
**Operation, Maintenance, Repair,
Replacement and Rehabilitation
Manuals and Inspections of
Completed Projects for Ecosystem
Restoration: *An Assessment of
Guidance Needs***

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Operation, Maintenance, Repair, Replacement and Rehabilitation Manuals and Inspections of Completed Projects for Ecosystem Restoration: *An Assessment of Guidance Needs*

Purpose

Ecosystem restoration has been formally recognized as a primary mission of the Corps of Engineers civil works program since 1990. As of 2005, a substantial number of the Corps Districts have completed the construction of one or more ecosystem restoration projects. The post-construction or operational phase of ecosystem restoration projects has begun to receive increased attention within the Corps. In response to a request by leaders of the civil works environmental sub-community of the Environmental Community of Practice, the Corps' Institute for Water Resources (IWR) reviewed current Corps guidance for ecosystem restoration projects. Current guidance was reviewed in regard to the preparation of Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) or, more commonly, "O&M" manuals, and the inspection of completed projects by the Corps. IWR also surveyed Corps Districts to identify common problems and needs related to the preparation of OMRR&R manuals for ecosystem restoration projects. This paper presents the findings of IWR's review and survey.

Methods

Review of guidance

Engineer Regulations, Pamphlets and Circulars on the Headquarters publication website were reviewed to identify guidance pertaining to the OMRR&R of civil works projects and the inspection of completed civil works projects. In addition, the language in model Project Cooperation Agreements (PCA's) for ecosystem restoration projects under the continuing authority program was compared to model PCA's for other project purposes to identify any differences in requirements or expectations related to OMRR&R or Corps inspections.

Informal survey

IWR conducted an informal email survey of Corps Districts. The questions included in the survey were:

1. How many (a) specifically-authorized ecosystem restoration projects (including distinct project features) and (b) continuing authority ecosystem restoration projects have been completed by your District since 1990? (For this question, a project or feature on non-Corps lands is considered to have been completed when it is turned over to the sponsor.)

Considering your experience with the preparation of O&M manuals for ecosystem restoration projects or features...

2. What were the most significant problems encountered in developing O&M manuals?

3. Is there a need for additional guidance regarding the preparation of O&M manuals for ecosystem restoration projects? (Please explain)

4. What else about your experience would you like to share with someone preparing an O&M manual for an ecosystem restoration project?

5. What information would you like to have from people who have prepared O&M manuals for ecosystem restoration projects?

We are also looking for examples of O&M manuals that have been completed for ecosystem restoration projects of all types, including both specifically-authorized and continuing authority projects. Please provide the following information regarding O&M manuals completed for ecosystem restoration projects in your District:

6. How many O&M manuals have been completed for ecosystem restoration projects (or features) in your District?

7. Please provide a list of the project names and locations for which O&M manuals have been completed. Indicate CAP authority, if applicable. Identify a point-of-contact for obtaining a copy of the O&M manual. (If a complete list would require excessive effort, please provide a list of projects that is representative of the types of projects in your District.)

An email containing the survey questions was sent in May 2005 to each of the designated leaders of the civil works environmental sub-community of the Environmental Community of Practice for the Corps' eight civil works Divisions. The email requested that the Division environmental leaders distribute the survey to their Districts. The manner in which the survey was distributed, and the manner in which the District responses were coordinated with the Divisions, were left to the discretion of the Division environmental leaders. An email reminder was sent to the Division environmental leaders after the initial announced deadline for responses had passed. Responses to the survey were voluntary.

Results

Guidance review

A total of 32 current guidance documents related to OMRR&R or Corps inspections of completed projects were identified and reviewed. Those documents are listed in Table 1, which also summarizes the relevance of each guidance document to ecosystem restoration projects. Most of the documents listed in Table 1 do not specifically address ecosystem restoration projects. In most cases, either (1) the guidance document addresses only operation and maintenance by the Corps of Engineers, while ecosystem restoration projects are normally operated and maintained by non-federal sponsors, or (2) the guidance document is limited to specified project purposes other than ecosystem restoration.

