PROJECT MANAGEMENT PLAN (PMP)

GATHRIGHT DAM AND LAKE MOOMAW LOW FLOW AUGMENTATION FEASIBILITY STUDY, VIRGINIA

P2 Number: 110460

Covington, Virginia

January 2010

U.S. Army Corps of Engineers
803 Front Street
Norfolk, Virginia 23510-1096

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EXECUTIVE AGREEMENT

The undersigned agree to follow the provisions of this Project Management Plan for the Gathright Dam Low Flow Augmentation Study (Section 216) located near Covington, Virginia. Each activity will focus its influence to provide complete, comprehensive, up-front planning and to meet, or exceed, the objectives of conducting and completing the study with minimum changes, at the least possible cost growth, and within schedule. Changes to the plan must be coordinated with and approved by the undersigned or their designated representatives:

15 Jan 10 (Initial/Date)
Daniel R. Haubner, P.E. , PMP
Project Manager
US Army Corps of Engineers

21 Jan 10 (Initial/Date)
Lawrence Ives
Team Technical Leader, Planning Resources
US Army Corps of Engineers

02-21-10 (Initial/Date)
Charles Martin
Watershed Program Manager, DEQ
Commonwealth of Virginia

1/26/10 (Initial/Date)
Mark Mansfield
Chief of Planning and Policy
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19 Jan 10 (Initial/Date)
Mark Hudgins, P.E.
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25 JAN 2010 (Initial/Date)
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US Army Corps of Engineers

1/25/10 (Initial/Date)
Jason O'neal
Geospatial Services ~~Branch~~ Section
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26 JAN 2010 (Initial/Date)
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Real Estate Office
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1-22-10 (Initial/Date)
Michelle Hamor
Flood Plain Management Services Section
US Army Corps of Engineers

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Helene Haluska (Initial/Date)

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Lindsay Robson 1/15/10 (Initial/Date)

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1/26/10 (Initial/Date)

Jennifer Spencer
Lead Economist
US Army Corps of Engineers

1. PURPOSE

1.0 This document supports the Feasibility Cost Sharing Agreement (FCSA) and outlines the Project Management Plan (PMP) for the conduct of the Gathright Dam and Lake Moomaw Section 216 Low Flow Augmentation Feasibility Study. The Feasibility Study is the second phase of the two-phase U.S. Army Corps of Engineers (USACE) process and follows a favorable Reconnaissance Report. This PMP has been developed by the Norfolk District, USACE, in conjunction with the Commonwealth of Virginia, the study's local sponsor. The success of the PMP lies within the team derived critical factors outlined in Table 1.

1.1 The PMP details the scope, schedule, and budget of the Feasibility Study tasks as well as the division of responsibilities to be accomplished by the Norfolk District and the sponsor, as well as the respective consultants and contractors. Included in the PMP is a detailed work description, cost summary table, and schedule outlining the initiation of tasks by the aforementioned sponsor.

1.2 The PMP was prepared by the Norfolk District and will have to be approved by the North Atlantic Division (NAD) (Norfolk District's next higher authority) and certified by the Office of the Chief of Engineers. The plan will be implemented by the Norfolk District and the sponsor.

1.3 This study and its recommendations will conform to and be fully compatible with the regulations on Project Management (Engineering Regulation [ER] 5-7-1 and Engineer Circular [EC] 1105-2-208, dated 23 December 1994); Real Estate (ER 405-1-12, Draft Chapter 12); Planning (ER 1105-2-100); Engineering and Design (ER 1110-2-1150); Cost Engineering (ER 1110-8-1); Ecosystem Restoration in the Civil Works Program (EC 1105-2-210); the National Environmental Policy Act (NEPA)of 1969, as amended; the Clean Water Act, 33 U.S.C. 1344; and the Fish and Wildlife Coordination Act (FWCA), 16 U.S.C. 661 et seq.

1.4 The PMP serves as the basis for negotiations between Norfolk District and the non-Federal sponsor. The document was coordinated with all District elements and the non-Federal sponsor to develop the baseline study cost, schedule, and assignment of responsibilities. The work scope, schedule, and cost detailed in this PMP were carefully developed and reflect the requirements, desires, and interests of all parties. The Commonwealth of Virginia provided specific comments, including item by item breakdowns on in-kind services that will be provided to support the Feasibility Study effort. Based upon this collaboration with the local sponsor, the PMP presents the share and value of the in-kind services.

Table 1 - Critical Success Factors	
Critical Success Factors	***Performance Measures***
Development of a Coordinated and Signed Project Management Plan	• Draft Completed • Review and Comment by Project Delivery Team (PDT) • Signatures/Concurrence Present on Final Document
Establishing Open and Continuous Communication Lines	• Regular Communications Established • Interaction Levels Identified (POCs) • Customer/User expectations shared/defined
Establishing the Project Team	• Disciplines Addressed Appropriately • Staff Availability Assured • Expertise/Background Coordination of Key Players (PM/TTL/H&H etc.)
Quality	• The product quality is consistent with the requirements of Feasibility Reports. Planning Resources Section will develop the Review Plan which will outline the ATR requirements.
No Feasibility Cost Increases	• Complete Study Within Budget
No Scope Increase	• As critical scope items are added, team is informed and concensus is obtained prior to implementation. • No Scope Changes after Formulation phase.
On Time Delivery Of Study	• Meet Established Schedule Milestones as Congressional Funding permits.
NEPA Requirements completely addressed	• Team members provide timely and accurate input into the NEPA process so that it may stay on schedule.
Establish Executive Staff Oversight and Support of Execution	• Continuous communication of status, issues, concerns
Change Management Processes During Construction	• Establishing authority lines • Requiring appropriate written direction for user requested changes • Documenting differing site or other unforeseen conditions • Establishing expedited change management process
	•

2. ORGANIZATIONAL BREAKDOWN

2.0 INTRODUCTION: This section defines the study organization and the roles and authorities of the USACE and the local sponsor in accomplishing the study. This breakdown can be found in Table 2 below.

2.1 Executive Committee: *Membership:* Norfolk District Engineer; the Chief of Programs and

Table 2 Project Team Contacts and Responsibilities				
Name	**Role**	**Phone**	**E-Mail**	**Responsibilities**
Norfolk District				
	Account Manager	757.201.xxx		• Oversight
Dan Haubner, P.E., PMP	Project Manager	757.201.7704	Daniel.R.Haubner@usace.army.mil	• Coordinate PMP Development with PDT • Acquisition Strategy Coordination with PDT • Leads the PDT • Funding Management • Schedule Management • Upward Reporting • Customer/End-User Focal Point • Weekly Reports • Brief PRB • P2 Labor Funding • Attend Meetings • Provide Weekly Status Report
Lindsay Robson	Project Scheduler	757..201.7686	Lindsay.H.Robson@usace.army.mi l	• PM Assistant • Distribution of Funds • Tracking Expenditures • Provide Financial Support Functions and P2 support to the PM
Larry Ives	Team Technical Lead, Plan Formulator	757.201.7769	Lawrence.Ives@usace.army.mil	• Scope development and participation in negotiations • Coordinate Technical Team Members • Lead PDT in Project formulation and report preparation • Schedule/Scope Input • Lead Technical Resolution Meetings • Prepare Technical Meeting Minutes • Brief Chief of Planning on all issues associated with formulation of the project
Jennifer Spencer	Economist	757.201.7102	Jennifer.A.Spencer@usace.army.mil	• Ensure economic criteria are met
Craig Seltzer	Environmental Specialist	757.201.7390	Craig.L.Seltzer@usace.army.mil	•
Michelle Hamor	Flood Plain Svcs	757.201.7491	Michelle.l.hamor@usace.army.mil	• EO11988 Compliance
Helene Haluska	Sociologist	757.201.7008	Helene.W.Haluska@usace.army.mil	•
Jason O'Neal	Geospatial Specialist	757.201.7108	Jason.A.ONeal@usace.army.mil	• Identify geospatial data requirements and ensure that the appropriate geospatial and data standards are followed. • Acquire existing geospatial datasets from federal, state, local agencies, the public domain and available through USACE licenses agreements. • Create new data layers through the integration of existing and acquired data. • Integrate CADD and GIS

Table 2 Project Team Contacts and Responsibilities				
Name	**Role**	**Phone**	**E-Mail**	**Responsibilities**
				data. • Identify geospatial application requirements needed for the project. • Perform spatial analysis and data modeling. • Provide data visualization and mapping products.
Michael Hall	Cost Estimator	757-201-7691	Michael.K.Hall@usace.army.mil	• Develop Cost Estimates for Alternative Array • Develop Cost Estimate for Selected Plan
Mark Hudgins, P.E.	Chief, H&H Section	757.201.7107	Mark.H.Hudgins@usace.army.mil	• Hydrology Design Oversight • Build Technical Team • Provide TTL/PM with budget/labor split • Provide TTL/PM with Engineering Schedule
David Parson	Real Estate	757.201.7736	David.B.Parson@usace.army.mil	• Review Plans and Alternatives for potential RE impacts and provide input to team • If Required, develop RE plan • Support team with any required ROEs
Owen Reece, PE	Hydraulic Engineer	757.201.7772	Owen.R.Reece@usace.army.mil	• H&H Design • Coordinate O&M conflicts
• **State Offices**				
Jason Hill.	Freshwater Probabilistic Monitoring Coordinator	540.562.6724	Jason.Hill@deq.virginia.gov	• Projects Oversight • Clarify Scope • Direct POC with Plan Formulator on Project planning •
Mary Dail	TMDL Coordinator	540.562.6715	Mary.Dail@deq.virginia.gov	•
Kip Foster	BRRO Permit Manager	540.562.6782	Kip.Foster@deq.virginia.gov	•
Charles Martin	TMDL Program Manager	804.698.4462	Charles.Martin@deq.virginia.gov	•
Arthur Butt	TMDL Coordinator	804.698.4314	Arthur.Butt@deq.virginia.gov	•
Paul Bugas	Fisheries Scientist		paul.bugas@dgif.virginia.gov	•

Project Management Division; the Chief of Projects Branch, which is within Planning, Programs, and Project Management Division (P3MD); the Chief of Planning Branch; and the Commonwealth of Virginia (or their representatives). *Responsibilities/Roles:* As indicated in the FCSA, the overall study management is the responsibility of the Executive Committee that will meet to review study progress, finances, and findings developed and reported by the Steering Committee and study team. The Chief of Planning Resources Section, Norfolk District, will act as alternate for the Chief of Planning Branch while also serving as liaison to the study team. The Executive Committee must approve any amendments to the FCSA. *Meeting Frequency*: Biannually or as-needed.

2.2 Steering Committee: *Membership:* A Steering Committee is comprised of field-level representatives from the local sponsor, appropriate Planning District Commissions, and various state agencies and academia. The Technical Advisory Committee for the Jackson River TMDL will be the basis for the Steering Committee for this study. *Responsibilities/Roles:* As indicated in the FCSA, the day-to-day study management is the responsibility of the Steering Committee. This includes dealing with the daily issues related to conduct of the study, including design of field studies, accomplishment of field investigations, preparation of documents and other work products, public involvement, provision of in-kind services, etc. *Meeting Frequency*: Quarterly or as determined by the committee.

