power.

a. Cost Allocation and Power Rates

Under the 1944 Flood Control Act, as amended by the 1978 Energy Reorganization Act, the Corps delivers power from its reservoir projects, not required for the operation of its facilities, to the U.S. Department of Energy's Power Marketing Administrations (PMA).⁹³ These are: Southeastern Power Administration, Southwestern Power Administration, Alaska Power Administration, and the Western Area Power Administration. The applicable PMA markets the power to "encourage the most widespread use thereof at the lowest possible rates to consumers consistent with sound business principles."⁹⁴ "All allocated hydroelectric power costs will be funded by the Corps and ultimately repaid to the U.S. Treasury out of the power revenues collected by the Federal marketing agency."⁹⁵

Before construction, the District estimates capacity, power generation, and the severable costs of construction, operation, and maintenance related to power generation. "The Corps of Engineers is responsible for determining the costs allocated to the hydroelectric power function."⁹⁶ It periodically updates the allocated costs on the basis of capital modifications, repairs, or operating experience.

Based on the cost allocation as well as the estimated power generation provided by the Corps, the PMA establishes rates for the sale of power. These rates must be sufficient to

⁹⁰ EM 1110-2-3600, ¶7-7.b.

⁹¹ EM 1110-2-3600, ¶7-7.c.

⁹² A non-federal entity may construct and operate a powerplant at a Corps dam, with the Corps' permission and subject to a license from the Federal Energy Regulatory Commission. See note 85.

⁹³ EP 1130-2-510, ¶ 2-2.b. See <http://www.energy.gov/organization/powermarketingadmin.htm>.

⁹⁴ EP 1130-2-510, ¶ 2-2.b.

⁹⁵ EP 1165-2-1, ¶ 6-6.

⁹⁶ EP 1165-2-1, ¶ 16-3.

“...recover the costs of producing and transmitting the power, including repayment of the Federal investment, over a reasonable period of years (50 years is established by the Secretary [of the Army]).”⁹⁷ The DOE adopts the rates by administrative order, and then submits them to the Federal Energy Regulatory Commission (“FERC”) for approval under the Federal Power Act.⁹⁸

b. Operating Requirements

The Corps and the applicable PMA have a Water Management Agreement (WMA) for any federally-owned powerplant at a project. The agreement is “supplementary” to the Water Control Plan. It provides that the PMA markets the capacity and power from the powerplant. It establishes directions for the Corps' operation of the project so as to "maximize[e] hydropower generation" in a manner that “prevent[s] significant conflict with other water control objectives...”⁹⁹ The Corps provides written notice to the PMA of any change in operation or other condition which could substantially affect the cost or availability of power.¹⁰⁰

It is customary that a non-federal utility operates the powerplant at a Corps project. This arrangement occurs, for example, where the utility also operates its own hydropower project in the same basin. Such an arrangement is controlled by a contract between the United States (on behalf of the Corps), the PMA, and the utility. The contract typically specifies: the dependable capacity of the federal powerplant, a monthly power generation, and procedures for dispatch of the powerplant on a real-time basis, and obligations to transmit power to preference customers served by the PMA. In effect, the contract carries forward the operating requirements of the Water Control Plan for power generation. However, such a contract cannot limit the Corps' authority to modify the plan or otherwise regulate project operations to optimize benefits for all project purposes.

Thus, the Corps is responsible to operate a project and provide information on cost and availability of power to the PMA, subject to delegation of authority to a utility to operate a

⁹⁷ EP 1165-2-1, ¶ 16-5.a.

⁹⁸ EP 1165-2-1, ¶ 16-5.a. *See*, for example, “DOE Rate Order No. SEPA-46,” administratively adopting rates for Kerr Dam in Virginia (*available at* www.ferc.gov, e-Library no. 20060823-0142 (Aug. 15, 2006)); “Notice of Filing” for approval of that order under 16 U.S.C. § 825s (FERC e-Library 20060824-3039 (August 24, 2006)); and FERC’s “Order Confirming and Approving Rate Schedules on a Final Basis” (e-Library no. 20061208-3010 (Dec. 8, 2006)).

⁹⁹ EM 1110-2-3600, ¶ 8-4.b(4)(a). For a non-federal powerplant at a Corps project, the Corps and non-federal licensee have a Memorandum of Understanding which specifies “operational procedures and power guide curve [that is]...consistent with overall project management objectives and efficient system regulation.” EM 1110-2-3600, ¶ 8-4.b(4)(b).⁹⁹ This memo focuses on federally owned powerplants.

¹⁰⁰ EP 1130-2-510, ¶ 2-3.e(2)(a).

project to comply with the existing Water Control Plan. In turn, the PMA is responsible for marketing the power surplus to project operation and for recovering the federal investment.¹⁰¹ Put another way, the PMA does not have any authority to direct operations of a Corps project, even for power generation. Instead, the Corps has exclusive authority to operate the project in a manner that optimizes all project purposes. The WMA reflects this general obligation and, while providing direction to the Corps for power operations, preserves the Corps' discretion to adjust operations as necessary for prevention or minimization of conflict with other project purposes.

The Corps' general guidance finds that power generation may have "...adverse impacts on fish and wildlife habitat, aesthetics, navigation and public safety."¹⁰² "Reservoir releases to provide peak power service may result in a substantial change in the regimen of a stream. In some cases, the change from relatively steady rates of flow to frequent fluctuations may cause undesirable effects. Fluctuation may reduce the benefits from other reservoir functions, such as recreation, pollution abatement, and water supply."¹⁰³ Absent a re-regulation dam, the Water Control Plan will include "specific operating limits for fluctuations in power production and/or water level in the river system below the project]..."¹⁰⁴ "Positive means to prevent or reduce adverse effects are considered in the planning and operation phases. Tangible and intangible benefits may be obtained from measures such as: modification in power output; location of a re-regulating reservoir downstream; or acquisition of additional interest in land."¹⁰⁵

5. Protection of Environmental Quality

Protection of environmental quality is an integral element of any Water Control Plan, even if the authorizing statute for a given project is limited to developmental uses such as flood protection.

a. Environmental Operating Principles

The Corps adopted Environmental Operating Principles (EOP) in 2002. These principles "embrace the concept of sustainability"¹⁰⁶ in all activities "...to the extent legally and financially practicable..."¹⁰⁷ The EOP define sustainability as a "synergistic process whereby

¹⁰¹ EP 1130-2-510, ¶ 2.2.e(2)(a).

¹⁰² EM 1110-2-3600, ¶ 4-10.h(5).

¹⁰³ EP 1165-2-1, ¶ 16-8.a.

¹⁰⁴ EM 1110-2-3600, ¶ 4-10.h(5).

¹⁰⁵ EP 1165-2-1, ¶ 16-8.b.

¹⁰⁶ Commander's Policy Memorandum #12 (April 1, 2005).

¹⁰⁷ ER 200-1-5, ¶ 6.

environmental and economic considerations are effectively balanced through life cycle of project planning, design, construction, operation and maintenance to improve the quality of life for present and future generations." ¹⁰⁸

Under the EOP and other general guidance, the Corps applies “principles of good environmental stewardship” in its administration of each project. “Environmental stewardship shall include both passive and proactive management to sustain healthy ecosystems and biodiversity, and conserve natural resources, such that Corps' lands and waters are left in a condition equal to or better than their condition when acquired, and such that those natural and cultural resources are available to serve the needs of present and future generations.”¹⁰⁹

The Corps defines ecosystem as a “biotic community held together with its physical environment considered as an integrated unit.”¹¹⁰ The objective of ecosystem management is to “restore and sustain the health, productivity, and biological diversity of ecosystems and the overall quality of life through a natural resources management approach that is fully integrated with social and economic goals.”¹¹¹ The Corps recognizes and seeks to remedy the “problems of habitat fragmentation and piecemeal restoration and mitigation....”¹¹² It addresses unintended (as well as foreseeable) impacts “both on and off the project site.”¹¹³

The Corps may pursue ecosystem protection and restoration through water control activities, including revision to a Water Control Plan, without new authority.¹¹⁴ “Additional opportunities for ecosystem restoration and protection may also be pursued through existing project authorities for the management of operating projects, e.g., through water control changes, or as part of natural resources management.”¹¹⁵

Collaboration with stakeholders is “integral” to such restoration.¹¹⁶ “The Corps will solicit participation from Federal, tribal, state, and local agencies, organizations, and the local

¹⁰⁸ EC 1105-2-404, ¶ 4.a.

¹⁰⁹ ER 1130-2-540, ¶ 1-2.

¹¹⁰ EP 1165-2-502, ¶ 7.a.

¹¹¹ EP 1165-2-502, ¶ 7.e.

¹¹² EP 1165-2-502, ¶ 7.e.

¹¹³ EP 1165-2-502, ¶ 7.g.

¹¹⁴ EP 1165-2-502, Table 2.

¹¹⁵ EP 1165-2-502, ¶ 5, Table 2.

¹¹⁶ EP 1165-2-502, ¶ 7.o.

community to ensure their interests are considered in the formulation and implementation of this effort.”¹¹⁷ Indeed, “major Subordinate Commands should encourage and develop partnerships with Federal, state, and tribal agencies and non-governmental organizations in the accomplishment of restoration studies and financing. Cooperative efforts could include, for example, information and data base sharing, cooperating planning efforts, as well as collaboration in implementation, operation and maintenance, and monitoring activities.”¹¹⁸

b. Water Quality

Each Corp project must comply with water quality standards.¹¹⁹ “Typically, projects built for flood control operate only 2 to 3 percent of the time and must operate for water quality to some degree all of the time.”¹²⁰ Thus, it is “essential” that the District properly include water quality in its daily real-time decisions.¹²¹

For each project, the general management objective “...is to maximize beneficial uses of the resource through enhancement and nondegradation of water quality. Attaining that goal requires continuous efforts at managing water quality by developing programs and objectives and performing the necessary studies, data collection, analysis, coordination, and real-time management.”¹²²

The District also develops “specific water quality management objectives” for each project. These objectives are intended to assure that the project complies with applicable water quality standards; “...offer[s] the lowest stress possible to the aquatic environment”; and where degraded conditions exist, contributes to the restoration of “the aquatic environment to a desirable, biologically diverse, productive and robust condition.”¹²³

c. Fish and Wildlife

¹¹⁷ EP 1165-2-1, ¶ 3-20.b.

¹¹⁸ EP 1165-2-502, ¶ 10.b.

¹¹⁹ 33 U.S.C. § 1251 *et seq.* Executive Order 12088, *Federal Compliance with Pollution Control Standards* (1978), requires compliance by federal facilities and activities with applicable pollution control standards. *See* EM 1110-2-3600, ¶ 2-6.b(1), ER 1110-2-8154.

¹²⁰ EM 1110-2-3600, ¶ 2-6.a.

¹²¹ EM 1110-2-3600, ¶ 2-6.a.

¹²² EM 1110-2-3600, ¶ 2-6.a.

¹²³ ER 1110-2-8154, ¶¶ 8, 8.j-k.

Under the 1958 Fish and Wildlife Coordination Act, the Corps gives equal consideration to fish and wildlife and the project purposes established by the authorizing statute for a project.¹²⁴ To the extent practicable, the Corps prevents damages to fish and wildlife by "...incorporating the mitigation principles defined within the Council on Environmental Quality's NEPA guidelines, i.e., first avoid the impact; next, minimize the impact; and finally, compensate for unavoidable damages to significant fish and wildlife resources."¹²⁵ "Water control managers should take the initiative to evaluate opportunities for managing fish and wildlife habitats, by *continually* evaluating the effects of project regulation."¹²⁶ "Fish and wildlife conservation...shall be coordinated with other features of water resource development programs through effective planning, development, and maintenance...."¹²⁷

d. Threatened and Endangered Species

Under Endangered Species Act (ESA) section 9, the Corps must operate a project to prevent the take of any species of fish or wildlife listed as threatened or endangered.¹²⁸ Under ESA section 7(a)(2), and in consultation with the U.S. Department of Interior or Commerce as appropriate, the Corps must "...utilize their authorities in furtherance of the purposes of [the ESA] by carrying out programs for the conservation of endangered species and threatened species . . ."¹²⁹

6. Monitoring

As a general water control policy, the Corps monitors each completed project "to ascertain whether they continue to function in a satisfactory manner and whether potential exists for better serving the public interest. Such monitoring may be accomplished coincidentally in carrying out existing project inspection programs, as a by-product of the day-to-day operations of on-site Corps personnel charged with project operations. Whenever reporting officers find that changes in a completed project may be desirable, investigations should be undertaken to document the need for and feasibility of project modification."¹³⁰

¹²⁴ 16 U.S.C. § 661 *et seq.* See EM 1110-2-3600, ¶ 2-7.a.

¹²⁵ EP 1165-2-1, ¶ 19-21.

¹²⁶ EM 1110-2-3600, ¶ 2-7.b(2).

¹²⁷ EP 1165-2-1, ¶ 19-17.

¹²⁸ 16 U.S.C. § 1538.

¹²⁹ 16 U.S.C. § 1536(a)(1). See also *Sierra Club v. Glickman*, 156 F.3d 606, 618 (5th Cir. 1998) (the plain language of section 7(a)(1) requires each federal agency to adopt substantive conservation programs for listed species in consultation with and with the assistance of the Fish and Wildlife Service).

¹³⁰ ER 1165-2-119, ¶ 5.

