The EM Integration Handbook

COMPLEX-WIDE
EM INTEGRATION

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SUBJECT: EM Integration Handbook

TO: Distribution

Attached is a copy of the first edition of the EM Integration Handbook. All comments received on the draft Handbook have been addressed. The purpose of this Handbook is to assist the Program Area Integration Teams (PAITs) in their efforts to identify and evaluate integration opportunities by providing consistent integration guidance to the PAITs. The Handbook describes all aspects of the EM integration effort including an overview of process, products, integration tools as well as points of contact. The Handbook will be updated as needed.

If you have any questions regarding this handbook, please contact Jonathan Kang (jonathan.kang@em.doe.gov) at 301-903-7178.

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Tab 1: Introduction and Purpose of Handbook

1. INTRODUCTION AND PURPOSE OF HANDBOOK

This handbook has been prepared to assist Program Area Integration Teams (PAITs) in their efforts to identify and evaluate integration opportunities. Included in this handbook is an overview of the integration methodology and tools for use by the PAITs. This handbook is intended to serve as a guide book that provides general consistency in the tools that the PAITs use to bring forth new opportunities and evaluate their feasibility. The intent is for the PAITs to focus their efforts on determining and evaluating integration opportunities and to fulfill their responsibilities outlined in the *Working Charter for Environmental Management Program Integration* (see Appendix A). Special attention should be given to Tab 2 – Integration Opportunity Process and Products – where specific guidance is given regarding the systems engineering process to be used as well as the products that each PAIT is expected to produce.

EM Program Integration

"The goal of integration is to achieve program efficiencies by eliminating redundant facilities and using available capacity, crossing program boundaries or removing "stovepipes," taking advantage of the collective learning curve, applying site successes and lessons learned nation-wide, employing innovative technologies, and using national procurement vehicles to meet unique needs. Integration requires corporate thinking on the part of headquarters and field managers, looking at broader interests than a single program or site, and focusing on those needs which achieve the cleanup vision in an optimized fashion. Integration ensures an overall, consistent approach to address national policy issues and issues that affect more than one site."

It is recognized that not all recommendations will require the same steps as described in the integration process diagram (see *Appendix A: Working Charter, Figure 1*) and that flexibility is important to the teams as they move through the evaluation and approval process. However, to ensure that a proven systems approach is used through the process to achieve consistency among teams, the following elements/products shall be completed by all PAITs unless otherwise approved by the Integration Core Team (Core Team) or the Integration Executive Committee (IEC):

1. Three decision support products to be developed by PAITs:
   - *Opportunity Description Document* (Decision Gate 1),
   - *Recommendation Evaluation Plan* (REP) (Decision Gate 2),
   - *Implementation Decision Support Document* (Decision Gate 3);

2. Workshops to identify new opportunities and evaluate existing opportunities;

3. Complete disposition of all opportunities through applicable steps of the integration opportunity process established in the *Working Charter for EM Integration;*

4. Use of the systems approach as described in Tab 2 of this handbook;

5. Use of an existing baseline, as formulated from the sites *Accelerating Cleanup: Paths to Closure* document, for the starting point;

6. Annual schedules, including planned workshops and key events;

7. Tracking of the status of recommendation evaluations by the Core Team;

8. Documentation by the PAITs of back-up data; and

9. Deliverables as specified in the *REP* or requested by the IEC.

The following paragraphs summarize each of the tabs contained in this handbook which further describe these elements/products.

Tab 2: Integration Opportunity Process and Products

This tab details the systems engineering-based integration process to be used for the development and evaluation of integration opportunities and the actions required to move forward from the opportunity-identification step to the evaluation step and the decision-making step, as appropriate. It also contains formats for the products that each PAIT will be requested to develop in order to move through the process.

Tab 3: Integration Tools

This tab details the proven set of tools for use by the PAITs to ensure that integration opportunities are properly evaluated, communicated, and staged through the integration process. These tools are a great asset if used appropriately. In order to maximize the benefits from these tools, all PAITs should contact the systems engineering support point-of-contact (POC), as identified in the appendices. There are a number of tools currently available to the PAITs such as disposition maps, in/out (I/O) maps, waste quantity data, and technology development barrier identification tools. The disposition maps for the respective waste types or materials can be found at http://infoshare.inel.gov. Information on other tools can be provided to the PAITs by contacting the Core Team staff.

Tab 4: Recommendations

This tab contains a list of existing and potential recommendations, as well as the respective PAITs that will be responsible for the evaluation of recommendations. The list includes the recommendations originally developed by the EMI contractors and the recommendations developed during integration workshops and round robin meetings held during the past few months as well as opportunities that are no longer being considered.

Tab 5: EM Integration References

The appendices include: 1) a copy of the approved integration charter, which lays out roles and responsibilities, team structure, integration POCs, composition of PAITs, and the evaluation process for integration opportunities; 2) a fact sheet on integration; 3) the PAIT Schedules and membership list; 4) a list of resources, including systems engineers, subject matter experts, National Programs/Centers of Excellences, and other EM integration participants; 5) additional information on risk; and 6) a reference list of integration material.

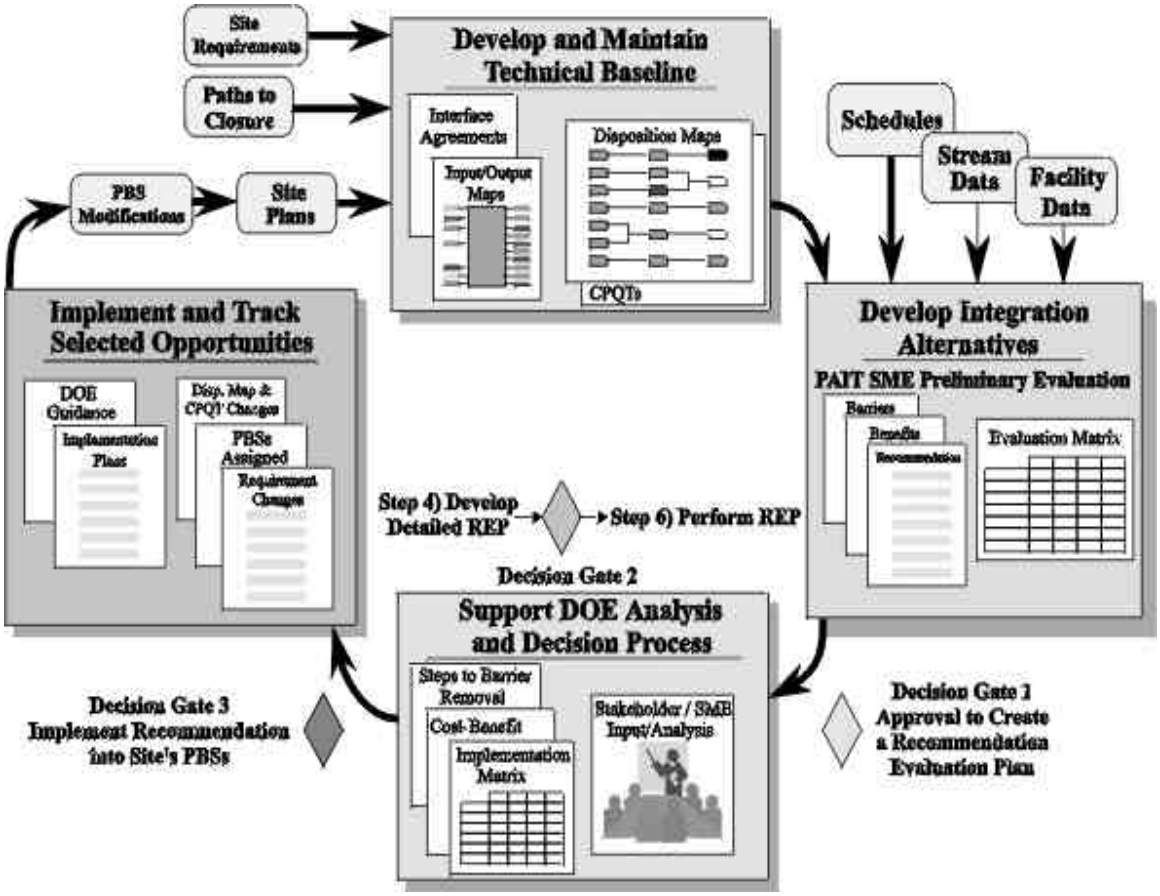
This handbook is maintained by the Integration Core Team and updates will be issued as needed. Clarifications concerning the information contained in this handbook should be addressed to Jonathan Kang (301-903-7178; jonathan.kang@em.doe.gov).

Tab 2: Integration Opportunity Process and Products

2. INTEGRATION OPPORTUNITY PROCESS AND PRODUCTS

EM integration uses a systems engineering approach. In general, the process consists of defining the driving requirements, identifying tasks to meet the requirements, and evaluating integration opportunities for a unified system. This allows the team to identify opportunities to combine, eliminate, and/or simplify activities across the complex. The process has three decision gates to pass through to mature an idea to implementation decisions. The decision process follows the systems engineering process as shown in Figure 2-1 with decision gates shown.

Figure 2-1 EM's Systems Engineering Process



What is Systems Engineering

Systems engineering is a structured process for developing and improving systems, products, and services. It ensures that a problem is fully understood before a solution is created and implemented. Emphasis is given to disciplined analysis of requirements and functions to ensure the solution satisfies the problem. Development and analysis of multiple alternatives avoids "point solutions" and ensures the best solution is used. The result is a system that delivers products and/or services that fully meet customer requirements.

In this approach, the systems engineering staff facilitates group sessions, conducts trade studies, and participates on the subteams as they were broken out from the larger team. This provides process and information continuity throughout the project.

The PAITs are actively involved in three of the four steps shown in the figure:

Develop and Maintain Technical Baseline – The PAIT's knowledge of the EM baseline is critical in evaluating the baseline for additional integration opportunities, in evaluating impacts of proposed and recommended opportunities on the baseline.

Develop Integration Alternatives – The PAITs identify, evaluate, and recommend integration opportunities.

Support DOE Analysis and Decision Process – The PAITs perform detailed analysis of recommended opportunities.

This section of the handbook provides detail on activities of the PAITs for each of the three process steps described above. Products that PAITs are required to develop are described and tools that support product development are identified. The tools themselves are described in greater detail in Tab 3.

2.A PAIT Role in Baseline Development

The EM integrated technical baseline is established in the *Accelerating Cleanup: Paths to Closure* document; Site and Project Baseline Summaries; and supporting waste and material quantity data and disposition maps. PAITs identify and evaluate integration opportunities that can improve the baseline which may result in recommendations that may change the current baseline if implemented. In this context, the PAITs are responsible to be knowledgeable of the baseline and to fully evaluate the impacts of their recommendations. A baseline of the sites' planned functions, costs, schedules, and requirements is established and used throughout the project for comparison with potential integration opportunities. The baseline data consists of the driving requirements, disposition maps (portraying the disposition steps that a stream goes through, i.e., generation, storage, characterization, treatment, transportation, and final disposition) and data forms (capturing requirements, barriers, costs, and schedules). Information included in Tab 3 provides additional description of the integrated technical baseline including, quantity data, disposition maps, site in/out maps, and barrier identification/linkage data that make up the baseline.

2.B Identification of Integration Opportunities

PAITs identify, evaluate, and recommend opportunities to resolve waste and material disposition paths that are incomplete or uncertain. They also identify and evaluate integration opportunities that can improve the existing baseline. "Alternative Development" and "Analysis and Trades Studies" are systematic processes used to identify and evaluate integration opportunities.

Alternative Development – In a series of workout sessions, the PAIT members from each site identify ways in which the baseline could be improved through integration of processes and facilities, following successful examples set by individual sites, and/or through changing requirements. PAITs ensure that the problem or baseline is fully understood before a solution is created and implemented. Problem definition includes establishing a baseline scenario, identifying driving requirements, and developing a clear problem statement. Once the problem is defined, the opportunity, a positive statement of action focused on resolving the problem, is defined. Opportunities are identified and grouped into compatible system alternatives. These system alternatives are evaluated against the problem statement and the baseline.

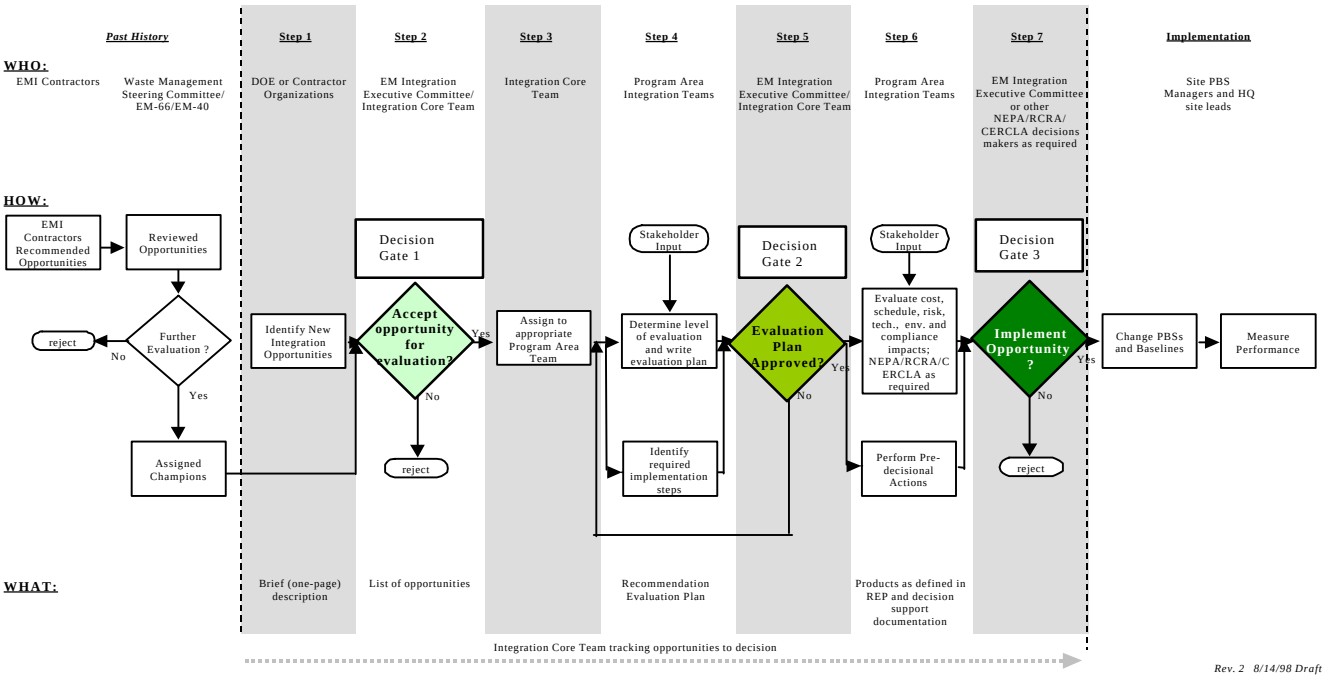
Analysis and Trade Studies – Once alternatives are defined, an analysis of how they might be implemented should be conducted. This phase evaluates different ways of satisfying the existing general requirements of the system concept. The alternatives developed are then analyzed by the team members using their professional expertise and judgment on how each alternative performed against a set of criteria, which may include cost reduction, schedule improvement, speed of implementation, stakeholder acceptance, site consensus, and risk reduction.

2.C Integration Opportunity Process

The Integration Opportunity Process (Figure 2–2), is a key component of the systems engineering process. It is designed to identify, evaluate, and provide recommendations to senior management resulting in decisions to pursue or reject implementation of integration opportunities. The process has three decision gates to pass through to mature an idea to implementation. The decision process follows the system engineering process previously shown in Figure 2–1, where three decision gates were added as checks prior to implementation. (Note: This figure is currently being revised based upon input from the Integration Executive Committee at their November 1998 meeting.)

Figure 2–2 shows the integration opportunity process in a linear view with more detail added to clarify the actions and products to support each decision gate.

Figure 2–2 Integration Opportunities Process



Decision Gate Descriptions – The decision gates included in the process are intended to provide checks and approval prior to each increase in the level of effort needed to move opportunities towards implementation. Decision Gate 1 ensures adequate preliminary evaluation is performed to make a sound decision to expend additional resources to create an *REP*. After completion of the *REP*, Decision Gate 2 is used to confirm the adequacy of the evaluation plan and to initiate the detailed evaluation described in the *REP*. Decision Gate 3 is exercised when the results of the *REP* (cost–benefit analysis, implementation matrix, etc;) are complete and a recommendation to implement or reject can be

proposed based on the detailed evaluation. Once a decision is made to implement the recommendation at the Decision Gate 3, the appropriate site's PBSs are changed in accordance with the implementation matrix and DOE direction.

Each decision gate has specific products that enable the decision to be made first by the Core Team, followed by the IEC or other decision makers. A recommended opportunity can be implemented by passing this process if no barriers are identified.

- Decision Gate 1 – Approval of a recommendation from an *Opportunity Description Document* – This document contains the summary information for a recommendation from the supporting preliminary evaluation data. Adequate preliminary evaluation will enable better decisions on where to expend effort in the development of an *REP*. This activity may take one to two workshops to identify, define, and find necessary supporting data for alternatives evaluation, as well as other data collection activities. The *Opportunity Description Document* outline and a sample are given in Section 2.C.1.

- Decision Gate 2 – Approval of a *Recommendation Evaluation Plan (REP)* – The *REP* identifies the actions necessary to plan the scope, cost, and schedule for removal of identified barriers and other implementation steps, as well as the validation activities for the benefits of the recommendation. It should be noted that an *REP* is not an implementation plan; rather, it describes activities required to evaluate implementation feasibility. An *REP* is anticipated to require at least one workshop with follow-up prior to presentation to the IEC. In some cases multiple *REPs* can be worked at the same workshop. The *REP* outline and a sample are provided in Section 2.C.2.

- Decision Gate 3 – Approval of a recommendation from an *REP* evaluation – The *REP* results must show the cost, schedule, and other activities that were evaluated in accordance with the *REP*. The implementation recommendation must include a complete baseline comparison. It should be noted that all back-up data that support a PAIT's recommendation must be carefully maintained. The evaluation results format is provided in Section 2.C.3.

2.C.1 Opportunity Description Document

The purpose of this document is to enable the IEC to make a decision on whether a potential new integration opportunity should proceed to the formal evaluation stage (i.e., to prepare and implement a *REP*). The brief document (1–2 pages) will summarize the proposed opportunity, its benefits to complex-wide integration, and key factors to be evaluated. It should be noted that, prior to the identification of a recommendation, a number of alternatives should be considered such as which of these alternatives can be forwarded as "recommendations" that warrant an *Opportunity Description Document* to be prepared. It should be noted this *Opportunity Description Document* does not apply to the existing recommendations that are described in Tab 4 Part A of this document. It only applies to new opportunities that will be identified. The tools described in Tab 3 of this document should be used in evaluation of the alternatives.

It is not the intent of this *Opportunity Description Document* to perform a full cost/benefit analysis. Rather, it is to assess the reasonableness of pursuing a specific opportunity. For this document to be forwarded to the IEC, there should be satisfactory confidence that the benefits of pursuing the proposed opportunity would outweigh the barriers. This is necessary to minimize expenditure of resources on opportunities that have little implementation feasibility.

The data needed in the *Opportunity Description Document* will include the following:

- Proposed opportunity
- Proposed by
- Problem or current baseline description, including statements on why change is needed
- Recommendation, including specific reasons:
  - benefits to the system
  - cost savings
  - schedule improvement
  - risk reduction
  - other reasons
- Sites affected
- Expected barriers and issues that may be associated with implementation of this opportunity
  The barriers and issues may include, but not be limited to:
  - funding
  - technology limitation or gaps
  - facility and/or equipment limitations
  - interdependencies on other programs or sites
  - transportation issues
  - schedule
  - regulatory/permitting/NEPA issues
  - stakeholder concerns
  - other
- Schedule of recommendation
- Recommendation of PAIT
- Preparer of *Opportunity Description Document*

A sample is attached for your information.

SAMPLE

OPPORTUNITY DESCRIPTION DOCUMENT

Proposed Opportunity: It is recommended that site A accept wastes/materials from sites B and C for treatment and disposal.

Proposed by: Integration Executive Committee – identified during June round robin meeting

Sites affected: Sites A, B, and C

Problem or current baseline description: Currently sites B and C have plans to build onsite treatment and/or commercial treatment for their low-level waste.

Recommendation: The utilization of xxx treatment facility at site A will eliminate the need to build onsite treatment facilities or pursue commercial facilities. A high level "quick and dirty" analysis shows that, if a decision is made by xxx and implemented by xxx, this may result in the following benefits to the system:

- Cost Savings: it may result in net savings of $5M to $10M over the next five years and additional savings of $10M to $20M over the life cycle
- Schedule Improvement: it will accelerate site B's site closure schedule by two years and enable site C to meet the current site closure schedule of 2012.
- Cost Savings: savings can be reinvested to perform other critical missions at sites B and C to accelerate the site closures even more

Expected barriers and issues: It is expected that the following issues need to be addressed before this opportunity can be implemented.

1. The implementation of this opportunity will require additional up-front investment of $xM at site A and $xM for sites B and C in order to implement and take full advantage of this opportunity.
2. If a decision is not made by 2000 and implemented by 2001, the benefits will not be valid.
3. Extensive discussions with States and stakeholders are needed. Stiff resistance from States A and B is expected.
4. Site A currently does not have a permit to treat wastes from sites B and C.
5. If this opportunity is evaluated, but not implemented, sites B and C may have a schedule slip of two and three years respectively.

Schedule:
Opportunity Description Document completion date - December 1997
Recommendation Evaluation Plan completion date – TBD
Decision Support Document completion date – TBD

Recommendation of PAIT: It is recommended that the IEC approve preparation of the *REP* for this opportunity

Preparer of *Opportunity Description Document*: LLW/MLLW PAIT

2.C.2 Recommendation Evaluation Plans

The *Recommendation Evaluation Plan* (*REP*) defines and describes the activities, timing, and responsible party to fully evaluate the feasibility of implementing an integration recommendation. The objective of the *REP* is to document the activities needed to fully evaluate the recommendations. The documented results of the evaluation prescribed in the *REP* then become the basis for an implementation decision. The evaluation should be in sufficient detail for the decision makers to make decisions regarding implementation. It is important to note that the *REP* does not describe steps to "implement" the recommendation. Rather, the *REP* describes the steps of the evaluation and delivery of data needed by the IEC and/or other decision makers to make the decision to either implement or reject the recommendation. The tools described in Tab 3 of this document should be used in evaluation of the alternatives.

