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A Contractor Report to the Department of Energy on Environmental Management Baseline Programs and Integration Opportunities (Discussion Draft)

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COMPLEX-WIDE
EM INTEGRATION

Complex-Wide EM Integration Team

May 1997

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INEL/EXT-97-00493

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The Project Management Team concurs that the charter has been fully met by documenting baseline environmental management programs and developing integration opportunities that are technically feasible and have the related *potential* cost savings. The opportunities provide a technical baseline from which meaningful discussion between the U.S. Department of Energy (DOE) and the stakeholders can take place. The team recognizes that when technical approaches are being developed that the opportunities will, by necessity, cross into the regulatory and political arenas. We acknowledge that DOE will make the decision as to which of these opportunities to incorporate into the department's plans.

Greg Brandsen, Idaho National Engineering and Environmental Laboratory	5/30/97 Date
Bruce Kimmel, Oak Ridge	5/30/97 Date
Vernon Daub, Fernald	5/30/97 Date
Ed Hess, Waste Isolation Pilot Plant	5/30/97 Date
Reed Jensen, Los Alamos National Laboratory	5/30/97 Date
Jim Kannard, Nevada Test Site	5/30/97 Date
Sam Kelly, Savannah River Site	5/30/97 Date
Robert Lawrence, West Valley Demonstration Project	5/30/97 Date
Allen Schubert, Rocky Flats	5/30/97 Date
Les Shephard, Sandia National Laboratories	5/30/97 Date
Dick Wilde, Hanford	5/30/97 Date

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ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CH	contact-handled
Cs	Cesium
DOE	U.S. Department of Energy
DOE-HQ	U.S. Department of Energy Headquarters
DOE-RW	U.S. Department of Energy Office of Civilian Radioactive Waste Management
EM	environmental management
ER	environmental restoration
HAW	high-activity waste
HLW	high-level waste
INEEL	Idaho National Engineering and Environmental Laboratory
LANL	Los Alamos National Laboratory
LAW	low-activity waste
LLW	low-level waste
MLLW	mixed low-level waste
NEPA	National Environmental Policy Act of 1969
NMED	New Mexico Environmental Department
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
NWPA	Nuclear Waste Policy Act
OU	operable unit
PCB	polychlorinated biphenyl
Pu	plutonium
RFCA	Rocky Flats Cleanup Agreement
RH	remote-handled
ROD	Record of Decision
SNF	spent nuclear fuel
SNL	Sandia National Laboratories
Sr	Strontium
SRS	Savannah River Site
STP	Site Treatment Plan

TPA	Tri-Party Agreement
TRU	transuranic
TRUPACT	Transuranic Package Transport
TSCA	Toxic Substances Control Act
TSD	treatment, storage, and disposal
WAC	Waste Acceptance Criteria
WERF	Waste Experimental Reduction Facility
WIPP	Waste Isolation Pilot Plant
WVDP	West Valley Demonstration Project

A Contractor Report to the Department of Energy on Environmental Management Baseline Programs and Integration Opportunities (Discussion Draft)

INTRODUCTION

In July 1996, the U.S. Department of Energy (DOE) Assistant Secretary for Environmental Management (EM) chartered a government contractor led effort to develop a suite of technically defensible, integrated alternatives which meet the EM mission. The contractor team was challenged to "think outside-the-box" for solutions that cross traditional site boundaries and enable the programs to get the job done at an earlier date and at a lower cost. This report

- Documents baseline programs' current plans for material disposition
- Presents the opportunities for additional acceleration of cleanup and cost savings.

A graphical depiction of the disposition of EM-owned waste and material from current state to final disposition is shown as disposition maps, in Attachments 1, 3, 5, 7, 9, and 11. These disposition maps detail the material disposition at eleven major DOE sites as planned in the current discussion draft plan, "Accelerating Cleanup: Focus on 2006." Maps reflecting material disposition at additional sites will be added in the future.

Opportunities to further accelerate the cleanup of DOE-EM sites and reduce the overall cost of cleanup are depicted in the alternative disposition maps shown in Attachments 2, 4, 6, 8, 10, and 12. These integration opportunities bring nation-wide resources to bear on common problems facing the DOE sites.

The Problem

The DOE-EM program faces significant technical and financial challenges in cleaning up the environmental legacy of nuclear weapons production and research and development, while facing an uncertain future in obtaining the needed funding to perform this work. At the same time, requirements are becoming more complicated. Many of these requirements, including State and Federal regulations and negotiated agreements, continue to be significant contributors to EM program costs and schedules. Historically, the sites have managed their programs focusing on their individual site's needs. While this approach maximized successes at individual sites, it has resulted in a more costly program than if more integration across the DOE system occurred. The sites have

Complex-Wide EM Integration Team—
A Systems Engineering Approach

developed their own solutions for problems common to multiple sites. Addressing these common problems from an integrated, complex-wide perspective is necessary to enable DOE to meet its programmatic objectives within an acceptable budget.

The Solution

To address this problem, DOE chartered this government contractor led effort to develop a suite of technically defensible alternatives or opportunities which meet the EM mission at an earlier date and at a lower cost. These opportunities were derived using a systems engineering approach and represent significant cost and schedule improvement over the baseline. However, they have not been agreed to by DOE. Integration opportunities identified in this report have been developed independently by government contractors and must now be evaluated by DOE and stakeholders. Discussions need to occur with Tribal Nations, regulators, and other stakeholders. As a result of the evaluation an ensuing discussions, some of these integration opportunities may be incorporated into the draft "Accelerating Cleanup: Focus on 2006" (hereafter referred to as the Plan) while others may have action plans written for resolution, and still others may be rejected.

As demonstrated by previous smaller-scale integration efforts, it is possible to develop cost effective, efficient solutions that meet requirements and reduce the gap between projected costs and anticipated funding levels. This can be accomplished by consolidating wastes, integrating management of similar waste forms, and capitalizing on existing capabilities of DOE sites. Additionally, stakeholders are expressing the willingness to work with DOE in order to address the legacy issues and to develop a path forward that will allow cleanup to be done in a manner suitable for all parties. This willingness provides an opportunity to seriously consider the alternatives developed through this effort.

This report documents opportunities for waste and nuclear materials management integration activities in six areas: transuranic (TRU) waste, mixed low-level waste (MLLW), low-level waste (LLW), environmental restoration (ER), high-level waste (HLW), and spent nuclear fuel (SNF). The opportunities represent technically defensible solutions which reduce cost, accelerate schedules, and result in no significant increase in risk.

Although stakeholder acceptability of the opportunities was considered, by charter the contractor integration team did not perform a detailed evaluation of stakeholder issues such as site equity and political acceptability. Therefore, the opportunities discussed in this report may not be acceptable to the Department or its stakeholders. A listing of the barriers associated with each opportunity is found in the benefits and barriers tables. It is not intended that this report serve as an EM policy or planning document but as a tool to facilitate discussion for possible implementation into future Plans. Of course, formal evaluation as required by the National Environmental Policy Act of 1969 (NEPA) would also have to occur for any opportunities that would require programmatic changes as a part of this decision process. The estimated cost savings were developed from existing analyses; they should be considered as order of magnitude savings used to gauge the value of pursuing the opportunity.

Approach

The integration effort used a prescriptive systems engineering approach (defining requirements, developing alternatives, conducting trade studies), as detailed in the previous report,[1] and assembled subject matter experts from each of eleven major sites to perform the following activities:

- Develop and evaluate integration alternatives against an established baseline
- Provide technically defensible recommendations
  - Efficiencies under existing requirements
  - Efficiencies through modifying requirements
  - Filling programmatic gaps in existing programs
- Identify cost savings opportunities.

Strategies

The majority of the integration opportunities evaluated were encompassed by several high-level strategies, which are:

- Utilize complex-wide system resources effectively (eliminate redundancy)
- Cross program boundaries where effective
- Challenge requirements
- Apply site successes complex-wide
- Employ national procurements to fill unique DOE needs.

Results

By integrating these strategies across the complex, the team was able to develop opportunities with the potential for significant benefits, as outlined below. The information in this report represents the relative magnitude of the savings that DOE could realize through these opportunities. The cost data used in this project range from detailed estimates from existing planning documents to rough-order-of-magnitude estimates. However, it is important to note that the opportunities developed during this project are not overly sensitive to the data. Cost savings represent dollar savings that potentially could be realized from the Plans. Cost avoidances represent dollars that would not have to be added into the Plans to fill program gaps. The savings labeled "Savings Incorporated" are derived from those integration opportunities incorporated into site draft Plans. Stakeholder involvement for these opportunities will occur with the Plan.

DOE has determined that 25 of 36 integration opportunities should receive further consideration. The breakthrough actions that comprise these 25 integration opportunities are rolled together in this report

to directly correlate with the integration opportunities as summarized in the Plan. (Additional breakthrough actions that do not fit into the 25 integration opportunities are found at the end of the respective tables.) For 22 of these opportunities, DOE has decided to prepare an action plan that describes the Department's evaluation process and specific actions for stakeholder involvement prior to a decision on whether to implement the recommendation. Of the remaining 14 integration opportunities, 3 are already being implemented and require no action plan, 8 require more evaluation before decision on an action plan is reached, and 3 will no longer be considered.

This report is a summary of a previous EM Integration report[1]; updated to correlate to the current discussion draft Plan and reconcile data discrepancies identified during reviews of those plans including the Gap Analysis Workout. It is based on data submitted as part of the discussion draft Plan. However, the data appearing in this report and accompanying disposition maps may not match identically with the discussion draft Plan or other data sources. This is because: (1) the data supporting this report reflects reconciliation of data gaps and inconsistencies in the discussion draft Plan data, and (2) data needed to evaluate integration opportunities and build disposition maps is not always traceable to the discussion draft Plan data because it is often at a different level of detail. For example: ER volumetric data included in the discussion draft Plan was not reported at the same level of detail as volumetric data for the Waste Management program, therefore, the data in this report cannot be verified until the discussion draft Plan data is updated.

It should also be noted that some material disposition data and maps are based on site planning assumptions relative to pending NEPA, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act, and other regulatory and permitting actions. The disposition data and maps will be updated to reflect any changes to concur with final actions.

Both the discussion draft Plan and the EM integration study are "works in progress." In the near future, the discussion draft Plan data will be more completely integrated with other DOE data sources and this report and the accompanying disposition maps will be revised to reflect updates in the discussion draft Plan.

TRANSURANIC WASTE

The preferred alternatives developed by the TRU waste subteam for contact-handled (CH) and remote-handled (RH) wastes encompass programmatic and technical approaches which are capable of dispositioning essentially all currently identified TRU waste under DOE purview by 2023, allowing Waste Isolation Pilot Plant (WIPP) costs to transfer to other users. Strategic elements reflected in the preferred alternatives lead to a potential savings of $2.5B from the effected Plans, and resolve waste disposition issues not otherwise addressed in draft Plan submittals, thereby avoiding additional future costs of $1.3B, as shown in Table 1. The preferred alternatives are captured in the following opportunities:

TRU Waste Destined for Shipment to WIPP

- ***Consolidate TRU Waste Storage***— Consolidate storage of CH- and RH-TRU waste from sites with small inventories to sites with greater inventories (e.g., Idaho National Engineering and Environmental Laboratory [INEEL], Hanford Site, Los Alamos National Laboratory [LANL], Oak Ridge, and Savannah River Site [SRS]). This could expedite closure of some sites.

- ***Improve Transportation Systems for TRU Waste***—Expand or develop improved transportation methodologies for the shipment of both CH- and RH-TRU waste to improve efficiency, avoid large-scale fixed-plant operations, and overcome current limitations due to size, weight, or other restrictions.

- ***Pursue TRU Waste Acceptance Changes Affecting Disposal***—Pursue changes to allow disposition of all TRU waste and allow waste characterization by acceptable knowledge for RH-TRU waste.

- ***Use Mobile Systems for TRU Waste***—To avoid redundant systems at several sites, mobile (transportable/modular) systems for TRU waste preparation, packaging, treatment, and loading will be developed and deployed to service the sites.

- ***Accelerate TRU Waste Shipments and Closure of WIPP***—To realize cost savings from early closure of the WIPP, the department could pursue a strategy to accelerate ER, decontamination and decommissioning, and other programs that will generate TRU waste during site cleanup.

Table 1. TRU waste integration benefits and site-specific barriers.

Breakthrough Action by Opportunity	Plan Savings (Life-Cycle) ($M)[a]	Cost Avoidance for Plan ($M)[b]	Savings Incorporated ($M)[c]	Schedule Improvement (Years)	Barriers	Near-Term Decision Date[d]
Consolidate TRU Waste Storage						
Hanford						
• Ships 2.4 m^3 of non-Waste Acceptance Criteria (WAC) compliant plutonium (Pu)-238 CH-TRU waste to SRS for repackaging and certification for shipment to WIPP. (Completed by 2010.)	—	60	—	—	• Requires a new "high-activity" Type B packaging system for drums of Pu-238 CH-TRU waste.	—
• Ships 73 m^3 of polychlorinated biphenyl (PCB)-contaminated CH-TRU waste to INEEL for treatment and certification for shipment to WIPP. (Completed by 2010.)					• Requires expansion of TRU Package Transport (TRUPACT)-II authorized contents or alternate certified packaging for intersite shipments. • Agreement with states involved.	—
• Receives up to 372 m^3 of non-WAC compliant Pu-239 CH-TRU waste from SRS, and 527 m^3 from Oak Ridge for repackaging and/or certification for shipment to WIPP.					• DOE Headquarters (-HQ) and the State of Washington. • Agreement must be revised to allow receipt of TRU waste from other sites.	—
INEEL						
• Provides treatment of 2,943 m^3 SRS mixed alpha-LLW, 73 m^3 Hanford PCB-contaminated TRU waste, 967 m^3 Rocky Flats non-WAC compliant TRU waste, and 467 m^3 Oak Ridge non-WAC compliant CH-TRU waste.	(2.7)	28.1	—	—	• The Settlement Agreement must be revised to allow earlier receipt of waste for treatment after WIPP opens.	—
LANL						
• Receives 31 m^3 of non-WAC compliant Pu-239 CH-TRU waste from Sandia National Laboratories (SNL) by 1997.	—	—	—	—	• Requires expansion of TRUPACT-II authorized contents or alternate certified packaging for intersite shipments.	1998
• Receives 2.6 m^3 of RH Pu-238 from SNL.	—	—	—	—		
Oak Ridge						
• Ships 467 m^3 of non-WAC compliant CH-TRU legacy Pu-239 waste to INEEL for treatment.	2.7	—	—	—	• Requires expansion of TRUPACT-II authorized contents or alternate certified packaging for intersite shipments. • Dependent on INEEL revising Settlement Agreement for earlier receipt of waste.	—
• Ships approximately 527 m^3 non-WAC compliant CH-TRU Pu-239 waste to Hanford for characterization.	—	—	—	—		—
• Recertifies 150 m^3 of CH-TRU to WIPP-WAC Rev. 5.	—	—	—	—		—
Rocky Flats						
• Ships 967 m^3 of non-WAC compliant CH-TRU waste to INEEL for treatment.	—	40	—	6	• Requires expansion of TRUPACT-II authorized contents, or alternate-certified packaging, for intersite shipments. • Dependent on INEEL revising Settlement Agreement for earlier receipt of waste.	—
SNL						
• Ships 31 m^3 of non-WAC compliant Pu-239 CH-TRU waste to LANL.	0.5	1.5	—	8	• Requires expansion of TRUPACT-II authorized contents or alternate certified packaging for intersite shipments.	—
• Ship 2.6 m^3 RH-TRU waste to LANL.	—	2	—	15	• Requires development of systematic approach to using shielded overpacks or shielded drums in TRUPACT-II.	—

Table 1. (continued).

Breakthrough Action by Opportunity	Plan Savings (Life-Cycle) ($M)[a]	Cost Avoidance for Plan ($M)[b]	Savings Incorporated ($M)[c]	Schedule Improvement (Years)	Barriers	Near-Term Decision Date[d]
SRS						
• Ships 2,943 m^3 CH alpha-MLLW to INEEL for treatment.	(40)	105	—	10	• Requires expansion of TRUPACT-II authorized contents or alternate certified packaging for intersite shipments. • Dependent on INEEL revising Settlement Agreement for earlier receipt of waste.	1/99
• Receives 2.5 m^3 non-WAC compliant CH-TRU Pu-238 waste from Hanford.	—	—	—	—	• Requires a new "high-activity" Type B packaging for drums of Pu-238 CH-TRU waste.	—
• Receives 291 m^3 of Mound CH-TRU waste.	—	—	—	—		
Small-Quantity Sites						
• TRU waste from Mound and Argonne East is consolidated to larger sites.	20	—	—	—	• Requires mobile characterization systems.	—
Improve Transportation Systems for TRU Waste						
Hanford						
• Load approximately 100 m^3 of RH-TRU boxed waste directly into an overpack, with no repackaging required.	—	5	—	1	• Requires development of systematic approach to using shielded overpacks or shielded drums in TRUPACT-II.	2001
• Ship retrieved RH drums directly, without repackaging.	—	7.5	—	—	• Requires development of systematic approach to using shielded overpacks or shielded drums in TRUPACT-II.	2001
INEEL						
• Ships 30,000–40,000 m^3 of treated CH waste to WIPP in new high-weight capacity transport system.	—	45	—	—	• Requires a new "high-capacity" Type B packaging for heavy drums of treated CH-TRU waste.	—
LANL						
• Expand transportation capabilities allowing shielded drums, shielded shipping container, oversize shipment, and solve gas generation issues. Reduces RH-TRU waste characterization costs by 33%.	—	2.5	—	—	• Requires development and approval of use of new shipping packages.	1998
SRS						
• Ships CH-TRU Pu-238 waste to WIPP without thermal treatment in certified packaging, but requires capital for sort and repackage facility.	—	457	—	—	• Requires a new "high-activity" Type B packaging for drums of Pu-238 CH-TRU waste. • Requires additional funding in Plan to incorporate Pu-238 repackaging capabilities.	10/98
WIPP						
• Develop new high-weight and high-activity transportation packages for CH-TRU waste and associated facility modifications.	(88)	—	—	—	• Requires new transportation system.	10/98
West Valley Demonstration Project (WVDP)						
• Package 200 m^3 of noncompliant RH-TRU waste in large containers for shipment to alternate sites.	—	13	—	—	• New transportation package required.	—

Table 1. (continued).

Breakthrough Action by Opportunity	Plan Savings (Life-Cycle) ($M)[a]	Cost Avoidance for Plan ($M)[b]	Savings Incorporated ($M)[c]	Schedule Improvement (Years)	Barriers	Near-Term Decision Date[d]
Pursue TRU Waste Acceptance Changes Affecting Disposal						
Hanford						
• Dispose of RH-TRU waste in low-level burial ground onsite.	—	75	—	5	• Allow onsite disposal of oversize waste that meets performance assessment.	2000
LANL						
• Reduce RH-TRU waste characterization requirements. This reduces characterization costs by approximately 50%.	—	4.2	—	—	• Requires regulatory/policy flexibility to enable acceptable knowledge and risk based characterization.	1998
Oak Ridge						
• Provide onsite disposal of RH-TRU waste in Solid Waste Storage Area 5N.	—	20	—	—	• Allow onsite disposal of oversize waste that meets performance assessment.	—
WVDP						
• Dispose of all WVDP managed RH-TRU waste at WIPP, eliminating long-term storage.	—	4	—	20	• Amendment to Land Withdrawal Act needed to allow nondefense waste disposal at WIPP.	—
Use Mobile Systems for TRU Waste						
Hanford						
• Implement mobile systems for preparation of two RH shipping campaigns, reducing scope of facilities to be constructed.	—	157	—	—	• Requires development of shielded mobile systems to support repackaging, waste characterization and certification.	2000
INEEL						
• Implement mobile repackaging, characterization, and loadout systems, in concert with expanded capability to utilize TRUPACT, to avoid costly hot cell operations for low dose rate RH-TRU waste.	3	—	—	5	• Requires development of shielded mobile systems to support repackaging, waste characterization and certification. • Requires development of systematic approach to using shielded overpacks or shielded drums in TRUPACT-II. • Requires timely resolution of characterization and gas generation issues.	—
LANL						
• Utilize consolidated procurement of mobile systems for decontamination and size reduction of RH-TRU waste. 55 m^3 requires size reduction. This action eliminated the need to construct a facility estimated at $150M.	—	90	—	—	• Requires mobile or modular system capable of size-reducing oversize RH-TRU waste. This cost is not included in LANL costs, as it would be a shared capability.	1998
Rocky Flats						
• Implements use of Fourier Transform Infrared System for headspace gas analysis of CH-TRU waste.	—	—	22.4	—	• Requires mobile characterization system in next 3 years.	—
SRS						
• Uses mobile characterization for 372 m^3 CH Pu-239 waste for shipments to Hanford for repackaging.	—	7	—	10	• Requires mobile characterization systems.	1/99
WVDP						
• Implement mobile systems to package 466 m^3 of noncompliant RH-TRU waste.	—	60	—	—	• Mobile systems for handling RH waste required.	—

Table 1. (continued).

Breakthrough Action by Opportunity	Plan Savings (Life-Cycle) ($M)[a]	Cost Avoidance for Plan ($M)[b]	Savings Incorporated ($M)[c]	Schedule Improvement (Years)	Barriers	Near-Term Decision Date[d]
Accelerate TRU Waste Shipments and Closure of WIPP						
INEEL						
• Ships 25 m^3 non-mixed alpha-LLW to Hanford for disposal.	—	0.1	—	—	• Dependent on Hanford DOE and the State of Washington reaching agreement to allow disposal of offsite wastes.	—
LANL						
• Accelerated workoff of CH-TRU waste by 2005.[e]	(7)	81	—	9	• Requires a new "high-activity" Type B packaging for drums of Pu-238 CH-TRU waste.	1998
WIPP						
• Costs for the disposal of TRU waste are transferred after 2023.	2,719[f]	—	—	—	• Sites ability to certify and ship waste within 25-year window.	—
• Develop mobile system for RH-TRU waste.	(100)	—	—	—	• Mobile systems for handling RH-TRU waste, including new characterization technology.	1998
TOTAL	2,507	1,265	22.4			

a. Plan savings are life-cycle costs currently in the Plans. These savings reflect dollars that can be used to support additional scope or scope acceleration.

b. This column reflects program gaps that have been filled as a result of the integration effort. This represents dollars that will need to be added to the Plan to correct this situation if the integration alternative is not implemented.

c. This column reflects the savings for breakthrough recently incorporated into the current Plan, as a result of this integration effort.

d. The dates reflect when decisions are required in order to achieve the maximum benefit. Typically, there are still benefits that can be obtained even if the decision date slips.

e. The LANL Plan already identifies use of mobile systems to accelerate workoff 8-1/2 years and the need for a high activity transportation package.

f. Cost savings derived from DOE-Carlsbad Area Office February 28, 1997 draft Plan, Base Operations for the ten-year period.

MIXED LOW-LEVEL WASTE

The MLLW subteam has identified an alternative set of programmatic and technical approaches that could potentially save nearly $0.3B and accelerate completion of the MLLW inventory workoff across the DOE complex by five years, as shown in Table 2. The cost savings and schedule improvements are attributed to MLLW management strategy that features the following opportunities:

Toxic Substances Control Act (TSCA) Incinerator Treats MLLW and LLW

- ***Use Consolidated Procurement for MLLW Analytical Services***—Use consolidated procurement for analytical services and audits to obtain necessary characterization and certification of MLLW in lieu of individual site contracts. This will minimize the number of audits conducted at the same facility.

- ***Establish "De Minimis" Radioactivity Levels for MLLW***—Establish *de minimis* or "below-regulatory-concern" levels for radionuclide content in MLLW to enhance capability to segregate hazardous-only and MLLW.

- ***Standardize MLLW Characterization***—Develop common characterization standards which satisfy requirements that are necessary and sufficient to allow MLLW to be accepted at any treatment, storage, and disposal (TSD) facility in the complex without multiple characterization steps.

- ***Maximize Use of Existing DOE Facilities for MLLW Treatment***—Maximize the use of existing DOE operating facilities for treatment of MLLW to achieve the best cost efficiency.

- ***Expand Use of National Procurement Contracts for MLLW***—Expand use of national procurement contracts to enable treatment of MLLW that cannot be treated through existing DOE capabilities.

- ***Use Combination of DOE and Commercial MLLW Disposal Capacity***—Continue disposal at existing commercial facilities and initiate centralized disposal at Hanford Site with Nevada Test Site (NTS), as backup, for MLLW to achieve cost efficiencies.

Table 2. MLLW integration benefits and site-specific barriers.

Breakthrough Action by Opportunity	Plan Savings (Life-Cycle) ($M)[a]	Cost Avoidance for Plan ($M)[b]	Savings Incorporated ($M)[c]	Schedule Improvement (Years)	Barriers	Near-Term Decision Date[d]
Maximize Use of Existing DOE Facilities for MLLW Treatment						
Fernald						
• Treat 480 m^3 at the Waste Experimental Reduction Facility (WERF) at INEEL and 120 m^3 at TSCA.	14.4	—	—	1	• Modify Site Treatment Plan (STP) to allow offsite treatment. • Further waste characterization is needed to assure acceptability.	5/97
Hanford						
• Treat up to 1,451 m^3 at WERF/TSCA rather than contract (private contract will treat 600 m^3).	—	—	—	1	• Resolve Hanford site labor issues relative to offsite MLLW treatment. Assumes treatment can be accomplished at WERF for minor incremental sampling and operational costs. • Schedule completion of Hanford waste treatment at WERF by 2003.	10/00 10/97
LANL						
• 87 m^3 of MLLW to be treated at DOE incinerators and 158 m^3 of waste to be treated through national contracts.	3.9	—	—	—	• Dependant on the establishment of the Broad Spectrum Treatment contract by 1998.	10/98
Oak Ridge						
• Separate 2,917 m^3 of spottily contaminated soils from Broad Spectrum Contract for treatment in TSCA Incinerator.	11	—	—	—		
Rocky Flats						
• DOE incinerators to treat 5,859 m^3 alpha MLLW rather than treat onsite at $3,567/$m^3$.	—	—	20.9	3		—
SNL						
• WERF to treat and eliminate storage.	17	—	—	4		—
• Eliminate Packed Bed Reactor and treat 59.7 m^3 of miscellaneous waste streams.	3.2	—	—	—	• Modify schedule and compliance order to facilitate elimination of the Packed Bed Reactor.	10/97
Expand Use of National Procurement Contracts for MLLW						
Hanford						
• 20% reduction in unit cost for economies of scale associated with national stabilization procurement strategy (over 30,000 m^3).	10	—	—	—		
INEEL						
• Eliminate mercury retort facility to process waste at national procurement.	0.3	—	—	—	• Modify STP (public comment) for mercury retort.	11/97
Oak Ridge						
• Treat 10,993 m^3 in Broad Spectrum Procurement. DOE sites participate to reduce unit treatment costs from $15 to $10 per Kg. Additional savings from accelerated closure of storage.	75	—	—	3	• Dependant on establishment of Broad Spectrum Contract and full participation by all sites.	12/97

Table 2. (continued).