The monitoring program is intended to "...identify long-term trends as well as abrupt changes. In some instances, special studies of reservoir conditions will be required in order to develop guidance for modifying operating procedures or, perhaps, control structures. Such studies may be relatively simple in time and scope or may require modeling, reservoir system analysis or physical model applications."¹³¹

a. Water Control Data System

In developing a Water Control Plan, the District uses systems analysis to develop, test, and refine the guide curves.¹³² Before initial impoundment, the curves are based on hindsight. The District uses historical flow data to predict future conditions.¹³³ It also uses system analysis to evaluate long-term water use for each project function under these curves.¹³⁴ After the start of operations, the District then periodically re-applies system analysis to refine these curves.¹³⁵

The Water Control Plan provides for a Water Control Data System (WCDS). This system, as described in a Master Plan, provides "...knowledge of current project and hydrologic conditions, project capabilities and restraints and water control elements in the river system that affect streamflow, water level, and water quality."¹³⁶ It is a "comprehensive data base."¹³⁷ The Master Plan includes facilities and procedures for: observation and storage of data at field stations, transmission from the field stations, storage and management in a database, analysis, and exchange with other users.¹³⁸

The Water Control Data System fundamentally manages hydrometeorological data. These include: project storage and release, inflow, precipitation, and evaporation; groundwater; ambient temperatures, humidity, evaporation, and wind.¹³⁹

¹³¹ EM 1110-2-3600, ¶ 3-6.d(3).

¹³² EM 1110-2-3600, ¶ 3-3.d(2)(a)

¹³³ EM 1110-2-3600, ¶ 3-4.a.

¹³⁴ EM 1110-2-3600, ¶ 3-4.c.

¹³⁵ EM 1110-2-3600, ¶ 3-6.a.

¹³⁶ EM 1110-2-3600, ¶ 5-1.b(1).

¹³⁷ EM 1110-2-3600, ¶ 3-2.b(2)

¹³⁸ EM 1110-2-3600, ¶ 5-1.b(2).

¹³⁹ EM 1110-2-3600, ¶ 5-2.b(2).

b. Water Quality

Monitoring of water quality is also “essential for real-time water control management.”¹⁴⁰ Under the Water Control Data System, the District takes field samples of temperature, conductivity, dissolved oxygen, pH, turbidity, and other parameters as appropriate.¹⁴¹ The monitoring is intended to “develop an understanding of cause and effect relationships”¹⁴² between project operations and water supply, aquatic habitat, and fisheries.¹⁴³ “These monitoring activities will provide data for daily operating decisions, evaluating long-term trends or changes in water quality conditions and tracking the effectiveness of the operating plan.”¹⁴⁴

c. Adaptive Management

“Post-construction monitoring of mitigation measures may be necessary, in some cases, and should be designed to evaluate whether or not the mitigation measures are working as planned following their construction. Adaptive management is a technique that should be considered for monitoring programs for projects/measures that have the potential for uncertainty in achieving their objectives.”¹⁴⁵

“Creativity in the development of monitoring arrangements and assessing project performance is encouraged. Collaborative monitoring efforts and information sharing with the sponsor and among resource agencies, academic institutions, the research community and nonprofit organizations will improve the efficiency and the effectiveness of data collection and project performance evaluation.”¹⁴⁶

d. Environmental Compliance

A District periodically undertakes an Environmental Compliance Assessments is to identify and correct noncompliance with environmental requirements at a project. This assessment is “...a proactive approach to assuring that potential environmental protection and

¹⁴⁰ EM 1110-2-3600, ¶ 5-2.d(1).

¹⁴¹ EM 1110-2-3600, ¶ 5-2.d(2).

¹⁴² EM 1110-2-3600, ¶ 5-2.d(1).

¹⁴³ EM 1110-2-3600, ¶ 3-2.b(3).

¹⁴⁴ EM 1110-2-3600, ¶ 3-2.b(5).

¹⁴⁵ EP 1165-2-1, ¶ 19-21.f.

¹⁴⁶ EC 1105-2-409, ¶ 9.b.(4).

compliance issues are promptly identified. Once identified, the full range of specialties with the Corps can be called on to assist in their resolution. Deficiencies are prioritized and corrective actions taken as routine maintenance work or programmed in the Civil works budget process.”¹⁴⁷ The assessment is based on “The Environmental Assessment and Management (TEAM) Guide and the Environmental Review Guide for Operations (ERGO),” which are the “...foundation of a comprehensive program to achieve, maintain, and monitor compliance with applicable environmental laws and regulations, and to implement good management practices.”¹⁴⁸

¹⁴⁷ EP 1165-2-1, ¶ 11-17.b(2)(a).

¹⁴⁸ EP 1165-2-1, ¶ 11-18.b(2)(b).

APPENDIX D: REAL-TIME PROJECT OPERATIONS

As discussed below, the District, through its Commander and actual line operators, have discretion to modify the guide curve and other requirements of the Water Control Plan in the course of actual operations, as necessary to protect public safety or otherwise respond to unforeseen or unusual circumstances.

A. Line Responsibility for Plan Implementation

Each project has employees who operate the physical controls, such as damtenders, power plan superintendents, lock masters, and resource managers. The Water Control Plan and Manual include “Standing Instructions to Project Operators for Water Control” to assure efficient and routine operation of each project.¹⁴⁹ These establish step-by-step instructions for operations during normal and emergency conditions, data collection, and other water control activities.¹⁵⁰

The project operators report to the District's Water Management Center.¹⁵¹ In turn, the District reports to the Division's Water Control Center.¹⁵²

B. Annual Water Management Plan

The District adopts an Annual Water Management Plan to implement the Water Control Plan for a given project. The annual plan reflects current hydrologic and other conditions. It is consistent with the Water Control Plan and is developed through systems analysis and the other methods required for that long-term plan.¹⁵³

C. Water Control Analysis

Once a Water Control Plan is adopted, “effective regulation ... ultimately depends upon the experience and judgment of the water control manager,” who must evaluate and understand “complex interactions among the many meteorological and hydrologic processes, combined with the effects of project control...”¹⁵⁴ The District uses “rigorously defined analytical procedures, rather than subjectively determined estimates,”¹⁵⁵ to forecast rainfall and inflow¹⁵⁶ and water

¹⁴⁹ EM 1110-2-3600, ¶ 9-2.a.

¹⁵⁰ EM 1110-2-3600, Appendix A.

¹⁵¹ EM 1110-2-3600, ¶ 8-1.a.

¹⁵² EM 1110-2-3600, ¶ 8-1.a.

¹⁵³ EM 1110-2-3600, ¶ 3-2.c.

¹⁵⁴ EM 1110-2-3600, ¶ 6-1(a).

¹⁵⁵ EM 1110-2-3600, ¶ 6-1(a).

quality conditions, including oxygen, turbidity, nutrients, sediments, fish migration, and contaminants.¹⁵⁷ These analytical methods “constitute the technical support by which the water control manager may form decisions during actual project operations,”¹⁵⁸ in order to “regulate [a project] in the most effective manner possible.”¹⁵⁹

Specifically, the District uses models to forecast weather, flow, project operations, and riverine responses to project operations, including water quality, on a near- and long-term basis.¹⁶⁰ The forecasts permit a “probability distribution”¹⁶¹ how the project will meet its functions over a specified period and thus permit real-time management to enhance effectiveness.

D. Real-Time Decisions

The operator for each project daily compares current operations against the guide curves and other requirements of a Water Control Plan, to determine the actual schedule for the next 24 hours.¹⁶² The Corps recognizes that these curves are “generalized since they are based on historical data and hindsight operation.”¹⁶³ Accordingly, operational decisions in real time are made “under the guidelines of the water control plan, but adjusted as necessary to meet any unique conditions.”¹⁶⁴

“Special situations or unanticipated conditions may arise...” in actual operations.¹⁶⁵ These include emergencies, such as a severe flood, spill of toxic pollution, grounding of a ship, or search-and-rescue. These also include non-emergencies, such as short-term construction in a

¹⁵⁶ EM 1110-2-3600, ¶ 6-3 – 6-5.

¹⁵⁷ EM 1110-2-3600, ¶ 6-7.a-c.

¹⁵⁸ EM 1110-2-3600, ¶ 6-1.a.

¹⁵⁹ EM 1110-2-3600, ¶ 6-1.b(4).

¹⁶⁰ EM 1110-2-3600, ¶¶ 6-2 - 6-8.

¹⁶¹ EM 1110-2-3600, ¶ 6-1.b(3).

¹⁶² EM 1110-2-3600, ¶ 7-2.

¹⁶³ EM 1110-2-3600, ¶ 6-1.b(4).

¹⁶⁴ EM 1110-2-3600, ¶ 6-1.b(4).

¹⁶⁵ EM 1110-2-3600, ¶ 7-1.a(2).

waterway, maintaining flows for whitewater boating, or improving wildlife habitat.¹⁶⁶ In those conditions, the Project operator has “a certain degree of flexibility ... to depart from normal operating criteria...”¹⁶⁷ A “significant departure” from the guide curves may require the approval of the Division Commander.¹⁶⁸

In anticipated conditions, the project operator has limited authority to vary from the guide curves in the course of setting the schedules for near-term operations. The District daily uses systems analysis – long-term forecasts (*see* Appendix C, Section C.6.) and “complete knowledge” of current conditions – to “simulate the proposed operation and thereby anticipate the effects...on a short and medium-range time frame, to test the effects of various alternatives..., and thereby to provide an objective and rational basis for making operating decisions...”¹⁶⁹ In addition, the District consults with public agencies and other interested entities on technical matters or desired project schedule.¹⁷⁰ On the basis of the systems analysis and consultation, the project operator may “shade the operations when conditions indicate a particular need, as, for example, a mid-month adjustment...”¹⁷¹ “By being alert to changed runoff potentials as they occur, the overall efficiency of multipurpose project regulation may be significantly improved.”¹⁷²

E. Public Involvement

The District may form a standing committee with other agencies or utilities which operate other water control facilities in a given basin, for the purpose of coordinated operations.¹⁷³ It may form a Regional River Basin Interagency Committee with other public agencies which regulate or plan water control facilities, for the purpose of coordinated management.¹⁷⁴ It may enter into an agreement with other public agencies for routine exchange of hydrologic data or forecasts.¹⁷⁵ Each such relationship is formalized in a Water Management

¹⁶⁶ EM 1110-2-3600, ¶ 7-1.a(2).

¹⁶⁷ EM 1110-2-3600, ¶ 7-1.a(2).

¹⁶⁸ EM 1110-2-3600, ¶ 7-1.a(2).

¹⁶⁹ EM 1110-2-3600, ¶ 7-3.c(1).

¹⁷⁰ EM 1110-2-3600, ¶ 7-1.b, 7-4.a(1).

¹⁷¹ EM 1110-2-3600, ¶ 7-4.a(2).

¹⁷² EM 1110-2-3600, ¶ 7-4.a(2).

¹⁷³ EM 1110-2-3600, ¶ 8-4.a(4).

¹⁷⁴ EM 1110-2-3600, ¶ 8-4.a(3).

¹⁷⁵ EM 1110-2-3600, ¶ 8-4.b(2).

Agreement, typically a Memorandum of Understanding.¹⁷⁶

In implementing a Water Control Plan, a District also coordinates with entities other than facility operators who are "...affected by river regulation."¹⁷⁷ It "...should have an 'open door' policy to local interest groups..."¹⁷⁸ Although these relationships do not involve "...operating agreements, they are an important source of information and coordination and provide input to [the Corps'] water control managers."¹⁷⁹ The needs for data exchange or discussion with such non-operators, if "infrequent,...can be dealt with informally on a case-by-case basis..."¹⁸⁰ If the needs are "continuing..., it is highly desirable to establish formal working relationships to coordinate these activities."¹⁸¹ Although there "...is no set procedure,"¹⁸² the District will decide how to coordinate with such non-operators, and how to document the coordination, "...based on the initiative and judgment of all parties to best reflect the public interests."¹⁸³ It may form a standing committee (not limited to other facility operators or other public agencies) to assist in coordination of basin water management.¹⁸⁴

F. Dispute Resolution

The Corps understands that conflicts regarding project operations may arise due to "competing interest of water users" in flood control, power, fishery protection, and environmental quality.¹⁸⁵ A District may use "negotiation and judgmental decisions" to adjust a project schedule or otherwise "accommodate special requirements" without significantly affecting other functions.¹⁸⁶ The Corps, through a District or Division, may also hold a public

¹⁷⁶ EM 1110-2-3600, ¶ 8-4.b(1).

¹⁷⁷ EM 1110-2-3600, ¶ 8-4.a(5).

¹⁷⁸ EM 1110-2-3600, ¶ 8-4.c(1)(e).

¹⁷⁹ EM 1110-2-3600, ¶ 8-4.a(5).

¹⁸⁰ EM 1110-2-3600, ¶ 8-4.c(1)(e).

¹⁸¹ EM 1110-2-3600, ¶ 8-4.c(1)(e).

¹⁸² EM 1110-2-3600, ¶ 8-4.c(1)(c).

¹⁸³ EM 1110-2-3600, ¶ 8-4.c(1)(f).

¹⁸⁴ EM 1110-2-3600, ¶ 8-4.c(1)(d) - (e).

¹⁸⁵ EM 1110-2-3600, ¶ 8-4.c(2).

¹⁸⁶ EM 1110-2-3600, ¶ 8-4.c(3).

hearing to air such conflicts, permit discussion, consider expert testimony, and generally “seek input which would be considered in formulating operating decisions.”¹⁸⁷

¹⁸⁷ EM 1119-2-3500, ¶ 8-4.c(4) - (5).

