STREAMLINING INITIATIVES STARTING TO PAY BIG DIVIDENDS IN CLEANUP OF THE PADUCAH GASEOUS DIFFUSION PLANT

Gary Bodenstein, Department of Energy, USA
Dianna Feireisel, Department of Energy, USA
Carl Froede, Environmental Protection Agency, Region 4, USA
Tuss Taylor, Kentucky Division of Waste Management, USA
Mike Guffey, Kentucky Division of Waste Management, USA
John Volpe, Kentucky Radiation Health and Toxic Agents Branch, USA
Steve Hampson, Kentucky Radiation Health and Toxic Agents Branch, USA
John Morgan, Bechtel Jacobs Company, USA

ABSTRACT

The Paducah Gaseous Diffusion Plant is a federal facility owned U.S. Department of Energy, subject to the cleanup requirements of both RCRA and CERCLA authorities. While site cleanup activities have been progressing since the early 1990's, Senior Management of the Department of Energy, Environmental Protection Agency, and the Common Wealth of Kentucky recently adopted several streamlining initiatives to expedite site remediation. These initiatives include strategies for RCRA/CERCLA coordination, establishment of remedial action objectives based on land use, deployment of a phased operable unit approach, and an improved method to project scoping.

INTRODUCTION

The primary scope of the Environmental Management Program for Department of Energy's Oak Ridge Operations Office includes three Gaseous Diffusion Plants; the East Tennessee Technology Park located in Oak Ridge, Tennessee; the Paducah Gaseous Diffusion Plant located in Paducah, Kentucky; and, the Portsmouth Gaseous Diffusion Plant located in Portsmouth, Ohio. The Paducah facility is located in Western Kentucky approximately 10 miles west of the community of Paducah and 3 miles south of the Ohio River. The plant is an active uranium enrichment facility whose production operations is the responsibility of the United States Enrichment Corporation (USEC), a newly formed private company created by the Energy Policy Act of 1992. While USEC assumed responsibility for plant operations and leases the production facilities from DOE, the Act requires DOE to retain responsibility for remediation of all pre-existing environmental contamination at the site and facility D&D once USEC ceases operation.

In July of 1988, groundwater samples from residential wells north of the plant revealed the presence of trichloroethene and technetium-99 which led to an immediate DOE action to provide alternate drinking water to affected residents and implementation of other various interim actions. As a result of that discovery, a series of site investigations were conducted to define the nature and extent of off-site contamination. Those efforts delineated two large off-site groundwater plumes and several potential sources of concern, including burial grounds and DNAPL sources, contaminated scrap metal, and various PCB and radionuclide releases to the sediment and surface water. Consequently, the facility was placed on the National Priorities List under CERCLA. As a result of NPL status, DOE entered into a Federal Facility Agreement (FFA) with EPA and Kentucky outlining the legal framework for site remediation, which includes regulatory strategies to coordinate the cleanup authorities of RCRA and CERCLA.

While the site has made progress since the discovery of site contamination in 1988, the Parties of the FFA recognized there were still opportunities for further improvement. In particular, the original site strategy employed the traditional SWMU by SWMU approach common to the RCRA process, resulting in the potential to omit areas of contamination that were not previously identified SWMUs. This approach also

reduced opportunity to benefit from regional approaches and economies of scale and resulted in a significant amount of resources being consumed by development of documentation and the administrative processes associated with multiple RI/FS activities. Additionally, lack of early consensus among the agencies on scope and technical objectives were resulting in multiple revisions of CERCLA documentation, delays in the regulatory approval process, and different expectations on the degree of site characterization needed to support the decision-making process.

As part of on-going site initiatives to continuously seek ways to improve, Senior Management from DOE, EPA, Kentucky, and Bechtel Jacobs Company participated in a series of key meetings, which resulted in a strong commitment by all Parties to further streamline the cleanup process. Accordingly, a Tri-Party Working Group (TPWG) consisting of representatives from each organization was chartered by Senior Management to provide additional streamlining recommendations that can produce and sustain breakthroughs in project performance. The team met over a 10-month period and employed the "Principles of Environmental Restoration" throughout the process, a DOE-headquarters' streamlining initiative, developed in cooperation with EPA-headquarters, that has proven to be very effective at other sites. As a result of these strategy sessions, a new cleanup approach is being employed at the site that is paving the way for significant progress and is expected to reduce lifecycle costs and expedite site cleanup by several years. This new approach includes FFA strategies to coordinate regulatory authorities, establishment of remedial action objectives based on land use, deployment of a phased operable unit strategy with a bias for early actions addressing off-site releases, and an improved method to project scoping.