Breakthrough Action by Opportunity	Plan Savings (Life-Cycle) ($M)[a]	Cost Avoidance for Plan ($M)[b]	Savings Incorporated ($M)[c]	Schedule Improvement (Years)	Barriers	Near-Term Decision Date[d]
Use Combination of DOE and Commercial MLLW Disposal Capacity						
Hanford						
• Open Hanford disposal to offsite wastes.	—	—	—	—	• Secure funding to operate the Hanford Subtitle C Disposal Facility immediately. • Obtain stakeholder buy-in to the use of the Hanford Subtitle C Disposal Facility for disposal of "complex-wide" MLLW. • Modify basis documentation (permits, safety analysis reports, etc.) to accept added offsite wastes.	10/98
INEEL						
• Dispose 600 m^3 at Hanford.	11.3	—	—	5	• Relies upon Hanford to modify basis documentation to accept offsite wastes.	10/00
Oak Ridge						
• Saved storage costs—disposal of 570 m^3 waste at Hanford that couldn't be disposed of commercially and was to be stored onsite indefinitely.	—	10	—	—	• Relies upon Hanford to modify basis documentation to accept offsite wastes.	10/00
Rocky Flats						
• Direct ship 60,868 m^3 waste to Hanford for disposal. Eliminate a planned Rocky Flats treatment facility.	—	—	40.6	1	• Relies upon Hanford to modify basis documentation to accept offsite wastes. • Modify STP to address new treatment and disposal pathways.	10/99 —
SRS						
• Hanford accepts 1,000 m^3 of waste for disposal at $1,400/$m^3$ rather than previously budgeted $7,600/$m^3$.	—	—	6.2	10	• Dependant on Hanford to modify basis documentation to accept offsite waste by 2000. • Upgrade Part B permit to allow acceptance of offsite wastes. • Modify STP (public comment) for acceptance of offsite wastes.	10/99
TOTAL	146	10	68			

Table 2. (continued).

Additional Complex-Wide Opportunities	Potential Savings
• Eliminate one incinerator from DOE incinerator system after 2001.	$300M
Establish "De Minimis" Radioactivity Levels for MLLW	
• Establish De Minimus levels.	$100M
Use Combination of DOE and Commercial MLLW Disposal Capacity	
• Modify DOE Order 5820.2A to allow for use of commercial disposal without need for variance.	$3M
Standardize MLLW Characterization	
• Eliminate redundant characterization of newly generated waste.	$50M

a. Plan savings are life-cycle costs currently in the Plans. These savings reflect dollars that can be used to support additional scope or scope acceleration.

b. This column reflects program gaps that have been filled as a result of the integration effort. This represents dollars that will need to be added to the Plan to correct this situation if the integration alternative is not implemented.

c. This column reflects the savings for breakthrough recently incorporated into the current Plan, as a result of this integration effort.

d. The dates reflect when decisions are required in order to achieve the maximum benefit. Typically, there are still benefits that can be obtained even if the decision date slips.

LOW-LEVEL WASTE

The LLW subteam has recommended a preferred alternative that could provide $0.4B cost savings and avoidances with schedule enhancements for select sites (as shown in Table 3), utilizing the following opportunities:

- ***Consolidate LLW Disposal Operations***—Consolidate disposal operations for LLW at NTS and Hanford Site to obtain cost efficiencies.

- ***Disposal of Special Case LLW***—Provide a final disposition path for special case LLW.

- ***Minimize Storage and Treatment of LLW***—To minimize cost and personnel exposure, direct disposal of LLW and process only when cost effective and/or where required.

Area 5 Radioactive Waste Management Site at NTS

Table 3. LLW integration benefits and site-specific barriers.

Breakthrough Action by Opportunity	Plan Savings (Life-Cycle) ($M)[a]	Cost Avoidance for Plan ($M)[b]	Savings Incorporated ($M)[c]	Schedule Improvement	Barriers	Near-Term Decision Date[d]
Consolidate LLW Disposal Operations						
INEEL						
• Close site disposal (Radioactive Waste Management Complex). Ship LLW by 2003.	—	—	43.7	34	• Onsite generators subject to offsite WAC.	9/00
Hanford						
• Accepts 348,833 m^3 of Fernald waste.	(8)	—	—	—	• State equity issues.	9/98
SNL						
• Close Building 6596 in 2001 rather than 2015.	2.1	—	—	14		9/01
• Close six bunkers in 2001.	3.5	—	—	—		9/01
Oak Ridge						
• Eliminate disposal cell.	—	85	—	—		—
SRS						
• Consolidated disposal at NTS/Hanford reduce existing vault disposal through 2020.	42	60	—	10	• Renegotiate Record of Decisions (RODs) and obtain site management approval.	—
• Eliminate building of two vaults.	40	—	—	—	• Renegotiate RODs and obtain site management approval.	—
NTS						
• Receive 3,000,000 ft^3 of EM.	(60)	—	—	—	• Eliminate charge back.	9/97
• Receive 11,000,000 ft^3 of ER.	—	1.8	—	—		9/97
• ER excludes Oak Ridge, INEEL, SRS, Hanford.	—	—	—	—		—
• Direct funding.	6	—	—	—		9/97
Rocky Flats						
• Ship 6,000 m^3 (routine waste) and 56,000 m^3 (ER waste) to NTS for disposal and save $17/$ft^3$.	—	—	37	—	• Direct fund NTS.	9/97
WVDP						
• Ship 350,000 ft^3 of legacy wastes to NTS.	—	—	—	—		—
• Ship 20,000 ft^3/year to NTS.	—	—	—	—		—
Minimize Storage and Treatment of LLW						
INEEL						
• Eliminate treatment except where cost effective for transportation and packaging (save 50%), incineration, compaction, and sizing.	—	—	42.8	—	• DOE approval for disposal at NTS/Hanford (5820.2A variance).	9/00
Hanford						
• Eliminate compaction for 27,070 m^3.	14	—	—	—		12/98
Fernald						
• Eliminate private contract for disposal. Ship to Hanford from Operable Unit (OU)-1.	80	—	—	—	• Renegotiate ROD and obtain site management approval.	9/97
Oak Ridge						
• Eliminate treatment (compaction).	18	—	—	—		—
LANL						
• Eliminate compaction.	6.25	—	—	—		9/97

Table 3. (continued).

Breakthrough Action by Opportunity	Plan Savings (Life-Cycle) ($M)[a]	Cost Avoidance for Plan ($M)[b]	Savings Incorporated ($M)[c]	Schedule Improvement	Barriers	Near-Term Decision Date[d]
SRS						
• Eliminate compaction prior to obligation with private company.	18.2	—	—	—	• Change waste minimization policy.	9/97
• Consolidated disposal at NTS/Hanford.	—	—	—	—		—
• Eliminate treatment except where cost effective for transportation and packaging (save 50%), incineration, compaction, and sizing.	—	—	42.8	—	• DOE approval for disposal at NTS/Hanford (5820.2A variance).	9/00
WVDP						
• Eliminate treatment except where required to meet WAC or cost effective.	40	—	—	2+	• Make decision on treatment and disposal.	—
TOTAL	202	147	124			

a. Plan savings are life-cycle costs currently in the Plans. These savings reflect dollars that can be used to support additional scope or scope acceleration.

b. This column reflects program gaps that have been filled as a result of the integration effort. This represents dollars that will need to be added to the Plan to correct this situation if the integration alternative is not implemented.

c. This column reflects the savings for breakthrough recently incorporated into the current Plan, as a result of this integration effort.

d. The dates reflect when decisions are required in order to achieve the maximum benefit. Typically, there are still benefits that can be obtained even if the decision date slips.

ENVIRONMENTAL RESTORATION

The ER subteam evaluated three opportunities that could result in potential savings and avoidances of $0.6B, as shown in Table 4. Due to the high degree of uncertainty in future site cleanup decisions and waste volume characterization that is typical of ER programs, the cost and schedule reduction benefits of waste stream integration have a greater level of uncertainty. The opportunities evaluated are:

- ***Establish Uniform Radiological Cleanup Standards for ER***—To reduce costs and schedules associated with remedial activities at each site and accelerate cleanup, establish and implement uniform radiological cleanup standards across the DOE complex, Promulgate 10 Code of Federal Regulations (CFR) 834 with clear unambiguous "as low as reasonably achievable" criteria. Have a formal, mutually acceptable land use agreement with stakeholders and have remedial action based on an established set of future land use assumptions.

- ***Implement Accelerated Remedial Process for ER***—To reduce costs and schedules associated with remedial action reports/plans, use the accelerated remedial action process to streamline report/plan preparation, review, and approval cycles for ER activities across the complex.

- ***Share ER Expertise and Resources***—Establish a system that will facilitate sharing of ER expertise and resources across the DOE installations.

INEEL—Power Burst Facility Pond Interim Action to Remove Cesium (Cs)-137 and Chromium

Table 4. ER integration benefits and site-specific barriers.

Breakthrough Action by Opportunity	Plan Savings (Life-Cycle) ($M)[a]	Cost Avoidance for Plan ($M)[b]	Savings Incorporated ($M)[c]	Schedule Improvement (Year)	Barriers	Near-Term Decision Date[d]
Establish Uniform Radiological Cleanup Standards for ER						
Fernald						
• Increase soil and debris cleanup level to 30/100 mrem/year dose—volume changes: 535,189 m^3 (estimated).	50	—	—	2	• Revision of OU-3 Interim ROD and Level 1 milestones.	9/97
Hanford						
• Increase soil and debris cleanup levels to 30/100 mrem/yr dose (significant cost savings for radioactive waste only).	—	—	—	—	• Change Tri-Party Agreements (TPAs) and incorporate into Plan. • Change land-use agreements to realistic future use of the near river sites change TPAs.	1998
LANL						
• Increase soil and debris cleanup level to 30/100 mrem/year dose (this scenario is already figured into our Plan).	8	—	—	—	• Obtain final consensus from Environmental Protection Agency and New Mexico Environmental Department (NMED). • Future land-use scenarios have been used to support less restrictive radioactive cleanup requirements and have been incorporated into LANL Plan and LANL ER baseline.	1998
NTS						
• Increase soil and debris cleanup level to 30/100 mrem/year dose.	5	2	—	2	• Drop the "resident rancher" scenario and use "open space" as future land use.	1998
Oak Ridge						
• Increase soil and debris cleanup level to 30/100 mrem/year dose.	—	—	—	—	• DOE-HQ acceptance of increased cleanup standard. Most Oak Ridge projects in Plan were not based on cleanup for unrestricted residential use, but were based on industrial scenarios. Although this change is very beneficial for areas open to the public, the majority of the projects at Oak Ridge are not affected by this change. Plan project estimates were not based on a specified exposure rate, but on a more generic end state. A change in end state as a result of stakeholder discussions currently in progress could result in significant changes to the Plan estimates.	1998

Table 4. (continued).

Breakthrough Action by Opportunity	Plan Savings (Life-Cycle) ($M)[a]	Cost Avoidance for Plan ($M)[b]	Savings Incorporated ($M)[c]	Schedule Improvement (Year)	Barriers	Near-Term Decision Date[d]
Rocky Flats						
• Increase soil and debris cleanup level to 15/85 mrem/year dose. All ready incorporated in Plan. $300M. Potential. All ready incorporated into the Plan. Based on $83M. 47,000 m^3 = 36,000 for TSD.	—	—	—	—	• Rocky Flats Cleanup Agreement (RFCA) of Plan. The required changes have been incorporated by RFCA and the Plan.	—
SNL						
• Increase soil and debris cleanup level to 30/100 mrem/year dose.	0.4	—	—	—	• DOE and regulator support stakeholder approval.	1998
SRS						
• Increase soil and debris cleanup level to 30/100 mrem/year dose.	100	9	—	—	• Regulator acceptance. • Identification of contaminant profile. Renegotiate Federal Facility Agreement at unknown cost. • Risk analysis improvements. • Accuracy of contaminant profile.	1998
Implement Accelerated Remedial Process for ER						
LANL						
• Adopt accelerated remedial action process. Savings in Plan from process acceleration.	10	—	—	2	• This process largely incorporated into LANL process. NMED has accepted acceleration approaches (expedited cleanup) in principle through the Document of Understanding. Persuade NMED that the proof is in the pudding, not the process.	—
NTS						
• Accelerated remedial action cleanup process.	—	—	—	2	• Nevada will need to renegotiate the Federal Facility Agreement and Consent Order and the approval process in its entirety. This includes the 4-step approval process.	—
Oak Ridge						
• Accelerated remedial action cleanup process.	—	100	—	—	• DOE Field Office acceptance and renegotiation with stakeholders. The Oak Ridge Plan already contains a very aggressive acceleration of the decision process and methods of doing business.	1998
Rocky Flats						
• Accelerated remedial action process. All ready incorporated in Plan.	—	—	—	—	• RFCA of Plan. The required changes have been incorporated by RFCA of and the Plan.	—

Table 4. (continued).

Breakthrough Action by Opportunity	Plan Savings (Life-Cycle) ($M)[a]	Cost Avoidance for Plan ($M)[b]	Savings Incorporated ($M)[c]	Schedule Improvement (Year)	Barriers	Near-Term Decision Date[d]
SNL						
• Adopt accelerated remedial action process. Implemented—A reduction of $255M in estimated cost has been realized. In 1997, a more aggressive application of an accelerated process, has achieved an additional reduction from total estimated cost.	3	3–4	—	—	• DOE support stakeholder concurrence. DOE-HQ and field offices must actively support with recognition of increased programmatic risk. Stakeholders and regulators must be convinced.	—
SRS						
• Adopt accelerated remedial action cleanup.	20	10	—	2	• Standard remedy acceptance, "same" profile for sites.	—
Share ER Expertise and Resources						
Fernald						
• Develop, receive, and share technology within or outside the complex.	—	160	110	5	• Flexible procurement and cost control systems to allow for rapid implementation.	—
INEEL						
• Consolidate CERCLA LLW onsite utilizing lessons learned from other sites.	12.4	—	—	—	• Regulators must accept onsite consolidation and incorporation of decontamination and decommissioning debris under CERCLA at the INEEL.	10/98
• Employ waste reduction technology through micro-purging.	8	—	—	—	• Regulators must support application of micro-purging for groundwater.	—
LANL						
• Integrate ER waste streams for TSD.	5	—	—	—	• Communications. Cost recovery for fully funded resources (e.g., incinerators). Acceptance by LANL waste management group.	—
NTS						
• Integrate ER waste streams for TSD.	5	2	—	2	• Change Nevada Operations Office-325 WAC for NTS. Institute waste profiling and bulk disposal.	—
• Oak Ridge resource sharing.	2	—	—	—		
Rocky Flats						
• Share resources across DOE complex.	—	—	—	—	• Improve communications across the complex to share ideas, procurement, and schedules. To be determined for next workout.	—
SNL						
• Integrate ER waste streams for TSD. Estimate based on full-time equivalent loading savings.	0.5	0.5	—	—	• DOE support.	—

Table 4. (continued).

Breakthrough Action by Opportunity	Plan Savings (Life-Cycle) ($M)[a]	Cost Avoidance for Plan ($M)[b]	Savings Incorporated ($M)[c]	Schedule Improvement (Year)	Barriers	Near-Term Decision Date[d]
SRS						
• Share resources across complex.	—	—	—	—	• Issue of contaminated equipment. • Transfer of second wastes. • Increased source term. • Material consolidation.	—
TOTAL	229	286	110			

a. Plan savings are life-cycle costs currently in the Plans. These savings reflect dollars that can be used to support additional scope or scope acceleration.

b. This column reflects program gaps that have been filled as a result of the integration effort. This represents dollars that will need to be added to the Plan to correct this situation if the integration alternative is not implemented.

c. This column reflects the savings for breakthrough recently incorporated into the current Plan, as a result of this integration effort.

d. The dates reflect when decisions are required in order to achieve the maximum benefit. Typically, there are still benefits that can be obtained even if the decision date slips.

HIGH-LEVEL WASTE

The HLW subteam identified an alternative set of programmatic and technical opportunities that could potentially result in cost savings and avoidances of nearly $18B and would accelerate completion of the HLW mission by seven years, as shown in Table 5. A large fraction of these savings ($4B) are realized by reducing the volume of vitrified HLW designated for geologic repository disposal by almost 10,000 m^3. The cost savings, schedule improvements, and volume reduction are attributed to a HLW disposal strategy that features:

- ***Use Existing INEEL Cs/Strontium (Sr) Storage Capacity***—To minimize new facilities, utilize existing storage capacity at INEEL for long-term storage of separated Cs/strontium wastes from Hanford Site (includes both existing Cs/strontium capsules and Cs/strontium wastes resulting from potential future pretreatment).

- ***WVDP HLW Canisters to SRS***—To complete the WVDP mission, develop and deploy a process for shipment of vitrified HLW canisters to SRS for interim storage.

- ***Use Hanford Vitrification Capabilities for INEEL HLW***—To minimize new facilities, use facilities at Hanford Site for vitrification of INEEL pretreated HLW. (This is a companion recommendation to: Store INEEL HLW at Hanford.)

- ***Store INEEL HLW at Hanford***—To expedite completion of INEEL HLW program, store canisters of INEEL vitrified HLW at Hanford Site. (This is a companion recommendation to: Use Hanford Vitrification Capabilities for INEEL HLW.)

- ***Reduce Hanford HLW Volume***—Reduce disposal costs by obtaining significant volume reduction of Hanford Site HLW through aggressive pretreatment similar to a process proposed for INEEL. This enables better separation of the low-activity waste (LAW) fraction reducing volumes and better dissolution of solids in the high-activity sludge.

- ***Accelerate Calcine Separation of INEEL HLW***—Begin final treatment of INEEL HLW by initiation of calcine separations at an earlier date.

- ***Implement Risk-Based HLW Retrieval and Tank Closure***—Implement risk-based HLW retrieval and tank closure (e.g., remove waste from tanks that pose highest health and safety risks first) primarily at Hanford Site and INEEL.

Table 5. HLW integration benefits and site-specific barriers.

Breakthrough Action by Opportunity	Plan Savings (Life-Cycle) ($M)[a]	Cost Avoidance for Plan ($M)[b]	Savings Incorporated ($M)[c]	Schedule Improvement (Years)	Barriers	Near-Term Decision Date[d]
Use Existing INEEL Cs/Sr Storage Capacity						
Hanford						
• Cs and Sr capsules will be packaged for near-surface disposal (INEEL's Bin 7).	170	—	—	10	• Change requirement for disposal of Cs and Sr capsules as HLW.	—[e]
INEEL						
• Dispose Hanford's Cs/Sr capsules in Bin 7.	(25)	—	—	—	• Agreement with State of Idaho to allow disposal of capsules.	6/00
WVDP HLW Canisters to SRS						
WVDP						
• Construct WVDP load-out facility.	—	770	—	11	• Funding guidance consistent with March 1997 Plan.	7/97
• Upgrade rail spur extension.	—	—	—	—		—
• License shipping casks.	—	—	—	—		—
SRS						
• Accelerate completion of Glass Waste Storage Building #2 by one year.	(10)	—	—	1	• Funding not currently in March 1997 Plan.	—[e]
• Acceleration completion of HLW canister shipping/receiving facility from 2014 to 2000.	(20)	—	—	14	• Funding not currently in March 1997 Plan.	10/97
Use Hanford Vitrification Capabilities for INEEL HLW						
Hanford						
• Specify borosilicate glass as waste matrix for HLW.	—	100	—	2	• Privatization request for proposal allows non-borosilicate glass as waste matrix for HLW.	4/98
INEEL						
• Ship pretreated high-activity waste (HAW) from INEEL to Hanford.	200	—	—	7	• Agreement with stakeholders of acceptability of receiving HAW form INEEL for vitrification. • Acceptability of shipping denitrated solids.	6/00
Store INEEL HLW at Hanford						
INEEL						
• Store canisters of vitrified HLW at Hanford.	115	—	—	7	• Acceptance by Hanford to store all HLW canisters.	6/00
Reduce Hanford HLW Volume						
Hanford						
• Reduced volume of vitrified HAW, resulting from pretreatment breakthroughs.	4,050	—	—	—	• Successful deployment of pretreatment technologies.	—[e]
• Reduced requirements for HLW canister storage capacity.	750	—	—	—	• Revised shipping schedules to repository. • Pretreatment of HLW.	—

Table 5. (continued).

Breakthrough Action by Opportunity	Plan Savings (Life-Cycle) ($M)[a]	Cost Avoidance for Plan ($M)[b]	Savings Incorporated ($M)[c]	Schedule Improvement (Years)	Barriers	Near-Term Decision Date[d]
Accelerate Calcine Separation of INEEL HLW						
INEEL						
• Begin final treatment (separations) early.	1,100	—	—	7	• Agreement with stakeholders and regulators of acceptability to stop calcination.	6/97
Implement Risk-Based HLW Retrieval and Tank Closure						
Hanford						
• Waste retrieval based on risk.	3,000	—	—	—	• Agreement with stakeholders of acceptability to leave low-risk wastes in place.	—[e]
INEEL						
• Tank closure based on risk.	—	3,000	—	—	• Agreement with stakeholders of acceptability to close tanks based on risk (i.e., not to "clean close").	6/00
• Fill INEEL tanks with standardized LAW matrix after tank closure.	50	—	—	7	• Agreement with stakeholders and regulators of acceptability to dispose LAW matrix in tanks.	6/00
Other						
Hanford						
• Use of standardized waste matrix for LAW.	1,500	—	—	—	• TPA currently requires vitrification of LAW.	4/98
• Fill Hanford's single- and double-shell tanks with standardized LAW matrix as part of tank closure.	500	—	—	—	• Agreement with stakeholders and regulators of acceptability of stabilizing tanks using clean salt grout.	—[e]
SRS						
• SRS accelerates completion of its vitrification mission from 2028 to 2022.	—	—	2,400	6	• Funding guidance consistent with March 1997 Plan.	—[e]
• Demonstrate alternative technologies.	—	—	104	—	• Funding guidance consistent with March 1997 Plan. • Must start salt pretreatment.	10/98
TOTAL	11,380	3,870	2,504			

a. Plan savings are life-cycle costs currently in the Plans. These savings reflect dollars that can be used to support additional scope or scope acceleration.

b. This column reflects program gaps that have been filled as a result of the integration effort. This represents dollars that will need to be added to the Plan to correct this situation if the integration alternative is not implemented.

c. This column reflects the savings for breakthrough recently incorporated into the current Plan, as a result of this integration effort.

d. The dates reflect when decisions are required in order to achieve the maximum benefit. Typically, there are still benefits that can be obtained even if the decision date slips.

e. Decision date needed beyond FY 2000.

SPENT NUCLEAR FUEL

Management of DOE SNF is currently focused on storage of SNF inventories in existing wet storage facilities and construction of new dry storage facilities at several sites pending availability of the geologic repository. The current program to achieve this includes the regionalization of SNF by type, primarily at Hanford, INEEL, and SRS.

A recommended alternative to this approach was selected which offers $160M savings in the ten-year window and substantial life-cycle cost avoidances (~$1.1B), as shown in Table 6. These savings would be achieved by applying the following:

- ***Establish Performance-Based SNF Storage and Disposal***—Establish requirements for geological disposal of SNF based on performance-based assessments of fuel groups that verify acceptable performance during interim storage and enable direct disposal as a viable alternative for a significant portion of the unprocessed SNF. This will minimize repackaging and enable cost-effective repository acceptance of the majority of DOE-owned SNF.

Table 6. SNF integration benefits and site-specific barriers.

Breakthrough Action by Opportunity	Plan Savings (Life-Cycle) ($M)[a]	Cost Avoidance for Plan ($M)[b]	Savings Incorporated ($M)[c]	Schedule Improvement (Years)	Barriers	Near-Term Decision Date[d]
Establish Performance-Based SNF Storage and Disposal						**1998 (for acceptance)**
INEEL						
• Characterize/package small quantity SNF for disposal on the basis of limiting requirements for repository performance.	—	350	—	—	• Current definition of failed SNF in the Nuclear Waste Policy Act (NWPA) based on commercial fuel experience only. • DOE Office of Civilian Radioactive Waste Management (-RW)/Nuclear Regulatory Commission (NRC) Interpretation of 10 CFR 60.	
• Utilize composite packaging of multiple SNF types for TSD.	—	50	—	—	• DOE-RW/NRC Interpretation of 10 CFR 60, 10 CFR 71, and 10 CFR 72.	
Hanford						
• Redefine the containment, allowable reactivity, characterization, and particulate encapsulation requirements for K-Basin and miscellaneous Hanford SNF on the basis of repository performance.	—	300	—	—	• Current definition of failed SNF in the NWPA based on commercial fuel experience only. • DOE-RW/NRC interpretation of 10 CFR 60, 10 CFR 71, and 10 CFR 72. **NOTE:** Current regulations likely preclude implementation of direct disposal of K-Basin SNF (approximately 80% of total DOE SNF metric tonnage).	
SRS						
• Adjust existing aluminum alloy SNF packaging limits on the basis of repository performance criteria.	—	50	—	—	• Current definition of failed SNF in the NWPA based on commercial fuel experience only. • DOE-RW/NRC interpretation of 10 CFR 60, 10 CFR 71, and 10 CFR 72.	
• Stabilize aluminum SNF if direct disposal of highly enriched uranium not permitted by NRC.	—	200	—	—	• Cost for alternative treatment if processing or direct disposal not allowed by NRC.	
• Minimize and focus research and development requirements and SNF treatment capacity needs at SRS.	—	25	—	3	• Repository acceptance criteria development schedule does not sufficiently support definition of a 1998 Request for Proposal.	
• Reduce stakeholder anxiety over de-facto permanent storage at SRS.	—	30	—	—	• Requires performance-based management criteria.	