Standard PCA language for all project purposes requires sponsors to perform OMRR&R in accordance with the OMRR&R manual furnished by the Corps. Standard PCA's also give the Corps the right to enter project lands for the purpose of inspection or to perform required OMRR&R if the sponsor fails to do so. While there is presently no model PCA for specifically-authorized ecosystem restoration projects, the model PCA's for ecosystem restoration projects under the continuing authority program include the same language as the PCA's for other project purposes.

General guidance on the preparation of OMRR&R manuals for all project purposes is provided by ER 1110-2-401, "OMRR&R Manual for Projects and Separable Elements Managed by

Project Sponsors” (1994). This engineer regulation does not specifically address ecosystem restoration, and does not address any other specific project purpose in depth. Instead, ER 1110-2-401 provides a general outline for OMRR&R manuals that is applicable to any project purpose. There are additional guidance documents that identify general OMRR&R requirements for all flood damage reduction and shore protection projects (33 CFR Part 208.10 and ER 1110-2-2902, respectively). There is no similar guidance document that identifies general OMRR&R requirements for all ecosystem restoration projects.

Review of guidance documents related to Corps inspections of completed projects, including budgetary guidance, identified a significant discrepancy in the current guidance. Model PCA’s require sponsors to provide access for Corps inspections of completed projects, including ecosystem restoration projects. Although Corps regulations assign the primary responsibility for periodic inspections to the non-federal sponsors as part of their operation and maintenance responsibilities, the language in model PCA’s anticipates that the Corps may also conduct inspections to ensure that sponsors are fulfilling their legal obligations under PCA’s. However, FY 2006 budgetary guidance limits funding for inspection of completed projects to flood damage reduction projects. This discrepancy has been addressed in the Program Development Guidance for FY 2007, EC 11-2-187, which for the first time includes a work category code in the O&M Operations Accounts for Studies, Surveys and Inspections of Ecosystem Restoration Projects. Districts were able to request funding for the inspection of completed ecosystem restoration projects beginning with the FY 2007 budget.

Current guidance on Corps inspections of completed, sponsor-maintained projects is directly applicable only to flood protection projects that qualify for emergency rehabilitation under PL 84-99 (Chapter 3 of ER 1130-2-530). There is no current guidance that specifically addresses procedures for Corps inspections of ecosystem restoration projects.

Survey responses

Responses to IWR’s email survey were received from 6 of the 8 civil works Divisions. The responses included specific information from nine Districts. A total of 15 completed ecosystem restoration projects were identified by name in the responses, including 6 continuing authority projects. One Division stated that they had about 14 additional completed continuing authority projects, but did not identify those projects by name. None of the responses identified a completed ecosystem restoration feature as part of multiple-purpose project. The responses are not considered to be comprehensive or statistically representative, because no response was received from most Corps Districts, and some of the responses may be incomplete. The responses were not endorsed through the chain of command and are thought to generally represent only the views of the individual respondents. However, the responses were fairly well distributed throughout the Nation and addressed a variety of ecosystem restoration projects. The responses are therefore thought to sufficiently represent the most common issues and needs related to the preparation of OMRR&R manuals for ecosystem restoration projects for the purposes of the survey.

Eight completed OMRR&R manuals were identified in 6 Districts representing 5 Divisions. Three Districts representing 3 Divisions identified a total of 10 OMRR&R manuals currently being prepared. The total number of manuals completed or in preparation (18) exceeds the number of completed projects (15) because preparation of an OMRR&R manual may begin before a project is completed. Also, in at least one case, a District determined that no OMRR&R manual was required for a project.

Responses to the four survey questions that required narrative answers are summarized below. Six sets of responses were received. The responses presented here have been edited for brevity and clarity. The numbers in parenthesis are the number of times each response was given, if more than once.

What were the most significant problems encountered in developing O&M manuals?

- Insufficient attention or priority from District or project team (3)
- Insufficient sponsor commitment or capability (2)
- Lack of personnel with necessary experience (2)
- O&M manual developed too late in process – usually after construction, rather than developing O&M requirements during planning phase (2)
- Lack of a prototype or example to follow (2)
- Fundamentally different O&M needed than for typical structural projects for other purposes (2)
- Current guidance is insufficient/too vague (2)
- Need for flexibility and a process for updating manuals in response to experience and changing conditions (2)
- Incorporating an adaptive management process, including identifying a funding mechanism for continued Corps involvement after construction is completed (2)

Is there a need for additional guidance regarding the preparation of O&M manuals for ecosystem restoration projects?