2.3 **Project Delivery** Team: *Membership:* The Project Delivery Team is composed of representatives from the Norfolk District Contracting Branch, Construction Branch, Operations

study funds; organizing the study team; conducting further reconnaissance of the study area; preparing research, analysis, evaluation, formulation, and the Feasibility Report; coordinating with the District and non-District study team; coordinating with higher headquarters; monitoring progress on work tasks; preparing correspondence, public involvement, and institutional studies; and handling any miscellaneous tasks that may develop.

2.3.3 National Economic Development (NED) effects on alternatives are not an appropriate measure for environmental restoration projects, but have a role in the current Flood Risk Management mission of the Gathright Dam. For environmental restoration purposes, the National Ecosystem Restoration (NER) benefit category will be used. The NER Plan is one which maximizes the environmental restoration opportunity while keeping other needs, costs and uses in balance. During the Feasibility Phase, environmental quality (EQ) benefits will be established by determining the environmental outputs of all alternatives that will be measured in like units. Output estimates may be measured in acres, habitat units, population counts, or any other cardinal units of measurement that are consistent when evaluating alternatives.

2.3.4 Other study team members of Environmental Analysis Section of Planning Branch are responsible for developing socio-economic, cultural, and environmental data; assessing study impacts on these subjects; preparing an Environmental Assessment (EA); accomplishing environmental coordination and compliance; and managing the U.S. Fish and Wildlife Service (FWS) contract.

2.3.5 The study team members of RE Branch are responsible for developing real estate cost estimates, obtaining real estate mapping and rights-of-entry, coordinating all real estate aspects, and developing a Real Estate Plan (REP).

2.3.6 The study team members of both Planning and Engineering Branches are responsible for all hydrology and hydraulics studies; geotechnical matters including subsurface exploration and sediment testing; Hazardous, Toxic, and Radiological Wastes (HTRW) investigations; surveys and mapping; engineering and design; and cost estimates for initial construction and maintenance of alternative plans and the selected plan(s).

2.3.7 The study team members of Office of Counsel are responsible for assisting in the institutional analysis, developing the Design Agreement and the Project Partnership Agreeemnt (PPA), and reviewing of the Feasibility Report.

2.3.8 The study team members of Construction, Operations, and Regulatory Branches are responsible for monitoring and reviewing the study as it proceeds through the permitting process to the PED Phase and for coordinating other issues (regulatory) that may affect the study.

2.3.9 The study team members of Contracting Branch are responsible for providing contract support. They will review scopes of work and assist in procuring contractors to support the District's work during feasibility.

2.3.10 The local sponsor is responsible for assisting in the Feasibility Study and, where possible, providing in-kind services. They also appoint representatives to coordinate scheduling, study management of in-kind services, review, and other matters related to study conduct. Representatives will also participate on the Executive Committee and the Steering Committee to oversee and review the study progress.

2.4 COMMUNICATION

- Communication of factual information and data is expected to take place freely among PDT members as required.

- If issues raised during the study process between members of the PDT cannot be achieved by direct communications, resolution of issues on scope, schedule, budget, and communication shall be facilitated by NAO Project Manager.

- The NAO Project Manager will provide Monthly Study status updates to the Non-Federal Sponsor using e-mail.

- Monthly earned value reports will be developed and provided to the PDT by the Project Manager.

- PDT meetings will be conducted monthly at a minimum by the NAO Project Manager.

Communication Plan			
Communication Element	**Participants**	**Frequency**	**Media/Setting**
Project Management Plan	PDT	Updated as required	Meetings and e-mail
Communication report	PM	Weekly	Design status report via E-mail
Sponsor and Stakeholder meetings	All	As needed	Conference call and face to face
PDT Meetings	PDT	Monthly	Meet at NAO, written minutes by Project Manager
Other milestones	PDT	As needed	Meetings, reports, review comments, e-mail, etc

2.5 CHANGE ORDER POLICY & CLASSIFICATIONS

All changes, which impact scope and schedule, must be coordinated, in advance, with a Sponsor representative. This coordination will be documented in writing, e-mail will suffice if appropriate.

2.5.1 Policy:

(1) All expenditures for Sponsor requested changes require prior approval from entire PDT.

(2) NAO will document requested changes and provide team with impacts to schedule and budget.

(3) All expenditures from the contingency account for non-mandatory study changes require prior approval from NAO PM.

(4) Upon receipt of a Sponsor change request, the NAO PM in coordination with the Sponsor will prepare a Change Management Plan (CMP) form (see below). The CMP will be presented to the entire PDT for relevant signatures. Significant changes to project scope, schedule or costs will have to be briefed at the District's Project Review Board for concurrence.

Change Management Plan Form

(insert change language in this area)

Identify Change:

Impact To:

Budget: _____

Schedule: _____

Other: _____

Individuals Endorsing Change:

_____ x _____
(name) (signature)

_____ x _____
(name) (signature)

_____ x _____
(name) (signature)

_____ x _____
(name) (signature)

_____ x _____
(name) (signature)

Authorization to Proceed With Change:

_____ _____

(customer) (owner/client)

Date: ___ Date: _____

3. DESCRIPTION OF PRODUCTS

3.0 INTRODUCTION: The PMP will cover the development of seven products during the Feasibility Study. Each of the products described below will include the submission and review of interim deliverables to the local sponsor for each study objective. The content, schedule, and the distribution of interim deliverables will be mutually agreed upon by the Norfolk District and the sponsor.

3.1 Project Management Plan: As part of the Feasibility Study efforts, a draft PMP will be prepared based on the recommended project, and a baseline cost estimate will be developed. The draft PMP will address the schedule of Planning, Engineering and Design (PED) activities, which include preparation of plans and specifications for the initial construction contract. The draft PMP may also address the development of other supporting plans, such as local cooperation, real estate and acquisition, quality control, value engineering, environmental and cultural matters, safety and security, and operation and maintenance. This document will form the basis for the PMP to be finalized for project implementation. The draft PMP will be submitted with the Draft Feasibility Report. It is important to stress that the PMP is a living document and the scope can be refined by the project delivery team as more information is known about conditions affecting the project.

3.2 Feasibility Cost Sharing Agreement: The Feasibility Cost Sharing Agreement (FCSA) documents the commitments of the Department of the Army and a non-Federal sponsor to share the cost of the feasibility phase. The FCSA is intended to promote a partnership for the conduct of the feasibility study. The Department of Army remains responsible for representing the Federal interest by following Federal policies and budgetary priorities. Both parties will conduct planning within the framework established by the P&G with guidance provided in this regulation. The FCSA will be accompanied by a signed Certification Regarding Lobbying and, if applicable a completed Disclosure of Lobbying Activities.

3.3 Review Plan: Documentation of the technical review for the Feasibility Study will be sufficient to ensure a quality assurance reviewer that a comprehensive, independent review was conducted in accordance with the principles and guidelines established. Both the scope of the review and the documentation of the review process for the Feasibility Study are established in the Review Plan (RP), which has been prepared for this Feasibility Study and is attached to this PMP. The RP was prepared in accordance with EC 1105-2-410, Review of Decision Documents, dated 22 August 2008. It is expected that all in-progress review actions, study and review team meetings, and other significant review-related actions will be documented in the form of written memoranda. A Quality Control Report will be prepared that includes all review-related memoranda as discussed previously, the technical review team's comments with

responses and actions, and the executive-level certification that the review process has been conducted in accordance with the RP and other pertinent regulations and guidelines.

3.4 Feasibility Report: This product includes all activities leading to the approval of the Final Feasibility Report documentation by the Office of the Chief of Engineers. The report will consist of a main report summarizing the technical findings and containing the study conclusions and recommendations. It also includes the supporting documentation, which consists of technical sections covering work accomplished in the various work task subaccounts. The report entails all problem identification and formulation activities required to identify and recommend a plan of improvement. It also includes NEPA, Section 106, and other environmental compliance documentation; coordination of the study and results with all interested parties; initial and final review by NAD; final review by the Office of the Chief of Engineers, the Assistant Secretary of the Army for Civil Works, and the Office of Management and Budget; and ultimately, transmittal to Congress.

3.5 Environmental Impact Statement or Environmental Assessment: The EIS/EA, although an independent document, will be physically included in the Feasibility Report. This product includes all activities leading to the assessment of environmental impacts related to the plans for the restoration of the study area. This includes scoping and preparation of the environmental document, public coordination and review, and notification of findings. The EIS/EA will be approved in conjunction with the Final Feasibility Report.

3.6 Preliminary Design Agreement: Prior to the initiation of the PED Phase (in the case of this study, this refers to the plans and specifications portion of the PED Phase) and subsequent to the completion of the Feasibility Study, a Design Agreement will have to be executed with the non-Federal sponsor. Therefore, as the details of the recommended plan are finalized in the latter stages of the Feasibility Study, coordination will be undertaken with the non-Federal sponsor to review the model language for a Design Agreement. A letter of intent will be developed acknowledging the requirements of non-Federal sponsor cooperation and expresses a good faith intent to sign the Design Agreement and cost share in the PED Phase. Additionally, a financing plan will be provided by the non-Federal sponsor. An assessment of this plan will then be completed by Norfolk District.

3.7 Preliminary Project Partnership Agreement: Prior to the initiation of the Construction Phase and subsequent to the completion of the PED Phase (in the case of this study this refers to the plans and specifications portion of the PED Phase), a PPA will have to be executed with the non-Federal sponsor. At the same time the model Design Agreement is coordinated with the non-Federal sponsor, a model PCA will also be provided. Near the end of the PED Phase, a letter of intent will be developed acknowledging the requirements of non-Federal sponsor cooperation and expresses a good faith intent to sign the PCA and cost share in the Construction and Operation and Maintenance Phases. A financing plan will also be developed by the non-Federal sponsor to detail plans for financing costs for the life of the project. An assessment of this plan will then be completed by Norfolk District.

4. SCOPE OF WORK

4.0 INTRODUCTION: This scope of work identifies and outlines the processes and procedures that the Norfolk District and the local sponsor will use in this Feasibility Study. The scope of work will be used to develop a work breakdown structure and will also be combined with an organizational structure in the schedule and cost summary to produce a responsibility matrix that will govern the development of the products and interim deliverables in this PMP.

4.1 STUDY AUTHORITY: This study was authorized by Section 216 of the River and Harbor and Flood Control Act of 1970 (Public Law 91-611), dated 31 December 1970, which states:

> "The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due to significantly changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest."

4.2 STUDY PURPOSE: The purpose of this low flow augmentation Feasibility Study is to ensure the timely and economical completion of a quality Feasibility Report that will review the existing conditions of the Gathright Dam and Lake Moomaw Federal project to determine if any changes to release procedures, pool levels, and/or storage allocations would significantly enhance habitat and benefit water quality downstream of the project on the Jackson River to the confluence with the head of the James River. The primary focus of the study will be directed to fine tuning the water release procedures during low flow conditions by incorporating new techniques, such as pulsing, to better mimic natural stream conditions that occurred before the project existed. These release modifications shall be developed to protect the in-lake fishery and downstream fisheries. Habitat enhancement shall address benthic organisms, siltation, and water quality. The Feasibility Study shall be fully consistent with and in support of the goals, mandates, and direction of the Chesapeake Bay Agreement and other pertinent state and Federal statutes and initiatives. The Feasibility Study shall serve as the basis for formulating projects and strategies and for developing a decision-making document to determine whether a change in project operation should be authorized for Federal implementation. The solution must be in the Federal interest and in concert with current polices and budgetary priorities.