Table 6. (continued).

Breakthrough Action by Opportunity	Plan Savings (Life-Cycle) ($M)[a]	Cost Avoidance for Plan ($M)[b]	Savings Incorporated ($M)[c]	Schedule Improvement (Years)	Barriers	Near-Term Decision Date[d]
Other						1999
INEEL						
• Evaluate small quantity, unique SNF for disposal, develop a path on the basis of economics and technical need. Process SNF at SRS or potentially Argonne National Laboratory-West as indicated from evaluation.	—	Balanced with disposal cost and feasibility	—	—	• DOE-HQ and administration change in policy regarding the use of processing for SNF disposition. **NOTE:** Small quantity SNF at INEEL involves ~90 SNF types for which characterization/ packaging development may be prohibitively expensive.	
• Eliminate characterization, packaging, and repository transport for small quantity SNF selected for processing.	—	Balanced with processing	—	—	• SNF must be processed to allow this action.	
SRS						
• Extend canyon operations to process aluminum clad and small quantity SNF where technically necessary and/or economically desirable. Avoid building hot vacuum drying facility.	(25)	50	—	10	• Requires DOE-HQ and Administration change in policy regarding the use of processing for SNF disposition.	
• Eliminate characterization, packaging, and repository transport for aluminum and small quantity SNF selected for processing.	—	50	—	—	• Requires implementation of processing action.	
• Accelerate the de-inventory and shutdown of L-Basin and receiving basin for offsite fuel.	35	—	—	3	• Requires implementation of processing action.	
• Delay construction and reduce size of new dry storage and packaging facility.	150	—	—	—		1998
TOTAL	160	1,105	—			

a. Plan savings are life-cycle costs currently in the Plans. These savings reflect dollars that can be used to support additional scope or scope acceleration.

b. This column reflects program gaps that have been filled as a result of the integration effort. This represents dollars that will need to be added to the Plan to correct this situation if the integration alternative is not implemented.

c. This column reflects the savings for breakthrough recently incorporated into the current Plan, as a result of this integration effort.

d. The dates reflect when decisions are required in order to achieve the maximum benefit. Typically, there are still benefits that can be obtained even if the decision date slips.

SUMMARY BENEFITS

A summary of savings and investments within and out of the 10-year window show savings far exceeding the investment in both time periods. This summary of the potential cost savings, cost avoidances, and investment costs by waste stream is shown in Table 7.

A summary of cost benefits by site shows savings at each site except NTS which receives an investment associated with its disposal activities. This summary of the potential cost savings and future cost avoidances to the Plan by site and program is shown in Table 8.

Table 7. Cost savings, investments, and cost avoidances ($ in millions).

Program	Savings in Ten-Year Window	Investment in Ten-Year Window	Savings Beyond Ten-Year Window	Investment Beyond Ten-Year Window	Savings Incorporated	Cost Avoidance	Potential Net Benefit
TRU Waste	23	238[a]	2,722	0	22	1,265	3,794
MLLW	136	0	10	0	68	10	224
LLW	228	68	42	0	124	147	473
ER	199	0	30	0	110	286	625
HLW	120	554	11,814	0	2,504	3,870	17,754
SNF	135	25	50	0	0	1,105	1,265
Totals	841	885	14,668	0	2,828	6,683	24,135

a. Required to fill RH-TRU waste and Pu-238 program gaps.

Table 8. Total cost savings and cost avoidances ($ in millions).

Site	TRU Waste	MLLW	LLW	ER	HLW	SNF	Totals
Fernald	0	14	80	320	NA	NA	414
Hanford	304	10	6	TBD	10,070	300	10,690
INEEL	73	12	87	20	4,440	400	5,032
LANL	171	4	6	23	NA	NA	204
NTS	0	0	(52)	14	NA	NA	(38)
Oak Ridge	23	96	103	102	NA	0	324
Rocky Flats	62	62	37	0	NA	NA	161
SNL	4	20	6	7	NA	NA	37
SRS	529	6	160	139	2,474	565	3,873
WIPP	2,531	NA	NA	NA	NA	NA	2,531
WVDP	77	NA	40	NA	770	0	887
Totals	3,794[a]	224	473	625	17,754	1,265	24,135[a]

a. Reflects cost savings for small quantity sites of $20M.

ISSUES

It is important to understand that the strategies and underlying opportunities developed for these six program areas are integrated and therefore interdependent. They were developed with potential impacts to each area considered to ensure that the opportunities resulted in a synergistic system. Changing or eliminating one strategy or opportunity will impact the other strategies and opportunities and the associated benefits. Therefore, it is critical that these strategies be worked as a system and not as individual entities.

Although the strategies and opportunities developed have the potential to result in significant benefits for the complex, there are major issues that will need to be addressed as summarized below:

- Transportation of wastes and materials between DOE sites
- Stakeholder interests
- State equity
- Regulatory changes.

It is anticipated that these issues will be discussed along with the integration strategies and opportunities, during the stakeholder reviews of the Plan. Addressing these issues in a timely manner will be a critical step in the overall stakeholder review of the EM Integration project.

CONCLUSION

By managing the above six program areas across the complex as a cohesive unit rather than as independent sites, DOE will achieve significant progress toward meeting its Plan objectives and programmatic missions while also reducing costs. The integration efforts have identified potential net savings (including incorporated savings) within the ten-year window of $170M and beyond the ten-year window of $17,282M. Life-cycle cost avoidances of $6,683M have also been identified. The actions introduce proposed cooperative efforts among the major DOE sites and take aggressive approaches in challenging many existing constraints and requirements. Many of the integration opportunities require extensive stakeholder and DOE involvement. This report provides the basis for meaningful discussions in support of the Plan and the DOE decision making process.

Several of the integration opportunities presented in this document have also been identified during other programmatic efforts (e.g., the development of the National TRU Waste Management Plan). This contractor led, complex-wide effort validated those other efforts as well as developed further integration opportunities.

REFERENCES

1. *Contractor Report to the Department of Energy on Opportunities for Integration of Environmental Management Activities Across the Complex (Predecisional Draft)*, Revision 1, INEL/EXT-97-00065, March 1997.

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Attachment 1

TRU Waste Enhanced March Baseline Disposition Map

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TRU Baseline Waste Disposition Map

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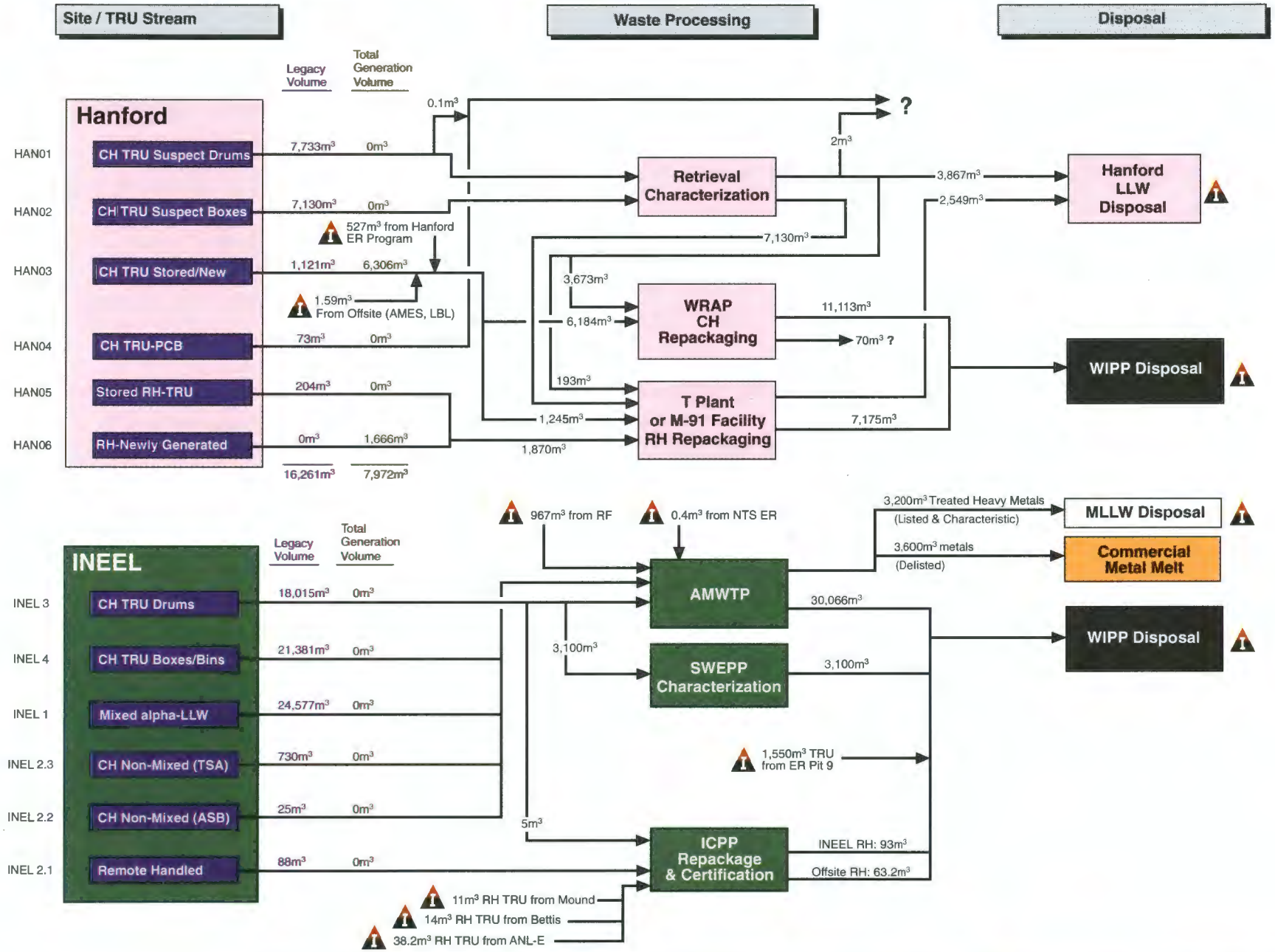

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TRU Baseline Waste Disposition Map

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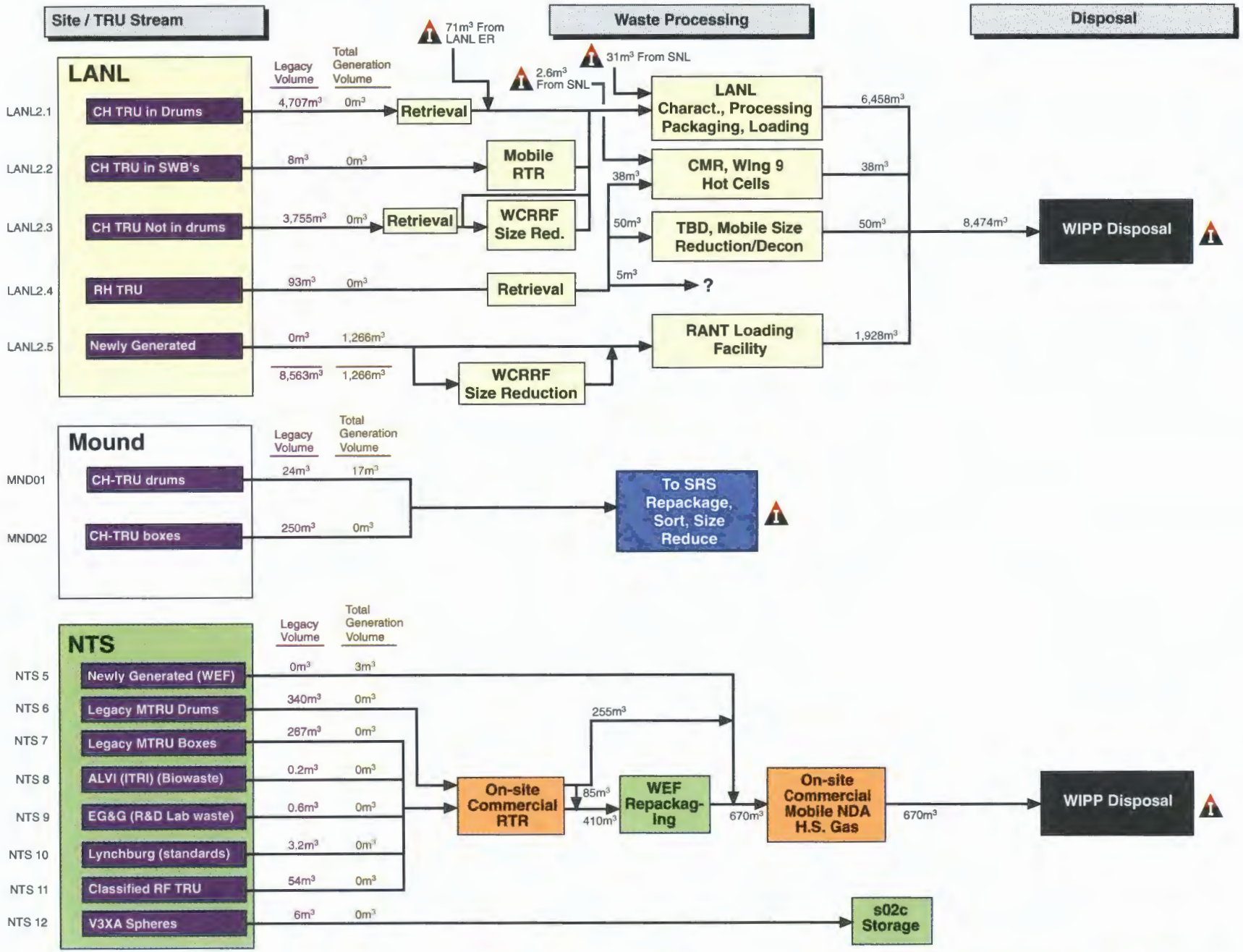

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TRU Baseline Waste Disposition Map

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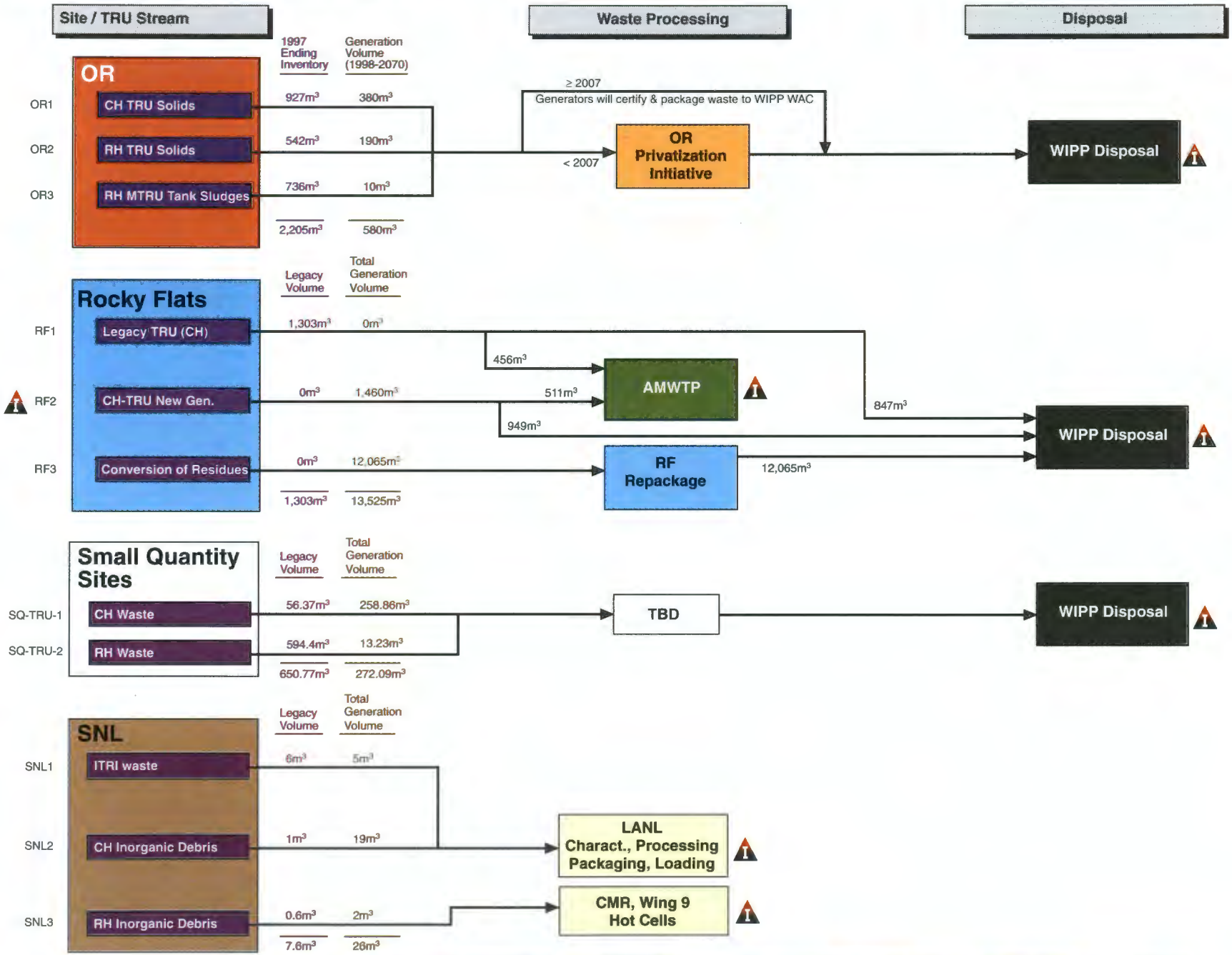

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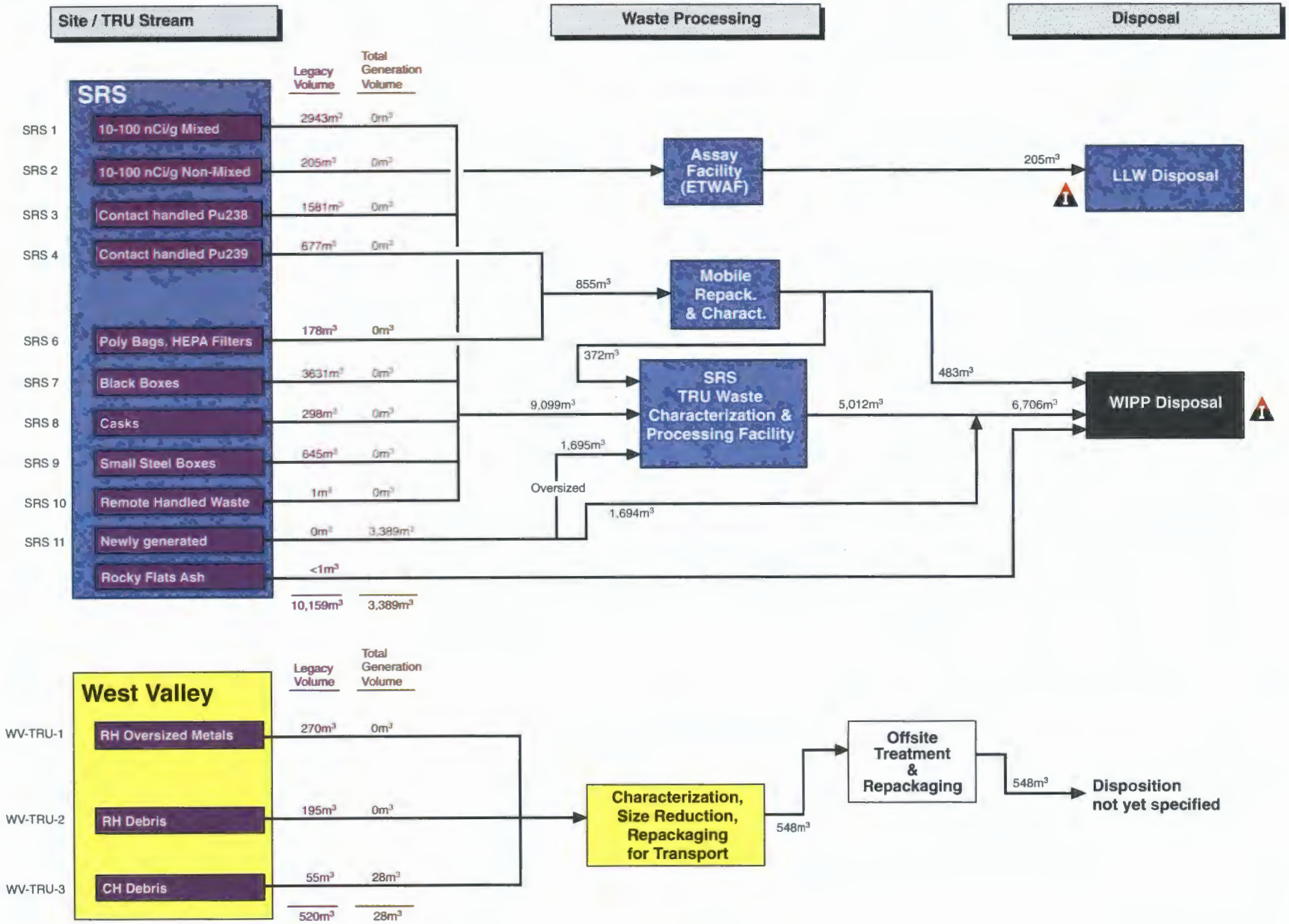

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Attachment 2

TRU Waste Disposition Map for Preferred Alternative

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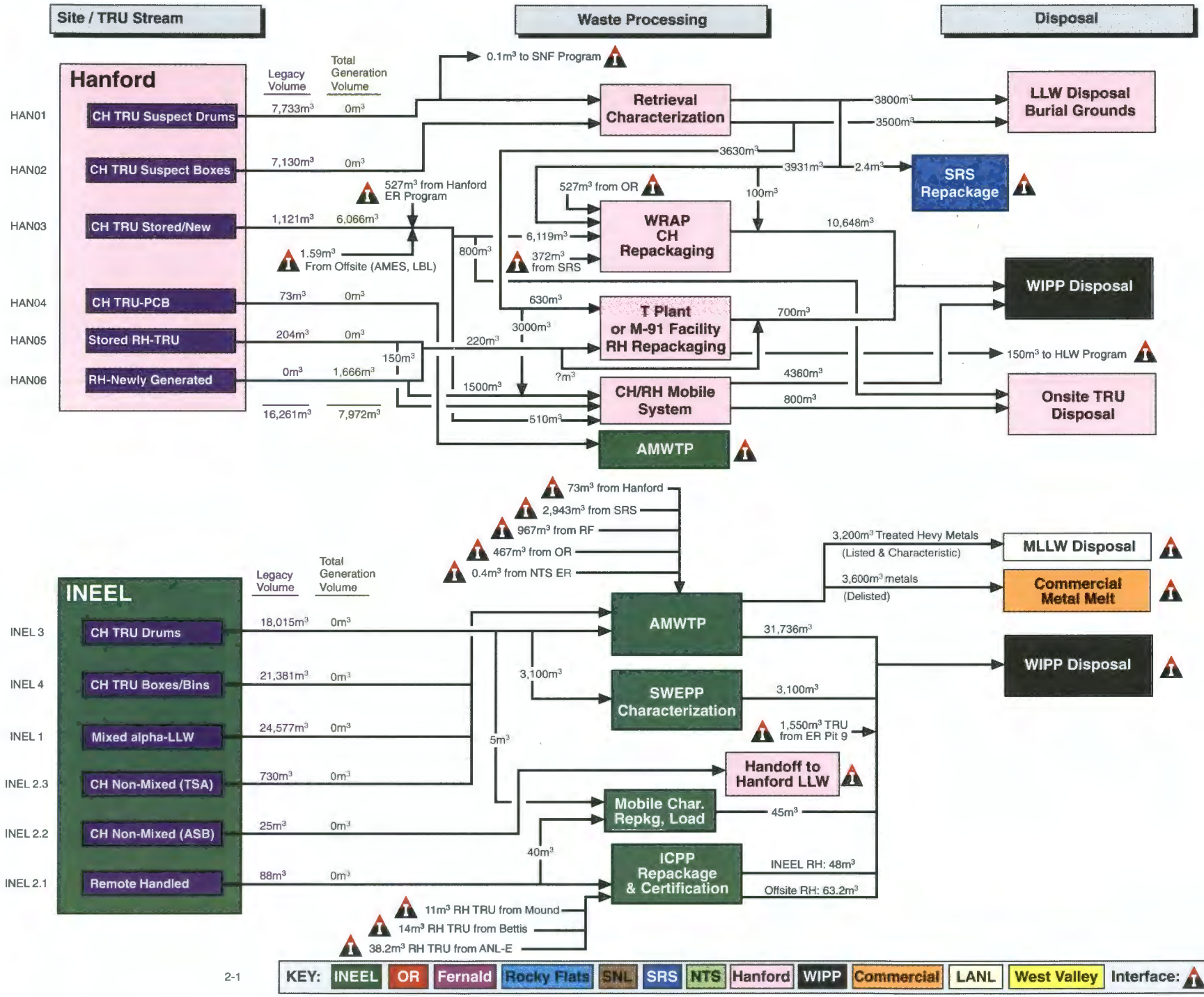