All of the responses stated that there is a need for additional guidance. Specific areas identified as requiring additional guidance were:

- Model O&M manual (2)
- Inspection and repair of natural features, such as vegetation, stream channels, etc. (2)
- More stakeholder (sponsor and Operations) involvement in development of manuals (2)
- Standard process for developing O&M manuals, with clear delineation of responsibilities for developing the various components (2)
- Specific listing and examples of items to be included
- Comprehensive sources for cost information for O&M items
- Checklist of potential problems or considerations, including management of vegetation and recreational activities
- Linkages between O&M and monitoring

What else about your experience would you like to share with someone preparing an O&M manual for an ecosystem restoration project?

- There needs to be close and early coordination with the sponsor and any third parties involved in O&M to ensure their commitment. (4)
- O&M manual needs to be based on clearly defined restoration objectives. (3)
- Funding requirements for Corps inspections (and for Federal O&M cost-share, if applicable) need to be considered. (2)
- O&M requirements for structural ecosystem restoration features can be based on established O&M practices for other project purposes.
- Lessons learned from environmental stewardship at Corps-operated projects, and from mitigation projects, can be applied to O&M for ecosystem restoration projects.

What information would you like to have from people who have prepared O&M manuals for ecosystem restoration projects?

- Example manuals, including specific items to be included (5)
- Source of funding used for inspections
- How should project performance be evaluated?
- What problems have been encountered?

Conclusions

Review of current Corps guidance on the preparation of OMRR&R manuals and Corps inspections of completed projects identified significant gaps in guidance applicable to ecosystem restoration projects relative to other project purposes. This is not surprising considering the shorter amount of time that the Corps has been widely involved in ecosystem restoration as a primary project purpose. Although the Corps has general guidance on the preparation of OMRR&R manuals, there is no specific guidance on OMRR&R for ecosystem restoration projects that is comparable to the existing guidance for flood damage reduction and shore protection projects. Similarly, there is no specific guidance on Corps inspections of completed ecosystem restoration projects that is comparable to the detailed guidance available for flood damage reduction projects. Budgetary guidance has recently been revised to include budgeting for Corps inspections of completed ecosystem restoration projects, but there are no established guidelines for such inspections.

Guidance developed for other purposes can be used as a starting point for preparing OMRR&R manuals or conducting inspections of ecosystem restoration projects. This is especially true for the structural features of ecosystem restoration projects, such as water control structures, levees, and access roads. Maintenance and inspection requirements for structural features may be similar regardless of the project purpose. However, careful consideration should be given to ensuring that maintenance requirements are appropriate to both the purpose of the feature and the purpose of the project.

Responses to the IWR survey were unanimous that additional guidance is needed regarding the development of OMRR&R manuals for ecosystem restoration projects. The respondents were most interested in having previously prepared or model OMRR&R manuals made available as examples. There was also substantial support for developing checklists of suggested items for inclusion in OMRR&R manuals, including identification of potential problems or other considerations that should be addressed. The responses seemed to suggest that such guidance should be informational, rather than directive. Another recurring theme was the need for a more clearly defined process for developing OMRR&R manuals that includes a clear delineation of responsibilities and ensures participation by both internal stakeholders, such as Operations, and sponsors. Current guidance on the preparation of OMRR&R manuals briefly addresses responsibilities and the need for coordination; nonetheless, some of the survey respondents indicated a need for additional guidance in those areas.

Potential actions to address the need for additional guidance for OMRR&R manuals and Corps inspections of ecosystem restoration projects include:

- Provide copies of example OMRR&R manuals on a Corps website, such as the Ecosystem Restoration Planning Center of Expertise website.

- Develop informational guidance, such as checklists, discussion of potential issues, and recommendations for the content of OMRR&R manuals. These could be made available as a series of webpages, or as a guidebook.
- Develop and distribute informational guidance on conducting Corps inspections for completed ecosystem restoration projects, similar to the current guidance for sponsor-maintained flood damage reduction projects.
- Encourage discussion of OMRR&R manuals and Corps inspections of completed ecosystem restoration projects at appropriate Corps meetings and conferences of the Planning, Engineering, Operations, and Environmental Communities of Practice.
- Include discussion of OMRR&R manuals and Corps inspections in future training courses that address ecosystem restoration planning and design.
- Develop and distribute a model OMRR&R manual for optional use by Districts.
- Further evaluate the need for formal directives regarding OMRR&R manuals and Corps inspections of completed projects for ecosystem restoration.

