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200 Areas Source Remediation Strategy - Environmental Restoration Program

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Bechtel Hanford, Inc.
Richland, Washington

For External Review

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EXECUTIVE SUMMARY

The remediation and waste management activities in the 200 Areas of the Hanford Site currently range from remediating groundwater, remediating source units (contaminated soils), decontaminating and decommissioning of buildings and structures, maintaining facilities, managing low-level and mixed waste, and operating tank farms that store high-level waste. This strategy focuses on the assessment and remediation of source waste sites that resulted from the discharge of liquids and solids from processing facilities to the ground (e.g., ponds, ditches, cribs, burial grounds) in the 200 Areas. The 200 Areas remedial action effort is in the early stages of implementation. A series of workshops have been held by the Tri-Parties (Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Richland Operations Office) to review the historical work performed to date in the 200 Areas and assess the most efficient and cost-effective way to achieve progress quickly in the 200 Areas. A set of assumptions and constraints that apply to assessment and remediation of the source operable units (OU) was developed to provide a framework for this strategy. An evaluation of how the waste sites are grouped was then performed by brainstorming, developing criteria, and evaluating the options against those criteria. The evaluation established nine initial waste site groupings that integrate the treatment, storage, and disposal and past practice waste sites and build on the common chemical processes and waste site types (cribs, ponds, ditches) that cross between OUs. These nine groupings are significantly less than the original 32 source OUs (does not include tank farm OUs) used as the basis for the waste site groupings.

When the Tri-Parties reviewed the required work plans for the 200 Areas remedial action effort, the number of work plans were reduced to three, as compared to the original plan with a work plan for each of the 32 source OUs. Reducing the number of work plans is possible by incorporating the analogous site approach that has been effectively used in the 100 and 300 Area remediation activities. The nine waste site groupings will use a limited number of representative sites that will be characterized, and these characterization data will be applied to all the sites in the waste site grouping to evaluate and select remedial alternatives. This analogous site approach builds on the common process history, contaminants of concern, etc., for sites within each group. Thus, instead of requiring 32 source work plans for the 32 source OUs that include approximately 1,000 waste sites, the strategy will result in the approximately 1,000 waste sites being covered in three work plans that focus on characterizing a limited number of representative waste sites.

Characterization requirements outlined in the work plans will be implemented in the field using waste-group-specific Descriptions of Work. After the characterization activities are completed and remedies have been selected for representative sites, the remaining waste sites can be addressed by referencing the existing remedial action documentation. In this manner, the additional waste sites are integrated into the process used for the original waste sites. Then, in the early stages of remedial design, each waste site will have data collected that verify the applicability of the representative waste site conceptual model, as well as data that support remedial design/remedial action. The streamlining associated with these enhancements will result in a quicker and more efficient use of available resources and will allow actual remediation to occur in an expedited manner.

The remedial action documentation required to achieve remediation has also been streamlined, and the process outlined in this document has flexibility that can be used in the application of the process. The *Resource Conservation and Recovery Act of 1976* and the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* requirements have been integrated into the documentation required to obtain a Record of Decision (ROD). Focus packages (a consolidation of paperwork that have been effectively used in the 100 Areas) have been identified to streamline the remediation process for waste sites. Waste site reclassification has also been included in this strategy to address sites that present little or no threat to human health and the environment. The explanation of significant difference approach will be used to add waste sites to RODs that have already been developed, and removal actions will be emphasized to expedite remedial activities.

The implementation of the 200 Areas Source Strategy is driven by the requirement to meet the year 2008 *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) milestone (pre-ROD characterization complete) and the permit modification schedule (incorporation of the 216-B-3 Main Pond, 216-B-63 Trench, and 216-A-29 Ditch into the year 2000 permit modification). The long-term goal of the strategy is to meet the 2018 Tri-Party Agreement milestone (complete remedial actions for all OUs) in a cost-effective manner. Priorities associated with characterization and remediation have also been established to develop a framework for sequencing work that meets these overall milestones.

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ACRONYMS

AAMS	*Aggregate Area Management Study*
CA	cost analysis
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CMS	corrective measure study
CPT	cone penetrometer test
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
DOW	Description of Work
DST	double-shell tank
DQO	data quality objective
Ecology	Washington State Department of Ecology
EE	engineering evaluation
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
ERA	expedited response action
ERC	Environmental Restoration Contractor
ESD	explanation of significant difference
FFS	focused feasibility study
FS	feasibility study
FY	fiscal year
HLW	high-level radioactive waste
HPPS	*Hanford Site Past-Practice Strategy*
HSIS	Hanford Site Integrated Schedule
IRM	interim remedial measure
LFI	limited field investigation
LLBG	Low-Level Waste Burial Ground
NPL	*National Priorities List*
OTD	Office of Technology Development
OU	operable unit
PFP	Plutonium Finishing Plant
PUREX	plutonium uranium extraction
RARA	Radiation Area Remedial Action
RAWP	*Remedial Action Work Plan*
RCRA	*Resource Conservation and Recovery Act of 1976*
RDR	*Remedial Design Report*
RI	remedial investigation
RFI	RCRA Facility Investigation
RL	Richland Operations Office
ROD	Record of Decision
S&M	surveillance and maintenance
SPN	spent nuclear fuel

SST	single-shell tank
SWM	solid waste management
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRU	transuranic
TRUSAF	Transuranic Waste Storage and Assay Facility
TSD	treatment, storage, and disposal
TWRS	Tank Waste Remediation System
WIDS	Waste Information Data System
WM	waste management
WSCF	Waste Sampling and Characterization Facility

1.0 INTRODUCTION

In November 1989, the U.S. Environmental Protection Agency (EPA) included the 200 Areas of the Hanford Site on the *National Priorities List* (NPL) under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA). The 200 Areas, located near the center of the Hanford Site, are primarily the 200 West and 200 East Areas, which contain reactor-fuel processing and waste management (WM) facilities. The 200 NPL Site encompasses these areas as well as the 200 North Areas and select portions of the 600 Area and includes 42 operable units (OU), including 19 in the 200 East Area, 17 in the 200 West Area, 1 in the 200 North Area, and 5 isolated OUs.

In May 1989, the Washington State Department of Ecology (Ecology), U.S. Department of Energy (DOE), and EPA entered into an interagency agreement, the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1990), which established a compliance and cleanup program for the Hanford Site. The agreement covers all CERCLA past practice, *Resource Conservation and Recovery Act of 1976* (RCRA) past practice, and RCRA treatment, storage, and disposal (TSD) activities on the Hanford Site.

The 1991 revision to the Tri-Party Agreement (Ecology et al. 1991) required that an aggregate area approach be implemented in the 200 Areas based on the *Hanford Site Past-Practice Strategy* (HPPS) (DOE-RL 1991). The HPPS was developed by Ecology, EPA, and DOE to streamline the existing remedial investigation/feasibility study (RI/FS) and RCRA facility investigation/corrective measure study (RFI/CMS) processes and emphasizes the use of interim actions to expedite the remediation process. The HPPS included three paths for interim decision making (expedited response action [ERA], interim remedial measure [IRM], and limited field investigation [LFI] paths) and a final remedy selection process. A concept advanced in the HPPS is the use of analogous data to reduce the amount of assessment needed at individual waste sites by performing assessments for groups of similar waste sites. This concept of grouping waste sites is applicable to the 200 Areas, where many waste sites share similarities in geological conditions, function, and waste disposal practices (i.e., are analogous), including the types of waste received.

The aggregate-area approach was implemented in the 200 Areas through the conduct of *Aggregate Area Management Studies* (AAMS), which were similar in nature to the RI/FS scoping process, and were intended to maximize the use of existing data to allow a more limited and focused RI/FS. Ten AAMS reports were prepared, including eight source and two groundwater aggregate area reports. The source AAMS evaluated source terms on a plant-wide (e.g., U Plant, B Plant) scale.

The need for near-term action was identified for three groundwater plumes designated as candidates for interim action in the groundwater AAMS reports. No source sites were identified that needed near-term action. In 1994, the DOE, EPA, and Ecology agreed (Ecology et al. 1994) to begin groundwater cleanup on the three high-priority groundwater contaminant plumes. As a result, three pilot-scale pump-and-treat projects were implemented, two of which have or are

leading to an interim Record of Decision (ROD) requiring additional pumping and treating. In addition, an ERA using soil vapor extraction to remove carbon tetrachloride from the vadose zone began full-scale operations in 1992. With the most immediate need for action in the 200 Areas being addressed, the Environmental Restoration (ER) Program is focusing on the source strategy to streamline the assessment and remediation of source waste sites.

This source strategy is being developed for the 200 Area waste sites where liquids and solid waste have been discharged to or buried in the ground, and the source strategy is currently within the DOE-Richland Operations Office (RL) ER Program for assessment and remediation. This strategy does not specifically address sites associated with tank farms, the Decontamination and Decommissioning (D&D) Program, or other waste management programs. Groundwater remediation is addressed in a separate document (DOE-RL 1995). This strategy recognizes the interrelationships between these programs and the need for integration to complete the final remedy selection process for the 200 Areas.

This strategy has been developed jointly by the Tri-Parties (Ecology, EPA, DOE-RL) through a series of workshops and by building on existing technical information that has been developed in the 200 Areas and practices effectively used in the 100 and 300 Areas. Contributing workshop members represent a broad base of regulatory and technical knowledge and experience in the 200 Areas, including both source and groundwater. The purpose and intent of the strategy, as discussed above, has been captured in the following vision statement:

> The 200 Areas strategy is a streamlined process of getting to and performing remediation that is technically sound, protective of human health and the environment, and publicly acceptable.