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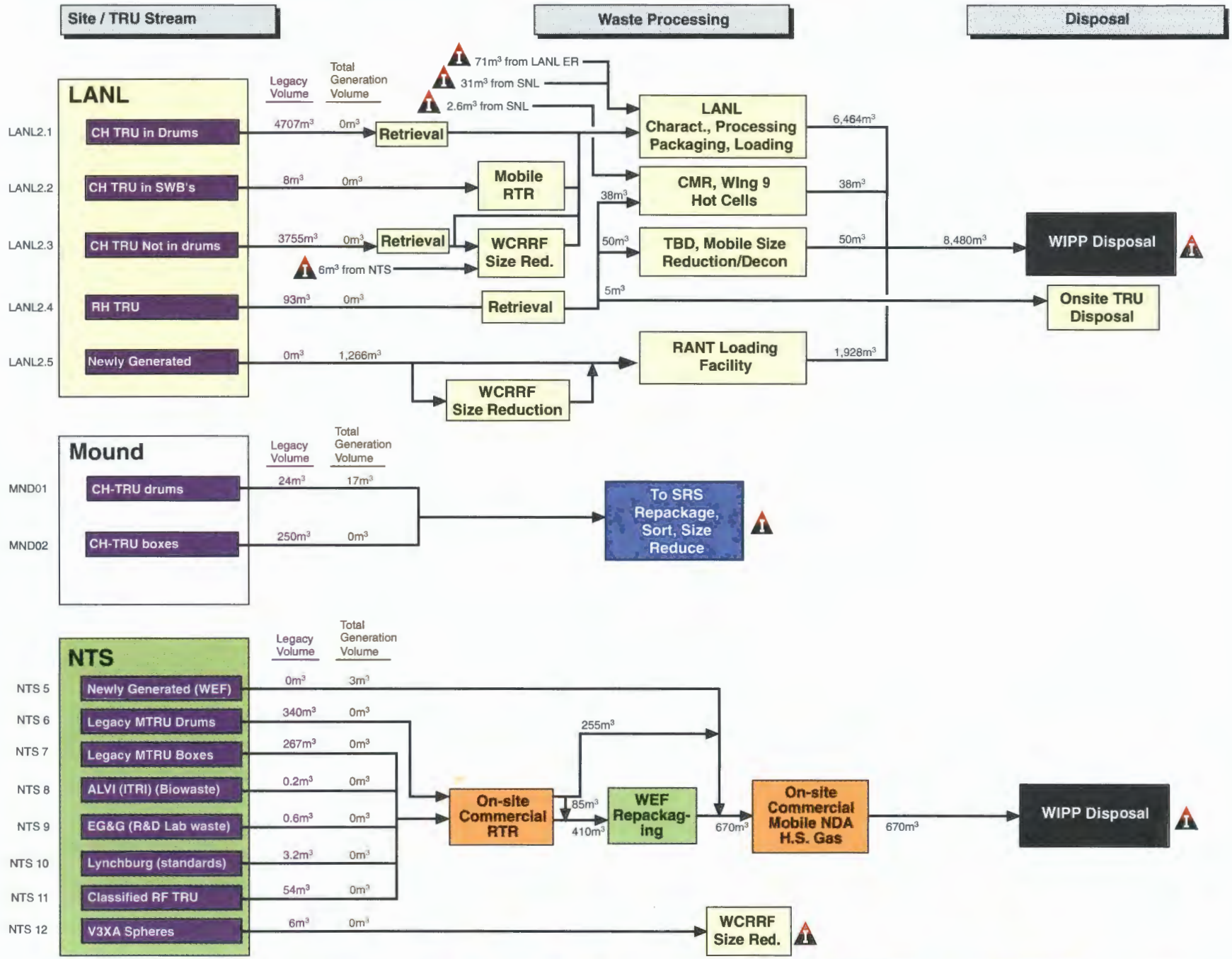

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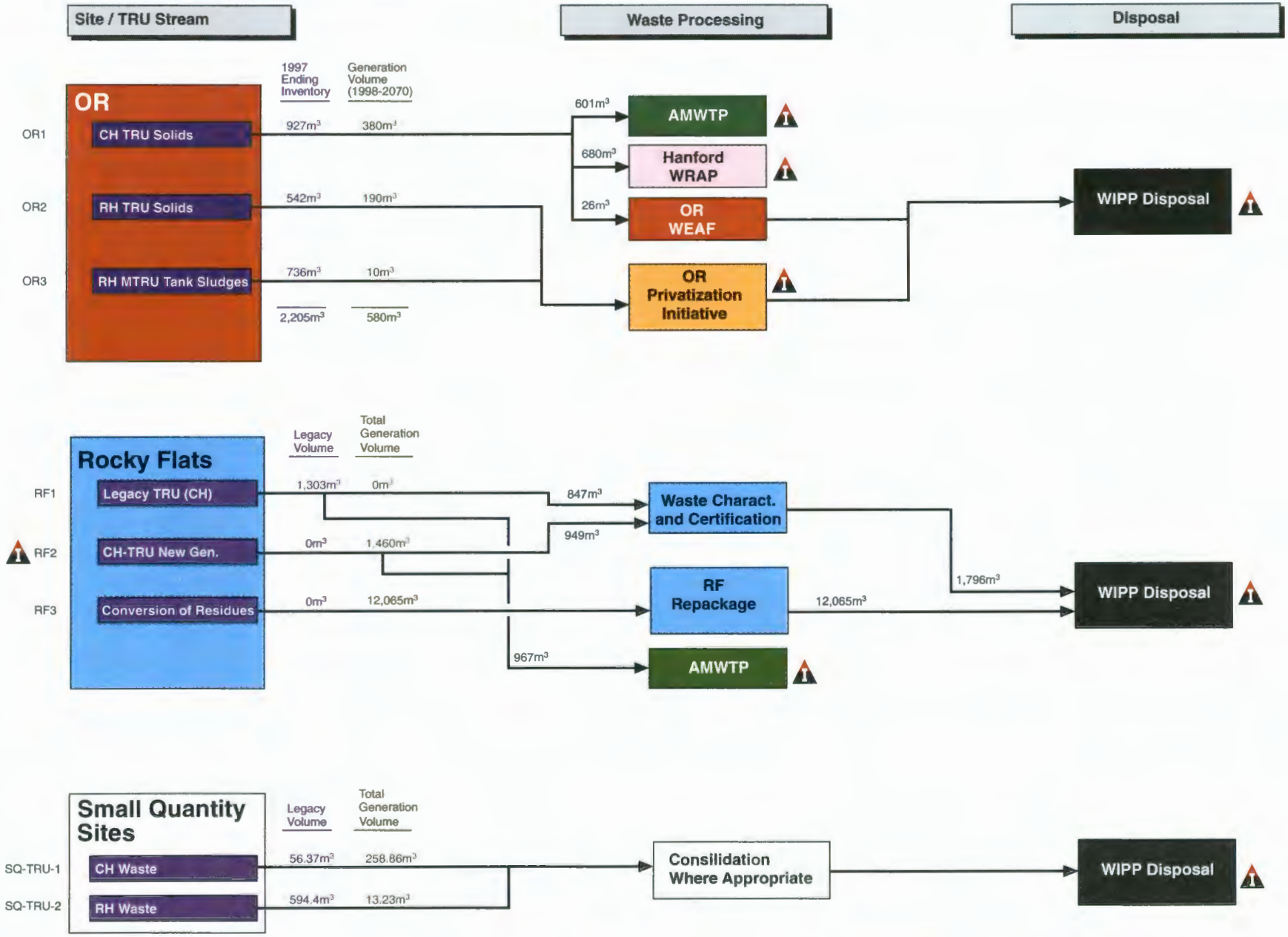

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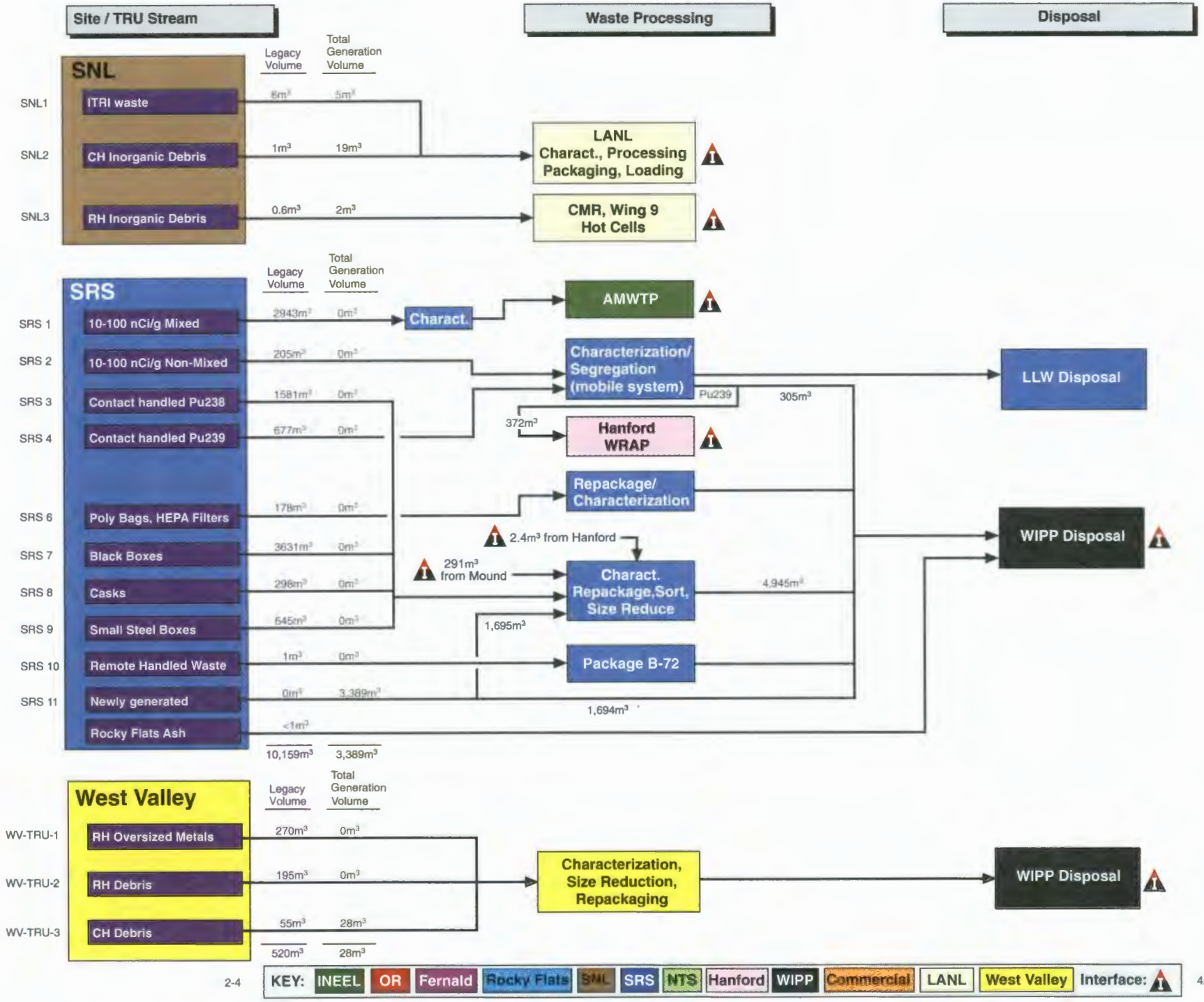

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MLLW Enhanced March Baseline Disposition Map

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MLLW Baseline Waste Disposition Map

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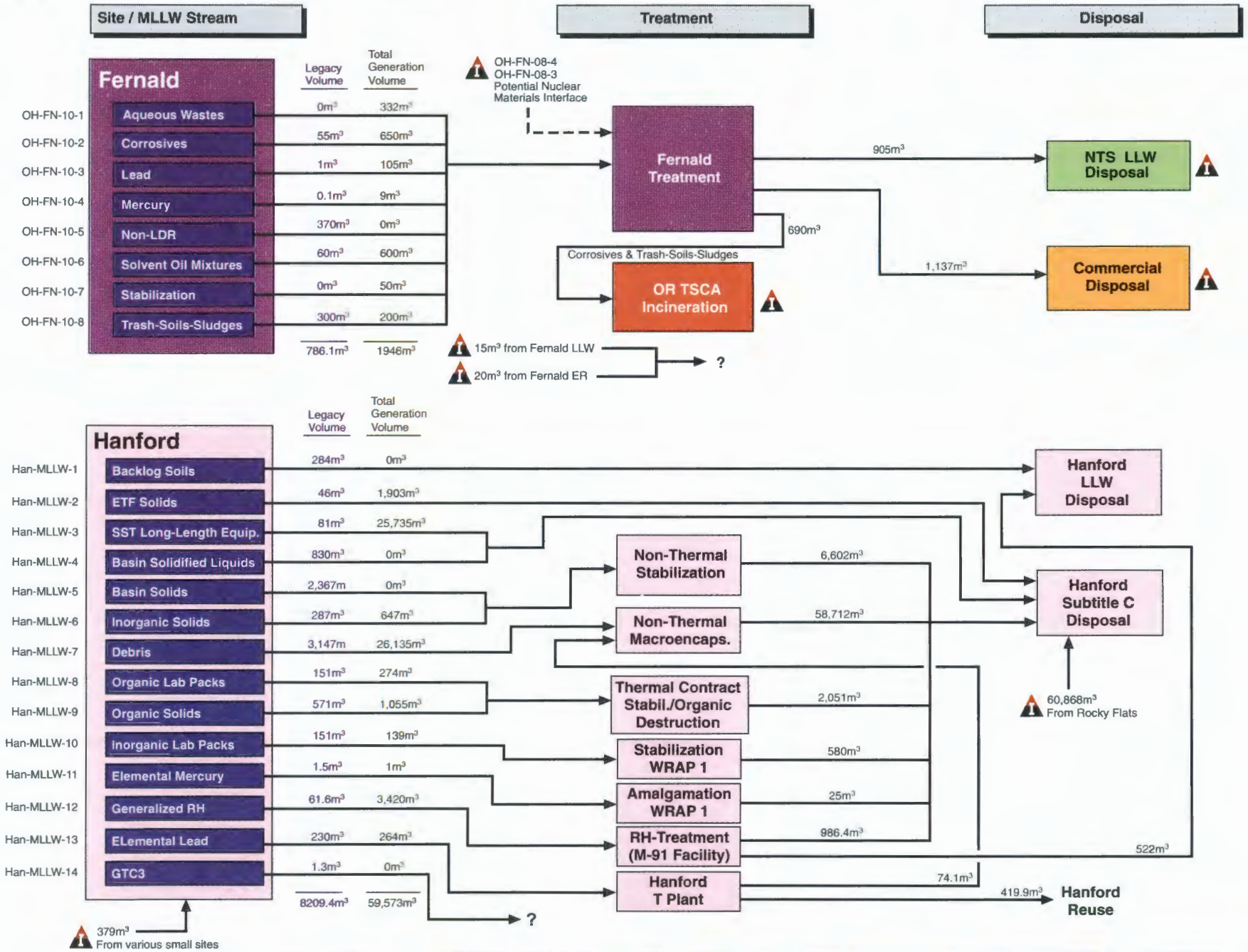

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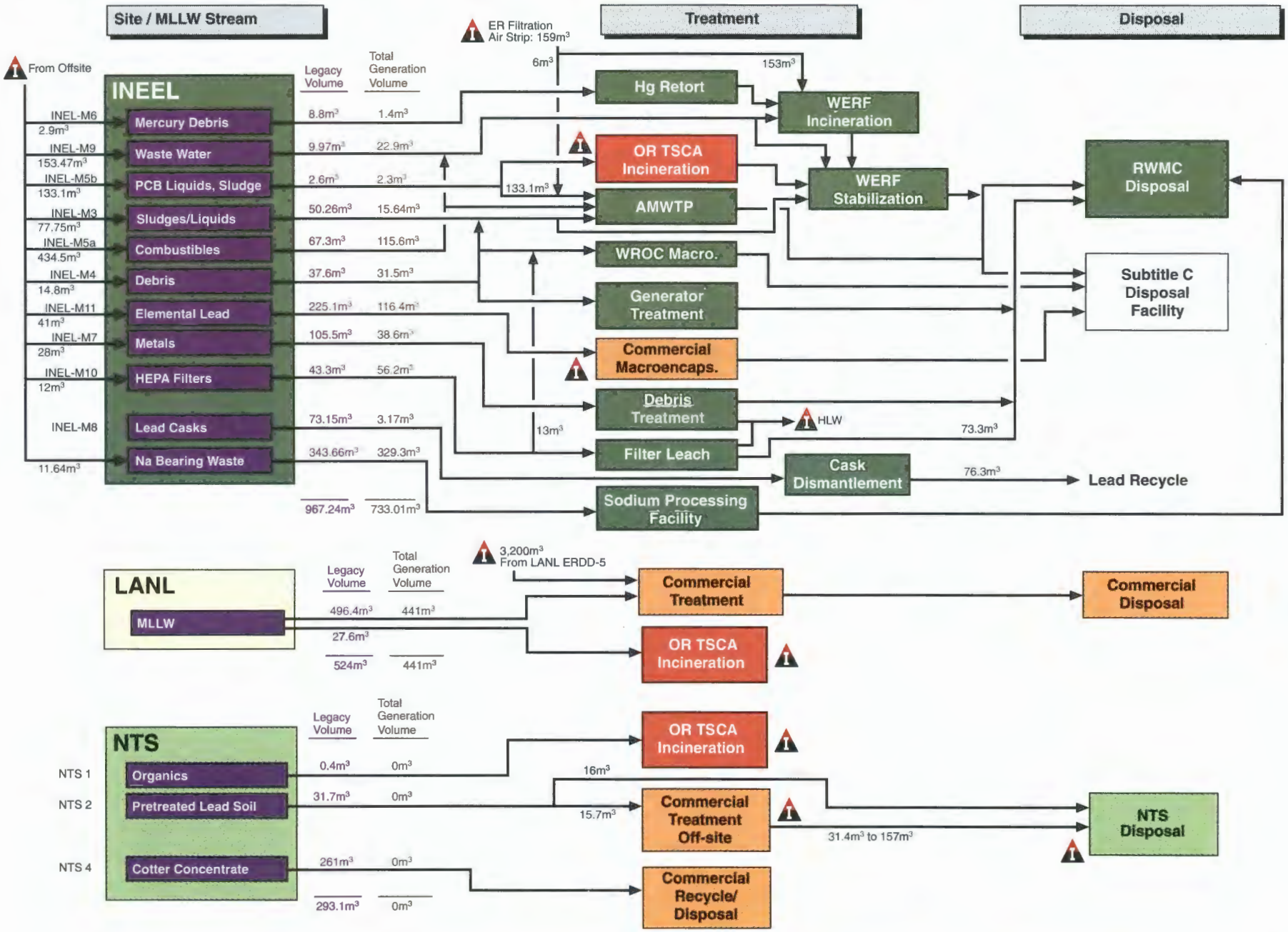

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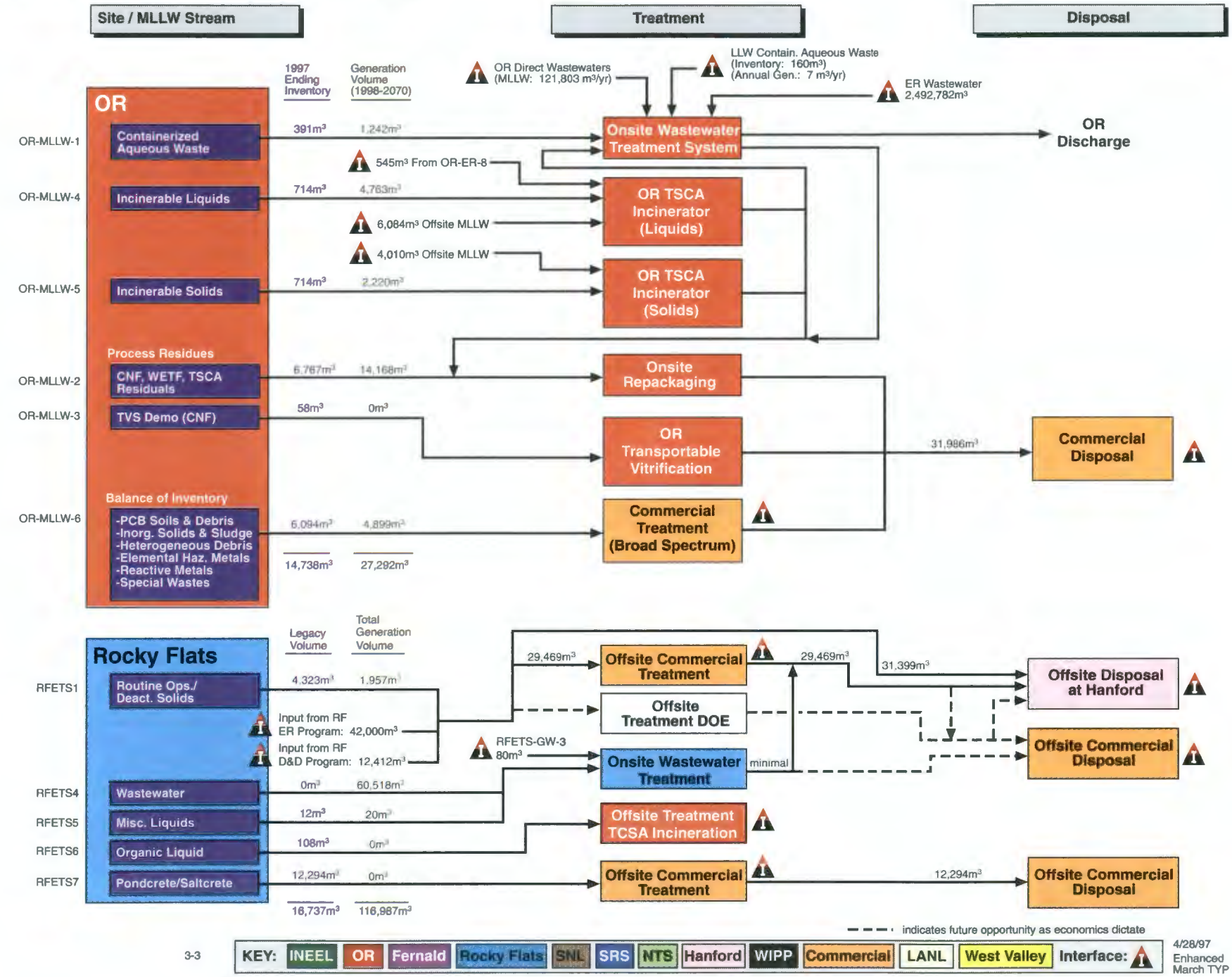

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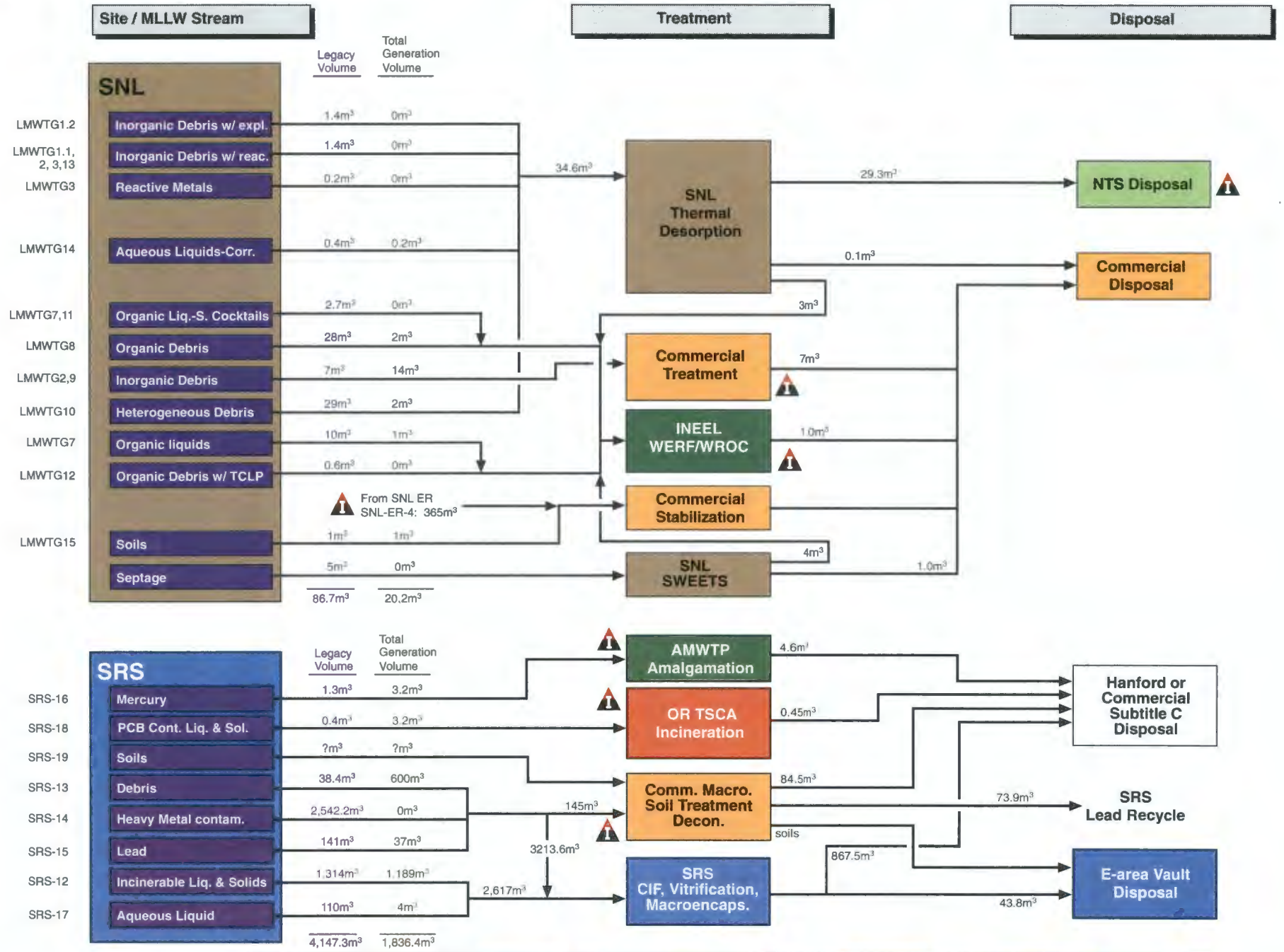

