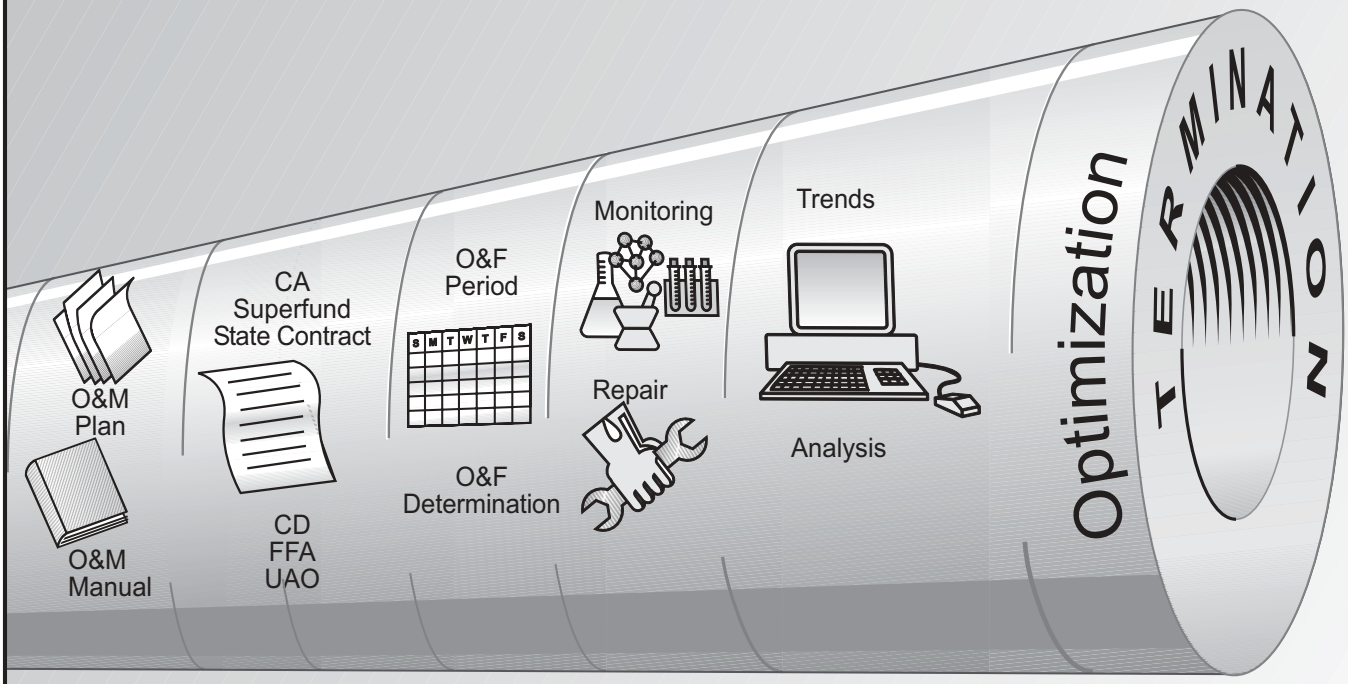
Operation and Maintenance in Superfund
Part 1 Internet Course

Participant Manual



Summer 2004

Abbreviations and Acronym List

AFCEE	Air Force Center for Environmental Excellence
ALR	Action leakage rate
ARAR	Applicable or relevant and appropriate requirements
ATV	All terrain vehicle
ASTSWMO	Association of State and Territorial Solid Waste Management Officials
BTU	British thermal unit
BUREC	U.S. Bureau of Reclamation
CA	Cooperative agreement
CCL	Construction completion list
CD	Consent decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
COPC	Chemical of potential concern
DCE	Dichloroethene
DNAPL	Dense non-aqueous phase liquid
ECOS	Environmental Council of States
EPA	U.S. Environmental Protection Agency
ESD	Explanation of significant differences
FCOR	Final close-out report
FF	Federal facility
FFA	Federal facility agreement
FS	Feasibility study
GAC	Granular activated carbon
gpm	Gallons per minute
H_2S_2	Hydrogen disulfide
HPLC	High performance liquid chromatography
HQ	Headquarters
IAG	Interagency agreement
IC	Institutional control
INSS	Information Network for Superfund Settlements
LR	Long-term response
LTRA	Long-term response action
LTTD	Low temperature thermal desorption
MAROS	Air Force Software Program
MCB	Monochlorobenzene
MCL	Maximum contaminant level
MNA	Monitored natural attenuation

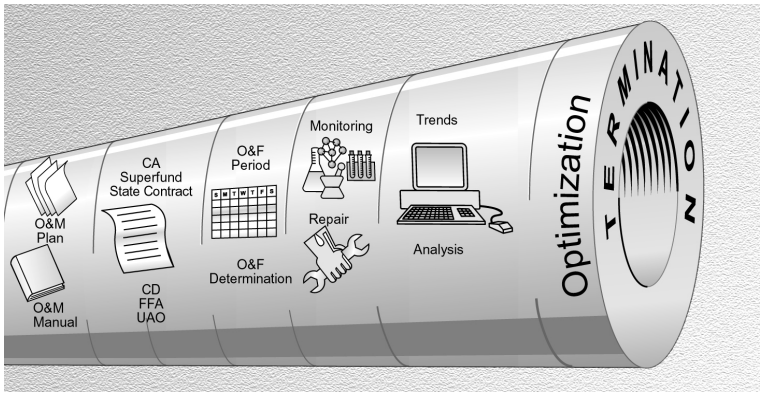
Abbreviations and Acronym List (continued)

NCP	National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan)
NOD	Notice of deletion
NOID	Notice of intent to delete
NOV	Notice of violation
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&F	Operational and functional
O&M	Operation and maintenance
ORC	Office of Regional Counsel
OSC	On-Scene Coordinator
OSRTI	Office of Superfund Remediation and Technology Innovation
OSWER	Office of Solid Waste and Emergency Response
OU	Operable unit
PCB	Polychlorinated biphenyls
PCC	Post-construction completion
PCE	Tetrachloroethene (also known as perchloroethene)
PCOR	Preliminary close-out report
POLREP	Pollution Report
POTW	Publicly-owned treatment works
ppb	Parts per billion
PRP	Potentially responsible party
P&T	Pump and treat
RA	Remedial action
RAO	Remedial action objectives
RCRA	Resource Conservation and Recovery Act
RD	Remedial design
RDX	Cyclotrimethylenetrinitramine
RI	Remedial investigation
ROD	Record of decision
RPM	Remedial project manager
RSE	Remediation system evaluation
RT3D	Groundwater model
SOW	Statement of work
SPIM	Superfund Program Implementation Manual
SSC	State Superfund contract
SVE	Soil vapor extraction
SVOC	Semivolatile organic compound

Abbreviations and Acronym List (continued)

TCE	Trichloroethene (or trichloroethylene)
TCLP	Toxicity characteristic leaching procedure
TI	Technical impracticability
TNT	2,4,6-Trinitrotoluene
TRT	Technical review team
UAO	Unilateral administrative order
USACE	U.S. Army Corps of Engineers
µg/L	Micrograms per liter
VC	Vinyl chloride
VE	Value engineering
VOC	Volatile organic compound

Welcome to EPA's Internet-Based Training *Operation and Maintenance in Superfund – Part 1*



This training is sponsored by EPA's Office of Superfund Remediation and Technology Innovation.

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Notes:

General Logistical Reminders

- Phone Audience
  - » Keep phone on mute
  - » * 6 to mute your phone and again to un-mute
  - » Do NOT put call on hold
- Simulcast Audience
  - » Use  at top of each slide to submit questions
- Links to Additional Resources
- Your Feedback

EPA I-2

Notes:

Specific Course Logistics

- *Operation and Maintenance in Superfund* contains two parts
  - » Part 1 presented on September 20, 2004
  - » Part 2 presented on September 21, 2004
- Slide and page numbering
  - » Slides and pages are numbered sequentially for each module beginning with a letter that identifies the module
  - » Slide and page numbers may not match because some notes are longer than one page
  - » Instructors will refer to the slide number
- Acronyms
  - » A list of acronyms used in the course is located at the beginning of the course materials

EPA I-3

Notes:

Specific Course Logistics (continued)

- Questions and Answers (Q&A)
  - » 3 Q&A sessions, at the end of most modules
  - » Instructors will do their best to address all questions
  - » Telephone audience must wait until the Q&A session to ask questions
  - » Simulcast audience may submit questions at any time to be addressed in Q&A session
- Moderator - Therese Gioia, Tetra Tech EM Inc.
  - » 20 years of experience in all phases of the Superfund program
  - » U.S. EPA Remedial Project Manager from 1984 until 1992
  - » Broad-based experience in training development for EPA Superfund courses

EPA I-4

Notes:

Meet Instructor Tracy Hopkins

- Biography
  - » 15 years of Superfund experience (EPA Headquarters
  - » Works on policy and implementation issues for remedial design, remedial action, and post-construction
  - » Leads an effort to develop a Superfund Post Construction Completion Strategy
  - » Involved in the development and presentation of this O&M course since 1999
  - » 8 years of Navy facilities engineering experience (NAVFAC)
  - » B.E., chemical engineering, Vanderbilt University; M.S., environmental engineering, Stanford University
  - » Professional Engineer, Virginia

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Notes:

Meet Instructor Fran Costanzi

- Biography
  - » Senior EPA Remedial Project Manager
  - » Manages many different types of Superfund sites during all phases of the process
  - » Develops and reviews EPA guidance and policy regarding many different Superfund activities, including RD/RA and post-construction activities
  - » Involved in the development and presentation of this O&M course since 1999

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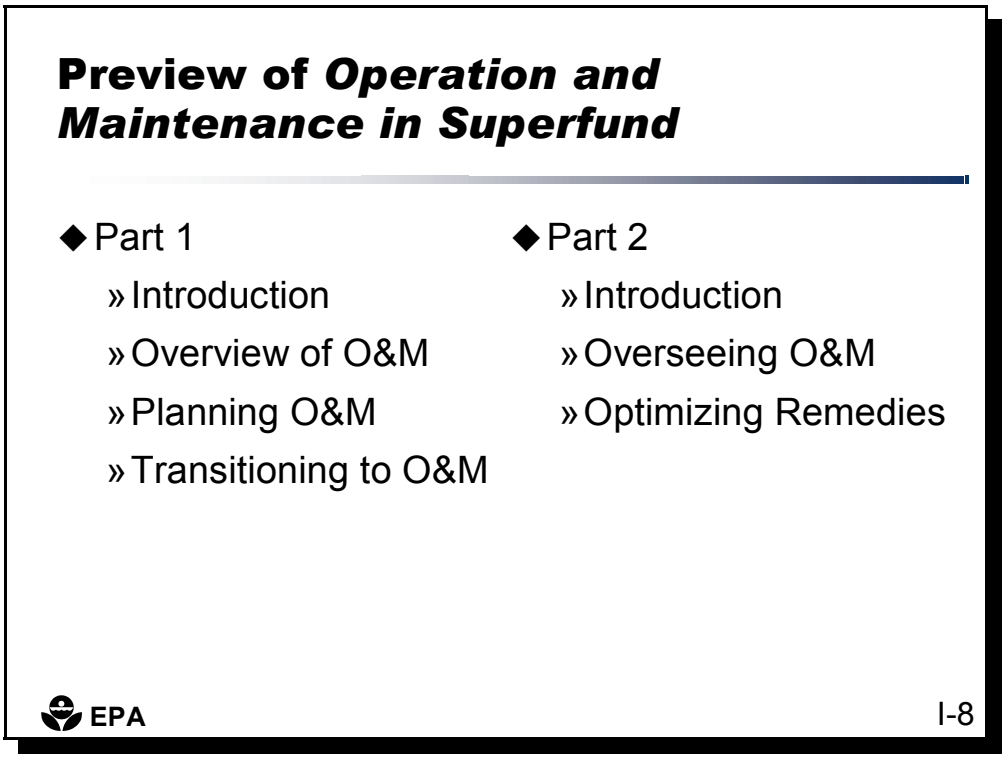
Notes:

Course Background

- 1998 RPM survey identified O&M as an area where additional training was needed
- As a result of the RPM survey, the O&M training was first developed for and presented at EPA's National Association of Remedial Project Managers (NARPM) conference in 1999
- Developed by a team of EPA technical and program experts and Tetra Tech EM Inc. staff
- Revised and updated each year for presentation at the NARPM conference
- Simulcast on the web during the 2002 NARPM conference presentation

EPA I-7

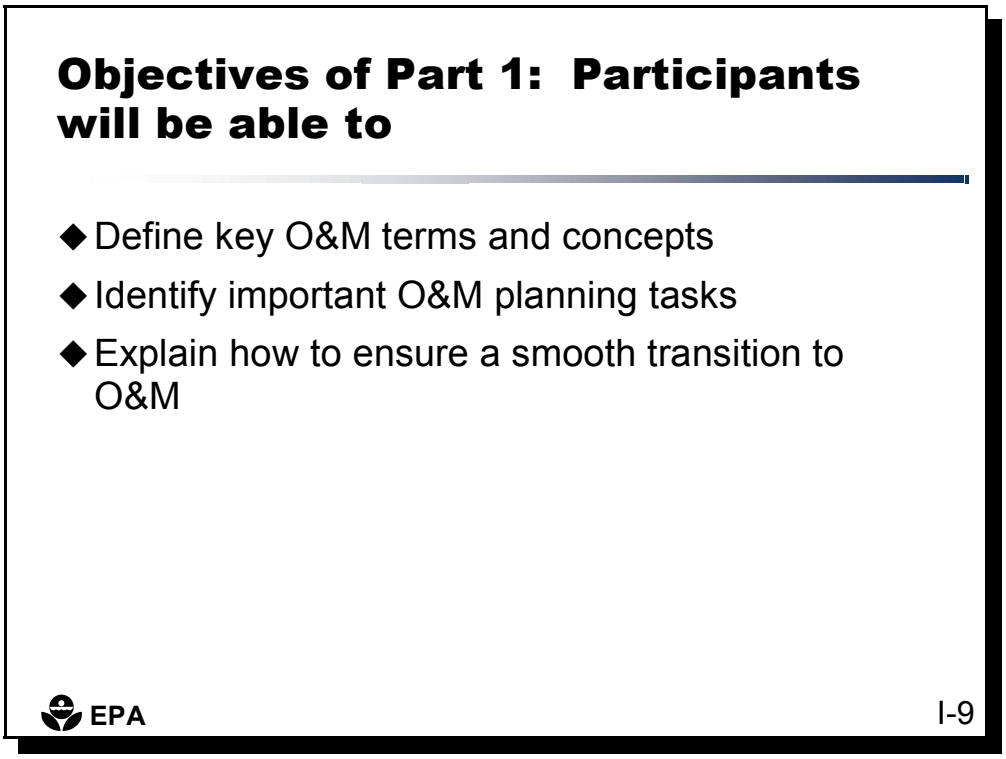
Notes:



Notes:

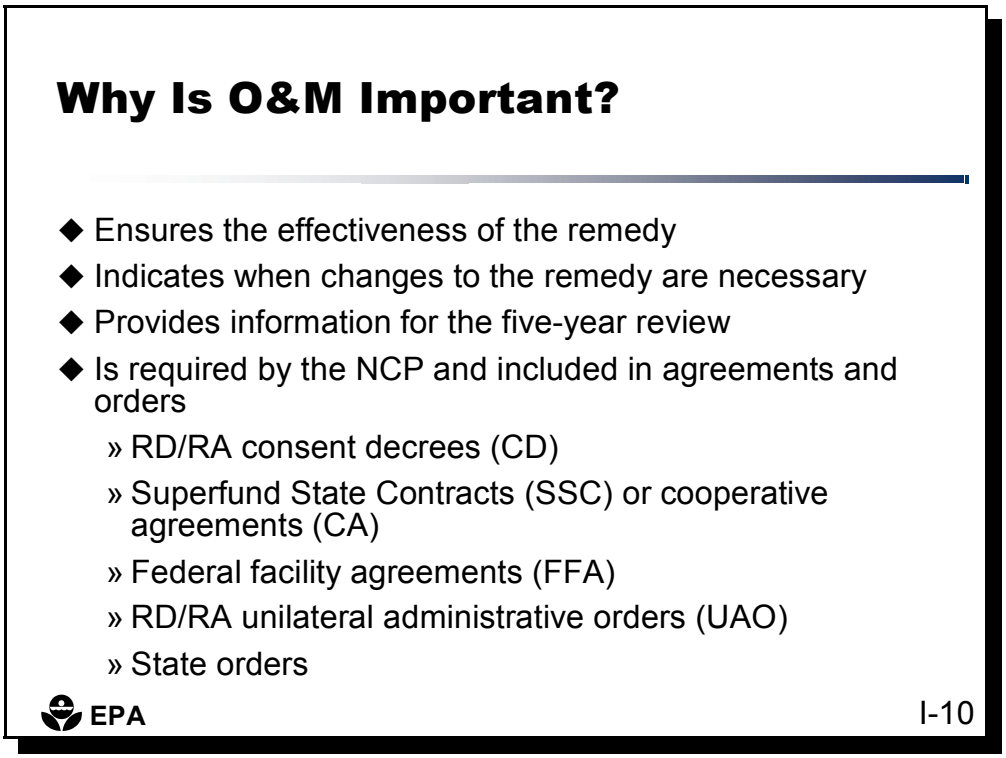
- *Operation and Maintenance in Superfund - Part 1* consists of four modules. The Introduction module reviews the development of this workshop and the importance of O&M. The Overview of O&M module covers important definitions related to O&M. The Planning O&M module addresses important planning steps during the remedial investigation and feasibility study (RI/FS), remedial design (RD), and remedial action (RA). The Transitioning to O&M module examines the important steps and milestones for moving from the remedial action phase to the O&M phase.