Below is a sample *REP* for use. In order to achieve consistency in the evaluation process, PAITs follow the given outline, however, each PAIT can modify the format with prior approval from the Core Team.

SAMPLE

RECOMMENDATION EVALUATION PLAN

"Maximize Use of Existing DOE Facilities for Treatment of Mixed Low–Level Waste"

Lead Site: Department Incinerator Systems Team (comprised of the Idaho, Oak Ridge, and Savannah River Operations Offices) and the Low-Level Waste/Mixed Low-Level Waste (LLW/MLLW) Center of Excellence (managed and staffed by the Albuquerque, Idaho, and Nevada Operations Offices)

Affected Sites: Complex-Wide

Problem or Current Baseline Description: There are multiple MLLW treatment facilities that are being under utilized.

Recommendation: Maximize use of existing DOE MLLW treatment facilities

Subrecommendations:

1. Fernald to send 480 m^3 of waste for treatment at the Waste Experimental Reduction Facility (WERF) at Idaho National Engineering and Environmental Laboratory (INEEL) and 120 m^3 to the Toxic Substances Control Act Incinerator (TSCAI) at Oak Ridge.

2. Hanford to send up to 1,451 m^3 of waste for treatment at WERF/TSCAI rather than contract.

3. Los Alamos National Laboratory to send 87 m^3 of waste for treatment at DOE incinerators and 158 m^3 through national contracts.

4. Oak Ridge separates 2,917 m^3 of spottily contaminated soils from Broad Spectrum Contract for treatment in TSCAI.

5. Rocky Flats to send 5,859 m^3 of alpha MLLW to existing facilities rather than treat on site at $3,567 per m^3.

6. Sandia National Laboratory to send waste to WERF and eliminate storage. Also, Sandia should eliminate the packed bed reactor and treat 59.7 m^3 of miscellaneous waste streams at existing DOE facilities.

Current Assumption: Existing DOE treatment facilities will continue to operate with continued or expanded capability (e.g., stakeholder acceptance) to receive waste from offsite DOE generators.

Evaluation Approach:

1. This recommendation will continue to be addressed by the Department Incinerator System (DIS) Team, which was formed in Spring 1997 in response to the EM Integration initiative. The DIS Team consists of the three currently operating incinerators permitted to treat MLLW within the DOE complex: TSCAI on the Oak Ridge Reservation, WERF at the INEEL, and the Consolidated Incinerator Facility (CIF) at the Savannah River Site. As stated by their draft charter, the "purpose of the DIS Team is to ensure that all DOE waste requiring incineration is treated, and to identify and facilitate resolution of common issues impacting the optimum utilization of the incinerators." To this end, the DIS Team has identified the following key roles:

    - Develop integrated burn plans for the optimal utilization of the existing incinerators. The DIS Team held a generator workshop in August 1997 that resulted in the Fiscal Year (FY) 1998–2001 Integrated Burn Plan for all MLLW requiring incineration. The Team will make updates, as needed, to the plan to ensure that all waste requiring incineration is treated within required schedules.
    - Support the identification and resolution of key issues and barriers to system optimization (e.g., funding, residuals disposition, State requirements).
    - Enhance communication on incinerator utilization for waste acceptance, operations, lessons-learned, and regulatory developments.
    - Function as a subject matter expert group for the DOE incinerators.

2. The LLW/MLLW Center of Excellence will review EM Baseline Waste Disposition Maps to assess whether any "orphan wastes" or wastes identified for commercial treatment can be efficiently treated in-house, thereby maximizing system efficiency. These wastes could then be added to the Integrated Burn Plan.

3. The LLW/MLLW Center of Excellence will coordinate with the responsible sites for the subrecommendations identified above as to whether they are worth pursuing from a programmatic standpoint. The analysis will consider costs, benefits, schedule, regulatory compliance, and other factors.

4. Stakeholder involvement will continue to be maintained through national (e.g., Intersite Discussion Workshop) and site-specific stakeholder communication processes. The ability to accept off site waste at CIF and TSCAI continues to be a major obstacle for the optimum utilization of these incinerators. The DIS Team will continue to support EM in their efforts to resolve equity issues and other barriers to stakeholder acceptance of offsite waste.

5. **Participants:** The DIS Team will include participation from the LLW/MLLW Center of Excellence, DOE generator sites, Headquarters program offices, and the Mixed Waste Focus Area. State and Federal regulatory agencies and other stakeholders from the affected sites will be actively involved, particularly regarding transportation and the acceptance of offsite waste for treatment. Other participants may be needed and included in the process, as appropriate.

Evaluation Schedule:

Completed activities:

- Formed DIS Team to address the subject recommendation: *Spring 1997.*
- Prepared white paper on issues impacting integrated planning for utilization of the DIS Team: *August 1997.*
- Held Generator Workshop for the development of integrated burn plan and identification of issues/barriers to system optimization: *August 1997.*
- Issued Final FY 1998-2001 Integrated Burn Plan: *November 1997.*

Planned FY 1998 activities:

- Assess need for FY 1998 annual generator workshop: *June 1998.*
- Establish DIS Team information clearinghouse on web site: *May 1998.*
- Review 2006 Plan Waste Disposition Maps to identify in-house treatment opportunities: *July through October 1998.*
- Issue FY 1999 Integrated Burn Plan: *September 1998.*
- Develop, prioritize, and implement action plans for the resolution of issues/barriers identified by the 1997 Generator Workshop, including standardized waste characterization/acceptance criteria, residuals disposition, system cost-efficiency, and funding: *May through December 1998.*
- Evaluate system efficiency and conduct other activities as identified by the DIS Team through interactions with generator sites, stakeholders, and other avenues: *FY 1998 and out-years.*

Decision Gate Schedule:
Gate 1 – completed
Gate 2 – November 1998
Gate 3 – TBD

2.C.3 Evaluation Results

The evaluation results are to be documented by the PAIT and summarized for the decision makers, including implementation recommendations. A *Decision Support Document* is expected to be few pages in length and may include the following specific areas:

- Proposed Opportunity/Decision to be Made
- Proposed by
- Evaluated by
- Sites affected
- Problems or current baseline description
- Evaluation Results:
  – baseline impacts
  – benefits to the system
  – cost savings

– schedule improvement
– risk reduction
– other results
- Unresolved barriers and/or issues
- Implementation Recommendation of PAIT

Each team will maintain back-up documentation for the evaluation, and the results should be traceable to the back-ups. The back-up documents should be provided to the IEC/Core Team upon request.

2.D Integration Tracking System (Scorecard)

The Integration Tracking System (Figure 2–3) provides an easy-to-understand representation of the status and progress of each opportunity as it advances through the EM integration process. This tracking system is the primary tool used by the Core Team and IEC to monitor, report, and troubleshoot the progress of opportunities. It is not the intent to "backfit" existing opportunities to the tracking system; only the remaining steps will be filled in (e.g., Step 6 activities).

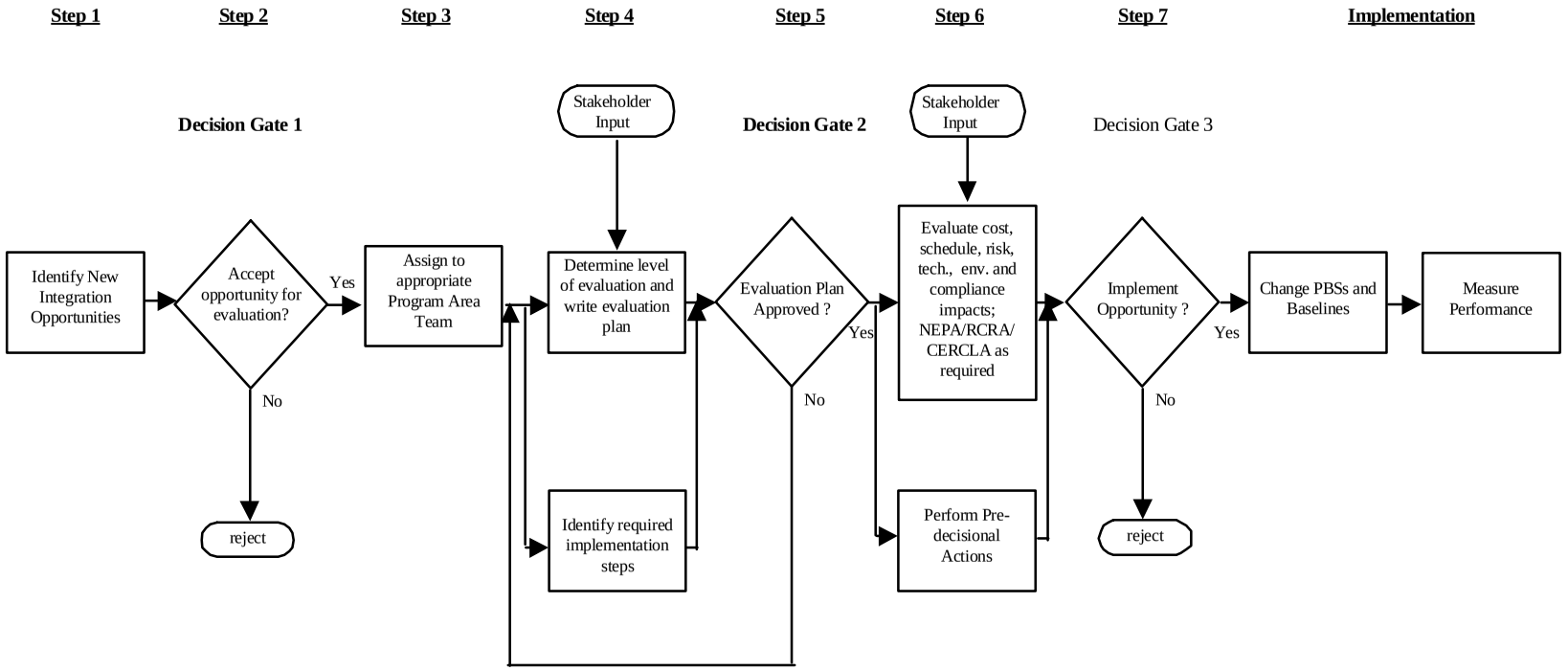
The tracking system is maintained by the Core Team staff and updated, as a minimum, prior to each Core Team and IEC meeting. PAITs are responsible to provide updated information upon request. A print out of the tracking system, current at the time this Handbook was issued, is provided in Tab 4. To obtain the latest update, contact Jonathan Kang (301-903-7178; jonathan.kang@em.doe.gov).

Description

In addition to providing a title and reference/basis for each recommended opportunity, the tracking system assigns each opportunity a unique identifier, lists the source of the opportunity, and identifies the PAIT to which it is assigned. As shown in Figure 2-3, progress of each opportunity is tracked through the seven steps of the EM integration process.

Column	Heading	Description
1	PAIT	Name of PAIT to which opportunity has been assigned from Recommendations List, Tab 4
2	No.	Official Tracking Number from Recommendations List, Tab 4.
3	Title	Title of Recommendation from Recommendations List, Tab 4. For recommendations in Step 6, this column will include milestones to track *REP* scheduled activities.
4	Step 1	Opportunity submitted for consideration
5	Step 2/(Gate 1)	Gate 1 submittal/decision — Accept opportunity for decision
6	Step 3	Assign to Appropriate Program Area Integration Teams
7	Step 4	Determine level of evaluation and write Evaluation Plan
8	Step 5/(Gate 2)	Gate 2 submittal/decision — Approve Evaluation Plan
9	Step 6	REP scheduled activities
10	Step 7/(Gate 3)	Gate 3 submittal/decision — Implement Opportunity
11	Comments	Any comments to clarify status.

Figure 2–3 Sample Integration Opportunity Scorecard



PAIT	*Official Tracking Number*	*Title*	*Step 1*	*Gate 1* / *Step 2*	*Step 3*	*Step 4*	*Gate 2* / *Step 5*	*Step 6*	*Gate 3* / *Step 7*	*Comment*
TRU-ST	**A-1**	Consolidate TRU Waste Storage from sites with small inventories to sites with greater inventories								
TRU-TD	**A-2**	Improve Transportation Systems for TRU Waste							Post	
TRU-ST TRU-TD	**A-3**	Pursue a Path Forward for Disposal of All TRU Waste not currently acceptable at the WIPP			(on hold)					
MLLW	**A-4**	Maximize Use of Existing DOE Operating Facilities for MLLW Treatment						Post		some sub-recommendations in the implementation phase

Tab 3: Integration Tools

3. INTEGRATION TOOLS

This tab details the proven set of tools for use by the PAITs to ensure that integration opportunities are properly evaluated, communicated, and staged through out the integration process. These tools are a great asset if used appropriately. In order to maximize the benefits from these tools, all PAITs should contact the systems engineering support POC as described in the Appendix. There are a number of tools currently available to the PAITs such as disposition maps, in/out (I/O) maps, waste quantity data, and technology development barrier identification tools. Information on other tools can be provided to the PAITs by contacting the Core Team staff.

3.A Integration Disposition Maps

Disposition maps are graphical depictions of each site's waste/material life cycle disposition plans/strategies. There are common rules that apply to all disposition maps. They are also a tool to be used for displaying program end states and functions that represent baseline plans. Maps can be created to meet the unique requirements of each program. Figure 3–1 shows an annotated example of a waste-type disposition map. The disposition maps have been a very useful tool in communicating the EM program with States and stakeholders. The Environmental Restoration (ER) program and the Nuclear Material Integration Team have expanded the rule set to address unique needs and stakeholder commitments. The disposition maps for the respective waste types or materials can be found at http://infoshare.inel.gov. Example disposition maps for waste management, environmental restoration, and nuclear materials are shown in Figures 3–2, 3–3, and 3–4, respectively. An additional map, the I/O diagram, depicts the waste/material transfers between sites. An example I/O is shown in Figure 3–5.

The main benefits of disposition maps include the following:

- Describes the EM program at a level manageable by DOE Headquarters and understandable by the stakeholder groups;
- Displays the "big picture" and clearly shows end states; and
- Depicts dependencies and interfaces between sites.

Figure 3-1 Annotated Waste Disposition Map

Each stream has an inventory and generation volume specified in cubic meters or MTHM. The date the inventory is valid is shown in the inventory title. The range of years of generation may be shown in the title is specified in the generation title.

The title specifies the Site, Program and whether it is Baseline or Alternative.

Waste/mat'l that is tranferred into this site from another site directly into a processing facility is shown here.

Waste/mat'l is transferred to another site is shown with a box with the total to be transferred on the left and an interface triangle with the appropriate colors.

The receiving program is shown for waste/mat'l that is handed off to another program within the site.

Disposal facilities show a box with the total to be disposed of on the left and nothing on the right.

Waste/mat'l that is tranferred into this program from other sites and programs is shown here.

Each processing facility is shown with this total input volume on the left and total output volume on the right. All split flows come into and out of the nodes to the left and right of the facility box as shown. Each box describes a facility and the function that it performs. (abbreviate if necessary)

Where there is a split, each line is labeled with the total volume that travels through that route.

Waste/Material Streams are entered in this column. Streams are grouped together that have the same first processing step. Streams may utilize the same grouping as the DOE Treatability Group Guidance. Each stream will have a unique identifier.

Where the disposition path is not known, a dashed box with TBD is shown (the path not yet determined).

The Revision and the date the diagram was last modified is shown here.

These two numbers are the subtotals of the inventory and generation volume numbers above.

The Legend shows the color code for each of the major sites. Small quantity sites are gray and unknown are white.

The interface triangle shows transfers between sites. The originating site color goes the big side of the triangle and the destination site color goes on the small side of the triangle.

A diamond indicates an on site transfer between programs. It is filled with the site's color.

INEEL LLW Baseline Disposition Map

PREDECISIONAL DRAFT

This map is conceptual and in many cases does not represent cleanup or transfer decisions; this map does not preclude the on-going regulatory and stakeholder decision-making processes.

Waste/Mat'l Streams | **Disposition**

FY97 Existing Inventory | Total Generation Volume

INEEL-LLW-DD-1 **Non-Treated RH-LLW** 0m³ 485.5m³ AAA
- 39.1m³ LLW from ANL-W AAB
- 522.7m³ LLW from NRF AAC

INEEL-LLW-DD-2 **Non-Treatable CH-LLW from routine generators** 3,510.69m³ 25,144m AAD
- 2,910.41m³ LLW from ANL-W AAE
- 1,326.58m³ LLW from NRF AAF
- 12,371.92m³ LLW from ER/D&D AAG

INEEL-LLW-TR-1 **Incinerable LLW from routine generators** 2,109.46m³ 28,584.6m³ AAH
- 5,547.9m³ LLW from ANL-W AAI
- 3,841.9m³ LLW from NRF AAJ
- 4,995.1m³ LLW from ER/D&D AAK

INEEL-LLW-TR-2 **Sizable LLW from routine generators** 3,153.07m³ 8,012m³ AAL
- 1,565.75m³ LLW from ANL-W AAM
- 1,070.2m³ LLW from NRF AAN
- 832.7m³ LLW from ER/D&D AAO

INEEL-LLW-TR-3 **Compactible LLW from routine generators** 487.43m³ 10,779.1m³ AAP
- AAQ
- AAR
- AAS

INEEL-LLW-SC-2 **Special Performance Assessment Req'd LLW** 7.3m³ 0m³ AAU

9,352.4m³ 73,221.8m³

Consoli-dation (×4)

1,038.8m³ From ANL-W 2007-2035 ABU

3,448m³ From HLW 2007-2038* ABV

AAV 687.8m³ (FY2009 to FY2035) → TBD Offsite R… Disposal 687.8m³

AAW (FY1998 to FY2008) 359.5m³

AAX (FY2007 to FY2044) 21,554.1m³ → TBD Offsite CH LLW Disposal 31,993.4m³

AAY (FY1998 to FY2006) 23,709.7m³

331.38m³ From MLLW WERF Stabilization ABR

AAZ (FY1998 to FY2003) 7,216.6m³ Handoff to MLLW WERF Incinerator

36,333.2m³ (FY2004 to FY2035) ABA → Commercial Incineration (37,862.5m³ / 196.7m³)

1,529.3m³ (FY1…

4,936.0m³ (FY1998 to FY2003) ABC → WERF Sizing (4,936.0m³ / 987.2m³)

14,226.9m³ → Commercial Compaction (4,226.9m³ / 4,064.9m³)

WERF Compaction (3,… / 890.3m³)

TBD Treatment

TBD Treatment

17.0m³ ABI (FY2004 to FY2006)

4.4m³ (FY1999) ABH

175.3m³ (FY2007 to FY2044) ABG

987.2m³ ABJ

354.2m³ ABO (FY2004 to FY2006)

3,710.7m³ ABN (FY2007 to FY2044)

890.3m³ ABM

ABP 301m³ → RWMC Disposal 28,268m³

ABQ 7.3m³ → TBD Disposal

ABS 322.38m³ From ANL-W 1998-2006

ABT 1,118m³ From HLW 1998-2006*

BL … BK …

*On HLW Disposition Map

KEY: INEEL | OR | Fernald | RFETS | SNL | SRS | NTS | Hanford | WIPP | Offsite Comm. | Onsite Comm. | LANL | West Valley | SQS | Unknown | Intersite Interface: | On site Interface:

5-7
5-3

Rev. 3.1
6/16/98

Alpha-numeric code in blue is the site stream link identifier (used to link the map to the data)