APPENDIX E: BASES AND PROCEDURES FOR ORDINARY PLAN REVISION

A. Specific Bases for Plan Revision

1. Legal Requirements for Environmental Protection

The Water Control Plans for many projects were developed, consistent with their authorizing statutes, to address “basic economic functions” of flood control and navigation. A plan “...may be modified to add a purpose for which Congress has granted general authority for all Corps reservoirs. Such additional purposes are limited to: recreation (PL 78-534); municipal and industrial water supply (PL 85-200); fish and wildlife conservation (PL 85-624); water quality control (PL 92-500); and threatened and endangered species preservation (PL 93-205).”¹⁸⁸ “Proposed changed, including those required to maintain instream flow needs, must be reviewed carefully in conjunction with the authorizing legislation to determine the *extent of the change* which may be undertaken” (emphasis added).¹⁸⁹

2. Hydrologic Data and Analysis

A Water Control Plan may be revised to reflect new hydrologic data, including rainfall, snowmelt, meteorology, or other conditions which are relevant to the plan of regulation. The Corps should “fully utilize all available hydrologic data when revising the water control plan.”¹⁹⁰

“These additional records not only extend the period of record of the basic data used in the initial water control studies, but also enhance the determination of regulation criteria and basin watershed characteristics that are used in modeling procedures. The new data may also include records of significant events of extreme conditions of flood or drought which may require modification of the water control diagram. In some cases, the additional basic data warrants a complete system hydrologic analysis for refining the derived streamflows at the projects.”¹⁹¹

A Water Control Plan may also be revised to reflect new methods for analyzing hydrologic data, including advances in systems software which may be appropriate to optimize project functions.

“...[F]or many projects that have been operational for a number of years, the water control plans and water control manuals are out-of-date, and there is a need for revising them to make them applicable to current conditions. Many of the existing water control

¹⁸⁸ EP 1165-2-1, ¶ 11-7.

¹⁸⁹ EP 1165-2-1, ¶ 11-7.

¹⁹⁰ EM 1110-2-3600, ¶ 3-3.b(2).

¹⁹¹ EM 1110-2-3600, ¶ 3-3.b(2).

manuals were prepared prior to current concepts of system regulation and sophisticated computerized methods of analysis. Requirements for enhancing the multi-purpose use of projects have become important, particularly with regard to environmental and public use aspects of the projects. For all of the above reasons, there is a requirement to periodically review and update the regulation procedures.”¹⁹²

3. Changes in Floodplain

A Water Control Plan may be revised because of “...changed conditions with respect to seasonal downstream channel capacities, possible downstream development adjacent to the river channel, and changed economic values for flood protection. In many cases there are encroachments in the flood plain that require a reevaluation of target control elevations for flood regulation, or controlled river levels during the post flood evacuation period.”¹⁹³ Such a reevaluation is also appropriate in the event of reversal of floodplain encroachment.

4. Changes in other Resource Conditions

A Water Control Plan may be revised to account for any changes in local conditions that affect the project functions.¹⁹⁴ For example, “[t]he fact that changes will occur in terms of water quality and operating procedures must be anticipated. Land use changes, extreme or unusual weather events, etc., may induce abrupt or long-term changes in water quality conditions.”¹⁹⁵

5. Project Performance

Fundamentally, a Water Control Plan is revised when analysis of actual performance shows that an alternative to the existing guide curves or other requirements will better achieve project functions. “Operating experience may suggest alternative procedures or indicate need for major modifications.”¹⁹⁶

B. Process for Plan Revision

1. District Initiative

The District has the delegated authority to revise the Water Control Plan, subject to approval of the Division. Thus, the scope of a revision is largely up to the District, although it

¹⁹² EM 1110-2-3600, ¶ 3-3.b(1).

¹⁹³ EM 1110-2-3600, ¶ 3-3.b(3)(c).

¹⁹⁴ See EM 1110-2-3600, ¶ 2.1.b.

¹⁹⁵ EM 1110-2-3600, ¶ 3-6.d(2).

¹⁹⁶ EM 1110-2-3600, ¶ 3-6.d(2).

must undertake a periodic revision to assure compliance with all applicable water quality standards.

2. NEPA Compliance

The Corps, like every federal agency, complies with the National Environmental Policy Act (NEPA),¹⁹⁷ which requires the “[u]se [of] all practicable means, consistent with the requirements of the Act and other essential considerations of national policy, to restore and enhance the quality of the human environment and avoid or minimize any possible adverse effects of their actions upon the quality of the human environment.”¹⁹⁸ Under that statute, a federal agency prepares an Environmental Assessment (EA) or Impact Statement (EIS) for any discretionary action which may have a significant impact on environmental quality.¹⁹⁹

That general obligation is subject to categorical exclusions for actions which individually and cumulatively are considered not to have significant impacts.²⁰⁰ The Corps has categorical exclusions for “activities at completed Corps projects which carry out the authorized project purposes,”²⁰¹ and for all “general plans.”²⁰² Typically, the Corps does not prepare an EA or EIS to prepare or revise a Water Control Plan. It evaluates project impacts on environmental quality under legal authorities other than NEPA, including its own authorizing statutes, Clean Water Act, and Endangered Species Act.

a. Alternatives

In any planning process, the Corps considers “the full range of alternative solutions to a problem, including their positive and negative impacts.” It considers structural and non-structural solutions, including those which (if approved) would be implemented by non-Corps entities.²⁰³

b. Impact Analysis

¹⁹⁷ 42 U.S.C. §§ 4321 *et seq.*

¹⁹⁸ 40 C.F.R. § 1500.2(f).

¹⁹⁹ See definitions in 40 C.F.R. §§ 1508.9 (environmental assessment), 1508.11 (environmental impact statement), 1508.18 (major action), and 1508.27 (significantly)..

²⁰⁰ See definition in 40 C.F.R. § 1508.4 (categorical exclusion)..

²⁰¹ ER 200-2-2, ¶ 9.a.

²⁰² ER 200-2-2, ¶ 9.d.

²⁰³ EP 1165-2-1, ¶ 3-1.a.

The Corps evaluates any proposed action against a baseline, which is the condition of a water resource under any existing control and "if the natural forces of change continue to develop free of the influence" of the proposed action. The Corps evaluates the impacts of a proposed action "by measuring the difference between indicator values" with and without that action.²⁰⁴

3. Public Participation

Any revision to a Water Control Plan must be developed "with full public involvement."²⁰⁵ The District develops a Water Control Plan (or any revision) "...in concert with all basin interests which are or could be impacted by or have an influence on project regulation."²⁰⁶ At a minimum, this requires "close coordination" with all other public agencies with jurisdiction over the affected resources.²⁰⁷ In addition, the District holds one or more public meetings, subject to 30 days advance notice, to receive public comment on any substantive revision of a plan.²⁰⁸ Beyond these procedures, the District has discretion to establish a standing committee, undertake meetings, request technical assistance, or otherwise involve the public and stakeholders.

4. Schedule for Plan Revision

As discussed in Section A of this Appendix above, the District has a general obligation to revise the Water Control Plan whenever changes in law, data, or circumstances warrant optimizing the project benefits. At a minimum, however, a plan "must be reviewed and updated as needed but not less than every 10 years ... to achieve environmentally sustainable overall use of the resource."²⁰⁹

²⁰⁴ EP 1165-2-1, ¶ 3-1.b.

²⁰⁵ EP 1165-2-1, ¶ 11-7.

²⁰⁶ ER 1110-2-240, ¶ 6.i.

²⁰⁷ ER 1110-2-240, ¶ 6.i.

²⁰⁸ ER 1110-2-240, ¶ 7.c.

²⁰⁹ ER 1110-2-8154, ¶ 8

APPENDIX F: PROCESS FOR MAJOR MODIFICATION

A. New Authorization

1. Additional Statute

Certain types of revision to a Water Control Plan probably require additional Congressional authorization. For example, a revision which calls for the addition of a major facility improvement, such as the addition of a turbine to a completed powerplant, would require such authorization, if the original statute did not anticipate such post-impoundment improvement. A District must “carefully” review any proposed revision “...to determine the extent of change which may be undertaken consistent with the authorizing legislation.”²¹⁰

2. Continuing Authorities Program

A revision to a Water Control Plan that significantly departs from the original or other specific purposes for the project may nonetheless be implementable through the Continuing Authorities Program (CAP). This consists of ten legislative authorities to undertake project improvements without seeking specific further Congressional authorization in the form of a new statute.²¹¹ Before committing to such an improvement, the District studies alternatives, using the two-phase planning process described below.²¹²

Each of these continuing authorities has limits in scope and cost as well as required procedures.²¹³ As a general matter, the authorities are “targeted to meeting additional needs ... rather than to adjustments of the completed project so as to better meet the needs the project was originally intended to serve.”²¹⁴ Such improvements must be “complete-within-themselves, incrementally justified improvements which will not impair or substantially change the project’s purpose.”²¹⁵ Further, such improvements cannot be “substitutions” for uncompleted modifications authorized by Congress.²¹⁶ Because of these limitations, the CAP is generally not a suitable or desirable basis for revising the operational requirements of a Water Control Plan to include environmental purposes.

²¹⁰ ER 1165-2-119, ¶ 8.c.

²¹¹ ER 1105-2-100, ¶ F-2.a.

²¹² EP 1165-2-1, ¶ 5-2.e.

²¹³ EP 1165-2-1, ¶ 2-1.c, Table 2-1.

²¹⁴ ER 1165-2-119, ¶ 11.

²¹⁵ ER 1165-2-119, ¶ 11.

²¹⁶ ER 1165-2-119, ¶ 11.

B. Section 216 Study to Develop Recommendation

Under Section 216 of the 1970 Flood Control Act, the District may study proposed modifications “...when found advisable due to significantly changed physical or economic conditions....”²¹⁷ Any such study follows the procedures described below. Implementation of the study recommendation may either occur under the Continuing Authorities Program or require additional statutory authorization.

The general purpose of a Section 216 study is to evaluate potential modifications to project features, operations, real estate interests, or purposes.²¹⁸ Such a study is a form of General Investigation, which consists of a Reconnaissance Study and then a Feasibility Study, as described below.²¹⁹

C. Reconnaissance and Feasibility Studies

The Corps uses a General Investigation to evaluate alternatives for project design before construction, or for project modification under CAP or Section 216.

1. Purpose and Classification of Recommended Improvement

A General Investigation results in a recommendation regarding a plan of improvement. There are two types of plan: National Economic Development (NED) and National Ecosystem Restoration (NER).²²⁰ The plans have different cost-sharing requirements (which are outside of the scope of this memo) and different substantive requirements, addressed summarily below.

A completed water control project is typically (indeed, almost universally) based on a NED plan. As a result, a Section 216 study which proposes an improvement as an NER plan would probably change existing cost-sharing arrangements for the project and may cause significant political opposition. Further, ecological sustainability may be included as element of a NED plan. Because of these fundamental considerations, the memo below focuses mostly on a Section 216 Study intended to produce a NED plan.

2. Reconnaissance Study

The District initiates a Reconnaissance Study to determine whether the federal interest is substantial enough to justify proceeding with a Feasibility Study. In the context of a Water

²¹⁷ ER 1165-2-199, ¶ 12.

²¹⁸ ER 1165-2-119, ¶ 4.c (emphasis added).

²¹⁹ EP 1165-2-502, ¶ 5.a(1)(c); ER 1105-2-11, ¶ 4-1, ¶ G-2.

²²⁰ ER 1105-2-100, ¶ 2-3.f(1) – (2).

Control Plan, it answers scoping questions: is the plan seriously out of date? The Corps funds the Reconnaissance Study out of O&M funds, typically limited to \$20,000.²²¹

3. Feasibility Study

The Feasibility Study results in a report which presents a coordinated and implementable solution to the problem which is the focus of the study. It is a decision document which fully presents all factual findings, indicates compliance with applicable laws, and provides a sound and document basis to judge the recommended plan.²²²

a. Cost-Sharing Agreement

The Corps enters into a Feasibility Cost Sharing Agreement (FCSA) with a non-federal sponsor, which is responsible for 50% of the Feasibility Study costs. One-half of the non-federal sponsor's share may be in-kind products and services.²²³

b. Project Management Plan

The Corps and non-federal sponsor adopt a Project Management Plan (PMP). It is completed in two phases: the first until the In-Progress Review (IPR), and the second for the remainder of the study.²²⁴

The PMP estimates the total study cost and the local share.²²⁵ It specifies tasks, milestones, negotiated costs, responsibility for drafting or other task work, professional criteria to assess the adequacy of the completed work, procedures for review and acceptance of work and for dispute resolution, and schedule.²²⁶

The PMP establishes appropriate procedures to maximize the cooperative involvement of the non-Federal sponsor and other stakeholders in the study.²²⁷ Since there is no single best

²²¹ EP 1165-2-502, ¶ 5.a(1)(c).

²²² ER 1105-2-100, ¶ G-1.a, ¶ G-9.

²²³ ER 1105-2-100, ¶ 2-8.b, ¶ 4-1.a(2), ¶ G-8, ¶ G-9.b.

²²⁴ ER 1105-2-100, ¶ G-8.c(2).

²²⁵ ER 1105-2-100, ¶ G-8.c(2)-(4).

²²⁶ ER 1105-2-100, ¶ G-8.c(5).