The 200 Areas are in the early stages of assessment and remediation, and a need to develop a streamlined approach to assessment and remediation has been identified. To obtain a more cost-effective and efficient approach to the 200 Areas assessment and remediation, the lessons learned in the 100 and 300 Areas assessment and remediation activities will be considered. The lessons learned include using the observational approach to adapt to actual site conditions during remediation, combining OUs, implementing the analogous group concept, and using interim actions and the "plug-in" approach to remediate high-priority waste sites quickly. This streamlined approach will also take advantage of the commonalities that exist between the different OUs in the 200 Areas and will build on the historical and scoping work already performed in the 200 Areas (e.g., AAMS). This strategy takes the historical work one step further by looking not only at each aggregate area individually, but looking collectively to identify commonalities between aggregate areas and provide a more integrated and streamlined program.

Current long-range plans show little activity in the near term for the ER Program in the 200 Areas due to the priority of emphasizing cleanup in the 100 and 300 Areas. Of the 32 source OUs (does not include tank farm OUs) in the 200 Areas, only 200-BP-1 and 200-UP-2 have

prepared and implemented work plans, and no near-term remedial actions are planned. A work plan has also been prepared for the 200-BP-11 OU; however, implementation of the plan is unscheduled.

2.0 ASSUMPTIONS AND CONSTRAINTS

This section identifies the assumptions and constraints from which the foundation and framework of the 200 Areas strategy was developed. The workshop group considered key public values that were expressed in previously published 200 Area-related documents. Assumptions and constraints are discussed below.

Assumptions

- Near-term IRM focus is on worker protection and controlling the spread of contamination, and on long-term risk reduction/remedial action, when appropriate.
- A new way of grouping sites for characterization may be needed, and the groupings may or may not be the same for remediation.
- Applicable presumptive remedies, analogous sites, and the observational approach can be used, provided that characterization (which includes, but is not limited to, historical data) information supports the items.
- The HPPS, integrated with RCRA closure requirements, will provide process steps to be used in this strategy.
- Waste or contaminated media, including transuranic (TRU) constituents and pre-1970 TRU waste, may be left in place as long as the risk associated with this in-place remediation is acceptable. Alternative technologies will continue to be assessed.
- DOE-RL shall ensure that surveillance and maintenance (S&M) are adequate for addressing surface contamination migration.
- The Tri-Party Agreement and Long Range Plan schedule dates may need to be reconciled. It is assumed that this is possible, and the strategy will be the basis for these changes.
- The 200 Areas' strategy will be developed within the scope of the environmental laws.
- Decay may be a viable remediation option for short-lived (half-life of approximately 30 years or less, [e.g., Cs-137, Sr-90, Co-60]) radionuclides.
- Integration with other ER projects or Hanford Site programs will occur.

- Waste generated from remedial activities in the 200 Areas (except for TRU waste) will be managed (to include treatment and/or disposal) on the Hanford Site.

Constraints

- Funding is a constraint to developing schedules, not to the strategy. The priority 100 and 300 Areas is recognized.

Certain assumptions have been applied or addressed directly in this strategy, whereas other assumptions and constraints will be applied at the appropriate step in the implementation process or will be applied during the long-term planning process.

3.0 WASTE-SITE GROUPING OPTIONS AND EVALUATION CRITERIA

The grouping of waste sites is the first step in the assessment process following the 200 Areas Source Strategy document; the results will be identified in the Technical Document (Figure 1). The grouping of the sites has historically been based on an OU approach and has resulted in 42 OUs (i.e., 32 source OUs, 6 tank farm OUs, and 4 groundwater OUs). The intent of defining the OUs was to group associated waste sites together that resulted in geographically based OUs, with approximately the same number of waste sites.

Opportunities exist to streamline the remedial action process by applying the analogous site approach used in the 100 and 300 Areas to assemble waste site groups based on similar characteristics such as physical structure, function, and types of waste received. Waste sites can be grouped across OUs, aggregate areas, or the 200 Areas. These groupings can then be used to streamline the assessment process by focusing the characterization effort on a limited number of specific waste sites that represent the group. The representative site data can then be used to make remedial action decisions for all sites within a group. Sampling of individual waste sites is expected to be required before remedial design to confirm that remedial action decisions, based on the analogous site approach, are appropriate and to provide data needed to design the remedy.

As part of the grouping process, it is expected that sites may be identified that will not require characterization and/or remediation. In some cases, sites may be determined to be nonhazardous and nonradioactive, and it may be appropriate to remove them from further consideration under the Tri-Party Agreement. In other cases, minor actions (e.g., housekeeping) may be performed to remove contaminated or suspect contaminated debris and surface soil, substantially streamlining the CERCLA process. As these sites are identified, the waste site reclassification process being used in the 100 Areas will be used in the 200 Areas.

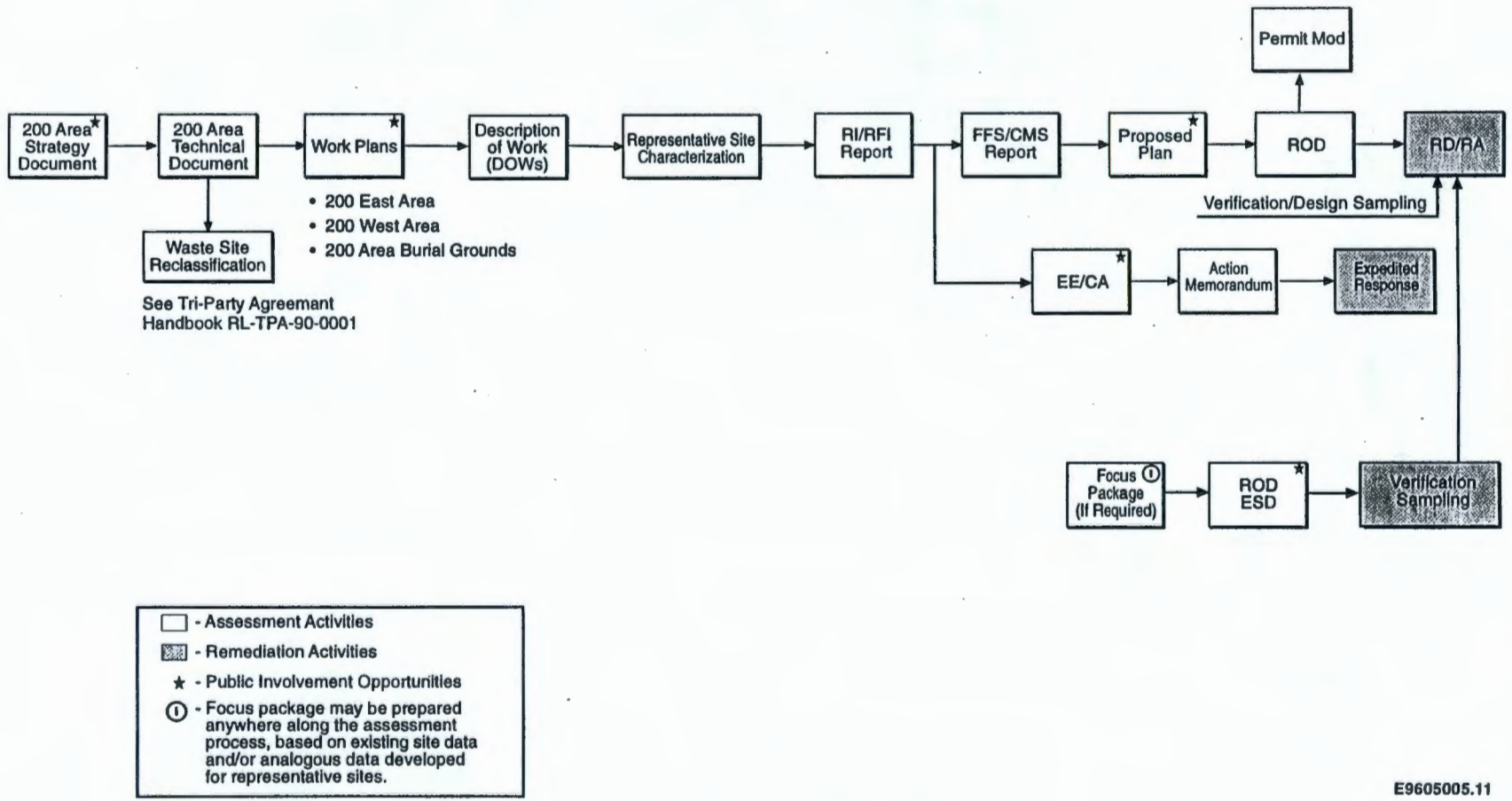


Figure 1. 200 Areas Implementation Flowchart.

3.1 CHARACTERIZATION GROUPINGS

Waste site groupings will provide the basis for organizing characterization activities and can be assembled based on a set of criteria. These criteria are discharge type (e.g., solid waste, cooling water, process water), followed by waste-site type (e.g., pond, crib, ditch). It was determined that these criteria would provide the most efficient method of grouping waste sites, based on what is currently known about the facilities that generated the waste and the waste sites themselves.