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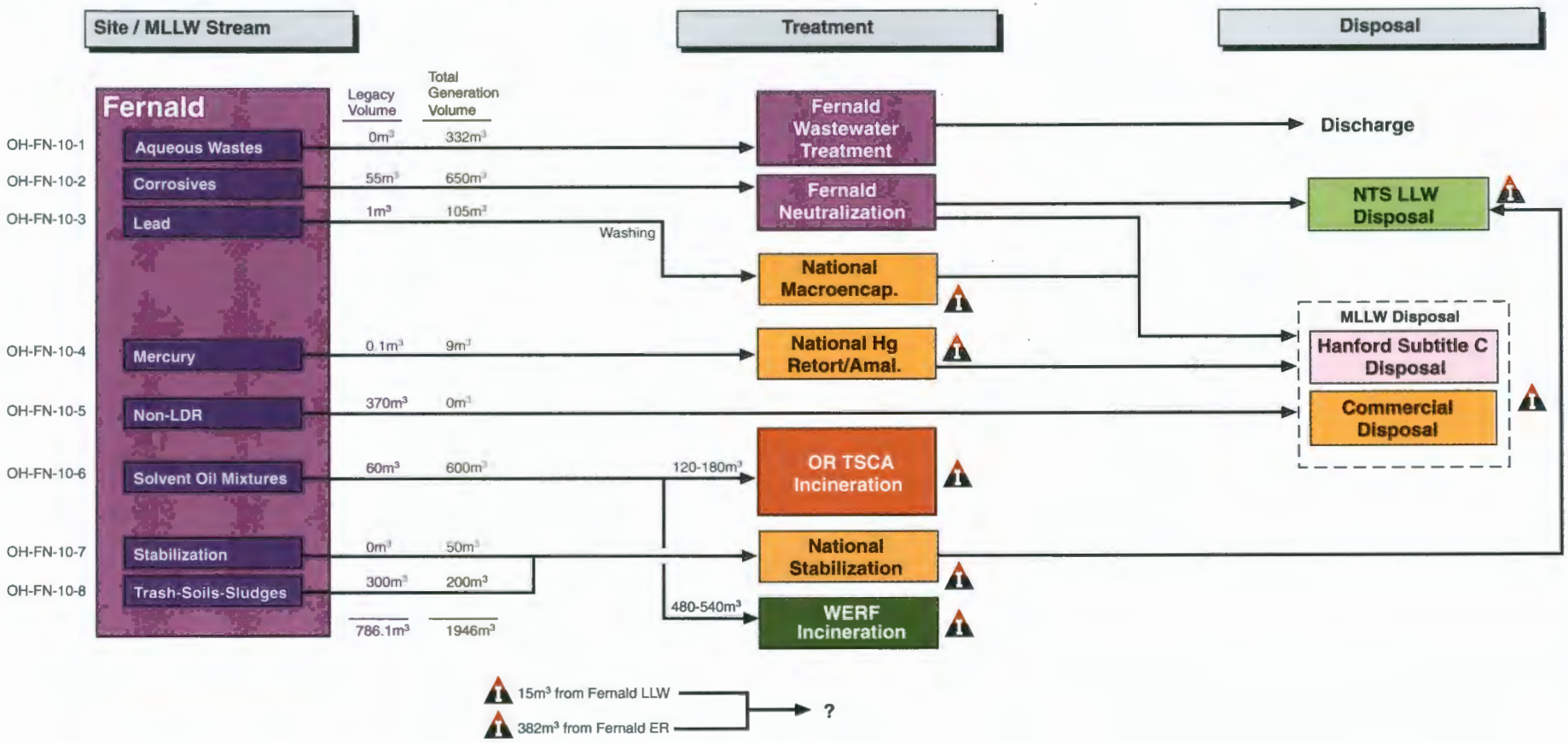

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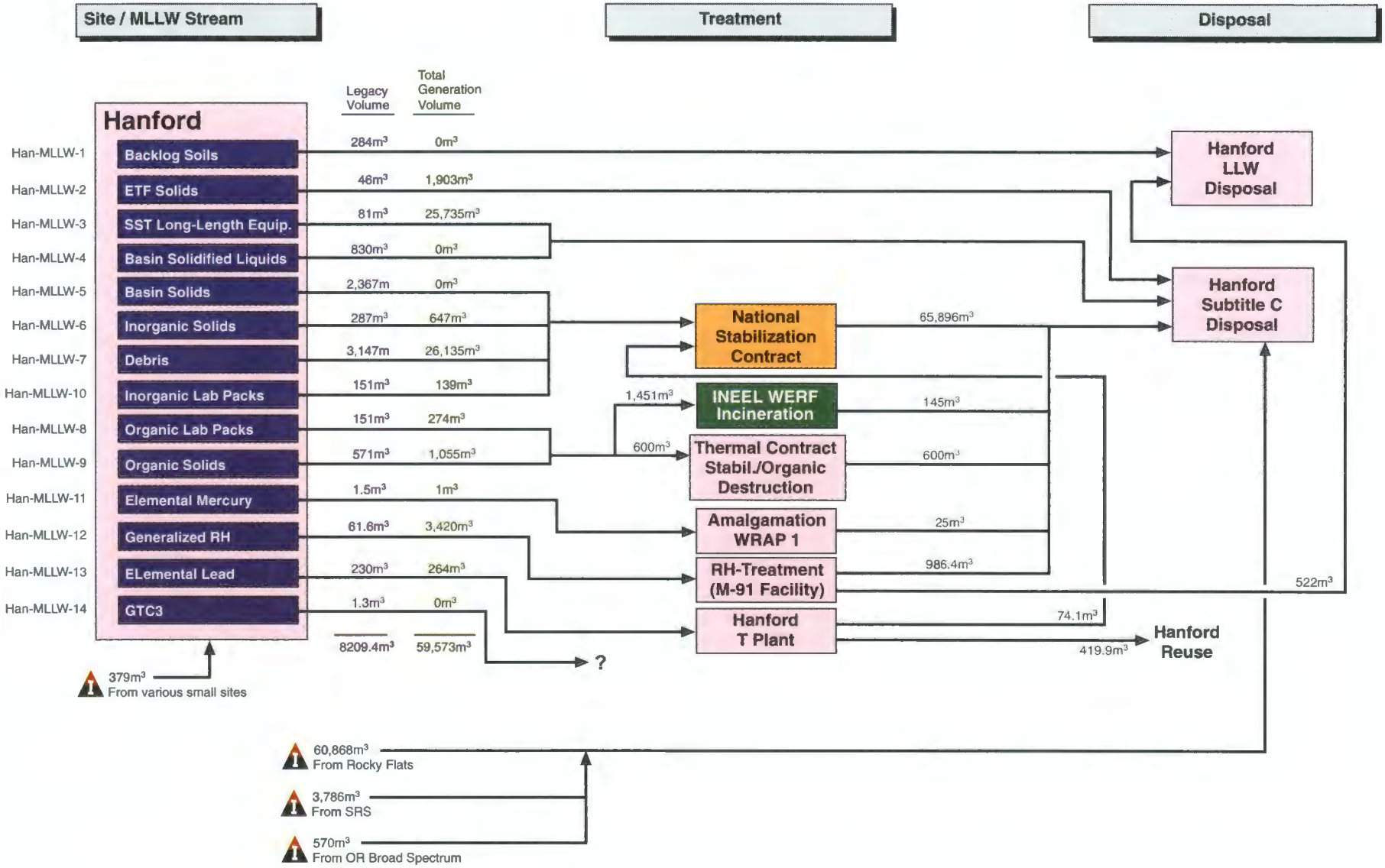

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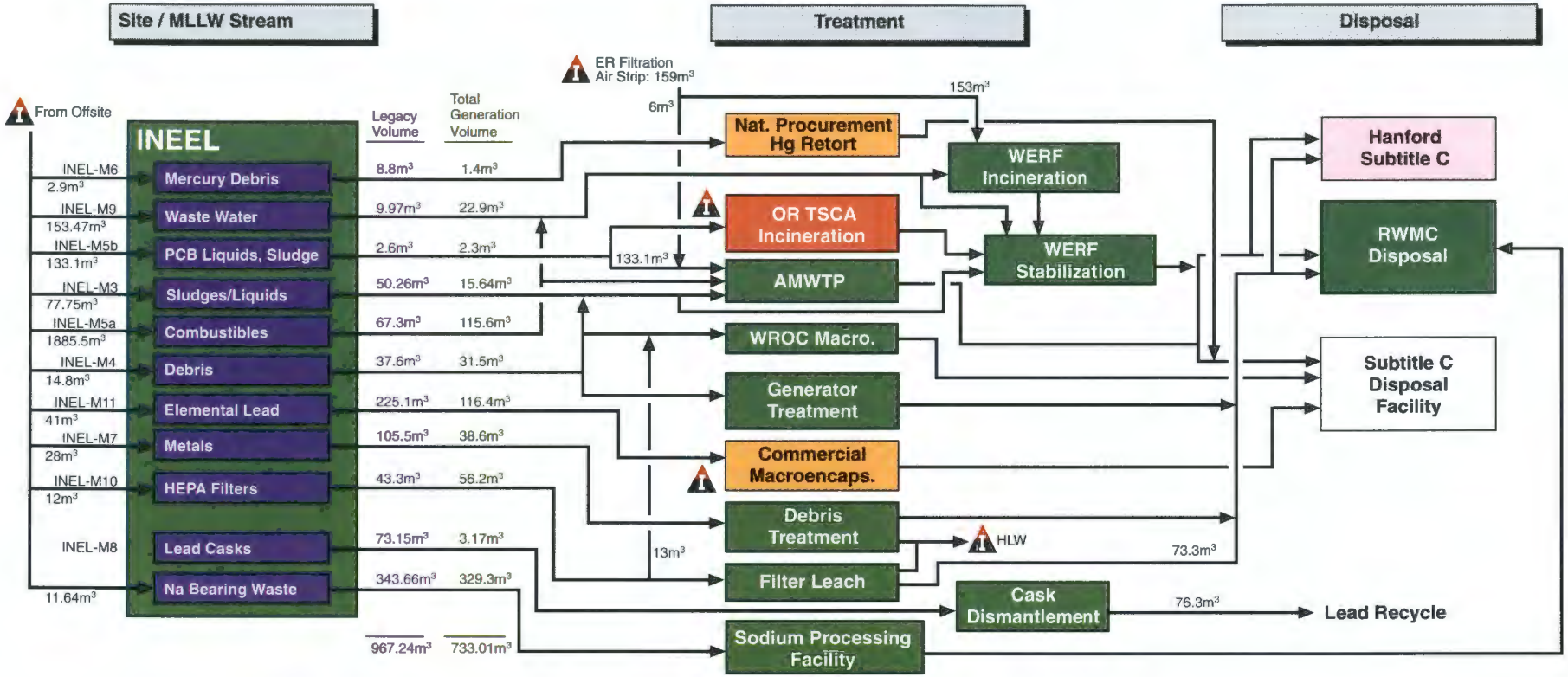

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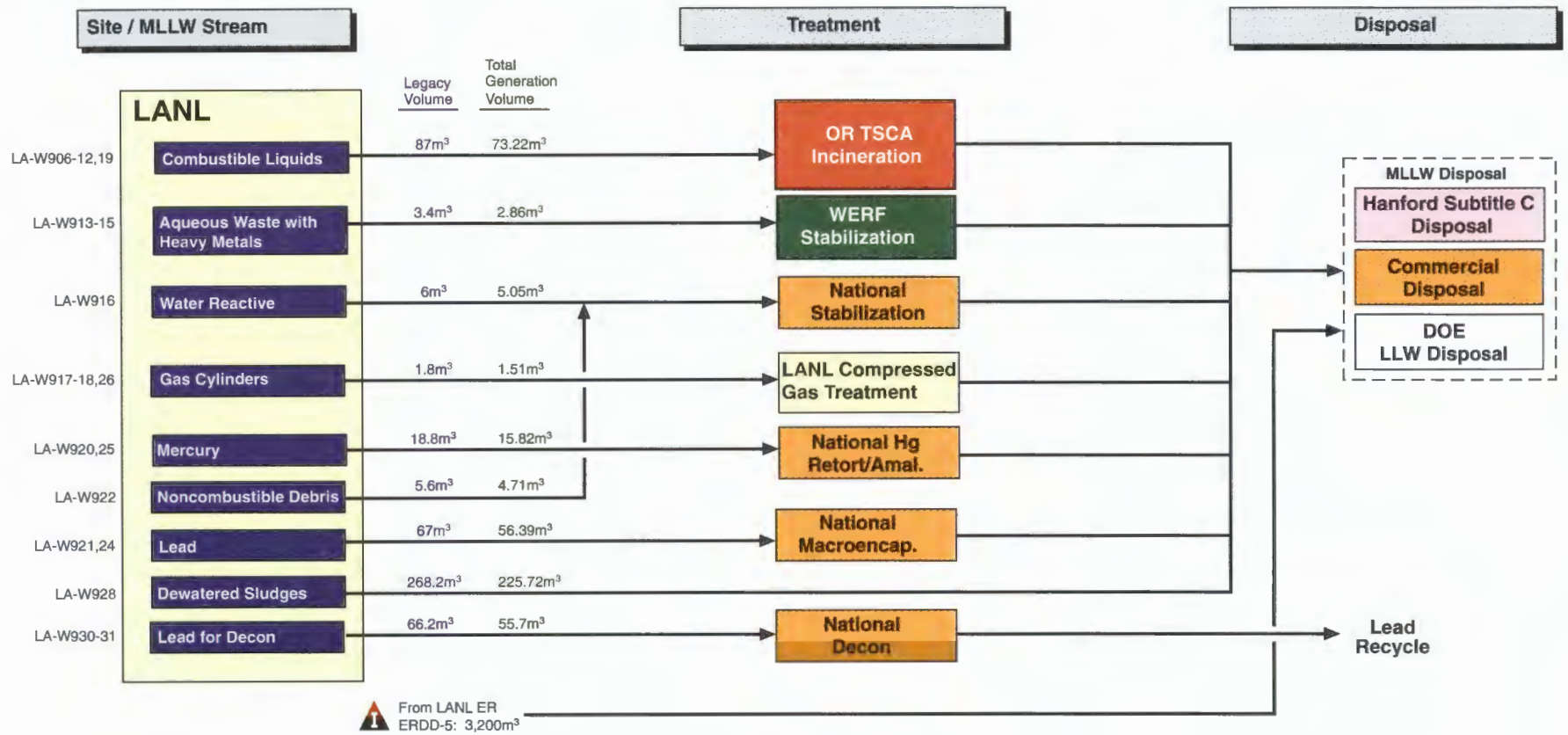

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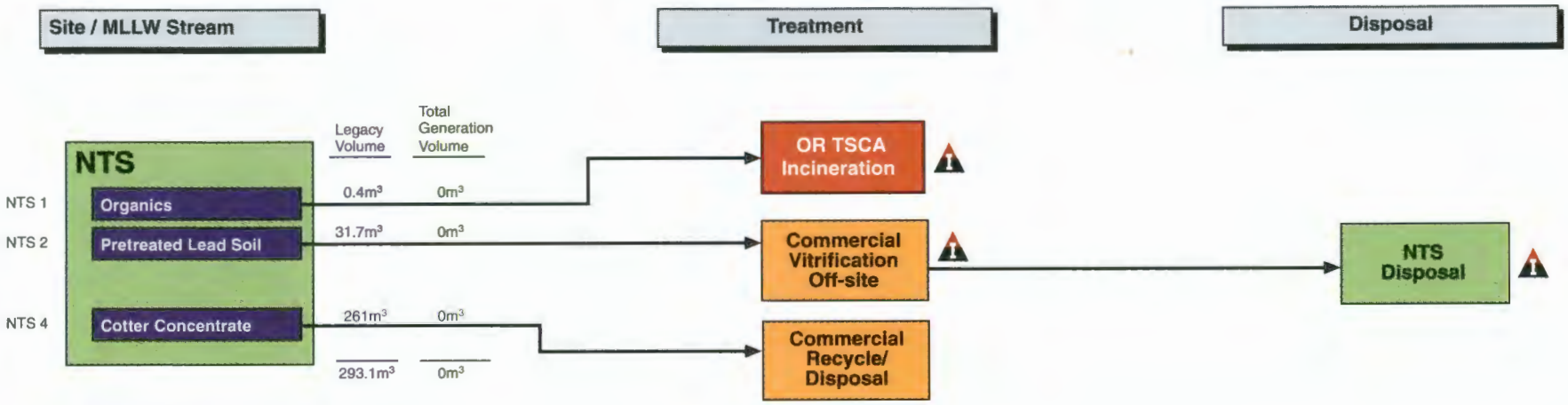

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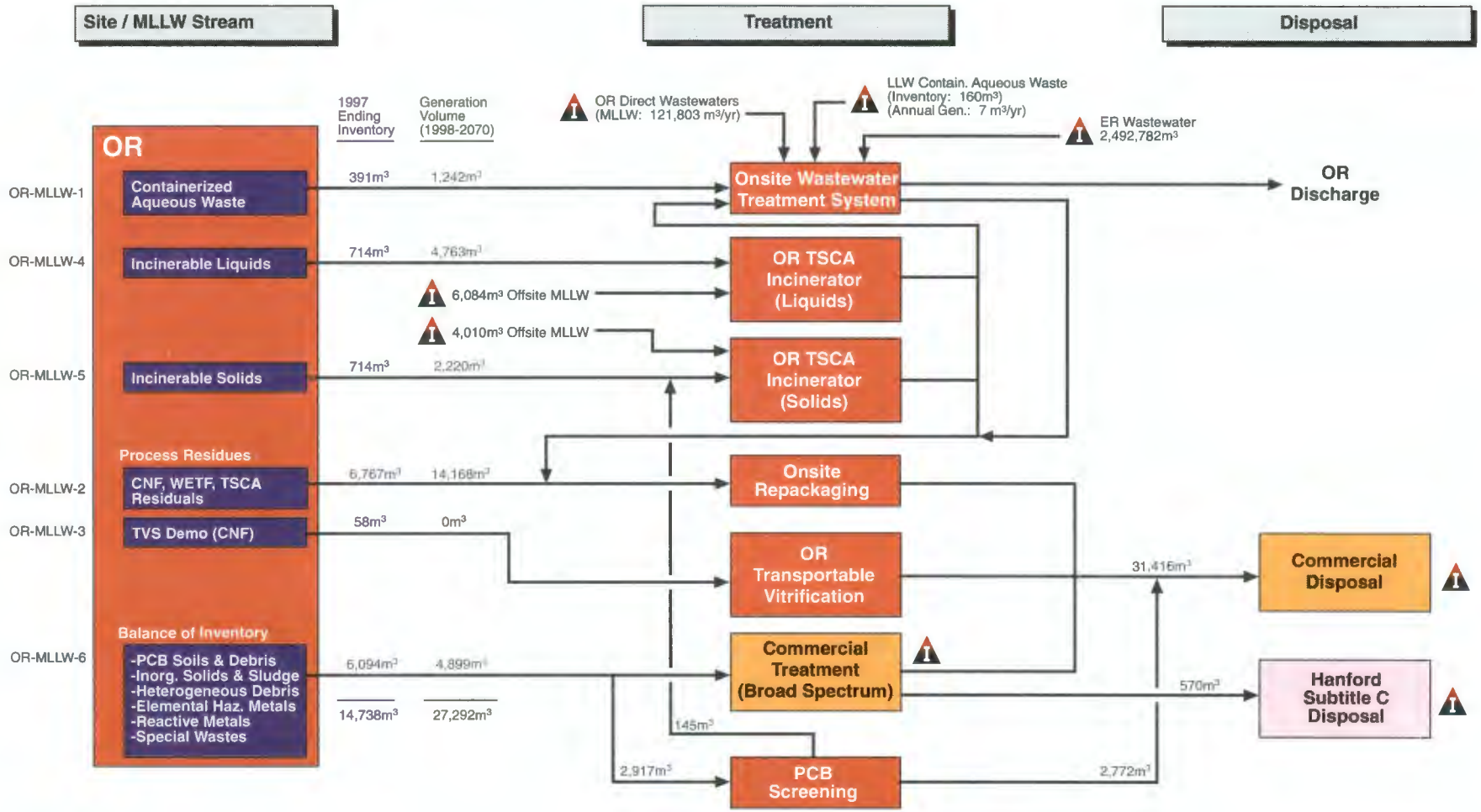

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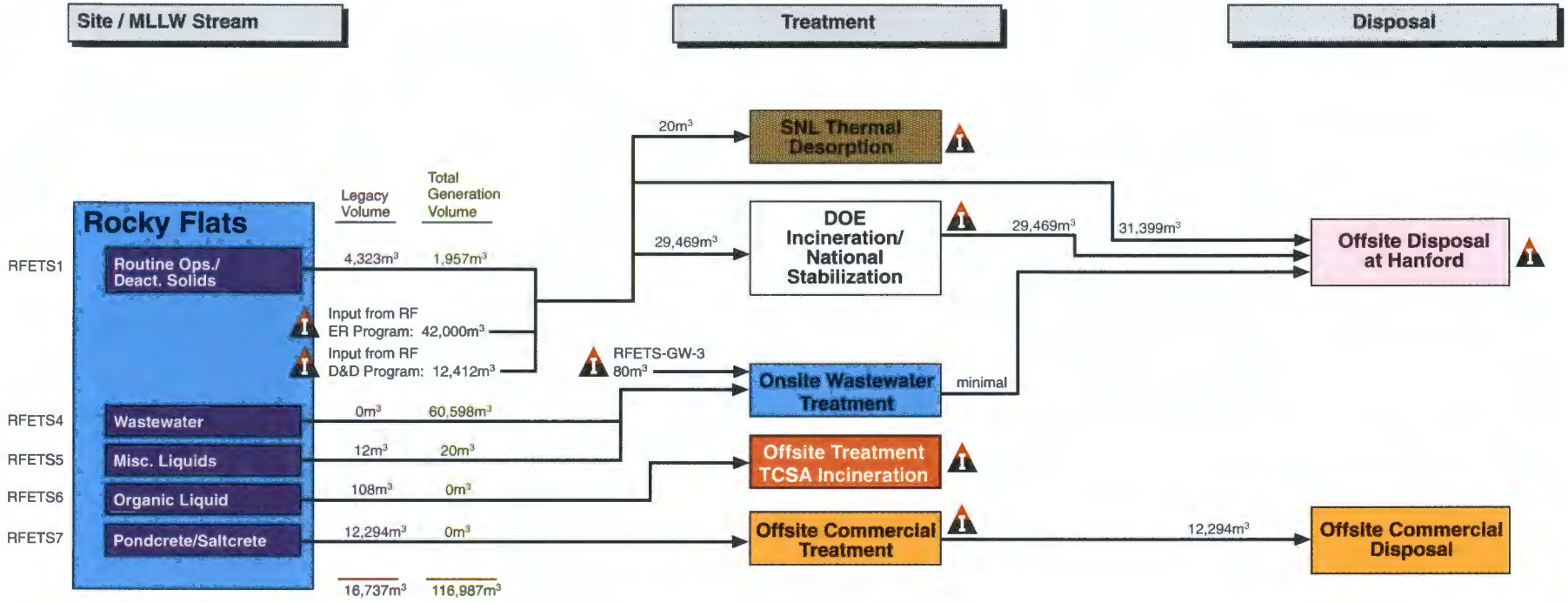

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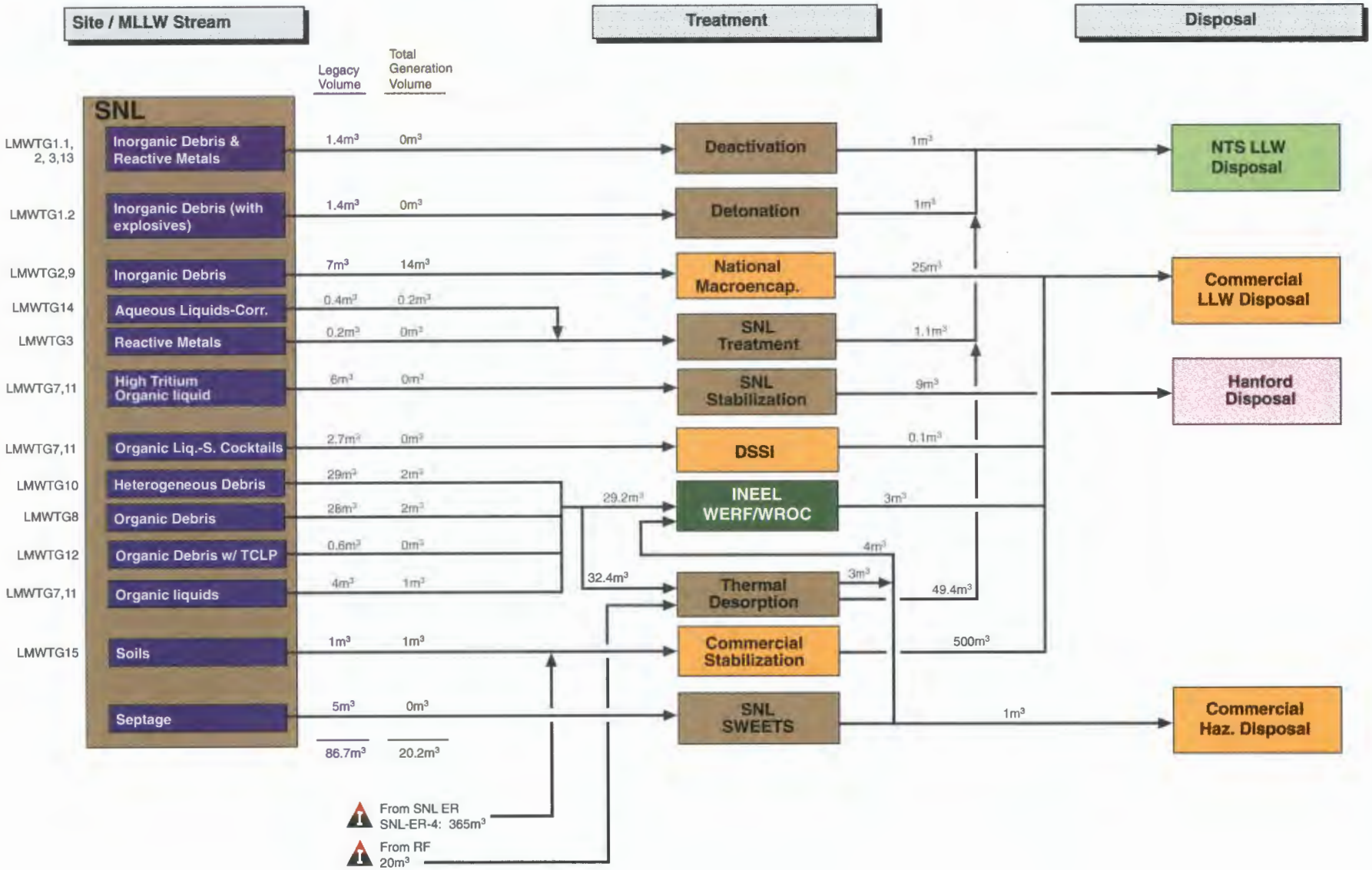

