REMR TECHNICAL NOTE EI-M-1.1

ENVIRONMENTAL METHODOLOGY FOR REMR ACTIVITIES

PURPOSE: To provide guidance in developing a methodology to systematically and expeditiously consider environmental impacts and identify problems and opportunities to improve habitat, water quality, and aesthetic conditions within the framework of planning and implementing a REMR project.

APPLICATION: The methodology presented provides a step-by-step process for those not familiar with environmental considerations to begin to identify potential environmental problems with a planned REMR activity. It will help the nonenvironmental person communicate about the environmental benefits and losses associated with the project.

BACKGROUND: Because the routine nature of many REMR activities results in minor environmental impacts, environmental considerations are not usually an issue. However, the long-term impact of these relatively minor activities can sometimes result in cumulative, secondary, or indirect environmental impacts that can be significant. The fact that actions to avoid, reduce, or mitigate adverse environmental impacts may not be part of a standard REMR construction and maintenance procedure is unfortunate because the diverse settings of REMR projects offer multiple opportunities for improving the overall environmental effect of REMR activities. Also, public interest in the environmental aspects of an activity often is not demonstrated until after the project is well under way. Having a methodology in place may help assure the public that environmental values are being considered in a systematic way.

ENVIRONMENTAL METHODOLOGY:

Objective: The objective of using a good methodology is to assure that the net environmental effects of the actions taken will be an improvement over existing conditions. The methodology objectives are accomplished through the following:

a. Identifying institutionally protected resources (for example, endangered species) early enough to alter implementation plans.

b. Initiating required compliance efforts at the beginning of the project to prevent stoppage or delay while compliance issues are resolved.

c. Identifying important local natural resources (such as, wildlife habitat) and including them in the plans for the rehabilitation and maintenance activities. These habitat resources may support important food web or other ecosystem components but may be degraded or destroyed because no institutional mandate singles them out.

d. Systematically considering the REMR activity and identifying its secondary, unintended, and cumulative impacts.

Components of the methodology: Environmental impacts, both beneficial and adverse, occur through change in the physical and chemical environment brought about by REMR activities. The terrestrial ecosystem is affected by excavation or clearing for access, the removal of vegetation that results in erosion or loss of riparian habitat, and creation of borrow pits. Aquatic impacts occur through work done on locks or other structures, underwater repair, and addition of new structures to water courses. The impact of a REMR activity may be insignificant and the project area may revert to preproject conditions, or it may be so extensive that the ecosystem can be permanently changed. The Environmental Methodology is organized into four steps:

a. Step 1: Inventory of Baseline Conditions.

An adequate inventory of the existing conditions at a project setting is essential in determining what impacts may occur and, as importantly, if the changes represent significant losses in environmental value. (The aquatic habitat types for REMR activities are categorized in Table 1, adapted from Ref a). An accurate inventory can identify important natural resources that should be protected or conditions (for example, erosion) that should be considered in implementing REMR activities at the project site. For example, loss of all vegetation for access to a site is more significant from a wildlife habitat standpoint if the loss represents the last hardwood stand in an area than if a small area of grassy vegetation is lost. The land and water areas affected by a REMR activity may include resources not previously part of or contiguous with the project. Activities that require vegetative clearing or excavation or that result in effluent disposal that causes downstream water quality changes can cause impacts that are not limited to the project site. Such activities should include an identification and evaluation of the affected areas or water quality conditions.

Table 1

Habitat Categories for REMR Activities

Coastal Habitats
Estuarine--Low Salinity
Estuarine--Medium Salinity
Estuarine--High Salinity
Inland Lakes (for example, Great Lakes)
Reservoir Habitats
Inland Waterway Habitats

The compliance laws that can assist in identifying the resources to be part of the Inventory for a particular project are listed in Table 2. The applicability of environmental laws for particular

REMR activities is summarized in Ref b, along with legal citations and explanations of the intent and implementation information.