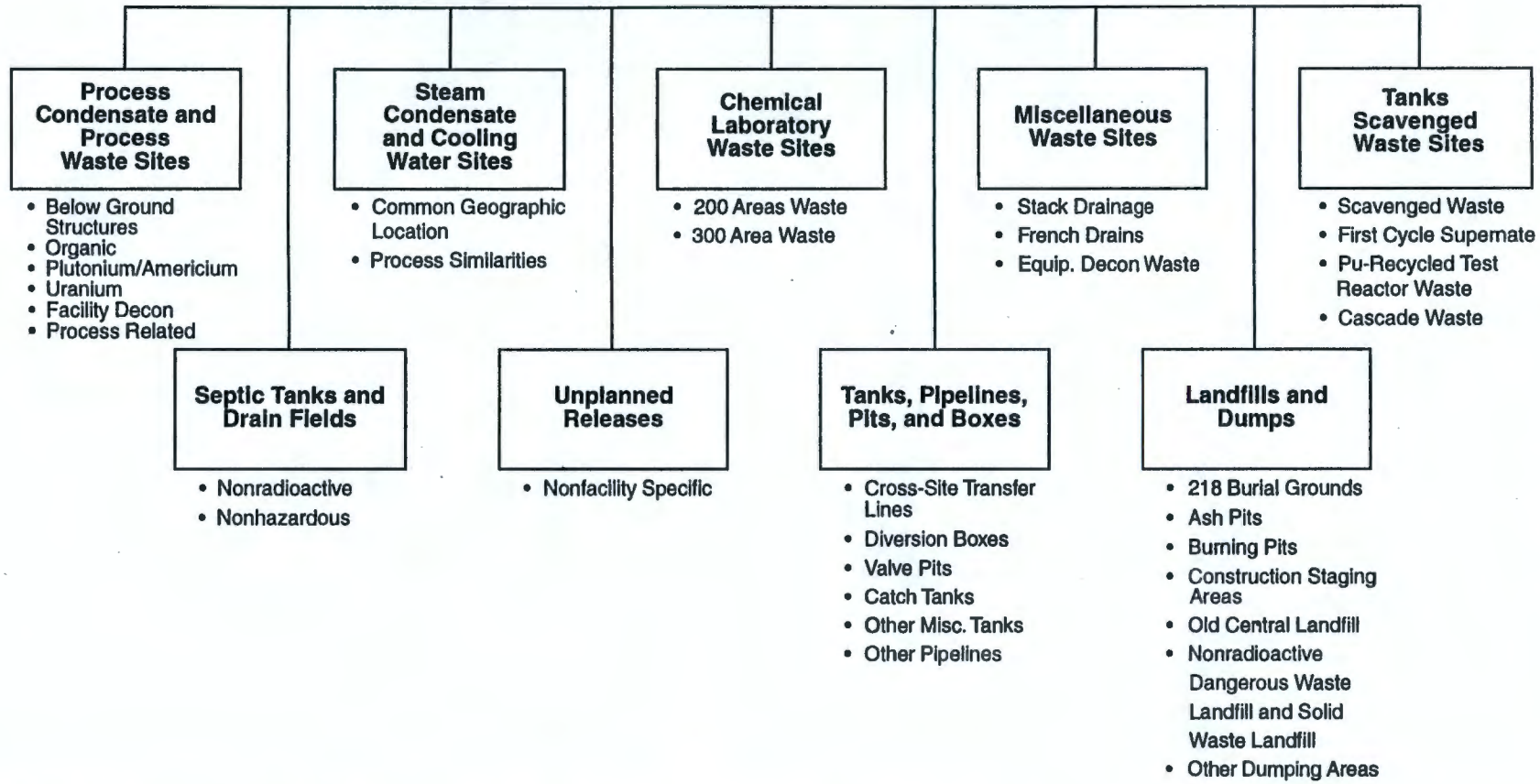
Using this methodology, grouping the waste sites for characterization purposes resulted in nine major groupings (Figure 2). To be able to provide flexibility in establishing specific conceptual models, preliminary subgroupings were developed within the major groupings. These subgroupings were based on contaminant type (e.g., organic, acidic, uranium, plutonium, inorganic) and waste-site type.

The placement of waste sites in the groupings will be done using a systematic review of available historical data for every waste site, including the use of the AAMS reports, the Waste Information Data System (WIDS), and other related published documents. An initial review of all waste sites was performed for (1) description of where the waste came from (process or processes responsible), (2) type of contaminants discharged (inventory history), (3) type of waste site, (4) volume of liquid discharged, and (5) geohydrological conditions, such as potential driving forces in the vadose zone. A more extensive evaluation of the groupings will be performed before developing the work plans. Categories such as "miscellaneous sites" and "unplanned releases" may be eliminated (if all waste sites anticipated to be in these groups can be incorporated into the other groups) or other groups may be added (e.g., miscellaneous sites may expand into two groups). The refinement of the subgroup levels will be part of the more extensive evaluation. The rationale for establishing groups and subgroups is further discussed in Appendix A.

This more detailed evaluation will also include selecting a representative site, along with the refinement of the groups/subgroups and placing 200 Area waste sites into their respective groups. The representative sites will be selected based on existing information and how the waste sites fit as a "typical" or "worst-case" (i.e., has the greatest amount and extent of contamination) site for the waste sites within the group. Therefore, the data obtained from characterization activities for this representative site can be used for all sites within the group for remedial alternative evaluation and selection. More than one site may be required to ensure that all pertinent information can be collected.

3.2 REMEDIATION GROUPINGS

Data collected during characterization will be used to refine waste site groups for remediation. Groupings may be based on geographic location so the sites within a general area are remediated at the same time to reduce mobilization costs and to take advantage of economies of scale or to support the remediation of outlying areas (e.g., buffer zone). Groupings are also expected to be



Excluded: Single- and double-shelled tanks and everything within tank farm fences and ancillary facilities.

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Figure 2. 200 Areas Source Waste Site Groups.

influenced by site priorities, the remedy selected, and coordination needs from other programs. Remediation waste site groups will build on the "plug-in" approach to remediation. The plug-in approach, developed by EPA (1993), is consistent with the analogous site approach and links sites that have similar characteristics (e.g., physical attributes, contaminants, and contaminated media). Knowledge gained from previous studies and actions provides the basis and justification for subsequent actions at similar sites. If an individual site is sufficiently similar to (or compatible with) sites for which alternatives have already been developed and analyzed, the subject site is said to "plug in" to the analysis for that group, and a full analysis for the subject site is not necessary.

4.0 STRATEGY APPROACH AND IMPLEMENTATION

The overall approach to the 200 Areas strategy has been captured in the flowchart shown in Figure 1. This flowchart breaks the strategy down into several broad, high-level steps. The detail within these steps is discussed in subsequent sections. The key elements of this flowchart are as follows:

- The Strategy Document develops the overall approach to assess and remediate the 200 Areas (Section 3.1).

- The Technical Document will identify the final waste groups, prioritize groups (for characterization), and identify representative sites to support future work plan development.

- Work plans and Descriptions of Work (DOW) will describe the characterization approach and scope for representative sites identified in the Technical Document.

- Characterization data collected for each representative waste site will be documented in a RI/RFI report and used to evaluate and select the remedy for all sites associated with (i.e., in same group) a representative site (focused feasibility study [FFS]/CMS report and proposed plan). This effort will support the issuance of a ROD (and will be supplemented by a permit modification, if needed). Waste site groupings developed for characterization would be modified to facilitate remediation (Section 3.2). If the characterization data indicate a need for an immediate action, a removal action will be performed supported by an engineering evaluation/cost analysis (EE/CA) and an action memorandum.

- For sites that do not have site-specific characterization data, limited verification sampling will be performed in parallel with the remedial alternative selection process (proposed plan and ROD) and/or in association with remedial design/remedial action. This verification sampling effort is performed on a site-by-site basis to verify that the site fits the representative waste site group, verifies the applicability of the conceptual model to the particular waste site, and will provide necessary data to support remedial design.

- The RI/FS, FFS/CMS, and proposed plan will be condensed into a brief summary document; focus packages can be used where sites (because of similarities) are able to benefit from existing site-specific and analogous data or documentation.

Pre-ROD characterization activities will be optimized by maximizing the use of geophysical techniques, field screening techniques, and test pits (in lieu of boreholes) to streamline the process. Characterization is intended to provide a technically sound basis for future decision making, will focus on the ultimate goal of remediation, and will consider this in the establishment of types and location of characterization sampling. Additional discussion on the level of characterization needed to support the strategy is provided in Appendix C.

The general approach to remediation is to cap waste in place for sites with high levels of contamination, to remove contamination at sites that exhibit high levels of spotty contamination or lower levels of persistent contamination over a broad area, and no action at sites where risks are demonstrated to be acceptable or where natural attenuation (e.g., decay of short-lived radionuclides) is an effective remedy. In general, this approach results in placing engineered barriers at sites located within the 200 Areas fenceline and removing actions at sites outside the fenceline (i.e., 200 Areas buffer zone). Sites that have mobile contaminants deep in the subsurface and have the potential to impact groundwater may require some level of treatment (preferably in situ).

Based on the strategy's concepts and approach (as outlined in Sections 3.0 and 4.1), the workshop group considered that the current Tri-Party Agreement requirement of preparing a work plan for each OU was not consistent with the strategy. The workshop group developed and evaluated the following options to prepare work plans: (1) by major waste site group for a total of approximately nine work plans; (2) by plant (e.g., B Plant) or aggregate area for a total of approximately six work plans; (3) by a single, all-encompassing work plan; and (4) by the 200 East and 200 West Area, except for burial grounds that would be addressed separately for a total of three work plans. The fourth option (three work plans) was considered to be the most efficient means of applying the strategy while maximizing the number of documents produced.

4.1 ASSESSMENT

The documentation steps (starting with this strategy) that lead to a ROD, permit modification, or action memorandum (Figure 1) are considered part of the assessment phase of the ER Program. A discussion of each assessment step is provided below.

4.1.1 Technical Document

The Technical Document will identify the final waste site groupings and associated representative sites, as discussed in Section 3.0. The groups will be prioritized based on criteria outlined in Appendix B. Finally, conceptual models will be prepared for each group to predict the nature, extent, fate, and transport of primary contaminants. The selection of representative sites and development of conceptual models in the Technical Document will provide the basis for

future work plans. The RCRA TSD sites will be incorporated into the grouping process and where several representative sites can be used for characterization, the RCRA TSD sites will be given preference when final representative sites are selected. The integration of the RCRA TSDs are intended to meet the RCRA TSD closure characterization requirements.