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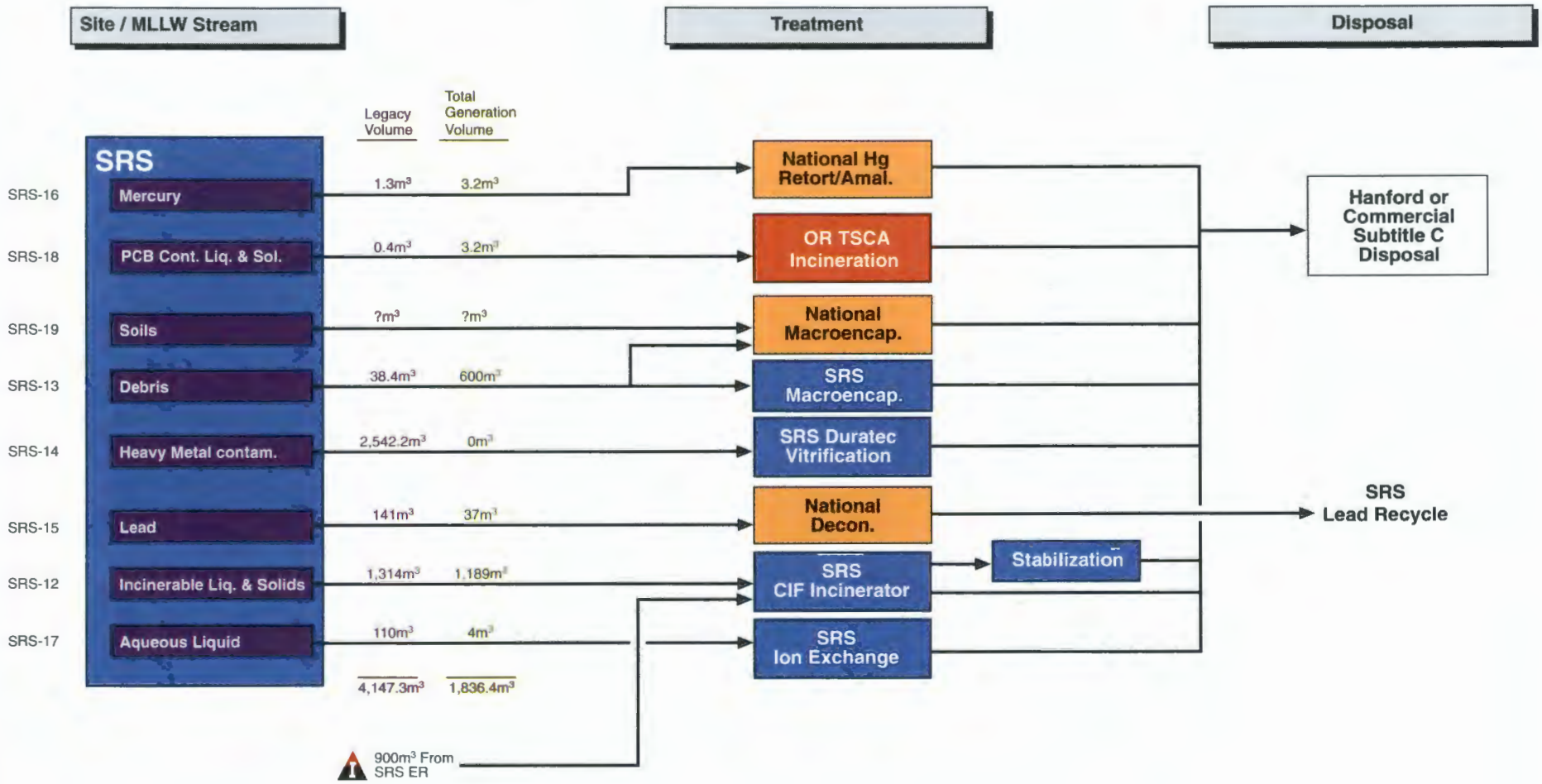

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LLW Enhanced March Baseline Disposition Map

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LLW, SCW Baseline Waste Disposition Map

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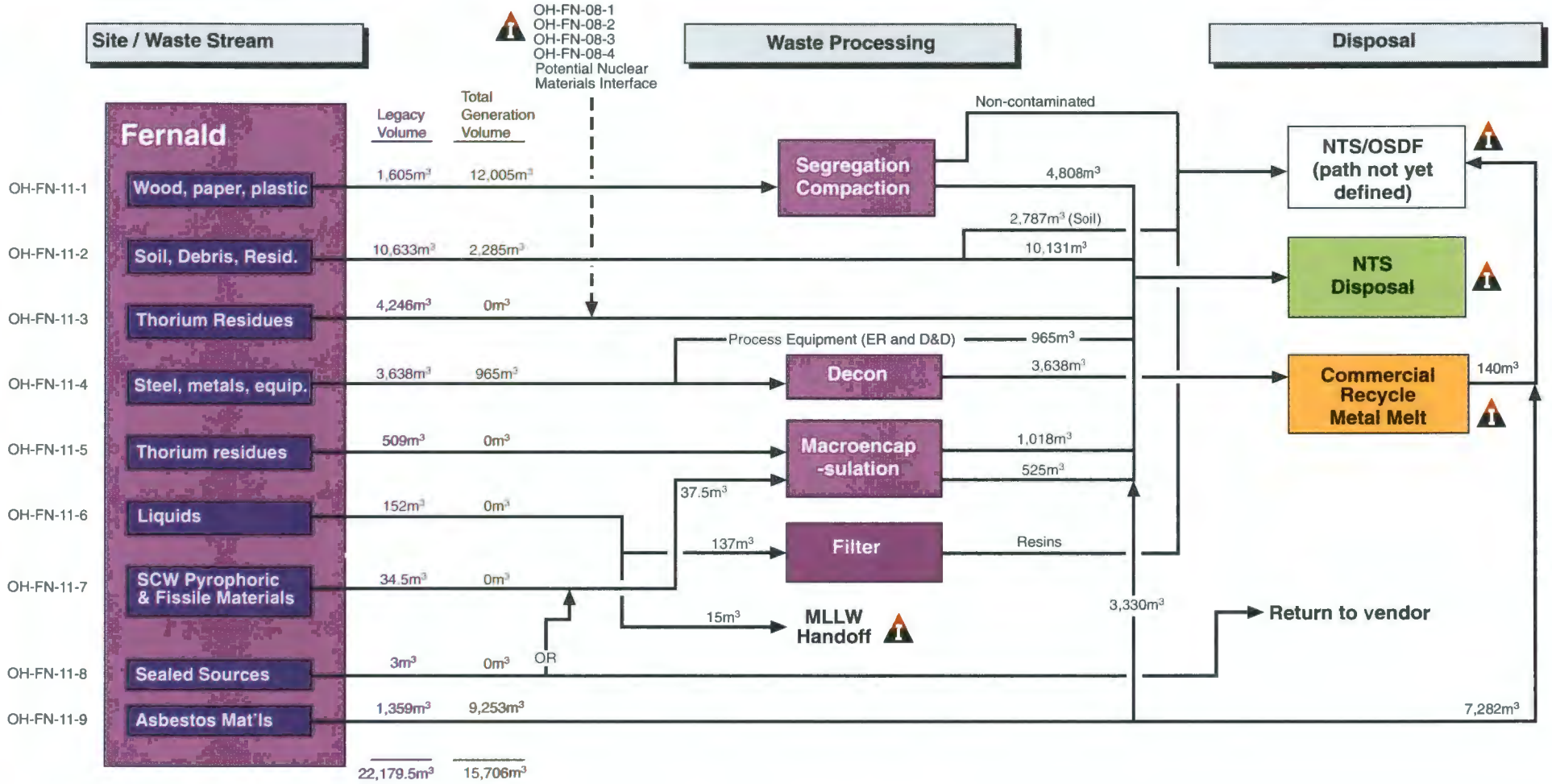

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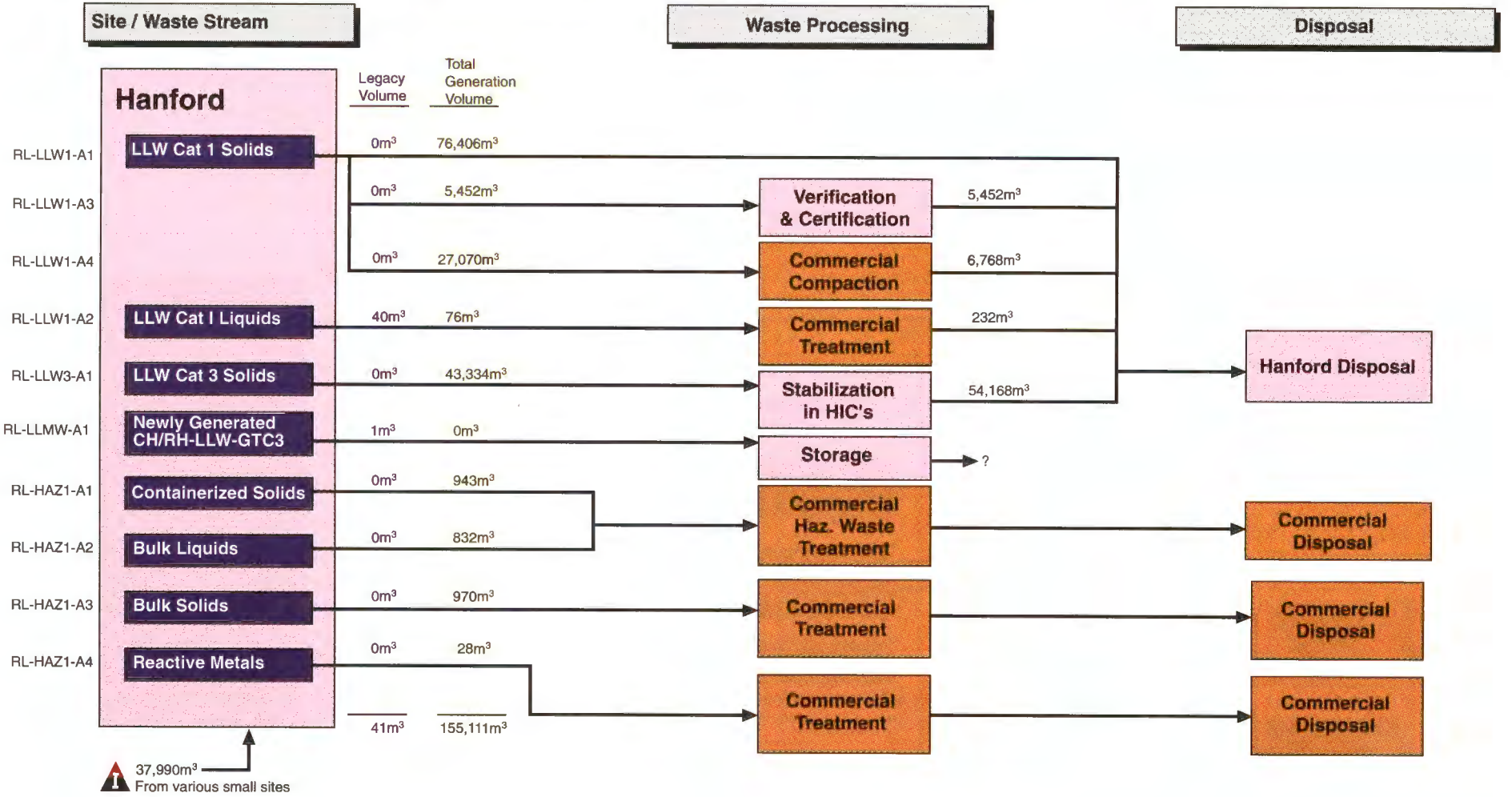

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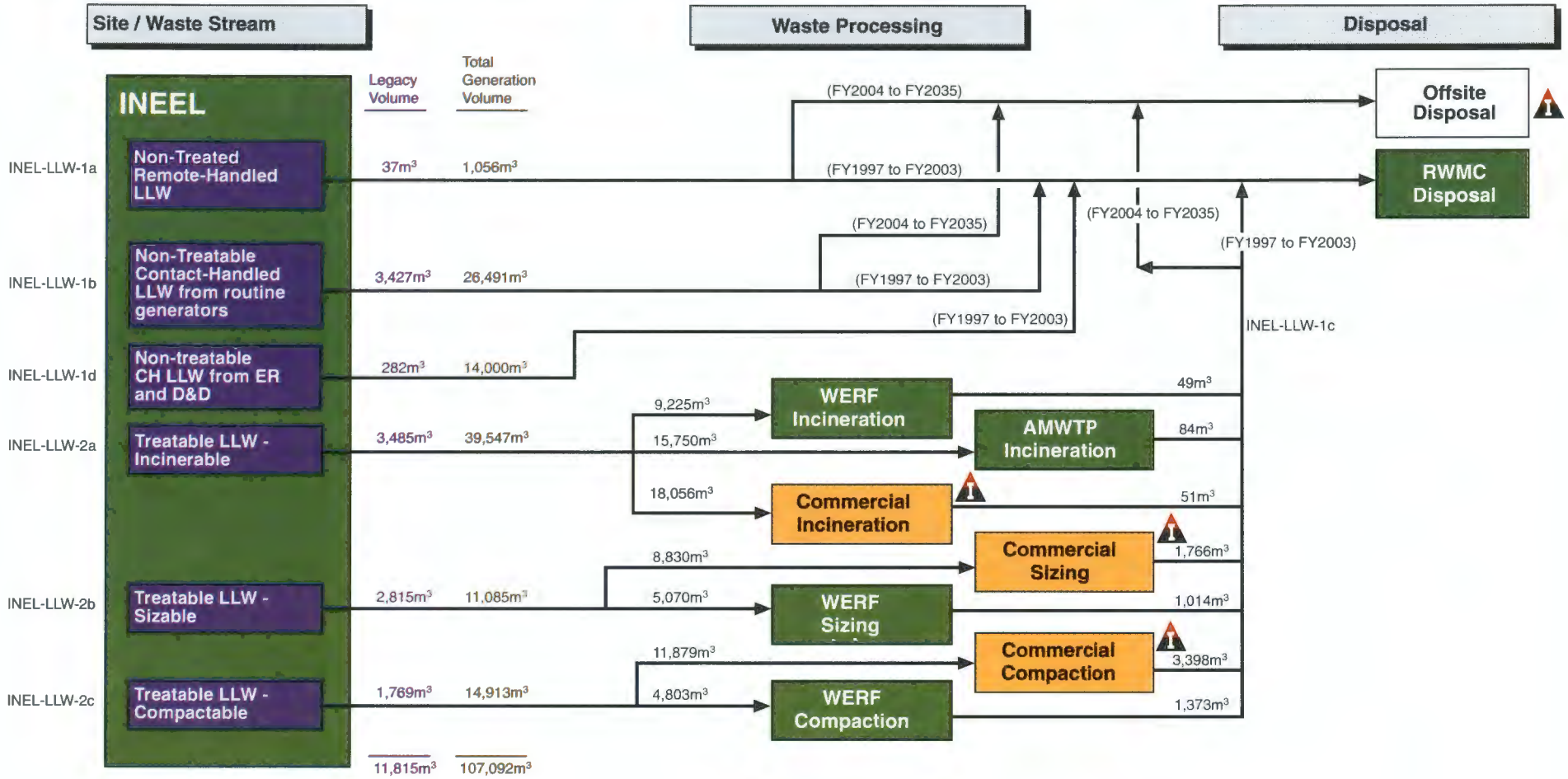

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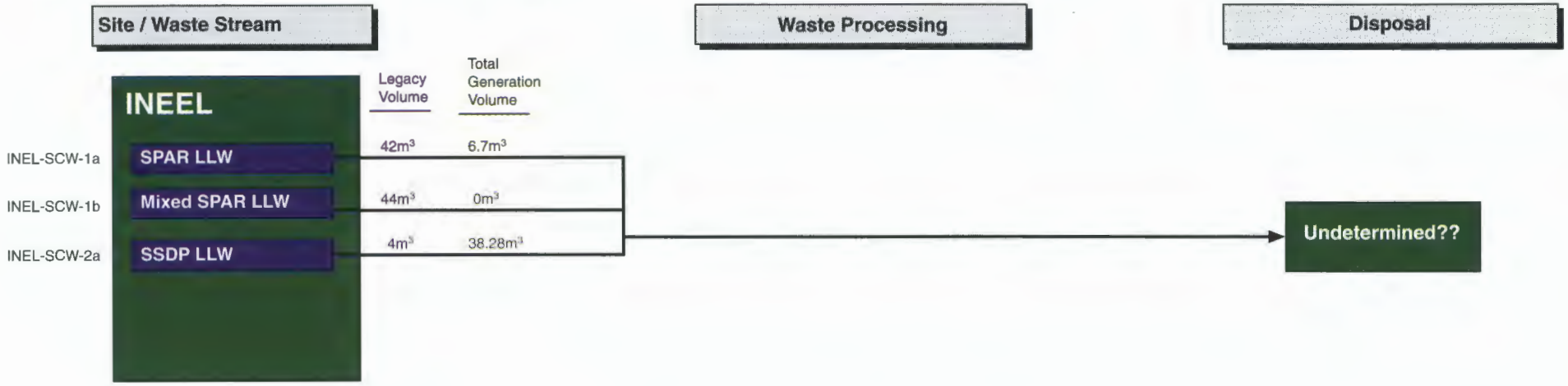

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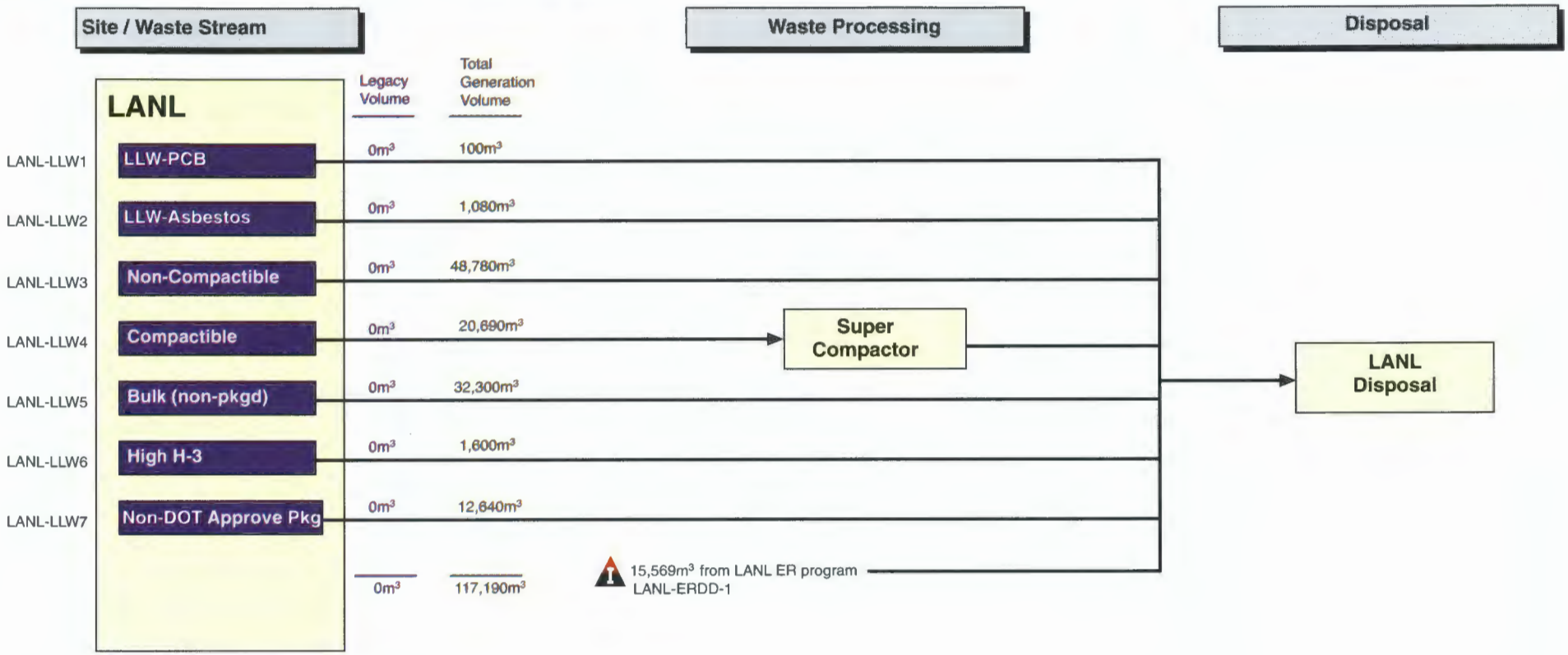

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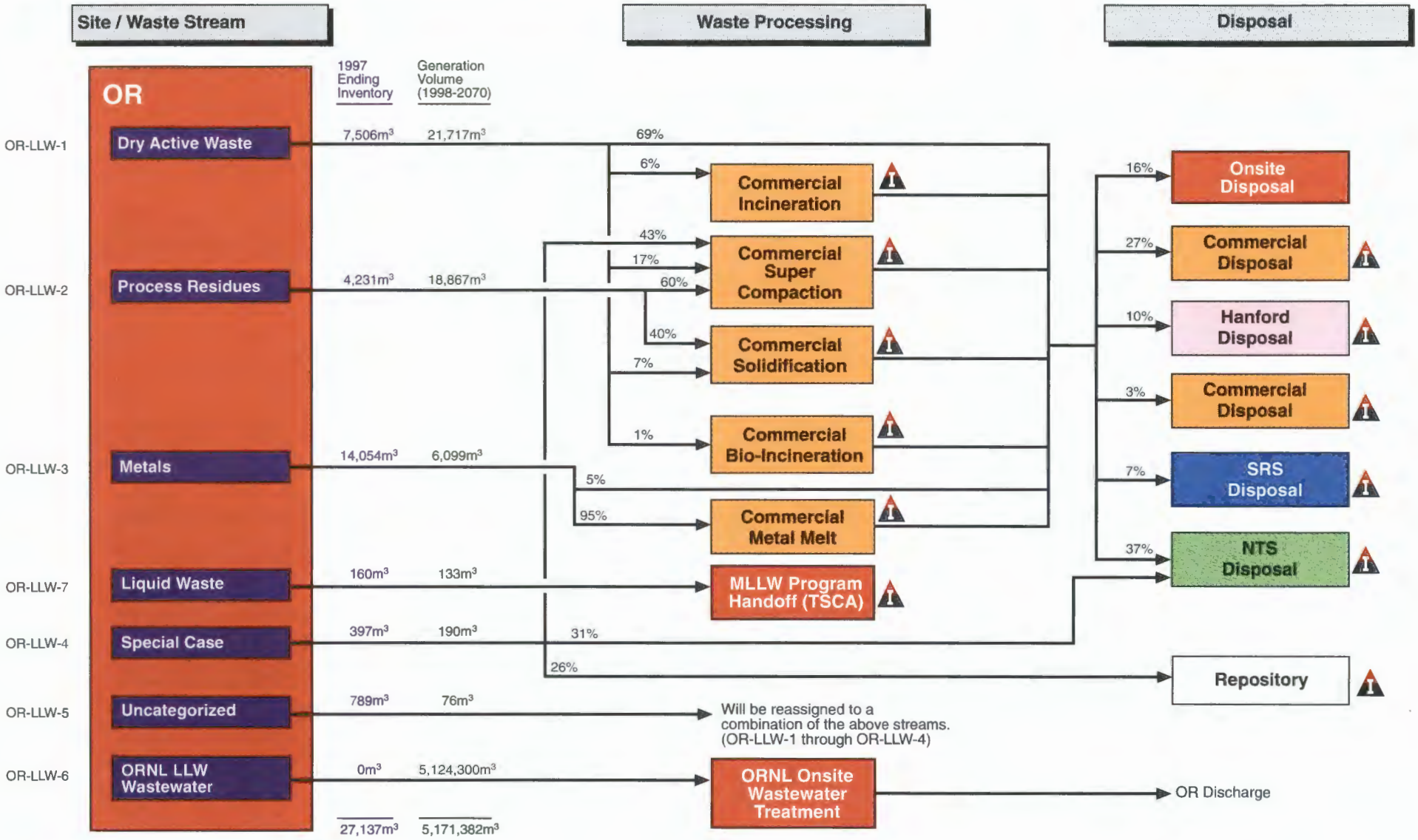