4.3 STUDY AREA: The study area for low flow augmentation is the area along the from Lake Moomaw to the head of the James River. The study area is located in Virginia Congressional District VA-07 and VA-09.

4.4 PRIOR STUDIES AND REPORTS: The following table summarizes pertinent reports and design memoranda (DM) that have been conducted in connection with the Gathright Dam and Lake Moomaw project.

Table 4.1. PRIOR REPORTS

	Description	Date
HD 207/80/1:	Survey Report Recommending Authorization of Gathright – Falling Spring Project	1953
DM 1:	Hydrology (Preliminary)	Mar 1953
DM IA:	Hydrology	Jun 1965
DM IA:	Hydrology (Supplement)	May 1967
DM 2:	Site Selection and Alternative Projects (Preliminary)	Aug 1953
DM 3:	Review of Deferred for Restudy Classification	Mar 1964
DM 4:	Project Selection	Jul 1965
DM 5:	Preliminary Master Plan	Jan 1966
DM 6:	Real Estate (Revised)	Aug 1969
DM 6A:	Real Estate (Supplement)	Feb 1967
DM 6B:	Real Estate (Supplement)	Mar 1967
DM 6C:	Real Estate (Supplement)	May 1968
DM 6D:	Real Estate (Supplement)	Aug 1969
DM 6E:	Real Estate (Supplement)	Apr 1973
DM 7:	General Design	Apr 1967
DM 8:	Outlet Works & Administration Building	Mar 1968
DM 9:	Concrete Materials	Aug 1966
DM 10:	Access Road	Oct 1968
DM 11:	Geology and Foundation	Jul 1969
DM 11:	Geology and Foundation (Supplement)	Feb 1976
DM 12:	Embankment and Spillway	Sep 1969
DM 12:	Embankment and Spillway (Revision)	Aug 1974
DM 13:	Shop, Maintenance, and Residential Area	Jan 1971
DM 14:	Master Plan	Jun 1970
DM 15A:	Relocation - Utilities	Feb 1971
DM 15B:	Relocation - Roads	Sep 1971
DM 15B:	Relocation - Roads (Revision)	Feb 1978
DM 15C:	Relocation - Cemeteries	Feb 1974
DM 16:	Clearing	Sep 1970
DM 17:	Instrumentation	Nov 1970
DM 18:	Sedimentation Ranges and Investigations	May 1970
DM 19:	Hydrologic Data Collection (Preliminary)	May 1971
DM 19:	Hydrologic Data Collection	Jul 1974
	Report on Alternative Plans of Improvement	Aug 1965
	Intake Tower Operation and Maintenance Manual	Jan 1979
	Gathright Dam and Lake Moomaw Final Regulation Manual	Aug 1984
	Section 216 Study Reconnaissance Report Gathright Dam and Lake Moomaw, Virginia Hydropower and Water Supply	Mar 1987

Table 4.1. PRIOR REPORTS (cont.)

Dam Safety Plan, Gathright Dam and Lake Moomaw Project	Mar 2001
Section 216 Study Initial Appraisal Gathright Dam and Lake Moomaw, Virginia Low Flow Augmentation	Jun 2003

Review Report on James River, Virginia	Jan 1962
James River Basin Water Resources Study	Dec 1975
National Hydroelectric Power Resources Study (23 Vols)	1981 - 1983
Water Supply Study, Hampton Roads, Virginia	Dec 1984
Reconnaissance Report Upper James River Basin, Virginia and West Virginia, Flood Control Study	Apr 1992
Section 905(b) Reconnaissance Report Gathright Dam and Lake Moomaw, Virginia Low Flow Augmentation	Sep 2004

4.5 STUDY ALTERNATIVES: The expedited Reconnaissance Study has identified five feasible alternatives for activities that would provide ecosystem restoration benefits to the study area to be considered in the detailed feasibility plan. Since that time, negotiations have reduced the five alternatives to four. These four alternatives are:

(1) Modify the existing storage allocation to allow more storage for low flow augmentation.

(2) Modify existing low flow augmentation release procedures.

(3) Modify low flow augmentation release requirements.

(4) Combination of plans.

4.5.1 All proposed alternatives, with the exception of the no action alternative, will provide opportunities for releasing more water to the Jackson River under low flow conditions. As the remaining alternatives are being evaluated for environmental benefits, consideration during Feasibility-level efforts will also be given to the timing/pulsing of flows to mimic a natural riverine system, in order to maximize benefits to living resources. In addition, any recommended alternatives will not have a negative effect on water withdrawers on the James and Jackson Rivers and also will not negatively affect the study area during periods of drought conditions. Moreover, recommended alternatives will not adversely affect existing fishery resources in the study area.

4.5.2 Alternatives in an ecosystem restoration project should avoid impacts that require mitigation. Specifically, ER 1105-2-100, Appendix E, para. E-30 (d) states: "...Ecosystem restoration projects should be designed to avoid the need for fish and wildlife mitigation."

4.5.3 Plans that are cost effective and maximize environmental outputs will be recommended. The "no action" plan will be considered.

4.6 SCOPE OF WORK ASSUMPTIONS: Assumptions for developing costs and schedules for work tasks/products addressing the three Study Alternatives are as follows:

4.6.1 Specific assumptions for this scope include this study being a 24-month,3-fiscal-year

4.7.4 Cultural Resources Studies/Report (22D): This subaccount includes all tasks required for compliance with Section 106 of the National Historic Preservation Act of 1966, as amended. Specifically, an analysis will be conducted of the historical and archaeological aspects of the specific areas that could be affected by any of the proposed actions. The analysis will involve a background investigation of areas that could be affected by implementation of any of the alternatives under consideration. A baseline description of the cultural resources of the study area will be prepared for the "Existing and Future Conditions" portion of the Feasibility Report and summarized in the EIS/EA. The possible impacts of the various alternative plans on the historical and archaeological features in the study area will also be assessed and discussed in the EIS/EA and the Feasibility Report. Coordination of this study with the Virginia Department of Historic Resources and other interested parties will be carried out in this phase of the study.

4.7.5 Environmental Studies/Report Except for U.S. Fish and Wildlife (22E): This subaccount includes collection of environmental data, including field evaluations, providing a baseline identification and description of environmental resources in the study area, assessing the impacts resulting from the various alternative plans on these resources, developing restoration measures as needed, preparing all appropriate NEPA and other environmental compliance action documents, and coordinating a review of the documents. It also includes determining the extent of proposed outputs, using approved methodologies, such as biological indices or other accepted methodologies recommended by technical committee. The baseline description of the environmental aspects of the study area will be prepared for the "Existing and Future Conditions" portion of the Feasibility Report. The impact of the various alternative plans on the environmental features in the study area will also be assessed and summarized in the "Plan Formulation" and "The Selected Plan" sections of the Feasibility Report addressing the evaluation of the alternative plans and the recommended plan. The EIS/EA, although an independent document, will be physically included in the Feasibility Report. This subaccount also includes managing all aspects of the mandatory FWS contract, pursuant to the FWCA, and the FWCA Report will be included as a separate section in the supporting documentation. The USACE Regulatory Branch will be coordinated with for Section 404 (Clean Water Act) consistency in the evaluation of alternatives. Other environmental documentation will be included in the Feasibility Report as needed. Additional information follows.

4.7.5.1 Specific assumptions for the environmental estimate and scope include this study's being a 3-fiscal-year effort, 3 alternatives to be addressed, the Commonwealth of Virginia TMDL modeling effort will specify the volumes of water for these scenarios, and there are no threatened/endangered species conditions to require formal Section 7 consultation.

4.7.5.2 An investigation into impacts of low flow augmentation and periodicity on existing fisheries to maximize benefits and minimize or eliminate adverse impacts will be conducted.

4.7.5.3 A periphyton study will be conducted to include an evaluation of modeling runs to predict periphyton response under alternative scenarios downstream.

4.7.5.4 The FWS will be coordinated with throughout the Feasibility Study. A FWS Coordination Act Report will be prepared by FWS and will become part of the feasibility document, as discussed. A Scope of Work will be prepared for FWS to cover tasks to be accomplished during the Feasibility Study.

4.7.5.5 Aquatic resources and their habitat are valuable environmental assets and are regulated at local, state, and Federal levels. Future studies will verify by field examination the exact type, location, and area extent of these resources that should be documented in relation to any proposed habitat restoration activity.

4.7.5.6 The Virginia Outdoors Plan (VOP) provides a vision for the future of Virginia's outdoors and attempts, in a comprehensive way, to preserve Virginia's open space and its natural and recreation resources. Over the past 20 years, Virginia has developed a set of goals that describe the state's intent toward the protection, acquisition, and development of its natural and recreational resources. These goals form the basic policy of the Commonwealth with respect to meeting the challenge of providing adequate recreational opportunities for resident and visitors while preserving the resource base. The recommended plan for Lake Moomaw and the Gathright Dam Low Flow Augmentation Study will be evaluated to ensure that it is consistent with the VOP and would support the goals of the VOP.

4.7.5.7 An EIS or an EA will be required in compliance with the NEPA. As part of the NEPA process, a Section 404 (b) (1) Evaluation Report and Federal Consistency Determination will be prepared and included in the EIS/EA. These documents, along with the Feasibility Report, will be coordinated for review and comment with all interested Federal, state, and local agencies.

4.7.5.8 As part of the economic studies (22G), an incremental cost analysis will be performed with an objective to maximize environmental outputs and minimize costs. To support this analysis, habitat evaluation methods will be performed. As discussed earlier, biological indices or other accepted methodologies geared for evaluating aquatic resources will be used to determine environmental "outputs"; i.e., benefits derived from alternative environmental restoration measures/projects. The environmental impacts unique to various alternatives will also be assessed. A thorough evaluation of the alternatives as they may affect fisheries and other biological resources will be conducted. A monitoring plan will be developed, and success criteria will be established for the restoration projects.

4.7.6 Fish and Wildlife Studies (22F): This subaccount includes the participation of the FWS (as required by the FWCA, referenced previously) in technical environmental investigations such as a baseline description of the existing and future without project conditions and an evaluation of potential impacts resulting from the various alternative plans. These investigations will be documented in a FWCA Report. As discussed previously, the FWS Coordination Act Report will be included as a separate section in the supporting documentation.