RCRA/CERCLA COORDINATION

It is not uncommon for cleanup activities at federal facilities to be regulated under the dual authority of RCRA and CERCLA with both state and federal regulatory oversight. If these two authorities are not properly coordinated, this can result in duplication of effort and excessive costs from inefficiencies. In the case of the Paducah facility, DOE was issued a RCRA Permit on July 16, 1991, with corrective action provisions including a schedule of compliance specifying timetables for DOE to conduct a series of RCRA facility investigations (RFIs). On May 31, 1994, the Paducah facility was placed on the NPL under CERCLA. Section 120 of CERCLA requires all federal facilities listed on the NPL to enter into an Interagency Agreement (hereafter referred to a FFA) outlining the legal and procedural framework for site remediation. A key component of the Paducah FFA is a strategy to coordinate the cleanup requirements of both RCRA and CERCLA into a set of comprehensive requirements for site remediation.

In general, RCRA requires corrective action of environmental releases of hazardous wastes and constituents originating from SWMUs. In comparison, CERCLA requires remedial actions for releases of CERCLA-hazardous substances, regardless if the release originated from a regulated unit or a SWMU. With a few exceptions (e.g., radionuclides), a release of a CERCLA-hazardous substance would also constitute a release of a RCRA-hazardous waste/constituent from a SWMU and vice versa. The risks from these releases, in most instances, would be indistinguishable, and the facility would be required to pursue cleanup under one of these programs. Therefore, as part of the RCRA/CERCLA coordination strategy, all known environmental releases have been included under the FFA, regardless if the release is a RCRA- or CERCLA-type release.

In addition to the similarities in RCRA and CERCLA cleanup authority, the RCRA corrective action and the CERCLA remedial action processes are generally the same (Figure 1). The FFA recognizes these processes as equivalent, and allows DOE to conduct a single activity to satisfy the requirements of both RCRA and CERCLA. For example, one field investigation conducted under the FFA will evaluate both RCRA-hazardous constituents and CERCLA-hazardous substances, and will be documented in a single RI report constituting the requirements from both the RFI and CERCLA remedial investigation for a

given area. Appendix D of the FFA contains document outlines for each of the Primary Documents. The document outlines have been designed to reflect the reporting requirements of both RCRA and CERCLA.

REMEDIAL ACTION OBJECTIVES

The primary objective of the Paducah strategy, as required by RCRA and CERCLA, is to select and implement actions protective of human health and the environment. The approach to accomplish that objective varies from site to site and is highly dependent on site-specific factors such as land use, contaminants of concern, migration pathways, location of receptors, and routes of exposure. Each of these components is a critical link in establishing an accurate site conceptual model. To protect a potential receptor at a given location, a response action could either target the source of the contamination, focus on the migration pathway leading to the receptor, restrict certain actions of the receptor to limit exposure, or use a combination of the above.

Of those factors mentioned, the current and anticipated future land use at PGDP will have a significant impact on the cleanup standards, the types of response actions selected, and total costs for site remediation. For example, remediation for industrial areas may differ significantly from actions taken for residential areas. Therefore, the proper development of land use assumptions is critical to implementing an efficient, cost-effective program protective of human health and the environment. A primary goal of the new strategy was to clearly define remedial action objectives that directly correspond to the current and reasonably anticipated future land use.