- *Operation and Maintenance in Superfund - Part 2* consists of three modules. The Introduction module provides logistical information, reviews the topics covered in Part 1 and previews the topics covered in Part 2. The Overseeing O&M module discusses activities conducted during O&M and examines typical problems that occur during O&M. The Optimizing Remedies module describes various components of remedies that may be able to be optimized.



Note:

- After attending this course, participants will be better able to plan and implement O&M activities. The course reviews the key provisions, terms, and concepts for O&M. The participants will be able to define the key O&M terms and concepts and incorporate them into their understanding of the Superfund process. The course also explains the important planning tasks for O&M. The course explains the purpose of each planning step and each major planning document and stresses the practical issues that need to be addressed while planning O&M. In addition, the course examines issues that arise during the transition from RA to O&M and offers strategies for addressing these issues.



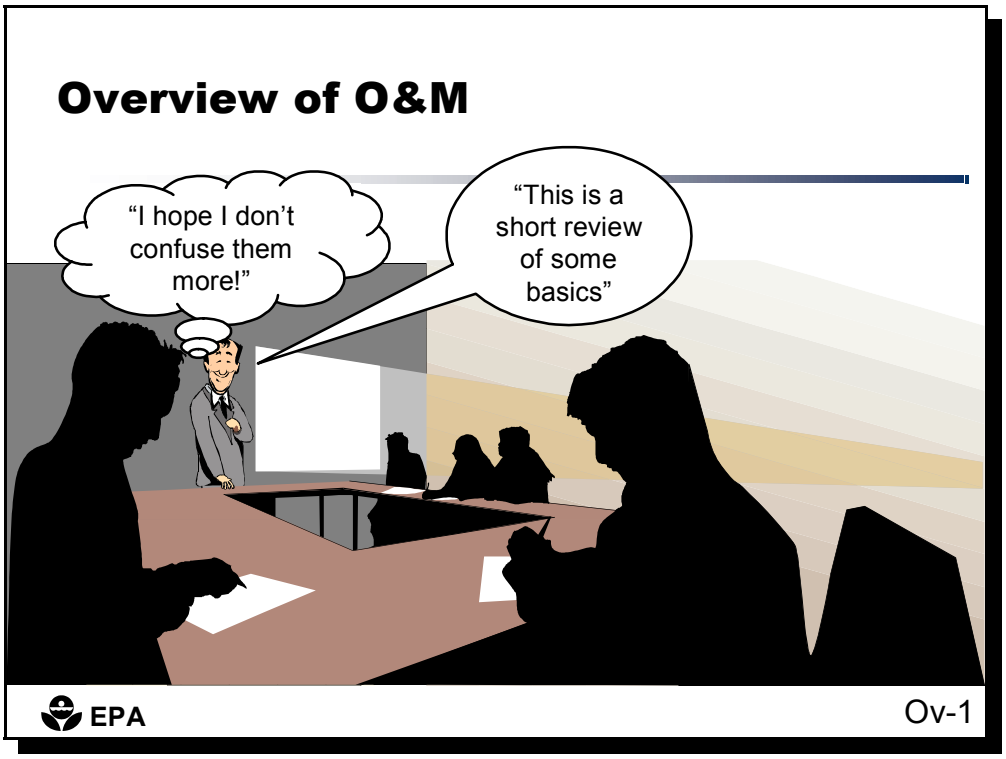
Notes:

- O&M activities are important because they ensure that a remedy remains effective in protecting human health and the environment. A remedy must be operated and maintained properly to be effective. It doesn't matter how well a remedy is constructed if it is not operated and maintained properly. For example, a landfill cap will be less effective if settlement causes ponding of precipitation on the cap. Maintenance and repair of the cap (which are typical O&M activities) will ensure that ponding is avoided or eliminated.

- Data collected as part of O&M activities indicate when changes to a remedy are necessary to ensure its effectiveness. A remedy must be adjusted as new information becomes available and as experience with the remedy is gained. For example, a groundwater extraction system may need to be adjusted (such as changing the well placement and pumping rates) in order to better collect a contaminant plume. Monitoring data generated during O&M are used to determine when such changes may be necessary.

- O&M activities generate the information that EPA needs to conduct the five-year review of the RA. The monitoring and operational data are necessary to ensure the that five-year review requirements are met.

- O&M activities are required by various agreements and orders. RD/RA consent decrees (CD), SSCs or cooperative agreements (CA), Federal facility agreements (FFA), RD/RA unilateral administrative orders (UAO), and State orders all contain enforceable requirements for conducting O&M activities.


Overview of O&M
"I hope I don't confuse them more!"
"This is a short review of some basics"
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Ov-1

Notes:

Preview of Overview of O&M Module

- Review of key definitions and concepts related to O&M
- Review several O&M scenarios

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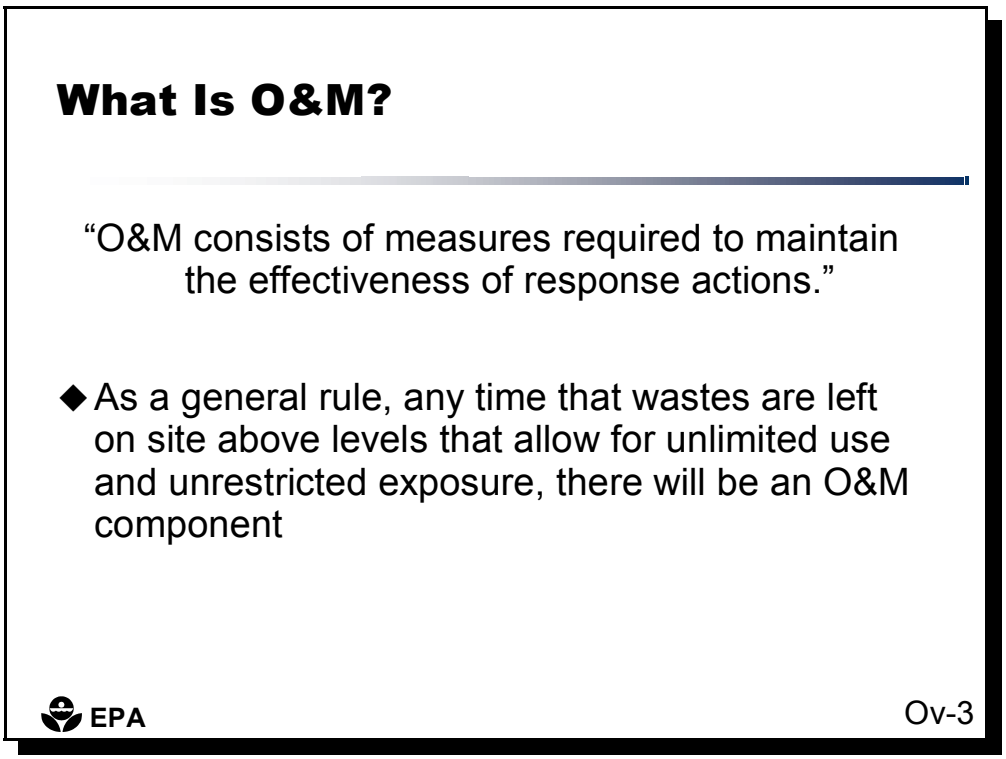
Ov-2

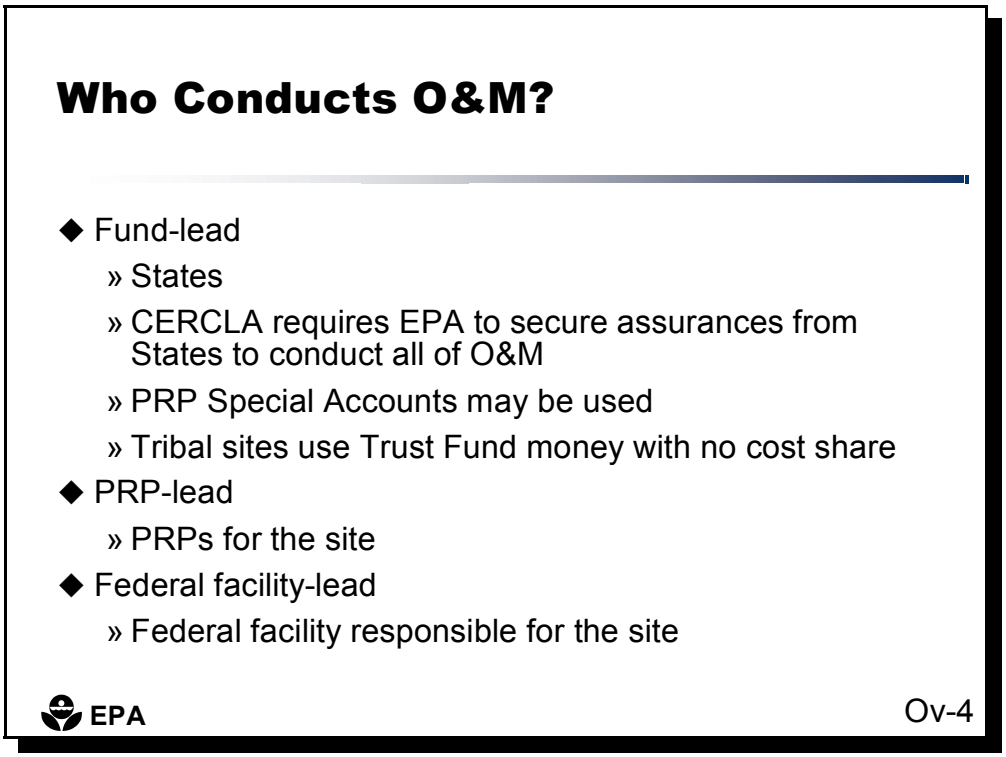
Notes:



Notes:

- Section 300.5 of the National Contingency Plan (NCP) states that O&M consists of "measures required to maintain the effectiveness of response actions."

- EPA's "Superfund Program Implementation Manual" (SPIM) defines O&M in a similar manner. However, the Superfund definition of O&M is more narrow than the engineering and construction definition. Typically, O&M starts immediately after construction and start-up. Superfund, however, has special considerations for Fund-lead groundwater restoration projects.

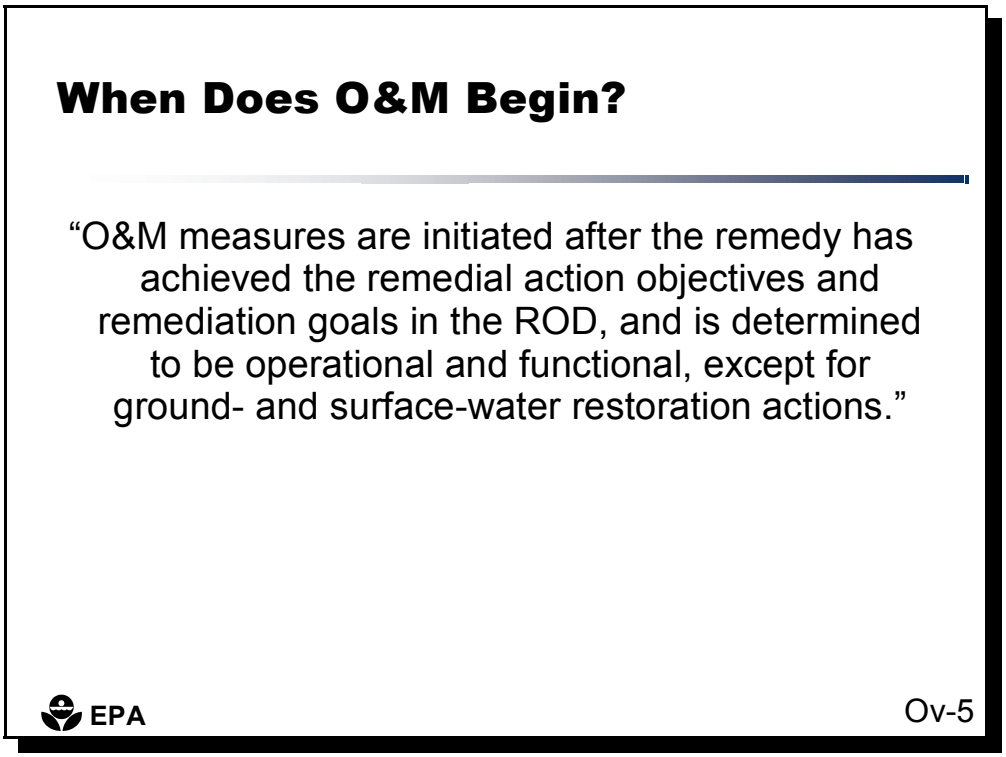


Notes:

- O&M at Fund-lead sites is discussed below:
  - States in which the sites are located are 100 percent responsible for conducting O&M at all fund-lead sites.
  - CERCLA Section 104(c)(3) states that no remedial actions shall be provided unless the State in which the site is located first enters into a contract (Superfund State Contract) or cooperative agreement providing that the State will assure all future maintenance of the action. States must assure that they will provide for all O&M of remedial actions before EPA can provide funds for conducting the remedial actions. CERCLA Section 104(c)(6) provides for EPA to conduct long-term response actions (LTRA) for groundwater and surface water restoration for up to 10 years. The activities conducted during this LTRA period continue to be funded 90 percent by EPA and 10 percent by the State. At the end of the LTRA, the State conducts 100 percent of O&M activities.
  - For sites where the PRPs have set up a Special Account and EPA or the State is using the funds from the special account to conduct site activities, those Special Account funds may be used by EPA or the State to conduct O&M.
  - Sites on tribal lands are handled differently in that the Superfund Trust Fund is used to conduct 100 percent of O&M. Tribal sites are discussed later in this module.

- In general, the PRP or PRPs at a site will be 100 percent responsible for conducting O&M. The enforcement document, such as the Consent Decree, will specify the O&M activities to be conducted and provide EPA with oversight responsibilities.

- Federal facilities conduct all O&M activities for their sites. The FFA should specify the O&M requirements and provide for EPA oversight of O&M activities.



Notes:

- O&M initiation is described in Section 300.435(f)(1) of the NCP. The point at which O&M measures begin and the RA ceases is when remedial action objectives (RAO) and remediation goals in the record of decision (ROD) are achieved and when the remedy is operational and functional (O&F).

  The exception is for groundwater and surface water restoration actions. O&M start dates are signified by different events, depending on the lead for a site.

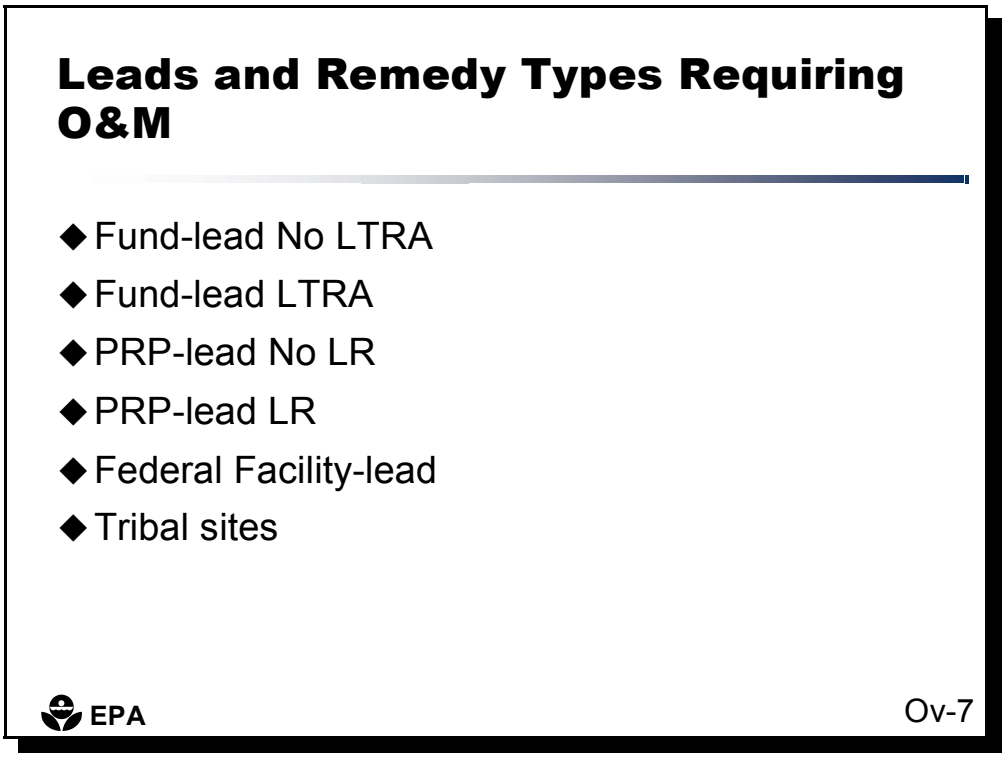
When Does Long-Term Response Action Begin?