4.7.7 Economic Studies (22G): This subaccount includes studies pertinent to an economic assessment of the alternative plans under consideration, and, where applicable, studies of cost

allocations among the purposes involved. The economic analysis will include the most recent data available and will provide an incremental cost analysis of plans to determine which alternatives are most cost effective and which ones maximize environmental outputs. Environmental outputs are the benefits derived from the alternative plans. As discussed earlier, IFIM/PHabSim, biological indices, or other accepted methodologies will be used to determine environmental outputs. The Feasibility Study will evaluate both the cost effectiveness and the expected habitat quality changes associated with the restoration alternatives. Cost effectiveness is defined as "...those project (alternatives) which produce the greatest environmental output when compared to the cost of the project (alternative)" (EC 1105-2-210, paragraph 10). Cost effectiveness will be used to screen all project alternatives to assure that for any level of output, the alternative is the least costly option. Incremental cost analysis will then be employed to identify changes in costs for increasing levels of environmental output.

4.7.7.1 An incremental cost analysis will be performed that will include estimates of environmental outputs, investment costs, interest during construction, average annual costs, present value and annual equivalent value of restoration costs.

4.7.7.2 Situations of risk and uncertainty will be defined and evaluated in the Feasibility Study. Their assessment in project formulation will be reported and displayed in a manner that makes clear to decision makers the types and degree of risk and uncertainty believed to characterize the benefits and costs of the alternative plans considered.

The non-Federal sponsor will be responsible for assisting Federal Government personnel and its contractors during field surveys in the study area. Additionally, the non-Federal sponsor may work with Government personnel to estimate future with and without project conditions.

4.7.8 Real Estate Studies (22H): In general, this subaccount includes the RE work products as set forth in the "Real Estate Handbook," ER 405-1-12, Draft Chapter 12, such as preparation of preliminary real estate cost estimates for each of the alternatives, including the recommended plan; determination of the methodology for acquiring real estate interests; participation in pre-PCA activities; preparation of a Gross Appraisal Report; preparation of baseline cost estimate for lands, easements, rights-of-way, relocations, and dredged material placement areas (LERRD's) prepared in the Chart of Accounts format; and preparation of information for the real estate portion of the PMP. This information will be compiled in the supporting documentation section entitled "Real Estate Plan" and summarized in "The Selected Plan" portion of the Feasibility Report. Specific tasks conducted under the "22H" subaccount are as follows; other subaccounts are shown subsequently.

4.7.8.0.1 Coordination: This activity includes, but is not limited to RE participation in team meetings, negotiation of work agreements, coordination with other offices regarding project data needed for RE's major study projects, and monitoring of progress and findings associated with RE study products.

4.7.8.0.2 Preparation of Preliminary Real Estate Cost Estimates: This activity includes the

development of preliminary cost estimates of the total real estate costs associated with various alternative plans. The real estate cost estimates will include an estimate of the various alternative plans' real property requirements, an assessment of land values for market value and "nearshore" land value to assist in the economic analysis of the alternative plans, an estimate of the local sponsor's administrative cost to accomplish these requirements, and an estimate of the Federal Government's administrative cost to assist and monitor the local sponsor's real property acquisition program. The cost estimates will be included in the Feasibility Report where the various alternatives are analyzed.

4.7.8.0.3 Preparation of Baseline Cost Estimate for Real Estate: This activity includes accounting for the recommended plan's total estimated real estate cost in Chart of Accounts format. This estimate of total real estate cost should include estimated costs for all Federal and local sponsor activities necessary for completion of the project.

4.7.8.1 *Real Estate Plan (22H1):* In general, this document will be attached as a separate section of the supporting documentation to the Feasibility Report. The REP is an overall plan describing the minimum real estate requirements for the recommended plan and will include such information as ownership data, acreage, gross appraisal, and preliminary real estate right-of-way maps. The plan will identify easements needed for surveying, coring, construction, and access to potential restoration sites.

4.7.8.2 *Gross Appraisal/Report (22H2):* This document includes a detailed estimate of all real estate costs of LERRD acquisition of the recommended plan's real property requirements, if any, and a written narrative discussion of the method used to determine value, sales comparisons, etc. The costs include the administrative costs of real estate acquisition and will be part of the baseline cost estimate for the recommended plan. ER 405-1-12, Draft Chapter 12, Section III, Appraisals, paragraph 12-12b and Real Estate Policy Guidance Letter Number 3, Guidance for Preparation of Gross Appraisals, dated 31 May 1991, will be used to prepare this document.

4.7.8.3 *Preliminary Real Estate Acquisition Maps (22H3):* This product includes the set of maps and drawings that delineates the real estate acquisition lines, if any, based on technical design drawings developed during the Feasibility Phase. These maps and drawings reflect the real estate required for project purposes and should be reconciled to the engineering mapping.

4.7.8.4 *Rights of Entry (22H6):* This is the written temporary permission to be on privately owned property that is obtained for the purposes of environmental and cultural assessments, core samplings, surveys, and explorations. They can be obtained by the Federal Government, the contractor, or the local sponsor.

4.7.8.5 *All Other Real Estate Analyses/Documents (22H7):* This includes any documents pertinent to the study, such as preliminary title reports, plat maps, county recorder's data, etc., as needed, including input to the PMP (taskings, costs, and schedules). It also includes all activity involved in ensuring that the REP is provided to the planning TTL and its components are properly incorporated into the PMP; that the Chief of RE's endorsement of the PMP that certifies

that the real estate requirements, including schedule of acquisition, are adequately and accurately included in the PMP; and that the Feasibility Report is reviewed and responses provided for any comments. The local sponsor may assist Federal Government personnel in obtaining rights-of-entry and conducting field surveys of affected properties in the study area. Where applicable, the local sponsor may furnish tax maps and survey information. Additionally, the local sponsor will work with Government personnel to establish the local sponsor's administrative costs for acquiring LERRD, if any are needed. Also included are the costs for obtaining the necessary rights-of-entry and assistance in preparation of real estate documents.

4.7.9 Hydrology and Hydraulic Studies/Report (22J): This information will be compiled in the supporting documentation section entitled "Engineering, Design, and Cost Estimates" and summarized in the "Plan Formulation" and "The Selected Plan" portions of the Feasibility Report.

4.7.9.1 General work involves the initial data and reports gathering and review for initiation of the hydrologic and hydraulic work activities for the Feasibility Study and the presentation of results of the hydrologic and hydraulic modeling for the accomplishment of informed decisions by the various sponsors and environmental agencies. Specific information is as follows:

4.7.9.2 The initial set of alternatives will involve three release scenarios that accomplish pulsing by modifying the monthly low flow augmentation requirements resulting in no overall change in the limits of the existing conservation pool.

4.7.9.3 The release schedules for conservation storage will be limited to a maximum release of 1,000 cfs as controlled by the capacity of the Water Quality system while maintaining release temperature mixing procedures. During pulse releases the Water Quality system will be used to minimize the amount of cold water releases and moderate the release water temperature variation.

4.7.9.4 In-Lake, Release and Downstream water quality modeling will be accomplished in accordance with the Water Quality Modeling Scope of Work and will produce the environmental enhancement measurable parameters required for plan formulation.

4.7.9.5 An analysis will be conducted using the historic record and synthetic events to demonstrate its effect on pool elevations (drawdowns, increased rises, etc.) for each of the storage and release schedule combinations.

4.7.9.6 A Documentation Report will be prepared to present all findings and analyses.

4.7.10 Geotechnical Studies/Report (22K): This task includes conducting an evaluation of the proposed alternatives, coordinating with the study team, attending team meetings, and participating in Feasibility plan preparation. Original geotechnical studies that were prepared in 1968 evaluated the overall dam stability. There was also a concern for the right abutment stability above the intake tower, and an assessment of the abutment stability was performed in

1970 and again in 1979. The purpose of the study is to determine the feasibility of changing the lake operation and water management operations necessary to improve the water quality and fish habitat downstream from Gathright Dam. GeoEnvironmental Engineering Section personnel will research historical records and conduct field reconnaissance to verify existing conditions and gather data. Upon compiling all the data, GeoEnvironmental Engineering Section personnel will evaluate the embankment and abutment stability using the historical test data, new pool levels, and instrumentation readings. While considered unlikely that the initial alternatives would have negative geotechnical impacts, the effects, especially of sudden drawdowns below the top of conservation pool should be addressed This information will be compiled in the supporting documentation section entitled "Engineering, Design, and Cost Estimates" and summarized in the "Plan Formulation" and "The Selected Plan" portions of the Feasibility Report.

4.7.11 Surveys and Mapping Except for Real Estate (22N): This subaccount includes all surveying, mapping, drafting, digitizing, and GIS support that may be required to support analysis for the Feasibility Study. Any survey tasks assume that sufficient horizontal and vertical control exists within the project area. The horizontal datum will be on the Virginia State Gird (south zone) based on the North American Datum of 1983 in U.S. Survey Feet, and the vertical datum will be on National Ocean Service Mean Lower Low Water, 1960-1978 tidal epoch in feet. This information will be compiled in the supporting documentation section entitled "Engineering, Design, and Cost Estimates" and summarized in the "Plan Formulation" and "The Selected Plan" portions of the Feasibility Report. The National Geospatial Data Clearinghouse will be checked for available GIS data during initial phase of feasibility effort (ER 1110-1-8156).

4.7.11.1 Data Management Plan

A data management plan (DMP) shall be developed for each project, as applicable, to better manage electronic geospatial data in an enterprise manner and facilitate the re-use of this data for multiple purposes and projects.

Every effort shall be made, as funding and resources allow, to standardize the collection, storage and retrieval of geospatial data.

The geospatial specialist shall:

(1) Facilitate the effective and efficient collection, management and use of geospatial data throughout the life-cycle of the project.

(2) Prepare and update the DMP, as applicable, to document the integration of geospatial data and technology into the project. The DMP shall be stored electronically and easily accessible to members of the project delivery team.

The project delivery team, in coordination with the geospatial specialist, shall:

(1) Seek to use existing geospatial data to the extent possible and to ensure that any newly collected data is compliant with appropriate standards.

(2) Integrate geospatial technologies into the PMBP, as appropriate and funding allows.

(3) Take care to protect and preserve the corporate investment in geospatial data, applications and institutional knowledge.

4.7.12 Engineering and Design Analysis/Report with Preliminary Drawings (22P): While considered unlikely that the initial alternatives would have significant negative impacts to the existing recreational facilities, this account provides for minimal assistance should any effects need to be addressed. This subaccount includes the development of designs, plates, and quantity estimates, as well as abbreviated cost estimates for alternative projects, final cost estimates for recommended projects, cost estimates for average annual project operation and maintenance, and cost estimates for project PED. This portion of the study and its recommendations will conform to and be fully compatible with the regulations on Engineering and Design. These regulations and Engineering Appendix requirements are set forth in ER 1110-2-1150 (31 March 1994), as amended by CECW-EP memorandum, 31 May 1995, subject: Engineering, Design and Dam Safety Guidance.

4.7.12.0.1 The design cost estimate is based on the following project assumptions:
The team design engineer will refine alternative project design sketches, so as to describe the proposed projects in enough detail to obtain a reasonable preliminary cost estimate. The design engineer will prepare detailed designs for the recommended to obtain a reasonable preliminary cost estimate. Cost estimate quantities will be calculated for each alternative and recommended project.