Figure 3-2 Example Waste Disposition Map

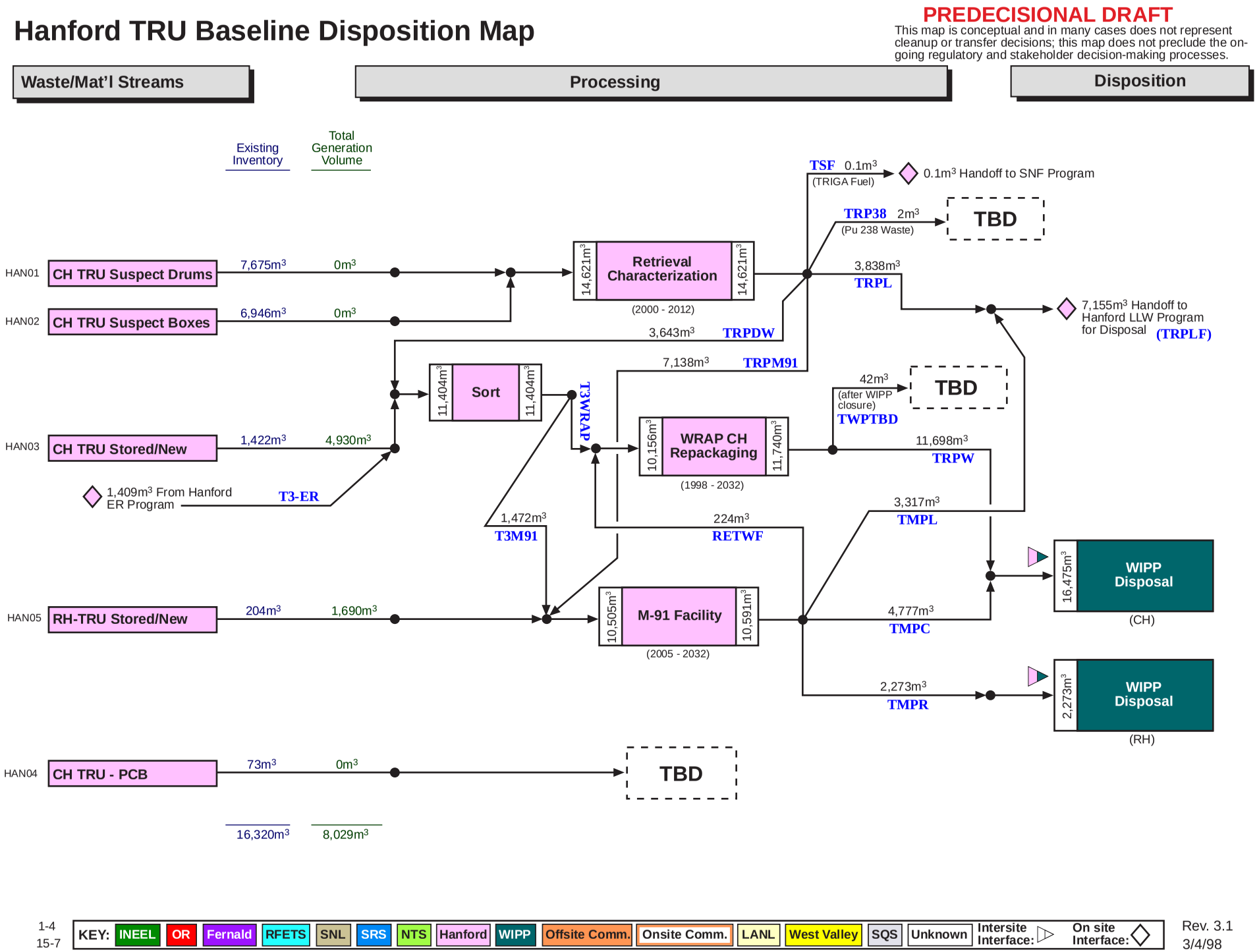
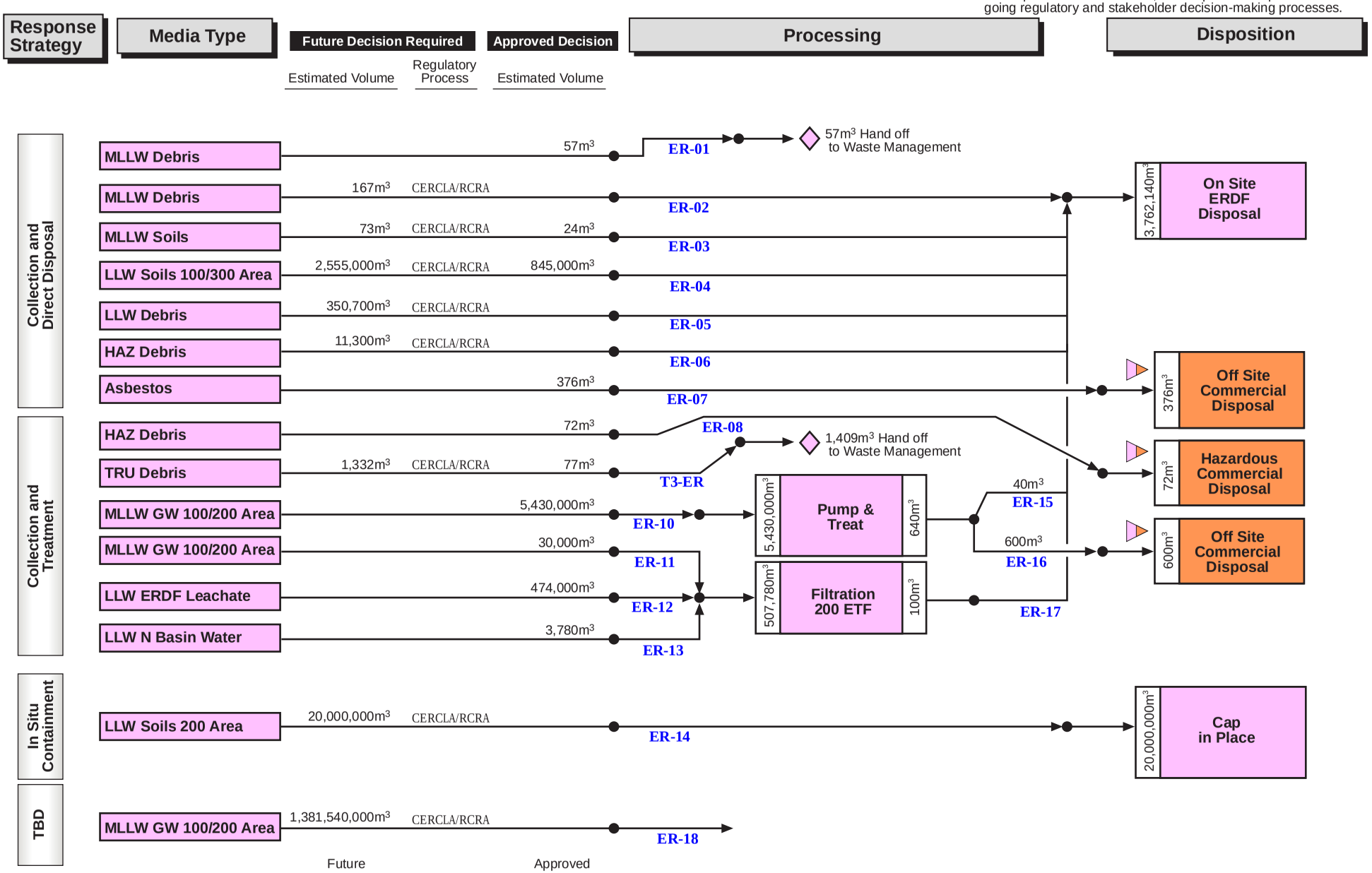


Figure 3-3 Example Environmental Remediation Disposition Map

Hanford ER Baseline Disposition Map

PREDECISIONAL DRAFT

This map is conceptual and in many cases does not represent cleanup or transfer decisions; this map does not preclude the on-going regulatory and stakeholder decision-making processes.



	Future	Approved
Groundwater/Surfacewater:	1,381,540,000m³	5,460,000m³
Media in Place (In Situ):	20,000,000m³	0m³
Waste (Ex-Situ):	2,918,572m³	1,323,386m³

NOTE: Volumes are estimates only (based on March 1998 Paths to Closure data) and they will change as cleanup activities progress.

KEY: INEEL | OR | Fernald | RFETS | SNL | SRS | NTS | Hanford | WIPP | Offsite Comm. | Onsite Comm. | LANL | West Valley | SQS | Unknown | Intersite Interface: ▷ | On site Interface: ◇

Alpha-numeric code in blue is the site stream link identifier (used to link the map to the data)

Figure 3-4 Example Nuclear Material Disposition Map

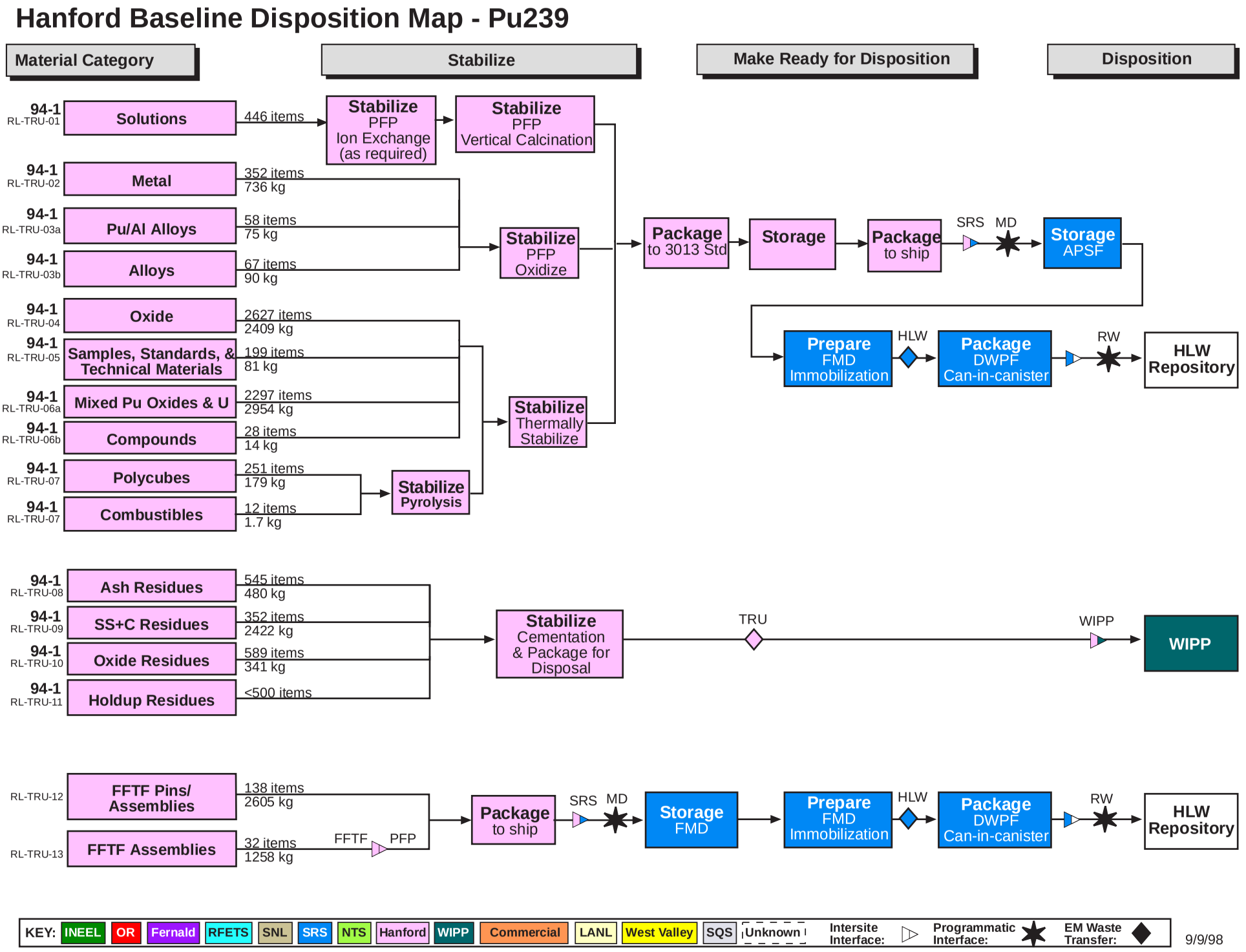


Figure 3-5 Example I/O Map

Transfer Disposition Summary Map

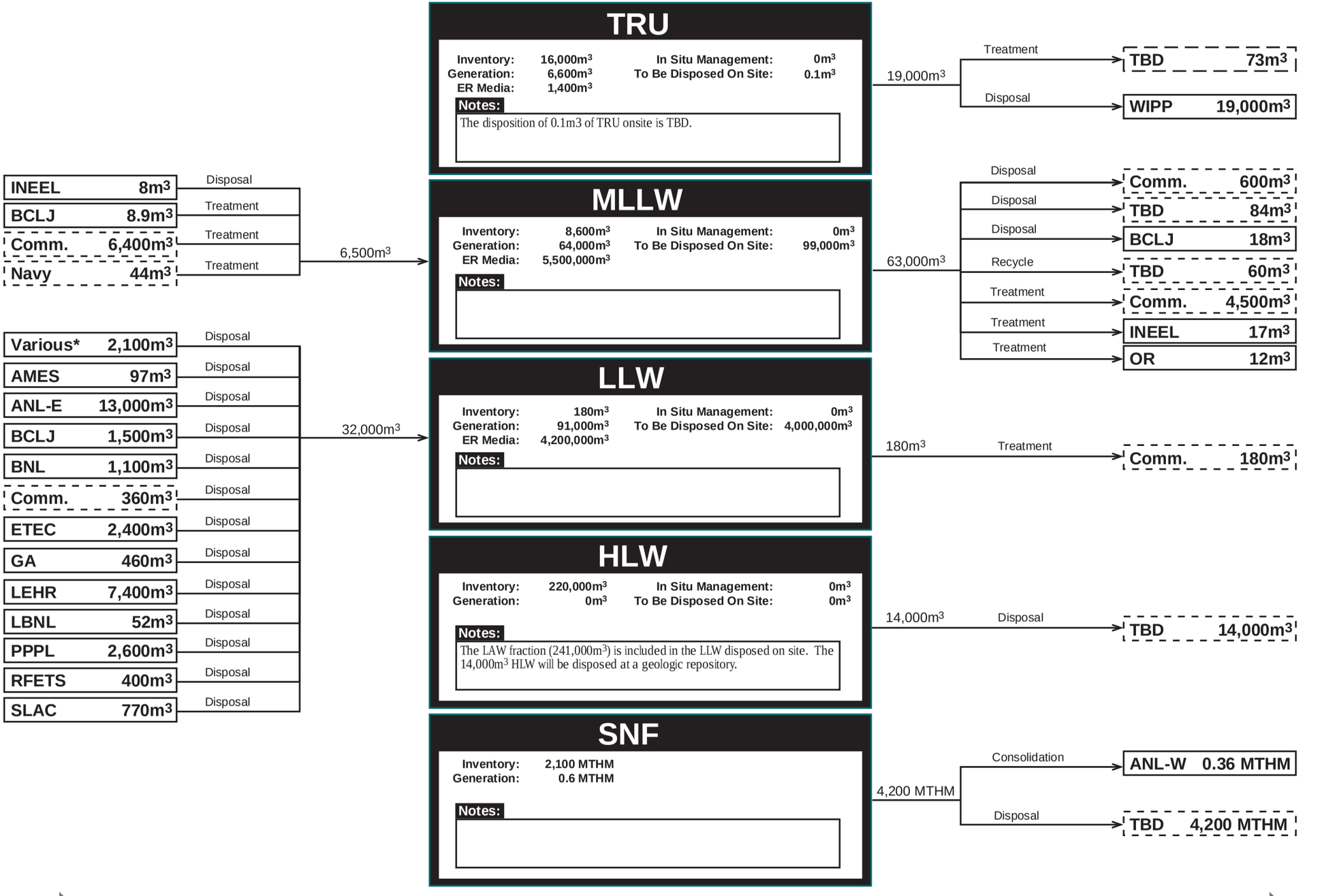
Hanford

This map is conceptual and in many cases does not represent cleanup or transfer decisions; this map does not preclude the on-going regulatory and stakeholder decision-making processes.

DRAFT

Inputs

Outputs



NOTE: Input, Output, and Disposal volumes may not add up because of treatment volume changes and handoffs. Hazardous waste volumes are not shown. D&D waste may or may not be included in the volumes shown.

Inputs

Outputs

4/30/98

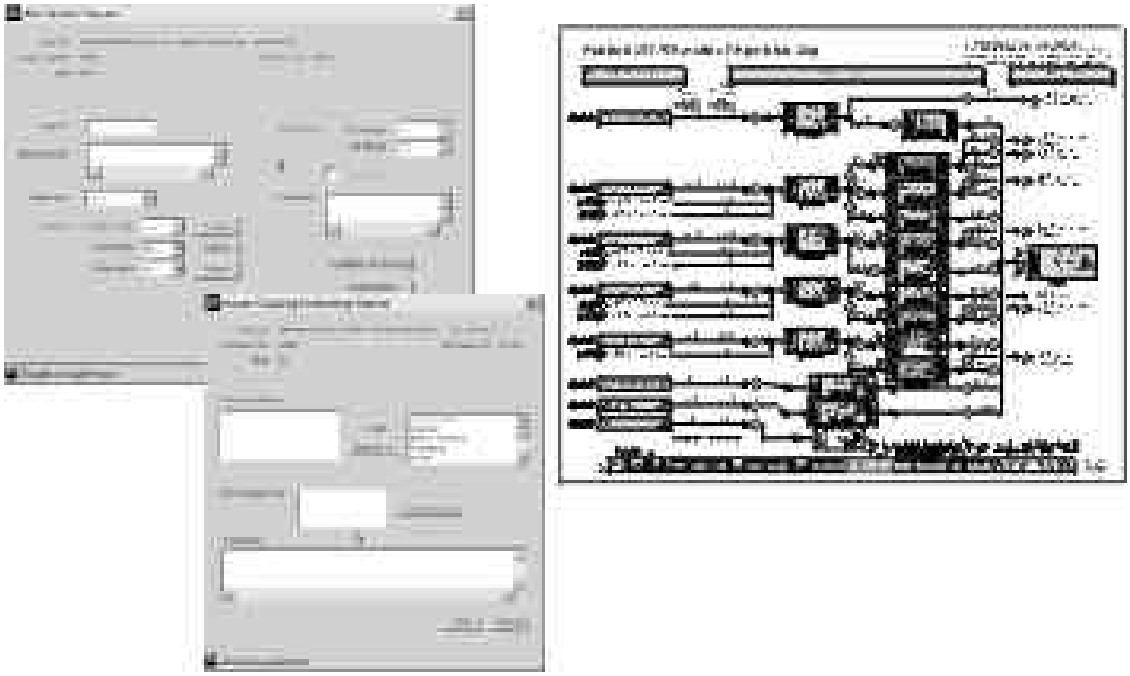
3.B Analysis and Visualization System (AVS)

The Analysis and Visualization System (AVS) is a suite of web-based application tools designed to help users understand EM waste and materials strategies by using powerful graphic depictions. The graphical tools (e.g., disposition maps, I/O diagrams, and site maps) are dynamically created from an integrated database as defined by the Integrated Planning Accountability and Budgeting System data requirements and contain information from all DOE Field Offices. AVS also dynamically generates reports from the most current information stored in the database.

A critical aspect of the AVS provides a data-maintenance application where field offices can add/modify their waste and material quantity data in real time. Sites can quality-check site interfaces and other data before submitting it to DOE-HQ. This gives sites a powerful tool to minimize the number of technical gaps/disconnects between site waste transfers up front in the data collection process. By using the AVS to gather information, users are guaranteed current information with minimum research time.

Barriers documented in the AVS data maintenance sub-system display disposition needs and problems on the disposition map using colored dots or "stop lights." In the future, the needs/barriers identification will span several categories including technology and facilities/equipment. A stop light is a clickable object associated with additional information defining problem(s) and what is being done to resolve the problem(s).

AVS also provides the capability for PAITs to record and update progress of the integration opportunities and *REPs*. The tracking function in the AVS increases communication across the



complex by giving DOE a place to baseline opportunities and provides a quick reference on opportunity status.

3.C GroupSystems by Ventana

GroupSystems, a new electronic meeting system available to the PAITs, allows the use of interactive computer visualization to enable participants to work together to identify novel approaches and ideas to problem-solving.

The system uses GroupSystems, a software developed by the Ventana Corporation, to facilitate communication on a given idea or issue. This type of tool has been used for the past 15 years by universities, industry, and other Federal agencies to identify concerns, priorities, and perceptions on issues and to develop potential solutions using collaboration.

Research indicates that meeting times can be reduced by as much as 50 percent. The idea is to use the system to foster involvements by the team members and to provide a forum to promote communication and consent-building among decision makers. The portability of the system, along with the ability to be used on the World Wide Web creates a favorable environment to involve people in one location or participants that are in separate locations. This application is available through portable meeting rooms, a distributed meeting setting over the INEEL local area network, and as a virtual meeting place on the Internet.

GroupSystems supports the PAITs by providing a new tool for communicating and problem-solving. Some specific tools include:

Electronic Brainstorming provides a simple process in which a question or issue is distributed to participants, who respond with comments. It promotes creative and far-reaching discussions.

Categorizer helps your group generate a list of ideas and supporting comments. You then create categories for the ideas and easily sort the ideas and comments into the desired categories.

Topic Commentor offers participants the opportunity to comment on a list of topics. This tool's format for idea generation is more structured than Electronic Brainstorming, but less structured than Group Outliner.

Group Outliner allows the group to create and comment on a multi-level list of topics. Structure lines, bullets, or a legal numbering format may represent the levels.

Vote provides a variety of methods to help the group evaluate a list of ideas and develop consensus or reach a decision. The results can be displayed in statistical and graphic formats.

Survey can be used to learn about participants attitudes or accumulate detailed information prior to or during a meeting. Analysis of responses can be done immediately upon collection of the finished surveys. Standard surveys can be stored and reused for trend analysis.

Alternative Analysis allows groups to rate a list of alternatives against a list of criteria using a matrix (or spreadsheet) format. The results of the evaluation can be viewed in a variety of formats, including scatter plots, bar charts, pie charts, vote-spread tables, and text reports. Additionally, groups can test "what-if" scenarios by adjusting the weighting of each criteria.

Final Documentation can be provided electronically or as a hard-copy. The documentation provides a complete record of all system inputs, idea categorization, voting results, statistical calculations, and graphical presentations.

For more information visit the Internet site: http://edsc.inel.gov

3.D Workshops

A PAIT workshop is a central meeting designed to:

- Identify and solve common problems/issues;
- Improve complex-wide communications and baseline planning;
- Develop and evaluate technically defensible alternatives; and
- Develop specific actions that plot a path forward to implement alternatives.

3.D.1 Method

Systems engineering is a proven approach to problem-solving. The systems engineers develop prescriptive integration processes deployed in a workshop setting to meet the objectives and product needs of the customer. Subject matter experts (SMEs) and other key personnel make the process work efficiently and ensure products are technically defensible.

3.D.2 Participation

In order for a workshop to be efficient and effective the participants must actively participate and follow the "do's" and "don'ts" shown below. Every issue discussed at a workshop may not directly affect a participant or that participant's site. However, each participant is needed as part of the "brain trust" required to determine a correct path forward.

Do's	Don'ts
Roll up your sleeves and get involved; look for ways to improve the workshop outcome.	Come to the workshop expecting to be entertained.
Send the real experts and decision makers.	Come and go as you please.
Maintain continuity of participants.	Get distracted from the process.
Remain on task until the work for the day is complete.	Be judgmental.

3.D.3 Roles

Each group involved in the workshop process has a defined role as follows:

Group Name	Role
PAIT Lead and Co-Lead	Establish expectations and objectives. Sponsor integration workshops. Ownership of the integration opportunities and the implementation planning.
Field Offices Members	Bring site knowledge and perspective.
SMEs	Share knowledge and experience to solve problems.
Systems Engineers	Ensure application of integration process to solve problems and meet integration objectives.

3.D.4 Preparation and Homework

To achieve the desired outcome of a workshop, four to five weeks lead time should be allowed to prepare/design workshop processes. During this time homework assignments may be given to participants. Additionally, action items may be assigned during the workshop to be completed as post-work to the workshop.