"For fund-financed remedial actions involving treatment or other measures to restore ground- or surface-water quality to a level that assures protection of human health and the environment, the operation of such treatment or other measures for a period of up to 10 years after the remedy becomes operational and functional will be considered part of the remedial action."

EPA Ov-6

Notes:

- LTRA initiation is described in Section 300.435(f)(3) of the NCP. LTRA begins when a fund-lead groundwater or surface water restoration remedy becomes operational and functional.
- Under Section 300.435(f)(4) of the NCP, the following actions do not constitute LTRA:
  - Source control maintenance measures, and
  - Ground- or surface-water measures initiated for the primary purpose of providing a drinking-water supply, not for the purpose of restoring groundwater.



Notes:

- Fund-lead remedies that leave waste in place (and that do not include groundwater or surface water restoration) require O&M. These remedies usually include groundwater and source containment. Examples include landfill caps and hydraulic or physical containment of groundwater.

- Fund-financed operation of groundwater and surface water restoration measures, including natural attenuation, for the first ten years of operation is defined as LTRA. Only Fund-lead actions are designated LTRA. The LTRA designation should not be used for potentially responsible party (PRP)- or Federal Facility-lead remedies. Examples include groundwater pump and treat remedies, in-situ groundwater cleanup remedies, and natural attenuation remedies. LTRA does not apply to groundwater or surface water containment; monitoring; measures initiated for the primary purpose of providing drinking water; or any soil cleanup remedies such as bioremediation and soil vapor extraction.

- PRP-lead remedies that leave waste in place (and that do not include groundwater or surface water restoration) require O&M. These remedies usually include groundwater and source containment. Examples include landfill caps and hydraulic or physical containment of groundwater.

- PRP operation of groundwater and surface water restoration measures are designated as long-term response (LR). PRP LR is a specific type of O&M that runs for the period of the restoration and is not subject to the 10 year time frame applicable to fund-lead LTRA. PRP LR does not apply to groundwater or surface water containment; monitoring; measures initiated for the primary purpose of providing drinking water; or any soil cleanup remedies such as bioremediation and soil vapor extraction.

- Federal facilities do not use long-term response action terminology or definitions. Federal Facility-lead remedies that leave waste in place, and groundwater and surface water restoration measures go from RA completion directly to O&M.

- Tribes are governed under Section 126 of CERCLA – 'The governing body of an Indian Tribe shall be afforded substantially the same treatment as a State with respect to provisions of 103(a) (regarding notification of releases), 104(c)(2) (regarding consultation on remedial action), 104(e) (regarding access to information), 104(i) (regarding health authorities) and 105 (regarding roles and responsibilities under NCP and priorities for remedial action, but not including the provision regarding the inclusion of at least one facility per State on the NPL.)'

- Assurances Required of Indian Tribes:

  Section 104(c)(3) **Cost Share and O&M and Off-Site Storage, Treatment or Disposal** – "In the case of remedial action to be taken on land or water held by an Indian tribe, held by the U.S. in trust for Indians, held by a member of an Indian tribe (if such land or water is subject to a trust restriction on alienation), or otherwise with the border of an Indian reservation, the requirements of this paragraph for assurances regarding future maintenance and cost-sharing shall not apply, and the President shall provide the assurance required by this paragraph regarding the availability of hazardous waste disposal facility.

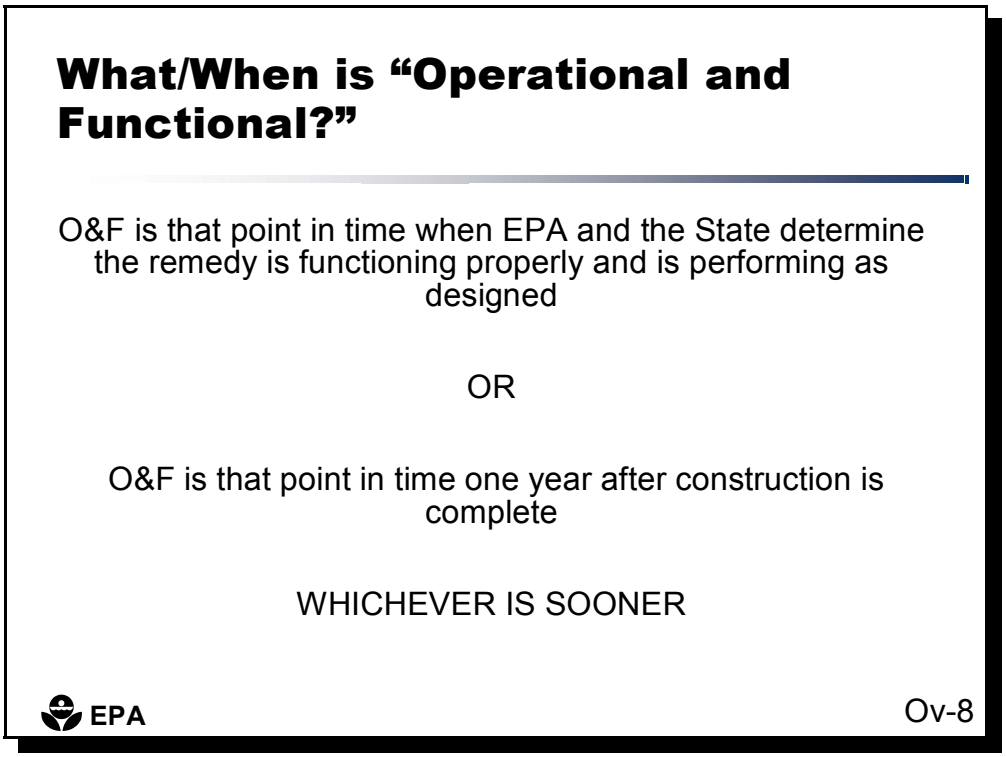
  Section 104(c)(8) **Twenty-Year Waste Capacity** – No direct Indian tribal reference in the law (by omission in Section 126, Tribes are not the same as States for this provision.) Both Subpart O and the NCP (Subpart F, Section 300.510(e)(2) specifically do not address whether or not Indian tribes are states for purposes of this paragraph.

  Section 104(j) **Real Property Acquisition** – No direct Indian tribal reference in the law (by omission in Section 126, Tribes are not the same as States for this provision.) However, Subpart O regulation states: (Section 35.6110(2)) "If EPA determines as part of the remedy selection process that an interest in real property must be acquired in order to conduct the site-specific response action, the Indian Tribe will be required, to the extent of its legal authority, to assure EPA that it will take title to, acquire interest in, or accept transfer of such interest in real property acquired with CERCLA funds, including any interest in property that is acquired to ensure the reliability of institutional controls restricting the use of that property."

Other interesting aspects of working with Indian Tribes:

1. **Tribal Consortia** Several bands of tribes have joined together and given certain authorities to a central governing body called a consortia. This includes the Pueblo Indians of New Mexico, the Cherokee nation (and other Indian Tribes) in Oklahoma, and the Alaskan Native Americans in Alaska, among others. In 1999, EPA issued a notice in the Federal Register that the Agency would consider duly authorized consortia to receive funding as a Tribe. This notice applies to all EPA grant programs, not simply Superfund.

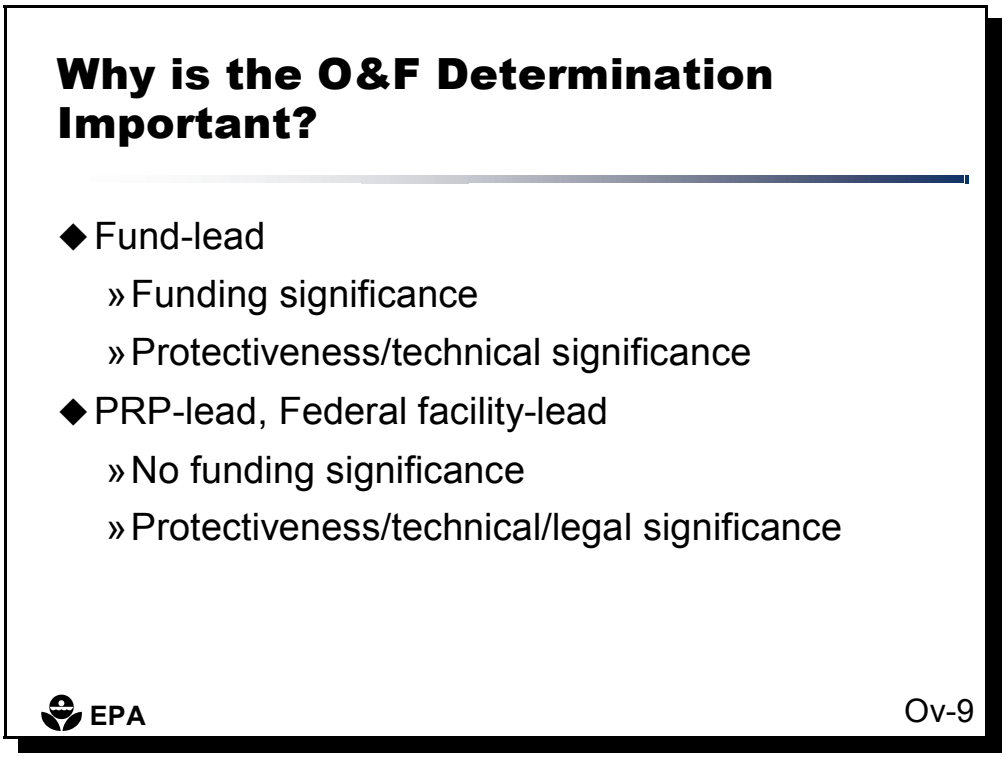
2. **Core Program Cost Share** The Core program, which funds program management and capability building requires a cost share of 10%. Indian Tribes are not exempt from this cost share.



Notes:

- Section 300.435(f)(2) of the NCP explains when a remedy becomes O&F. The determination that a remedy is O&F should either be when EPA and the State determine the remedy is functioning properly and is performing as designed or, one year after construction of the remedy is complete, whichever is sooner. Under normal circumstances, the O&F determination should be made not more than one year after construction completion and in many cases, sooner. As appropriate, EPA may grant extensions to the 1-year period in writing.

- The period between RA construction completion and the O&F determination is often called the "shakedown period." During the shakedown period, the remedial action components are adjusted, as necessary, so that the remedial action is functioning properly and performing as designed. The objective of the shakedown period is to be able to make the O&F determination. The elements necessary for making the O&F determination should be specified in the SSC or enforcement document and are called O&F factors. O&F factors are discussed in more detail later in the Planning O&M module.



Notes:

- The O&F determination is important for fund-lead sites that do not involve LTRA because the source of funding for site activities shifts from 90% EPA and 10% State to 100% State. In addition, the O&F determination has significance from a protectiveness and technical point of view. It indicates that the remedy is functioning properly and operating as designed. The O&F determination is important for fund-lead LTRA sites because it starts the LTRA period. The LTRA period can be up to 10 years long but may be shorter. During the LTRA period, EPA funds 90% of the activities and the State funds 10%. At the end of the LTRA period, the State becomes 100 % responsible for O&M activities. In addition, the O&F determination has significance from a protectiveness and technical point of view.

- The O&F determination has no funding significance for PRP sites with no LR, PRP sites with LR, and Federal facilities because there is no change in the entity funding the site activities. However, the O&F determination is a major protectiveness and technical milestone and may also have legal ramifications depending on how this milestone is addressed in the enforcement agreements for the individual sites.

O&M Start Dates for Fund-lead No LTRA

- Groundwater and source containment with ICs
  - » Date remedy is determined to be O&F
- Source and soil cleanup for industrial use with ICs
  - » Date remedy is determined to be O&F
- Source and soil cleanup with no ICs
  - » No O&M start, O&M never occurs

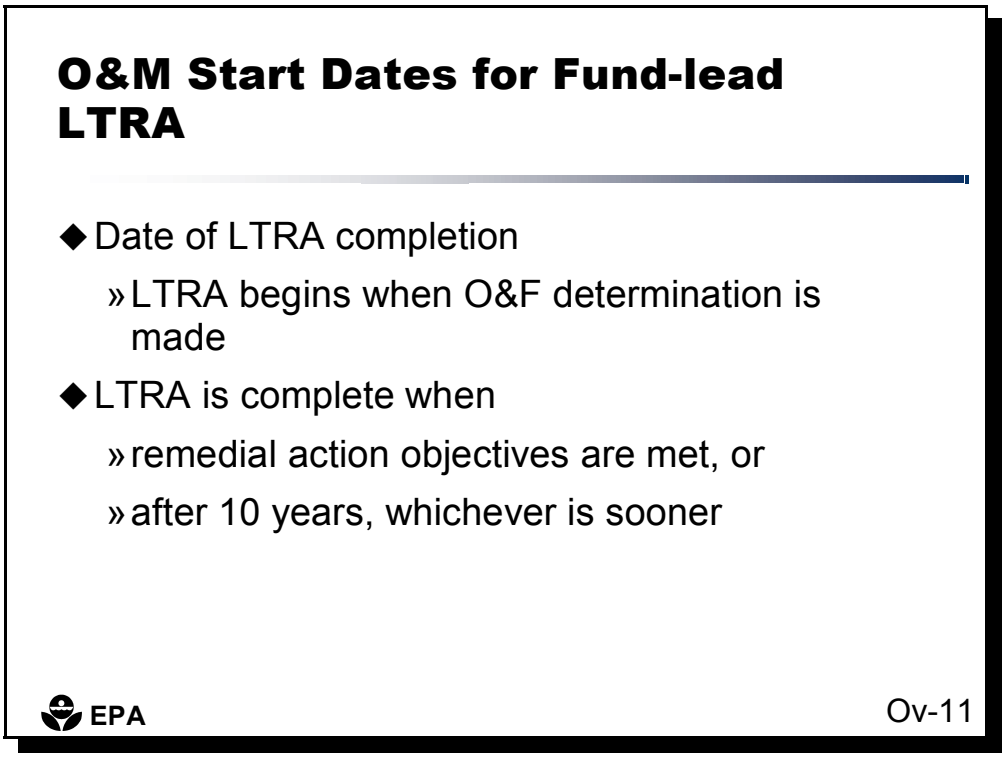
EPA Ov-10

Notes:

- Groundwater containment remedies using either hydraulic or physical containment and all source containment remedies, such as landfills, require institutional controls and O&M. O&M starts when the remedy is determined to be O&F, as documented in the Final RA Report and in a letter to the interested parties. The O&F determination should occur no later than one year after RA construction is complete, or sooner. At this point, all remedy activities should be transferred to the State.

- Remedial actions that involve source and soil cleanup but require institutional controls, such as cleanup to industrial use standards, also require O&M. The O&M may be as simple as monitoring and ensuring ICs remain in place. O&M starts when the remedy is determined to be O&F, as documented in the Final RA Report. The O&F determination should be made as soon as the ICs are in place and could closely coincide with completion of construction. At this point, all site activities should be transferred to the State.

- O&M is not necessary for remedial actions that achieve a level of cleanup that does not require any institutional controls, but rather provides for unrestricted future use. This may include remedial actions that take several years to achieve the cleanup standards, such as those using bioremediation or soil vapor extraction. Although O&M-like activities occur during the intervening years until cleanup levels are achieved, these activities are considered part of the remedial action.



Notes:

- For groundwater and surface water restoration sites, O&M starts the date that LTRA is complete. The LTRA period begins when the remedy is O&F. The O&F milestone is documented in the Interim RA Report and in a letter to the interested parties. Groundwater restoration remedies are the most common type of LTRA and may include extraction and treatment or in-situ treatment remedies.