4.7.12.0.2 The team cost engineer will prepare Reconnaissance-level cost estimates for each alternative design and a detailed Feasibility-level cost estimate for the recommended project(s). Unit costs for miscellaneous construction items will be based on historical cost data that is available and will be adjusted to meet the needs of the current site conditions. The estimate will be developed in accordance with the guidance addressed in ER 1110-2-1302, "Civil Works Cost Engineering" using the Micro-Computer Aided Cost Estimating System software and will be presented in the Civil Works Breakdown Structure. The estimate will be documented with notes to explain the assumed construction methods, crews, sources of materials, and other specific information. Labor costs will be based on the prevailing Davis-Bacon wage rates for each trade. Equipment costs will be based on EP 1110-1-8, "Construction Equipment Ownership and Operating Expense Schedule." Contingencies will be developed and applied where areas of uncertainty exist. Detailed costs for all of the non-construction cost items (lands and damages, pre-construction engineering and design, construction management) will be provided by the appropriate offices and incorporated into the estimate. The cost Engineering Appendix will include a written description of the methodology used in the development of the baseline cost estimate. The appendix will also include a description of the scope of the projects included in

provides restoration of a degraded ecosystem structure, function, and dynamic processes to a less degraded, more natural condition, which will involve consideration of the ecosystem's natural integrity, productivity, stability, and biological diversity.

5) Alternative project plans will be compared. Cost effectiveness and incremental cost analysis will be the principal organizing framework for comparison. Project impacts will also be considered.

6) A plan will be selected for recommendation, and a justification for the selection will be provided. Detailed designs will be developed for the recommended restoration project.

4.7.17.2 The Planning TTL, in cooperation with the PM and with assistance from the study sponsor, will review information provided by the study team and lead the plan formulation process. The Planning TTL will provide an account of the plan formulation process in the study report.

4.7.17.3 The non-Federal sponsor will participate on the study team throughout the Feasibility Phase and will be responsible for providing administrative and technical guidance on local acceptability of the plan alternatives and for input regarding the Locally Preferred Plans, if any, other than the EQ plan.

4.7.18 Report Preparation (22S): This subaccount includes assembling, writing, editing, typing, drafting, reviewing, reproducing, and distributing the Feasibility Report, the EA or EIS, and other related documentation required for transmittal to higher authorities. Work will entail preparing a Draft Feasibility Report and Draft EA or EIS; soliciting comments from the study team, NAD, and Federal, state, and local agencies; responding to those comments; and preparing a Final Feasibility Report and Final EA or EIS.

4.7.18.1 The non-Federal sponsor will be responsible for providing guidance and comments throughout the report preparation phase, assisting in documentation of that portion of the work provided as in-kind service, reviewing the report, and assisting in distributing the report to all local constituents and responding to comments.

4.7.19 Programs and Project Management and Project Management Plan (22T): This subaccount includes costs for macro-level tracking of the study by the PM in P3MD. The PM has the overall responsibility of a project through all phases of the Feasibility Study, PED, and construction. This work effort also includes the primary responsibility for preparing and presenting monthly reports for the Project Review Board and preparing for a minimum of three meetings of the Feasibility Study Executive Committee and monthly meetings of the Steering Committee. The PM has the primary responsibility for disseminating the Feasibility Review Conference (FRC) memo and NAD comments on the Draft Feasibility Report to the study team and coordinating their responses, if necessary. The Planning TTL is responsible for the day-to-day management of the Feasibility Study as discussed in the "Coordination Documents" work

task.

4.7.20 Quality Control and Assurance (22U). Provides for development of a PRP as well as the verification and validation of study assumptions, methodologies, data, level of detail, and reasonableness of results. Provides for an independent technical review team led by another District within the USACE that has personnel representing all technical elements providing significant input to the Feasibility Report. The team members will be selected based on their experience and knowledge relative to the subject matters under review. The technical review team has the credentials and experience necessary to provide a comprehensive review particularly as it relates to plan formulation, environmental, economic, engineering, real estate, legal, and public involvement matters. The team members will not have been involved in the preparation of the technical products under review. Also includes documentation of the review process. The independent technical review/certification will be conducted in compliance with ER 1105-2-100, Planning Guidance Notebook, dated 22 April 2000, and Planning Branch's Quality Management Plan, dated April 2001.

4.7.20.1 The local sponsor will be responsible for reviewing work products including participating in the technical review and quality control of the work products.

4.7.21 Design and Project Cooperation Agreement Package(s) (22V): This subaccount includes work by the PM, who has the primary responsibility, and supporting technical personnel who assist the PM, for coordination with the local sponsor to develop a Design Agreement and PCA to include obtaining a letter of intent from the local sponsor to sign the Design Agreement and PCA.

4.7.21.1 The local sponsor will be responsible for assisting Federal Government personnel in developing the Design Agreement and PCA and for providing the letter of intent.

4.7.22 Washington Level Report Approval (22Y): By regulation, 5 percent of study cost (or $50,000, whichever is less) is set aside to cover the expenses incurred by Norfolk District and the local sponsor during the review of the Feasibility Report at the Washington-level (this does not include the review by NAD) subsequent to the Division Commander's Notice announcing the completion of the Feasibility Report. If costs for this work task exceed this limit, then a negotiated modification to the FCSA will be required to cost share the additional amount.

4.7.22.1 The local sponsor will be responsible for responding to comments on that portion of the work provided as in-kind service. Additionally, representatives of the local sponsor may, along with representatives of Norfolk District, attend one meeting in Washington, D.C., and one meeting at the project site with representatives of the HQUSACE.

4.8 RISK AND UNCERTAINTY: There is some risk and uncertainty regarding the scope and cost of the study tasks. No field investigations of any detail were conducted during the expedited Reconnaissance Study. During the course of the Feasibility studies, broader areas of sediment contamination may be encountered that will require more intensive characterization;

wetland sites may be discovered to contain fill material that requires more intensive testing and evaluation. These and other potential risks and uncertainties have been accounted for in developing the study costs by adding a contingency factor to the Environmental Studies (22E) of approximately 15 percent.

4.9 STUDY COST: The cost for the Feasibility Study will be determined in consultation with the local sponsor. More detailed information on study costs are within Section 9 of this report.

5. WORK BREAKDOWN STRUCTURE

5.0 The WBS is based on the "Description of Products" and "Work Tasks" sections. The work products shown depict the major work products that comprise study management, the Feasibility Report, PMP, PCA package, and Washington-level review. Each numerically higher level provides additional detail on the major work product.

Level 1: Gathright Dam and Lake Moomaw, Virginia – Low Flow Augmentation Feasibility Study Phase

Level 2: Feasibility Study

Level 3	Level 4	Level 5
Study Management		
	Coordination Documents	
	All Other Management Documents	
	Programs and Project Management	
	Peer Review Plan	
Feasibility Report		
	Main Report	
		-Introduction Section
		-Existing and Future Conditions Section
		-Problems, Needs, and Opportunities Section
		-Plan Formulation Section
		-The Selected Plan Section
		-Division of Plan Responsibilities Section
		-Financial Analysis Section
		-PMP Section
		-Public Coordination and Comments Section
		-Conclusions Section
		-Recommendations Section
		-Note on the Information Presented in This Document
		-References Section

	Supporting Documentation	-FWS Coordination Act Report -Engineering, Design, and Cost

Level 3	Level 4	Level 5
	Estimates Section	
		-Benefit Evaluation Section -REP -Pertinent Correspondence Section -EA or EIS

PMP

Design Agreement

PCA Package

Quality Control Report

Washington Level
Report Approval

6. ORGANIZATION BREAKDOWN STRUCTURE

RESOURCE NAME	RESOURCE CODE
Norfolk District & USACE Resources	
Office of Counsel	CENAO-SS-O
Contracting Office	CENAO-SS-C
Public Affairs Office	CENAO-SS-D
Technical Support Division	CENAO-TS
Engineering Branch	CENAO-TS-E
Civil Engineering Section	CENAO-TS-EC
Civil Works Section	CENAO-TS-EW
Cost Engineering Section	CENAO-TS-EE
Geoenvironmental Section	CENAO-TS-EG
Operations Branch	CENAO-TS-O
Survey Section	CENAO-TS-ON-S
GIS Spatial Section	CENAO-TS-OG
Regulatory Branch	CENAO-TS-G

RE Office	CENAO-RE-D
Programs and Project Management Division	CENAO-PM
Planning Branch	CENAO-PM-P
Environmental Analysis Section	CENAO-PM-PE
Planning Resources Section	CENAO-PM-PR
Flood Plain Mgt	CENAO-PM-PF
Projects Branch	CENAO-PM-J
Programs Branch	CENAO-PM-R
Other Federal Agency Resources	
U.S. Fish and Wildlife Service	FWS
U.S. Forest Service	FS
Local Sponsor Resources	
Commonwealth of Virginia	VA
Support Organization Resources	
Planning District Commission	PDC
Department of Environmental Quality	DEQ
Virginia Department of Game & Inland Fisheries	VDGIF
Chesapeake Bay Foundation	CBF
Virginia Marine Resources Commission	VMRC
Department of Conservation and Recreation	DCR
Architect-Engineer Resources	
Various Contractors	CONTR

7. RESPONSIBILITY ASSIGNMENT MATRIX (to be developed)

7.0 The responsibility assignment matrix presents the assignment of product responsibility to the specific organizational elements and other responsible resources (see the section entitled "Organization Breakdown Structure") for the Feasibility Study. The resources are shown in Table 9.1 entitled "Budget and Cost Estimates" and Table 9.2 entitled "Cost Matrix" and may be adjusted as required by the PM in consultation with the functional managers and the local sponsor to achieve the study objectives.

8. SCHEDULES

8.0 The Feasibility Study schedule by fiscal year is currently being developed and will be presented in table 8.1 in a Pert Chart format. The schedule will be developed cooperatively with each performing organization to derive a detailed estimate and commitment as to the duration in man-hours and start and finish dates for each task, based on the "Work Tasks" section. As discussed previously in the section entitled "Responsibility Assignment Matrix," the responsible

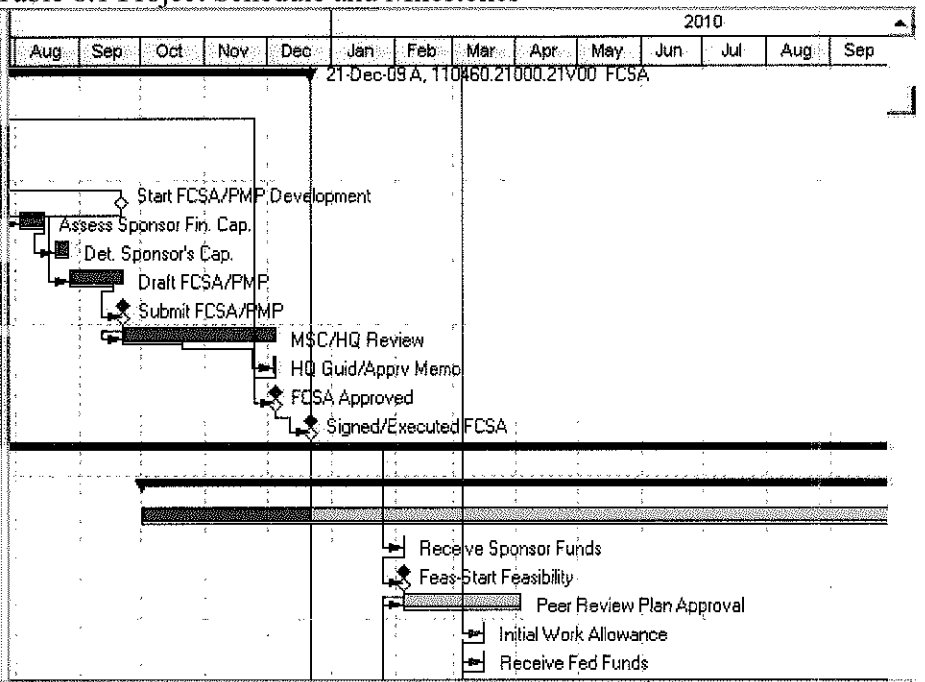
organizational elements are shown in BOLD in Table 9.1. The major milestones have been excerpted from the schedule and are included in Table 8.2.