3.D.5 Benefits

Workshops have proven successful in promoting/deploying integration across site and program boundaries within DOE Environmental Management. Specific benefits include:

An integrated baseline plan for the entire complex;
Focus on complex-wide problems with technically defensible solutions; and
Disciplined and repeatable methods.

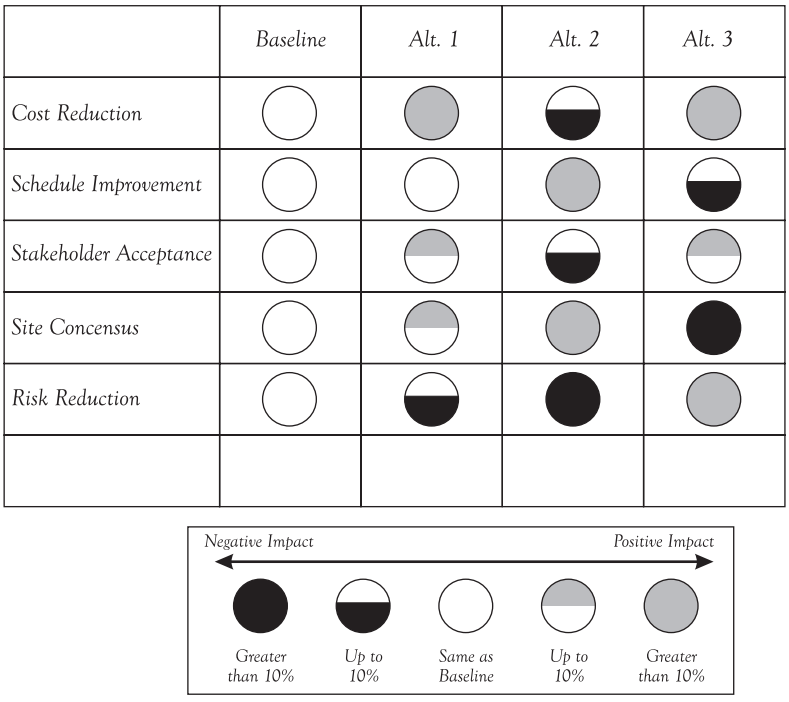
The following are some methods that can be used during workshops to consistently evaluate and consider various alternatives for opportunities.

3.D.6 Workshop Tools

3.D.6.1 Consumer Reports Analysis

During the workshop one or more alternatives are developed to solve a specific complex-wide problem. Each workshop participant evaluates each alternative against the current baseline by applying a set of defined criteria using his or her professional judgment and experience. The raw data is then summarized into a consumer report chart. The consumer report chart depicts how the workshop participants scored the alternatives as compared to the baseline. Figure 3-6 is an example of a generic consumer report chart.

Figure 3–6 Example Consumer Report Chart



3.D.6.2 Cost/Time Analysis

Standardized savings and investment calculations, based on a complex-wide perspective, are necessary for determining the value of an opportunity, as well as for prioritizing implementation opportunities.

When developing the *Opportunity Description Document*, each PAIT should provide a preliminary estimate of net savings that includes savings and/or cost avoidances offset by any initial investment costs. Information and gross assumptions relative to the accuracy of the estimate should also be provided, e.g., "order of magnitude," ±50%, etc.

Given that development of a *Recommendation Evaluation Plan (REP)* has been approved and the purpose and scope of the integration opportunity has been clearly defined, the *REP* should identify how the following cost information will be developed:

- identify the current Complex-wide configuration (or current approach) and associated life-cycle cost baseline;

- determine how the proposed integration opportunity will impact the current configuration (baseline) and include how much of the baseline configuration will remain and require continued funding;

- conduct "before and after" net savings analyses that include savings and cost avoidances offset by any initial investment costs from implementing the proposed integration opportunity; and

- present results to include Savings/Investment Ratio, Net Present Value, Break-Even Time, etc.

Determine the life-cycle cost impacts resulting from a proposed integration opportunity by clearly identifying the current *Paths to Closure* cost 'baseline' (e.g., LLW is currently being shipped to six DOE sites for disposal at an annual cost of $X), which should include an itemized list of the key contributors to life-cycle costs – to be hereafter known as the "cost elements" (e.g., fixed infrastructure costs, generator fees, taxes, shipment, facility operations, disposal, S&M, etc).

With life-cycle cost elements identified for the baseline configuration, determine which cost elements will be impacted (and how) by the introduction of the proposed action (e.g., if proposed integration opportunity recommends closing four of six disposal sites, how will fixed infrastructure costs, generator fees, taxes, shipment routes, facility operations, S&M, etc, be affected?). What current baseline activities will still require funding? Will any existing cost elements be avoided? What new cost elements will be introduced as a result of the integration opportunity (e.g., up-front investment, increased risk/continency, regulatory costs)? Document all assumptions.

After the baseline and proposed action costs have been calculated, implementation cost schedules can be developed. These schedules must be sufficiently detailed to enable creation of yearly cash flows. The schedules must show the anticipated net cash flows (sum of cash outflows and inflows) that are associated with each year of implementation. Cash flows for expenditures will be outflows, salvage value of equipment, if any, is considered a cash inflow. The following table shows simplified cash-flow schedules over six years.

Simplified cash-flow schedules, in millions of dollars

Option	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Baseline	10.0	2.5	4.0	4.0	4.0	2.0
Integration Opportunity	12.0	1.5	1.5	1.5	3.0	0

Cash flows can be expressed in either constant or escalated dollar amounts. Constant dollars represent the amount of purchasing power required for future tasks as if the tasks were to be paid for at present. Constant dollars are not escalated for anticipated inflation. Escalated dollars, on the other hand, represent the amount of purchasing power required for future tasks given an assumed rate of escalation. Cash-flow analyses must not mix constant- and escalated-dollar estimates.

Cash-flow should be discounted and net present value (NPV) determined for both options in order to ensure an 'apples-to-apples' life-cycle cost comparison. From the cash-flow schedules, each year's net cash flow will be discounted to present-year or year-zero values, using the appropriate discount rate established by the Office of Management and Budget (OMB) in OMB *Circular A-94*[1]. For project costs expressed in constant dollars, the OMB real discount rate should be used. For project costs escalated to show estimated actual costs (e.g., Project Baseline Summaries (PBS) out-year costs in *Paths to Closure* document, escalated at 2.7% per year), the effects of escalation must be removed before discounting with the OMB real discount rate.

Cost/time and cash flows analysis need to plan for and reflect budget cycle considerations. Other analyses of benefit such as break-even time, savings/investment ratio, and related graphical presentations can be easily performed as necessary with the information developed above.

Additional information on life-cycle cost analysis can be obtained from the Federal Energy Technology Center publication, *Standard Life-Cycle Cost-Savings Analysis Methodology for Deployment of Innovative Technologies*. Copies of the publication and assistance can be obtained from the Center for Acquisition and Business Excellence (Please see Appendix F or contact Rob Martinez at 304-285-4121)

3.D.6.3 Risk Analysis

Documenting risks to workers and the public is a key component of the trade study process. EM program managers, often not experts in risk assessment, will be considering risks and factoring them into Integration planning. This section summarizes some of the information program managers need to consider in planning risk assessments or determining whether to conduct them at all. Appendix I provides additional detail. Risk studies can be conducted to help investigate EM Integration opportunities similar to how they've been used for the last several years in the Nuclear Material and Facility Stabilization (EM-60) program. They are used to identify, describe, and compare (i.e.,

[1]The Circular is revised periodically. It can be obtained from the OMB Publications Office, 202-395-7332, or on the Internet: http://www.whitehouse.gov/WH/EOP/omb

understand "tradeoffs") viable alternative courses of action. They are part of effective program management and not necessarily tied to any regulatory requirement.

Even though risks may be low, understanding risks enables decision-making. In today's democracy, just stating that the risks are low is not adequate. The public and its representatives (elected-officials, courts, and advocacy groups) are interested in how risks are being managed. Knowledge of the risks is the first step in communicating, controlling, and minimizing them.

In general, there are two different risk questions that should be considered when doing a trade study.

- When the project is completed, what is the risk reduction (or increase) achieved? The amount of risk reduction between the present-day storage and configuration of hazardous material or waste and the end state of a proposed alternative for its stabilization or disposition is a factor that should be considered in choosing among the alternatives. The amount of risk reduction may also be a factor in setting the priority for one EM project relative to another.

- What are the increases in risks to the public, workers, or and the environment while the project is being carried out? In the short term, postponing action is less risky than doing something with a waste or material that needs to be stabilized. Also, the various alternatives may have very different risks during their execution.

Note that the risk questions above only consider *relative risk*, that is, the difference in risk between one course of action and another. Characterizing the differences in risks can often be done in a qualitative or semi-quantitative way when data are not reasonably available to predict the absolute risk. In some cases, absolute risk values may be useful, for example, to indicate if risk is high enough to be a discriminating factor for either option. Appendix G says more about this graded approach.

A number of tools and resources are available to Program Area Integration Teams to scope and conduct risk assessments. The Center for Risk Excellence can help PAITs identify potential risk assessment needs, scope assessments, and peer review assessments. The Center (including its National Laboratory Support Team) is also available to help select teams to conduct assessment work. (Please see Appendix F and G or contact Peter Siebach at 630-252-2007)

3.E Barrier Identification and Visualization – "Stop Lights"

Barriers to achieving disposition of waste and materials can be easily identified by providing colored dots, or "stop lights," on disposition maps. These stop lights–green circles, yellow triangles, and red squares—denote the status of all map elements. Basically, green indicates the link works; yellow denotes minor problems to be overcome prior to use or an inefficient element; and red means it does not work at all or there is no path forward. The "Stop Light" system can be available to PAITs through the AVS. Currently only the Technology Development system is available. In the future, the needs/barriers identification will span several categories including technology and facilities/equipment.

Using this method the user, at a glance, can see the status of all waste and material stream disposition paths. This method allows EM to rapidly view the status of science, technology, transportation, and facility needs (Figure 3–7). An example disposition map with the associated stop lights is shown in Figure 3–8. This information can be used to balance current and future portfolio investments to solve the highest priority issues.

Figure 3–7 Stop Lights

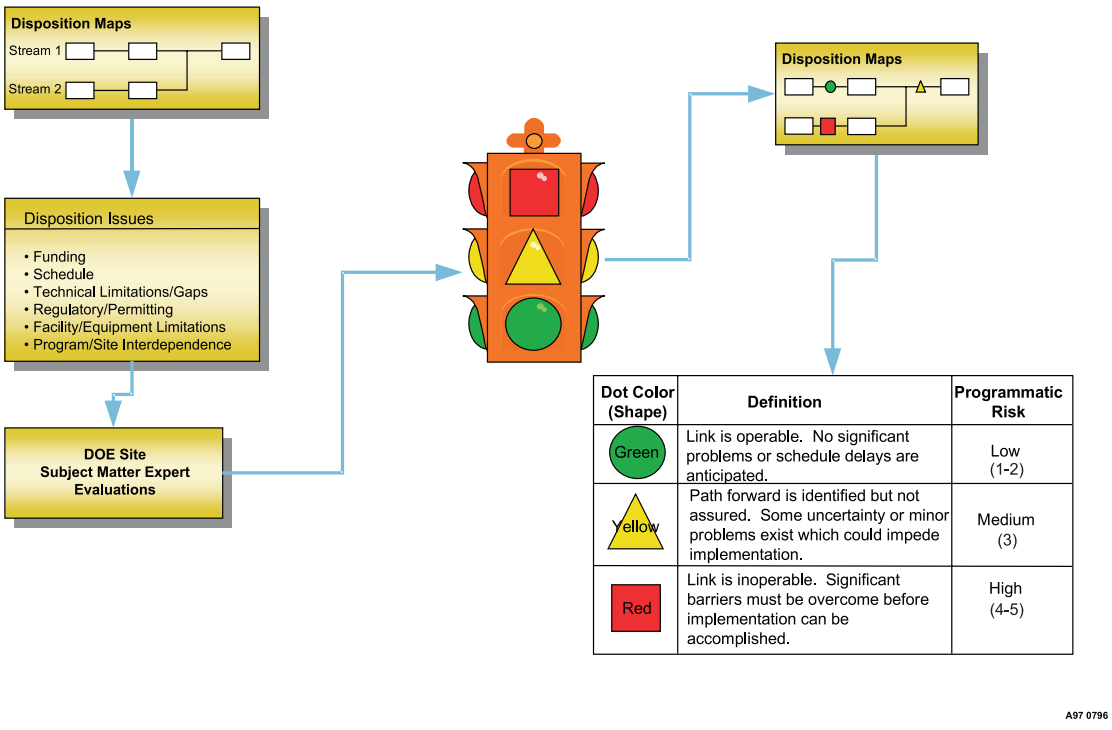
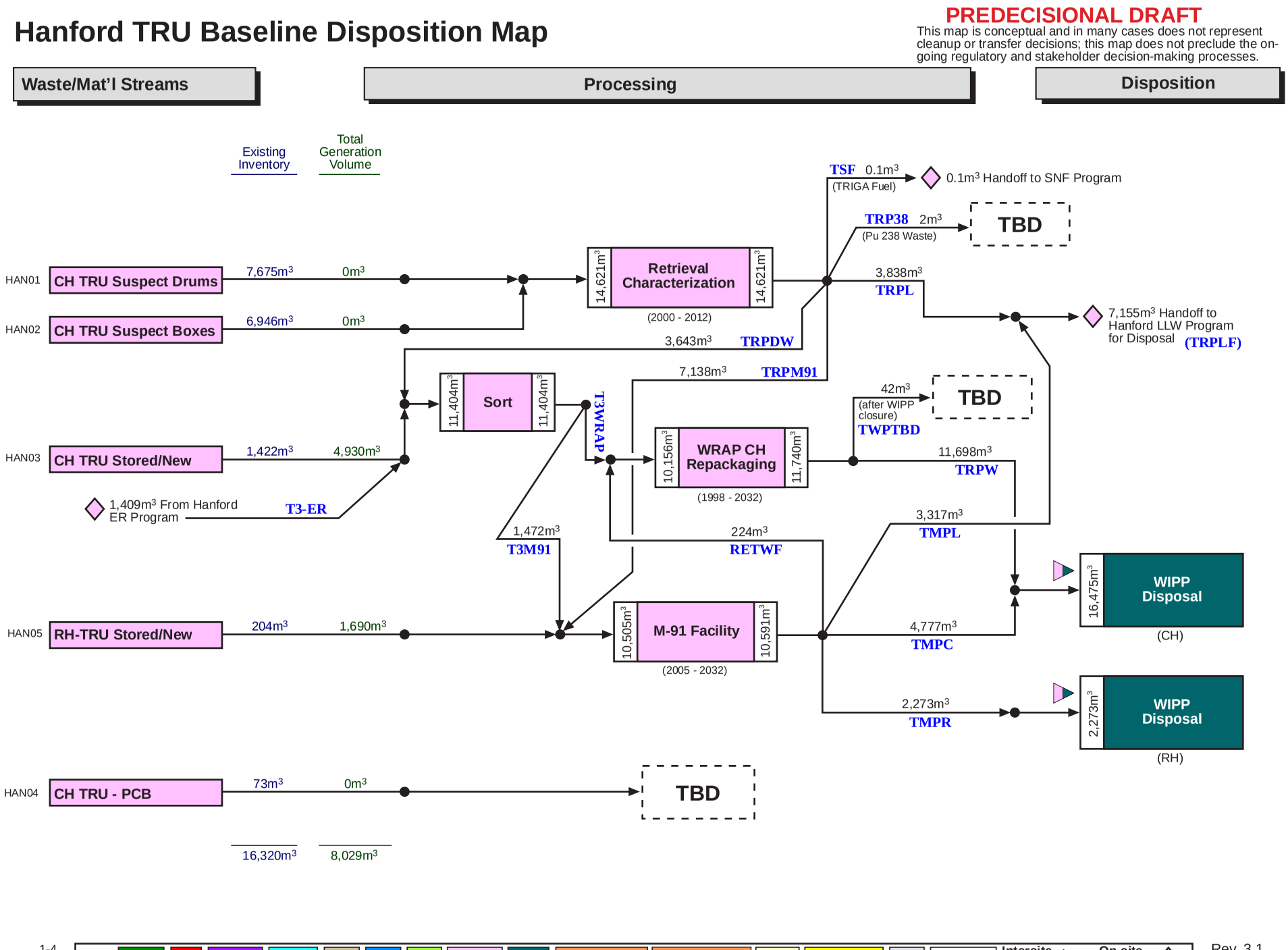


Figure 3-2 Example Waste Disposition Map



Tab 4: Recommendations

4. RECOMMENDATIONS

This tab is not included on the web version of this handbook.

Tab 5: Appendices-EM Integration References

APPENDIX A

WORKING CHARTER
FOR
ENVIRONMENTAL MANAGEMENT PROGRAM INTEGRATION

Working Charter for Environmental Management Program Integration

September 1998

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Assistant Secretary for Environmental Management

James C. Hall

Oak Ridge Operations Manager

Jessie M. Roberson

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Savannah River Operations Manager

G. Leah Dever

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for Jerry W. Johnson

Nevada Operations Office Manager

John P. Kennedy

Chicago Operations Office Manager

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WORKING CHARTER
FOR
ENVIRONMENTAL MANAGEMENT PROGRAM INTEGRATION

Background

Prior to 1989, the Department of Energy managed its waste and nuclear materials through individual headquarters programs in support of its nuclear weapons production and research and development missions. Since 1989, the Office of Environmental Management (EM) has consolidated ongoing cleanup activities from various programs. The EM program includes: management of sites that no longer have a weapons production mission; direct cleanup activities associated with environmental restoration; deactivation, decontamination and decommissioning; waste and nuclear materials management; science and technology development; and a large array of support services.

Initially, the EM program focused on corrective action activities aimed at bringing sites into compliance with environmental statutes and eliminating urgent risks. With corrective activities largely in place, the EM program now is focusing on a vision to accelerate cleanup in DOE's *Accelerating Cleanup: Paths to Closure (*hereinafter referred to as *Paths to Closure).* Implementing strategies in *Paths to Closure* will require sites to achieve increasing program efficiencies to accomplish the cleanup vision within budget constraints.

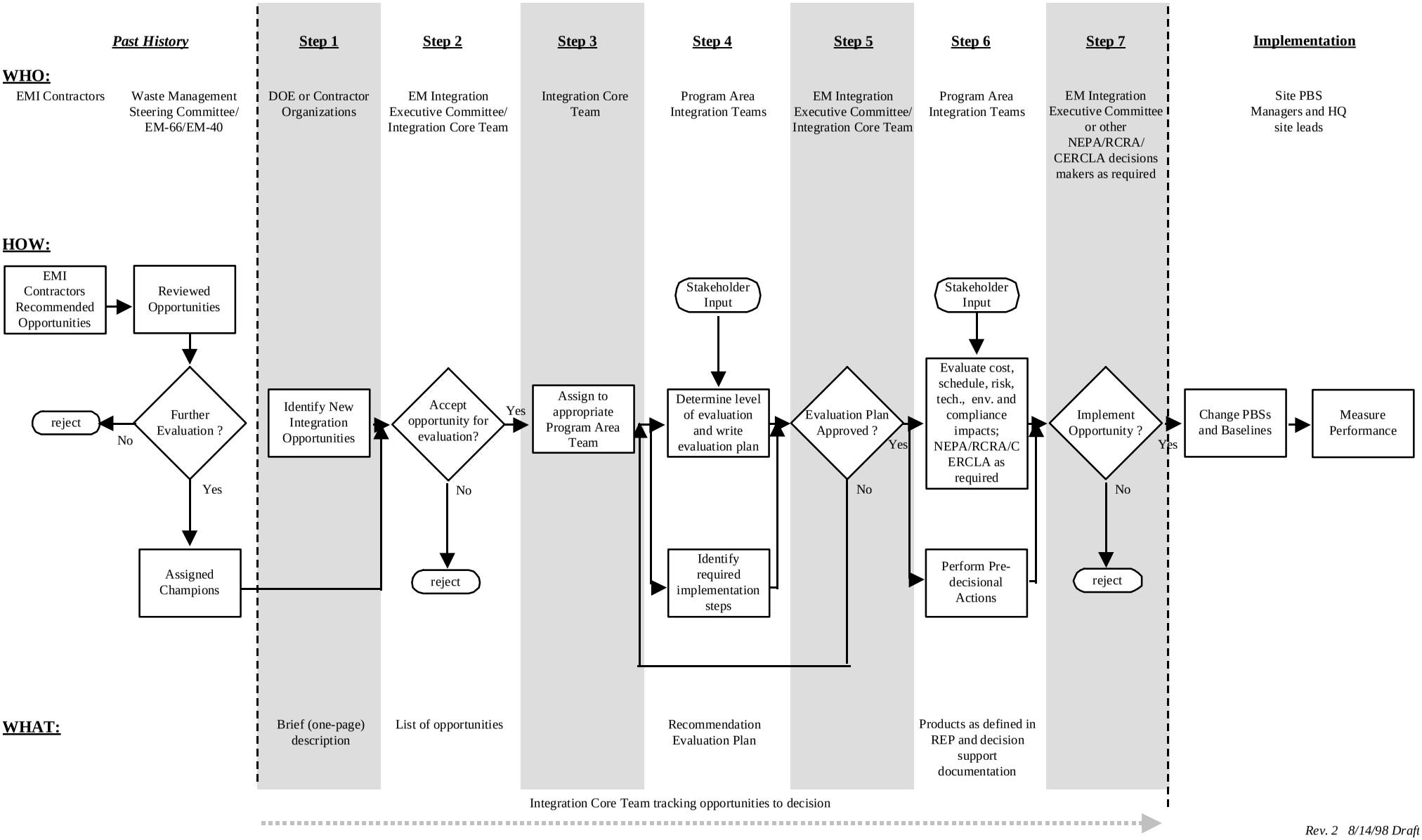
The goal of integration is to achieve program efficiencies by eliminating redundant facilities and using available capacity, crossing program boundaries or removing "stovepipes," taking advantage of the collective learning curve, applying site successes and lessons learned nation-wide, employing innovative technologies, and using national procurement vehicles to meet unique needs. Integration requires corporate thinking on the part of headquarters and field managers, looking at broader interests than a single program or site, and focusing on those needs which achieve the cleanup vision in an optimized fashion. Integration ensures an overall, consistent approach to address national policy issues and issues that affect more than one site.