- LTRA is complete when the remedial action objectives established in the ROD are achieved or after 10 years, whichever is sooner. At this point, all remedy activities should be transferred to the State.

O&M Start Dates for All PRP-lead and Federal Facility-lead Remedies Requiring O&M, Including PRP LR

- Groundwater and source containment with ICs
  - » Date Final RA Report is approved by Regional Official
- Groundwater or surface water restoration
  - » Date Interim RA Report is approved by Regional Official
- Source and soil cleanup for industrial use with ICs
  - » Date Final RA Report is approved by Regional Official
- Source and soil cleanup with no ICs
  - » No O&M start date, O&M never occurs

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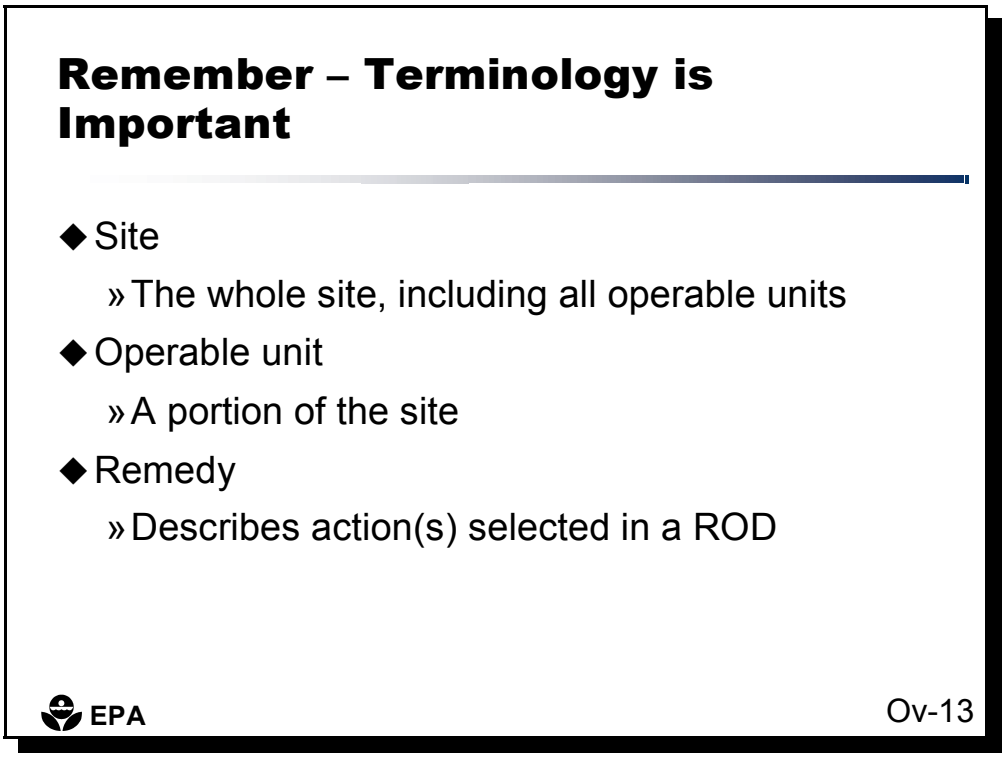
Notes:

- For all PRP-lead remedies that require O&M, including those that are PRP LR, and for all Federal Facility-lead remedies that require O&M, the start for O&M is the date the designated Regional official approves the Final or Interim RA Report.

- For source and soil cleanup remedies that allow for unrestricted use in the future, O&M is not required.



Notes:

- The term "site" means the whole site, including all operable units. Some important completion milestones are only applicable to the site as a whole not to individual operable units, such as construction completion, Preliminary Closeout Report (PCOR), and Final Closeout Report (FCOR).

- The term operable unit means a portion of a site, either a medium or a geographic area. It is not interchangeable with the term "site." Some completion milestones are only important to operable units for a site, such as interim or final RA reports.

- The term "remedy" refers to a specific set of actions described in a record of decision (ROD). A remedy can address the whole site or an operable unit.

Scenario 1: When Does O&M Begin?

You are working on a site involving cleanup of soil to achieve levels that allow industrial use. The cleanup will take 2 years to complete. The site is likely to be developed into a parking structure.

What O&M activities will be necessary?

When does O&M begin exactly if this is a PRP-lead site?

When does O&M begin exactly if this is a Fund-lead site?

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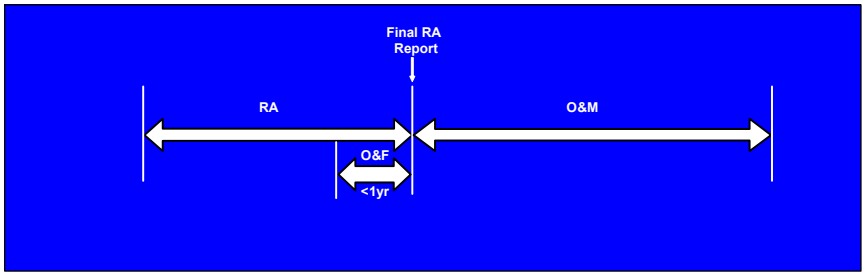
Ov-14

Notes:

Fund-Lead Containment Remedies Pipeline



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Notes:

Scenario 2: When Does O&M Begin?

Your fund-lead site has a groundwater restoration remedy. Based on groundwater data, restoration should be achieved in 15-20 years.

When does O&M begin?

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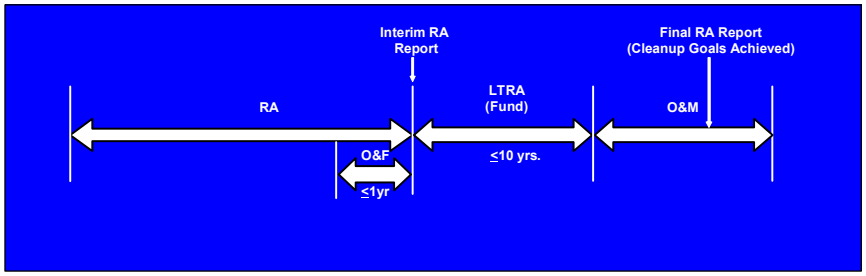
Notes:

Fund-Lead Groundwater and Surface Water Restoration Pipeline



EPA

Ov-17

Notes:

Scenario 3: When Does O&M Begin?

Your site is undergoing a soil cleanup that will take 7 years. The cleanup involves soil vapor extraction and bioventing to achieve cleanup levels that will allow unrestricted use of the site. During the 7-year period, the remedy must be operated, monitored, and maintained. Six months after startup, the remedy is considered to be operating as designed.

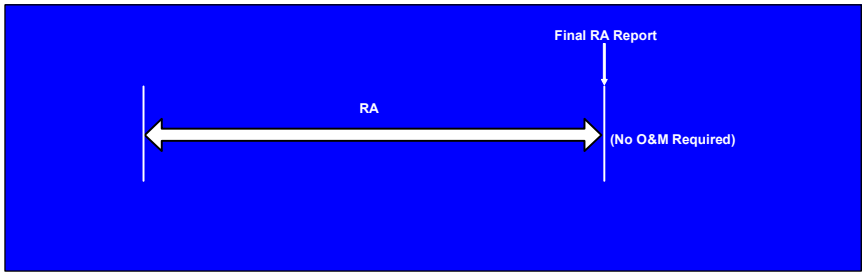
When does O&M begin?

EPA

Ov-18

Notes:

Treatment and Off-site Disposal Remedies Pipeline for All Leads



EPA

Ov-19

Notes:

Scenario 4: When Does O&M Begin?

Your site is a Federal Facility with many different operable units (OU). At one OU, a groundwater pump-and-treat system was installed and the system was started. EPA and the Federal agency agreed to a 1-year "shakedown" period. Two months into the shakedown period, data indicates that significant changes are required to the pumping rates and to the treatment components. The Federal Facility submitted a draft interim RA report one month after start up.

When does O&M begin?

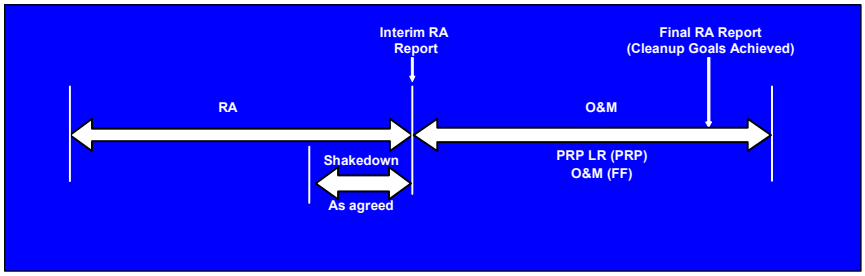
What should be done with the draft interim RA report?

EPA

Ov-20

Notes:

PRP- or Federal Facility-Lead Groundwater or Surface Water Restoration Pipeline



EPA

Ov-21

Notes:

Questions and Answers

EPA

Ov-22

Notes:

Planning O&M

• See Appendix 1 for additional information about planning O&M

EPA

P-1

Notes:

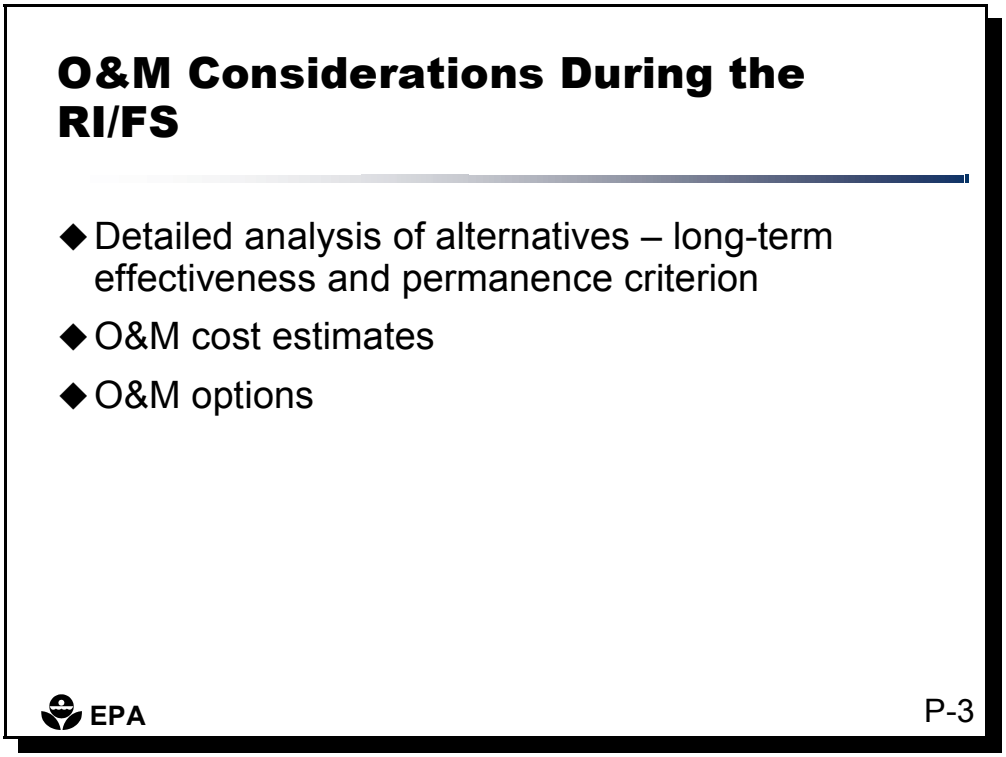
Preview of Planning O&M Module

- Review O&M considerations during RI/FS, RD, and RA
- Review O&M considerations for a specific remedy
- Review SSC/CA function and O&F determination
- Review O&F considerations for a specific remedy

EPA

P-2

Notes:

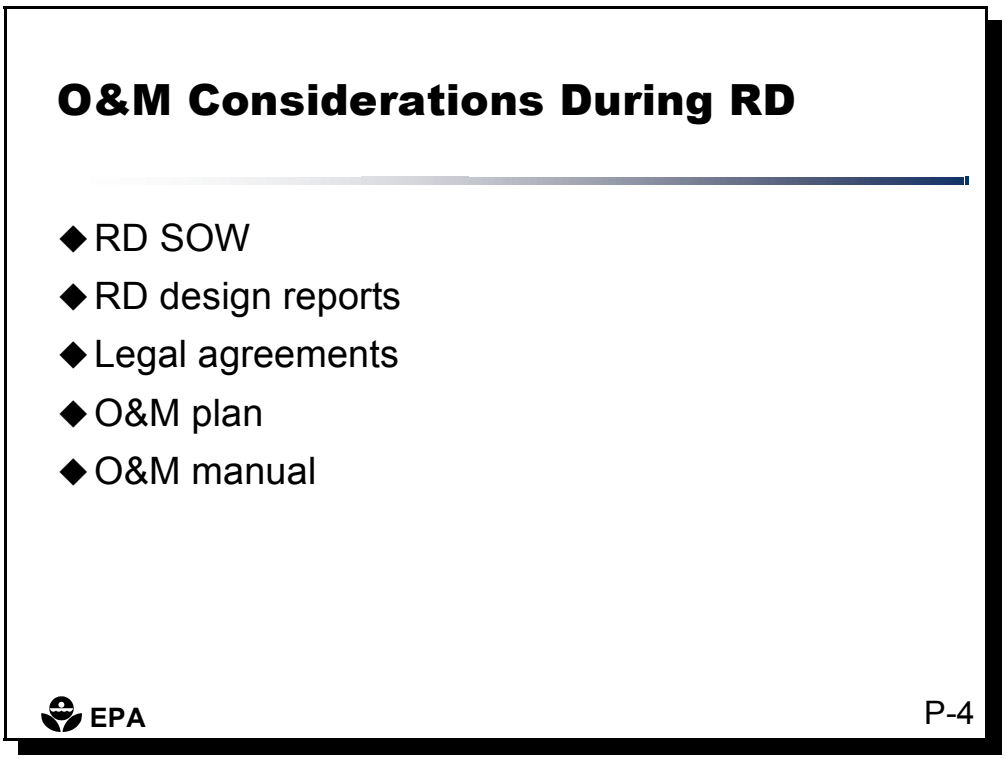


Notes:

- O&M requirements for each alternative in the detailed analysis should be as specific as possible. The O&M requirements should be thoroughly evaluated as part of the long-term effectiveness and permanence criterion. The degree of O&M required should be a consideration when evaluating alternatives. For sites with groundwater issues, the RI/FS should include multiple rounds of groundwater sampling in order to set the stage for O&M.

- All O&M activities should be included in the cost estimates for the remedial alternatives. The O&M costs are first considered during the FS. A combination of capital and O&M costs are considered when evaluating alternatives. EPA's remedy cost estimating guidance "A Guide to Developing and Documenting Cost Estimates" encourages the use of realistic remediation time frames rather than assuming O&M continues for 30 years.

- For fund-lead sites, review of various O&M options for the alternatives should be thoroughly reviewed with State officials. The State must ultimately agree to conduct O&M and therefore, during the FS (OSWER 9355.0-75 July 2000), the State must have a good understanding of the general O&M requirements.



Notes:

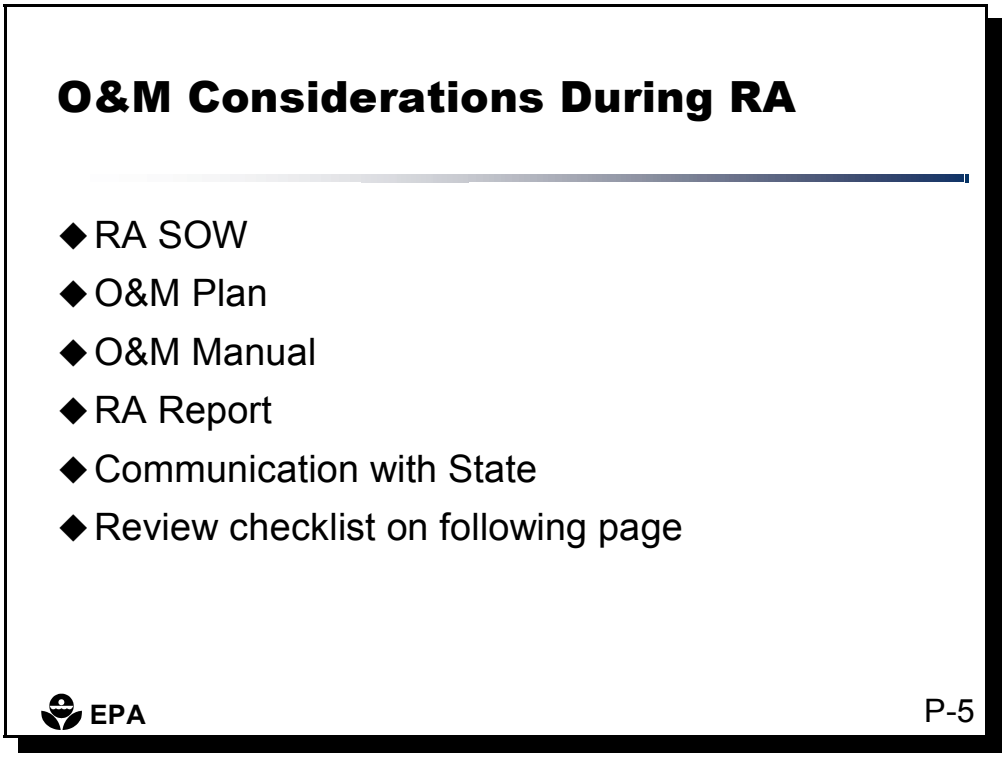
- The SOW should address how O&M requirements are to be planned and costed. The RD SOW should require all design reports to address O&M of the remedy.