Recognizing the important role of developing reasonable land use assumptions to support decision-making for the CERCLA process, the Secretary of Energy previously directed DOE site managers nationwide to identify stakeholder-preferred alternatives for land use at each DOE site. In accordance with that directive, DOE conducted a limited land use study for PGDP and submitted a recommendation to DOE Headquarters on December 30, 1995. As part of the PGDP evaluation, several factors were considered, including; 1) existing and anticipated lease commitments, 2) the nature of site contamination currently present at the facility, and 3) stakeholder input. Based on the results of that evaluation and stakeholder input, three land use patterns were identified as the most reasonable anticipated future land use for the area. These include industrial use within the plant security fence; recreational use immediately surrounding the facility, and residential for the remaining area. These land use assumptions will be incorporated into the appropriate decision documents and subject to public review and

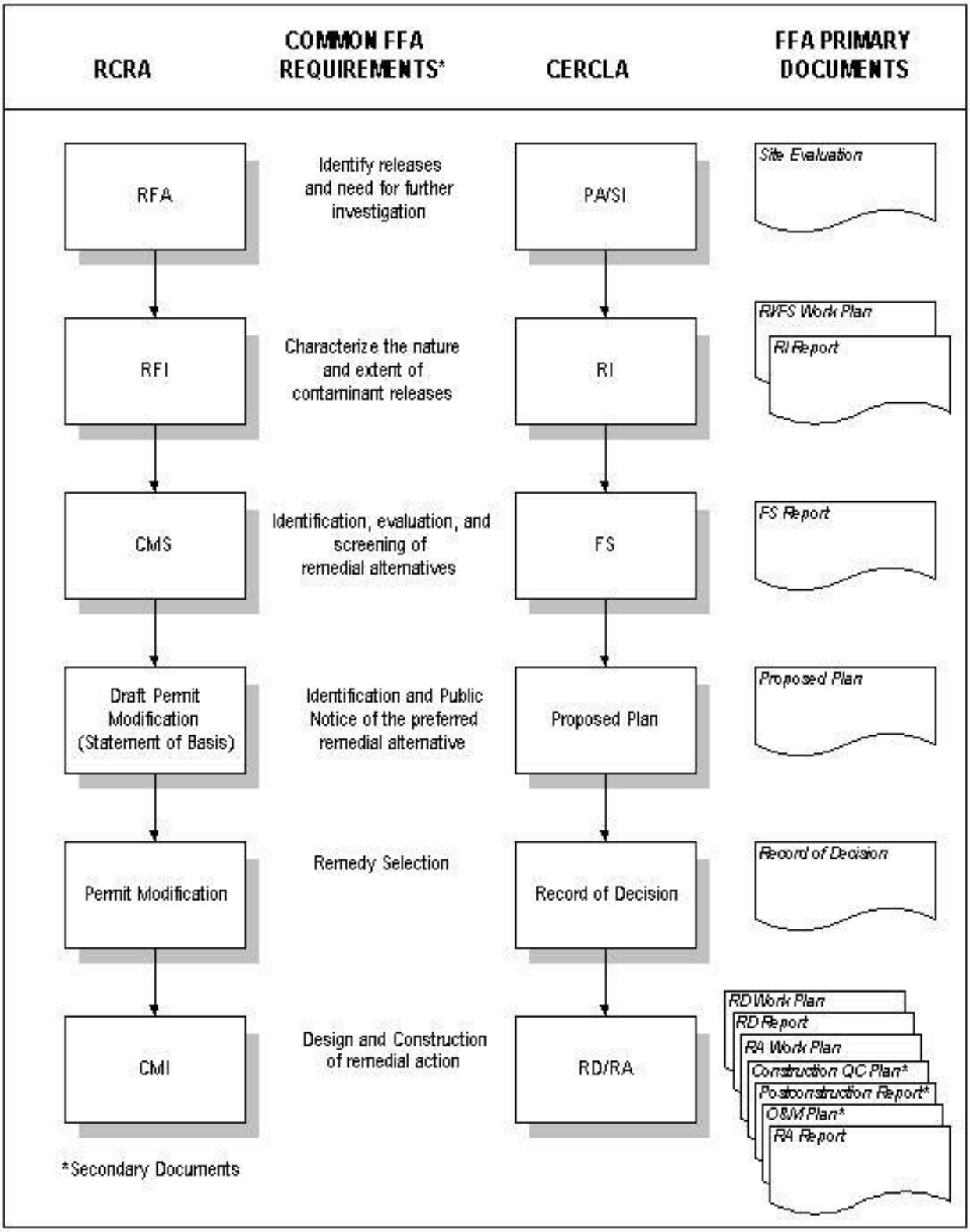

Figure 1. RCRA/CERCLA Coordination.