4.1.2 Waste Site Reclassification

During the review of the sites for the Technical Document effort, all ER sites will be evaluated to determine whether there are any candidates that may be reclassified as "rejected," "closed out," "deleted from NPL," or "no action" sites. A procedure is currently being developed for the Tri-Party Agreement Handbook Guideline TPA-MG-08 to reclassify sites and will be followed when approved. Reclassified sites will be kept in a separate list for tracking purposes. Candidates for reclassification may include instances where (1) waste disposal facilities were constructed but not used, (2) duplicate labeling exists for a waste site produced by an unplanned release, (3) sites have been cleaned up, (4) the contamination has decayed to background levels, (5) sites were misclassified as a waste site, or (6) a voluntary action may remediate a site. All reclassifications are expected to be based on data packages provided to the Tri-Party Agreement reclassification team and will require reclassification approval from the team.

4.1.3 Work/Closure Plans

Work plans establish site characterization needs by (1) evaluating existing data, (2) developing conceptual models, and (3) identifying data needs and data quality objectives (DQO). Data are generally needed to refine the conceptual model and support an initial assessment of risk. Based on the DQOs, investigation tasks, including sampling and analysis requirements, are defined. The RCRA TSD closure plans perform a similar function by defining characterization needs to support closure of the site. The RCRA TSD closure sites will be addressed (along with other past-practice sites) and will result in an integrated work/closure plan that satisfies RCRA TSD closure documentation needs (the format will follow the general structure of CERCLA work plans).

Three work plans will be prepared: one for 200 East Area, one for 200 West Area, and one for 200 Area Burial Grounds. The three work/closure plans will describe the general approach to characterization of 200 Area representative waste sites and will include Health and Safety, Quality Assurance Project, Data Management, and Project Plans. The Technical Document, AAMS reports, and other related scoping documents (such as the Aggregate Area Technical Baseline Reports) will be referenced to provide key information relating to waste site descriptions and contaminants of concern. If a presumptive remedy can be identified for a particular site early in the RI/FS process, the work plan will focus on data collection to confirm the use and design of the presumptive remedy.

4.1.4 Descriptions of Work

The DOWs provide site-specific details of field activities outlined in the work/closure plans. For example, borehole or test-pit designs and locations are finalized and specific sample points are

identified. The DOWs function as a guide to perform field work and identify specific methods and procedures. The DOWs will be prepared based on waste site groups and, therefore, focus on characterizing representative sites associated with a particular waste group. The DOWs will include a schedule for subsequent assessment documentation for that particular waste group.

4.1.5 Remedial Investigation/RCRA Facility Investigation Report

A RI/RFI report documents the results of the field investigations, provides refinements to the conceptual model developed in the work/closure plans, updates the list of contaminants of concern, and provides a summary assessment of risks. The report may identify the need for interim actions if current risks are demonstrated to be unacceptable. The RI/RFI report serves as a primary source of information to prepare a FFS/CMS and subsequent remedial action decision documents (e.g., proposed plan and ROD). If a RCRA TSD site is to be addressed, the report will be modified, as necessary, to include closure plan documentation requirements to support a permit modification.

Reports will be prepared upon the completion of field activities. The scope of these reports will be limited to representative waste sites consistent with the implementation of fieldwork. The RI/RFI reports of this type are referred to as LFI reports. If characterization of more than one waste group occurs in the same timeframe, the results may be combined under a single report to minimize the number of documents.

4.1.6 Focused Feasibility Study/Corrective Measure Study

The purpose of FFSs or CMSs is to develop, screen, and analyze remedial alternatives. Developing viable remedial alternatives requires the development of remedial action objectives and general response actions, identifying and screening of technologies and process options, assembling and screening remedial alternatives, and refining applicable or relevant and appropriate requirements. A detailed analysis of alternatives is performed and mainly consists of evaluating each alternative against EPA criteria (EPA 1988). The results of the detailed analysis provide the basis to identify a preferred alternative and prepare a proposed plan. Where RCRA sites are included in waste groupings, the RCRA TSD closure requirements will be integrated into the FFS/CMS report.

The FFS/CMS will be developed using information contained in existing documentation and will be collected through 200 Areas work/closure plans. In particular, AAMS reports provide an initial level of evaluation (similar to a Phase I FS) that generally addresses all waste sites in the 200 Areas and provides the basis for subsequent FFS/CMSs. This effort will establish the number of alternatives considered. If a presumptive remedy can be applied at a particular site, the range of alternatives would be limited to the presumptive remedy and no action. The reports will be based on representative waste sites that have been characterized for a particular group, but the results will apply to all sites within that group. Multiple groups may be addressed under a single report to minimize the number of documents.

4.1.7 Proposed Plan

The proposed plan provides the public with a summary of the work performed and alternatives considered (e.g., RI/RFI and FS/CMS) and proposes a remedial alternative for specific waste sites. If a RCRA TSD site or RCRA corrective action site is to be addressed by a proposed plan, the plan will include closure plan documentation requirements to support a permit modification. Based on public comments and concerns regarding the proposed plan, the remedy selection process is finalized and documented in a ROD.

4.1.8 Focus Package

Focus packages may be used to further streamline the process for particular waste sites and can be applied anywhere along the assessment process. Focus packages are used when the work plan or characterization activities indicate that there is either minimal need for remediation or that remedial action would follow a similar path already performed at similar waste sites. The focus package explains why additional evaluation/analysis and documentation remedial alternatives is not required, provides the site-specific information needed to complete the remedy selection process, and supports the issuance of a ROD or explanation of significant difference (ESD) to an existing ROD. This approach is applicable to analogous waste sites within a particular group where the associated representative sites have been characterized and remediated. In this case, verification sampling of the analogous sites may be required to demonstrate that analogous conditions exist.

4.1.9 Record of Decision, Explanation of Significant Difference and Permit Modification

The RODs are decisional documents (prepared by the lead regulatory agency) that select the remedial alternative. Decisions for RCRA sites are also documented by modifying the Hanford site-wide permit. The decision documents (ROD, permit modification) will be structured to provide a streamlined and flexible means of achieving remedial action. In particular, the ROD/permit modification will be structured so the decision document can contain waste sites from different work plans or characterization groups. An ESD will be used to the maximum extent possible to incorporate additional waste sites into existing RODs and expedite remedial alternatives selection and approval.

4.1.10 Engineering Evaluation/Cost Analysis and Action Memorandum

Emphasis will be placed on performing removal actions, in lieu of the remedial action process, to expedite remedial field activities. Removal actions are used when it is appropriate to accelerate remedial activities and the number of remediation options is limited. Removal actions have been successfully implemented at several locations on the Hanford Site. Three types of removal actions exist: emergency, time critical, and nontime critical. These actions may serve as an initial response or provide a final remedy for a site. For any removal action except an emergency action, an EE/CA is prepared to provide a rapid and focused evaluation of available technologies. Based on the evaluation, the EE/CA identifies the preferred response action, provides

information on implementing the alternative, and is submitted to the regulators for review. If the response action is not time-critical, the EE/CA is made available for public review before implementing the action. An action memorandum is then issued authorizing initiation of cleanup activities. The removal action process allows actions to be completed within a relatively short timeframe.

4.1.11 Treatability Testing and Technology Needs

Treatability testing of particular technologies may be necessary to properly evaluate remedial alternatives. Treatability testing can generally involve laboratory and bench-scale tests to initially assess the feasibility of a technology or pilot-scale tests that provide data that are more representative of a full-scale process.

Decisions to conduct treatability tests can be made at any time during the assessment process; however, efficiencies can be realized if treatability testing is initiated early in the project, particularly if pilot-scale testing is needed. Pilot-scale testing can be used to initiate remedial activities, as demonstrated by the groundwater pump-and-treat projects in the 200 Areas.

The HPPS recognizes that treatability testing can be costly and time consuming. As a result, the HPPS recommends that only a limited number of promising technologies be tested early in the cleanup schedule. A technology that has broad application in the 200 Areas and is currently being tested in association with the 200-BP-1 OU, is engineered covers or barriers. The unique environment (i.e., arid) and design requirements (e.g., up to 1,000 year design life) for the 200 Area covers (DOE-RL 1996b) necessitates the use of select materials that are atypical of the standard RCRA-type cover. The performance life of these materials/cover system has not been established and is recognized as a significant data gap. Other general technology development needs that have been identified for 200 Area waste sites include in situ treatment of deep and mobile contaminants and advanced characterization methods, particularly those that apply nonintrusive techniques. Testing of promising technologies will require support from the DOE Office of Technology Development (OTD) (Section 6.0).

4.2 REMEDIATION

The steps following the issuance of a ROD are considered part of the remediation phase of the ER Program and include verification sampling and remedial design/remedial action. A discussion of each of the remediation steps is provided below.

4.2.1 Verification/Design Sampling

For sites with decision documents based on analogous site information, sampling will be performed to verify that analogous conditions exist and that the remedial alternative decision is appropriate. The approach to verification sampling will be to maximize the use of nonintrusive techniques and field screening analytical techniques. Alternatively, these data can be collected before issuing a ROD. In addition, the list of analytes to be addressed will be limited, relying on

key constituents or indicator parameters. If the sampling is alternative-specific, these data should not be collected until there is reasonable assurance of the remedial alternative that will be selected. In addition to or in combination with verification sampling, sampling may also be performed to support remedial design.

4.2.2 Remedial Design Report/Remedial Action Work Plan

The primary purpose of the *Remedial Design Report/Remedial Action Work Plan* (RDR/RAWP) is to summarize the design and the implementation process for remedial actions required by a ROD. The RDR and RAWP will be combined, consistent with 100 Area lessons learned, to streamline the documentation process. The document will address all waste sites (included in the ROD) and will establish a project schedule.