- Several different types of design reports are required at various stages of the design process. O&M should be adequately addressed in each of these reports. As with design of the remedy, O&M is addressed with increasing detail and accuracy as the design proceeds.

- Legal agreements, such as SSC/CA, FFA, CD, or UAO should address O&M. The RPM is responsible for understanding and ensuring compliance with the terms of the legal agreement that addresses O&M.

- The O&M plan should be developed and finalized during design. The O&M plan may be revised during the RA, if necessary.

- The O&M manual should be in draft form when the design is finalized.



Notes:

- For Fund-lead sites, O&M requirements must be addressed in the RA SOW. It is especially appropriate to provide O&M training to the State during the transition to O&M. O&M training should be part of the RA schedule.

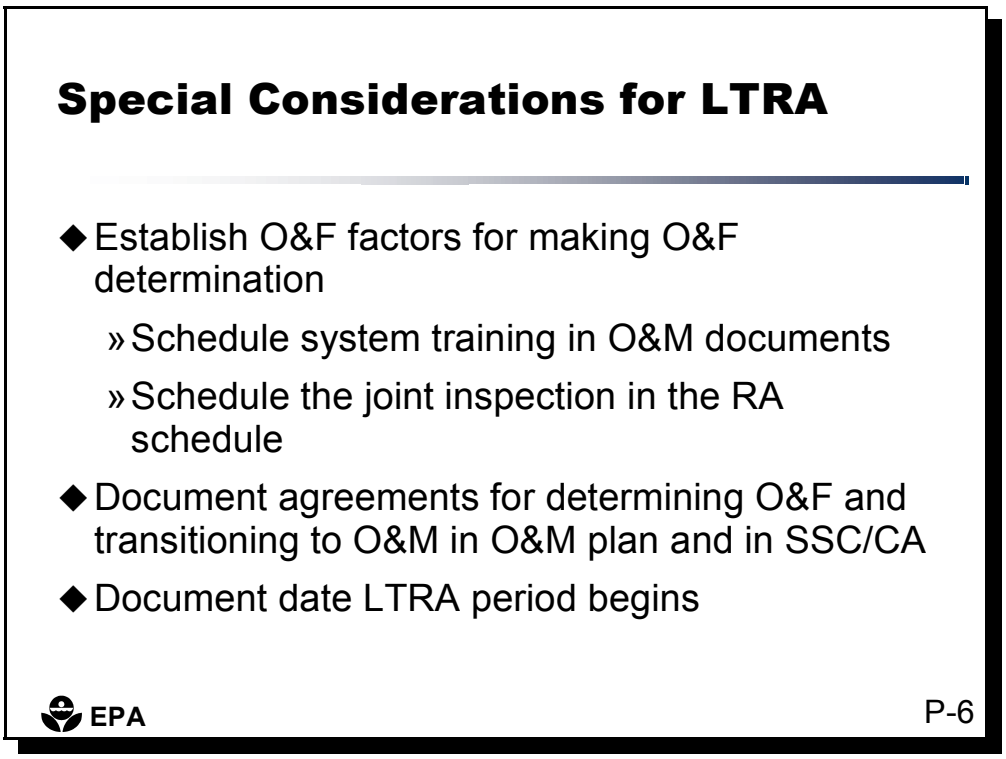
- The RA SOW for Fund-lead remedies should address the use of construction and service contracts in order to use proper wage rates. Service contracts are appropriate for O&M activities and use less expensive wage rates. Construction contracts use more expensive Davis-Bacon Act wage rates.

- The O&M manual is finalized based on actual operational experience obtained during the shakedown or O&F period and the specific equipment being used. The final O&M manual must be in place when the site transitions to O&M or LTRA for fund-lead sites.

- The RA report is prepared at the completion of construction activities for each operable unit by the entity most familiar with the construction. The RA report should discuss O&M requirements.

- For fund-lead sites, the RPM must communicate with the State about O&M requirements and any changes that are deemed necessary based on the shakedown period. Communication is necessary in order to ensure a smooth transition to O&M.

Checklist of O&M Considerations During a Superfund Project	
Project Phase	**O&M Considerations**
RI/FS	“ Specify O&M activities for each screened alternative requiring O&M “ Estimate the costs for all O&M activities “ For a fund-lead site, review O&M options with State officials
RD	“ Ensure that the RD SOW addresses O&M “ Consult with the State to develop an O&M plan for the selected remedy “ Ensure that the draft O&M manual is sufficiently detailed “ Perform an operability review (assistance is available from USACE or contractors) “ Ensure SSC/CA for fund-lead sites; CD, UAO, or State order for PRP-lead sites; or FFA for Federal facilities includes language on O&M responsibilities “ Review RA and O&M cost estimates
RA	“ Ensure that the RA statement of work and design specifications require training of O&M staff before site turn over “ Update O&M plan “ Coordinate review and finalization of the O&M manual with the State “ Draft the RA report at the completion of construction including a section on required O&M activities “ Coordinate the smooth transition to O&M through good communications with State officials – Fund-lead only
At RA Completion	“ Conduct joint EPA/State inspection “ Execute EPA and State joint memorandum documenting the date of the inspection and commencement of the O&F period “ Notify State by letter of impending O&F period deadline “ Make O&F determination
O&M, LTRA, or LR Period	“ Conduct periodic site inspections “ Conduct ongoing monitoring/review of O&M reports “ Optimize O&M “ Conduct five year reviews

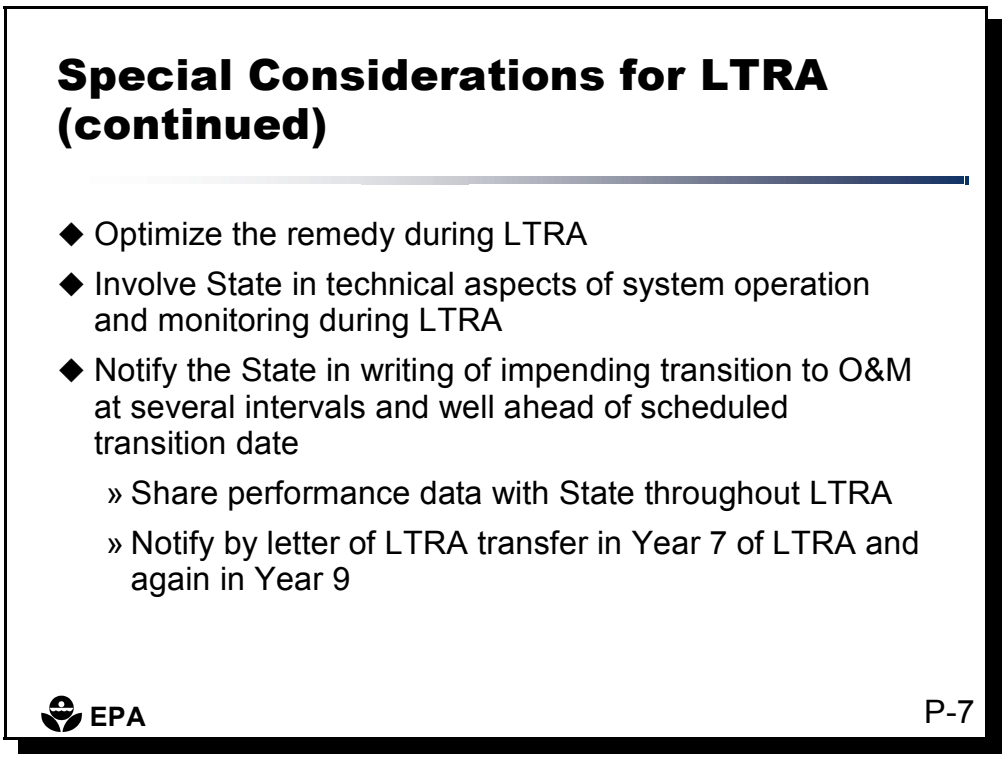


Notes:

- EPA has developed guidance to assist RPMs in transferring LTRA to States, entitled "Transfer of Long-Term Response Action (LTRA) Projects to States: Fact Sheet," April 2003, OSWER Directive No. 9355.7-08FS. Planning ahead for transfer from LTRA to O&M should start during RD. Early preparation helps to clarify State financial and performance commitments. The O&M Plan developed during RD should define administrative, financial, and technical details and requirements for inspecting, operating, and maintaining various components of the remedy. The State should be involved in the development of the O&M Plan. The factors that will be used to determine if the remedy is O&F should also be specified and agreed upon.

- The SSC/CA (which includes the O&M Plan) should clearly document the State's assurance to conduct O&M and how O&F will be determined. O&F is documented in the Interim RA Report and in a letter to the interested parties.

- The date of approval of the Interim RA Report is the date that the LTRA period begins. For sites where the O&F date was not entered into WasteLan, the RPM should review the site files and establish the O&F completion date. The State should be notified, in writing, of both the O&F completion date, LTRA start date, and the date when the LTRA will transition to O&M.



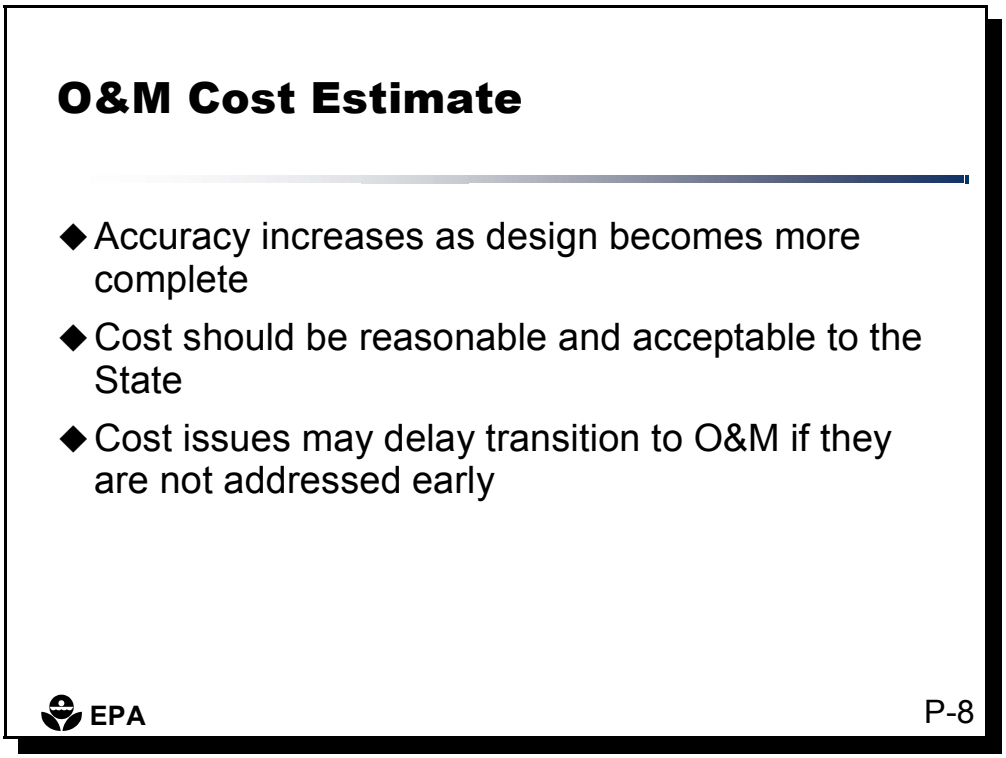
Notes:

- EPA intends to transfer to States groundwater or surface water restoration systems that are operating effectively and efficiently. Optimization reviews by an independent party are an important tool used to evaluate operating systems. In general, optimization reviews to verify remedy effectiveness and identify opportunities for cost savings should be conducted early in the LTRA period. If an optimization review is not conducted within the first few years of system operation, RPMs are encouraged to conduct the review and implement recommendations prior to transferring an LTRA project to the State.

- EPA should continue to involve the State in technical decisions regarding operation of the system during LTRA and resolve any issues. The State should have a complete technical understanding of the operation of the remedy and the activities that need to be conducted during O&M.

- RPMs should notify the State in writing several years before transfer from LTRA to O&M is scheduled to ensure the State takes all necessary actions to conduct O&M.

Checklist of LTRA Considerations During a Superfund Project	
Project Phase	**LTRA Considerations**
Remedial Design	“ Ensure that the RD statement of work includes development of an O&M Plan for LTRA; “ Consult with the State to develop an O&M Plan for the selected remedy; and “ Ensure signed SSC/CA includes language on the process for determining O&F date, EPA and State obligations, and disposition of real property.
Remedial Action	“ Ensure that the RA statement of work and design specifications require training of O&M staff before the remedy is turned over; “ Update O&M Plan; “ Coordinate review and finalization of the O&M Manual with the State; “ Draft the Interim RA Report at the completion of construction, including section on required O&M activities; “ Encourage State officials to visit site during construction; “ Conduct joint EPA/State inspection at completion of remedy construction; and “ EPA and State make an O&F determination and document it in the Interim RA Report as well as in a letter to the State.
O&F through Year 6 of LTRA Period	“ EPA (or State) operates system, makes adjustments, repairs, replacements, as appropriate; “ Conduct a five-year review, consistent with the schedule for the site; “ Consider an optimization review to ensure effective and efficient operation; and, “ Strengthen communication with State (e.g., share performance and monitoring data, results of performance reviews, etc.).
Year 7 of LTRA	“ EPA initially notifies State by letter of date of LTRA transfer; and “ State should initiate funding requests for continued O&M after LTRA is complete.
Year 8 of LTRA (PLANNING AND PERFORMANCE REVIEWS)	“ Revise O&M Plan as appropriate; “ Continue to share cost and performance data and other technical data with State; “ Review property transfer and site access requirements; “ State begins staffing activities for O&M (e.g., hiring initiatives, procurement strategy and time line for contract support); “ Identify equipment for repair/replacement; and “ Consider an optimization review, if not previously performed.
Year 9 of LTRA (IMPLEMENT SYSTEM CHANGES)	“ EPA notifies State again by letter of date of anticipated transfer from LTRA to O&M so State can have ample time for budgeting O&M costs, agree on schedule and milestones; “ Design/construct revisions to system, as required; “ EPA (or State) operates system; “ Revise all manuals, sampling plans, and monitoring plans; “ Conduct second five-year review, consistent with the schedule for the site; and “ Prepare to transfer permits, warranties, certificates of occupancy, deeds, and other agreements.
Year 10 of LTRA (COMPLETE TRANSFER)	“ State completes arrangements for conducting O&M services; “ State personnel or contractor should observe operations and receive training on the treatment system; “ Complete all transfer documents/arrangements; and “ EPA sends final letter confirming transfer date and schedule for any remaining actions.
O&M Period	“ State assumes responsibility for conducting O&M; “ State provides progress reports to EPA as agreed; “ State (or EPA) conducts subsequent five-year reviews; “ State and EPA determine when cleanup goals have been achieved; and “ State or EPA prepares final RA Report.



Notes:

- The accuracy of the O&M cost estimate should increase as the design becomes more complete. When the design effort begins, the overall cost estimate has an accuracy of about +50 to -30 percent. When the design is final, the overall cost estimate, including the O&M cost estimate, should have an accuracy of about +15 to -5 percent. For non-LTRA fund-lead sites, the O&M costs are those incurred after RAOs are achieved and the remedy is deemed O&F. For PRP- and Federal facility-lead sites, the O&M costs are those incurred after the RA is complete or after the O&M start date specified in the controlling enforcement documents.

- For fund-lead sites, the RPM should ensure that a reasonable balance exists between initial capital and O&M costs. The O&M costs and the estimated length of time for O&M should be as accurate as possible to facilitate agreement on the SSC. The RPM should make sure that the State reviews and understands the O&M costs throughout the RD. For PRP- and Federal facility-lead sites, the RPM should ensure that the O&M cost estimate reflects the particular O&M requirements for the RA.