comment in accordance with CERCLA and the FFA. Therefore, based on these long-term planning assumptions, the following remedial action objectives were identified:

- Return surface waters to their classified use(s), to the maximum extent practicable.
- Return groundwaters to its beneficial use(s), to the maximum extent practicable.
- Ensure media (e.g., soil, sediment, air) poses no unacceptable human health risk for industrial land use for those areas with a future industrial land use designation.
- Ensure media (e.g., soil, sediment, air) poses no unacceptable human health risk for recreational land use by land managers and nearby residents for those areas with a future recreational land use designation.
- Ensure ecological receptors are protected from exposure to contaminated media, to the maximum extent practical.

OPERABLE UNITS

The original site strategy employed the traditional SWMU by SWMU approach common to the RCRA process. Accordingly, the existing SWMUs were grouped into approximately thirty (30) Waste Area Groups (WAGs) for the purpose of undergoing individual RI/FSs. However, the Parties of the FFA were concerned that the original approach had the potential to omit areas of contamination that were not previously identified SWMUs. It also reduced opportunity to benefit from regional approaches and economies of scale, and resulted in a significant amount of resources being consumed by documentation and other administrative processes associated with multiple RI/FS activities.

As a better understanding of site conditions was gained through the various WAG investigations, the agencies concluded it would be more effective if the existing WAGs were grouped more broadly, thereby providing the framework to more effectively integrate, focus, and prioritize response actions across the site. This data and other process knowledge was used to develop site conceptual models for each of the source areas to support the further consolidation of the WAGs into larger operable units. Source areas that were suspected as being a primary contributor of contamination to a specific environmental media and/or exposure pathways were grouped under the same OU. This effort resulted in identification of five potential operable units:

- Groundwater OU,
- Surface Water OU,
- Burial Grounds OU,
- Soils OU, and
- D&D OU.

The scopes of these potential OUs is intended to include both the contributing source area and the affected media, which is a significant change from the previous WAG strategy where sources were addressed separately from the contamination that had already migrated to groundwater and surface water. The combining of the source areas and affected media under the operable unit approach is intended to enhance the agencies ability to develop integrated remedial solutions that will account for interactions between source areas and affected media.

While the source areas have been grouped into potential operable units based on suspected releases to a common media and/or exposure pathway, this does not mean the RI/FS strategies or response actions for a given OU will not evaluate impacts to other media or exposure pathways. For example, the intent of the Soils OU is to help focus data collection and decision-making on a group of source areas where the probable site conditions, based on existing data and process knowledge, suggest the contamination may

be primarily limited to the shallow soil horizons, thereby providing a primary route of exposure to plant workers through direct contact. However, it is not unrealistic for some sources within this OU to also be a contributor to surface water or groundwater via contaminant transport. In comparison, sources in the groundwater and surface water OUs may also contain contamination at locations where plant workers could experience direct contact exposure with contaminated soils or sediments. Therefore, the RI/FS strategies and corresponding response actions need to contain adequate flexibility to manage uncertainties and address impacts to other media and secondary routes of exposure when appropriate.

Also, it should be noted that some OUs contain operating SWMUs. Since some of these units may not be able to be fully characterized or remediated until they cease operation, the scope of the RI/FS may be focused in nature, with emphasis on the migration pathways to determine whether there is an on-going release that poses a current risk, thereby warranting an immediate action. However, the extent of investigation and remedial action for operating units will be determined on a case-by-case basis after consideration of site-specific conditions. In some cases, if the investigation determines there is no immediate risk or potential for off-site migration, additional characterization and/or remediation may be deferred to the D&D OU when these units cease operation.

Once the five OU actions are complete, a comprehensive site-wide OU (CSOU) will be conducted, as depicted in Figure 2. The scope of the CSOU will include a comprehensive site-wide baseline risk assessment to evaluate any residual risk remaining at the site after completion of the five OUs, and the cumulative effects from all media. If the CSOU risk assessment concludes the actions taken to date collectively provide adequate protection to human health and the environment, a final CSOU Proposed Plan and ROD will be issued, followed by a final remediation report declaring site remediation complete. In the event, the CSOU risk assessment determines additional actions are needed, an FS will be developed with the preferred alternative documented in a Proposed Plan and ROD, followed by the necessary remedial actions prior to issuing the final remediation report.