Regardless of the form in which guidance is provided, it is important to keep in mind that ecosystem restoration encompasses a wide range of objectives and methods for achieving those objectives. It is therefore important that any guidance be sufficiently broad and flexible to accommodate the variation among ecosystem restoration projects.

Table 1
Summary of Authorities/Policy/Guidance Relevant to
OMRR&R and Inspection of Completed Projects
for Ecosystem Restoration

Document and Summary of Relevant Provisions	Applicability			
	ER	FDR	HSP	Fed O&M
General Policy				
Flood Control Act of 1970, Sec. 221(e) Required annual report to Congress on the status of performance of terms of project cooperation agreements by non-Federal interests. Report requirement eliminated by Sec. 1064, PL 104-106 (1996).	2	2	2	
ER 1150-2-301 – Local Cooperation (1967 updated 1970) Addresses non-Federal O&M for local flood protection projects only. “Upon transfer of a completed project to local interests for [O&M],... authority is considered to expire for expenditure of Federal funds for construction...or for maintenance other than inspection of the completed works.” “District Engineers will keep informed as to the extent of compliance with approved regulations for [O&M] of local flood protection projects through regular, periodic inspection of the projects...and careful analysis of the semiannual reports which the [sponsors] are required to submit.” “A report of maintenance deficiencies on all local protection projects specifically authorized by Congress will be submitted...each year.”		1	1	1
ER 1150-2-302 – Annual Report on Local Cooperation Agreements (1981) “In order that the Chief of Engineers can respond to Section 221 (e) of the Flood Control Act of 1970 concerning required cooperation agreements on water resource projects,” local cooperation projects with deficient maintenance are to be reported to HQUSACE annually. Regulation specifies that this requirement is in addition to reports regarding the inspection of local flood protection projects.	2	2	2	
Model PCA’s – Article VIII – OMRR&R Standard PCA language requires sponsor to perform OMRR&R in accordance with the OMRR&R Manual and any subsequent amendments. Government has right to enter project lands for the purpose of inspection, or to perform OMRR&R if inspection shows sponsor is failing to perform required OMRR&R. (There is currently no model PCA for specifically-authorized ER projects.)	1	1	1	

ER = Ecosystem Restoration FDR = Flood Damage Reduction HSP =Hurricane and Shore Protection Fed O&M = Federally Operated and Maintained
 1 = Directive specifically addresses the indicated project purpose
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Document and Summary of Relevant Provisions	Applicability			
	ER	FDR	HSP	Fed O&M
OMRR&R Guidance				
33 CFR Part 208.10 – Local Flood Protection Works; Maintenance and Operation of Structures and Facilities (1944) Establishes specific O&M requirements applicable to all local flood protection works.		1		
ER 1110-2-2902 – Prescribed Procedures for the Maintenance and Operation of Shore Protection Projects (1989) Establishes specific O&M requirements applicable to all shore protection works. “District Engineers shall keep informed as to the extent of compliance with provisions of this regulation and the project [O&M] Manuals through periodic inspections of the projects, and analysis of project records maintained by the [sponsors].”			1	
ER 1110-2-401 – OMRR&R Manual for Projects and Separable Elements Managed by Project Sponsors (1994) Provides general instructions/outline for preparation of OMRR&R manuals, including identification of records to be maintained by sponsor for Government inspection. “Government inspections will be performed in consultation with the project’s sponsor.” Manuals may be updated for changed conditions or if warranted to correct conditions discovered during inspections. Regulation is not purpose-specific; specific purposes are only briefly mentioned as examples.	2	1	1	
ER 1130-2-500 & EP 1130-2-500 – Partners and Support (1996 updated 2003) Chapter 2 – Project Manuals. Policy for O&M manuals for Corps-operated projects only.				1
ER 1130-2-510 & EP 1130-2-510 - Hydroelectric Power Operations and Maintenance Policies (1996 updated 2002) Policy for O&M of Corps-operated projects only.				1
ER 1130-2-520 & EP 1130-2-520 – Navigation and Dredging O&M Policies (1996) Policy for O&M of Corps-operated projects only.				1
ER 1130-2-540 & EP 1130-2-540 – Environmental Stewardship O&M Guidance and Procedures (1996 updated 2002) Policy for O&M of Corps-operated projects only.				1
ER 1130-2-550 & EP 1130-2-550 - Recreation Operations and Maintenance Policies (1996 updated 2002) Policy for O&M of Corps-operated projects only.				1