5.0 PRIORITIES AND SCHEDULE

The 200 Areas remedial action work will span a multiyear timeframe. A schedule is required in the 200 Areas that identifies what activities will be focused on and given priority over other activities. Sites that pose an unacceptable risk will have the highest priority for characterization and remediation activities. The activity can range from performing a short-term solution as part of existing programs such as S&M (thus reducing its priority), performing a removal action to alleviate the problem, or including this work in the earliest possible ROD or other decision document. Other high-priority work will be associated with technical or technological development that is needed before implementing full-scale activities.

Once high-risk sites are addressed, sites with less priority (i.e., sites that will ultimately require remediation, but not immediately) will be prioritized according to criteria developed for the characterization and remediation groups.

5.1 CRITERIA FOR CHARACTERIZATION PRIORITIES

Criteria have been developed from which characterization priorities will be established for each waste site group. Characterization priorities will be established as part of the ranking process for waste site groups in the Technical Document.

Conditions that would rank a group high in priority include whether sites within the group will impact groundwater in the immediate future (i.e., will create a new groundwater plume) or demonstrate a high potential for impacting groundwater because of the relatively high mobility of contaminants or waste associated with the sites. Groups that can be represented well by a small number of sites and groups that are relatively simple and straightforward to characterize or remediate would also receive a higher priority than groups without these characteristics.

Conditions of intermediate importance are whether sites within the group are currently contaminating groundwater (i.e., groundwater plume already exists), generally lack characterization data (including historical data), are located outside the 200 Area fenceline or exhibit low levels of contamination over a broad area and are suitable for testing promising treatment technologies.

Conditions that are considered to be of relatively lesser importance include if groundwater has been impacted in the past (i.e., sites no longer contribute to groundwater contamination) or the presence of an external driving force or persistent contaminants. Sites that pose a risk due to surface contamination would also not receive a priority for characterization because they would receive priority and be addressed through the Radiation Area Remedial Action (RARA) Program.

The specific criteria and associated rankings (high, medium, or low) are outlined in Table 1. Key assumptions that will serve as a guide in applying the criteria include the following:

- A site must exhibit a known driving force and contain a known inventory of mobile contaminants to be considered as a potential contributor to groundwater contamination.

- Future groundwater impacts are defined as impacts expected to occur in the next 5 to 10 years.

- A good representative site is a site that represents a large (maximum) number of sites rather than only a few sites.

- Only surface exposure and the associated risk to onsite workers should be considered when assessing current risks.

- When assessing the mobility of contaminants and understanding the chemistry, the assessment will be made for the group as a whole (not individual sites) and be limited to contaminants/constituents of concern. Both physical and chemical factors will be considered when assessing contaminant mobilities. The effect of chemical complexing on contaminant mobility will be assessed, when applicable.

- An easier site is one that is physically easier to characterize (e.g., only nonintrusive testing and a low level of worker protection is needed) such that characterization activities can be completed in a relatively short timeframe. A site requiring boreholes and a high level of worker protection is considered difficult.

Table 1. Characterization Priorities.

Specific Criteria	Criteria Ranking
Groundwater has been impacted in the past.	Low
Groundwater is presently being impacted.	Medium
Groundwater will be impacted in the immediate future (5 to 10 years).	High
Mobile constituents (versus less mobile constituents) are present.	Med-High
Driving forces exist that are external to the waste sites.	Low
Characterization information, including historical data, is limited or nonexistent.	Medium
The chemistry promoting contaminant migration (increasing mobility) is poorly understood.	Med-High
Good representative sites (maximum number of sites addressed) are available.	High
Long-lived (versus short-lived) contaminants are present.	Low
Sites pose a current risk (surface threat) - assumes RARA Program provides short-term action to lower its priority.	Low
Low levels of contamination are expected over a large area.	Medium
Sites are located near perimeter of plateau/outside the 200 Area fencelines (versus inside the fenceline).	Medium
Easier (versus more difficult) to characterize and/or remediate.	High
Suitable for testing promising technologies.	Medium

5.2 CRITERIA FOR REMEDIATION PRIORITIES

Remedial action prioritization criteria have been developed and grouped into primary and secondary criteria. The primary criteria shall be predominantly considered in establishing priorities.

The primary criteria are as follows:

- Sites that have high risk/current spread of contamination should be remediated first. (No sites have currently been identified in this category that are not already being addressed. If a site is identified in the future, then an evaluation of what appropriate action is needed will be performed. This evaluation will factor in the remaining remedial action prioritization criteria.)

- The proximity to other facilities/site infrastructure will establish remedial action priorities. (For those facilities that are being remediated, the waste sites near that facility should be included in the facility remediation. The waste sites that are near facilities/site infrastructure that will not be remediated in the near term should not be given a high priority. A waste site near existing facilities/infrastructure that, if remediated, could impact the existing facility operation would be given a low priority.)

- Waste site remediation that would show early progress should be a high priority.

- Focus on removing/stabilizing remedial actions for the short term and capping for the long term. (This criterion does not imply a preference to remove/stabilize over capping, but when a remedial alternative of remove/stabilize is selected, these remedial actions are preferred to be performed before remedial actions that involve a cap to emphasize removal actions relative to leaving waste in-place. The sites that require a cap should also be dealt with collectively and should be grouped such that a single or fewer caps will be used to address multiple waste sites. Remedial action selection for all waste sites is not anticipated to be completed before the start of remedial action in the 200 Areas.)

The secondary remedial action prioritization criteria are as follows:

- Prioritize remedial actions that allow for coordination of worker skills. (Remedial actions that require certain worker skills, such as vitrification, should be grouped together to maximize the efficient use of these worker skills.)

- Coordination with other programs is required. (Where a need arises due to other 200 Area programs to delay or expedite a remedial action, these considerations need to be factored in when establishing the priorities for waste site remediation.)

- Where possible, waste sites should be remediated starting from the areas outside or within the buffer zone and working inward toward the WM areas.

- Sites that are considered easier to implement remedial actions should be considered over sites that are more complex to remediate.

- Efficiency gained by remediating/consolidating large geographic areas should be considered in prioritizing waste site remediation. (Consolidating material to minimize cap area and prioritizing work so all work in a specific geographic location is performed at one time should be considered.)

5.3 SCHEDULE AND MILESTONES

Figure 3 provides a schedule that implements the 200 Areas Source Strategy. The schedule indicates that the year 2008 Tri-Party Agreement milestones to complete characterization activities can be met. The schedule assumes that the additional funding needs will become available to support the schedule (i.e., current funding profile does not support the schedule). In addition to characterization funding needs, an additional $2 to 3 million per year will be needed, as a minimum, to sustain a cost-effective level of remediation starting in fiscal year (FY) 2002 through 2008.

Following approval of this source strategy, Tri-Party Agreement milestones will be updated accordingly. Currently, interim Tri-Party Agreement milestones are established based on the submittal of source OU work plans. These milestones will be redefined to reflect the submittal of three work/closure plans (200 East Area, 200 West Area, and 200 Area Burial Grounds) and associated DOWs. The schedule assumes that 24 DOWs will be prepared; however, the number of DOWs that will ultimately be required will be based on the waste site groups established in the Technical Document. In addition, for planning purposes, 24 characterization activities, characterization reports, and FSs are assumed. However, is as expected that additional consolidation of documents will occur consistent with the strategy. Six proposed plans and RODs are planned to year 2009, after which additional streamlining of the decision process is expected by using ESDs and focus packages. Active remediation in the field is planned to start in 2002.

The 216-B-3 Pond, 216-B-63 Trench, and 216-A-29 Ditch will not be integrated into the strategy to accommodate the existing year 2000 permit modification milestone. These RCRA TSDs will be addressed separately following the existing RCRA TSD closure process outlined in the Tri-Party Agreement.

To support the long-range planning process, several assumptions will be required to estimate costs. These assumptions will be based on the characterization and remediation approaches and criteria developed in Sections 4.0, 5.1, and 5.2.