²²⁷ ER 1105-2-100, ¶ B-2.c, ¶ B-5.a.

approach to public participation, it establishes a strategy appropriate to the circumstances of a given study.²²⁸

At a minimum, the strategy for public participation includes an Issue Resolution Conference (IRC), Feasibility Study Meeting (FSM), Alternative Formulation Briefing (AFR), and a Memorandum for the Record (MFR), as follows.²²⁹ The objective of an Issue Resolution Conference is to discuss and resolve policy issues to ensure that the study progresses in an orderly manner. An IRC may be held at any time during the study process.²³⁰ The objective of a Feasibility Scoping Meeting is to focus the study on key alternatives, define the depth of analysis, and refine study constraints.²³¹ In an Alternative Formulation Briefing, the Corps District briefs its headquarters on the recommended plan.²³² A Memorandum for the Record records all issues that are discussed in each meeting during the planning process.²³³

c. Schedule

A Feasibility Study, including the Reconnaissance Study, is ordinarily completed in three years.²³⁴

d. Six-Step Study Process

Any feasibility study, including a proposed revision to a Water Control Plan under Section 216, follows a six-step process. These are: (1) identifying problems and opportunities, (2) inventorying and forecasting conditions, (3) formulating alternative plans, (4) evaluating them, (5) comparing them, and (6) selecting a plan.²³⁵

(1). Problem Statement

Step one is the statement of problems and opportunities. This statement is framed in terms of the federal objective of maximizing the net benefits for national economic development

²²⁸ ER 1105-2-100, ¶ B-5.c.

²²⁹ ER 1105-2-100, ¶ 4-3.c(2)(a) - (d); ¶ G-6.f.

²³⁰ ER 1105-2-100, Exhibit G-3.

²³¹ ER 1105-2-100, Exhibit G-3.

²³² ER 1105-2-100, Exhibit G-3.

²³³ ER 1105-2-100, ¶ 4-3.c(2)(d).

²³⁴ EC 1105-2-409, ¶ 4.c(1).

²³⁵ ER 1105-2-100, ¶ 2-3.

or, for a restoration project, national ecosystem restoration (NER).²³⁶ It also reflects the objectives of the non-Federal sponsor and other participating stakeholders.²³⁷ This statement does not preclude the consideration of all potential alternatives. It encompasses future as well as present conditions. It is dynamic and iterative – that is, revised periodically as the study proceeds.²³⁸

Once the problem and opportunity statement – the study scope – is framed, the next task under Step One is defining study objectives. Such objectives state the desired study results that would solve the problem or take advantage of the opportunity previously identified. They are clearly stated to describe the desired environmental impact, its location, and its timing.²³⁹

(2). **Inventory and Forecast**

Step two is an inventory and forecast of critical resources, including environmental, demographic, economic, and social conditions relevant to the problem and opportunity statement.²⁴⁰ The inventory includes existing and future conditions without the proposed project.²⁴¹ This without-project condition provides the basis for evaluating the comparative benefits of alternative plans. In the context of a completed civil works project, the inventory and forecast establish a baseline under a no-action plan. The inventory and forecast are periodically revised throughout the planning process.²⁴²

In forecasting the environmental impacts of the no-action and alternative plans, a study considers risk and uncertainty²⁴³ and intended and unintended consequences.²⁴⁴ The study systematically addresses the causes of ecosystem degradation and restoration in order to increase the likelihood of long-term success (resilience and persistence) and reduce the need for extensive operation and maintenance.²⁴⁵ The analytical method (whether a habitat model or other

²³⁶ ER 1105-2-100, ¶2-3.a(1).

²³⁷ ER 1105-2-100, ¶2-3.a(1) - (2).

²³⁸ ER 1105-2-100, ¶ 2-3.a(1).

²³⁹ ER 1105-2-100, ¶ 2-3.a(4).

²⁴⁰ ER 1105-2-100, ¶ 2-3.b.

²⁴¹ ER 1105-2-100, ¶ 2-3.b.

²⁴² ER 1105-2-100, ¶ 2-3.b.

²⁴³ EP 1165-2-502, ¶ 16.e, (g); ER 1105-2-100, ¶ 2-4.g.

²⁴⁴ EP 1165-2-502, ¶ 7.g.

²⁴⁵ EP 1165-2-502, ¶ 7.j.

scientifically based method) is chosen to provide results at the level of detail appropriate for the planning objectives.²⁴⁶

(3). Alternative Plans

Step three is formulation of alternative plans. Alternative plans are formulated to identify specific ways to achieve planning objectives. Each consists of a system of structural or non-structural measures, strategies, or programs.²⁴⁷ Such plans are not limited to management measures that the Corps may implement directly or exclusively under existing authorities. They may include measures that may be implemented by other public agencies or stakeholders,²⁴⁸ or that may require changes in existing laws, rules, and common law.²⁴⁹

The first sub-step in formulating alternative plans is to identify management measures that could be implemented, giving equal consideration to structural and non-structural measures. The second is combining management measures into plans that are significantly differentiated.²⁵⁰ These sub-steps are undertaken iteratively.²⁵¹

Each plan is formulated to reasonably maximize benefits to the national economy, the environment, or the sum of both. It considers four criteria: completeness, effectiveness, efficiency, and acceptability.²⁵² Completeness is the extent to which a plan provides and accounts for all actions necessary to realize planning objectives, including actions by other federal and non-federal stakeholders. Effectiveness is the extent to which a plan contributes to the achievement of the planning objectives. Efficiency is the extent to which a plan is the most cost-effective means to achieve such objectives. Acceptability is the extent to which a plan conforms to applicable laws, rules, and public policies.²⁵³

²⁴⁶ ER 1105-2-100, ¶ E-33.1.

²⁴⁷ ER 1105-2-100, ¶ 2-3.c(1).

²⁴⁸ ER 1105-2-100, ¶ 2-3.c.

²⁴⁹ ER 1105-2-100, Figure 1-1, ¶ 5.

²⁵⁰ ER 1105-2-100, ¶2-3.c(2).

²⁵¹ ER 1105-2-100, ¶E-34.

²⁵² ER 1105-2-100, Figure 1-1, ¶ 5.d; ER 1105-2-100, ¶ E-38; EP 1165-2-502, ¶ 16.

²⁵³ ER 1105-2-100, ¶ 2-3.c(2).

At a minimum, alternative plans should include: No Action, Locally Preferred Plan, and National Interest Plan.²⁵⁴ The National Interest Plan may be:

NED Plan, which seeks to maximize the net “increases in the national outputs of goods and services”;²⁵⁵

NER Plan, which seeks to maximize “...restoration of significant ecosystems and resources.”²⁵⁶ The combined monetary and non-monetary benefits of an ecosystem restoration project must exceed its costs.²⁵⁷ An NER Plan is not justified on the basis of a traditional benefit-cost analysis, since the majority of benefits cannot be monetized. Therefore, it is not required to have a benefit-cost ratio greater than 1.0.²⁵⁸ However, it should be a cost-effective means to address the restoration need;²⁵⁹ or

Combined Plan (NED/NER). “From here on [following adoption of this 2006 policy]...Project delivery teams should consider and take advantage of every opportunity to engage in the formulation of combined plans unless prohibited by study authority, the lack of financial capability or authority of the sponsors.”²⁶⁰

In sum, under Step 3, “the first sub-step is to formulate plans that address the primary purpose of the study (flood damage reduction, navigation or ecosystem restoration). The second sub-step is to identify the NED or NER Plan. The third sub-step is to formulate plans that address other problems and opportunities as well as the primary problem under study. The emphasis of the formulation process will be on formulating alternatives that take advantage of

²⁵⁴ EC 1105-2-409, ¶ 7.d.

²⁵⁵ EC 1105-2-404, ¶ 5.

²⁵⁶ EC 1105-2-404, ¶ 5.

²⁵⁷ EP 1165-2-502, ¶ 16.a.

²⁵⁸ EP 1165-2-502, ¶ 16.a(1).

²⁵⁹ EP 1165-2-502, ¶ 16.a(2). An ecosystem restoration project should: (1) demonstrate acceptability to other public agencies and stakeholders; (2) be complete in providing for all necessary investments or actions necessary to achieve the restoration; (3) be effective in restoring ecosystem structure of function to a meaningful degree; (4) be efficient, in providing the benefit in a more cost-effective manner than an alternative plan; and (5) should have reasonable costs. EP 1165-2-502, ¶ 16.c- g. For a plan having both economic and restoration benefits, the plan with the greatest net sum of such benefits is to be selected. ER 1105-2-100, ¶ E-28.e(2).

²⁶⁰ EC 1105-2-404, ¶ 5.

the synergies created by the plans that address both the primary problems and the relevant secondary problems.”²⁶¹

(4). Evaluation of Alternative Plans

Step four is evaluation of alternative plans. In the context of a General Investigation of an existing civil works project, this step compares the alternative plan against the no-action alternative. The step consists of four sub-steps.²⁶²

The first sub-step is to forecast the conditions expected under each alternative plan. The forecast addresses each critical variable developed in Step Two. It includes impacts on the Federal objective, planning objectives, the evaluation criteria stated above, and any other criteria that the stakeholders deem significant.²⁶³ The period of analysis is the same for each alternative plan and the no-action plan. The period may not exceed 100 years for a major civil works project, although appropriate consideration may be given to environmental impacts beyond that limit.²⁶⁴

The second is to compare the alternative plan against the no-action alternative.²⁶⁵

The third is to characterize the beneficial and adverse impacts by magnitude, location, timing, and duration.²⁶⁶

The final sub-step is to identify the plans that will be considered further in the study process.²⁶⁷ *Id.*

The study uses four accounts in order to compare the alternative and no-action plans: National Economic Development (NED), environmental quality (EQ), regional economic development (RED), and other social effects (OSE).²⁶⁸ These accounts include monetized and

²⁶¹ EC 1105-2-404, ¶ 7.c.

²⁶² ER 1105-2-100, ¶ 2-3.d(1).

²⁶³ ER 1105-2-100, ¶ 2-3.d(2).

²⁶⁴ ER 1105-2-100, ¶ 2-4(j).

²⁶⁵ ER 1105-2-100, ¶ 2-4(j).

²⁶⁶ ER 1105-2-100, ¶ 2-4(j).

²⁶⁷ ER 1105-2-100, ¶ 2-4(j).

²⁶⁸ ER 1105-2-100, Figure 1-1, ¶ 7; ER 1105-2-100, ¶ 2-3.d(3).

nonmonetized outputs and costs, and they are used to determine which alternative plan maximizes net benefits.²⁶⁹

In this step, the Corps uses "...trade-off analysis..."²⁷⁰ to evaluate the competing uses of water. "Trade-off analysis requires the implicit or explicit assignment of preferences (weights) to each decision criterion. Assignment of preferences is a subjective process that should reflect the relative importance assigned to each criterion by the [Project Delivery Team or PDT] with inputs considered from stakeholders. Various techniques are available to assist the PDT in determining preferences. The technique selected for determining and the resulting weights must be properly documented and supported in the feasibility report. Sensitivity analyses will be conducted to demonstrate the impact of using different sets of preference (weights) in the final outcome of the analysis."²⁷¹ "A good trade-off procedure will be transparent, understandable, replicable, and will use valid data transformations and algorithms. Developing a valid trade-off approach can be both difficult and controversial, so PDTs are encouraged to seek specialized assistance in developing an approach, and must coordinate with their vertical team early in the planning approach to assure that their approach will be accepted."²⁷²

(5). **Ranking**

Step five is comparison of alternative plans. Here, building on the comparison of each alternative plan against the no-action plan accomplished in Step Four, the study ranks the alternate plans. For an ecosystem restoration project, cost-effectiveness and incremental cost analysis (CE/ICA), as prescribed by the Corps' guidance documents, are used to determine whether the outputs of an alternative plan could be accomplished at less cost by another alternative.²⁷³

(6). **Recommendation**

Step six is selection of a recommended plan. The study recommends a single plan among the alternatives.²⁷⁴ The criteria for selection depend on whether the plan purpose is or includes ecosystem restoration, as discussed above. In the past, the Corps has chosen the alternative plan that maximizes National Economic Development (NED plan), unless the Secretary of Army

²⁶⁹ ER 1105-2-100, ¶2-4.d, .k.

²⁷⁰ EC 1105-2-404, ¶ 7.a.

²⁷¹ EC 1105-2-404, ¶ 7.d(3).

²⁷² EC 1105-2-404, ¶ 7.d(3).

²⁷³ ER 1105-2-100, ¶ E-36.

²⁷⁴ ER 1105-2-100, ¶ 2-3.f.

grants an exception based on overriding considerations.²⁷⁵ Under recent policy, “any alternative plan may be selected and recommended for implementation if it has, on balance, net beneficial effects after considering all plan effects, beneficial and adverse, in the four Principles and Guidelines evaluation accounts: National Economic Development, Environmental Quality, Regional Economic Development, and Other Social Effects.”²⁷⁶

4. Implementation of Section 216 Study Recommendation

A recommendation in a Section 216 study may either be implemented under the Continuing Authorities Program or additional statutory authority.

a. Subject to Continuing Authorities Program

The applicable Division may approve a study recommendation that may be implemented under the Continuing Authorities Program without further Congressional authorization.²⁷⁷ Such approval is limited to a recommendation which meets the following conditions:

The incremental cost does not exceed the respective limits of Section 1135 of the 1986 Water Resources Development Act (WRDA), Section 206 of the 1996 WRDA, or Section 204 of the 1992 WRDA;²⁷⁸

It is a reasonable modification to project facilities, in the nature of an operation or maintenance effort;²⁷⁹

It enhances dam safety;²⁸⁰

It affects the water control plan in a manner that does not significantly depart from original purposes;²⁸¹

It enhances compliance with water quality standards.²⁸²

²⁷⁵ EP 1165-2-502, ¶ 8; ER 1105-2-100, ¶ 2-3.f.