A group of alternative ideas and opportunities to those proposed by sites in *Paths to Closure* was developed by a contractor-led Complex-Wide EM Integration (EMI) Project in 1997. Most of these ideas and opportunities are being further considered by EM in the context of this integration process.

Integration Process and Products

The overall integration opportunities process which will be used for EM Program Integration is depicted in the attached Figure 1. Opportunities are derived as alternatives to baseline plans or activities which fill gaps or fix disconnects in projects. Any organization can identify new opportunities. A systems approach to identify, plan, and evaluate integration opportunities results in recommendations to senior management for rejection or implementation. The approach involves stakeholders in planning and evaluation steps. Evaluation complies with established decision processes, e.g., National Environmental Policy Act (NEPA) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/ Resource Conservation and Recovery Act (RCRA).

Figure 1 - Integration Opportunities Process



Rev. 2 8/14/98 Draft

The EM integration process is guided by the following principles:

Integration is not a one-time effort to fix our planning base, but is institutionalized in the way we conduct business; it is a culture. Data collected through the EM Integrated Planning, Accountability and Budgeting System (IPABS) will be used to the maximum extent possible.

Decisions are made through existing process such as NEPA or CERCLA.

Integration is a partnership between EM headquarters and field organizations, both DOE and contractors.

Systems engineering ensures a consistent, technically defensible approach.

Innovative "out-of-the-box" thinking feeds integration; incentives could be established to promote and reward federal employees and contractors for new ideas; ideas and opportunities are promptly acted upon as needed to achieve efficiencies at the departmental level.

Integration activities will interface with other Departmental organizations, e.g., Defense Programs (DP), Fissile Material Disposition (MD), Nonproliferation and National Security (NN), Nuclear Energy (NE), and Civilian Radioactive Waste Management (RW).

Small increases in efficiency are important; when applied across the complex these can result in significant savings.

Consideration of health and safety of the public and workers and protection of the environment is an integral part of the process.

Transportation is key to the evaluation of integration opportunities for treatment, storage, and disposal. Considerations include: number of shipments, availability and timing of packaging and carriers, costs, risks, and efficiencies within the transportation system.

Science and technology offer unique opportunities for achieving efficiencies.

The integration process fosters coordination with Tribal nations, States, regulators, and other stakeholders during planning and evaluation and not "decide, announce, and defend."

The major products resulting from the EM program integration process described herein are: (1) a brief description of integration opportunities, (2) a list of opportunities identified and/or being evaluated, (3) recommendation evaluation plans (REPs), and (4) evaluation documentation. Consistent with the process depicted in Figure 1, the primary vehicle for evaluating the feasibility of integration opportunities is the REP. Once an opportunity has been identified and approved for evaluation, an REP will be developed that will clearly delineate the level and scope of evaluation needed in order to reach a decision on its implementation (i.e., evaluation of cost, schedule, risk, technical, environmental and regulatory compliance, and other key factors). The actions needed for implementing the recommendations should also be clearly identified, and the recommendations should be evaluated and prioritized against criteria that take into account various programmatic considerations (i.e., impacts on existing compliance agreements, regulatory compliance, timing to implement, availability of technology, cost, equity

considerations, etc.). Responsibilities for developing, approving, and implementing an REP are further delineated later in this document. Specific evaluation documents will be described in each REP. Once all evaluations are conducted, necessary decision support documents (evaluation documentations) will be developed that outline evaluation findings and implementation recommendations.

Structure

DOE has established a "corporate board" to plan, direct, facilitate, and evaluate program integration efforts across the DOE complex for EM programs. An *Integration Executive Committee,* comprised of senior EM managers, will oversee the overall operations of the EM integration process and twelve *Program Area Integration Teams*, who will use an "integrated product management" approach to identify, evaluate, and (where appropriate) implement integration recommendations. Day-to-day support to the Integration Executive Committee in carrying out its objectives will be provided by an Integration Core Team. The Integration Core Team will also provide support to the Program Area Integration Teams. Program Area Integration Team members will be selected that can bring technical expertise from their respective sites or programs. Expertise will also be provided, as needed, by the National Programs and Centers for Excellence.

The EM Integration structure, including the relationship of the Integration Executive Committee and each of its supporting entities, is depicted in the attached Figure 2, and the current membership is shown on page 11. Each entity will have full authority and accountability in carrying out their charters, as described in the paragraphs below.

To add breadth and perspective to those responsible for identifying and evaluating integration opportunities, field and HQ staff, as appropriate, are encouraged to spend periods of time at other sites (e.g., sabbaticals) to become familiar with similar EM activities performed around the DOE complex.

Integration Executive Committee

The Integration Executive Committee will serve as the ultimate decision authority within EM on the implementation of integration opportunities. The Committee will facilitate an integration culture throughout EM (DOE and contractors). The Integration Executive Committee assumes the charges of and sunsets the current federal and contractor Integration Steering Committees and the Technology Acceleration Committee. Specific responsibilities of the Integration Executive Committee include the following:

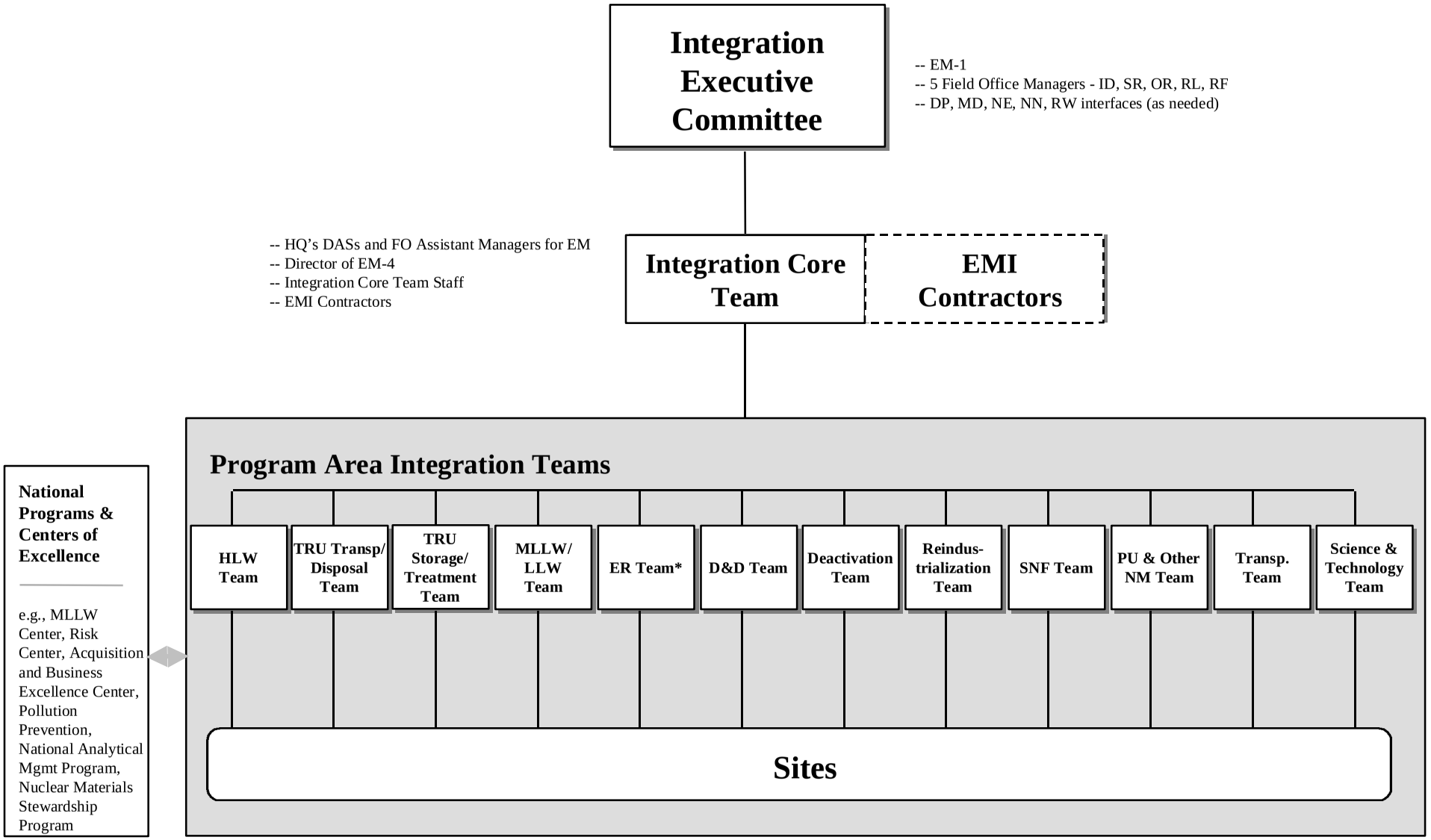
- Provide overall direction and leadership.

- Establish the Program Area Integration Teams and assign team leaders.

- Approve the Integration Core Team assignment of opportunities to the Program Area Integration Teams.

- Make decisions on integration opportunities based on input and analyses provided by the Program Area Integration Teams or the Integration Core Team (i.e., accept an integration

Figure 2 - Proposed EM Integration Structure



* Including focus on buried waste issues (e.g., complex-wide pre-1970 buried TRU/CERCLA issues)

- Ensure adequate resources are applied at the sites and HQ.

- Ensure coordination and interface directly with other field offices, as well as the other program offices within DOE (e.g., DP, MD, NE, NN and RW).

- Resolve process and organizational issues raised by the Integration Core Team or Program Area Integration Teams.

- Provide corporate leadership to ensure an aggressive effort to deploy alternative and more effective technology through full integration of the technology development and user organizations.

- Facilitate cross-site actions and ensure implementation of recommendations once decisions are made.

- Continually review the progress of Program Area Integration Teams.

- Continually evaluate the structure and process of the EM Integration effort and determine any changes needed in the structure, process, or continuance of the EM Integration Team and its organizational entities.

- Collaborate to work equity issues among States with regard to integration opportunities.

- Meet quarterly to review status and progress

The Integration Executive Committee is chaired by the Assistant Secretary for Environmental Management. Members will include the five Field Office Managers from Idaho, Savannah River Site, Oak Ridge, Richland, and Rocky Flats. The Integration Executive Committee will keep the other Field Office Managers informed. Other Field Office Managers are also invited to attend the Integration Executive Committee meetings as observers.

Integration Core Team

An Integration Core Team, reporting directly to the Integration Executive Committee, will provide a constant source of resources and support to both the Integration Executive Committee and the Program Area Integration Teams. The Integration Executive Committee will select a team leader for the Core Team. The Team's membership will include Deputy Assistant Secretaries; one member, preferably an Assistant Manager from ID, SR, OR, RL, and RF and a representative from the Carlsbad Area Office; the Director of EM's Office of Safety and Health (EM-4); and other members as selected by the Integration Executive Committee. The team will also have a small number of dedicated staff from the HQ program offices for "staff functions."

The Integration Core Team will work as "executive directors" to ensure progress and success. This will be accomplished through the EM program Deputy Assistant Secretaries and Site Assistant Managers for EM. The Integration Core Team has three major functions: (1) ensure direction from the Integration Executive Committee is implemented; (2) bring items promptly to the Integration Executive Committee; and (3) manage the day-to-day activities of the EM Integration process. Specific responsibilities include the following:

- Ensure the direction from the Integration Executive Committee is implemented.
  - Assign opportunities to the Program Area Integration Teams.
  - Champion changes in culture.
  - Coordinate and provide guidance to the Program Area Integration Teams.

- Bring items promptly to the Integration Executive Committee.
  - Perform additional analysis and provide a staff recommendation from a national perspective on results from the Program Area Integration Teams.
  - Track progress and raise issues for resolution to the Integration Executive Committee.
  - Propose new ideas for the Integration Executive Committee's consideration.
  - Plan and facilitate meetings for the Integration Executive Committee.

- Manage the day-to-day activities of the EM Integration process.
  - Ensure EMI contractor resources are available.
  - Ensure support is readily available from the National Programs and Centers of Excellence
  - Ensure coordination across the Program Area Integration Teams.
  - Communicate and coordinate with other HQ programs and teams (e.g., site teams, waste type managers).
  - Ensure the Program Area Integration Teams are fully staffed.
  - Develop and staff a "war room" at HQ to facilitate information exchange and communication, including disposition maps and other integration tools.

Program Area Integration Teams

Integration activities will be planned and evaluated by twelve Program Area Integration Teams (operating as integrated product teams). The Program Area Integration Teams are organized by waste and material type and functional area as follows:

- High-Level Waste
- Transuranic Transportation and Disposal
- Transuranic Storage and Treatment
- Mixed Low-Level and Low-Level Waste
- Environmental Restoration
- Deactivation
- Decontamination and Decommissioning
- Reindustrialization
- Spent Nuclear Fuel
- Plutonium and Other Nuclear Materials
- Transportation
- Science and Technology

The teams will follow a systems engineering approach to complete their products, evaluation plans, and decision documents. The teams will be fully supported by the EMI contractors.

The role of the Program Area Integration Team is to identify and evaluate additional site opportunities using a systematic method to plan and evaluate for the possible recommendation of the opportunity. In considering an opportunity, the Team should also consider issues such as technology, transportation, and stakeholder concerns. The Program Area Integration Teams will

be staffed with federal members and contractor personnel at the discretion of the team leader. They will utilize expertise among the various sites, as appropriate to the opportunity under evaluation. The costs of staffing the Program Area Integration Teams are borne by the sites from existing baselines.

The Executive Integration Committee will select leadership for Program Area Integration Teams in their respective program areas. The Program Area Integration Team leader, on behalf of his home organization, will be directly accountable to the Executive Integration Committee for pursuit of integration opportunities. In addition, co-leaders may be assigned by the Executive Integration Committee to assist the team leader in facilitating actions and provide "liaison" with other HQ and field program areas as appropriate. Program Area Integration Team leaders will report in person to the Executive Integration Committee at their quarterly meetings on progress, including requesting decisions to implement opportunities or not. Program Area Integration Team leaders will ensure teams have needed subject matter experts to ensure one-shop response and quick response on issues that arise at sites.

Program Area Integration Team leaders will utilize the resources available in their home organizations and can rely on Integration Core Team members to secure team members, both federal and contractor staff, from other field and HQ organizations to round out the teams. The Program Area Integration Teams do not take the place of existing EM program offices, National Programs, Steering Committees, Centers of Excellence, etc. because these entities have other important roles critical to the overall EM program success, as well as have additional cross-cutting and other specific missions.

The Program Area Integration Teams will have the following responsibilities:

- Upon identification of an integration opportunity, determine the level of evaluation required and prepare the REPs (REPs will detail the scope of the evaluation, schedule, and deliverable); establish "integrated product teams" to implement the evaluation; and submit the REP to the Integration Executive Committee for approval.

- Aggressively pursue and complete evaluations of proposed integration opportunities, per the approved REP, assuming full accountability for the disposition of the integration opportunities. (It is the expectation of the Integration Executive Committee that within the first six months, the teams will aggressively pursue completion of evaluations already covered by existing REPs.)

- Identify specific implementation steps required and work directly with site and HQ project managers.

- Hold periodic workshops to identify new integration opportunities and provide a brief summary of any new opportunities.

- Communicate activities to the appropriate program entities, i.e., the EM program.

- Ensure adequate stakeholder input and adherence in the integration and evaluation process.

EMI Contractors

The EM Integration (EMI) contractors, led by Lockheed Martin Idaho Technologies Company (LMITCo) under the guidance and direction of the Integration Core Team and DOE-ID, will include the existing network of contractors at the various sites. The contractor's main responsibilities are to participate on the Integration Core Team and to support the Program Area Integration Teams by providing systems engineering expertise on specific areas. The EMI Contractors will have the following responsibilities:

- Participate on the Integration Core Team integration activities.
- Provide systems engineering support to the Program Area Integration Teams.
- Provide Program Area Integration Teams with coordinated technical support from all sites (site contractors for Program Area Integration Teams).
- Assist the Program Area Integration Teams in conducting meetings.

National Programs and Centers for Excellence

The existing National Programs and Centers for Excellence will provide cross-cutting support to the Program Area Integration Teams in their respective areas. These Programs and Centers will work with the Core Team to ensure consistent support is provided (e.g., cost, risk, technology development evaluations) across the Program Area Integration Teams. They will also provide technical support to the Program Area Integration Teams, as needed. They may also identify and propose potential opportunities.

Membership List

Organization	Integration Executive Committee	Core Team	Program Area Integration Teams
EM-HQ	**Assistant Secretary for Environmental Management** - J. Owendoff	- S. Schneider, EM-30, Leader **Deputy Assistant Secretaries for EM** - B. Clark, EM-10 -G. Boyd, EM-50 - D. Berkovitz, EM-20 -D. Huizenga, EM-60 - M. Frei, EM-30 -G. Schmitt, EM-70 - J. Fiore, EM-40 **Director of Safety and Health** - C. Peabody, EM-4 **HQ Staff*** - D. Tonkay, EM-30 - D. Geiser, EM-50 - J. Kang, EM-30 - G. Turi, EM-60 - P. Blom, EM-40 - J. Shuler, EM-70	**Co-Leaders of Program Area Teams** HLW - K. Picha TRU Storage & Treatment - P. Altomare TRU Transp & Disposal - P. Altomare MLLW/LLW - H. Belencan Decontamination & Decommissioning - B. Murphie Deactivation - A. Szilagyi Reindustrialization - J. Thompson Environmental Restoration - S. Warren Pu and Nuclear Materials - R. Price SNF - H. Eckert Transportation - K. Kelkenberg Science & Technology - D. Geiser
Idaho	**Idaho Operations Office Manager** - J. Wilcynski	**Asst. Manager Office of Program Execution - ID** -J. Lyle **Staff** - B. Weingartner	**TRU Storage & Treatment** - L. Fritz, leader **Spent Nuclear Fuel** - P. Dirkmaat, leader **Transportation** - F. Holmes, co-leader **M/LLW** - G. Duggan, leader **Science and Technology** - C. Nichols, co-leader
Oak Ridge	**Oak Ridge Operations Office Manager** - J. Hall	**Assistant Manager for Environmental Management - OR** - R. Nelson	**Decon. & Decom.** - B. Sleeman, leader **Reindustrialization** - R. Brown, leader
Richland	**Richland Operations Office Manager** - J. Wagoner	**Assistant Manager for Facility Transition - RL** - J. Augustenborg	**High-Level Waste** - C. Sohn, leader **Deactivation** - D. Evans, leader **Science & Technology** - R. Rosselli, co-leader
Rocky Flats	**Rocky Flats Field Office Manager** - J. Roberson	**Assistant Manager for Program & Planning Integration - RF** - F. Lockhart	
Savannah River	**Savannah River Operations Office Manager** - G. Rudy	**Assistant Manager for Environmental Quality - SR** - T. Heenan	**Pu & Nuclear Materials** - D. Bridges, co-leader **ER** - C. Anderson, leader
Other Field Offices	-------	**Carlsbad Area Office** K. Hunter	**TRU Transp & Disposal** - B. Stroud (CAO), leader **Pu & Nuclear Materials** - R. Sena (AL), co-leader **Transportation** -M. Williams (AL), co-leader

* See next page for list of Field Staff Point of Contacts for general integration

Field Staff Point of Contacts for General Integration

AL- Rich Nevarez, John Evett
CH - Michael Klimas
CAO - Cliff Holman
ID - Brooks Weingartner
NV - Bobbie McClure/Angela Colarusso
OAK - Richard Scott
OH - Don Hodge
OR - Clayton Gist
RF - Glenn Doyle
RL - Jim Daily, Margaret Voogd
SR - Virginia Kay

National Program Point of Contacts for General Integration

CABE - Karl Stoeckle
M/LLW - Greg Duggan
Risk - Pete Seibach
SNF - Pete Dirkmaat/Ken Chacey
Transportation - Frank Holmes, ID; Steven Hamp, AL; Mike Keane, HQ

APPENDIX B

INTEGRATION FACT SHEET

Achieving Waste and Materials Management and Site Cleanup More Efficiently

DOE's Environmental Management Program Integration Efforts

Introduction

Throughout this decade, we at the Department of Energy have been changing the way we do business. The emphasis in our mission has shifted from nuclear weapons production toward safely managing wastes and nuclear materials that have accumulated at our sites over a large portion of this century; toward cleaning up contaminated water, soil, and buildings at our sites; and toward establishing a strong program to protect public health and the environment as we enter the next century.

Although each of our sites and laboratories is unique in its capabilities, the problems are common throughout the DOE complex - how best to treat, store and dispose of various types of radioactive and hazardous waste, manage our nuclear materials inventory, and bring contaminated sites to acceptable cleanup levels. Accordingly, we are proceeding to integrate existing unique capabilities and develop new technology at our sites in order to do business efficiently and to apply the best available technologies and resources to achieve common objectives.

This means sharing across sites - consolidating treatment, storage, and disposal facilities where it makes good sense; applying innovative technologies among sites; and working to assure consistency in reporting data such as waste inventory and generation, as well as available packaging and transportation for shipments of waste and nuclear materials - i.e., **integration**.

Opportunities for Complex-Wide Integration

In support of DOE's accelerated cleanup vision, as documented in "*Accelerating Cleanup: Paths to Closure*," DOE continues to look for ways to implement program efficiencies. This can be done through complex-wide integration. The goal of integration is to achieve program efficiencies by:

- eliminating redundant facilities where possible and using available capacity,
- crossing program boundaries or removing "stovepipes,"
- taking advantage of the collective learning curve,
- applying site successes and lessons learned nation-wide,
- employing innovative technologies, and
- using national procurement vehicles to meet unique needs.

Integration requires corporate thinking on the part of headquarters and field managers, looking at broader interests than a single program or site, and focusing on those needs which achieve the cleanup vision in an optimized fashion.

Progress to Date

In the process of developing DOE's *"Accelerated Cleanup: Paths to Closure"*, DOE undertook a major effort to develop a complex-wide set of "baseline" data on waste and material inventories (current and projected) and proposed disposition paths. From this data, tools have been developed to depict the baseline in a systematic fashion that will be used to evaluate alternatives and support stakeholder interactions.