PROJECT SCOPING

Historically at the Paducah site, the DOE project teams would prepare RI/FS work plans and other CERCLA documentation using the traditional approach whereby the documentation would be prepared internally with minimal upfront input and interaction with the regulator agencies and then submitted to EPA and Kentucky for review and comment. The lack of a common vision and early consensus among the agencies on scope and technical objectives was resulting in multiple revisions to the CERCLA documentation, delays in the regulatory approval process, and frustration on all sides. In November of 1999 Senior Management of the FFA parties met to evaluate the site strategy and identify further opportunities to streamline the process. As part of that effort, Senior Management endorsed a joint scoping initiative to obtain regulatory input early in the process. In February of 2000, project managers and technical support staff from all the agencies and contractors attended a streamlining workshop sponsored by DOE-HQ which was originally developed in cooperation with EPA-HQ. The workshop focused on the following principles:

- Effective team building with emphasis on early and continuous communication;
- Effective problem identification maximizing the use of existing data;
- Identification of opportunities for early actions; and,
- Management of uncertainties and focused data collection.

The parties subsequently adopted the process and established a Programmatic Core Team and Project Core Teams with dedicated representatives from all agencies participating (Figure 3). The Project Core

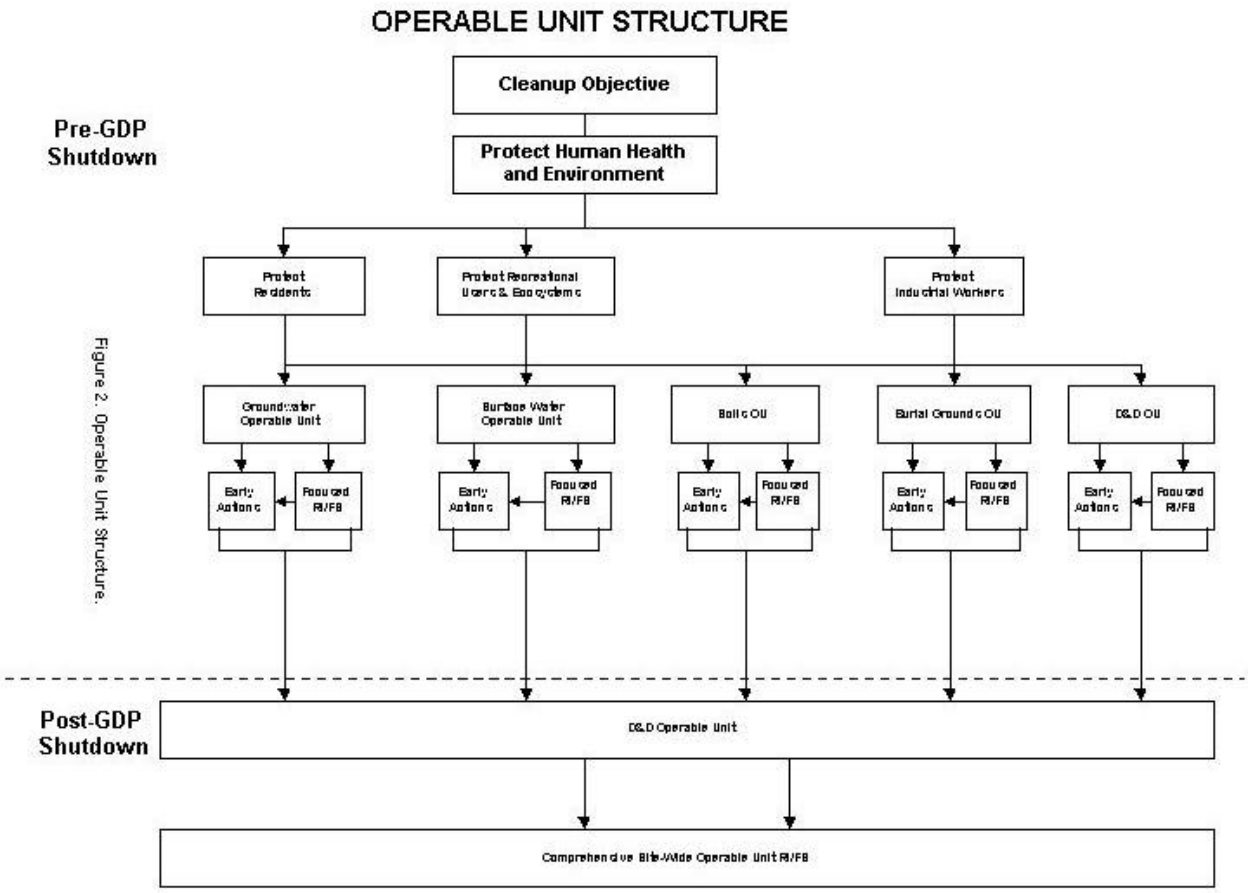

Fig. 2. Operable Unit Strategy.

Teams focus on technical scoping associated with project-specific activities whereas the Programmatic Core Team focuses on programmatic strategies, funding priorities, establishment of FFA enforceable commitments, and resolution of issues elevated by Projects Core Teams.

The Core Team activities are currently focusing efforts on review of existing data for each Operable Unit. The objective of the review is to place each source area from the various OUs into one of three categories: 1) Adequate data to define a problem and scope likely response alternatives for early actions; 2) Additional RI data needed for problem determination; and 3) Adequate data to recommend no further action. The Core Team refers to this process as the "Binning" process, which is depicted in Figure 4. Once consensus is reached that a source area represents a problem, then the Team works together to jointly scope likely response alternatives, which will ultimately be incorporated into the feasibility study and decision documents for public review and comment. Through this process, several actions have already been identifed, for example: 1) scrap metal removal; 2) North South Ditch; 3) Sediment Control Measures; 4) Groundwater Source Treatment (DNAPLs); and 5) Burial Grounds. In addition, this joint scoping process and early input expected to accelerate project schedules beyond the standard FFA scheduling protocols.