²⁷⁶ EC 1105-2-409, ¶ 4.c(3).

²⁷⁷ ER 1105-2-100, ¶ 2-3.f(5).

²⁷⁸ ER 1105-2-100, ¶F-4, F-19.

²⁷⁹ ER 1165-2-119, ¶ 8.a.

²⁸⁰ ER 1165-2-119, ¶ 8.a – b.

²⁸¹ ER 1165-2-119, ¶ 8.c.

²⁸² ER 1165-2-119, ¶ 8.e.

The Division may determine that a recommended plan does not satisfy these conditions – for example, because it involves significant cost exceeding the applicable limit. In that event, the plan requires additional Congressional authorization, as discussed immediately below.

b. Not Subject to Continuing Authorities Program

The Corps Headquarters must approve a study recommendation which is outside of the scope of the Continuing Authorities Program and thus requires additional statutory authorization. Upon such approval, Headquarters submits the study to Congress for such statutory authorization.

APPENDIX G: REPORTING OF PROJECT OPERATIONS

The Corps reports project operations, impacts, and plans for future operations, through a series of annual and more frequent reports.

A. Annual Reports

1. Division Water Control Management Report

A District prepares an annual report on significant water control activities. It lists all operating projects, describes operations in the prior year, and states expected operations for the current year.²⁸³ It also describes the status of water control manuals for the Corps' projects as well as those other projects subject to the Corps' regulation for flood control.²⁸⁴

The Division compiles all such reports from its reporting Districts and submits a Water Control Management Report to Headquarters by February 1st.²⁸⁵ This report is numbered RCS DAEN-CWE-16 (R1).²⁸⁶

2. Project Operating Plan Report

For any project subject to a River Basin Interagency Committee,²⁸⁷ the District prepares an Annual Operating Plan Report. This describes the achievements of the prior year and the plan of operations for the current year. It primarily focuses on navigation, hydropower, and water supply, which are expected to be of interagency interest.²⁸⁸

3. Division Water Quality Report

The Division prepares an Annual Water Quality Report. It addresses the implementation of the Division Water Quality Management Plan, which is intended to prevent, control, and abate all environmental pollution from the federally owned and operated projects. It also addresses the water quality impacts of specific projects.²⁸⁹

²⁸³ ER 1110-2-240, ¶ 13.b.

²⁸⁴ ER 1110-2-240, ¶ 13.c.

²⁸⁵ EM 1110-2-3600, ¶ 8-6.c.

²⁸⁶ ER 1110-2-240, ¶ 13.b.

²⁸⁷ See EM 1110-2-3600, ¶ 8-4.a(3).

²⁸⁸ EM 1110-2-3600, ¶ 8-6.b.

²⁸⁹ ER 1110-2-240, ¶ 13.e; EM 1110-2-3600, ¶ 8-6.m.

The Division submits the report to Headquarters by February 1. It accompanies the Annual Division Water Control Management Report described above.²⁹⁰ This report is numbered DAEW-CWE-15.

4. Master Plan and Annual Report for Water Control Data Systems

The Division prepares a Water Control Data System Master Plan. This describes its system, including computers, gages, and other equipment, to “acquire, process, display and distribute information for real-time project regulation.”²⁹¹

The Division prepares an annual report (which includes the Master Plan) to describe performance of the data system and alternative approaches to upgrade the system for the purpose of real-time project regulation.²⁹² The Division may adopt and implement revisions to the Master Plan to upgrade the data system in a cost-effective manner, as reported in the annual report.²⁹³

The Division submits this report to Headquarters by February 1. This report is numbered RCS DAEN-CWR-21.

5. Hydropower Reports

a. Hydropower Statistics Report

By January 15th of each year, the Chief of the Corps (through the Secretary of the Army) submits to Congress a report on each hydropower project constructed by the Corps. The District (through the Division) submits its data for this report by December 15th. As required by the 1986 Water Resources Development Act (P.L. 99-662), the report includes: amount of electricity generated, revenues, costs of construction, operation and maintenance allocated to power; and balance owed to the U.S. Treasury.²⁹⁴

b. Service Rate Report

²⁹⁰ EM 1110-2-3600, ¶ 8-6(d); ER 1110-2-240, ¶ 13.e.

²⁹¹ ER 1110-2-240, ¶ 13.f(1).

²⁹² ER 1110-2-240, ¶ 13.f(2), EM 1110-2-3600, ¶ 8-6.d..

²⁹³ ER 1110-2-240, ¶ 13.f(3) - (4).

²⁹⁴ EP 1130-2-510, ¶ 2-3.a.

By February 15th of each year, the District submits a Service Rate Report (RCS CECW-0-34) for the previous year. This report shows the rates of performance of the powerplant, including in-service operating rate, standby, forced outage, and availability.²⁹⁵

6. Project Benefits

The Planning Division of Headquarters prepares an annual report on the monetary benefits provided by projects. It specifically computes the benefits attributed to flood control, navigation, hydropower, water supply, and recreation. It may also include benefits for protection and enhancement of environmental quality.²⁹⁶

7. Budget Request

Two years in advance of expected expenditure, the District prepares a budget request for water control activities. This request is prepared between March and June, for submittal to Headquarters through the Operations Division.²⁹⁷

The request is divided by account. It includes Account 609, Water Control Management, which in turn consists of Category E10 (Data Collection and Maintenance for Water Control and Water Quality Activities), Category E11 (.09.2) (Water Control Analyses and Studies), and Category E12 (09.3) (same).²⁹⁸ It also includes Account 630.1, Purchase of Water Control Data System Equipment.²⁹⁹

B. Quarterly and Monthly Reports

1. Water Control Chart

For each project, the District prepares a Monthly Water Control Chart which describes reservoir operations, including in-flow, precipitation, storage expressed in acre-feet and elevation, and flow release, by day.³⁰⁰

²⁹⁵ EP 1130-2-510, ¶ 2-3.b(2).

²⁹⁶ EM 1110-2-3600, ¶ 8-6.1.

²⁹⁷ EM 1110-2-3600, ¶ 8-6.g(1).

²⁹⁸ EM 1110-2-3600, ¶ 8-6.g(2).

²⁹⁹ EM 1110-2-3600, ¶ 8-6.g(3).

³⁰⁰ ER 1110-2-240, ¶ 13.d.

2. Monthly Powerplant Report

By the tenth of any month, the Division will submit to the U.S. Department of Energy a Monthly Powerplant Report (Form EIA-759, OMB No. 1905-0129, RCS FERC 1001). This report shows gross power generation, use within the federal facility, and net power delivered to the PMA.³⁰¹

C. Weekly and Daily Reports

1. District Water Control Morning Report

Each day, the Water Management Office in a District prepares a Water Control Morning Report that describes prevailing conditions relevant to project operations. This includes water data, forecasts, release schedules, and power generation schedules.³⁰² The project operator also prepares a report on operations pursuant to Standing Instructions in the Water Control Manual.³⁰³

2. Chief's Weekly Significant Activities Report

The Chief receives this report, compiled by his staff from Division reports, to provide a “snapshot of significant achievements, key decisions, ...critical meetings, and other such events....”³⁰⁴

3. Command Management Review

The Division and District submit this report quarterly to address “various performance indicators -- both measurable bottom line indicators and influencing indicators, which in a project delivery cycle format, provide comprehensive program management information.”³⁰⁵

D. Ad Hoc Reports

1. Run-Off Report

Beginning February and continuing through a flood season, the Division submits to Headquarters a letter report on run-off including flood potential. The report describes snowmelt

³⁰¹ EP 1130-2-510, ¶ 2-3.d(2).

³⁰² EM 1110-2-3600, ¶ 8-5.c.

³⁰³ EM 1110-2-3600, ¶ 8.5.b.

³⁰⁴ EP 1165-2-1, ¶ 4-1.e.

³⁰⁵ EP 1165-2-1, ¶ 4-4.a.

and other runoff as well as current and forecasted status of reservoir storage. It is due by the 10th of each month until the flood potential has ended.³⁰⁶

2. Flood Event Report

The Division submits a Report on Project Operations during a Flood Emergency, during the flood event. This describes inflow and outflow, current and predicted maximum reservoir levels, and percent of control storage used to date. The Division submits this report to its Division and Headquarters in electronic form.³⁰⁷

The Division submits a Post-Flood Summary of Project Regulation. This evaluates operation during a flood, including evaluation of stage reduction at key stations and estimates of damages prevented.³⁰⁸

E. Freedom of Information Act and Other Sunshine-in-Government Requirements

With limited exceptions, all of these reports are public. The Corps has a general policy that “maximum amount of information shall be made available to public. Disclosure of information is the rule and withholding of information is the exception.”³⁰⁹ If the Corps declines to provide a report or other document, you may request it under the Freedom of Information Act, which requires disclosure within 10 days of receipt of request or, in the alternative, documentation of the specific basis for non-disclosure.³¹⁰

³⁰⁶ ER 1110-2-240, ¶ 13.g.

³⁰⁷ ER 1110-2-240, ¶ 13.h.

³⁰⁸ ER 1110-2-240, ¶ 13.i.

³⁰⁹ EP 1165-2-1, ¶ 5-14.a.

³¹⁰ 5 U.S.C. § 552.

APPENDIX H: BASIS FOR REVISION OF WATER CONTROL PLAN FOR KERR DAM



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October 4, 2007

MEMORANDUM

To: Sam Pearsall
Director of Science
North Carolina Chapter, The Nature Conservancy

From: Robert Wigington
Western Water Policy Counsel,
The Nature Conservancy

Richard Roos-Collins
Director of Legal Services,
Natural Heritage Institute

Re: Revision of Water Control Plan for John K. Kerr Dam

You asked whether the U.S. Army Corps of Engineers may modify the 1995 Water Control Plan for John H. Kerr Dam, and specifically, the operational requirements for flood control and power, in order to enhance the protection of the downstream ecosystem. Our answer is yes. Under the 1944 statute authorizing Kerr Dam, as well as general laws and policies applicable to all federal facilities, the Army Corps has authority to modify the existing plan and operations of Kerr Dam to optimize overall public benefits in a manner that attains all project purposes, including ecosystem protection.

This memorandum is organized as follows. Section I describes the 1944 authorizing statute and the 1995 Water Control Plan for Kerr Dam. Section II analyzes the Corps' authority to modify the plan to enhance the downstream ecosystem.

I. Legal Requirements

We discuss the legal requirements of the 1944 Flood Control Act and the 1995 Water Control Plan for Kerr Dam.

A. 1944 Flood Control Act

The 1944 Flood Control Act authorized Kerr Dam for “...flood control and other purposes recommended in House Document Numbered 650...”³¹¹ It approved construction and operation of the project “...substantially in accordance with...the general plan for comprehensive development of the Roanoke River Basin...” as so recommended.³¹² That document provided that project purposes additional to flood control are: power generation and low-flow augmentation or navigation.³¹³

Congress based this authorization on several needs which the Army Control had identified in the Roanoke River Basin. The Corps found that floods, including those in October 1937 and August 1940, had caused considerable damages to agricultural, commercial, and industrial developments and uses below Buggs Island.³¹⁴ It further found that industrial and other development could “...absorb large blocks of additional hydroelectric power.”³¹⁵ Finally, it found that Roanoke had a periodic “low-water condition,” specifically, natural flow as low as 500 cfs, which interfered with navigation and other beneficial uses.³¹⁶

House Document 78-650 generally described the design and operational requirements for Kerr Dam.³¹⁷ For example, it described minimum reservoir elevation for power (283.6 feet MSL) and maximum elevation for flood control (332 feet MSL).³¹⁸ It described maximum regulated flow releases (111,000 cfs), average power releases (7,040 cfs), and average releases during low-flow periods (4,650 cfs). The document did not prescribe exact requirements for flow storage or release for any purpose.

The document predicted benefits resulting from this plan of development. It found that the project would reduce by 90% the average annual flood damages to downstream lands, most of which were swamp and bottomland forests.³¹⁹ It estimated that the project would generate an

³¹¹ P.L. 78-534, Section 10, “Roanoke River Basin.”

³¹² *Id.*

³¹³ House Document 78-650, ¶ 220 and Cover Letter.

³¹⁴ *Id.*, ¶¶ 79 – 89.

³¹⁵ *Id.*, ¶ 123.

³¹⁶ *Id.*, ¶ 174.

³¹⁷ *Id.*, ¶ 155.

³¹⁸ *Id.*, Table 34

³¹⁹ *Id.*, ¶ 188, Table 44.

annual average of 278,000,000 kWh of “prime energy” and 153,000,000 kWh of secondary energy.³²⁰

B. 1995 Water Control Plan

The Wilmington District adopted the current Water Control Plan in October 1995. The plan lists the three original purposes³²¹ of Kerr Dam established by the 1944 Flood Control Act: namely, flood control, power, and low-flow augmentation. It also lists three other project purposes established by subsequent general laws applicable to all federal facilities: recreation, water supply, and fish and wildlife protection.³²²

³²⁰ *Id.*, Table 34.

³²¹ The Corps categorizes project purposes as follows.

“The purposes that a reservoir is to serve are given in laws that may be grouped into three categories: (1) laws initially authorizing construction of the project; (2) laws specific to the project passed subsequent to its construction; and (3) laws that apply generally to all Corps reservoirs.