These include:

Baseline disposition maps, which illustrate a site's proposed disposition path (waste generated and in inventory, stabilization or treatment and disposition) for each waste and material type; and

Site input/output diagrams, which, based on a site's baseline disposition maps, provide a picture of all waste and nuclear materials entering, exiting, or remaining at a particular site.

The development of this information will also guide decisions on where to focus technology development and deployment and specific needs for transportation. EM's baseline disposition maps are available on EM's web page and will be shared with stakeholders through national and regional workshops (e.g., National Governors' Association). Similar tools are currently being developed for the nuclear materials program.

EM is also considering as part of this integration process, recommendations developed by teams of site contractors assembled under executive EM direction. The teams' Complex-Wide Environmental Management Integration (EMI) project produced a number of potentially cost-savings recommendations. Completing the evaluation of these recommendations will be a high-priority of the integration effort over the coming year.

Formalizing EM Program Integration

In September 1998, DOE Field Managers and the Assistant Secretary for Environmental Management signed a "*Working Charter for Environmental*

(continued on page 2)

Office of Environmental Management

(continued from page 1)

Management Program Integration." Under the direction and leadership of an Integration Executive Committee, integration opportunities will be identified, evaluated, and implemented by 12 Program Area Integration Teams.

High-Level Waste
Transuranic Transportation and Disposal
Transuranic Storage and Treatment
Mixed Low-Level and Low-Level Waste
Environmental Restoration
Deactivation
Decontamination and Decommissioning
Reindustrialization
Spent Nuclear Fuel
Plutonium and Other Nuclear Materials
Transportation
Science and Technology

Structure of EM Program Integration

Each Program Area Integration Team will identify, analyze, and recommend technical opportunities which reduce costs, significantly accelerate cleanup schedules, and further the goals of EM's accelerated cleanup vision.

Identifying, Evaluating and Implementing Integration Opportunities

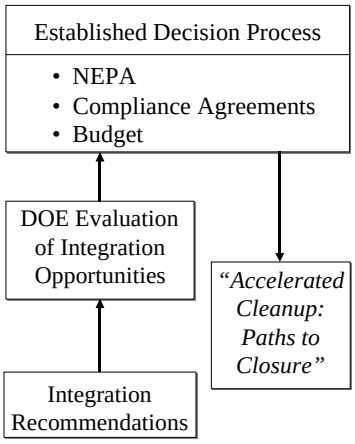
Opportunities are derived as alternatives to baseline plans or activities which fill gaps or fix disconnects in projects. Any organization can identify new opportunities. A systems approach to identify, plan, and evaluate integration opportunities results in recommendations to senior management for rejection or implementation.

Initiation of a detailed evaluation of an integration opportunity will be approved by the Integration Executive Committee based upon recommended evaluation steps laid out by the cognizant Program Area Integration Team in a *Recommendation Evaluation Plan*.

Integration recommendations will be approved by the Integration Exeuctive Committee only after an intensive review of their underlying assumptions and rationale, and a detailed evaluation of such factors as: consistency with NEPA documentation and compliance agreements; cost and schedule savings; initial investment; risk to workers, the public, and the environment; and perceptions of equity on the part of stakeholders. The evaluation will also include opportunities for stakeholder involvement where appropriate via DOE's established decision processes.

Relationship of Integration to Key Decisions

DOE's established decision-making processes include the following important elements. It should be noted that the IEC's decisions do not supersede NEPA decisions. All NEPA decisions are made by appropriate NEPA decision makers.



Relationship of Integration to DOE's Decision and Planning Process

The National Environmental Policy Act (NEPA) Process

The NEPA process ensures that potential health and environmental impacts of alternative approaches are thoroughly analyzed, that public input is considered, and that Records of Decision are issued. For example, the Waste Management Programmatic Environmental Impact Statement (WMPEIS) represents the first nationwide programmatic evaluation and integration of treatment, storage and disposal activities throughout the DOE complex. Other NEPA activities are underway for disposition of plutonium and highly-enriched uranium and for site-specific activities.

Compliance Agreements and Consent Orders

These legally binding agreements are key bases for the decisions that DOE needs to make.

Congressional Authorizations and Appropriations

Congressional authorizations and appropriations provide specific direction and allocate funds for carrying out programs within DOE. DOE's budget levels necessitate that the programs continue to seek efficient ways of carrying out their decisions and activities.

Consideration of Public Feedback

During the NEPA process, the public has numerous opportunities to provide views and suggestions to DOE on proposed decisions.

Beyond the NEPA process, additional opportunities exist for DOE public input into decision making. These include Site-Specific Advisory Board meetings; educational workshops; transportation planning meetings; and meetings with Tribal Nations, State and local governments, and national and regional coordinating bodies.

For Additional Information Contact:

Steve Schneider or Doug Tonkay
U.S. Department of Energy
EM-30/CLOVERLEAF
19901 Germantown Road
Germantown, MD 20874
Phone: 301-903-7163 or 301-903-7212

DRAFT

FY-1999 EM INTEGRATION MASTER SCHEDULE

DRAFT

LAST UPDATE: October 26, 1998

	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEP
IEC Decision Briefings	☆	✪ Focus Area Integ. Mtgs	☆	✪ OR Env Conf.	✪ WM 99 Conf.		☆			☆			☆
Core Team Meetings		□				□			□			□	
Program Area Integration Team Activities													
Baseline Development			0 D&D Reind Deac										
Pre-Decision Gate 1, Opportunities Definition		1 Deac 1,2 TRU 1 SNF	1 HLW ER 1 Deac MLLW SNF D&D	1 MLLW				1 D&D		1 HLW 1 MLLW 1 D&D		1 HLW	
Pre-Decision Gate 2, Prepare REPs			2 NM Trans	2 HLW	2 S&T	2 SNF	2 HLW SNF			2 D&D 2 D&D			
Decision Gate 3 Present Implementation Recommen-dations			3 MLLW				3 Trans	3 SNF		3 SNF Trans			3 Trans
Other Activities			✪ NM Lessons Learned ✪ NM Results		✪ TWSC Meeting ✪ (M)LLW ROD			✪ PTC Data Update		✪ ER End-User Tech Conference			

☆ - Integration Executive Committee Decision Meeting

◇ - Workshop

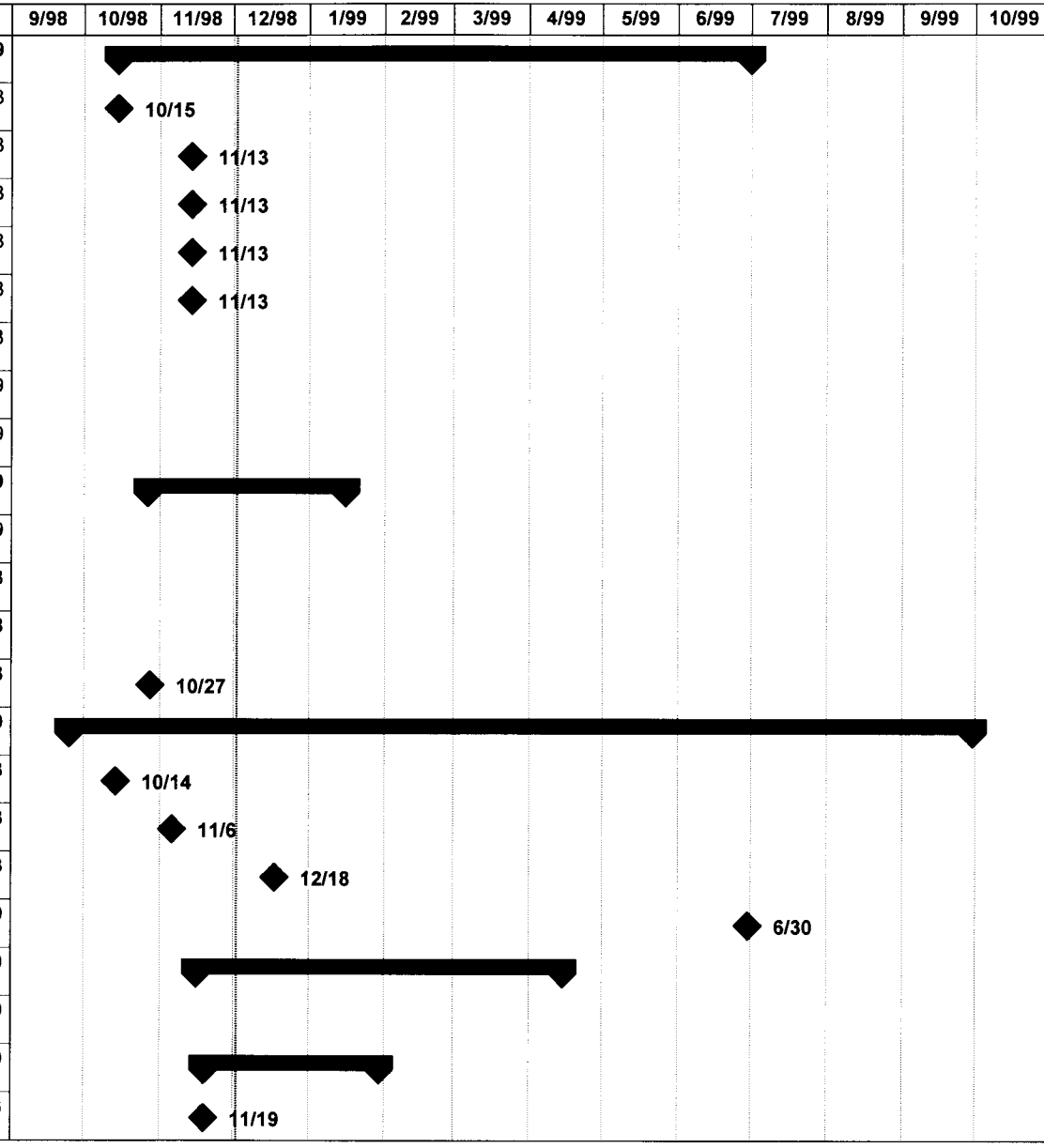
△ - IEC Presentation

✪ - Key Event

□ - Core Team Meeting

DRAFT FY99 Integration Project PAIT Schedule

ID	Task Name	Finish
1	**HLW PAIT**	**6/30/99**
2	Team identification	10/15/98
3	RL to meet to review existing opportunities	11/13/98
4	SR to meet	11/13/98
5	WV to meet	11/13/98
6	Idaho to meet	11/13/98
7	Complete revalidation of REPs	12/30/98
8	Present for IEC approval REPs for Implementation	2/28/99
9	Identify new opportunities	6/30/99
10	**TRU Transportation/Disposal PAIT**	**1/15/99**
11	TWSC	1/15/99
12	TRU Storage and Treatment team workshop	10/27/98
13	**TRU Storage/Treatment PAIT**	**10/27/98**
14	Workshop to review existing & identify new opport.	10/27/98
15	**MLLW PAIT**	**9/30/99**
16	Form (M)LLW PAIT	10/14/98
17	Identify Champion & Subteam for each existing Oppo	11/6/98
18	Identify New Opportunities - Workshop - 1	12/18/98
19	Identify new Opportunities - Workshop - 2	6/30/99
20	**Issue ROD and Implement Opportunity**	**4/14/99**
21	4 - Use a combination of DOE and COMM MLL	4/14/99
22	**REP 4: Use a combination of DOE & Commer**	**1/29/99**
23	Review MLLW disposal preferences & confi	11/19/98

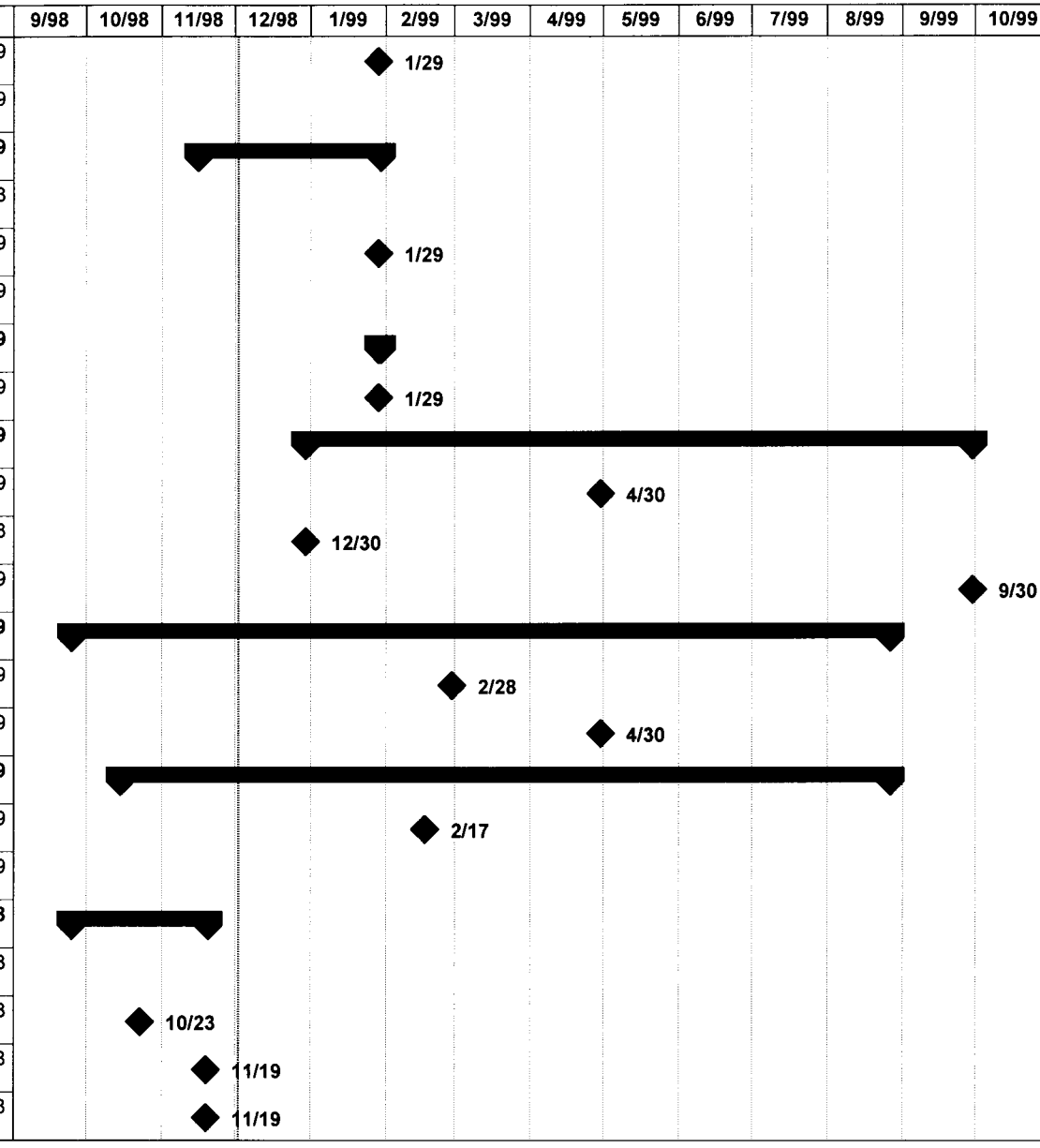


Project:
Date: 10/98

Milestone ◆ Summary

DRAFT FY99 Integration Project PAIT Schedule

ID	Task Name	Finish
24	Issue ROD	1/29/99
25	1 - Consolidate LLW Disposal Operations	4/14/99
26	**REP 1: Consolidate Low-Level Waste Dispos**	**1/29/99**
27	Review LLW disposal preferences & confir	11/19/98
28	Issue ROD	1/29/99
29	2 - Minimize LLW Storage and Treatment	4/14/99
30	**REP 2: Minimize storage & treatment of LLW**	**1/29/99**
31	Issue ROD	1/29/99
32	**Finalize Evaluation**	**9/30/99**
33	3 - Consolidate Analytical Service Procurements	4/30/99
34	5 - Standardized MLLW Characterization	12/30/98
35	5 - Standardized MLLW Characterization	9/30/99
36	**Implement Opportunity**	**8/26/99**
37	6 - Expanded use of National Procurements for	2/28/99
38	6 - Expanded use of National Procurements for	4/30/99
39	**7 - Maximize Use of Existing DOE Facilities fo**	**8/26/99**
40	Implement Quick Wins	2/17/99
41	Implement Remaining Sub Recommendatio	8/26/99
42	**REP 7: Maximize use of existing DOE facilitie**	**11/19/98**
43	M-Area Vit Plant assessment	10/7/98
44	Gather waste stream data	10/23/98
45	Present data for decision on continuation of	11/19/98
46	9 - Disposition of Material and Waste with No Ide	11/19/98

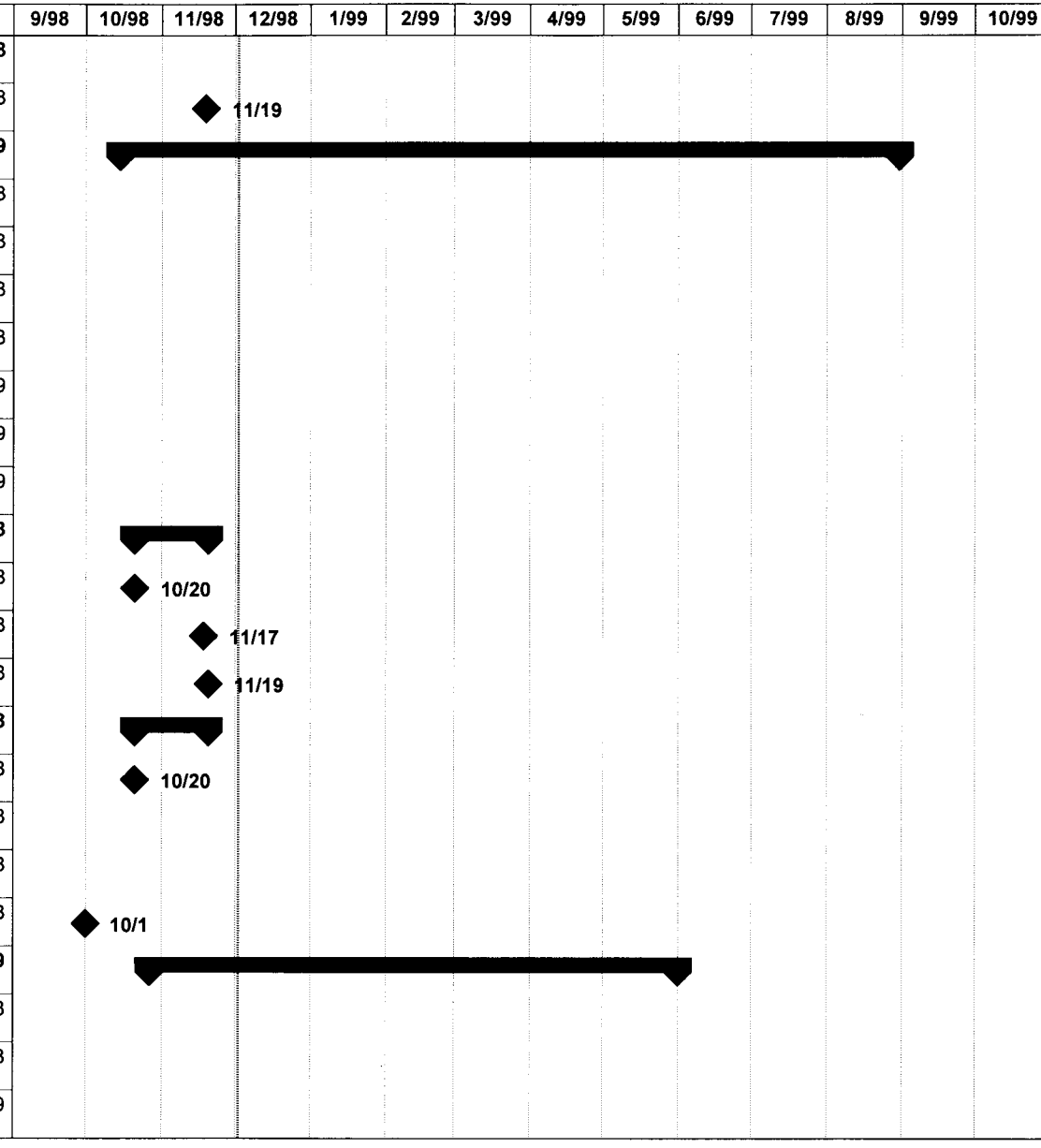


Project:
Date: 10/98

Milestone ◆ Summary

DRAFT FY99 Integration Project PAIT Schedule

ID	Task Name	Finish
47	**Reject Opportunity**	**11/19/98**
48	8 - Direct Fund LLW Disposal Operations	11/19/98
49	**ER PAIT**	**8/30/99**
50	Build team members list	10/15/98
51	ER PAIT Workshop NV	11/9/98
52	Develop comparison of site practices	12/30/98
53	Identify areas/Practices w/highest potential for $ savi	12/30/98
54	Dev list of existing info resources for sharing approac	4/30/99
55	Hold end users tech conference	6/30/99
56	Establish networks for different lev and interest areas	8/30/99
57	**D&D PAIT**	**11/19/98**
58	First workshop to share information	10/20/98
59	Second workshop with Decomissioning Team	11/17/98
60	Specific recommendations available for review to IEC	11/19/98
61	**Deactivation PAIT**	**11/19/98**
62	PAIT/Deactivation Committee Workshop	10/20/98
63	National Facility Deactivation Initiative (SR)	11/17/98
64	EM Program Integration Executive Committee	11/19/98
65	**Reindustrialization PAIT**	10/1/98
66	**SNF PAIT**	**5/31/99**
67	Initial Workshop	10/27/98
68	Team Lead Meet with ECI-Present Opportunities	11/19/98
69	Workshop to review REPs prepared	1/29/99