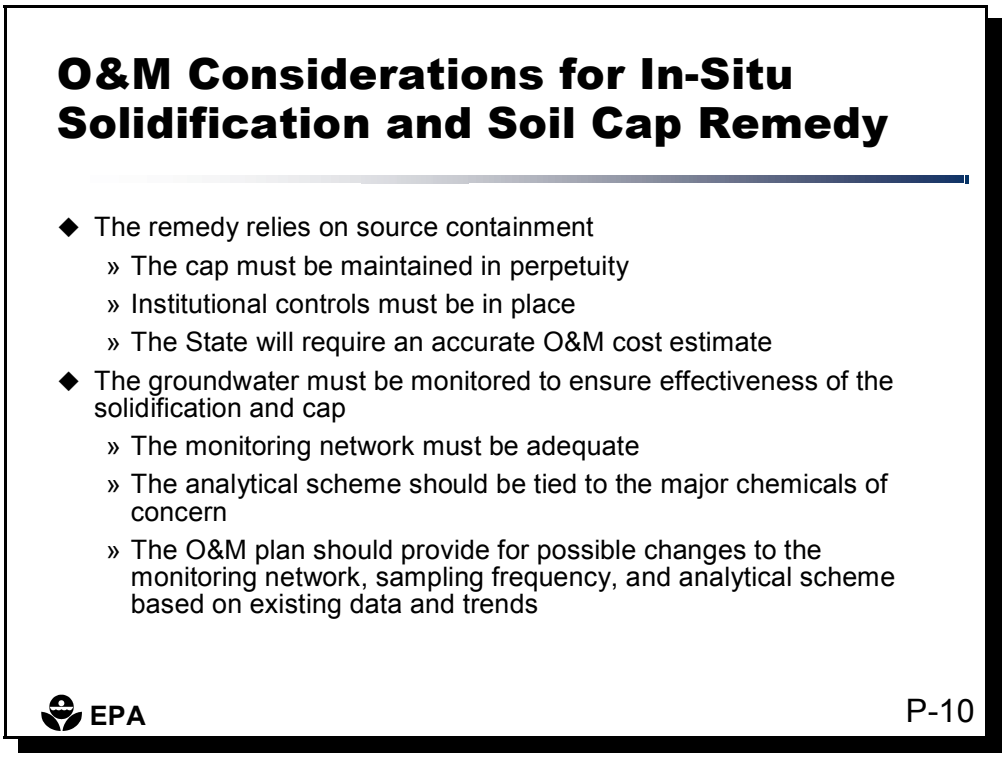
- The O&M cost estimate is critical for a fund-lead site. The State must agree to fund 100 percent of the O&M and will need an accurate estimate before signing the SSC. The O&M cost estimate also may be important for a PRP-lead site where allocation of costs is an issue. The RPM must ensure that all parties review and understand the O&M costs and must address issues associated with O&M costs as they arise.

O&M Considerations for In-Situ Solidification and Soil Cap Remedy – Remedy Components

- In-situ solidification of 3-acre source using soil mixing with fly ash
- Capping of solidified material with compacted soil of low permeability
- Groundwater monitoring to detect if leaching of contaminants from solidified material occurs

EPA P-9

Notes:



Notes:

- This remedy relies on containment for the source material. The containment must be maintained forever. The State will require accurate O&M costs estimates before agreeing to this type of remedy. EPA must establish an adequate groundwater monitoring network for this containment remedy. The groundwater monitoring network must be adequate to detect contaminant leaching but not so extensive that groundwater monitoring costs are exorbitant. The analytical scheme should be carefully considered to include only those contaminants that may leach from the source material. The O&M plan should provide for the possibility of changing the groundwater monitoring scheme (such as analytical requirements, sampling frequency, and monitoring well network) in response to the data collected.

O&M Considerations for In-Situ Solidification and Soil Cap Remedy (continued)

- Annual costs for O&M
  - » Inspection and maintenance of cap
  - » Groundwater monitoring
  - » Reporting
- O&F Factors
  - » Demonstrated containment of solidification and cap
    - – Geotechnical testing establishes effectiveness of solidification
    - – Geotechnical testing establishes permeability of cap
  - » Vegetation established over cap
  - » Groundwater monitoring network in place
    - – Proper number of monitoring wells installed in appropriate places
    - – Analytical scheme properly established
    - – Monitoring frequency properly established

EPA P-11

Notes:

O&M Considerations for Groundwater P&T – Remedy Components

- Groundwater contaminated with chlorinated solvents is extracted using 5 wells operating at 20 gallons per minute each
- Extracted groundwater is piped to on-site treatment facility
- Treatment components consists of:
  - » Equilibration tanks
  - » Air stripping
  - » Granular activated carbon polishing
  - » Storage tanks and discharge
- Discharge to nearby river

EPA P-12

Notes:

O&M Considerations for Groundwater P&T

- Proper placement and rates for extraction wells, demonstrating optimal extraction through the elimination of migration and without collecting excessive amounts of "clean" water
- Demonstrate that additional contaminant reductions can be achieved
- Actual reductions in contaminant levels within agreed upon percent of predicted reductions
- Contaminant plume is reduced in size or, at a minimum, not expanding

EPA P-13

Notes:

O&M Considerations for Groundwater P&T (continued)

- Sufficient number of monitoring wells placed in proper locations in order to conduct acceptable geostatistical analysis
- Properly functioning treatment components
- Effluent concentrations below discharge limitations

EPA

P-14

Notes:

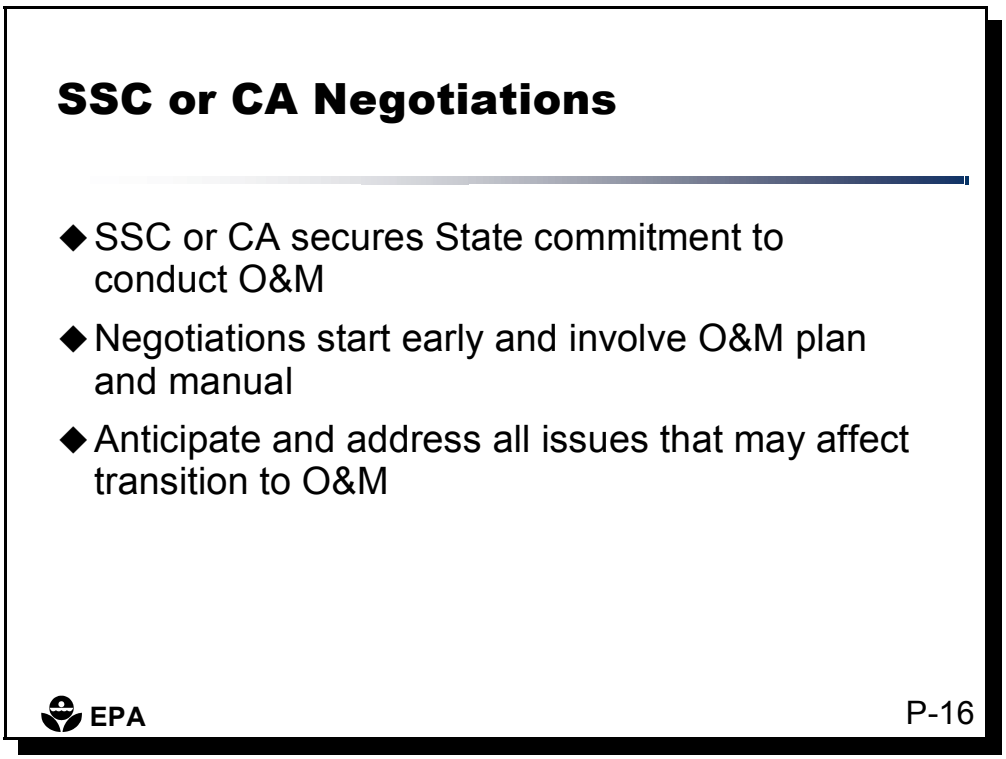
O&M Considerations for Groundwater P&T (continued)

- Periodic replacement of equipment
- Completion of optimization study and implementation of recommendations
- Institutional controls in place

EPA

P-15

Notes:

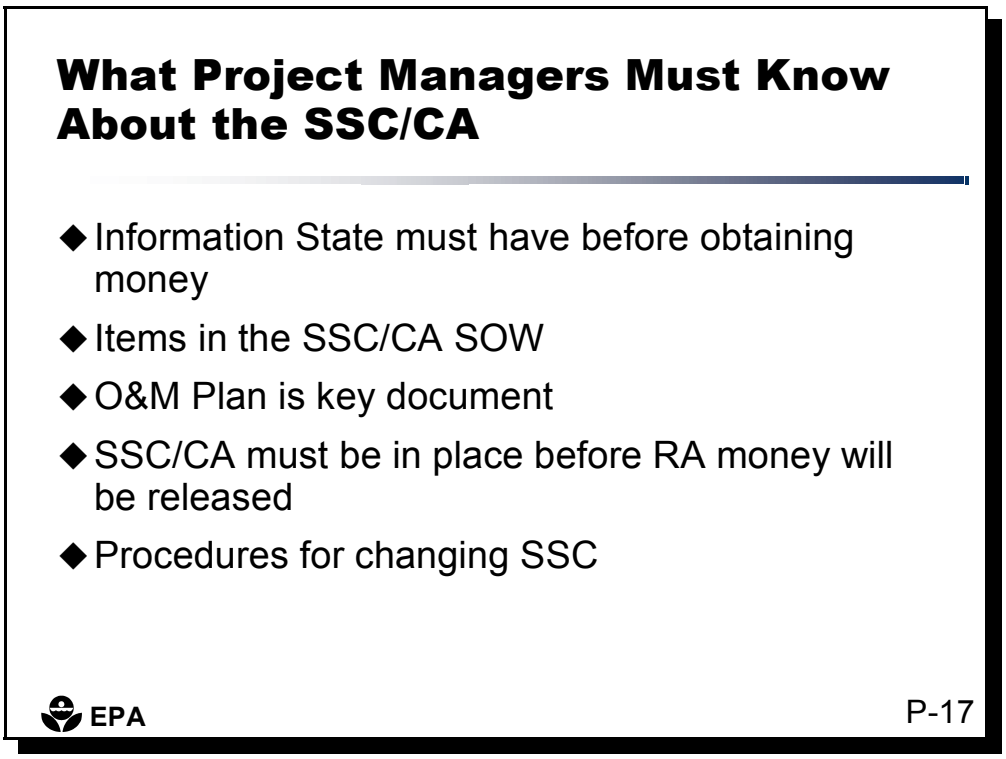


Notes:

- The Superfund State Contract (SSC) or Cooperative Agreement (CA) must be negotiated during the RD phase of the project or earlier. The SSC or CA secures the State's commitment to (1) assure 100 percent of the O&M; (2) pay a 10 percent cost share for the RA unless the State owned or operated the site, in which case the State pays a 50 percent cost share for the RA; and (3) take title to any property purchased upon completion of the RA. *For a fund-lead site, RA funds cannot be released until an SSC or CA is signed by the State.*

- The RPM must ensure that SSC or CA negotiations start early in the RD process. The RPM must involve the State in development and review of the O&M plan, draft manual, and cost estimate. The SSC or CA should describe how O&F will be determined. The O&F determination should be detailed in the O&M plan, and the O&M plan and draft O&M manual should be parts of the SSC or CA.

- The RPM must pay attention to potential O&M issues throughout the design phase and resolve them as soon as possible. The RPM must document specific procedures for determining O&F. The RPM must resist the tendency to put off addressing O&M because it does not actually occur until after the remedy is constructed and operating. The RPM should work with the State to determine what performance measures will show that the remedial system is working. If property purchase is involved the State must provide written assurance that it will take title of the property.



Notes:

- In order to ensure a smooth transition to O&M, the project managers must understand what information the State requires in order to obtain the funds for O&M. Depending on the State, issues may arise regarding insurance, procurement of services, timing of the funding request, and necessity to request funding annually. One or more of these issues may cause a delay in transitioning to O&M. The State official should investigate the types of information that will be necessary to get O&M funding.

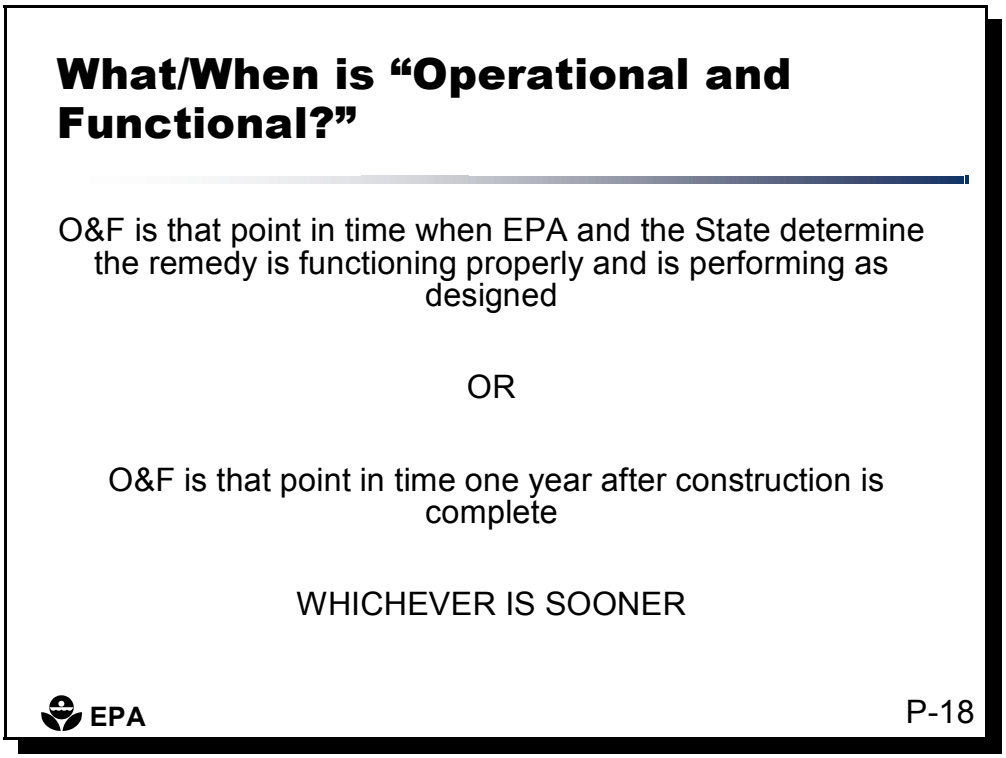
> ***Example**: At the New Lyme site, Ohio EPA was not aware that the Agency had to obtain liability insurance in order to obtain the State funding it requested. This caused a six month delay in the transition to O&M while insurance was obtained.*

- The SOW for the SSC should specify the various components of the RA that will be constructed by EPA and the costs of those components. The State will then pay 10% of that cost.

- The O&M plan contains much of the detail necessary to show the State what is required for O&M. The plan summarizes O&M requirements and defines O&F for the remedy. The plan should be incorporated into the SSC/CA.

- Without a signed SSC/CA, the RA cannot be funded. Ill-defined and hastily written SSC/CAs result when RPMs wait until the final design is complete before negotiating the SSC/CA. Ill-defined SSC/CAs can complicate disputes that arise over the proper determination of O&F. Start the SSC/CA drafting and negotiation process early and ensure the details for the transition to O&M are well defined.

- The procedures for amending the SSC/CA should be specified in the document. Significant changes in capital and O&M costs would likely precipitate an amendment of the SSC/CA. All modifications must be agreed in writing by both parties.



Notes:

- Section 300.435(f)(2) of the NCP explains when a remedy becomes O&F. The period between construction completion and the O&F determination is called the "shakedown period" for PRP-lead sites and the "O&F period" for fund-lead sites. For a fund-lead site, the O&F determination is an important finding for the transition to O&M and is made jointly by EPA and the State. For PRP-lead sites, the CD or UAO may define O&F similarly to the non-Superfund engineering definition.

- EPA may grant extensions to the 1-year O&F period in writing, as appropriate.