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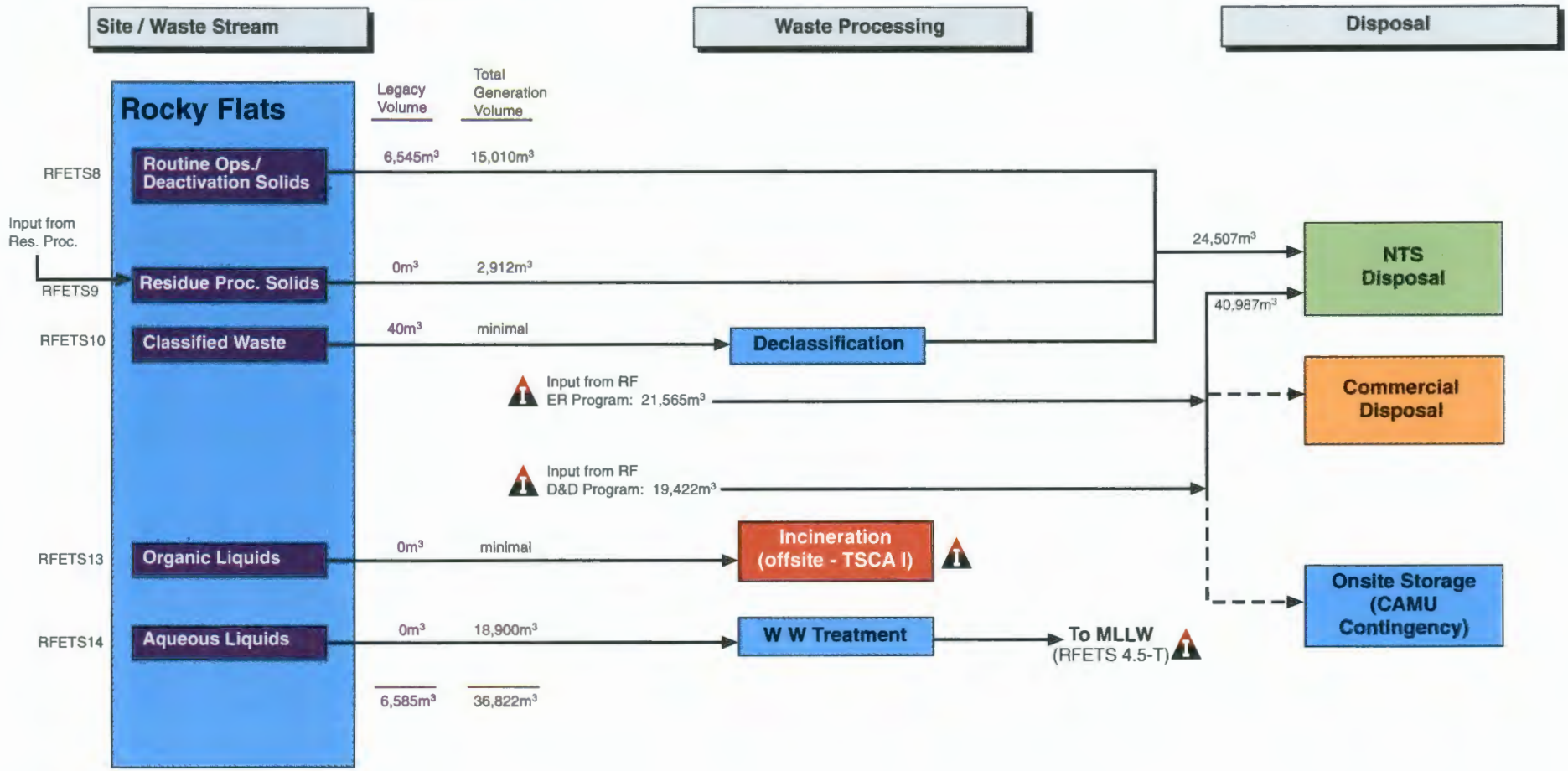

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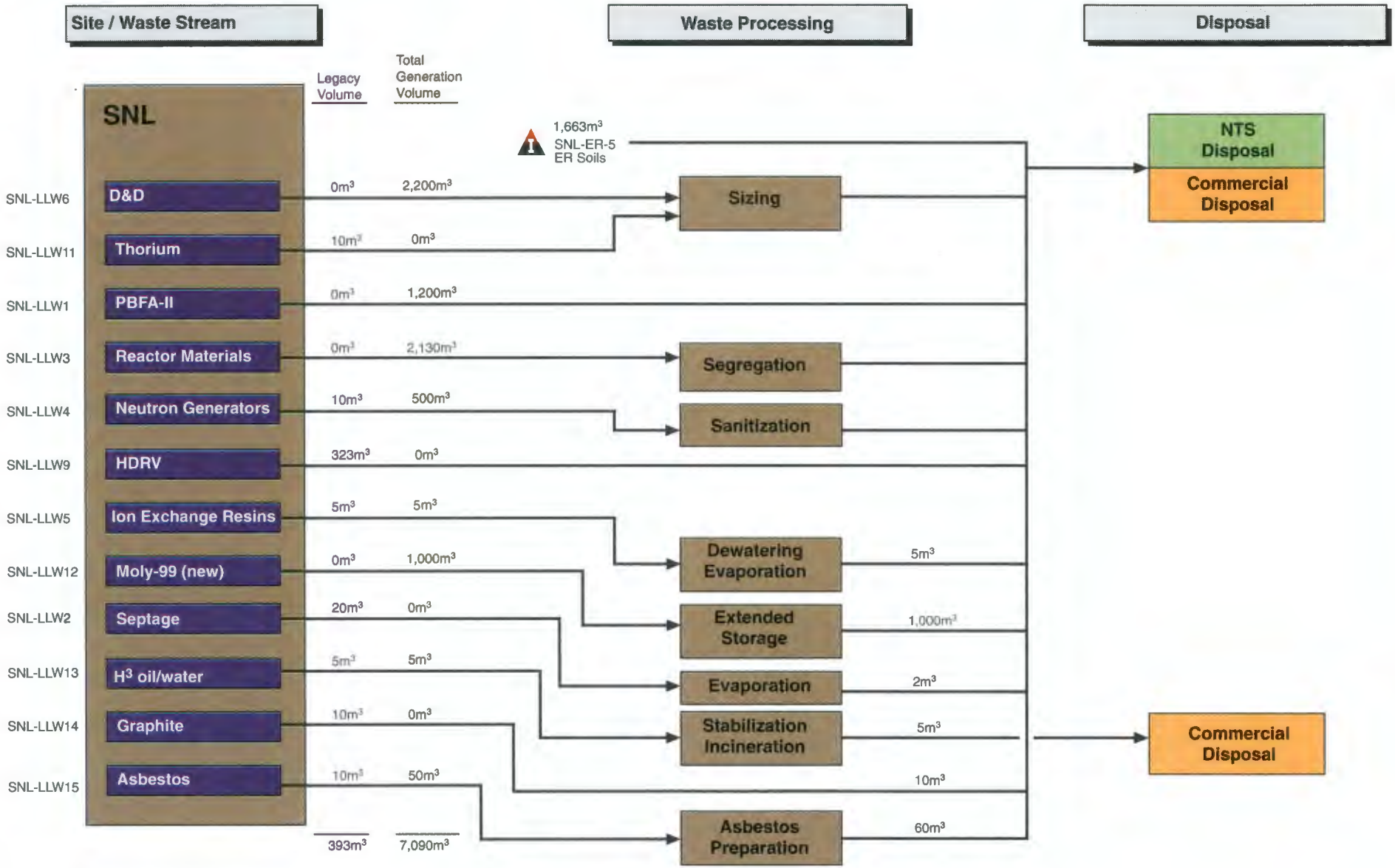

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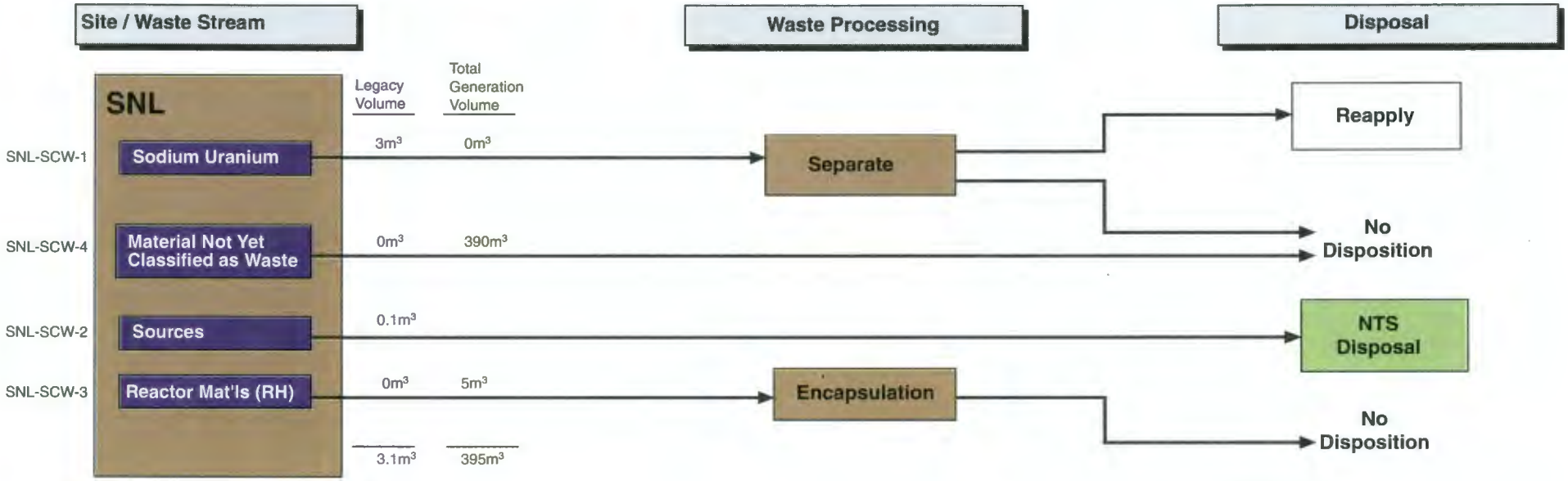

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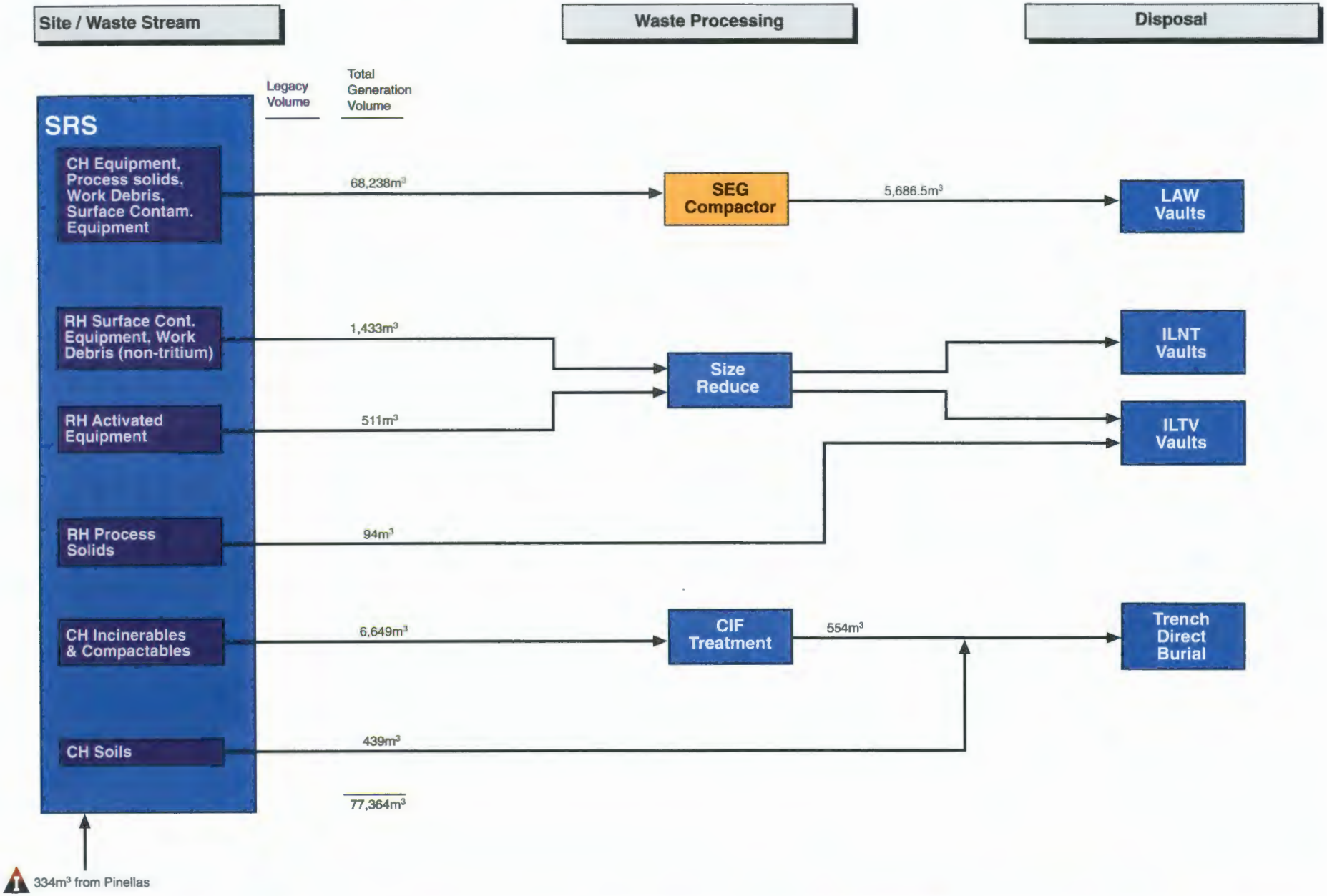

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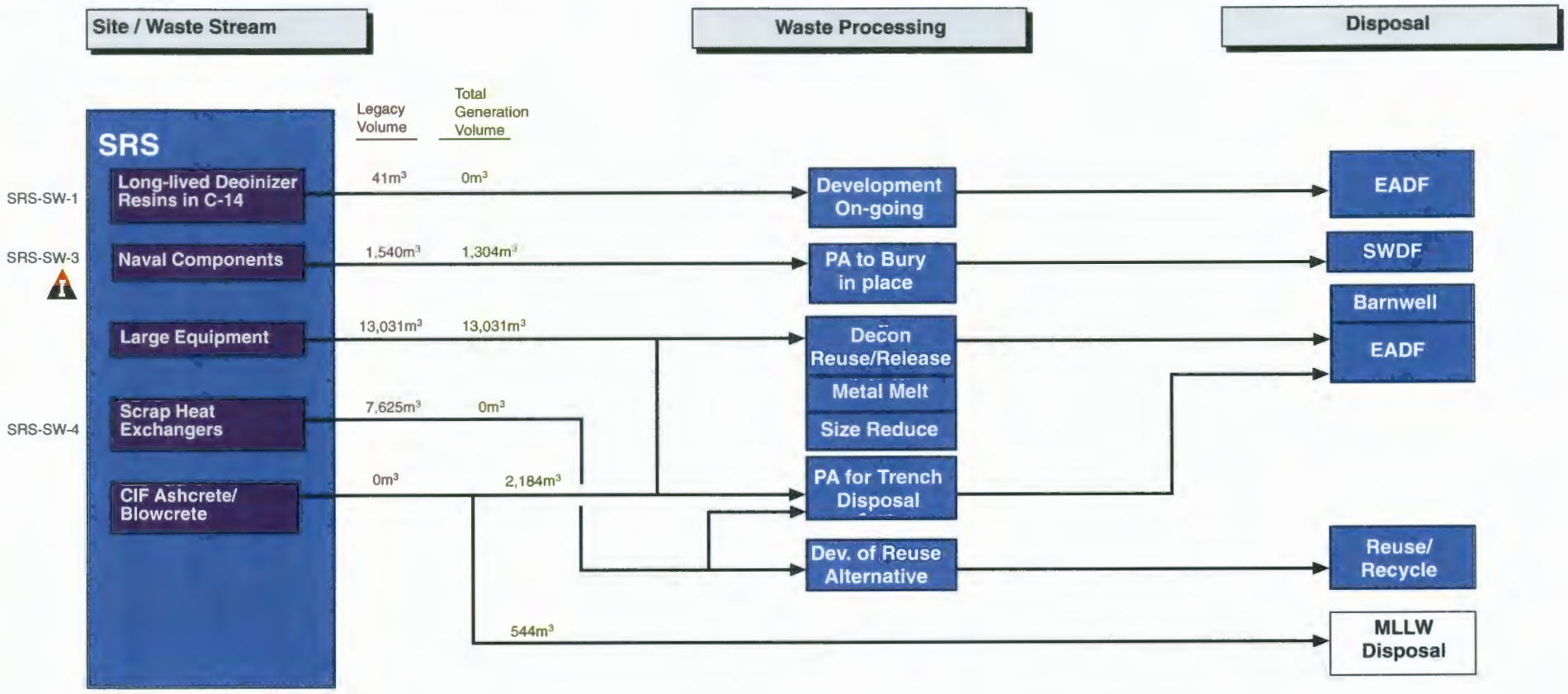

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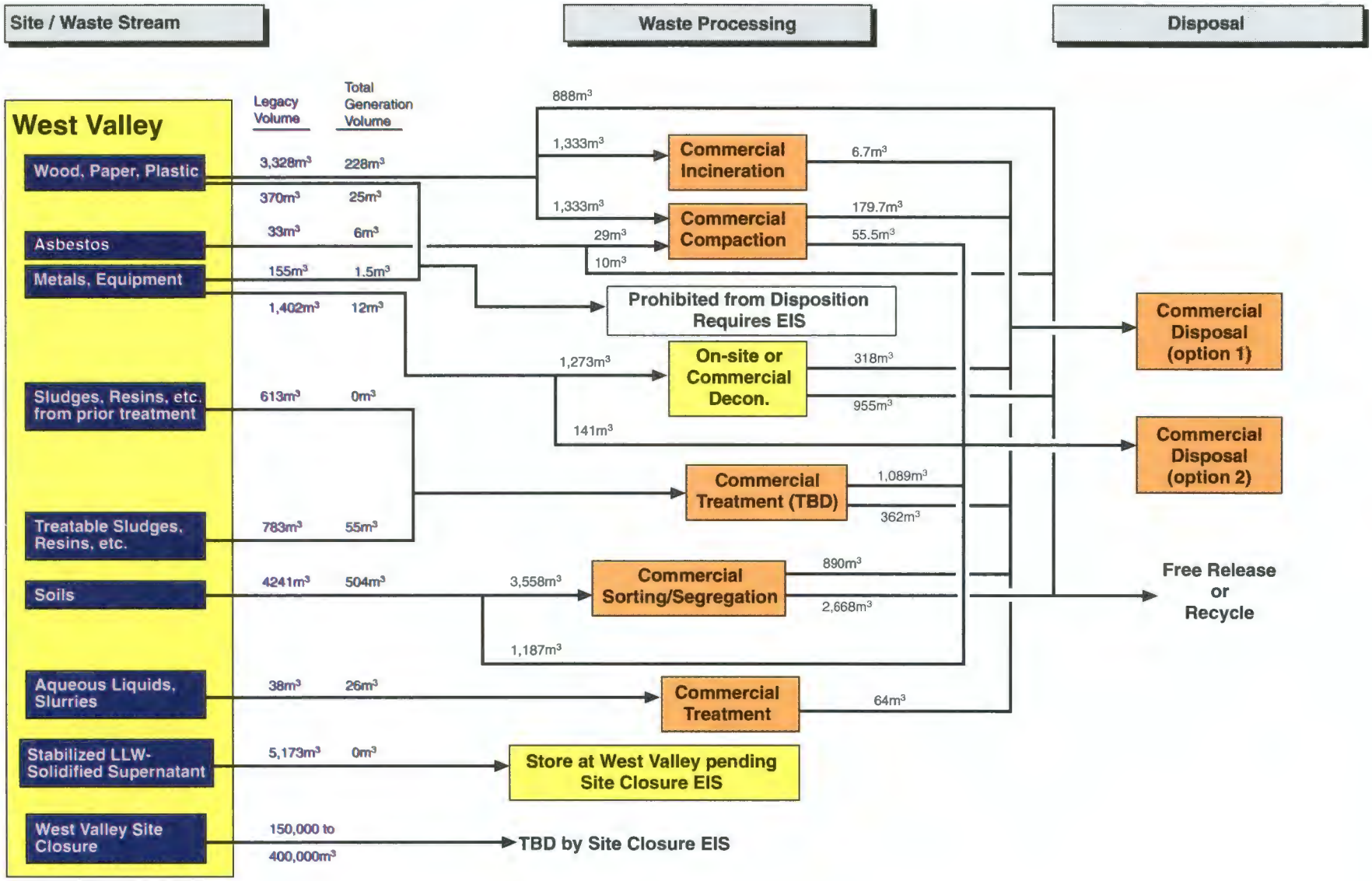

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Attachment 6

LLW Disposition Map for Preferred Alternative

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LLW, SCW Alternative Waste Disposition Map

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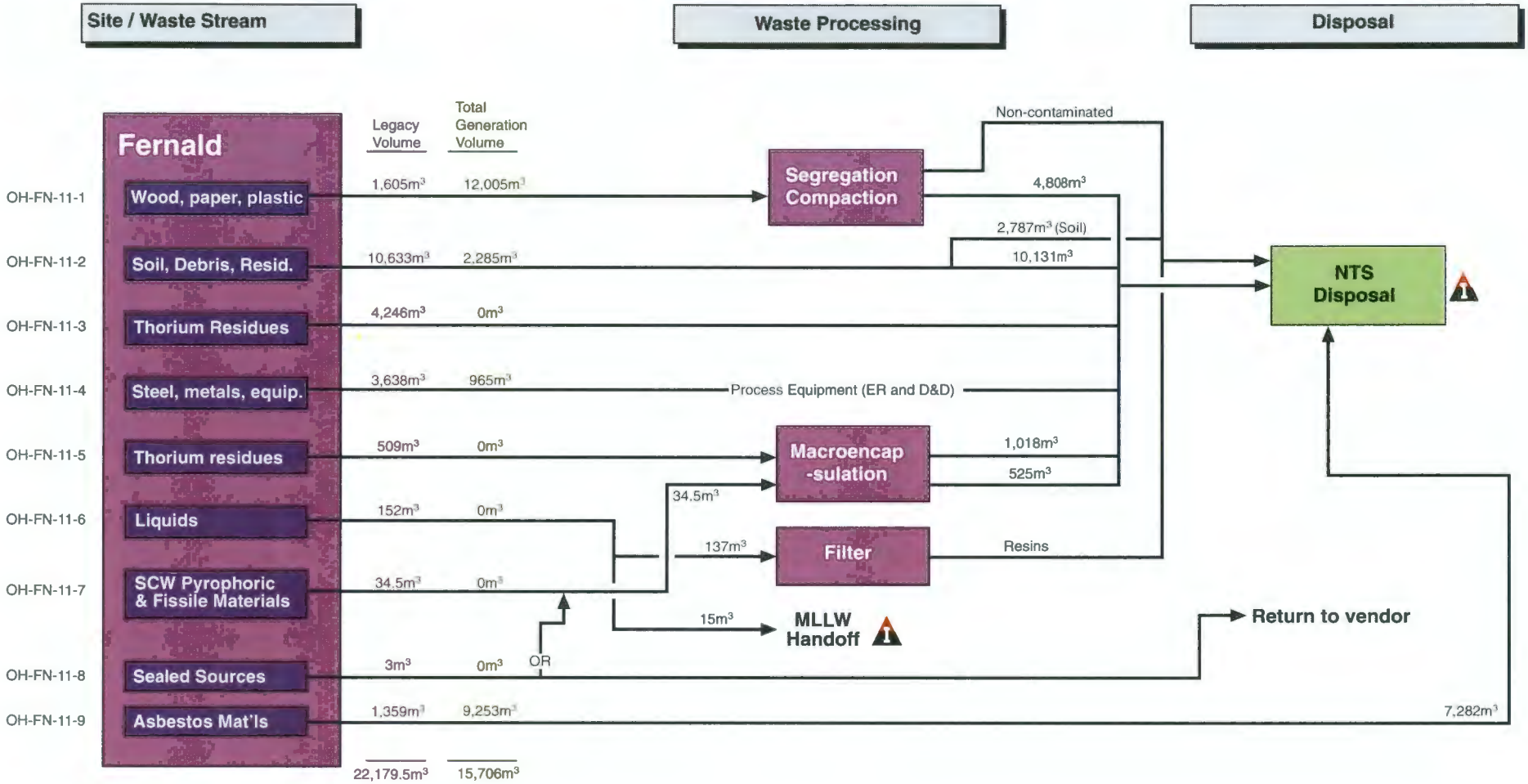