Table 2

Inventory Considerations/Environmental Laws

Law	Inventory Considerations
Clean Water Act	Existing water quality in project area; water quality standards
Clean Air Act	Air quality problems, such as, urban areas
Fish and Wildlife Conservation Act	Fish and wildlife lands as part of the Corps project
National Historic Preservation Act; Reservoir Salvage Act	Historic and cultural resources in the project area
Endangered Species Act	Identification of habitat of endangered species
Wild and Scenic Rivers Act	Identification of listed rivers
Coastal Zone Management Act	Coastal Zone Management Plan criteria consistency

b. Step 2: Impact Identification.

The water quality, habitat, and other impacts resulting from a specific REMR activity are determined by the REMR activities involved, the project setting, and the project size, scope, or extent.

The same REMR activity in different project settings can have different impacts because of differences in such attributes as vegetation, water chemistry (for example, salinities), and land uses. The scope of a REMR project refers to the magnitude or scale of REMR effort in terms of:

(1) Magnitude of the effort, for example, minor concrete repair versus lock rehabilitation.

(2) Geographical extent, for example, repair of a lock or groin field that results in sedimentation changes for several miles downstream.

(3) Temporal extent, for example, timing and duration of impacts on spawning, nesting, or other species activities.

In addition to the compliance laws listed in Table 2, the laws in Table 3 are focused on particular types of actions or impacts to specific environmental resources.

Table 3

Inventory Considerations/Environmental Laws

Law	Inventory Considerations
Clean Water Act	Discharges of effluents into waters of the United States
	Dredged material disposal
Clean Air Act	Air pollution emissions
Resource Conservation and Recovery Act	Generation and disposal of hazardous substances
Marine Protection, Research and Sanctuaries Act	Disposal of dredged and non-dredged material in open water or marine sanctuaries
Estuary Protection Act	Construction activities in estuaries (for projects requiring specific Congressional authorization)
Federal Insecticide, Fungicide, and Rodenticide Act	Pesticide use and disposal

The REMR activities, the actions to implement them, and potential environmental impacts are summarized in Table 4, taken from Ref c. This information should serve as a guide for identifying the environmental alterations that result from REMR activities.

Determination of long-term impacts: Identifying the long-term impacts on ecosystems is difficult; the assistance of environmental resources personnel is advisable. Table 5 summarizes and briefly describes the significance of long-term impacts resulting from REMR activities. Preparation efforts can result in major changes such as reservoir drawdown, river flow alteration, and vegetation removal. Even less drastic changes such as scraping, scouring of structural surfaces, or removal of sediments can result in destruction of benthic habitat and affect the food web for fish and other aquatic organisms. Rehabilitation work that causes changes in water flow, channel depths, or alignments can result in changing the type and quality of aquatic habitat available. Often projects that are intended to stabilize soil or channel conditions result in uniformity of conditions that destroy the natural character and structure of soil, vegetation, and water resources responsible for habitat diversity.

c. Step 3: Impact Evaluation: Impact evaluation determines the significance of the impacts and identifies appropriate actions in plans for implementation of the REMR activity. The evaluation of the identified impacts is based on the following considerations:

Table 4

Potential Environmental Impacts of REMR Activities*

REMR Activities	Actions	Potential Environment Impacts
Rehabilitation of navigation locks.	Closure during low-water period.	Interference with recreational and commercial navigation during peak-use periods; interference with fish movements.
Rehabilitation of stilling basins.	Dewatering; removal of accumulated sediments.	Desiccation of substrate and disruption of aquatic ecosystems; disruption of fish movements; dredged material disposal impacts; downstream water quality impacts.
Rehabilitation to control levee underseepage; methods to control underseepage in embankment dams and previous foundations.	Construction or expansion of landside berms; pool reduction.	Vegetation removal; general construction impacts; land use impacts; borrow pits; recreation impacts; aesthetic impacts; alteration of aquatic habitat for invertebrates and fishes; cultural resource impacts.
Erosion control and slope stabilization (including unlined channels, streambanks, reservoir slopes, and recreation areas).	Regrading; seedbed preparation; selection and design of erosion control features; reservoir pool lowering.	Vegetation disruption; erosion and sedimentation; aesthetic impacts; biological effects of elevated turbidity and suspended sediment concentrations; alteration of streambank materials; stream access affected; cultural resource impacts.
Erosion control in cold regions.	Revegetation; selection and design of erosion control features.	Permafrost thawing; ecosystem disruption.
Repair practices and quality control for rock slope protection.	Reengineering; armor replacement.	Loss or disturbance of rocky substrate; disturbance or riparian vegetation.
Repair or rehabilitation of rock channels and slopes.	Removal of damaged sections; debris disposal.	Debris disposal impacts; biological effects of elevated turbidity and suspended sediment concentrations.
Scour downstream of stilling basins.	Redesign, placement of stone, or other bank protection.	Altered substrate; aesthetic impacts.
Floating debris control systems.	Removal of floating debris.	Loss of large organic debris and consequent alteration of fish and invertebrate habitat.
Repair of scour around navigation training structures (including coastal).	Filling of scour holes with stone; modifying structures to reduce scour.	Substrate modification; alteration of fish habitat; biological effects of elevated turbidity and suspended sediment concentrations.
Techniques for repair of training structures (deep draft and shallow draft) including revetment.	Modification of structures; replacement of stone.	Effects on reef habitat; biological effects of elevated turbidity and suspended sediment concentrations.
Rehabilitation of rubble-mound structure toes.	Replacement of material; redesign of toe.	Effects on reef habitat; biological effects of elevated turbidity and suspended sediment concentrations.
Use of dissimilar armor for repair and rehabilitation of rubble-mound structure.	Rehabilitation or repair with different type or size of armor.	Altered marine habitat conditions.
Repair of localized damage to rubble-mound coastal structure.	Replacement of armor or repair with dissimilar material.	Effects on marine habitat.
Experimental testing of methods and materials for repair of rubble-mound structures.	Testing of various materials and methods.	Effects on marine habitat.
Development of methods to minimize maintenance requirements for wasted navigation channels.	New structure designs and placements; better dredging technology; dredged material disposal.	Marine habitat impacts; dredged material disposal impacts; interference with navigation.
Painting of submerged surfaces.	Painting.	Water quality impacts; toxicity to aquatic organisms.

* From Ref c.

Table 5

Long-Term Impacts

Impact	REMR Activity	Significance
Changes in benthic habitat	Removal of substrate, that is, streambank or natural channel bottom. Placement of stone, concrete, or other materials suitable for surface attaching benthic species. Stabilization of streambank and streambed so that benthic colonization is possible.	Adverse--Loss of stable substrate for burrowing benthic species. Beneficial--Hard surface for colonization by benthic organisms; stable streambank or bed conditions for burrowing habitat.
Changes in fishery habitat	Desiccation or destruction of fish eggs through dewatering or drawdown. Unsuitable water quality conditions, for example, turbidity, pollution, and low dissolved oxygen conditions caused by erosion, runoff, pollution, construction debris disposal.	Adverse--Loss of habitat or habitat structures through reduction in water area, clearing and snagging, and changes in flow conditions. Loss of habitat diversity by channel alterations that result in uniform aquatic habitat conditions, for example, revetment placement, filling of deepwater scour holes. Beneficial--Improvement in water quality conditions.
Changes in terrestrial habitat	Changes in habitat types or habitat diversity by vegetation removal. Land use impacts, for example, borrow pits, excavation, compaction by heavy machinery.	Adverse--Loss of mature vegetation, ground cover, through vegetation removal. Aesthetic impacts. Beneficial--Stabilization of eroding, unstable areas.

(1) Significance of the impact: Significance of environmental impact means that the change results in conditions that endanger or impinge on the functioning of the resource. The change may destroy the resource (for example, wetlands draining), reduce the capability for biological functioning (for example, smothering oyster beds by dredged material disposal), or result in violation of some institutional law or policy. An important consideration in determining significance is the duration of the alteration.

(2) Minimizing the impacts: Actions that minimize, avoid, or mitigate adverse impacts can be identified. (Ref c summarizes research that identified methods to minimize impacts.) Specific actions include such things as adjustments in scheduling to avoid spawning, migration, or other important life-cycle periods; preservation of vegetative or other important habitat components; and varying the size of riprap to increase the habitat diversity for benthic organisms.