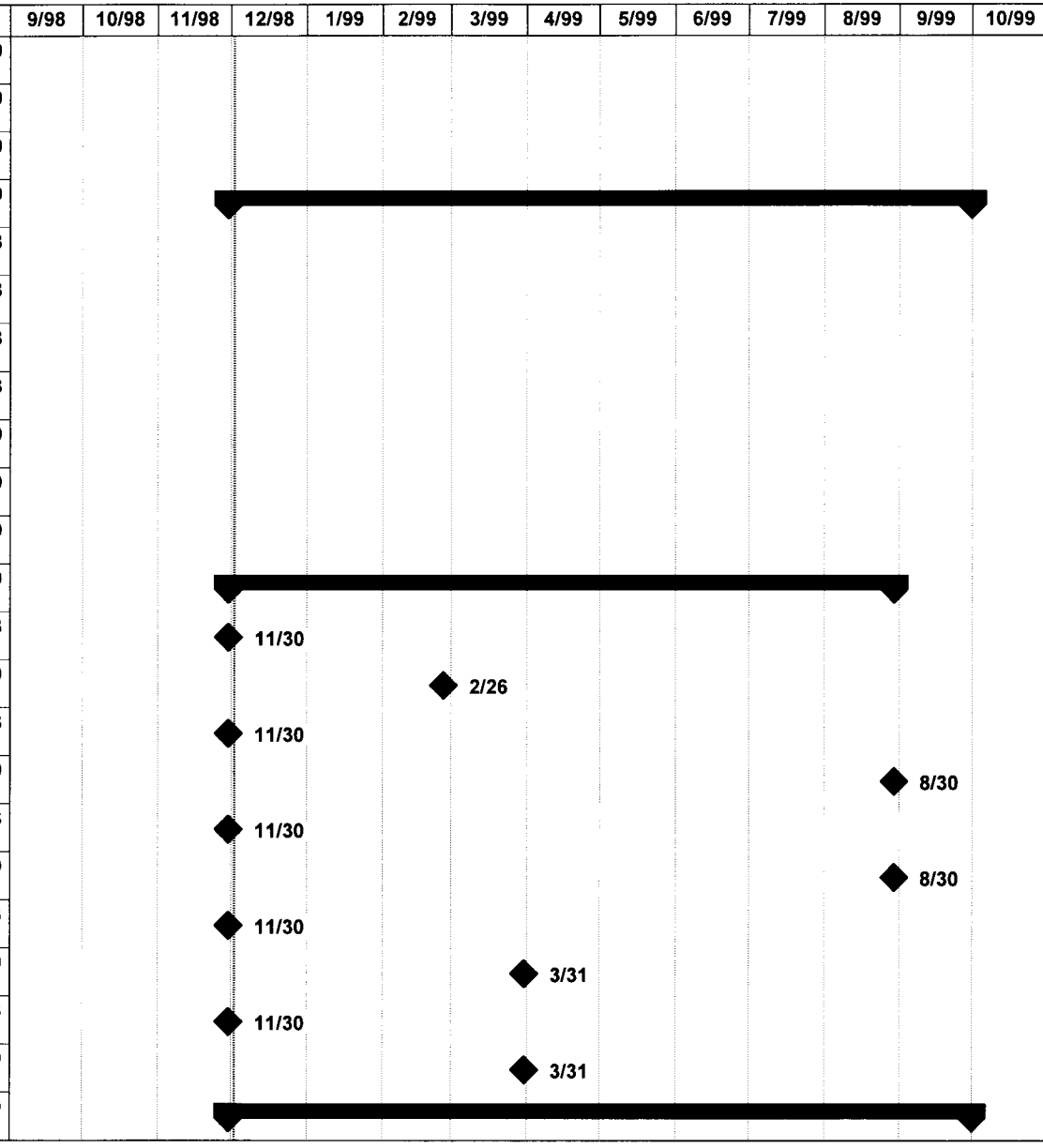


Project:
Date: 10/98

Milestone ◆ Summary

DRAFT FY99 Integration Project PAIT Schedule

ID	Task Name	Finish
70	Team Lead Meet with ECI for Gate 2 approval	2/28/99
71	Workshop to complete implementation for Gate 3	4/30/99
72	Team Lead Meet with ECI for Gate 3 approval	5/31/99
73	**PU & Other Nuclear Materials**	**9/30/99**
74	Present results of NM I	11/30/98
75	Complete NMI documentation of FY98 effort	12/31/98
76	Initiate implementation of mature recommendations	11/30/98
77	Seek EMI approval of 2 recommendations	11/30/98
78	Complete remaining NMI baselines and assessments	8/30/99
79	Conduct 5 major studies, 3 topical reports & database	8/30/99
80	Document FY99 results	9/30/99
81	**Transportation PAIT**	**8/30/99**
82	Request REP approval to eliminate excessive require	11/30/98
83	Request impl. approval to eliminate excessive require	2/26/99
84	Request REP approval to establish DOE Policy	11/30/98
85	Request implementation approval to establish DOE P	8/30/99
86	Request REP approval to transport existing Inventory	11/30/98
87	Request impl. approval to transport existing inventory	8/30/99
88	Request REP approval to establish container standar	11/30/98
89	Request impl.approval to establish container standar	3/31/99
90	Request REP approval to inventory Type B Container	11/30/98
91	Request impl. approval to inventory Type B container	3/31/99
92	**Science & Technology PAIT**	**10/1/99**

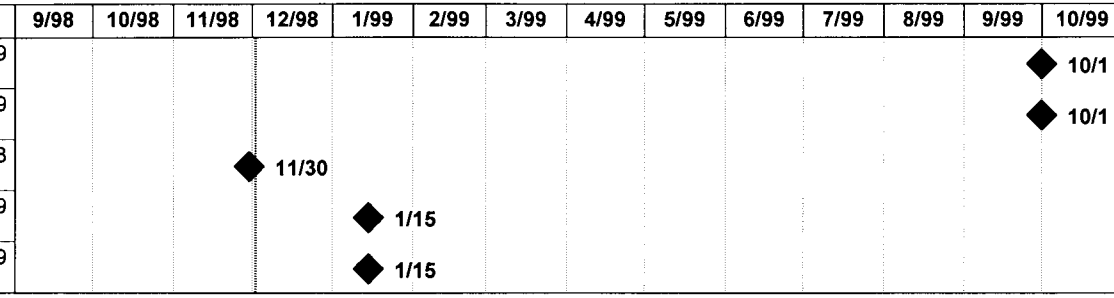


Project:
Date: 10/98

Milestone ◆ Summary

DRAFT FY99 Integration Project PAIT Schedule

ID	Task Name	Finish
93	Communicate with other PAITs	10/1/99
94	Review focus area/EMI linkage (gaps)	10/1/99
95	Team site visits an integration opportunities	11/30/98
96	REPs for selected EMI gaps	1/15/99
97	Initiate project level S&T roadmaps	1/15/99



Project:
Date: 10/98

Milestone ◆ Summary

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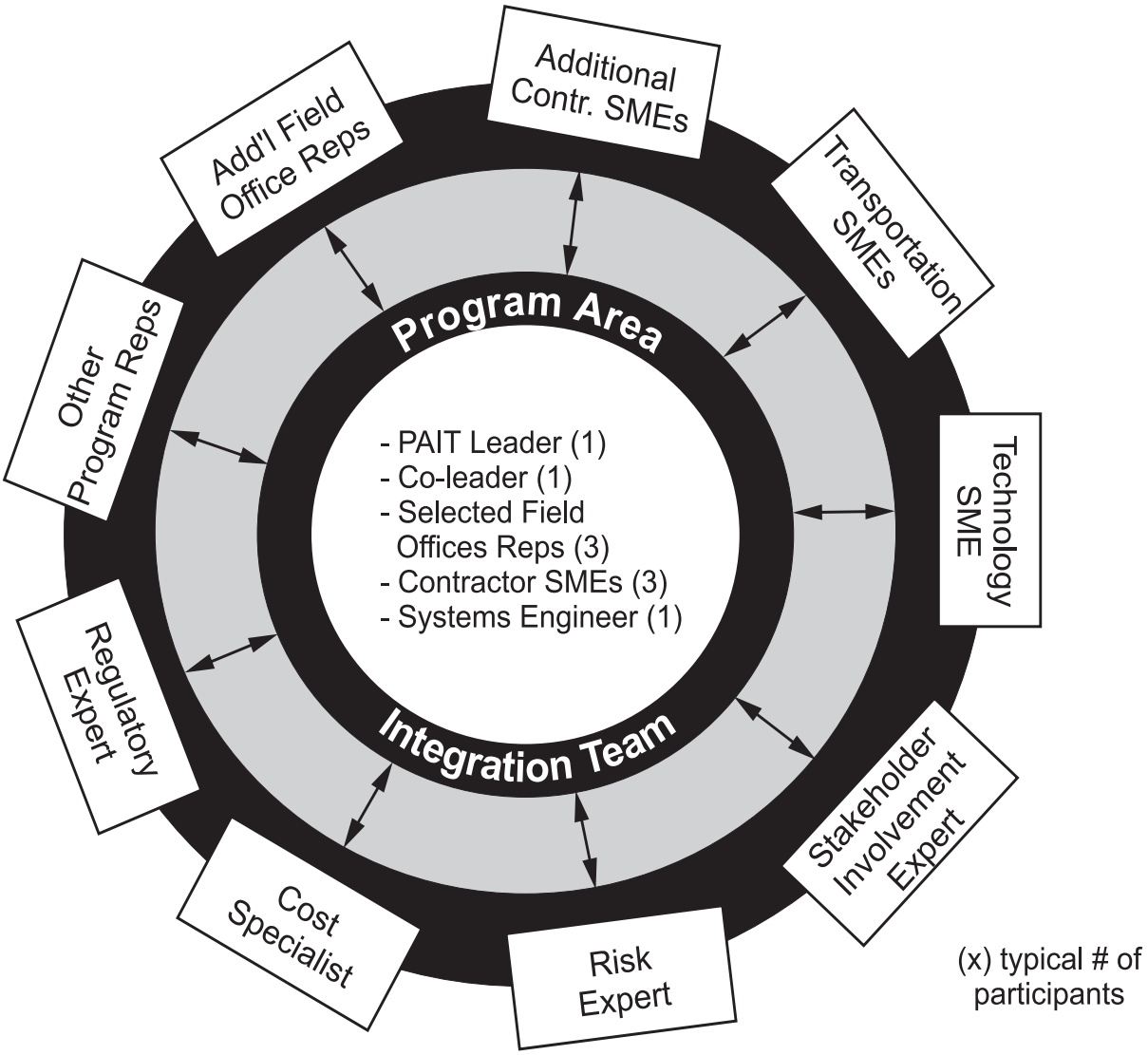
National Environmental Training Office (NETO)		
Nick R. Delaplane	U.S. Department of Energy P.O. Box A Aiken, South Carolina 29802	Phone: 803-725-0845 Fax: 803-725-0815 E-Mail: **nick.delaplane@srs.gov**

APPENDIX E
PROGRAM AREA INTEGRATION TEAM

The contractor members in the attached matrix are to provide systems engineering support to the PAITs from their respective sites or programs. Based on past experience, it is recommended each PAIT include at least three contractor subject matter experts (SMEs) and the systems engineer. The people identified as support for each team provide not only systems engineering and technical support to the team but also bring in historical background and consistency between teams. Ultimately, it is up to the team leaders to decide the membership of his or her team, the Core Team strongly recommends that all PAITs use the support of the contractor personnel identified in Figure D-1.

Per the request of the team leader and co-leader, additional expertise can be brought in to supplement the team for specific evaluations and opportunity analysis. For example a high-level waste opportunity that requires new transportation packaging will request support from the transportation PAIT as well as the National Centers and the Centers of Excellence. Please contact the Core Team members to request additional support.

Figure D-1 Resources Available to the PAITs



Program Area Integration Team
Systems Engineering and
Subject Matter Experts Support Resources

1.	**High Level Waste**
	Contractor SMEs - Steve Schaus, Hanford (509)372-1149
	Jim Valentine, INEEL (208)526-3267
	Karen Malone, WVDP (716)942-2320
	As needed, Mike Heiser, INEEL (208)526-3317
	HLW SME, SRS
	Systems Engineer - James Murphy, INEEL (208)526-4453
2.	**TRU Transportation/Disposal**
	Contractor SMEs - Andrew Orrell, Sandia (702)295-5600
	Brent Daugherty, SRS (803)557-6304
	Phil Gregory, WIPP (505)234-8303
	Tom Monk, (423) 576-6088
	Stan Kowiewicz, LANL (505)665-9227
	As needed, Mike Martin, INEEL (208)526-6466
	Systems Engineer - Dale Luke, INEEL (208)526-3610
3.	**TRU Storage/Treatment**
	Contractor SMEs - Ken Hladek, Hanford (509)373-3201
	Tom Clements, INEEL (208)526-0664
	Tom Monk, OR (423)574-0660
	As needed, Mike Griffin, NTS (702)295-1857
	Scott Anderson, RF (303)966-9645
	John Krueger, Mound (937)865-4801
	Systems Engineer - Dale Luke, INEEL (208)526-3610
4.	**MLLW/LLW**
	Contractor SMEs - Dale McKenney, Hanford (509) 376-1589 (MLLW)
	Bob Hightower, OR (423) 574-6777 (MLLW)
	Scott Anderson, RF (303) 966-9645 (Both)
	Earl Conway, Sandia (505) 844-1696 (MLLW)
	Max Dolenc, NTS (702) 295-5845 (LLW)
	Roger Piscitella, INEEL, (208) 526-1137 (Both)
	Rolf Migun, (423) 576-7344 (Both)
	Mike Lucas, Sandia (505) 844-2391 (Both)
	As needed, Cliff Thomas, SRS (803) 952-6970 (Both)
	Jerry Gnoose, Fernald (513) 648-5713 (Both)
	Systems Engineer - Greg Goltz, INEEL (208) 526-7801

5. ER

Contractor SMEs - Jerry Gnoose, Fernald (513)648-5713
Bob Johnson, SRS (803)952-6410
Doug Greenwell, INEEL (208)526-0858
Mike Redmon, (423) 241-1385
Larry Maassen, LANL (505)667-1691
As needed, Paul Aamodt, Sandia (505)284-2614
Systems Engineer - John Reisenauer, INEEL (208)526-0304

6. D&D

Contractor SME - Pat Erin, RF (303)966-8187
Roy Sheeley, OR (423)576-7742
Gary Person , (423) 574-9686
Systems Engineer - John Reisenauer, INEEL (208)526-0304

7. Deactivation

Contractor SME - TBD
System Engineer - John Reisenauer, INEEL, (208)526-0304

8. Reindustrilization

Contractor SME - TBD
Systems Engineer - John Reisenauer, INEEL (208)526-0304

9. SNF

Contractor SMEs - Rodger McCormack, Hanford (509)376-7057
Ray Canatser SRS (803)557-9588
Ron Denney, INEEL (208)526-3102
Doug Turner, OR (423)576-2017
As needed, Mark Dupont, SRS (803)557-9529
National Spent Fuel Program SME
Systems Engineer - James Murphy, INEEL (208)526-4453

10. Pu and Other NM

Contractor SMEs - Ed Moore, SRS
Shirley Cox, OR
Gary Polanski, SNL
Doug Turner, (423) 241-1240
Additional SMEs - Bob Davis, OR
As needed, Systems Engineer - Lance Cole, INEEL (208)526-1924

11. Transportation

Contractor SMEs - Greg Field, Hanford (509)376-0781
Ken Lenarsic, RF (303)966-2377
Phil Gregory, WIPP (505)234-8303
Tammy Pressnell, (423) 241-1385
Lloyd Donovan, WVDP (716)942-4805
As needed, Randy Walker, OR (423)574-5522
Systems Engineer - Charles Park, INEEL (208)526-1091

12.	**Science and Technology**
	Contractor SMEs - Craig Olson, INEEL (208)526-0375
	Additional SMEs - Roadmapping Core Team
	As needed, Systems Engineer - Ray McKenzie, INEEL (208)526-2565

APPENDIX F

CENTERS OF EXCELLENCE/NATIONAL PROGRAM FACT SHEET

Center/Program Name: Center of Excellence for Low-Level Waste/Mixed Low-Level Waste

Web Address: www.em.doe.gov/llw

Director's Name:	Gregory J. Duggan
Phone:	(208) 526-3181
Fax:	(208) 526-0160
E-mail:	duggangj@id.doe.gov
Address:	850 Energy Drive
	Idaho Falls, ID 83401-1118

Mission or Purpose of Center/Program: Analyze critical waste management issues, formulate effective solutions with respect to these issues, and assist the Field and Headquarters in creating policies which are put into practice by DOE Low-Level Waste and Mixed Low-Level Waste Programs nationwide.

Services the Center/Program offers:

- Lead Mixed Low-Level Waste Program Area Integration Team
- Member and Technical Secretary of the Low-Level Waste Federal Review Group (LFRG)
- Information Clearinghouse
- Manage the National Low-Level Waste Program (commercial)
- Co-lead Mixed Waste Focus Area End User Steering Committee

Center/Program Name: National Spent Nuclear Fuel Program

Web Address:

Director's Name:	Peter J. Dirkmaat
Phone:	(208)526-1439
Fax:	(208)526-7254
E-mail:	dirkmap@id.doe.gov
Address:	Department of Energy

Idaho Operations Office
850 Energy Drive, MS-1154
Idaho Falls, ID 83401

Mission or Purpose of Center/Program: Provide technical and managerial leadership in safely, reliably, and efficiently managing DOE-owned SNF and preparing it for disposal.

Services the Center/Program offers:

- Provides a single point of contact for EM with the Yucca Mountain Project Office for repository VA, EIS, and NRC License Application data requirements
- Facilitates the development of SNF characterization, transportation system design, total system performance analysis, criticality data and an integrated shipping schedule in cooperation with RW
- Assists in developing repository design requirements as they pertain to DOE SNF
- Provides QA oversight in accordance with Office of Civilian Radioactive Waste (RW) requirements and assists sites in achieving qualification for their programs

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Center/Program Name: National Environmental Training Office (NETO)

Web Site Address: www.em.doe.gov/neto

Director's Name: Nick R. Delaplane
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Fax: (803)725-0815
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Address: U.S. Department of Energy
P.O. Box A
Aiken, South Carolina 29802

Mission or Purpose of Center/Program: The NETO mission is to enhance and maintain the technical environment management skills and abilities of DOE Federal and contractor employees through a national, integrated program. The program coordinates and delivers uniform, high quality and technical environmental education and skills training, which will have cross-cutting applicability across the department as well as other Federal and state agencies.

Services the Center/Program offers: NETO pools its lean resources through partnerships with subject-matter experts to inexpensively provide "best-in-class" environmental training courses that are tailored to DOE activities. NETO also provides a nationwide training network to help disseminate information on new environmental policies, guidance, and management initiatives. Further, NETO has established an Environmental Training Partnership (ETP) agreement with major Field Offices and DOE contractor organizations with the aim of Department -wide standardization of environmental training among Federal and contractor employees. Such a partnership can achieve substantial cost savings for

the Department and its contractors, while enhancing quality of sponsored training. NETO also helps disseminate information on environmental management lessons learned, innovative treatment technologies and process improvement initiatives. The training is typically offered at nominal or no charge to Federal employees. The courses range from basic to advanced topics, are delivered locally--based on customer needs, and provide practical skills and information that can be put to immediate use in the work place. Course content is DOE-specific and features real-life case studies, lessons learned, practical exercises and examinations. NETO also offers a variety of self-study and computer-based training courses, plus distance learning courses. Contractor employees are welcome and encouraged to attend NETO classroom courses for a nominal fee.

Center/Program Name: National Transportation Program

National Transportation Management Team:

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Mission or Purpose of Center/Program:

The National Transportation Program (NTP) will provide policy, guidance and a transportation infrastructure to ensure availability of safe, efficient, compliant, and timely transport of all DOE materials with the exception of weapons, weapons components, and Navy spent fuel. The Goals of the NTP are:

- assure safe, environmentally compliant, and cost effective transportation policy for unclassified shipments;
- perform as a service center for transportation campaigns across the DOE complex; provide the Department's technical base program to support transportation and packaging requirement needs; maintain effective communications and institutional relations with internal DOE program elements and interested external parties including States, Tribes, and local governments

Services the Program Offers:

Program Integration: 1) serve as the corporate interface and consultant supporting Programs on transportation policy for unclassified shipments; and 2) provide technical assistance, training, information and risk assessment for EA/EIS transportation planning development/coordination, systems engineering integration and analyses.

Operations Support: 1) support the Department's logistics and operations activities through cost effective data collection and billing; and 2) support a comprehensive, coordinated DOE transportation and packaging safety program.

Package and Technology Services: 1) develop and maintain a corporate packaging fleet management system; and 2) maintain an infrastructure and base technology to support the Department's packaging and transportation needs.

Center/Program Name: Center for Risk Excellence

Phone: (888)36(DOE-RISK)

Fax: (630)252-2654

E-Mail: risk.center@ch.doe.gov

Director's Name:	Alvin L. Young
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E-mail:	alvin.young@ch.doe.gov
Address:	U.S. Department of Energy Center for Risk Excellence 9800 South Cass Avenue Argonne, IL 60439

Mission or Purpose of Center: Provide a focal point for coordination of risk-related activities within Environmental Management; promote the application of science and technology as tools for assessing and managing risk; and enhance communication and understanding of risk-related issues among all interested parties.

Services the Center offers:

- Offer technical expertise, analysis tools, and practical experience to help the Field effectively develop, use, and communicate risk information and achieve safe and efficient field work.
- Help scope, conduct, interpret, and peer review risk assessments.
- Provide evaluations of environmental technologies being developed and applied.
- Assist with risk-based prioritization and decision-making.
- Provide technical support related to regulatory negotiations and community discussions.
- Closely monitor internal and external risk policies and guidance as they are developed, to provide real-time field input and implementation assistance.
- Provide forums for risk communication and discussions among those interested in risk issues.

Center/Program Name: Nuclear Materials Stewardship

Directors' Name: Donald M. Bridges Rich Sena

	Savannah River Site	Albuquerque
Phone:	(803)952-2502	(505)845-6307
Fax:	(803)952-2495	(505)845-5975
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Mission or Purpose of Center/Program: The Nuclear Materials Stewardship Program provides complex-wide leadership and integration for the life cycle management of Environmental Management's nuclear materials.