PL 78-534, Flood Control Act of 1944 (provides authority to add recreation as a purpose and to contract for use of surplus water for domestic purposes)

PL 85-500, Title III, Water Supply Act of 1958 (provides authority to include storage for municipal and industrial supply)

PL 85-624, Fish and Wildlife Coordination Act of 1958 (provides authority to modify projects to conserve fish and wildlife)

PL 92-500, Federal Water Pollution Act Amendments of 1972 (establishes goal to restore and maintain the quality of the Nation’s waters)

PL 93-93-205, Endangered Species Act of 1973 (provides authority for operating projects to protect threatened and endangered fish/wildlife)

Project specific authorizations (categories 1 and 2 above) are found in a variety of public laws but most commonly in a series of River and Harbor and Flood Control acts passed by Congress since 1870. Recent project authorizations have been contained in a series of Water Resources Development acts. Commonly the purposes of a reservoir are not identified directly in the authorizing law but instead are contained in reports of the Secretary of the Army, Chief of Engineer Board of Engineers for Rivers and Harbors, or others referred in the law. Purposes may be added or deleted by laws passed subsequent to construction.”

W.K. Johnson and R. J. DiBuono, U.S. Army Corps of Engineers, Hydrologic Engineering Center, *Authorized and Operation Purposes of Corps of Engineers Reservoirs* (1994), p. 8.

³²² Corps policy recognizes that these general purposes are authorized for all projects. *See, e.g.*, Engineer Manual (EM) 1110-2-3600, ¶ 3-3.b(3)(a); Engineer Regulation (ER) 1110-2-240, ¶ 6.a.

The Water Control Plan states that flood control is the primary objective of Kerr Dam.³²³ It establishes operational requirements for flood control, power, and other purposes. This is consistent with the Corps' general policy that such a plan is intended to achieve the "optimum" benefits for all project purposes, within legal and physical constraints;³²⁴ and that the Corps manages each project "to balance the environmental and developmental needs of the Nation" in accordance with general laws as well as the authorizing statute for a project.³²⁵

Many of the specific operational requirements in the 1995 Water Control Plan do not appear in the 1944 Flood Control Act or House Document 78-650. For example, the plan specifies a staggered schedule for flood releases based on the reservoir elevation,³²⁶ while the House Document estimated the maximum release. Similarly, the plan specifies storage for power generation at three elevations (dependable, minimum, and maximum),³²⁷ while the House Document estimated only the extremes. The plan establishes minimum flow releases for navigation, water quality, and striped bass protection,³²⁸ while the House Document did not. Indeed, some of the operational requirements even vary from counterparts in the House Document. The minimum reservoir elevation for power generation at Kerr Dam as built is 268 feet MSL,³²⁹ while the House Document estimated 283.6 feet MSL. Again, this approach is consistent with general policy, which provides that any Water Control Plan will convert pre-authorization study (which by definition is predictive and somewhat general) into a specific form which, reflecting the as-built design as well as subsequent data, best achieves the project purposes.³³⁰

The 1995 Water Control Plan also describes the procedures for powerplant operation. In sum, the Corps issues a weekly declaration of water available for power generation through Southeastern Power Administration (SEPA) to Dominion Generation, which establishes a schedule of generation and is responsible for power transmission to preference customers.³³¹ SEPA markets the power in excess of project need at the dam and Island Creek Pumping Station,

³²³ Water Control Plan (October 1995) (WCP)), ¶ B.2.

³²⁴ ER 1110-2-240, ¶ 6.a.

³²⁵ Engineering Pamphlet (EP) 1165-2-1, ¶ 3-1.

³²⁶ 1995 WCP, ¶ C.1.

³²⁷ *Id.*, ¶ D.1.

³²⁸ *Id.*, ¶¶ D.4 – D.6.

³²⁹ *Id.*

³³⁰ ER 1110-2-240, ¶ 5.a

³³¹ WCP, ¶¶ D.12 – D.13.

through contracts with preference customers at rates approved by the Federal Energy Regulatory Commission.³³²

The operational requirements for power as established in the plan are also implemented through two related legal documents. First, the Corps' South Atlantic Division and SEPA entered into a "Memorandum of Understanding" (1991) for "...disposal of electric power and energy generated at the Corps projects within the Mobile, Savannah and Wilmington Districts,"³³³ including Kerr. The MOU provides that "[r]esponsibility for the planning design, construction, operation and maintenance of the project is vested in the Corps," and further that "...the Corps has the responsibility to manage project uses and functions as appropriate to assure utilization of the resources for all authorized purposes."³³⁴ It provides that the Corps makes available to SEPA the power from each project in accord with mutually agreed schedules.³³⁵ However, any such schedule is subject to the Corps' continuing responsibility to operate the project cost-effectively for all authorized purposes. The Corps follows the mutually agreed schedule at any given time, if "*in the opinion of the Corps*, compliance with such request in the operation of [a project]... would not conflict with statutory requirements for the operation of said projects with regard to fish and wildlife, flood control, navigation, recreation, water quality, water supply, or with other purposes as said projects are to serve, [or] would endeavor, insofar as practical, avoid detrimental effects on the environment" (emphasis added)³³⁶ Further, the Corps, SEPA, and Dominion Generation (formerly Virginia Electric and Power Company) entered into an "Amended and Restated Contract" (July 1999) which elaborates the Water Control Plan's procedures for weekly declaration, power generation, and transmission.

The 1995 Water Control Plan for Kerr, the 1991 MOU, and the 1999 Amended Power Contract are consistent with the Corps' general policy. Under the 1944 Flood Control Act as amended by the 1978 Energy Reorganization Act, the Corps delivers surplus power and capacity from all of its reservoir projects to the U.S. Department of Energy's Power Marketing Administrations,³³⁷ including SEPA; and the applicable PMA markets the power to "encourage the most widespread use thereof at the lowest possible rates to consumers consistent with sound business principles"³³⁸ and with timely repayment of the project costs allocated to power.³³⁹ The

³³² *Id.*, ¶ D.2.

³³³ Memorandum of Understanding (MOU), ¶ 1.a.

³³⁴ *Id.*, ¶ 1.b.

³³⁵ *Id.*, ¶ 3.a.

³³⁶ *Id.*, ¶ 3.c.

³³⁷ EP 1130-2-510, ¶ 2-2.b.

³³⁸ EP 1130-2-510, ¶ 2-2.b.

³³⁹ EP 1165-2-1, ¶ 6-6.

Corps and the applicable PMA have a Water Management Agreement (WMA), which is “supplementary” to the Water Control Plan. It provides that the PMA markets the capacity and power from the powerplant. It establishes directions for the Corps' operation of the project so as to "maximize[e] hydropower generation" in a manner that “prevent[s] significant conflict with other water control objectives....”³⁴⁰ The Corps provides written notice to the PMA of any change in operation or other condition which could substantially affect the cost or availability of power.³⁴¹ Thus, the Corps is responsible to operate a project and provide information on cost and availability of power to the PMA. The PMA does not have any authority to direct operations of a Corps powerplant. Instead, the Corps operates the project in a manner that optimizes all authorized purposes. The WMA reflects this general obligation and, while providing direction to the Corps for power operations, preserves the Corps’ discretion to adjust operations as necessary for prevention or minimization of conflict with other project purposes.

II. Revision to the 1995 Water Control Plan

You asked whether the Wilmington District has authority to revise the 1995 Water Control Plan to establish a more natural flow pattern to enhance the sustainability of the bottomland forests and fish and wildlife resources. Our understanding is that The Nature Conservancy has estimated that the proposed operational modifications both would enhance flood protection benefits for bottomland forest and would reduce power generation under the 1995 plan by 3.4%. Our short answer is yes, the Corps may so revise the 1995 plan, provided that further study confirms that the plan revision would not cause significant losses in flood protection or power generation. Turning the tables, power generation at Kerr must be managed in a manner that does not impair the general purposes of water quality and fish and wildlife protection. As discussed in Section I.B above, the Corps has a responsibility to manage operations of Kerr, like all of its projects, to achieve the “optimum” benefits for all authorized purposes.

The Wilmington District modified the 1992 Water Control Plan for Kerr Dam to add specific requirements for protection of striped bass. It did not seek or need any Congressional authorization for that modification. Under the Corps’ general policy, most revisions of Water Control Plans do not require new Congressional authorization or review under the Continuing Authorities Program.³⁴² “Further Congressional authorization is not required to add municipal

³⁴⁰ EM 1110-2-3600, ¶ 8-4.b(4)(a).

³⁴¹ EP 1130-2-510, ¶ 2-3.e(2)(a).

³⁴² The Continuing Authorities Program consists of ten authorities to undertake project improvements, including revisions to Water Control Plans, without seeking additional Congressional authorization. *See* ER 1105-2-100, Table F-2. In addition, the Corps may study a significant project modification under Section 216 of the 1970 Flood Control Act, subject to Congressional review and approval of its recommendation. Indeed, the Wilmington District is undertaking a Feasibility Study of revising the 1995 plan pursuant to such Section 216 authority. As discussed in the text, that authority, while available, is not necessary for a plan revision which does appear to significantly affect original purposes or facility design.

and industrial water supply, water quality, and recreation and fish and wildlife purposes if the related provisions in regulation would not significantly affect operation of the project for the originally authorized purposes.”³⁴³ The Corps has “...broad authority for making, as part of its operations and maintenance efforts, reasonable changes and additions to project facilities within the project boundaries as may be needed to properly operate the project or minimize maintenance.”³⁴⁴

Indeed, general policy requires periodic revision of Water Control Plans to assure optimum benefits. Under standard procedures established by ER 1110-2-240 and other policy, the Corps will take “necessary actions” to keep each Water Control Plan (and Manual) up-to-date.³⁴⁵ Specifically, a plan will be “...revised as necessary to conform with changing requirements resulting from developments in the project area and downstream, improvements in technology, new legislation and other relevant factors, provided such revisions comply with existing Federal regulations and established Corps of Engineers policy.”³⁴⁶ “The Corps is responsible for insuring the maximum sustained public benefits from each of its projects for all desirable purposes, including power, as integral parts of comprehensive plans for the regulation, control, conservation and utilization of water resources. Consistent with project authorizations, this is a continuing responsibility throughout the planning, design, construction and operation phases.”³⁴⁷

Under general policy, the Corps will use long-term forecasts and modeling to evaluate whether standard operations (as provided in a given Water Control Plan) should be modified to better achieve the project objectives in unusual circumstances.³⁴⁸ Indeed, “...there is a need to re-evaluate the current regulation as conditions change from those contained in the water control studies, in order to reflect the effects of the current operating experience on future regulation.”³⁴⁹ By maintaining “continuity and surveillance of system regulation, long-term analyses provide the water manager with the ability to anticipate future conditions that may be adverse to meeting the overall water management goals and to take appropriate corrective action in time to be effective.”³⁵⁰

³⁴³ ER 1165-2-119, ¶ 8.c.

³⁴⁴ ER 1165-2-119, ¶ 8.a.

³⁴⁵ ER 1110-2-240, ¶ 6.b.

³⁴⁶ ER 1110-2-240, ¶ 6.c.

³⁴⁷ EP 1165-2-1, ¶ 16-1.

³⁴⁸ EM 1110-2-3600, ¶ 6-6.d(1).

³⁴⁹ EM 1110-2-3600, ¶ 6-6.a(1).

³⁵⁰ EM 1110-2-3600, ¶ 6-6.d(1).

We understand that SEPA and Dominion Generation have expressed concern about any revision of operational requirements (as stated in Water Control Plan Section D) that may reduce power generation. Of course, The Conservancy acknowledges the validity of that concern. The legal issue, however, is whether a reduction in power generation is enough to prevent consideration of a plan revision to enhance authorized purposes of water quality and fish and wildlife protection. Our answer is plainly no. The 1944 Flood Control Act, which is the authorizing statute for Kerr Dam, does not require any specific amount of power generation. It does not provide that power generation trumps flood control or other purposes. Similarly, the 1991 MOU and the 1999 Amended Contract do not delegate to SEPA or Dominion Generation any of the Corp's responsibility to operate Kerr Dam to achieve all authorized purposes. Indeed, under general law and policy, the Corps has a fundamental responsibility to consider a plan revision whenever data (whether its own or a stakeholder's) show that baseline operations may cause adverse impacts on one or more such purposes. Since trade-offs inevitably occur between authorized purposes,³⁵¹ the Corps must determine the trade-off which provides optimum benefits across such purposes.

Indeed, general policy requires that the obligation to maximize power generation will be reconciled with the obligation to also protect environmental quality. That policy recognizes that power generation may have "...adverse impacts on fish and wildlife habitat, aesthetics, navigation and public safety."³⁵² "Reservoir releases to provide peak power service may result in a substantial change in the regimen of a stream. In some cases, the change from relatively steady rates of flow to frequent fluctuations may cause undesirable effects. Fluctuation may reduce the benefits from other reservoir functions, such as recreation, pollution abatement, and water supply."³⁵³ General policy requires that "[p]ositive means to prevent or reduce adverse effects [from peaking operations] are considered in the planning and operation phases. Tangible and intangible benefits may be obtained from measures such as: modification in power output; location of a re-regulating reservoir downstream; or acquisition of additional interest in land."³⁵⁴

III. Conclusion

We conclude that the Wilmington District has authority to consider a revision to the 1995 Water Control Plan to enhance protection of downstream riparian bottomlands, water quality, and fish and wildlife resources, even if that revision would reduce power generation. To adopt such revision under those procedures, the Corps must find that the revision would improve the 1995 plan's overall benefits across all project purposes. Stated differently, the Corps does not have authority to decline to consider a plan revision, merely because the revision would reduce power generation by some amount.

³⁵¹ See, e.g., EC 1105-2-404, ¶ 7.a.