Table 8.1. FEASIBILITY STUDY SCHEDULE, GATHRIGHT DAM AND LAKE MOOMAW LOW FLOW AUGMENTATION STUDY, VIRGINIA (UNDER DEVELOPMENT)

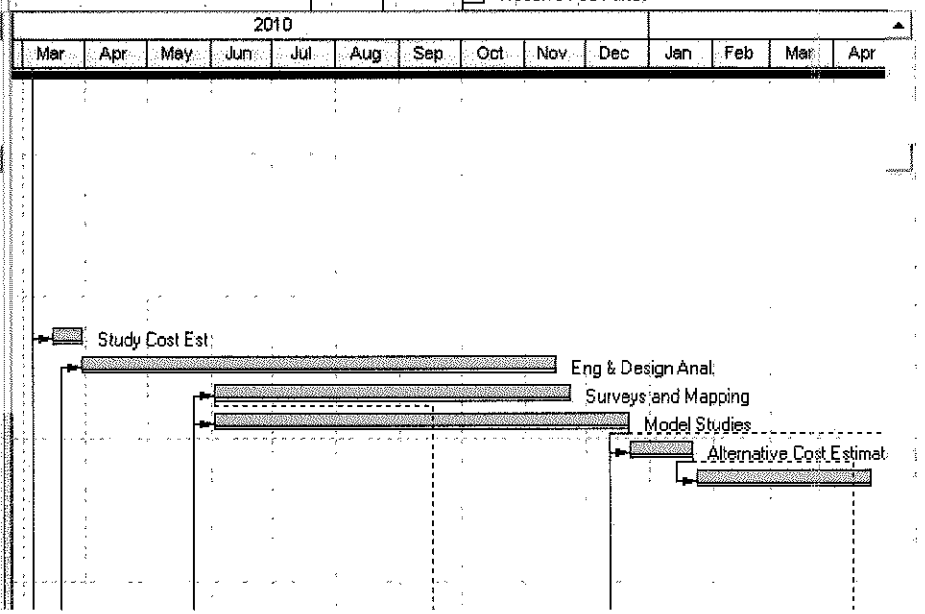
Attached

Gathright 216 Project Management Plan – Table 8.1 Project Schedule and Milestones

Activity ID	Activity Name	Original Duration	Start	Finish
110460.21000.21V00	FCSA	808.0d	02-Oct-06 A	21-Dec-09 A
REC1730	All Other FCSA Docs07	0.0d	02-Oct-06 A	28-Sep-07 A
REC1651	Assess Sponsor Fin.Cap.07	0.0d	02-Oct-06 A	28-Sep-07 A
REC1661	Det. Sponsor's Cap.07	0.0d	02-Oct-06 A	28-Sep-07 A
REC1640	Start FCSA/PMP Development	0.0d	01-Jul-09 A	
REC1650	Assess Sponsor Fin. Cap.	10.0d	03-Aug-09 A	14-Aug-09 A
REC1660	Det. Sponsor's Cap.	5.0d	20-Aug-09 A	26-Aug-09 A
REC1670	Draft FCSA/PMP	15.0d	27-Aug-09 A	22-Sep-09 A
REC1680	Submit FCSA/PMP	0.0d		21-Sep-09 A
REC1690	MSC/HQ Review	20.0d	22-Sep-09 A	04-Dec-09 A
REC1700	HQ Guid/Apprv Memo	1.0d	04-Dec-09 A	04-Dec-09 A
REC1710	FCSA Approved	0.0d		04-Dec-09 A
REC1720	Signed/Executed FCSA	0.0d		21-Dec-09 A
110460.22000	Feasibility Studies	1570.0d	02-Oct-06 A	04-Jan-13
110460.22000.22T00	Feas Prog & Proj Mgmt	251.0d	01-Oct-09 A	30-Sep-10
FEA1761	FY10 Programs and Project Mana...	251.0d	01-Oct-09 A	30-Sep-10
FEA1780	Receive Sponsor Funds	0.0d	05-Feb-10	05-Feb-10
FEA1790	Feas-Start Feasibility	0.0d	05-Feb-10	
FEA1765	Peer Review Plan Approval	40.0d	05-Feb-10	02-Apr-10
FEA1760	Initial Work Allowance	0.0d	16-Mar-10	16-Mar-10
FEA1770	Receive Fed Funds	0.0d	16-Mar-10	16-Mar-10

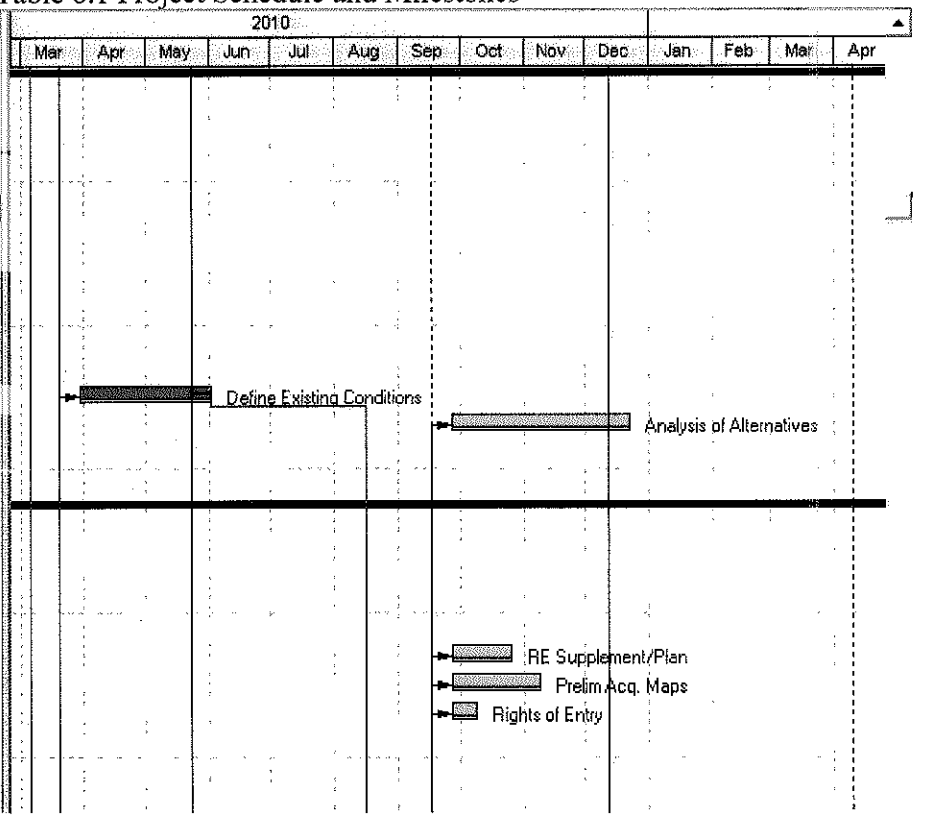


Activity ID	Activity Name	Original Duration	Start	Finish
110460.22000.22P00	Eng & Design/Cost Est	1258.0d	02-Oct-06 A	05-Oct-11
FEA1810	Hydro & Hydraulics07 FED	0.0d	02-Oct-06 A	28-Sep-07 A
FEA1820	Geotech Studies / Site Developm...	0.0d	02-Oct-06 A	28-Sep-07 A
FEA1811	Hydro & Hydraulics07 Non-FED	0.0d	02-Oct-06 A	28-Sep-07 A
FEA1821	Geotech Studies / Site Developm...	0.0d	02-Oct-06 A	28-Sep-07 A
FEA1812	Hydro & Hydraulics08 FED	0.0d	01-Oct-07 A	01-Oct-08 A
FEA1813	Hydro & Hydraulics08 Non-FED	0.0d	01-Oct-07 A	30-Sep-08 A
FEA1822	Geotech Studies / Site Developm...	0.0d	01-Oct-07 A	30-Sep-08 A
FEA1823	Geotech Studies / Site Developm...	0.0d	01-Oct-07 A	30-Sep-08 A
FEA1880	Study Cost Est	10.0d	16-Mar-10	29-Mar-10
FEA1840	Eng & Design Anal.	160.0d	30-Mar-10	15-Nov-10
FEA1800	Surveys and Mapping	120.0d	02-Jun-10	22-Nov-10
FEA1850	Model Studies	140.0d	02-Jun-10	21-Dec-10
FEA1870	Alternative Cost Estimates	20.0d	22-Dec-10	21-Jan-11
FEA1875	Draft Engineering Write Up	60.0d	24-Jan-11	18-Apr-11
FEA1890	PE&D Cost Est	5.0d	11-May-11	17-May-11
FEA1910	OMRR&R Cost Est	3.0d	11-May-11	13-May-11
FEA1900	Project Cost Est	5.0d	18-May-11	24-May-11
FEA1920	Fully Funded Cost Est	3.0d	03-Oct-11	05-Oct-11