(3) Compliance action requirements: Table 6 summarizes the compliance requirements for environmental laws applicable to REMR activities (Ref b). The necessary actions to fulfill the compliance requirements are explained in Ref d. Plans to address the identified compliance requirements should be initiated.

d. Step 4: Environmental Recommendations and Compliance Requirements.

The outcome of the evaluation of environmental impacts is the identification of actions and recommendations that can be used to improve the overall environmental effects of the rehabilitation effort. The two types of environmental actions are National Environmental Policy Act (NEPA) documentation and compliance requirements and environmental recommendations.

(1) NEPA documentation: The processing of environmental impact statements and environmental assessments follows the regulations for complying with the NEPA process. The District's actions to minimize impacts included in an assessment or an impact statement are undertaken as part of the project plans. Ref d provides an explanation of the NEPA process for REMR activities.

(2) Compliance requirements and environmental recommendations: Some REMR activities are covered by specific requirements that must be met as part of the compliance actions. Henderson and Peyman-Dove (1988) explain the compliance requirements. Recommendations for implementation of the REMR activity and modification to future operation and maintenance actions are formulated from the evaluation of environmental impacts. Important resources may be overlooked or lost from consideration if they are not part of an environmental assessment or statement, or covered by compliance requirements.

REFERENCES:

a. "Environmental Impacts and Seasonal Regulation of REMR Activities," REMR Technical Note EI-R-1.1, The REMR Notebook, Supplement 1, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

b. Henderson, Jim E., and Peyman, Linda D. 1986. "Applicability of Environmental Laws to REMR Activities," Technical Report REMR-EI-1, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

Table 6
Compliance Requirements

Law	Resource or Activity Regulated	Agency Requirement
National Environmental Policy Act	Federal projects or agency actions	Preparation and coordination of an environmental assessment or environmental impact statement
Clean Water Act	Discharges or dredged or fill materials into waters of the United States, except maintenance dredging	Compliance with EPA guidelines for Sec. 404(b)(1).
	Dredged or fill material discharge (Section 404)	Certification of water quality; Section 404 authorization; appropriate state permits
	Disposal of maintenance dredging material	
Clean Air Act	Air pollution emissions	New source permit for polluters of ≥250 tons (226 metric tons) of any air pollutant
Resource Conservation and Recovery Act	Hazardous substance generation and disposal	EPA notification of generation, transportation, and disposal
National Historic Preservation Act; Reservoir Salvage Act	Historic and archeological resources	Coordination with State Historic; Preservation Office; preservation of resources
		Consultation with Advisory Council on Historic Presentation
Fish and Wildlife Coordination Act	Management of Corps lands for fish and wildlife, fish and wildlife mitigation	Coordination with Fish and Wildlife Service

(Continued)

Table 6 (Concluded)

Law	Resource or Activity Regulated	Agency Requirement
Endangered Species Act	Threatened and endangered species and habitats	Formal consultation process
Marine Protection, Research and Sanctuaries Act	Disposal of dredged and nondredged material in open water or marine sanctuaries	Compliance with disposal requirements of Corps, Environmental Protection Agency, or National Oceanic and Atmospheric Administration
Coastal Zone Management Act	Planning or construction activities in coastal zones	Consultation with state agencies prior to implementation
Estuary Protection Act	Planning or construction activities (with Congressional authorization) in estuaries	Fish and Wildlife Service review to be incorporated in Congressional authorization reports
Marine Mammal Protection Act	Marine mammals	Consultation with Fish and Wildlife Service and National Marine Fisheries Service
Federal Insecticide, Fungicide, and Rodenticide Act	Pesticide use and disposal	Compliance with state and Federal regulations
Toxic Substances Control Act	Toxic substance use and disposal	EPA notification
Wild and Scenic Rivers Act	Permits for water resource projects on streams in the Wild and Scenic River System	Notification and coordination with Department of Interior and Forest Service

c. Nunnally, Nelson R. 1986. "Bibliography of Environmental Research Related to REMR," Technical Report REMR-EI-2, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

d. Henderson, Jim E., and Peyman-Dove, Linda D. 1988. "Compliance Requirements for Environmental Laws Applicable to REMR Activities," Technical Report REMR-EI-3, US Army Engineer Waterways Experiment Station, Vicksburg, MS.