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Document and Summary of Relevant Provisions	Applicability			
	ER	FDR	HSP	Fed O&M
Monitoring and Inspection Guidance and Funding				
ER 1110-2-8151 - Monitoring Completed Navigation Projects (1997) National program for intensive monitoring of selected navigation projects maintained by the Corps.				1
ER 1165-2-119 –Modifications to Completed Projects (1982) “It is... a general policy of the Chief of Engineers that completed Corps projects be observed and monitored by the Corps 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 contacts with local interests and other Federal agencies, and through the day-to-day observations of on-site Corps personnel charged with project operations.”	2	1	2	1
ER 1130-2-530 – Flood Control Operations and Maintenance Policies (1996) Superseded ER 1130-2-339 Inspection of Local Flood Protection Projects. Chapter 3 – Inspections of Federal Flood Control Projects Operated and Maintained by Non-Federal Sponsors. “This program (Inspection of Completed Works) should assure sponsor compliance with existing agreements that the structures and facilities constructed by the United States for flood protection will be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain maximum benefits.” “Any project which cannot qualify for emergency rehabilitation under PL 84-99, will not be inspected under this chapter.”		1		
ER 11-1-320 - Civil Works Emergency Management Programs (1998) Chapter 3 defines program categories and functions under the Flood Control and Coastal Emergencies program authorized by PL 84-99. The Rehabilitation and Inspection Program category includes funding for Initial and Continuing Eligibility Inspections for non-Federally constructed flood control works only.		1		

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Document and Summary of Relevant Provisions	Applicability			
	ER	FDR	HSP	Fed O&M
<p>ER 1110-2-100 – Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures (1995) “Civil Works structures whose failure or partial failure could jeopardize the operational integrity of the project, endanger lives and safety of the public or cause substantial property damage shall be periodically inspected and evaluated to ensure their structural stability, safety, and operational adequacy.” “For those facilities constructed by the Corps and turned over to others for operation and maintenance, the operating entity is responsible for periodic inspection and evaluation.” Under the authority of ER 1130-2-[530], the Corps, at government expense, will participate in the inspection of a sponsor operated and maintained structure (e.g., local flood protection project)...to assure that the operating entity is conforming to the requirements of the PCA, the agreed upon inspection program, and [O&M] program.” “The engineering division of the district office will be responsible for...[maintaining] assurances that sponsors with OMRR&R responsibilities are performing as required under the PCA agreements.”</p>	2	1		1
<p>ER 1110-2-101 – Reporting of Evidence of Distress of Civil Works Structures (1996) Prescribes procedures for immediate notification to higher authority of evidence of distress or conditions that could result in a potential hazard at civil works projects. Requires special inspections to immediately evaluate damages or changes. Primarily addresses dams, locks, levees, floodwalls, and similar structures.</p>	2	1	2	1
<p>ER 500-1-1 - Civil Emergency Management Program (2001) Chapter 5 defines the Rehabilitation and Inspection Program under PL 84-99 and specifies that funding for continuing eligibility inspections of Federally-constructed, locally-maintained flood control works (Federal FCW) will be O&M, General, 96x3123. Specifies that inspections will be conducted at least biennially for Federal FCW unless ER 1130-2-530 permits a longer period.</p>		1	1	
<p>EP 500-1-1 - Civil Emergency Management Program - Procedures (2001) Appendix B, Inspection Guide for Flood Control Works, is used for Initial and Continuing Eligibility Inspections under the Rehabilitation and Inspection Program for PL 84-99.</p>		1	2	