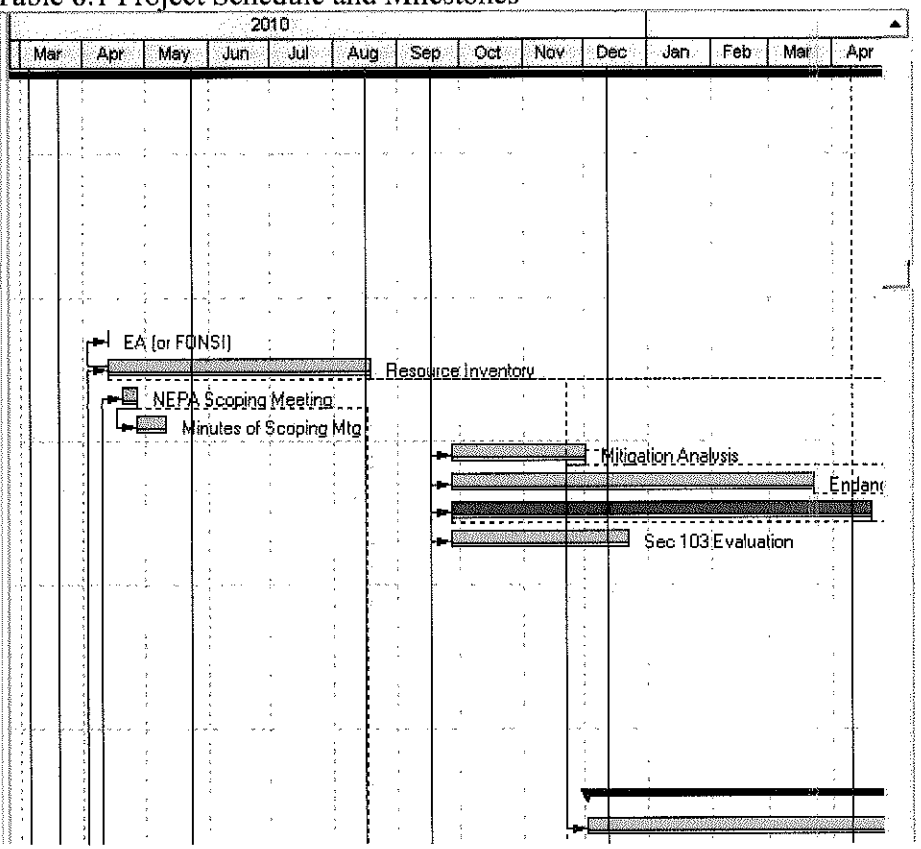
Gathright 216 Project Management Plan – Table 8.1 Project Schedule and Milestones

Activity ID	Activity Name	Original Duration	Start	Finish
110460.22000.22C00	**Socio/Economics**	1270.0d	02-Oct-06 A	24-Oct-11
FEA1940	Economic Analysis07 FED	0.0d	02-Oct-06 A	02-Oct-06 A
FEA1950	Social Studies07 FED	0.0d	02-Oct-06 A	28-Sep-07 A
FEA1951	Social Studies07 Non-FED	0.0d	02-Oct-06 A	28-Sep-07 A
FEA1941	Economic Analysis07 Non-FED	0.0d	02-Oct-06 A	02-Oct-06 A
FEA1960	Institutional Studies08 FED	0.0d	01-Oct-07 A	30-Sep-08 A
FEA1961	Institutional Studies08 Non-FED	0.0d	01-Oct-07 A	30-Sep-08 A
FEA1952	Social Studies08 FED	0.0d	01-Oct-07 A	30-Sep-08 A
FEA1953	Social Studies08 Non-FED	0.0d	01-Oct-07 A	30-Sep-08 A
FEA1942	Economic Analysis08 FED	0.0d	01-Oct-07 A	01-Oct-07 A
FEA1943	Economic Analysis08 Non-FED	0.0d	01-Oct-07 A	01-Oct-07 A
FEA1990	Define Existing Conditions	45.0d	30-Mar-10	01-Jun-10
FEA1995	Analysis of Alternatives	60.0d	27-Sep-10	22-Dec-10
FEA1970	Ability to Pay Rpt	10.0d	25-May-11	08-Jun-11
FEA1980	Financial Anal Rpt	15.0d	03-Oct-11	24-Oct-11
110460.22000.22H00	**Real Estate**	1245.0d	02-Oct-06 A	16-Sep-11
FEA2060	All Other RE Analyses07 FED	0.0d	02-Oct-06 A	28-Sep-07 A
FEA2061	All Other RE Analyses07 Non-FED	0.0d	02-Oct-06 A	28-Sep-07 A
FEA2062	All Other RE Analyses08 FED	0.0d	01-Oct-07 A	30-Sep-08 A
FEA2063	All Other RE Analyses08 Non-FED	0.0d	01-Oct-07 A	30-Sep-08 A
FEA2000	RE Supplement/Plan	20.0d	27-Sep-10	25-Oct-10
FEA2020	Prelim Acq. Maps	30.0d	27-Sep-10	08-Nov-10
FEA2050	Rights of Entry	10.0d	27-Sep-10	08-Oct-10
FEA2010	Gross Appraisal/Rpt	40.0d	11-May-11	07-Jul-11
FEA2030	Phys. Takings Anal	60.0d	11-May-11	04-Aug-11
FEA2040	Prelim Opinion of Comp.	30.0d	05-Aug-11	16-Sep-11



Gathright 216 Project Management Plan – Table 8.1 Project Schedule and Milestones

Activity ID	Activity Name	Original Duration	Start	Finish
110460.22000.22E00	**Environmental**	1550.0d	02-Oct-06 A	05-Dec-12
FEA2250	All Other Environ. Docs.07 FED	0.0d	02-Oct-06 A	28-Sep-07 A
FEA2251	All Other Environ. Docs.07 Non-F...	0.0d	02-Oct-06 A	28-Sep-07 A
FEA2254	Contract - IFIM/PhabSim07 FED	0.0d	02-Oct-06 A	28-Sep-07 A
FEA2255	Contract - IFIM/PhabSim07 Non-F...	0.0d	02-Oct-06 A	28-Sep-07 A
FEA2256	Contract - Environmental Studies0...	0.0d	02-Oct-06 A	28-Sep-07 A
FEA2257	Contract - Environmental Studies0...	0.0d	02-Oct-06 A	28-Sep-07 A
FEA2252	All Other Environ. Docs.08 FED	0.0d	01-Oct-07 A	30-Sep-08 A
FEA2253	All Other Environ. Docs.08 Non-F...	0.0d	01-Oct-07 A	30-Sep-08 A
FEA2080	EA (or FONSI)	0.0d	13-Apr-10	13-Apr-10
FEA2130	Resource Inventory	90.0d	13-Apr-10	18-Aug-10
FEA2069	NEPA Scoping Meeting	5.0d	20-Apr-10	26-Apr-10
FEA2070	Minutes of Scoping Mtg	10.0d	27-Apr-10	10-May-10
FEA2140	Mitigation Analysis	45.0d	27-Sep-10	01-Dec-10
FEA2150	Endangered Species	120.0d	27-Sep-10	22-Mar-11
FEA2160	Sec 404(b)(1) Anal	140.0d	27-Sep-10	19-Apr-11
FEA2210	Sec 103 Evaluation	60.0d	27-Sep-10	22-Dec-10
FEA2230	CZM Consistency Det	40.0d	11-May-11	07-Jul-11
FEA2120	Coord of Documents	60.0d	08-Jul-11	30-Sep-11
FEA2240	Feas CZM Compliance	0.0d		04-Aug-11
FEA2170	Water Quality Cert	120.0d	23-Nov-11	15-May-12
FEA2090	Feas EA or FONSI complete	0.0d		01-Dec-11
FEA2100	EIS (or SEIS)	0.0d	01-Dec-11	01-Dec-11
FEA2220	Stmt of Findings (SOF)	15.0d	01-Dec-11	21-Dec-11
FEA2190	Record of Decision	20.0d	06-Nov-12	05-Dec-12
110460.22000.22F00	**F&W Coordination**	120.0d	02-Dec-10	24-May-11
FEA2260	F&W Coordination	120.0d	02-Dec-10	24-May-11



Gathright 216 Project Management Plan – Table 8.1 Project Schedule and Milestones

Activity ID	Activity Name	Original Duration	Start	Finish
110460.22000.22S00	**Feasibility Report**	1570.0d	02-Oct-06 A	04-Jan-13
FEA2610	Final Feas Report/NEPA07 FED	0.0d	02-Oct-06 A	28-Sep-07 A
FEA2620	Technical Review07 FED	250.0d	02-Oct-06 A	28-Sep-07 A
FEA2611	Final Feas Report/NEPA07 Non-F...	0.0d	02-Oct-06 A	28-Sep-07 A
FEA2621	Technical Review07 Non-FED	250.0d	02-Oct-06 A	28-Sep-07 A
FEA2622	Technical Review08 FED	0.0d	02-Oct-06 A	28-Sep-07 A
FEA2623	Technical Review08 Non-FED	0.0d	02-Oct-06 A	28-Sep-07 A
FEA2612	Final Feas Report/NEPA08 FED	0.0d	01-Oct-07 A	30-Sep-08 A
FEA2613	Final Feas Report/NEPA08 Non-F...	0.0d	01-Oct-07 A	30-Sep-08 A
FEA2480	Draft Feas Rpt/NEPA	60.0d	22-Dec-11	20-Mar-12
FEA2490	Conduct ITR	20.0d	21-Mar-12	17-Apr-12
FEA2500	Submit Draft Feas Report	0.0d		15-May-12
FEA2510	Feas Public Review Period Start	0.0d	16-May-12	
FEA2520	Public Review Comments	40.0d	16-May-12	12-Jul-12
FEA2560	HQ Policy Compl Review	40.0d	16-May-12	12-Jul-12
FEA2570	Feas Review Conference (FRC)	0.0d		12-Jul-12
FEA2530	Feas Proj Guide Memo (PGM)	0.0d		09-Aug-12
FEA2580	Final Rpt Doc	20.0d	17-Aug-12	14-Sep-12
FEA2590	Issue Feas Div Commander's Notice	0.0d		05-Oct-12
FEA2630	Submit Final Feas Report	0.0d		05-Oct-12
FEA2660	Submit Feas Chief 's Report	0.0d		05-Oct-12
FEA2640	Wash. Level Rpt Apprv	20.0d	09-Oct-12	05-Nov-12
FEA2690	Feas State/Agency Review	0.0d		22-Oct-12
FEA2650	Feas Report Approval	0.0d		05-Nov-12
FEA2700	ASA(CW) Memo to OMB	0.0d		05-Dec-12
FEA2680	ASA(CW) Trans to Cong	20.0d	06-Dec-12	04-Jan-13
FEA2710	Feas Report to Congress	0.0d		04-Jan-13
FEA2715	Feas Study Termination	0.0d		04-Jan-13