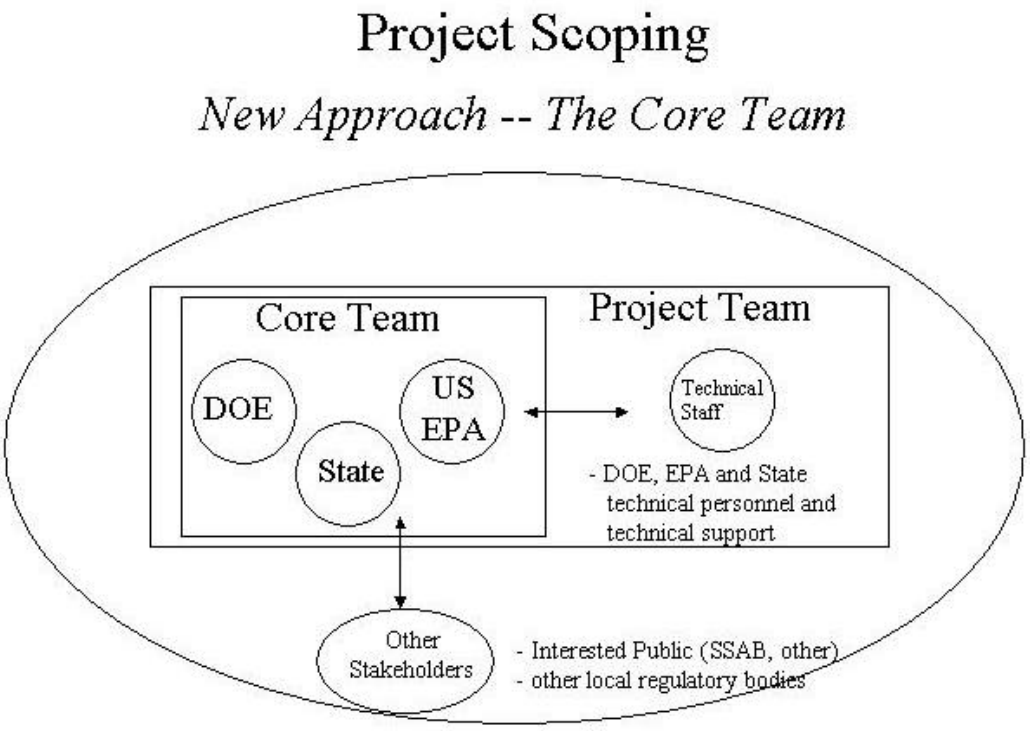

Figure 3. Core Team Approach