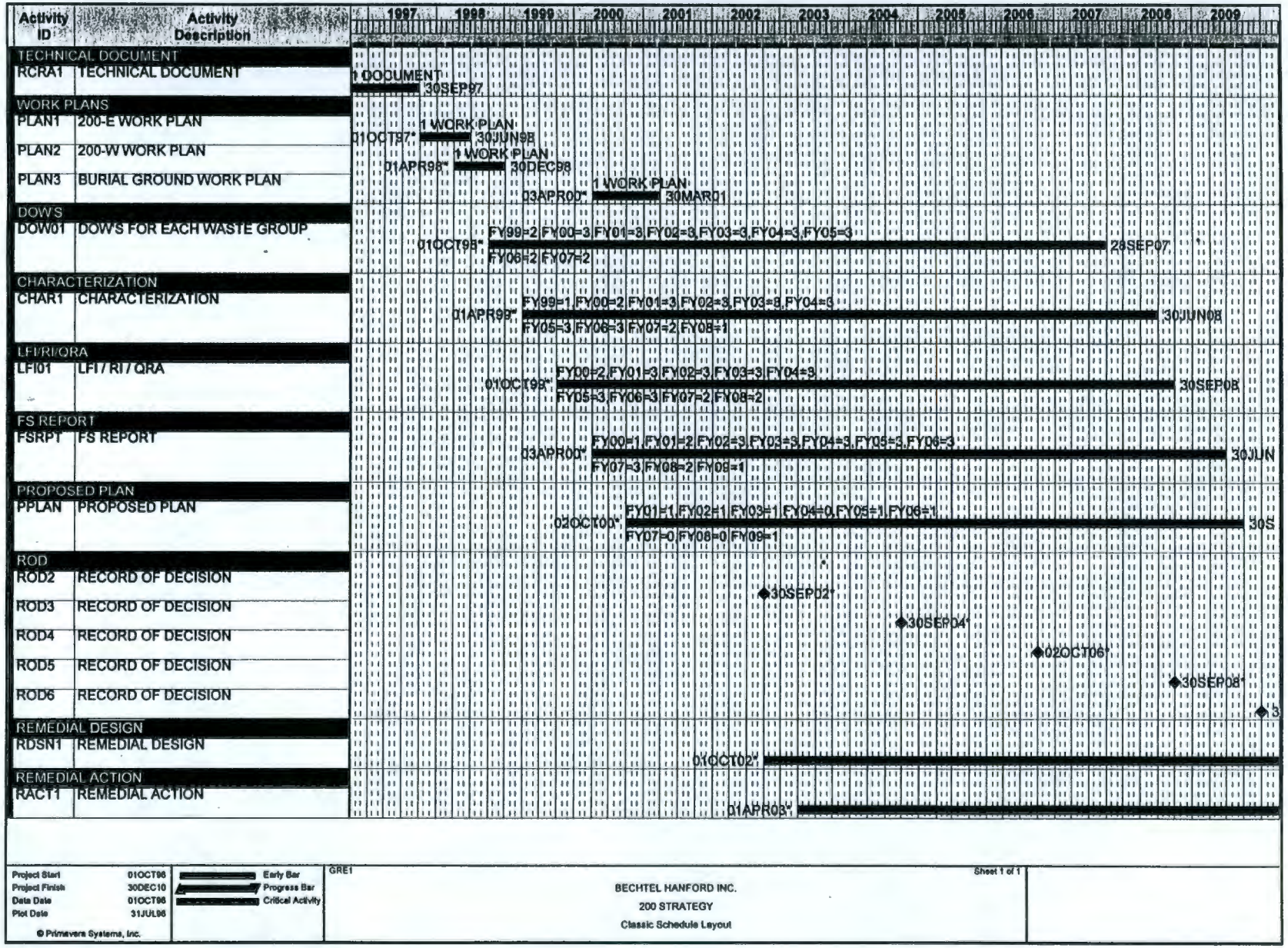


Figure 3. 200 Areas Source Strategy Schedule.

6.0 INTEGRATION NEEDS

Within the Hanford Site there are several ongoing programs that may impact or be impacted by ER (EM-40) activities. These programs include WM (EM-30), Facility Transition and Management (EM-60), and Technology Development (EM-50) Programs. In addition, several projects exist in the ER Program that are active in the 200 Areas and require integration. Sections 6.1 and 6.2 provide a brief discussion of each program and identify mechanisms that are currently in place to support integration of the programs.

The 200 Areas Source Strategy development team, which includes the Environmental Restoration Contractor (ERC), DOE, and regulatory agencies, provides a level of interface with other programs through their involvement in, or oversight of, other Hanford Site programs, projects, or work groups, and include the following:

- Ecology D&D Strategy Work Group
- Facility transition supporting Tri-Party Agreement Amendment
- Canyon Initiative Team
- B Plant Transition
- RCRA Closures and Permitting
- Groundwater Remediation
- Tank Waste Remediation System (TWRS)
- 100 and 300 Area Remediation Projects
- Environmental Restoration Disposal Facility
- Low-Level Burial Grounds
- B-Pond Closure.

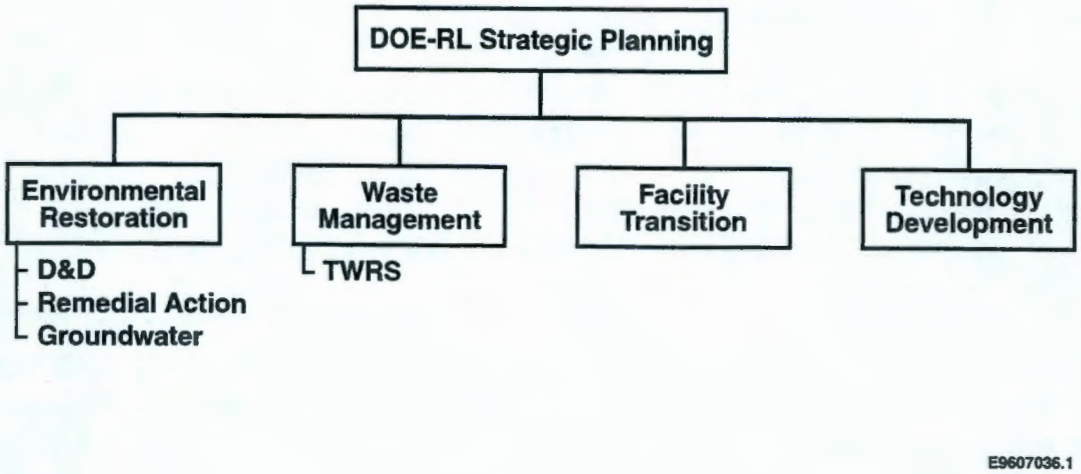
Following completion of the 200 Areas Source Remediation Strategy, the information will be incorporated into the DOE-RL strategic planning process (Figure 4) and other existing planning mechanisms identified below. Integration needs will be reviewed annually through meetings with the various programs and the strategic planning process.

6.1 ENVIRONMENTAL RESTORATION PROGRAM

The ER Program is responsible for assessing and remediating inactive hazardous and radioactive facilities and waste sites, including past-practice and RCRA TSD closure sites. The ER Program consists of several projects, including Remedial Actions and Waste Disposal, Groundwater Remediation, N Area (100 Areas), and D&D Projects. The 200 Area source waste sites addressed by this strategy are part of the Remedial Actions and Waste Disposal Project. The ER Project Long Range Plan provides an integrated technical, cost, and schedule baseline for the various projects.

Integration needs have been identified at various levels within the ER Program. Several OUs within the 200 Areas have completed various levels of assessment work and include the

Figure 4. DOE-RL Integration and Planning Process.



200-BP-1, 200-UP-2, and 200-ZP-2 source OUs, and 200-UP-1, 200-ZP-1, 200-BP-5 and 200-PO-1 groundwater OUs. The 200 Areas source work to date has been based on the OU approach to organizing waste sites.

Sites within these source OUs will be included in the grouping process during the application of the 200 Areas Source Strategy implementation process. The exception being the 216-B-3 Pond, 216-B-63 Trench, and 216-A-29 Ditch in the 200-BP-11 OU. These RCRA TSD sites will not be integrated into the strategy to accommodate the year 2000 permit and modification milestone. Previously characterized sites may serve as representative sites to take advantage of characterization work that has already been performed.

Interim groundwater remediation efforts are currently underway in the 200-UP-1 and 200-ZP-1 groundwater OUs. Integration of source and groundwater projects will primarily be required in the long term to implement final remedy decisions for the 200 Areas. However, a more immediate need for groundwater/source integration exists in the Z Plant area where extensive carbon tetrachloride contamination exists in both the vadose zone and groundwater. The 200-ZP-2 vapor extraction ERA is currently limited to four cribs. However, an expanded treatment program may be needed to address other areas of carbon tetrachloride contamination in the vadose zone in the 200 West Area.

Integration with D&D projects occurs at three levels. One level is provided by the RARA Program, which performs S&M at selected waste sites and interim stabilization of select inactive waste sites in the 200 Areas, if required. An annual report supplies information on the past years' S&M activities. Interim stabilization that may be required at a particular waste site is planned to include project input to ensure that the activity is consistent with possible CERCLA remedial actions. The information in the annual report is used to update the WIDS system to ensure that current status on waste sites is available. The second level of integration occurs during the facility transition process where the 200 Areas Project Manager is involved in the review and acceptance of waste sites associated with the facility. The third level occurs when the long-range plan is updated yearly and the planned CERCLA and D&D activities are reviewed for possible impacts. In addition, there is cross-project participation in strategy workshops, such as the current/ongoing canyon facility initiative team that is looking at alternatives for D&D of the canyon facilities.

6.2 OTHER HANFORD SITE PROGRAMS

The WM Program manages waste generated on the Hanford Site, including the storage, treatment, and processing of defense high-level radioactive waste (HLW), waste minimization efforts and corrective actions at WM facilities. Numerous subprograms within WM exist on the Hanford Site, including TWRS, Solid Waste Management (SWM), Liquid Effluent, Spent Nuclear Fuels (SPN), Landlord, Analytical Services, and RCRA Operations and Monitoring. An initial integration meeting with TWRS has been held, and other meetings are planned with WM programs.

The Facility Transition and Management Program must ensure that shutdown facilities are brought to a deactivated state, maintained, and eventually decontaminated and/or decommissioned or released for other uses.

The DOE OTD must develop technologies to meet DOE's ER goals and work closely with other ER programs to identify, develop, and implement innovative technologies. The DOE OTD has established five focus areas to address DOE's most pressing technology development needs, including (1) contaminant plume containment and remediation; (2) mixed waste characterization, treatment, and disposal; (3) high-level waste tank remediation; (4) landfill stabilization; and (5) D&D. Because of the unique nature of waste contamination in the 200 Areas and the lack of proven and cost-effective technologies, the need to evaluate promising technologies is recognized as an essential step to remediate the 200 Areas. The ER Program continues to actively work with DOE OTD to identify promising technologies and acquire the necessary support to evaluate/implement those technologies.

The Hanford Site Integrated Schedule (HSIS) identifies Hanford Site programmatic interfaces and site critical paths providing a high-level integrated plan. The HSIS provides a forum for dissemination of high level summary schedule information between the various site programs, the stakeholders, and regulatory bodies. It provides a mechanism to integrate, analyze, and monitor Hanford Site Programs.

The *Draft Hanford Mission Direction Document* (DOE 1996a) recognizes that the diversity and duration of activities necessary to remediate the Hanford Site requires an overall perspective be taken in mission planning and execution. This document defines the scope, requirements, and interfaces, for Hanford's mission, and discusses the strategic thinking done to date by RL, with support from the Hanford Site contractors. The document is designed to be periodically updated and provides a mechanism to incorporate the 200 Areas Source Strategy into the RL strategic planning process.