Services the Center/Program offers:

- Stabilization for safe storage and handling
- Consolidation of storage to reduce mortgages
- Disposition of surplus materials to other programs or waste streams
- Identification of potential national resource materials
- Accelerated de-inventory of facilities and sites

Center/Program Name: Center for Acquisition and Business Excellence (CABE)

Directors' Name:	Karl Stoeckle
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E-mail:	karl.stoekle@fetc.doe.gov
Address:	Center for Acquisition and Business Excellence 3610 Collins Ferry Rd Box 880 Morgantown, WV mailstop: ED2 26507-0880

Mission or Purpose of Center/Program: The Center for Acquisition and Business Excellence (CABE) provides the business expertise to solve the Nation's environmental and energy challenges. CABE provides program and project planning services; business management systems for government clients; total cost management services; and government solutions using sound, innovative acquisition planning and management practices.

Services the Center/Program offers:

- Program planning/analysis
- Acquisition planning and management
- Program/project management services
- Cost estimating and analysis

Center/Program Name: National Analytical Management Program

Directors' Name:	J. Stan Morton, Ph.D.
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	Idaho Falls, ID 83401-1118

Mission or Purpose of Center/Program: Promote quality in planning, management, and performance of analytical activities including sampling which generate characterization and monitoring data in support of environmental issues.

Services the Center/Program offers:

- National Program providing policy and guidance to Field Office Analytical Services
- Training Resource for Directed Planning of Environmental Management Project Manager
- Accrediting body under the EPA National Environmental Laboratory Accreditation Program (NEPLAP)
- DOE interface between DOE reference laboratories and the National Institute of Standards and Technology
- Lead investigator for analysis of laboratory contract audit consolidation
- DOE representative on EPA Taskforce on Environmental Data Quality
- Consolidated information management systems (IPEP/QAP/MAPEP/DEMSAR)
- Performance Evaluation Initiatives

Center/Program Name: National Pollution Prevention Program

EM Headquarters Champion: Kent Hancock, EM 77, (301)903-1380

DOE Operations/Field Office(s): Albuquerque

National Program or Center Manager: Michael Sweitzer, AL, (505) 845-4347

Mission or Purpose of Center/Program: Coordinates, monitors and funding pollution prevention activities and accomplishments throughout the DOE complex

Services the Center/Program offers:

- HQ retains National Program responsibility, including policy and guidance
- AL manages complex-wide pollution prevention projects

APPENDIX G
RISK APPENDIX

October 1998

Center For Risk Excellence
Chicago Operations Office
U.S. Department of Energy

The Use of Risk Assessment in EM Trade Studies

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Robert D. Stenner, PNNL
William B. Andrews, PNNL

Prepared for the Center for Risk Excellence:
Peter R. Siebach, Project Manager

The Use of Risk Assessment in EM Trade Studies

Introduction

In 1997, the Presidential/Congressional Commission on Risk Assessment and Risk Management summarized the goal of decision-makers, "Creative, integrated strategies that address multiple environmental media and multiple sources of risk are needed if we are to sustain and strengthen the environmental improvements and risk reduction has attained over the last 25 years." (Commission, 1997)

Earlier, Under Secretary Curtis set forth DOE's expectations on risk assessment as follows:

> Risks from DOE operations and actions to the public, workers, and the environment should be assessed using the best, reasonably obtainable scientific information.
>
> Assessments of risk should characterize risks from activities broadly enough that activities taken in the context of an overall program ultimately reduce risks.
>
> Risk assessments are a combination of descriptive and mathematical information. When data are not reasonably available, judgements and assumptions should be used to assess the risks. The rationale for and uncertainty caused by such judgements should be clearly identified.
>
> Risk assessments should consider appropriately all hazards to human health and the environment. Special attention should be given to sub-populations (for example, children) which may be more susceptible or more exposed to the hazard.
>
> Peer review and other processes should be used to assure that risk assessments are of sufficient quality to support DOE decision-making.
>
> Risks posed by hazardous agents or events should be evaluated with a consistent approach among DOE programs.

More about the above "principles" of risk assessment, and information on the associated subjects of risk management and risk communication can be found on EM's webpages (Curtis 1995).

Trade Studies are
- often conducted as an early step in DOE's decision-making process
- used to identify, describe, and compare (i.e., understand "tradeoffs") viable alternative courses of action.
- part of effective program management and not necessarily tied to any regulatory requirement.

Documenting risks to workers and the public is a key component of the Trade Study process.

EM program managers, often not experts in risk assessment, will be considering risks and factoring them into preliminary decision making before formal and thorough risk assessments are available. This document is an introduction to risk assessment for such individuals. The document is organized as a series of questions and answers. Rather than have a separate definitions section, terms that are important to risk assessment are in italics in the sentence in which their meanings can be best inferred. Program

managers can reference more detailed texts on risk assessment such as *Risk Assessment Methods - Approaches for Assessing Health and Environmental Risks* (Covello, 1993) should they need more details or choose to take an active role in the assessment process.

Why is understanding risks and risk assessment concepts important?

Even though risks may be low, understanding risks enables decision-making.

In today's society, just stating that the risks are low is not adequate. The public and its representatives (elected-officials, courts, and advocacy groups) are interested in how risks are being managed. Knowledge of the risks to human health and the environment is the first step in communicating, controlling, and minimizing them.

Secondly, risk considerations are a factor in prioritizing programmatic activities. Cost, mortgage reduction, regulatory requirements, and agreements with other government agencies and jurisdictions are other factors in setting priorities. However, often a strong argument can be made to give priority to a project that will produce a large reduction in risk.

What risk questions should be considered?

In general there are two different risk questions that should be considered when doing a Trade Study.

> When the project is completed, what is the risk reduction (or increase) achieved? A big factor in choosing among the alternatives considered should be the difference in risk between the present state (the current storage and configuration of a hazardous material or waste) and the end state of a proposed alternative. The amount of risk reduction may also be a factor in setting the priority for one EM project relative to another.
>
> What are the increases in risks to the public, workers, and the environment while the project is being carried out? In the short term, postponing action is less risky than doing something with a material or waste that needs to be stabilized. Also, the various alternatives may have very different risks during their execution.

Note that the risk questions above only consider *relative risk*, that is, the difference in risk between one course of action and another. Characterizing the differences in risks can often be done in a qualitative or semi-quantitative way, when data are not reasonably available to predict the absolute risk. In some cases absolute risk values may be useful, for example, to indicate if risk is high enough to be a discriminating factor for either option.

What effects are to be considered?

Health risks to workers and members of the public, along with effects on the environment, are of interest to DOE managers and other stakeholders. Heath effects can be *immediate*, such as physical injury in a traffic accident, or *delayed*, such as cancers that appear years after exposure to radiation or another carcinogen.

One can not predict when traffic accidents will occur or which members of a group of people exposed to a carcinogen will develop cancer because of that exposure. Risk assessments are done in terms of predictions of average numbers of effects, that is the *expected value* of what may occur in the future.

Caution should be used when comparing public risks and worker risks. Although they may have the same units, for example, expected cancer deaths, they are often not perceived on the same scale. Risks to workers are characterized as voluntary. (Workers have chosen the job that causes the risk and get the paycheck that is associated with both.) When exposed to a release of hazardous materials, members of the public see the risk as involuntary. Proper management of the workplace and good worker attitude toward safety can control risk to workers. Once hazardous material has been released into the environment, the risks are not easily controlled.

In general, how are risks evaluated?

The risks of injury from physical hazards, in the workplace or on the roadway, are generally well understood and quantified. Such risks should be included in risk assessments but need little explanation. Risks from other agents are most simply examined from a hazard-barrier-target perspective. A *hazard* can be an energy field, such as gamma radiation, or a substance, such as beryllium, that would have undesirable effect on a *target* (for example, cancer or berylliosis, respectively). *Barrier* is a term that covers a wide range of devices or conditions that protect a target from the exposure to a hazard. For example, thick enough concrete shields are a barrier to gamma rays. An air tight can might keep plutonium metal confined preventing it from oxidizing and dispersing. Administrative controls, such as following proper procedures, can act as barriers, minimizing the exposures of workers or preventing the release of hazardous materials into the environment.

Risks from a hazard can be evaluated by postulating one or more scenarios. A *scenario* is a hypothetical (but physically possible) accident or change to conditions, such as weather, which would weaken a barrier increasing the chance of an accident and the risk to workers, public, or the environment. Alternatively, a scenario might postulate a natural or person-initiated event that would allow a hazard to circumvent a barrier, and cause a human heath or environmental effect. For each scenario, the likelihood of the release of a hazardous material, the amount of the hazardous material released, and its affect on people would be estimated. For example, a scenario might involve an earthquake and a fire that would release plutonium from a facility. More likely scenarios might be initiated by individuals not following procedures or ignoring administrative controls. After a release of a hazardous substance, atmospheric dispersion models could be used to estimate the amount inhaled by near-by individuals, and a prediction could be made of the number of cancer deaths expected to occur as a result of this hypothetical accident.

What factors are considered in risk analysis?

Typically an analysis of risk considers sources, barriers, pathways, receptors, periods of exposure, and endpoints. In risk assessment, *endpoints* are the unhealthy effects (or environmentally deleterious effects) that would be caused by a failure or partial failure of a barrier controlling a *source* of hazard (that is, a quantity of potentially hazardous material). The exposure is modified by the effectiveness of the barrier, the pathway, and the *period of exposure* (that is the length of time that individuals or population are exposed to the material in their environment). *Pathway* is a generalized term for the route a hazardous material takes from its release to a *receptor* (a person or plant or animal that might be affected). Pathway includes travel through the environment and entry into the body (or *intake*). Since the movement of a hazardous material via one path through environment will often dominate intake for a single intake route, pathways are often named for the intake route.

and disposal of hazardous materials. It is meant to be illustrative only. The actual pathways and exposure times would depend on the particular programmatic activity being evaluated and the scenario being used to do the risk analysis. Endpoints are given on the left of the column because they are the outcome values that typically result from risk analyses. The sources and receptors yielding the various endpoints are related right to left in the table.

Table 1 - An Example for Treatment, Storage, Transportation, and Disposal Activities (Risk Table)

Endpoints	Exposure Period	Receptor	Pathways	Source
Number of Cancer Fatalities	10 years	Offsite Population	Inhalation, Ingestion, Direct Radiation	Radionuclides
		Noninvolved Workers	Inhalation, Direct Radiation	
		Waste Management (WM) Workers		
Number of Cancer Incidences	10 years	Offsite Population	Inhalation, Ingestion, Direct Radiation	Radionuclides
			Inhalation, Ingestion	Chemicals
		Noninvolved Workers	Inhalation, Direct Radiation	Radionuclides
			Inhalation	Chemicals
		Waste Management (WM) Workers	Inhalation, Direct Radiation	Radionuclides
			Inhalation	Chemicals
Number of Genetic Effects	10 years	Offsite Population	Inhalation, Ingestion, Direct Radiation	Radionuclides
		Noninvolved Workers	Inhalation, Direct Radiation	
		WM Workers		
Probability of Cancer Fatality	10 years	Offsite Maximally Exposed Individual (MEI)	Inhalation, Ingestion, Direct Radiation	Radionuclides
		Noninvolved Worker MEI	Inhalation, Direct Radiation	
Probability of Cancer Incidence	10 years	Offsite MEI	Inhalation, Ingestion, Direct Radiation	Radionuclides
			Inhalation, Ingestion	Chemicals
		Noninvolved Worker MEI	Inhalation, Direct Radiation	Radionuclides
			Inhalation	Chemicals
Probability of Genetic Effects	10 years	Offsite MEI	Inhalation, Ingestion, Direct Radiation	Radionuclides
		Noninvolved Worker MEI	Inhalation, Direct Radiation	
Non-cancer Risk	10 years	Offsite MEI	Inhalation, Ingestion	Chemicals
		Noninvolved Worker MEI	Inhalation	
		WM Worker		
Number of Trauma Fatalities	20 years	WM workers	Physical Hazards	Gravity, inertia, electricity, etc.

How much risk assessment must be done when performing a Trade Study?

The scope and complexity of risk assessments to support DOE decision-making activities varies over a wide spectrum. Environmental impact statements (EISs) typically have extensive risk assessments of the various alternatives considered. Significant amounts of time and money go in to data analysis and modeling to produce risk assessments of the quality and rigor needed. Similarly, safety analysis reports (SARs), the documentation underpinning needed to operate DOE facilities safely, are based on extensive modeling of a large collection of accident scenarios. Some DOE elements use short, simple "risk narratives" (that are just a few pages long) to use information about risks in setting priorities when budgeting.

Often, an acceptable measure of risk can be qualitative rather than quantitative. Table 2 shows a spectrum of different levels of risk assessment that may be selected using a graded approach. For any risk assessment approach, a screening assessment can be used to focus the risk assessment on the more important, decision-driving hazards.

Table 2 - Comparison of Risk Assessment Approaches Useful in Trade Studies

Risk Assessment Approach	Risk Assessment Expertise Needed	Benefits to a Trade Study	Disadvantages
Hazard-Barrier-Target Analysis	Can be done by those with little quantitative risk assessment expertise	Can be a simple, fast, and cost-effective tool for early stages of decision making.	Does not work well for situations involving more than one hazard (for example, radioisotopes and large quantities of flammable liquids).
Unbiased Expert Opinion	Trade Study leader needs little risk assessment expertise.	Can be a simple, fast, and cost-effective tool for early stages of decision making.	It may be difficult to defend the qualifications of the expert and his or her lack of bias.
Adaptation of Previous Analyses (from an EIS or SAR)	Some	Does not require a lot of time and money.	EISs and SARs are often excessively conservative to ensure they are a "bounding analysis."
Limited Scope Quantitative Risk Assessment	Quite a bit	Can differentiate between options.	Data gathering and analysis can lead to significant costs.
Comprehensive Quantitative Risk Assessment	most	Done well, they are the most defendable.	Are often overkill in the scoping Trade Study stage of the decision making process, but can be used to answer specific questions later.

The hazard-barrier-target (or receptor) model may be adequate to distinguish the risk differences among the various alternatives under consideration. For example, if for a set of alternatives, the barriers and receptors remained the same for all cases, then differences in the amount of material remaining on the site (that is, the hazard term) would be an indication of the differences in risk reduction among the alternatives. Similarly the risk of performing different stabilization activities would be proportional to the amount of material handled if the effectiveness of the barriers and the number and location of receptors didn't change among the alternatives.

In some cases the most reasonable measure of risk may be a "high, medium, or low" judgement given by an unbiased, informed expert. The opinion of an expert or an opinion poll of several experts may be adequate for risk assessment at the Trade Study stage of a decision making process. However, the information will not be much use later when more formal risk assessment is required. Also, it is often difficult to find a qualified expert, who is informed well enough to give a valuable expert opinion, who is not biased in his or her opinion about the best solution to the problem being considered.

When simpler methods don't yield adequate measures of risk, it may be possible to adapt risk assessments that have already been done for EISs and SARs. Accidents that cause releases typically have effects (such as dose to a member of the public) that are proportional to the amount released. The amount released is often assumed to be proportional to the amount in process. The effect of releases of different amounts may often be simply scaled to the calculated release. Sometimes an accident given in a SAR may describe an accident that would characterize risks, but the frequency of the accident used in the SAR is not appropriate for the activity being considered in a Trade Study. In such a case, other estimates of frequency may be used to characterize the risks. Often the most reasonable approach may be to ask an expert for his estimate of the frequency. The best question to ask may be "given the details of the alternative considered, would he or she expect the accident to occur once in 10 years, once in a hundred years, or in a period of time longer than that?"

When a situation involves several different hazards or when there are not any relevant, useful analyses in EISs or SARs, it may be necessary to have a quantitative risk assessment done for a Trade Study. Considerable time and money can be saved by limiting the scope of the quantitative risk assessment to only those hazards, scenarios, and pathways that differentiate among the various alternatives being considered. The common risks and risks of lesser magnitude do not need to be evaluated at this time. Further, it is likely that the work done for a limited scope quantitative risk assessment can be used in the more formal risk assessments done subsequent to the Trade Study.

The risk assessment for a Trade Study must produce an outcome that:

is easy to use (that is, it can be displayed visually), and

truly reflects the differences in risk among the alternatives.

<u>What is to be done about ecological risks?</u>

Ecological risk assessment evaluates the impacts on the plants and animals in an area possibly affected by one or more alternatives. It is not about compliance with most regulations limiting release or burial of environmental contaminants.

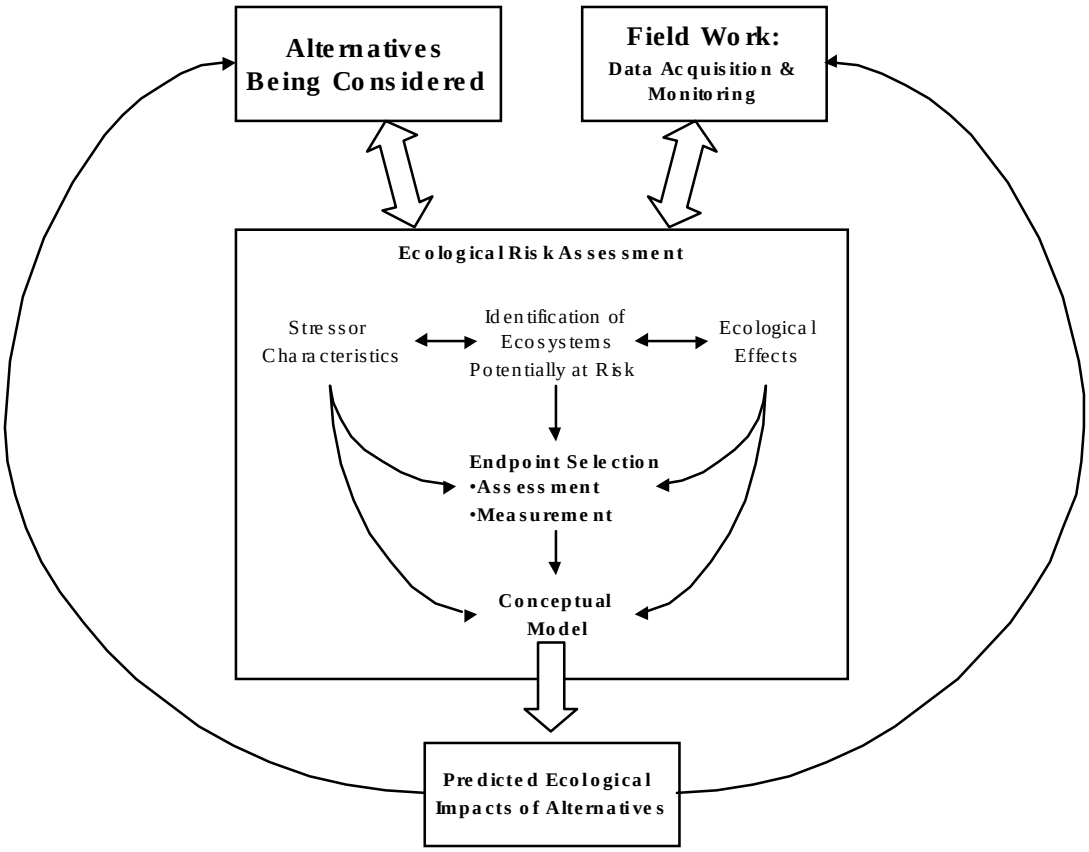
Most ecological systems are quite complex, and there is very little specific guidance on the methods used to assess ecological impacts. For these reasons, an experienced ecological risk assessor is needed for most ecological risk assessments.

In a Trade Study, in which no member of the study team is an ecological expert, there are two questions that should be addressed for each alternative under consideration.

Will the proposed activity have more than minimal impact on the environment? (Will there be construction outdoors, any more than a slight increase in vehicle traffic, or anticipated releases of contaminants in excess of those released during normal operations of the facility?)

Dose the area affected by the proposed alternatives contain any plants or animals protected by law or that perform an ecologically valuable function? The answer to this question must be based on input from someone knowledgeable of the species and ecology of the area. Environmental impact statements or environmental assessments for other, previous projects in the area may contain the needed information.

If the answer to either question is yes, then input from an ecological expert will be needed before the Trade Study is completed. If the answer to both is yes, ecological expertise for the Trade Study group should be acquired early in the process. Figure 1 shows the interrelation of the components involved in ecological risk assessment. Explaining the details of ecological risk assessment is beyond the scope of this introductory paper. Rather, the purpose of the figure is to give the program manager a starting-point for discussions with ecological risk assessors and a general appreciation of ecological risk assessment process.



What are some tips for program managers who become involved in Trade Study risk assessments?

1. *Have a clear picture of the decision that must be made.* This includes good knowledge of the current situation and the alternatives for consideration. Risk assessments are driven by the decision-making process and not vice versa. For the risk assessment produced in a Trade Study to help the decision-makers, the decision to be made must be clearly described. The formality and rigorousness needed for the risk assessment depend on the importance and irreversibility of the decision.
2. *Have a quantitative physical description of the activities to be performed for each alternative.* (For a transportation example, how many kilograms of plutonium, in what physical form, in what containers, are going to be move by what mode of transportation, over what distance, and what special precautions are going to be taken to minimize transportation accidents?)
3. *Have the risk assessment peer reviewed by risk assessors and other managers.* A risk assessment done by a team of a manager and a risk assessment specialist, should seem reasonable to another risk assessor and be defendable to other managers.

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APPENDIX H
LESSONS LEARNED

Significant improvements have been made in the EM Integration Process over the last several years, and it is anticipated that further improvements will be identified. A simplified form has been developed to enable all participants to document suggested improvements to the process. The top half of the form should be completed and submitted to the Jonathan Kang (see below) of the Core Team for formal evaluation and implementation. Documented results of the evaluation will be sent to the original submitter to close the information loop.

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EM Integration
Process Improvement/Lessons Learned

Submitter: _____

Date: _____

Issue:

Recommended Solution or Improvement:

Tracking No.: _____

Actionee(s): _____ _____ _____

Resolution:

Concurrence: Actionee(s): _____ _____ _____

Core Team Representative: _____

Acknowledgment: Submitter: _____

APPENDIX I

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