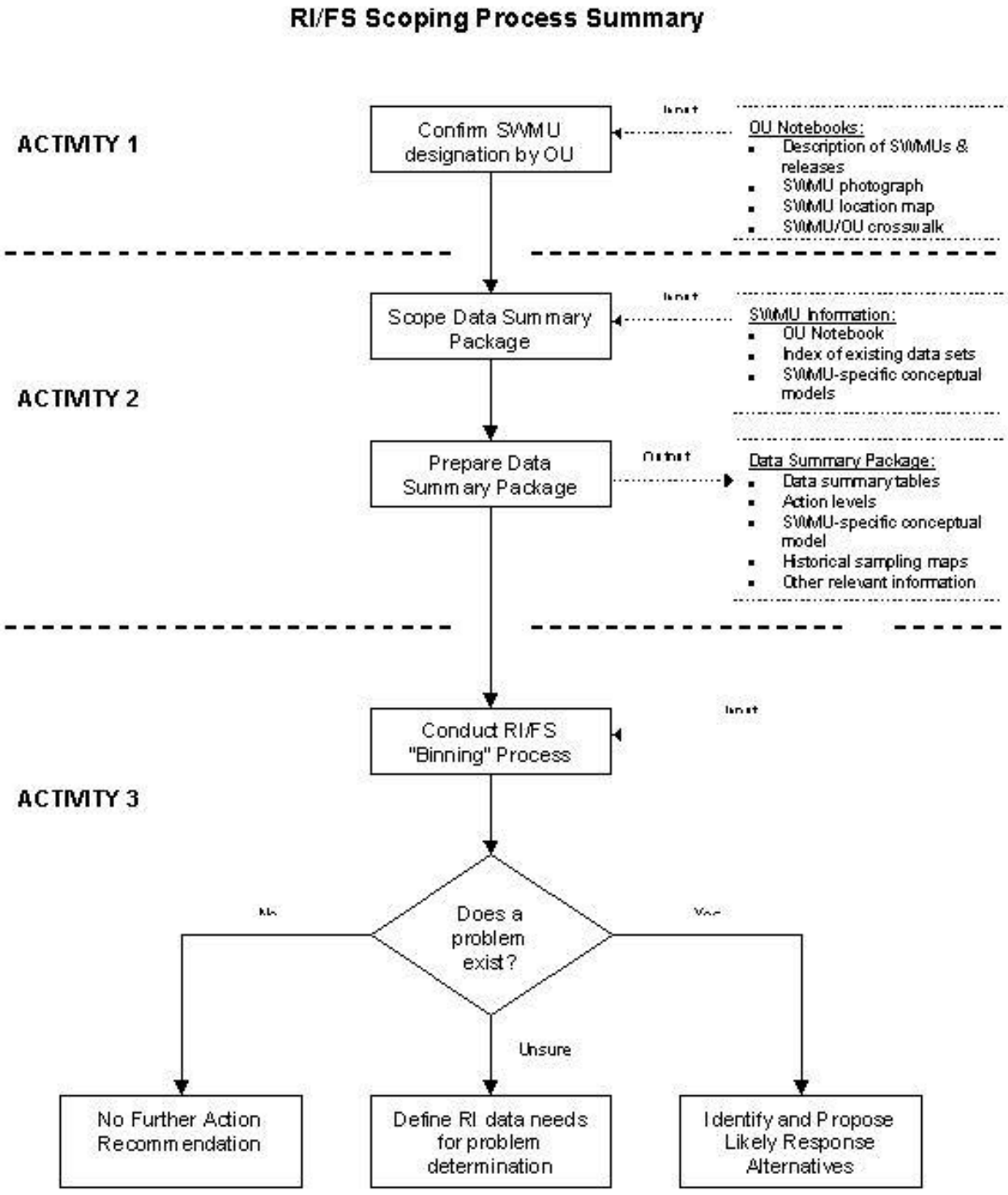

Figure 4. Binning Process