7.0 REFERENCES

DOE-RL, 1991, *Hanford Site Past-Practice Strategy,* DOE/RL-91-40, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1995, *Hanford Sitewide Ground Water Remediation Strategy,* DOE/RL-94-95, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1996a, *Draft Hanford Mission Direction Document*, DOE/RL-96-14, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1996b, *Focused Feasibility Study of Engineered Barriers for Waste Management Units in the 200 Areas*, DOE/RL-93-33, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, EPA, and DOE-RL, 1990, *Hanford Federal Facility Agreement and Consent Order,* (First Amendment) 89-10-Rev. 1, Washington State Department of Ecology, Olympia, Washington, U.S. Environmental Protection Agency, Region X, Seattle, Washington, and U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, EPA, and DOE-RL, 1991, *Hanford Federal Facility Agreement and Consent Order Change Package,* Washington State Department of Ecology, Olympia, Washington, U.S. Environmental Protection Agency, Region X, Seattle, Washington, and U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, EPA, and DOE, 1994, *Hanford Federal Facility Agreement and Consent Order*, Fourth Amendment, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

EPA, 1988, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA; Interim Final*, EPA-540/G-89/004, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1993, *Operable Unit Feasibility Study, VOCs in Vadose Zone, Indian Bend Wash Superfund Site, South Area, Tempe, Arizona*, U.S. Environmental Protection Agency, Tempe, Arizona.

8.0 BIBLIOGRAPHY

BHI, 1995, *B Plant Aggregate Area Management Study Technical Baseline Report*, BHI-00179, Rev. 00, Bechtel Hanford, Inc., Richland, Washington.

BHI, 1995, *PUREX Plant Aggregate Area Management Study Technical Baseline Report*, BHI-00178, Rev. 00, Bechtel Hanford, Inc., Richland, Washington.

BHI, 1995, *S Plant Aggregate Area Management Study Technical Baseline Report*, BHI-00176, Rev. 00, Bechtel Hanford, Inc., Richland, Washington.

BHI, 1995, *T Plant Aggregate Area Management Study Technical Baseline Report*, BHI-00177, Rev. 00, Bechtel Hanford, Inc., Richland, Washington.

BHI, 1995, *U Plant Aggregate Area Management Study Technical Baseline Report*, BHI-00174, Rev. 00, Bechtel Hanford, Inc., Richland, Washington.

BHI, 1995, *Z Plant Aggregate Area Management Study Technical Baseline Report*, BHI-00175, Rev. 00, Bechtel Hanford, Inc., Richland, Washington.

DOE-RL, 1991, *Hanford Past-Practice Strategy*, DOE/RL-91-40, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1992, *Remedial Investigation/Feasibility Study Work Plan for the 200-UP-2 Operable Unit, Hanford Site, Richland, Washington,* DOE/RL-91-19, Draft C, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1992, *U-Plant Source Aggregate Area Management Study Report*, DOE/RL-91-52, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1992, *Z-Plant Source Aggregate Area Management Study Report*, DOE/RL-91-58, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1992, *S-Plant Source Aggregate Area Management Study Report*, DOE/RL-91-60, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1992, *T-Plant Source Aggregate Area Management Study Report*, DOE/RL-91-61, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1993, *PUREX Source Aggregate Area Management Study Report*, DOE/RL-92-04, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1993, *B-Plant Source Aggregate Area Management Study Report*, DOE/RL-92-05, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1993, *SemiWorks Source Aggregate Area Management Study Report*, DOE/RL-92-18, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1993, *200 North Source Aggregate Area Management Study Report*, DOE/RL-92-17, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1993, *200 West Groundwater Aggregate Area Management Study Report*, DOE/RL-92-19, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1993, *200 East Groundwater Aggregate Area Management Study Report*, DOE/RL-92-16, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1994, *200-BP-11 Operable Unit RFI/CMS and 216-B-3 Main Pond, 216-B-63 Trench and 216-A-29 Ditch Work/Closure Plan*, DOE/RL-93-74, Draft B, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1995, *Hanford Sitewide Ground Water Remediation Strategy*, DOE/RL-94-95, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, EPA and DOE-RL, 1990, *Hanford Federal Facility Agreement and Consent Order,* (First Amendment) 89-10, Rev.1, Washington State Department of Ecology, Olympia, Washington, U.S. Environmental Protection Agency, Region X, Seattle, Washington, D.C. and U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, EPA, and DOE-RL, 1991, *Hanford Federal Facility Agreement and Consent Order, Change Package*, Washington State Department of Ecology, Olympia, Washington, U.S. Environmental Protection Agency, Region X, Seattle, Washington, D.C. and U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, EPA, and DOE-RL, 1994, *Hanford Federal Facility Agreement and Consent Order,* Fourth Amendment, Washington State Department of Ecology, Olympia, Washington, U.S. Environmental Protection Agency, Region X, Seattle, Washington, D.C. and U.S. Department of Energy, Richland Operations Office, Richland, Washington.

EPA, 1988, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA; Interim Final*, EPA-540/G-89/004, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1990, *A Guide to Developing Superfund Proposed Plans*, Directive 9335.3-02FS-2, U.S. Environmental Protection Agency, Washington, D.C.

9.0 GLOSSARY

Representative Site
Analogous Site
Analogous Approach
Plug-In Approach
Process Type
Contaminant Type
Conceptual Model
Characterization
Aggregate Area Management Unit
Aggregate Area Management Study Report
- Terms from Process Groupings (Process Condensate, . . .)
- Terms from Waste Site Types (Crib, Pond, . . .)
Presumptive Remedy

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APPENDIX A

WASTE SITE GROUPINGS

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In support of the strategy development process, workshop participants suggested grouping waste sites in the 200 Areas to streamline the assessment and remediation process. The group recognized that among OUs there are waste sites that are similar, and efficiencies could be realized using analogous conditions to reduce characterization needs and expedite the remediation process. The 200 Areas contain a large number of waste sites, but only a limited number of chemical separation processes (e.g., reduction and oxidation, UO_3) and waste disposal structures (e.g., burial ground, cribs, ponds) were used, providing a set of conditions that would allow for sites to be grouped.

A subteam with representatives from the ERC, Ecology, EPA, and RL was tasked to develop waste site groups. Chemical processes, type of contamination (e.g., uranium, plutonium, organics), and waste site type (e.g., pond, crib, burial ground) were identified as the primary factors used to group sites. Nine major waste site groups were developed as follows:

- Process Condensate and Process Waste Sites
- Steam Condensate and Cooling Water Sites
- Chemical Laboratory Waste Sites
- Miscellaneous Waste Sites
- Tanks Scavenged Waste Sites
- Septic Tanks and Drain Fields
- Unplanned Releases
- Tanks, Lines, Pits, and Boxes
- Landfills and Dumps.

The subteam systematically reviewed individual waste site data, including the following:

- Location
- Waste source and associated chemical process
- Volume of liquids received
- Type of contaminant(s) received and associated inventory
- Waste site type/structure.

Sites that were not addressed included those inside and ancillary to the double- and single-shell tank (DST and SST) farms. The major group (Process Condensate and Process Waste Sites) includes waste sites that are typically below-ground liquid disposal structures (e.g., cribs). Process condensate is generally water condensed from closed systems that was in direct contact with radioactive material and was commonly discharged to cribs. Process waste is low-level and/or hazardous waste that directly contacted radioactive material and may contain complexants that would enhance their mobility. This group was further subdivided into the four subcategories of sites based on the amount of organics, plutonium/americium the site received, uranium the site received, and other process-related information.

Further subdivisions within these subcategories may be appropriate to address other factors, such as specific waste inventory and volumes, highly acidic waste, sorption competition, complexants,

unique geohydrologic phenomenon or conditions, and/or unique disposal practices that could change the mobility of contaminants within the vadose zone.

The Steam Condensate/Cooling Water Waste Sites Group includes those sites that are typically above ground or uncovered liquid disposal/retention structures (e.g., ponds, retention basins). Condensate from steam and cooling water used to control processes did not directly contact radioactive material and had little potential for chemical or radionuclide contamination. Steam condensate and cooling water were commonly discharged to unlined ditches and/or ponds for evaporation and infiltration into the ground. Accidental releases of contaminants to this type of waste stream have occurred but represent only a small fraction of the volume discharged. This group was further subdivided into the two subcategories of sites based on geographic location and process similarities.

The Chemical Laboratory Waste Sites Group includes sites that received laboratory and/or decontamination waste. Laboratory facilities provided analytical services for various process operations in the 200 Areas and generated waste (e.g., laboratory process, used/discarded reagents and chemicals) that were discharged to underground disposal structures, such as french drains. These same structures may have also received laboratory waste that originated from the 300 Area. This group was further subdivided into the subcategories of 200 Areas waste and 300 Area waste. The waste sites are grouped separately, because the nature of the laboratory waste originating from the 300 Area may be significantly different from the laboratory waste generated in the 200 Areas.

The group referred to as Miscellaneous Waste Sites contains french drains, sites that received stack drainage, and equipment decontamination waste. Thus, these three subcategories were refined within this group. It is expected that these subcategories will be further subdivided based on specific inventory information, volume of liquid discharged, and equipment decontamination procedures.

The Tank/Scavenged Waste Site Group contains sites that received high-level tank waste. Scavenged waste produced during the uranium recovery process contained the most concentrated radioactive and chemical waste disposed to the ground in the 200 Areas. Suggested subcategories included scavenged waste, first-cycle supernate, plutonium-recycled tests reactor waste, and unscavenged tank waste (cascade waste). Further subdivisions within these subcategories may be delineated based on criteria, such as specific waste inventory and volumes, sorption competition, complexants, unique hydrologic phenomenon, and unique disposal practices that could change the mobility of contaminants within the vadose zone.