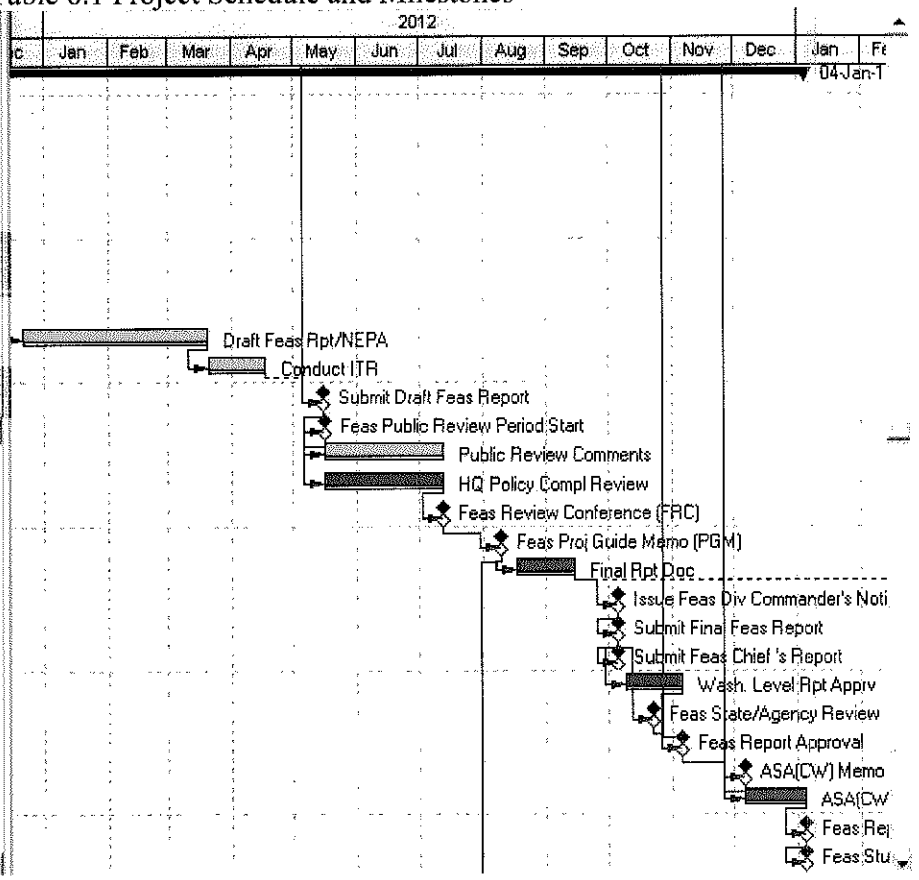


Table 8.2. MAJOR MILESTONES, PROJECT STUDY PLAN, GATHRIGHT DAM AND LAKE MOOMAW LOW FLOW AUGMENTATION STUDY, VIRGINIA

Milestone	Description of milestone	Date
	Forward Draft PMP to DEQ for Review	22 July 2009
	FCSA to DEQ	October 2009
P5	Execute FCSA	December 2009
	Initiation of Feasibility Study	February 2010
P6	Initial Feasibility Coordination Meeting	March 2010
	Division Receives Formulation Package	September 2011
P7	Formulation Meeting/Briefing	October 2011
P8	Division Receives Draft Feasibility Report/EIS FRC	May 2012
P9	Division & HQ Receive Final Feasibility Report/ EIS	October 2012
P10	Completion of Feasibility Report/ Division Engineer's Public Notice	November 2012

9. BUDGET AND COST ESTIMATES

9.0 A summary budget for the Feasibility Study by fiscal year is presented in tables 9.1 and 9.2 in the Microsoft Excel spreadsheet format. The budget was developed by coordinating a cost estimate and commitment from each performing organization, based on the "Work Tasks," "Organizational Breakdown Structure," and "Schedules" sections. As discussed previously in the section entitled "Responsibility Assignment Matrix," the responsible organizational elements are shown in Table 9.1 under the column entitled "Resource." The cost estimates were prepared using the Code of Accounts format and summarized for each element of the Organization Breakdown Structure. Table 9.1 summarizes the cash and in-kind services by Fiscal Year provided by the local sponsor in support of the Feasibility Study.

Table 9.1A. BUDGET AND COST ESTIMATE, GATHRIGHT DAM AND LAKE MOOMAW
LOW FLOW AUGMENTATION FEASIBILITY STUDY, VIRGINIA
NO INCREASE TO NORMAL POOL
(SEE ATTACHED)

Attached

Table 9.1A. BUDGET AND COST ESTIMATE, GATHRIGHT DAM AND LAKE MOOMAW LOW FLOW AUGMENTATION FEASIBILITY STUDY, VIRGINIA
NO INCREASE TO NORMAL POOL

Acct Number	Work Task	Resource	FY09	FY10	FY11	TOTAL	
22A	Public Involvement	PM-PR	$ 2,042.50	$ 4,085.00	$ 2,042.50	$ 8,170.00	
22A	Public Involvement	PM-PE	$ 2,365.00	$ 4,730.00	$ 2,365.00	$ 9,460.00	
22A	Public Involvement	PM-PE	$ 1,827.50	$ 3,762.50	$ 1,827.50	$ 7,417.50	
22A	Public Involvement	PM-PR	$ 1,612.50	$ 3,332.50	$ 1,612.50	$ 6,557.50	
22A	Public Involvement	PM-PR	$ 2,150.00	$ 2,150.00	$ 2,150.00	$ 6,450.00	
22A	Public Involvement	PM-P	$ 1,075.00	$ 1,075.00	$ 1,075.00	$ 3,225.00	
22A	Public Involvement	PM-J	$ 2,365.00	$ 4,730.00	$ 2,365.00	$ 9,460.00	
22A	Public Involvement	TS-EH	$ 1,827.50	$ 3,762.50	$ 1,827.50	$ 7,417.50	
22A	Public Involvement	PM-J	$ 2,365.00	$ 4,730.00	$ 2,365.00	$ 9,460.00	
22A	Public Involvement	In-Kind	$ 10,000.00	$ 30,000.00	$ 10,000.00	$ 50,000.00	
22B	Institutional Studies	PM-PR	$ -	$ 4,085.00	$ 3,117.50	$ 7,202.50	
22C	Social Studies	PM-PE	$ 3,225.00	$ 16,125.00	$ 3,225.00	$ 22,575.00	
22D	Cultural Resources	PM-PE	$ 2,687.50	$ 8,062.50	$ 1,075.00	$ 11,825.00	
22D	Cultural Resources	Contract	$ 2,687.50	$ 8,062.50	$ 1,075.00	$ 11,825.00	
22E	Environmental Studies	PM-PE	$ 34,615.00	$ 69,337.50	$ 34,615.00	$ 138,567.50	
22E	Environmental Studies	In-Kind	$ 41,666.67	$ 41,666.67	$ 41,666.67	$ 125,000.00	
22F	F&WS Report	Other	$ -	$ 32,787.50	$ -	$ 32,787.50	
22G	Economic Studies	PM-PR	$ 24,187.50	$ 48,267.50	$ 24,187.50	$ 96,642.50	
22H	Real Estate	TS-RP	$ -	$ 1,075.00	$ 1,075.00	$ 2,150.00	
22J	H&H Studies/Report	TS-EH	$ 67,990.00	$ 119,862.50	$ 25,047.50	$ 212,900.00	
22J	H&H Studies/Report	In-Kind	$ 354,000.00	$ -	$ -	$ 354,000.00	
22K	Geotech	TS-EG	$ 13,975.00	$ 26,875.00	$ 1,075.00	$ 41,925.00	
22L	HTRW	TS-EG	$ 4,407.50	$ 5,912.50	$ 1,505.00	$ 11,825.00	
22N	Surveys & Mapping		$ 5,375.00	$ 5,375.00	$ 2,150.00	$ 12,900.00	
22P	Engineering & Design	TS-EE	$ -	$ 7,632.50	$ 3,117.50	$ 10,750.00	
22Q	Coordination	PM-PR	$ 2,042.50	$ 6,127.50	$ 6,127.50	$ 14,297.50	
22Q	Coordination	In-Kind	$ 5,000.00	$ 15,000.00	$ 5,000.00	$ 25,000.00	**Article III of FCSA Costs**
22Q	All Other Coordination	PM-PR	$ 1,075.00	$ 3,117.50	$ 3,117.50	$ 7,310.00	
22Q	All Other Coordination	PM-PR	$ 1,827.50	$ 3,870.00	$ 4,515.00	$ 10,212.50	
22Q	All Other Coordination	PM-P	$ 537.50	$ 1,075.00	$ 1,182.50	$ 2,795.00	
22Q	All Other Coordination	PM-R	$ 322.50	$ 1,075.00	$ 1,182.50	$ 2,580.00	
22Q	All Other Coordination	PM-P	$ 2,365.00	$ 5,052.50	$ 5,267.50	$ 12,685.00	
22Q	All Other Coordination	In-Kind	$ 5,000.00	$ 15,000.00	$ 5,000.00	$ 25,000.00	**Article IV of FCSA Costs**
22R	Plan Formulation	PM-PR	$ 29,347.50	$ 58,695.00	$ 13,330.00	$ 101,372.50	
22S	Report Preparation	PM-PR	$ -	$ 5,160.00	$ 3,117.50	$ 8,277.50	
22S	Report Preparation	PM-PR	$ -	$ -	$ 5,375.00	$ 5,375.00	
22T	PM & PMP	PM-J	$ 11,932.50	$ 11,932.50	$ 11,932.50	$ 35,797.50	
22U	Quality Control	PM-PR	$ 3,117.50	$ -	$ -	$ 3,117.50	
22U	Quality Control	Other	$ 3,225.00	$ 12,900.00	$ 10,750.00	$ 26,875.00	
22V	PCA	PM-J	$ -	$ -	$ 2,687.50	$ 2,687.50	
22Y	Washington Review	All	$ -	$ -	$ 50,000.00	$ 50,000.00	
		Totals	**$ 648,239.17**	**$ 596,489.17**	**$ 299,146.67**	**$ 1,543,875.00**	
		Potential Sponsor In-Kind	**$ 415,666.67**	**$ 101,666.67**	**$ 61,666.67**	**$ 579,000.00**	
		Total Funds (Federal and Sponsor Cash) Required	**$ 232,572.50**	**$ 494,822.50**	**$ 237,480.00**	**$ 964,875.00**	
		Federal Funds (Cash) Required	**$ 232,572.50**	**$ 389,791.66**	**$ 149,573.33**	**$ 771,937.50**	
		Sponsor Funds (Cash) Required	**$ -**	**$ 105,030.84**	**$ 87,906.67**	**$ 192,937.50**	

In-Kind Summary

$ 279,000.00	Model - Year 1 - H&H Studies/Report
$ 125,000.00	Downstream Monitoring study (3 years) - Environmental
$ 100,000.00	Labor Roanoke & Central for Public Meetings (3 years) - Public Involvement, Coord, All Other Coord
$ 75,000.00	TMDL modeling costs - Year 1 - H&H Studies/Report
$ 579,000.00	

NOTE 15 (B)
Article IV.A. Breakdown of Study Costs
FCSA Model Calculations

Step 1	$ 771,937.50
Step 2	$ 721,937.50
Step 3	$ 192,937.50

NOTE 15 (C)
Article IV.A. Study Cost Percentage
FCSA Model Calculations

Step 1	$ 1,493,875.00
Step 2	48.3%

Table 9.2. COST MATRIX, GATHRIGHT DAM AND LAKE MOOMAW LOW FLOW AUGMENTATION FEASIBILITY STUDY, VIRGINIA
(SEE ATTACHED)

Attached

Table 9.2. COST MATRIX, GATHRIGHT DAM AND LAKE MOOMAW LOW FLOW AUGMENTATION FEASIBILITY STUDY, VIRGINIA
(SEE ATTACHED)

FY	Non-Federal Cash	Non-Federal WIK	Federal Cash
Fiscal Year 10	$ -	$ 415,666.67	$ 232,572.50
Fiscal Year 11	$ 105,030.84	$ 101,666.67	$ 389,791.66
Fiscal Year 12	$ 87,906.67	$ 61,666.67	$ 149,573.33
	$ 192,937.50	$ 579,000.00	$ 771,937.50
	Sponsor Sub	$ 771,937.50	
		Grand Total	$ 1,543,875.00