O&F Factors for Landfill – Remedy Components

- RCRA Subtitle C Cap
- Active leachate collection and on-site treatment
- Active landfill gas extraction and treatment using ground flare

EPA

P-19

Notes:

O&F Factors for Landfill Cap

- Establishment of vegetation
- Elimination of ponding
- Effective run-on and run-off controls
- Stabilized side slopes
- Fencing and signs
- Institutional controls in place
- Final State-approved O&M manual

EPA P-20

Notes:

O&F Factors for Leachate Management System

- Elimination of leachate seeps
- Leachate volumes within expected range considering precipitation
- Discharge limitations of treatment effluent reliably met
- No treatment plant equipment needs replacement
- Leachate collection and piping components operating properly
- Final State-approved O&M manual

EPA

P-21

Notes:

O&F Factors for Gas Management System

- Surface level gas concentrations meet regulatory requirements
- Gas concentrations in boundary probes meet regulatory requirements
- Condensate collection system operating properly
- Emissions from ground flare reliably meet regulatory requirements
- No headers, pumps, blowers, or other flare components require replacement
- Concentrations of gas constituents are within projected ranges
- Final State-approved O&M manual

EPA P-22

Notes:

O&F Factors for Groundwater Pump-and-Treat Remedy

- Proper placement and rates for extraction wells, demonstrating optimal extraction through the elimination of migration and without collecting excessive amounts of “clean” water
- Contaminant plume is reduced in size or at a minimum, not expanding
- Properly functioning treatment components
- Effluent concentrations below discharge limitations

EPA

P-23

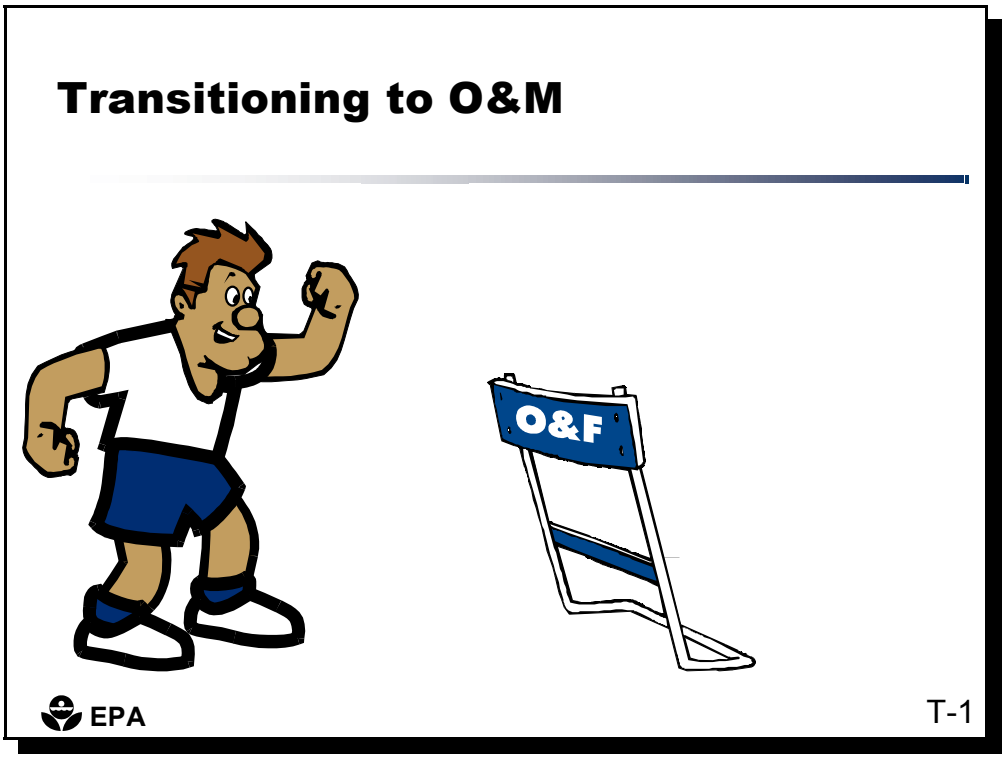
Notes:

Questions and Answers

EPA

P-24

Notes:



Notes:

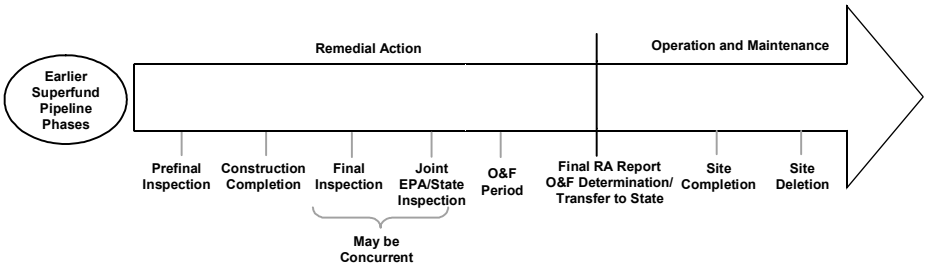
Preview of Transitioning to O&M

- Review activities that occur when construction ends, during O&F period, and at the beginning of O&M
- Use pipelines to facilitate review

EPA T-2

Notes:

Transition from RA to O&M for Fund-Lead Containment Remedy



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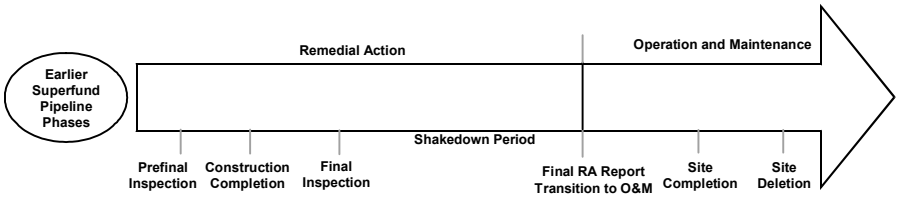
T-3

Notes:

Transition from RA to O&M for PRP- and Federal Facility-Lead Containment Remedies



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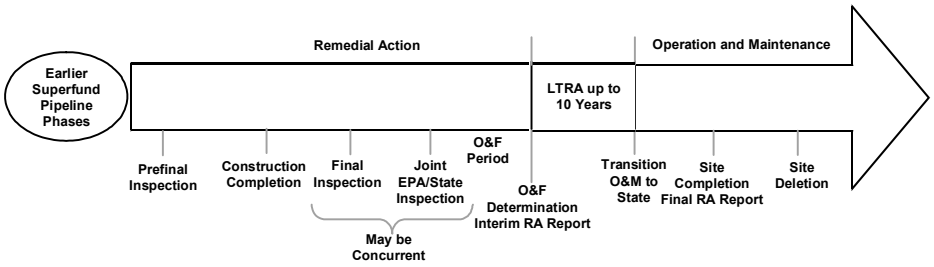
T-4

Notes:

Transition from RA to O&M for Fund-Lead Groundwater or Surface Water Restoration Remedies (LTRA)



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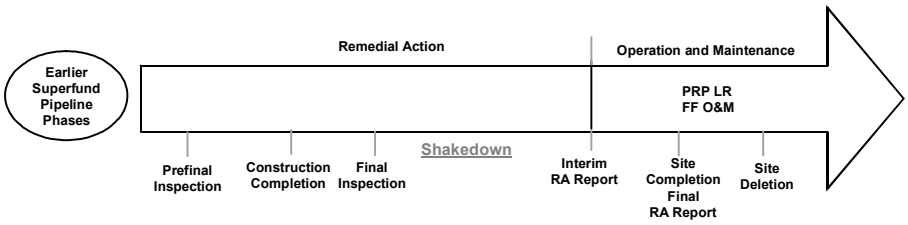
T-5

Notes:

Transition from RA to O&M for PRP- and Federal Facility-Lead Groundwater and Surface Water Restoration Remedies (PRP LR and FF O&M)



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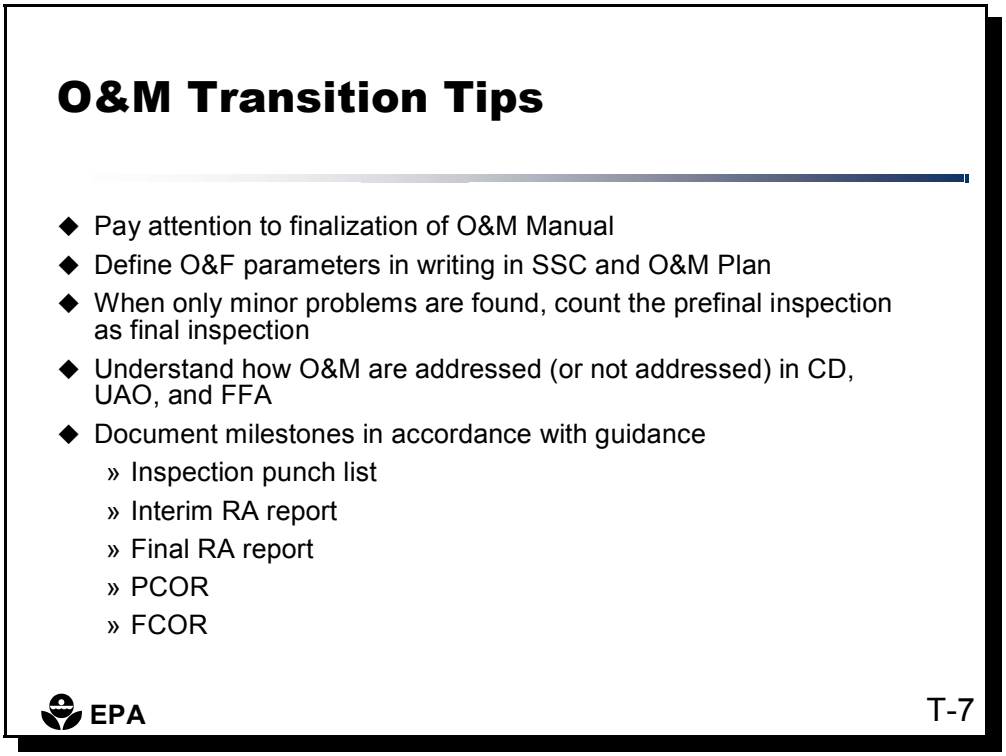
T-6

Notes:



Notes:

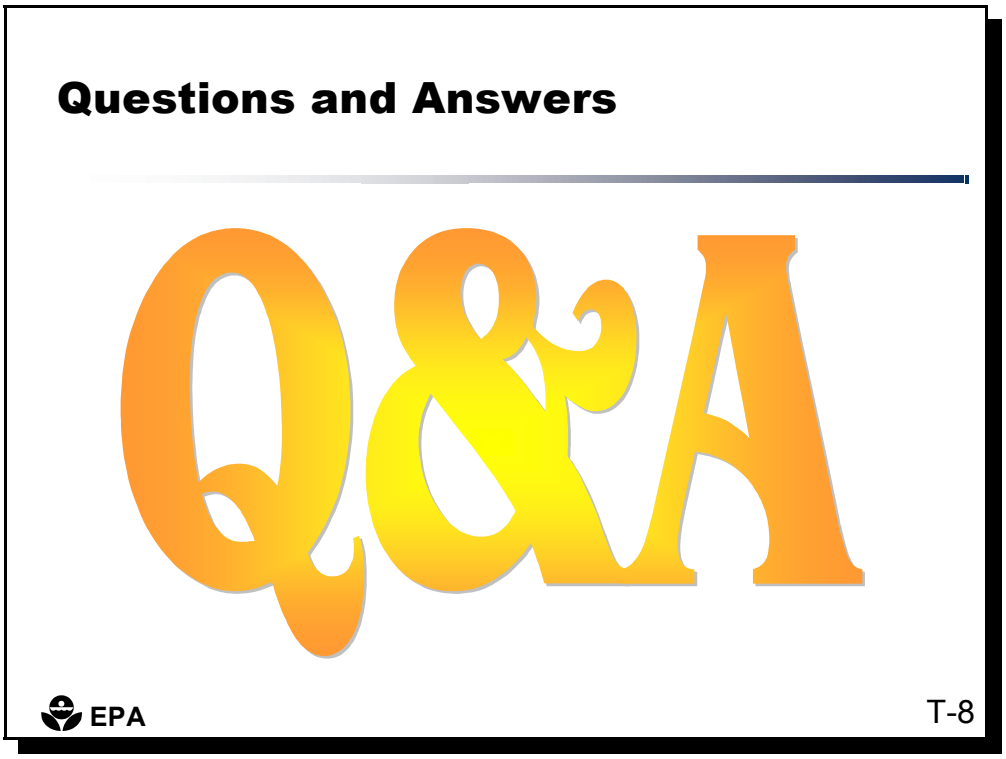
- Finalization of the O&M manual is especially important for fund-lead sites. For Fund-lead sites, the State should review the final O&M manual before a site transitions to O&M. Therefore, finalizing the O&M manual must be an important focus during the O&F period.

- The parameters that need to be met for a remedy to be considered O&F should be agreed upon between EPA and the State and put in writing. This will help to avoid disputes at the time of the O&F determination.

- The RPM can consider the prefinal inspection to be the final inspection if only minor problems with the remedial action are found during the prefinal inspection.

- Each site-specific CD, UAO, and FFA must be reviewed to determine how O&M is addressed. In some cases, O&M may not be addressed at all and in other cases, specific details about O&M may be written into the enforcement document. Some reports, such as the interim or final RA report, may not be required by the CD, UAO, or FFA. However, these reports will need to be prepared in order for an important milestone to be counted.

- RPMs should understand how to document the achievement of milestones to ensure these accomplishments are counted. Milestone achievement is very important to EPA.



Notes:

Wrap-Up for Part 1

- You need to understand Superfund O&M definitions and concepts
- You need to plan for O&M during every phase of a project; RI/FS, RD, and RA
- You can make the transition smooth if you understand the process and conduct the necessary activities
- *Operation and Maintenance in Superfund – Part 2* will be presented tomorrow September 21, 2004, from 2:00 p.m. to 4:15 p.m. EDT

EPA W-1

Notes:

Appendix 1

Planning O&M

Appendix 1

Planning O&M
Contents

1.0 Benefits of O&M Planning

1) **Clarifies State and PRP financial and performance commitments:** O&M planning ensures that the financial and performance commitments of the entity that will conduct O&M (the State, PRP, or Federal facility) are understood by all. These commitments are specified in planning documents that become part of the record of the RD/RA.

2) **Facilitates compliance with 5-year review requirements:** O&M planning ensures that the entity conducting O&M collects and documents the information necessary to facilitate EPA's 5-year reviews of the RA.

3) **Aids transition to O&M:** O&M planning is essential to smooth transition of O&M to the State. Past experience shows that lack of O&M planning delays and unnecessarily complicates transition of O&M to the State.

4) **Reduces the time needed to finalize the SSC:** Good O&M planning will result in negotiation of the SSC in less time and with less contention. O&M planning will also help EPA and the State to address any O&M issues well before the SSC must be signed.

5) **Helps ensure that cashout settlements involving O&M will be accepted by the State:** For a PRP-lead RA that involves cashout settlements and O&M, good planning will help get State buy-in for the settlement.

6) **Ensures that remedy can be operated and maintained:** Through the O&M planning process, the technical aspects of O&M are evaluated and addressed. This attention to the technical aspects will help ensure that the remedy can be effectively and efficiently operated and maintained once it is constructed.

2.0 Planning for Completion Milestones

What is construction completion? EPA only counts the construction completion milestone for sites that are final on the NPL. Construction is complete when all physical construction of all cleanup actions are complete, all immediate threats have been addressed, and all long-term threats are under control. A final NPL site has only one construction completion which is achieved after completion of all construction work in all operable units of the site.

What is a PCOR? The preliminary close out report (PCOR) documents construction completion and is drafted by the RPM. The PCOR is issued after the pre-final inspection when only minor punch list items remain. The PCOR is issued before the O&F determination. The PCOR must be signed by the Region and concurred upon by EPA headquarters before the construction completion milestone is counted.

What is site completion? Site completion is an important milestone for NPL sites. It signifies the end of all response actions at the site. Site completion is achieved when (1) cleanup goals specified in the ROD or removals are met; (2) institutional controls are in place; (3) all RA reports, OSC reports, and POLREPs are completed; (4) all RODs, ROD amendments, and ESDs are completed; (5) the site is protective of human health and the environment; and (6) the only remaining activities, if any, at the site are O&M activities that are performed by the State, Federal facility, or PRPs.

What is an FCOR? The final close out report (FCOR) documents site completion. The FCOR describes how the cleanup of the site was accomplished and provides the overall technical justification for site completion. Some sites may meet construction completion and site completion simultaneously. At these sites, only an FCOR is issued. The FCOR must be reviewed by EPA headquarters and the State before being finalized by the Region.

3.0 What is Typically in Place by the PCOR Stage for Sites with One Operable Unit?

1) **Final O&M Plan:** The O&M plan should be finalized with the design. Changes to O&M requirements are not usually made to the final O&M plan. Rather these are reflected in the O&M manual.

2) **Draft O&M Manual:** When construction is complete, the O&M manual is still in draft form. The O&M manual is not usually finalized until some time into the shakedown period.

3) **O&M cost estimate:** The O&M cost estimate is likely unchanged since RD completion.

4) **Pre-final inspection conducted:** The pre-final inspection should have been conducted at the PCOR stage. In some cases, when only minor punch list items are identified, construction completion criteria can be met after the pre-final inspection. Otherwise, a final inspection must be conducted to ensure pre-final inspection punch list items have been corrected before the PCOR is signed and construction completion is achieved.