³⁵² EM 1110-2-3600, ¶ 4-10.h(5).

³⁵³ EP 1165-2-1, ¶ 16-8.a.

³⁵⁴ EP 1165-2-1, ¶ 16-8.b.

APPENDIX I: ENVIRONMENTAL ASSESSMENT OF REVISED WATER CONTROL PLAN FOR GREEN RIVER DAM



PM-P-2002-11

Planning Branch
Economic and Environmental
Resources Section

May 17, 2002

PUBLIC NOTICE

Environmental Assessment

Green River Lake

Adair, Taylor, and Casey Counties, Kentucky

Modification of Regulation and Operation

TO WHOM IT MAY CONCERN:

Notice is given that the U.S. Army Engineer District, Louisville, under authority of Section 216 of the 1970 Flood Control Act (Public Law 91-611), is proposing to modify the operation of the Green River Lake project. This proposal is the result of a partnering relationship between the U.S. Department of Agriculture, Natural Resources Conservation Service, the Kentucky Department for Natural Resources and Environmental Protection, Division of Conservation, the Kentucky Chapter of The Nature Conservancy and the Louisville District Corps of Engineers.

A summary of the plans for the proposed action is as follows:

The proposed plan will modify the current operating plan at Green River Lake. The current operating plan and the proposed modification are listed below.

Current Operating Plan

Winter Pool 664

Summer Pool 675

Non-Crop Season Release Rates

Maximum 7200 cfs

Minimum 300 cfs

Filling Schedule

15 March – 15 April (or until 675 attained)

Minimum release 50 cfs

Fall Drawdown

15 September – 15 October 10% (1 foot)

16 October – 30 November 90% (10 feet)

Proposed Action

Winter Pool 668

Summer Pool 675

Non-Crop Season Release Rates

Maximum 8200 cfs

Minimum 300/1000 cfs

Filling Schedule

15 March – 15 April (5 feet)

16 April – 15 May (2 foot)

Minimum release - 100 cfs

Fall Drawdown Schedule

15 September – 31 October 10% (0.5 foot)

1 November – 30 November 90% (6.5 feet)

This plan was selected as the proposed plan because it best accomplishes the desired results based on a comparison of the key variables (flood control, recreation, water temperature, etc). This plan produces an improved flood control capability for events of high magnitude and only slightly worse utilization for routine annual events. It reduces the percent of time in the

ideal recreation zone during June, July, August and September by only 1.5 percent but increases the period for ideal recreation during October by over 40 percent. Use of this plan results in a reduction of May cold water releases by 8 percent and October cold water releases by over 46 percent. This plan also provides the best overall reproduction of a natural flow regime. In addition, the use of a 668 winter pool provides for greater capability/capacity in utilization of the upper opening of the multilevel release system. This capability/capacity provides for better opportunity to release higher temperature waters during the spring when the overall temperature of the reservoir water column is less than the natural temperature regime. With this plan, significant additional benefit can be realized by deferring the major fall drawdown until pool destratification is achieved.

The Environmental Assessment (EA) and the Finding of No Significant Impact (FONSI) for the proposed pool modification was prepared pursuant to the National Environmental Policy Act (NEPA) and by Policy and Procedures for Implementing NEPA, ER 200-2-2, 1.

A copy of the EA and FONSI is enclosed. Address all comments to the above address, ATTN: Mrs. Sharon Logsdon, CELRL-PM-P-E, or telephoning (502) 315-6869. Written comments received within 30 days of this notice will become a part of the record and will be given due consideration.

In addition, you may provide comments via e-mail at the following address:
sharon.m.logsdon@lrl02.usace.army.mil.

William Michael Turner
Chief, Economics and Environmental
Resources Section

ENVIRONMENTAL ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT
MODIFICATION OF REGULATION AND OPERATION
OF
GREEN RIVER LAKE, KENTUCKY

INTRODUCTION

This Environmental Assessment (EA) has been prepared to address the proposed modifications in the operation of the Corps of Engineers Green River Lake project in Adair, Taylor and Casey counties, Kentucky. The National Environmental Policy Act (NEPA) mandates environmental review of all proposed activities on Federal lands which could potentially cause significant impacts to the human environment. The proposed modifications are being carried out under the authority of Section 216 of the 1970 Flood Control Act (Public Law 91-611).

PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the proposed action is to restore natural hydrologic variability in flow and temperature in the Green River downstream of Green River Lake while continuing to meet the authorized project purposes, e.g., flood control. The Green River, from the tailwater of the lake to the eastern boundary of Mammoth Cave National Park, is known as one of the most biodiverse stretches of river in the United States.

The U.S. Department of Agriculture, Natural Resources Conservation Service, the Kentucky Department for Natural Resources and Environmental Protection, Division of Conservation, and The Nature Conservancy have joined into a public-private partnership to offer the conservation reserve enhancement program (CREP) to landowners to protect this stretch of river and preserve it for future generations. The goal of this partnership and the Louisville District is to implement strategies throughout the watershed to protect and restore the ecosystem functions and rare plants, animals, and communities that are indigenous to this aquatic area. This goal cannot be achieved without the modification of the current water regulation schedule for Green River Lake.

The Commonwealth of Kentucky Department of Fish and Wildlife Resources have requested review of pool levels and operational plans for all four Louisville District lakes in the Green River basin to benefit fish and wildlife resources and extend recreational opportunities. This proposed action at Green River Lake is the first to be considered.

The proposed operational changes are needed to assist the recovery of numerous state and federally protected plants and animals, especially aquatic species, downstream of the dam and to increase recreational opportunities in the fall for boating and sport fishing.

PROPOSED ACTION AND ALTERNATIVES

No Action

A basic alternative to any proposed plan is the no action alternative. This alternative continues the present operational plan as it exists for Green River Lake. Important components of the current operational plan are as follows:

Lake Water Elevations

Winter Pool 664

Summer Pool 675

Non-Crop Season Release Rates

Maximum 7200 cfs

Minimum 300 cfs

Spring Filling Schedule

15 March – 15 April (or until 675 attained)

Minimum release 50 cfs

Fall Drawdown or Release Schedule

15 September – 15 October 10% (1 foot)

16 October – 30 November 90% (10 feet)

Alternatives

Multiple alternatives were considered to meet the purpose and need for the proposed action. Four were evaluated in detail as these represented the best opportunities to improve downstream flows and temperature while having no adverse effect on flood control, water supply, or any other use of Green River Lake.

All the alternatives considered as operational modifications evaluated four important factors; (1) capability to increase the non-crop season maximum and minimum release rates without adverse impacts, (2) capability to delay the significant Fall drawdown until lake destratification and reduce the 15 September – 30 October drawdown to 0.5 foot without adverse impact, (3) capability to raise winter pool to elevation 668 without significant adverse flood control impact and, (4) capability to modify the filling schedule without significant impacts on recreation.

The four alternatives considered in detail are as follows:

Modification 1

Lake Water Elevations

Winter Pool 664

Summer Pool 675

Non-Crop Season Release Rates

Maximum 8200 cfs

Minimum 300/1000 cfs

Spring Filling Schedule

15 March – 15 April (10 feet)

16 April – 15 May (1 foot)

Minimum release 100 cfs

Fall Drawdown or Release Schedule

15 September – 31 October 5% (0.5 foot)

1 November – 30 November 95% (10.5 feet)

Modification 2

Same as Modification 1 except:

Spring Filling Schedule

15 March – 15 April (9 feet)

16 April – 15 May (2 feet)

Modification 3

Lake Water Elevations

Winter Pool 668

Summer Pool 675

Non-Crop Season Release Rates

Maximum 8200 cfs

Minimum 300/1000 cfs

Spring Filling Schedule

15 March – 15 April (6 feet)

16 April – 15 May (1 foot)

Minimum release - 100 cfs

Fall Drawdown or Release Schedule

15 September – 31 October 10% (0.5 foot)

1 November – 30 November 90% (6.5 feet)

Proposed Action

Same as Modification 3 except:

Spring Filling Schedule

15 March – 15 April (5 feet)

16 April – 15 May (2 feet)

Minimum release - 100 cfs

AFFECTED ENVIRONMENT

General Description/Land Use

Green River Lake is operated for the purposes of flood control, low flow augmentation, recreation and fish and wildlife enhancement, and serves as a source of water supply. The lake was authorized by the Flood Control Act of 28 June 1938, and was completed in February 1969. Green River Lake is located in south central Kentucky, about eight miles south of Campbellsville. The dam site is at mile 305.7 on Green River. The lake controls 682 square miles of the upper Green River watershed.

The lake has a minimum pool elevation of 653 feet msl, which forms a 5,070-acre lake 18 miles in length and a water quality pool elevation of 664 which forms a 6,650-acre lake 21 miles in length. Summer pool at 675 msl forms 8,210-acre lake 25 miles in length. Water supply storage has a volume of 64,500 acre-feet between elevations 653 and 664 and is equal to 1.77 inches of runoff. Total storage volume of the lake is 723,200 acre-feet at the flood control pool elevation of 713 feet msl. At this elevation, the lake covers 19,100 acres and extends 37 miles.

The pool is held, as near as possible, at elevation 664 from late fall through the winter months to provide additional storage capacity for floodwaters. From mid-April through mid-September, the pool is maintained at elevation 675, conditions permitting.

A total of 32,356 acres of land was acquired in fee for Green River Lake. Flowage easements were taken on an additional 1,587 acres. Approximately 2,430 acres are included in seven sites selected for public access. Five of the sites have been developed and are currently open to public use.

Climate/Air Quality

The climate of the project area is of the humid, subtropical type. The mean annual temperature is about 57 degrees Fahrenheit which varies from a mean of 37 degrees Fahrenheit in January to a mean of 76 degrees Fahrenheit in July, producing a growing season of approximately 180 days. Precipitation in the project area is fairly evenly distributed throughout the year, with smaller amounts occurring in late summer and fall. The average annual rainfall is approximately 51 inches.

Cultural Resources

Though numerous prehistoric sites have been reported in many portions of the Green River Valley, likely the best known prehistoric manifestations are the Shell Mound Archaic sites found further downstream. Historic settlement of the area was likely underway as early as the late 1700's. Two predominate categories of cultural resources are likely to be encountered within the environs of the study area. Prehistoric camp sites – likely seasonal in nature – will be found scattered across the landscape adjacent to local streams. Following initial Euro-American

occupation, numerous small farmsteads were established in the area – albeit typically on elevationally higher landforms – and this portion of the Green River Valley is yet largely undeveloped and retains much of its rural character.

Environmental Justice

Approximately 5 miles upstream from Green River Lake is the small town of Pellyton is an Amish/Mennonite community. The Pellyton community (population approximately 180) is northeast of Neatsville bridge on highway 210.

Recreation

The public use areas around the lake contribute a major portion of the camping, picnicking, water access, swimming and other day use opportunities in the Green River Lake area. There are three marinas located throughout the lake area that offer a full range of services.

Physiography, Geology and Soils

The Green River Lake project lies within the Mississippian Plateau Province, an area underlain by Mississippian age limestones and shales. The underlying geology in the lake area consists of clayey siltstone, medium to dark-gray shale, and light to bluish-gray siliceous limestone. The topography is moderately to highly dissected rolling uplands. The relief is more severe in the areas north and east of the lake, and the slopes are gentler in the areas adjacent to the south and west. Maximum relief in the project area is about 400 feet. The walls of the river valley form a relatively steep bluff on the side of the river and generally alternate with more gentle slopes on the opposite side.

The spillway cut (713 msl) is an outstanding geologic resource within the project area which offers a unique opportunity to witness the weathering of fractures in siltstone and limestone formations. Immediate access to the spillway is not available to the public, but visual inspection is provided from the overlook within the interpretive area.

Soils within the project area are divided into three major categories based on the material from which they were developed. Some soils in the uplands and along valley walls were developed from residuum, a weathered form of the bedrock. Other soils in the uplands were developed from loess. Soils in the bottomlands along stream valleys were developed in alluvium.

Of the major soil classifications which occur in the Upper Green River Basin, four encompass most of the project lying in the Mississippian Plateau Physiographic Region. They are the

Gilpin-Caneyville-Dekalb, Pembroke-Crider-Cumberland, Baxter-Bedford, and Garmon-Talbott-Baxter soil associations.

Farmland: Prime or Unique

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and which is available for these uses. Prime farmland can be cropland, pastureland, range land, forest land, or other open vegetated lands, but cannot be urban built-up land or water.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation. It also has favorable temperature and growing season, acceptable acidity or alkalinity. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent.

Unique farmland is land other than prime farmland used for the production of specific high value food and other fiber crops. Unique farmlands can economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods.

The U.S. Department of Agriculture, Soil Conservation Service has not classified any unique farmland within the Green River Lake area. There is a considerable amount of classified prime farmland scattered throughout all the counties in the Green River Lake project area, however, a very insignificant amount is adjacent to the lake itself. Downstream agriculture (as far as Mammoth Cave National Park) is dominated by pasture, hayfields, and forests.

THREATENED OR ENDANGERED SPECIES

The possible presence of threatened, endangered, or declining plant or wildlife species is an important consideration in the planning of any resource development. The United States Fish and Wildlife Endangered and Threatened Species List include the following species whose range includes the project area: bald eagle, Indiana bat, and gray bat. While the eagle occurs only as a migrant, the bats are residents of the area at least part of the year.

A well known, unique biological characteristic of the Green River Basin is the presence of a large and diverse mussel population, considered by some to be one of the most diverse of any stream in the country. Downstream of the dam from the Green-Taylor County line to the upstream boundary of Mammoth Cave National Park, there has been reported 39 species of freshwater mussels, six of which are endangered.