The Tanks/Lines/Pits/Diversion Boxes Waste Sites contain structures used to convey or control the conveyance of waste from the source facility to the waste disposal site. This group was further subdivided into the following subcategories: cross-site transfer lines, diversion boxes, valve pits, catch tanks, miscellaneous tanks, and pipelines. Where possible, ancillary facilities directly associated with a particular waste site will be characterized in conjunction with that waste site.

All unplanned releases not specifically associated with a waste site were grouped under Unplanned Release Waste Sites. Unplanned releases that are associated with particular waste sites will be characterized with that particular waste site. No subcategories were identified. The group Septic Tanks/Drain Fields Waste Sites contains sites that received nonradioactive, nonhazardous sanitary sewer waste. The Landfills and Dumps Waste Site Group contains solid waste burial and debris sites and was subdivided into the following subcategories: burial grounds, ash and burn pits, construction staging areas, nonradioactive dangerous waste landfill/solid waste landfill, old central landfill, and other miscellaneous dumping areas. Further subdivisions of these subcategories may occur based on waste inventory and volume of waste.

Table A-1 provides an initial list of waste sites that are included in some of the key major groups. This list is intended to provide an example of how the waste site groupings will occur and will be refined as part of the Technical Document development.

Table A-1. Liquid Waste Site Groupings.

Process Condensate/ Process Waste	Steam Condensate/ Cooling Water	Chemical Waste	Miscellaneous Waste	Tank/Scavenged Waste
B-9, B-11A & B	B-2, B-3	B-4, B-6, B-10A&B	B-13	B-5[TRU,GW], B-42
B-12, B-57, B-59, B-62	B-3 Pond System	T-2, T-8, T-34, T-35	B-56 & B-61[Not used]	B-43 thru B-49
B-55 & B-60 (higher activity)	B-63[Chem Sewer]	T-2-8	T-9, T-10, T-11, T-12	B-14 thru B-34[U] (BC)
T-6, T-19 T-25[U, Pu]	207-B	U-4, U-4A & -4B	T-13, T-29, T-33	B-7A&B, B-8
U-1&2[U], U-3, U-5[U]	T-1[Chem Sewer]	S-20, S-26	W-LWC	B-35 thru B-41 (1st cycle)
U-6[U], U-7, U-8[U], U-12[U]	T-4-1 & -2 P&Ds	A-2[O], A-4	U-13	B-52
U-15[O], U-16, U-17	200W Powerhouse Pond		S-12	T-3[TRU], T-5, T-7
S-21	U-9, U-10, U-11		Z-8, Z-13, Z-14, Z-15	T-14 thru T-17 (1st Cycle)
S-1&2, S-3, S-4	U-14[U]		A-11 thru A-17, A-21	T-18, T-32
S-7, S-8, S-9, S-13[O]	Z-1D, Z-11, Z-19		A-22, A-23A & B	T-21 thru T-24
S-14[O], S-15[O](Prox. to S-3)	207-U		A-26A & B, A-27, A-28	T-26, T-27, T-28
S-22, S-23, S-25	S-5 & S-6 (prox. to P&D)		A-32, A-34, A-35, A-41	T-32
Z-1[Pu], Z-1A[Pu], Z-2[Pu] Z-3[Pu], Z-9[Pu], Z-12[Pu] Z-18[Pu] (PFP Source)	S-10 P&D, S-11		A-33 & A-38 [Not used]	B-51[BC Pipeline Flush]
Z-4, Z-5[Pu], Z-6, Z-6A Z-7[Pu](300A Waste) Z-10, Z-16, Z-17 (Z-231 Source)	S-16 P&D, S-17 P&D		299-E24-111	B-53A&B, B-54
C-1, C-3, C-4[O]	S-19		C-2, C-7, C-8	B-58 (BC; Pu recycle test reactor waste 300 Area)
C-5, C-6, C-10	207-S		Gatehouse French Drains	
A-1[U?], A-3[U], A-5, A-6	Z-1, Z-11, Z-19		Criticality Mass Dry Wells	
A-7, A-8[U?], A-9 A-10[U?]	Z-20*, Z-21		BC Control Area UN-200-E-38	
A-18[U], A-19[U] A-20[U?]	207-Z			
A-24, A-30 A-31[O]	N-1, N-2, N-3, N-4			
A-36A[Hot]&B	N-5, N-6, N-7, N-8			
A-37-1&2, A-45	A-25, A-29, A-40			
	A-42			
	C-9			
	200E Powerhouse P&D			

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APPENDIX B

LEVEL OF CHARACTERIZATION - ADDITIONAL DISCUSSION

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The characterization strategy is based on using a graded or phased approach that collects the appropriate data to (1) understand the physical conceptual model of the site, (2) support the evaluation of alternatives, and (3) select a remedy, as well as support the design of the remedy. As the project progresses, previously and newly collected data will be continuously evaluated for uncertainty and adequacy to support decisions or determine additional data needs. In general, the strategy envisions four phases of data collection:

- Review process knowledge and previously collected data
- Collect characterization data to support the understanding/verification of the physical conceptual model, evaluation of alternatives, and remedy selection
- Verify data collection at analogous sites to either ensure that the remedy is appropriate or verify that the remedy is effective
- Collect data to support remedial design activities.

The process for grouping the sites (e.g., analogous site approach) supports the optimum use of process knowledge and previous site investigations to determine the data needs for the characterization phase. Characterization requirements are defined as part of the DQO process. Data are generally needed for the following:

- Physical conceptual model refinement
- Treatability tests
- Risk assessments
- Remedial alternatives evaluation.

The DQO process is applied when preparing work/closure plans to define the types and quality of data needed to satisfy data needs. Process history and existing data will be used to the extent possible to optimize the amount of characterization performed. It is expected that initial data needs will focus on chemistry and physical soil property data (including contaminant mobility as the foundation for 200 Areas subsurface data). Chemistry data, including site-specific chemical and/or radionuclide analyses of affected media, will be needed to assess the nature, extent, and level of contamination. Physical properties include geologic structures, cation exchange capacity, unsaturated hydraulic conductivity, and moisture content. These properties will be used with contaminant characteristics (e.g., mobility and persistence) to assess the fate and transport of contaminants. Fate and transport analytical models (computer codes) may be used to facilitate this assessment. As the certainty increases, less direct (intrusive) and more indirect (nonintrusive) data collection techniques will be used to guide decisions on conceptual model validation, remedial design, and final verification.

General characterization principles that were identified while developing the 200 Areas Source Strategy, and are intended as a guide to establish the level of characterization needed to support the strategy, include the following:

- Boreholes are regarded as the most definitive data (high confidence data) collection activity at sites with the potential for a significant inventory of contaminants or a high potential for deep vadose zone contamination since direct contact is made with the interval of interest in a highly controlled manner. Boreholes provide for the collection of discrete, representative soil samples and provide access for in situ geophysical logging, such as spectral gamma-ray logging.

- Boreholes would be used at representative sites to gather data that is the foundation for the decision process. The use of process knowledge, existing data, and/or the conceptual model will be used to determine placement of boreholes and their depths.

- Boreholes would not be used at analogous sites unless data that contradicts the physical conceptual model is obtained.

- Test pit data typically have a lower level of certainty than borehole data, and data is limited to near surface depths. Test pits allow direct visual assessment of the geology. Because the soils are disturbed, physical property data may not truly represent the undisturbed soil conditions.

- Cone penetrometer test (CPT) data represent the next level of certainty below test pits and offer the opportunity to use a variety of direct and indirect methods for collecting data using field-screening techniques. These techniques range from collecting physical property data to soil gas surveys or to gamma spectral logging for radionuclides. The CPT would be used at sites where a high degree of confidence of the physical conceptual model exists.

- Surface geophysical techniques (e.g., ground penetrating radar, seismics, electrical resistivity) generally provide the lowest level of confidence data, but are nonintrusive. Several promising technologies may provide higher confidence data.

- Because the approach has inherent checks, site data will be continuously evaluated for uncertainty and adequacy to support decision-making or to determine additional data needs. The number of samples required can be optimized to eliminate the collection of redundant data.

These principles should be applied during the DQO process associated with developing the work closure plan to ensure that the collection of data is focused on site remediation.

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ATTACHMENT 1

TECHNICAL ISSUES

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During the course of the strategy development process, several technical questions or issues were raised (some remain unresolved). These unresolved questions and issues are identified in Table A1-1 as a placeholder. The intent is to resolve these at the appropriate time or implementation step in the 200 Areas Strategy.

Table A1-1. Technical Issues.

Assigned to	Description	Status
ERC	Waste-site groupings need field review to see how they fit (reality check).	Items will be addressed as part of Technical Document Development, if approved.
ERC	Check to see what new information is available since the AAMS Report (geophysical logging).	Items will be addressed as part of Technical Document Development, if approved.
EPA/Ecology	Determine if a mechanism exists for RCRA acceptance of representative site data for a TSD closure.	--
--	100 mrem/yr basis	--
--	Land use (industrial standard?) • Does characterization drive land use or does land use drive characterization? • Does characterization drive remedial decisions or does remedial decision drive characterization?	Will be considered during Technical Document
--	Groundwater versus source correlations?	Prioritization issue. Hold pending priority discussion.
ERC	Assess alternative to fluid-applied asphalt.	Per DOE/RL-93-33
ERC	Develop biointrusion barrier design.	Per DOE/RL-93-33
ERC	Identify/obtain material sources for barrier construction.	Per DOE/RL-93-33
ERC	Identify modelling (i.e., contaminant transport) needs for 200 Areas source assessment.	--

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