4.0 What Needs to be in Place by the PCOR Stage for Sites with Multiple Operable Units?

1) **RA reports for all but final OU:** The PCOR should summarize the activities at all OUs for the site. RA reports for all but the final OU should be completed and summarized in the PCOR. The RA report for the final OU can be issued after the PCOR.

2) **Final O&M plans for all OUs:** The O&M plans should be finalized with the design for each OU. Changes to O&M requirements are not usually made to the final O&M plan. Rather these are reflected in the O&M manual.

3) **Draft O&M manual for the final OU:** When construction is complete, the O&M manual for the final OU is still in draft form. The O&M manual for the final OU is not usually finalized until some time into the shakedown period.

4) **O&M cost estimate for the final OU:** The O&M cost estimate is likely unchanged since RD completion. Note that O&M costs for previous OUs might be available based on O&M conducted to date.

5) **Pre-final inspection conducted for final OU:** The pre-final inspection should have been conducted for the final OU at the PCOR stage. In some cases, when only minor punch list items are identified, construction completion criteria can be met after the pre-final inspection for the final OU. Otherwise, a final inspection must be conducted to ensure pre-final inspection punch list items have been corrected before the PCOR is signed and construction completion is achieved.

5.0 RD: Design Submittals

Design documents indicate whether or not the designer understands the project and demonstrates forethought about O&M: O&M should be addressed in every design submittal. As the design progresses, more detailed O&M information is developed. Early design submittals display the designer's conceptual understanding of the project, including O&M requirements. Moreover, the early attention to O&M shows that the designer is considering O&M requirements early in the process.

The RPM should check to ensure that O&M requirements are discussed in the appropriate amount of detail given the type of submittal and the phase of the design. The RPM should coordinate with the State to address O&M requirements.

The RPM is responsible for ensuring that O&M implementation issues are addressed throughout the design. The RPM can draw on in-house expertise, the EPA contractor, or the U.S. Army Corps of Engineers (USACE) to address O&M implementation issues. For example, the remedy may lend itself to automation and remote monitoring and operation rather than hands-on monitoring and direct operation. Remote monitoring and operation are usually less costly than and just as effective as direct monitoring and operation.

6.0 RD: Operability Review and Value Engineering Design Study

The operability review determines whether the remedy conforms to applicable operation requirements and can be maintained for its intended use. This specialized review, which examines only O&M issues, should be an ongoing review conducted at each phase of the design. The purpose of the value

engineering (VE) study is to evaluate various design elements and recommend changes to the design in order to achieve the essential functions at the lowest cost consistent with performance, reliability, quality, and safety requirements. Projects are initially screened to determine whether a VE study could result in significant cost savings. The VE study is conducted by an independent VE team, and EPA must approve any design changes recommended by the VE study.

The RPM should check to ensure that the operability review is being conducted throughout the design process. The operability review should be conducted by an experienced individual who is knowledgeable about the systems involved in the particular project. Technical assistance is available from USACE or the EPA contractor. EPA's RD/RA handbook contains a useful operability review checklist to assist in the review process. The RPM should ensure that a VE screening is conducted for all fund-lead projects greater than $1 million and should also be conducted for PRP- and Federal facility-lead projects. The VE screening should be conducted early in the design process, such as during the preliminary design phase. Design and construction should not be delayed so that the designer can conduct a VE screening or study.

The RPM is responsible for ensuring that O&M issues identified during the operability review are properly addressed as early as possible in the design process. Examples of items reviewed include (1) the O&M manual, (2) facility and equipment layouts, (3) specifications regarding startup items, and (4) warranties applicable to O&M. The RPM is responsible for determining whether the VE screening indicates that a VE study is needed and whether recommendations from the VE study should be accepted by EPA. The VE study analyzes the functions of systems, equipment, facilities, services, and supplies. The RPM should keep the VE screening and VE study off the critical path for the project.

7.0 RD: O&M Plan

The O&M plan identifies administrative, financial, and technical parameters for conducting O&M. For a fund-lead site, the O&M plan ensures proper transition of responsibility for O&M to the State. Section 300.510(c) of the NCP requires EPA and the State to consult on a plan for O&M before initiation of the RA. For a PRP-lead site, an O&M plan is also important. If required by the enforcement document, the O&M plan will be submitted during the design phase. If an O&M plan is not required, the O&M manual documents the required O&M activities. Typically, the O&M plan contains less technical detail than the O&M manual. The O&M plan defines all the administrative, financial, and technical parameters and requirements for inspecting, operating, and maintaining remedial facilities and monitoring institutional controls.

The O&M plan for a fund-lead site should contain the following elements:

- Designation of the organizational unit of the State government responsible for O&M
- Identification of the availability of State funding mechanisms for O&M activities
- Milestone dates for State assumption of O&M responsibilities
- Criteria for O&F determination
- Description and duration of O&M activities

- Summary of O&M staffing needs (including training and certification requirements)
- Summary of O&M performance standards
- Contingency plan for handling abnormal occurrences
- Safety requirements for O&M activities
- Equipment and material requirements
- Estimates of annual O&M costs
- Reporting requirements
- Criteria for O&M completion (conditions for O&M termination)
- Description of site use and disposition of facilities following O&M completion
- Transition strategy for modifying existing site health and safety plan and quality assurance project plan

The RPM must ensure that O&M plan information is first submitted during the preliminary design stage. This information should include (1) O&M provisions that affect the design approach, (2) O&M requirements, and (3) updated cost estimate. The RPM should involve the State in development, review, and revision of the O&M plan. The O&M plan should be finalized by the date of the final inspection.

The RPM should ensure that all issues related to the O&M plan are identified and resolved. The critical elements of the O&M plan are the (1) criteria for O&F determination, (2) O&M performance standards, (3) equipment and material requirements, (4) O&M staffing needs, (5) O&M reporting requirements, (6) O&M cost estimates, and (7) criteria for O&M completion. However, the O&M plan should be flexible enough to allow for changes in O&M requirements that may be found necessary during the shakedown period.

The RPM should ensure that the O&M plan addresses O&M technical requirements in a logical manner. For example, if remote operation and monitoring are proposed, the O&M plan should specify (1) where the operational and monitoring data will be received and reviewed and (2) under what circumstances on-site adjustments to operational parameters will be made. If the remedial system has alarms or automatic shutdowns, the O&M plan should specify the individuals notified of the alarms and how they are to respond. The monitoring specified in the O&M plan should correspond to the applicable or relevant and appropriate requirements (ARAR) specified in the ROD in terms of parameters monitored and monitoring frequency.

8.0 RD: O&M Manual

The O&M manual provides all technical information necessary to operate and maintain the remedy. The O&M manual provides detailed technical information describing all activities necessary to operate and maintain the remedy. It serves as a guide to understanding the purpose and function of the equipment and systems that comprise the overall remedy. The O&M manual is different from the O&M plan in that the manual provides specific technical information and data, manufacturer information, protocols, process parameters, operational procedures, staffing requirements, training requirements, and maintenance schedules. The O&M plan provides a general description of the

technical parameters but does not provide detailed technical information. The O&M manual usually does not address financial or administrative requirements for O&M; these are provided in the O&M plan. The operator of the remedial system uses the O&M manual to conduct O&M activities. The O&M manual is started by the designer and finalized by the constructor.

A typical O&M manual contains the following sections:

- System description, including facility operation and control
  - Operational and managerial responsibilities
  - Process system operation and protocols
- Personnel
  - Staffing requirements
  - Staff qualifications and certifications
- Community involvement
  - Notices of operational status
  - Site tours
  - Responses to complaints
- Laboratory testing requirements
- Records
  - Format and delivery requirements
  - Operating and inspection logs
  - Monthly and annual reports
  - Maintenance records
  - Operating costs and recordkeeping
  - Personnel records
- Maintenance
  - Equipment record system
  - Equipment replacement instructions
  - Planning and scheduling
  - Warranty provisions
  - Contract maintenance
  - Monitoring of institutional controls
- Emergency operating and response program
  - Emergency equipment inventory
  - System vulnerabilities
  - Fire department, police department, emergency response center, or other emergency response information
  - Special reports (for floods, fires, and other emergencies)
- Safety issues
  - Emergency contacts and telephone numbers
  - Electrical, mechanical, laboratory, or other hazards
  - Safety equipment

- Utilities
  - Electrical, telephone, natural gas, water, and fuel oil information
- Electrical system
  - Schematic diagrams
  - Alternate power source
- Appendixes
  - Schematics, plans, as-built drawings, inspection checklists, and other remedy-specific items

The RPM should ensure that the draft O&M manual is developed throughout the RD phase of the project. The draft manual should be part of each design package submitted for review. The O&M manual is not finalized until after the shakedown period. The RPM should ensure that the final O&M manual is submitted before the O&F determination and that it is reviewed and approved in writing by the State.

The RPM must address all issues associated with remedy O&M and with finalization of the O&M manual. The RPM should ensure that all remedial equipment is in good working order and should perform any scheduled equipment replacements recommended by the O&M manual before transferring O&M to the State. The RPM may want to plan equipment replacement shortly before transferring O&M. This is especially important for an LTRA, where equipment repair or replacement may be an issue because the remedy may have been operating for as long as 10 years before the State begins O&M. The RPM should also pay particular attention to the monitoring and reporting requirements in order to ensure that they provide the necessary information and comply with ROD requirements without being overly burdensome.

9.0 O&M Requirements and SSCs

Most existing SSCs have generic language rather than remedy-specific language. The State simply agrees to conduct O&M activities. However, these activities are not usually specified.

Most SSCs do not define factors that will be used to determine if the remedy is operational and functional. This has often lead to differing interpretations between EPA and the State. The result is usually a delay in transitioning to O&M.

10.0 O&M Requirements and the CD and SOW

The model CD from 1995 contains only a few O&M requirements. The O&M plan is discussed as a document that must be prepared and submitted for review. The model CD also requires implementation of the O&M plan.

RPMs should add specific O&M requirements to the CD or the attached SOW, as appropriate. O&M requirements that should be addressed more specifically include (1) preparation, submittal, and implementation of an O&M manual, (2) periodic reporting on O&M activities, (3) O&M inspections, and (4) O&M data collection, analysis, presentation, and reporting.

11.0 As-Built Drawings and Final O&M Manual

The final O&M manual includes construction plans signed by a licensed professional engineer that have been marked to show all variations from the design plans and specifications. This set of marked-up drawings is called the as-built drawings (as-builts). Without as-builts, the operator of the remedy will be significantly hampered in performing of O&M because the actual facilities may be different than those depicted in the final design drawings. The RA contractor is responsible for delivering the as-builts. The RA contractor is also responsible for revising the O&M manual to reflect construction and O&M changes that have been made based on shakedown period observations.

The RPM must ensure that as-builts are included in the O&M manual and that the manual is revised to reflect the operational knowledge gained during the shakedown period. The RPM must ensure that the RA contractor includes all applicable equipment and material information, manufacturer information, and warranty information as well as any changes in the manual. If feasible, the RA contractor should consult individuals experienced in treatment system operation. The RA contractor should also update site-specific submittals and manufacturer information for installed equipment. The designer should review the completed manual before the O&M period begins. If possible, this reviewer should be the licensed professional engineer who created the draft O&M manual during the RD phase.

For a fund-lead project, the contract for RA construction should normally include a clause requiring the RA contractor to provide O&M training to State personnel shortly before the State takes over the project. The RA contractor should use the completed O&M manual to facilitate the training. For a PRP-lead or Federal facility-lead project, the O&M manual and as-builts should be submitted, reviewed, finalized, and approved in accordance with the CD, FFA, or UAO.

The RPM should ensure that all O&M issues identified during the shakedown period are addressed and reflected in the revisions to the O&M manual. For a fund-lead project, addressing O&M issues is necessary to ensure remedy effectiveness and transition of O&M to the State. For a PRP- or Federal facility-lead projects, addressing O&M issues is necessary to ensure remedy effectiveness.

12.0 Planning Institutional Controls

The RPM should understand what the reasonable future land use will be and therefore what types of land uses will be allowed and restricted. The objective of each IC should consider future land use and clearly state what the IC intends to accomplish. For example, an objective of an IC may be to restrict the use of groundwater as a drinking water source until the MCLs are met.

With the assistance of Regional Counsel, the RPM should develop a good understanding of the types of governmental and proprietary controls that are available. Governmental controls include zoning restrictions, ordinances, statutes, building permits, or other provisions that restrict land or resource use at the site. Proprietary controls include easements and covenants that create legal property interests and involve legal instruments in the chain of title of the site or property.

Working with the State and Regional Counsel, the RPM should determine the type of IC that will be necessary to meet the objective. More than one IC may be necessary to accomplish the objective.

Short- and long-term ICs are available. ICs may be necessary during a prolonged RI/FS or RD. The RPM should determine when an IC should be implemented and how long it should remain in place in order to ensure protectiveness.

Working with Regional Counsel, the RPM should understand what entity will be responsible for securing the IC and how the IC will be maintained and enforced. In most situations, a State or local entity must secure and enforce an IC.

13.0 O&M Considerations for Slurry Wall and Cap Remedy

This section describes the components of a slurry wall and cap remedy, the questions to consider for O&M, and the O&M considerations.

13.1 Remedy Components

- 40 foot deep bentonite wall tied into bedrock surrounding one acre disposal pit
- RCRA Subtitle D equivalent cap over disposal pit and slurry wall
- Groundwater within the slurry wall is extracted at a rate required to maintain water table at a level at least 5 feet below bottom of waste and to provide stability for the wall
- Extracted groundwater is treated using granular activated carbon and discharged to an adjacent river

13.2 Questions to Consider

- Will the extraction rate need to be increased in unusually wet years?
- Will the treatment system be able to handle an increased extraction rate?
- Will groundwater contaminant levels decrease in the future to below NPDES limits?
- Can the extraction and treatment system be operated remotely?

13.3 O&M Considerations

- The State is 100% responsible for both the source containment and the groundwater portion of the remedy. The groundwater portion of the remedy is not groundwater restoration.

– O&F Factors

- Demonstrated containment of the source by the wall and cap through geotechnical testing of the wall and the cap
- Vegetation established over cap
- Groundwater extraction and treatment system operating as designed so that 1) extraction rate successfully maintains acceptable water table level, 2) carbon usage within acceptable parameters, 3) NPDES limitations reliably met, and 4) pumps, piping, and tanks not scheduled for replacement
- Institutional controls in place

Reference Section of Web Sites

Reference Documents and Web Sites for Downloading

1. U.S. Environmental Protection Agency (EPA), Close Out Procedures for National Priorities List Sites, January 2000, OSWER Directive 9320.2-09A-P, PB98-963223
http://www.epa.gov/superfund/resources/closeout/index.htm

2. EPA, Operation and Maintenance in the Superfund Program, Final Fact Sheet, May 2001, OSWER Directive No. 9200.1-37FS, EPA 540-F-01-004
http://www.epa.gov/superfund/resources/sheet.pdf

3. EPA, Remedial Design/Remedial Action Handbook, June 1995, OSWER Directive 9355.0-04B, PB95-963307
http://www.epa.gov/superfund/whatissf/sfproces/rdrabook.htm

4. EPA, Institutional Controls: A Site Manager's Guide to Identifying, Evaluating, and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups, September 2000, OSWER Directive No. 9355.0-74FS-P, EPA 540-F-00-005
http://www.epa.gov/superfund/action/ic/guide/guide.pdf

5. EPA, Institutional Controls: A Guide to Implementing, Monitoring, and Enforcing Institutional Controls at Superfund, Brownfields, Federal Facility, UST and RCRA Corrective Action Cleanups, February 2003, DRAFT
http://www.epa.gov/superfund/action/ic/guide/icgdraft.pdf

6. EPA, Comprehensive Five-Year Review Guidance, OSWER Directive No. 9355.7-03B-P, June 2001
http://www.epa.gov/superfund/resources/5year/index.htm

7. EPA, Superfund Post Construction Completion Activities, OSWER Directive No. 9355.0-80FS, June 2001
http://www.epa.gov/superfund/action/postconstruction/pcc_act.pdf

8. EPA, Superfund Post Construction Completion: An Overview, OSWER Directive No. 9355.0-79FS, June 2001
http://www.epa.gov/superfund/action/postconstruction/pcc_over.pdf

9. EPA, Elements for Effective Management of Operating Pump and Treat Systems, OSWER Directive No. 9355.4-27FS-A, December 2002
http://www.epa.gov/superfund/resources/gwdocs/ptfactsheet.pdf

10. EPA, Transfer of Long-Term Response Action (LTRA) Projects to States: Fact Sheet, OSWER Directive No. 9355.7-08FS, April 2003
http://www.epa.gov/superfund/action/postconstruction/operate.htm