Impoundment of Green River Lake has reduced the mussel populations, which formally existed in that section of the river, but probably not eliminated all mussel species. Those capable of adapting to a lake environment may still persist to some degree.

Waste: Hazardous or Solid

Wastes at Green River Lake consist of domestic and sanitary wastes associated with a wide variety of recreational opportunities including boating, camping, picnicking, swimming, hiking and sightseeing and operational wastes associated with Green River and Emerald Isle Marinas. Domestic and sanitary wastes do not meet the definitions of hazardous waste and are therefore deemed solid wastes. Josco Construction disposes of these wastes through a contract with the Corps. Wastewater at the various recreation sites and facilities is disposed of by a septic system or a lift station.

Operational wastes generated from the marinas are disposed of by contract with Josco Construction. Disposal of hydraulic fluids and waste generated from the operation of the dam is also disposed of by Josco Construction.

Water Quality: Drinking and Ground

There are approximately 8,288 miles of streams and rivers in the upper Green River basin. Only 714.3 miles (9%) have been assessed to determine whether they meet water quality standards for swimming and fishing. Many of the streams in the upper watershed are relatively pristine but others have been negatively impacted by agriculture and development. The limited monitoring data available in the upper Green River basin indicates that streams have documented impairments due to agriculture (98.3 miles of stream impaired), industrial and municipal wastewater discharges (61.5 miles), urban runoff and development (17.9 miles), and other unknown sources (394.7 miles).

Wetlands

A naturally occurring process due to the impoundment of the Green River Lake is the development of several wetland areas at the headwaters of the Green River Lake. Also, there are numerous other small wetlands (less than one acre), mostly ephemeral wetlands downstream of the lake.

Wild and Scenic Rivers

A large segment of the upper Green River has been designated a state Wild River in recognition of its outstanding natural qualities and pristine setting. The designated stream segment is the highest quality, least-impacted stream in the basin. It consists of 26 stream miles of the Green River (Hart and Edmonson counties) and has a corridor area of 6,500 acres. This is part of a larger 157-mile segment, from Green River Lake Dam to Lock & Dam #4, that winds through Taylor, Green, Hart, Edmonson, Warren, and Butler counties. This stream segment is managed

by the Division of Water to protect its natural features and undeveloped character. In addition, Mammoth Cave National Park, managed by the National Park Service, also protects much of the Wild River segment of the Green River in Edmonson County, as well as portions in Hart County.

Wildlife and Vegetation

In general, the diversity of habitat in the Green River project area provides for a relatively large variety of wildlife species. Approximately 28,770 acres of project lands and water are licensed to the Kentucky Department of Fish and Wildlife Resources for wildlife management.

The Green River area provides many habitats, ranging from karst topography to bottomland woods, which allow for a large diversity of reptiles and amphibians. A total of 76 species have their geographic range and habitat requirements met within the project area. These 76 species include 21 species of salamanders, 13 species of frogs and toads, 7 species of lizards, 12 species of turtles, and 23 species of snakes.

A diversity of habitat in the project area ranging from upland forests to grasslands and marshes supports many varieties of birds. The project provides the opportunity to observe 230 bird species. These include 51 permanent residents, 25 winter residents, 65 summer residents and 89 migratory species. Although 33 of these species are considered game birds, dove and quail, supported by fairly good populations, are the most widely hunted.

The Green River Watershed is on the eastern most edge of the Mississippi Flyway. A small population of wood ducks commonly nest in the area; however, most of the waterfowl species are associated with fair sized wintering and migrating flocks. Waterfowl hunting is limited, with mallards comprising the majority of the take.

Forty-nine mammal species have their geographic ranges and habitat requirements met within the project area. The list includes five game species such as the cottontail rabbit, fox and gray squirrels, woodchuck, and whitetail deer. Also included are a number of furbearers and aquatic furbearers; however, their habitat is limited because of the steep banks surrounding the lake.

The fishery resource is typical of most large Kentucky impoundments, though some others are more productive. Much of the lake suffers from lack of suitable cover for fish. Banks sides are sheer bedrock which drop rapidly to the bottom. The fishes most sought by lake anglers include bass, catfish, crappie, and panfish.

There is one state park on Green River Lake operated by the Commonwealth of Kentucky. The park has a state wildlife management area associated with it that is administered by The Kentucky Department of Fish and Wildlife Resources.

The vegetation in the Green River basin can be broadly classified into four, general categories according to site. The four types are: bottomland, slopes, upland, and open lands. A listing of species associated with each type are shown below.

- A. Bottom Land. This broad type includes streambank thickets, flood plain forests, and marshes. Species include:

<i>Salix nigra</i>	Black willow
<i>Acer negundo</i>	Box elder
<i>Acer saccharinum</i>	Silver maple
<i>Platanus occidentalis</i>	Sycamore
<i>Liquidamber styraciflua</i>	Sweetgum
<i>Betula nigra</i>	River birch
<i>Juglans nigra</i>	Black walnut
<i>Gleditsia tricanthos</i>	Honey locust

- B. Slopes. This type consists of species which favor sites of lower slopes. Species include:

<i>Fagus grandiflora</i>	Beech
<i>Liriodendron tulipifera</i>	Yellow poplar
<i>Quercus alba</i>	White oak
<i>Acer saccharum</i>	Sugar maple
<i>Quercus rubra</i>	Red Oak
<i>Carya spp.</i>	Hickories
<i>Fraxinus Americana</i>	White ash
<i>Quercus velutina</i>	Black oak
<i>Nyssa sylvatica</i>	Black gum
<i>Acer rubrum</i>	Red maple
<i>Tilia Americana</i>	Basswood
<i>Aescular spp.</i>	Buckeyes
<i>Celtis occidentalis</i>	Hackberry
<i>Magnolia acuminata</i>	Cucumbertree

<i>Platanus occidentalis</i>	Sycamore
<i>Prunus serotina</i>	Cherry

- C. Upland. This type is found on the ridges, upper north slopes, and middle land upper south slopes. Species include:

<i>Quercus prinus</i>	Chestnut oak
<i>Fagus grandiflora</i>	Beech
<i>Acer saccharum</i>	Sugar maple
<i>Liriodendron tulipifera</i>	Yellow popular
<i>Acer rubrum</i>	Red maple
<i>Fraxinus americana</i>	White ash
<i>Nyssa sylvatica</i>	Black gum

- D. Open Lands. These lands, which consist of areas which have virtually no tree growth, are either old pasture, cropland, or residence sites. The land is generally vegetated with various weed species. In some areas, the eastern Red Cedar (*Juniperus virginiana*) has become fairly well established.

ENVIRONMENTAL IMPACTS

General Description/Land Use

Just as with the current operation, the initiation of maximum release following a flood event is based on guidance intended to reduce the potential for releasing stored floodwaters during periods when this release would be inappropriate. The maximum release, though higher, would be initiated and/or reduced according to the existing guidance. Therefore, a higher maximum release during the non-crop season has no significant impact on downstream crest reductions. The proposed change in minimum release from 300 to 1000 cfs, could result in minor differences in downstream reductions if the higher rate was initiated at the onset of the flood control operation. But, since the proposed modified release schedule provides for a minimum flood control release of 300 cfs during periods when the allowable release station and the first flood control station (Munfordville) dictate, the maximum benefit afforded by the project has been achieved prior to the increase in minimum release. Therefore, no loss of flood control benefit is attributed to the increase.

Pasture, hayfields and forests dominate downstream land use. The only potential adverse effect would be during crop season. Since crop season release rates will remain the same, there is no difference in crests experienced during the crop season.

Climate/Air Quality

The only air quality impact associated with the reregulation of Green River Lake would be a positive, very localized impact. Odors, primarily hydrogen sulfide, would be reduced or eliminated at the tailwater of the dam during Fall releases as these will not occur until after destratification. .

Cultural Resources

The reregulation of Green River Lake will have no adverse impact to cultural resources. Although there is a change to the current operation, it reasonably approaches the current level.

Environmental Justice

Pellyton is located approximately 5 miles upstream from the project area and, therefore, will not be affected by the reregulation of Green River Lake. No loss of flood protection or water supply anywhere in the basin will result from the proposed action.

Recreation

The proposed modified filling schedule (possibly beyond a dependable source of inflow) shows some potential for adverse impact on attainment of summer pool level. The current operation defines the filling curve as mid-March through mid April. In reality, no adverse impacts are associated with non-attainment of summer pool until Memorial Day. Though the current plan provides for slightly higher ideal summer pool utilization, the proposed plan reasonably approaches the current level. Additionally, the proposed plan produces over a 40 percent increase in ideal recreation levels in October from the current level.

Physiography, Geology and Soils

The plan only slightly modifies pool levels, release and fill dates within the Green River Lake project area, therefore, no adverse impacts associated with the physiography, geology or soils are expected. Likewise, downstream effects to physiography, geology, and soils are minimal even if identifiable.

Farmland: Prime & Unique

Prime farmland does exist in the Green River Lake area. However, there is none adjacent to the lake itself. No downstream lands will be affected as maximum releases are during non-crop season. Therefore, no adverse impacts to prime farmland are expected.

Most all low-lying property has been removed from crop production other than hay. Maximum releases will occur during non-crop seasons and are not expected to impact agricultural uses on the land.

Threatened & Endangered Species

No adverse impacts to threatened or endangered species are expected from this action. In fact, by restoring the more natural hydrologic variability in flow and temperature of the Green River downstream of the lake, the ecosystem functions along with rare plants, animals, and communities that are indigenous to the area are expected to recover.

Waste: Hazardous or Solid

No hazardous or solid wastes will be generated by this proposal. No sites will be impacted by the changes in lake reregulation.

Water Quality: Drinking and Ground

The proposed plan would defer the primary Fall drawdown until the lake has destratified. This would result in a significant benefit in the quality of release waters. Preliminary analysis indicates that a delayed filling and higher winter pool provides an improvement in overall lake water quality, but little advancement in the capability of the project to meet downstream Spring temperature objectives. The reservoir tends to respond much slower to increasing temperatures in the Spring than does the uncontrolled runoff area downstream. Often there is inadequate warm water in the project to meet May and June outflow temperature objectives. The current plan has a limited multilevel release capability and precludes meeting a downstream temperature objective about 45 percent of the time in May and 34 percent in June. The proposed multilevel release capability could improve the situation. The increase to 1000 cfs would permit multilevel control of about 80 percent of the May-June releases. The thermodynamics of the reservoir pool would still limit the capability to dependably meet Spring release temperature targets.

The proposed plan also provides a more dependable source of water supply as the quantity available at winter pool is increased.

Wetlands

The modification changes the filling and release schedules of the Green River Lake, along with an increase in winter pool elevation. These changes will have no adverse impact to surrounding wetlands, either on project lands or downstream of the lake.

Wild & Scenic Rivers

The changes in lake regulation will more closely mimic pre-impoundment conditions. This will restore natural flow and temperature conditions within that portion designated by the Commonwealth of Kentucky as a wild and scenic river.

Wildlife & Vegetation

The intention of the proposed plan is to restore the natural hydrologic variability in flow and temperature in the Green River Bioreserve Area. The restoration of a more natural hydrologic variability in flow and temperature of the Green River will restore ecosystem functions and rare plants, animals, and communities that are dependent on the same.

COMPLIANCE WITH OTHER ENVIRONMENTAL REQUIREMENTS

National Environmental Policy Act (NEPA). It has been determined that a Finding of No Significant Impact (FONSI) will satisfy the requirements of NEPA.

National Pollutant Discharge Elimination System (NPDES). A NPDES permit (storm water) will not be required for this action.

Farmland Protection Policy Act (FPPA)

This act directs Federal agencies to identify and take into account the adverse effects of their programs on the preservation of farmland. The most significant change to the proposed release rates will be during the non-crop season. Therefore, the proposed plan will have no significant effect on farmlands.

Floodplain Management (E.O. 11988)

Although the proposed plan is within a floodplain, no adverse impacts to the floodplain or flood stages will result from the proposed action.

PUBLIC INVOLVEMENT AND COORDINATION

Appendix A contains a list of all Federal, state, and local agencies, public officials, local libraries, and interested individuals that were advised of the project by public notice, and solicited for comments and concerns.

DETERMINATION AND CONCLUSION

I have reviewed and evaluated, in light of the overall public interest, the documents and factors concerning this EA and proposed reregulation of Green River Lake as well as the stated views of other interested agencies and the concerned public. In doing so, I have considered the possible consequences of the proposed project in accordance with regulations published in 33 CFR Parts 230 (Corps of Engineers Regulations) and 40 CFR 1500-1508 (Council for Environmental Quality Regulations). The following paragraphs provide my conclusion and how the action complies with the above-cited regulations.

I believe that the proposed project is environmentally sustainable. I believe that this reregulation will not result in any significant impact to the environment. I believe that this proposed action does not constitute a major federal action that would result in any irretrievable or irreversible losses to aquatic or terrestrial resources. Additionally, it would not significantly affect the quality of the human environment. This constitutes a Finding of No Significant Impact (FONSI). As a consequence, I find that an Environmental Impact Statement is not required by the provision of Section 102 of the National Environmental Policy Act Public Law 91-190, or 42 USC 4332, or by the applicable implementing Corps of Engineers regulations and guidance. This FONSI was prepared in accordance with 33 CFR 230 and 40 CFR 1500-1508.

Date

ROBERT E. SLOCKBOWER
Colonel, Corps of Engineers
Commander and District Engineer