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Document and Summary of Relevant Provisions	Applicability			
	ER	FDR	HSP	Fed O&M
<p>EC 11-2-187 - Corps of Engineers Civil Works Direct Program, Program Development Guidance, Fiscal Year 2006</p> <p>O&M Operations Accounts include Work Category Code 60223 – Studies, Surveys and Inspections of Completed Works – Local Protection Projects for flood damage reduction features. “Includes all costs related to the inspection of Federally constructed, locally operated and maintained projects to ensure compliance with local cooperative agreements. This Work Category does not include costs for projects covered by PL 84-99. Includes all costs for technical review and approval of sponsor-proposed alterations, improvements, excavation or construction within the limits of the project right-of-way; advice given to sponsors related to the effects of such activities on the function/operation of the project and information on acceptable construction methods; all costs to update O&M Manuals; initial funding of reconnaissance or evaluation reports; and PED for major rehabilitation, dam safety assurance, deficiency correction and reconstruction as applicable until Construction, General (CG) funds are allocated.”</p> <p>There is no equivalent Work Category Code for completed Federally constructed, locally operated and maintained projects for purposes other than flood damage reduction for FY 2006.</p>		1		1
<p>EC 11-2-187 - Corps of Engineers Civil Works Direct Program, Program Development Guidance, Fiscal Year 2007 (29 April 2005)</p> <p>O&M Operations Accounts include new Work Category Code 60422 – Studies, Surveys and Inspections of Ecosystem Restoration Projects for environmental stewardship features. “Includes all costs related to the inspection of Federally constructed, locally operated and maintained projects to ensure compliance with Project Cooperative Agreements. Includes inspection of ecosystem restoration features, observations regarding compliance with any access or easement restrictions, and minimal documentation of the condition of the ecosystem. Includes all costs for technical review and approval of sponsor-proposed alterations, improvements, excavation or construction within the project limits; advice given to sponsors related to the effects of such activities on the function/operation of the project and information on acceptable construction methods; initial funding of reconnaissance or evaluation reports; PED for deficiency correction and reconstruction as applicable until Construction, General (CG) funds are allocated.”</p> <p>EC also includes Work Category Code 60223 as described above for FY 2006.</p>	1	1		1

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	ER	FDR	HSP	Fed O&M
Ecosystem Restoration Guidance				
ER 1165-2-28 (33 CFR Part 236) – Corps of Engineers Participation in Improvements for Environmental Quality (1980). Does not address inspections or OMRR&R.	1			
ER 1165-2-501 & EP 1165-2-502 – Civil Works Ecosystem Restoration Policy and Ecosystem Restoration – Supporting Policy Information (1999) ER and EP contain identical guidance regarding real estate outgrants for non-Federal O&M of ecosystem restoration projects on existing Corps project lands owned by the U.S. No additional guidance regarding inspections or OMRR&R.	1			
ER 1105-2-100 – Planning Guidance Notebook (2000) Paragraph 3-5.b.(8) addresses monitoring and adaptive management. “Cost shared post-implementation monitoring will rarely be required...[and]...shall not exceed five years following completion of construction.” “[Cost shared monitoring] shall not exceed one percent of the total first cost of ecosystem restoration features.” “For complex specifically authorized projects that have high levels of risk and uncertainty of obtaining the proposed outputs, adaptive management may be recommended...[and]...will be limited to 3 percent of the total project cost excluding monitoring costs.” Appendix F paragraph F-19.f. addresses monitoring for CAP ER projects. “Cost shared post-implementation monitoring will rarely be required...and shall be limited to no more than five years. [Cost shared monitoring] shall not exceed one percent of the total first cost of the ecosystem restoration features. The non-Federal sponsor will be responsible for maintenance during the monitoring period. If additional monitoring is necessary consideration should be given to designating it as an O&M activity to be paid for by the sponsor.”	1	1	1	1
EC 1105-2-409 – Planning in a Collaborative Environment (2005) Paragraph 9.b.(1) addresses monitoring and adaptive management in relation to O&M. “Most projects will only require periodic inspection, as part of normal [O&M] to monitor whether or not it is functioning satisfactorily. When a specific monitoring requirement is included as part of the sponsor’s project O&M responsibility, it will be accomplished at 100 percent non-Federal cost. All monitoring requirements should be specified in the O&M manual along with other OMRR&R requirements provided to the sponsor upon project completion.”	2	2	2	2

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