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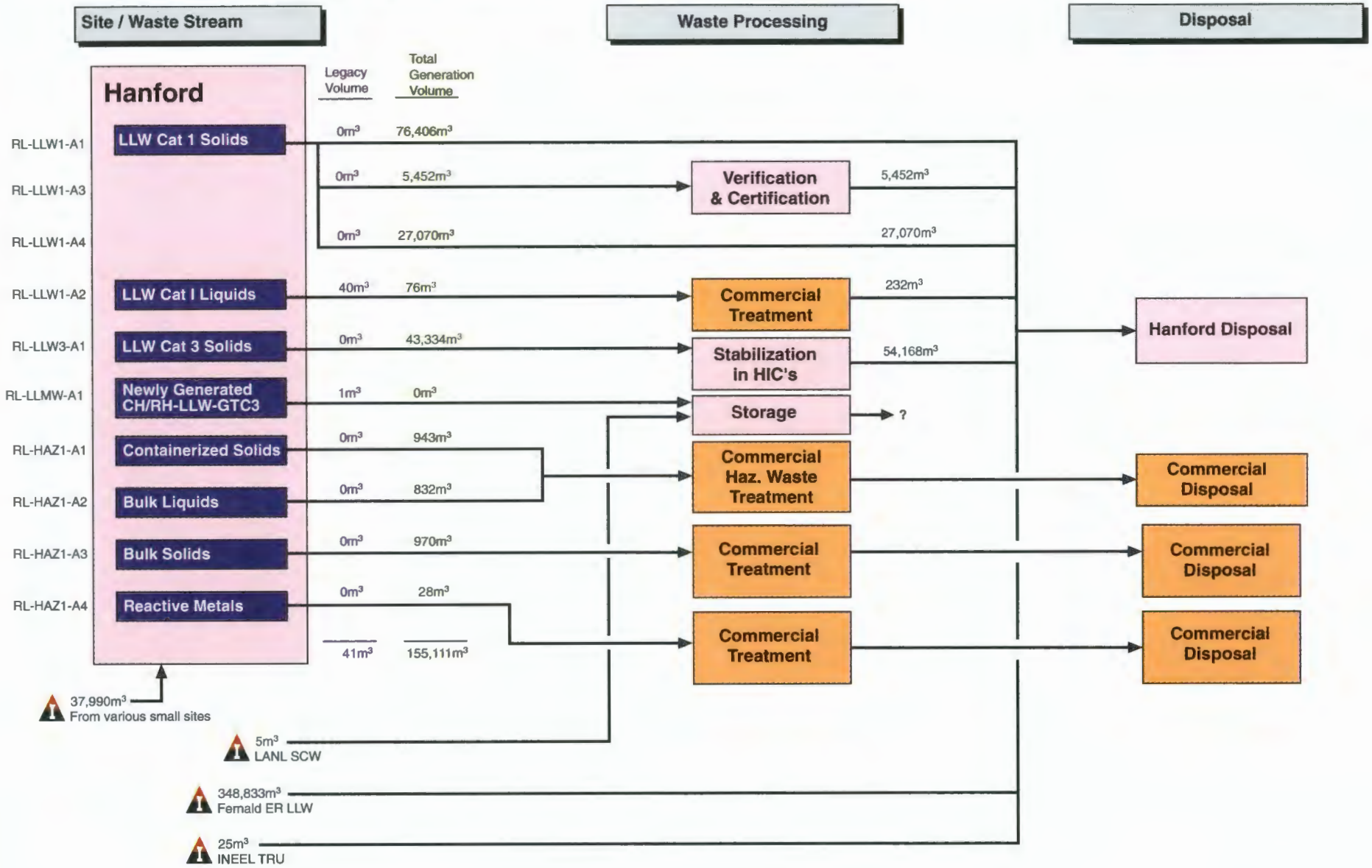

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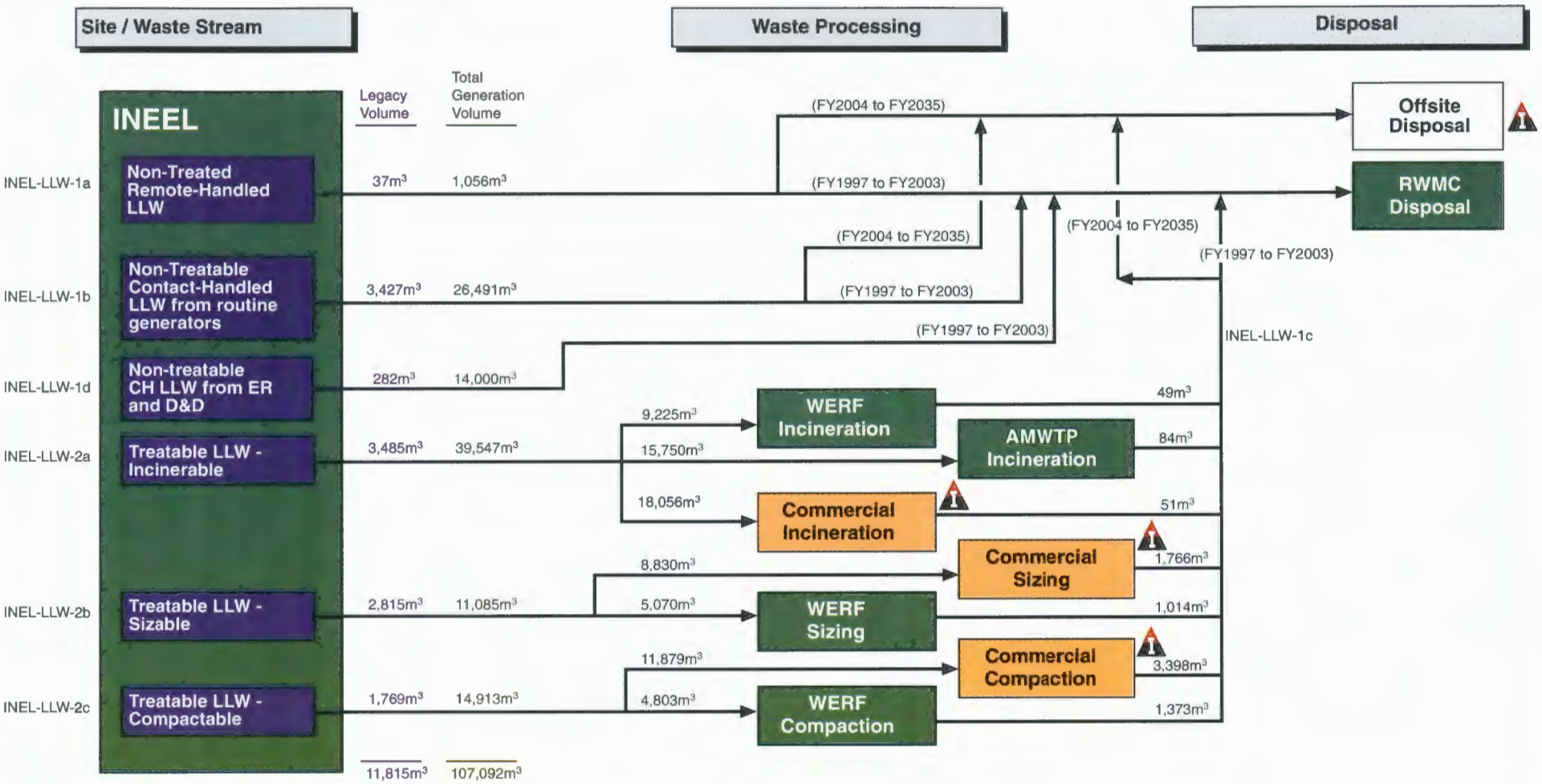

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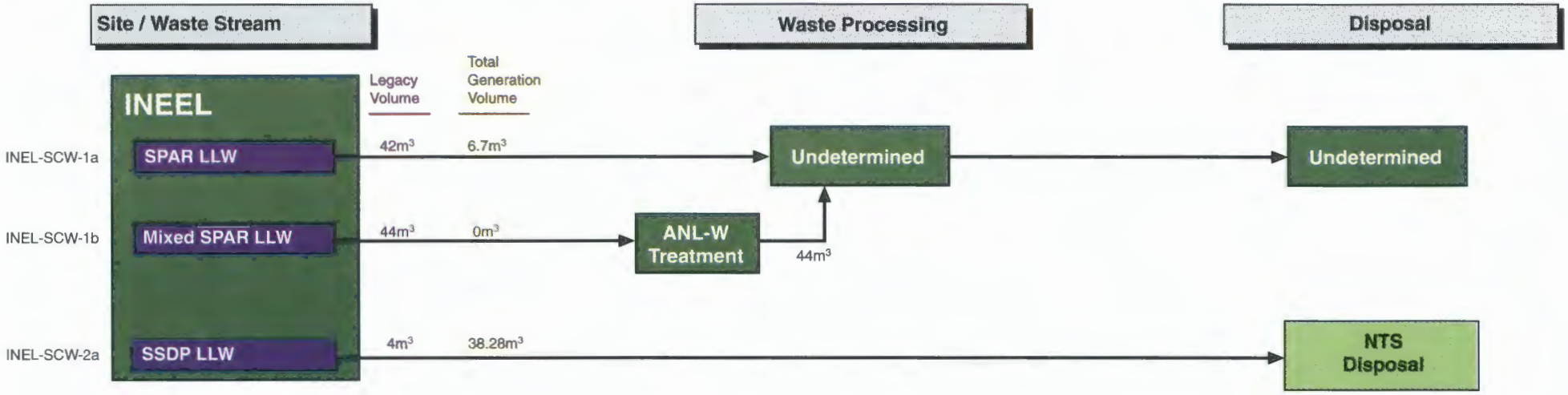

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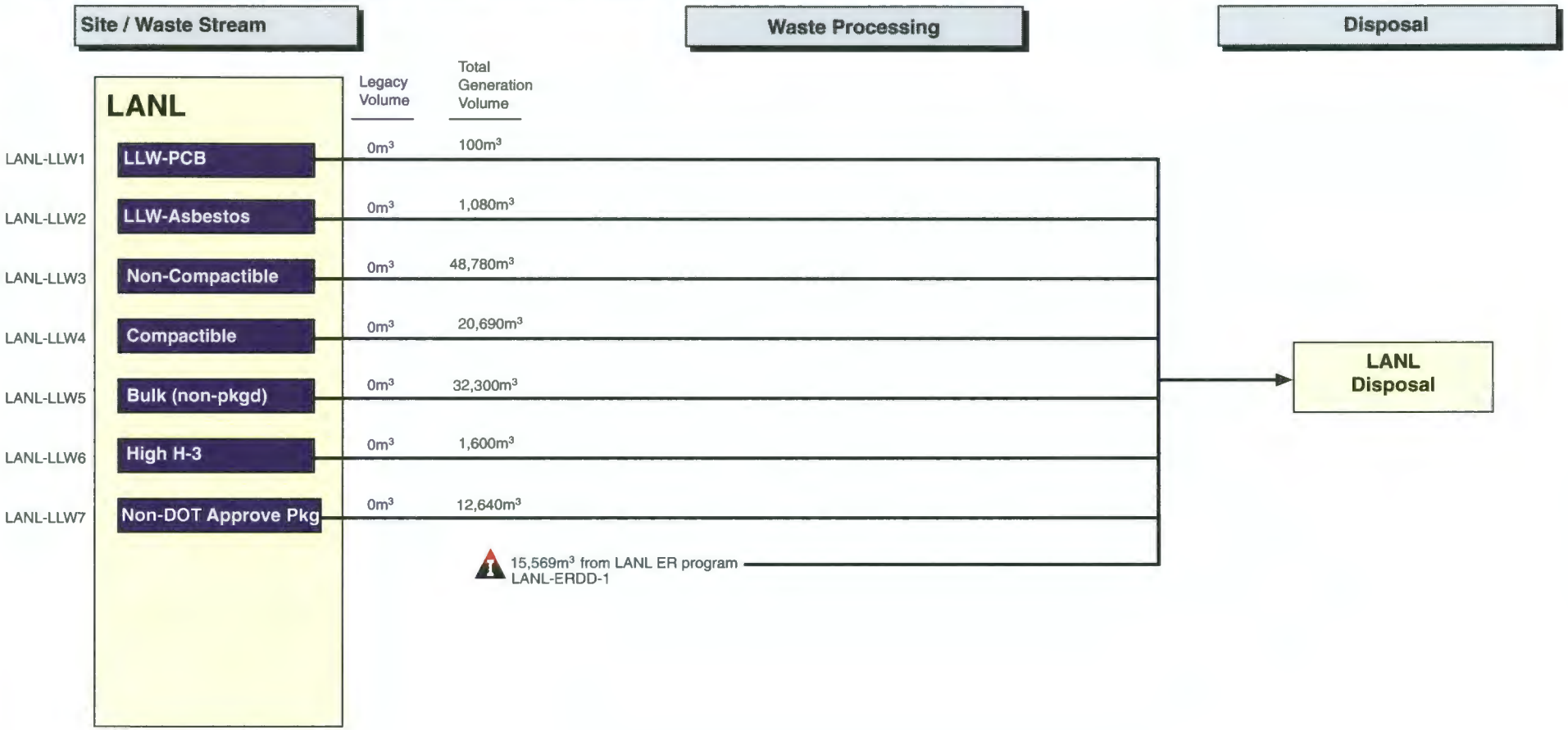
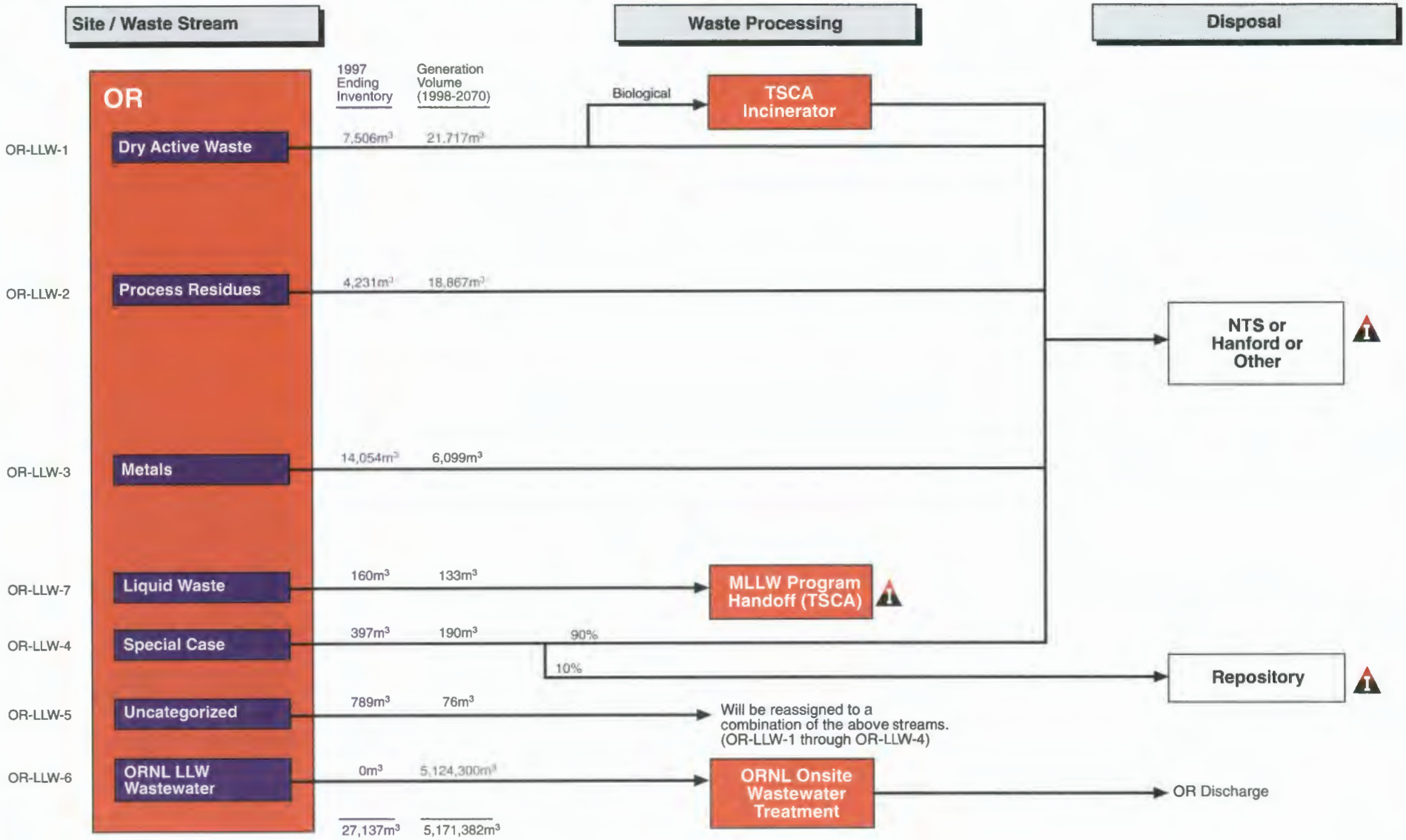


KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/10/97

LLW, SCW Alternative Waste Disposition Map PREDECISIONAL DRAFT



KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/28/97

LLW Alternative Waste Disposition Map

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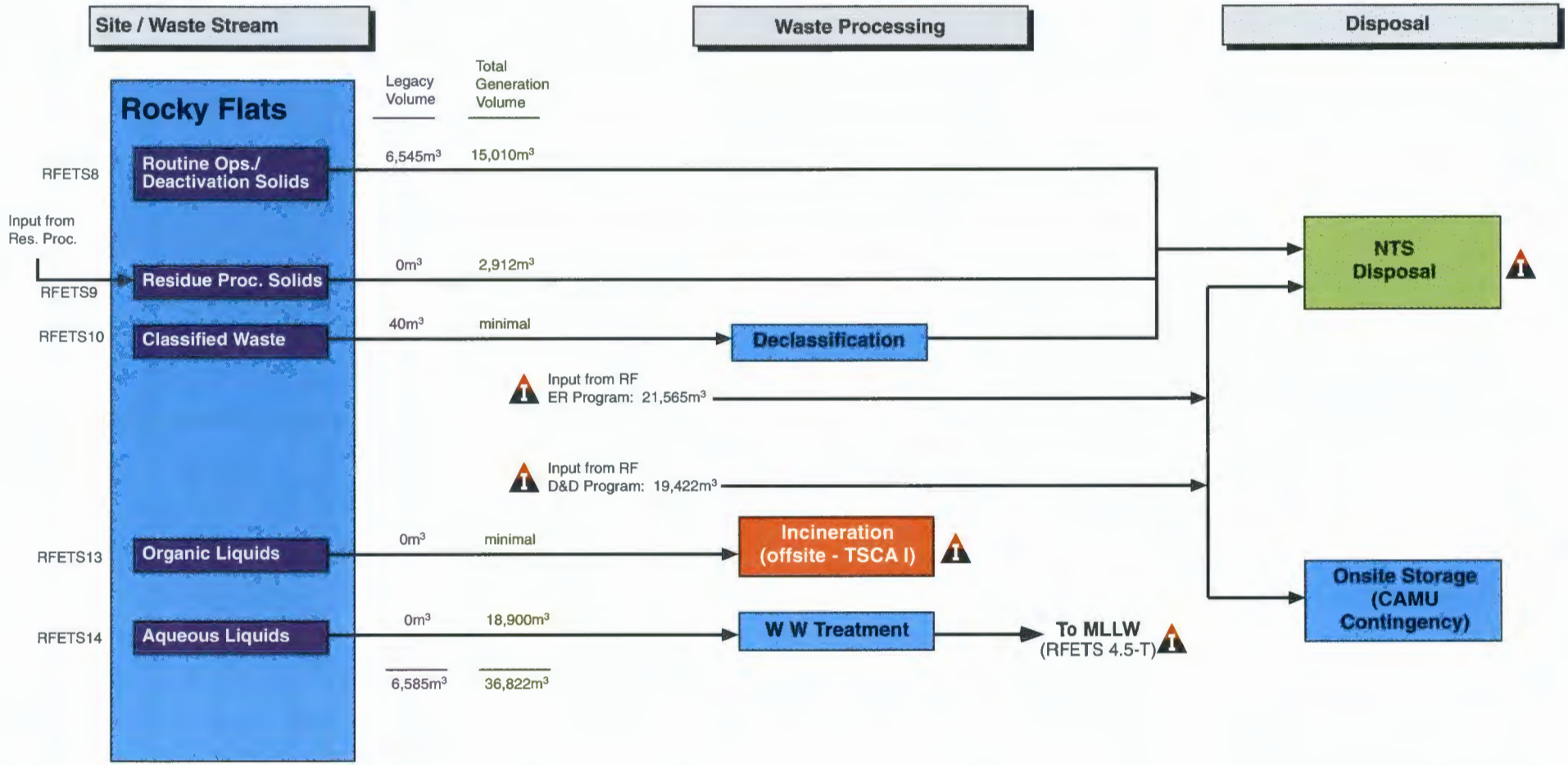

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4/28/97

LLW Alternative Waste Disposition Map

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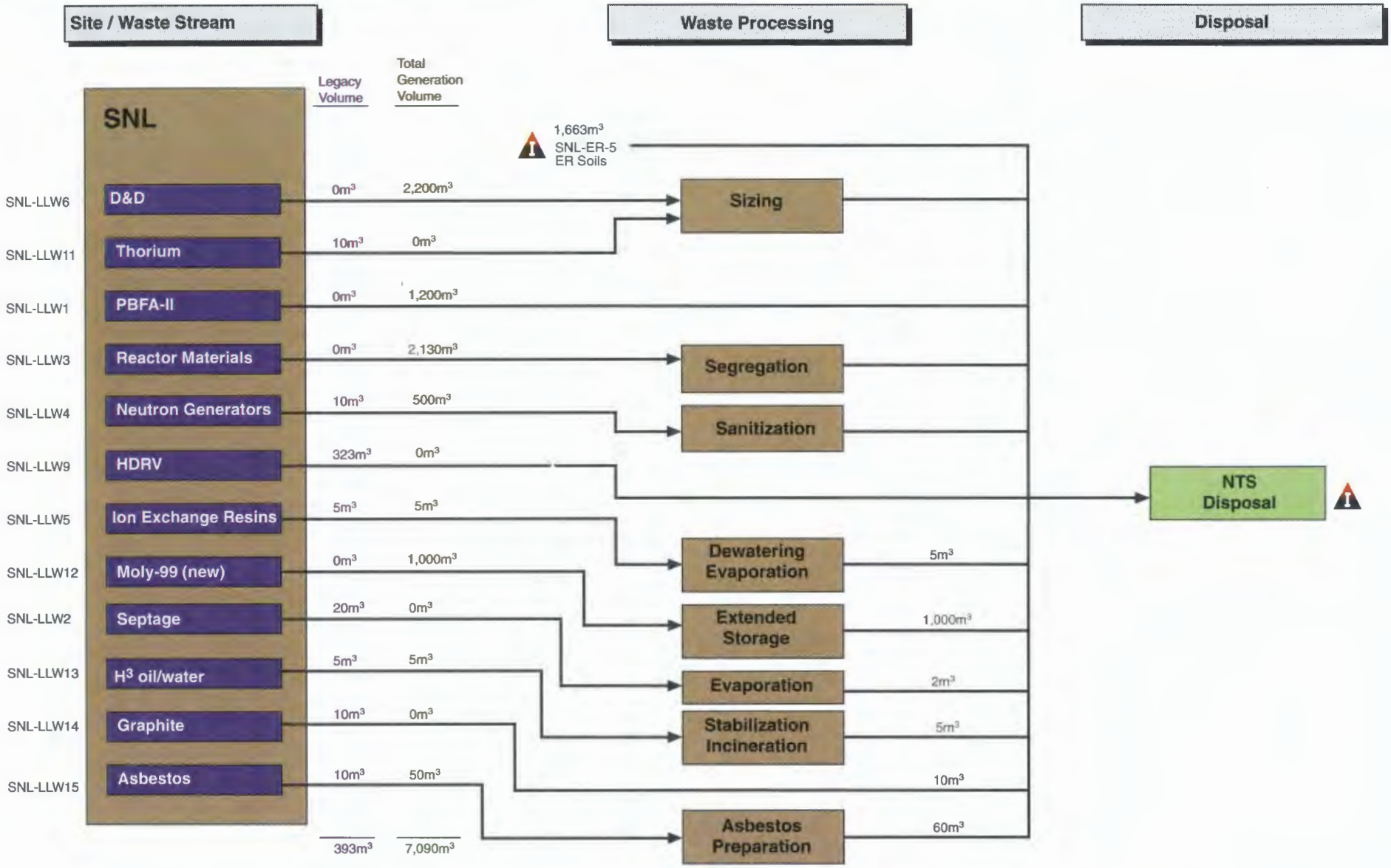

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4/28/97

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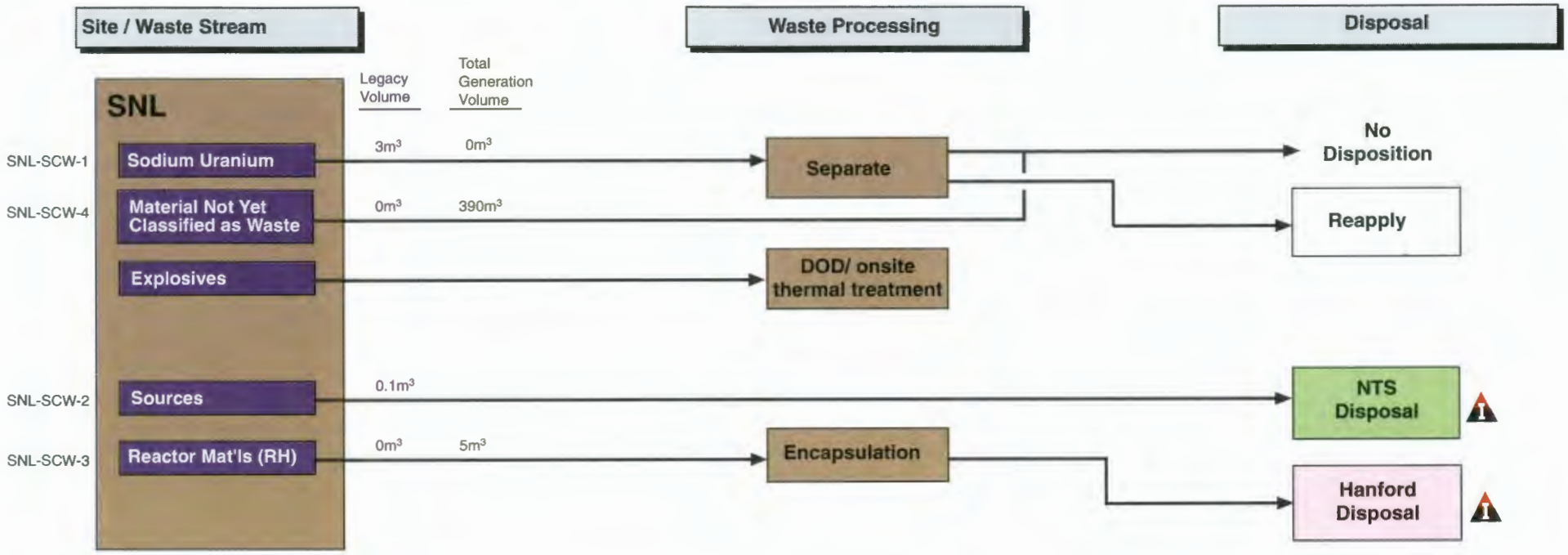

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4/23/97

LLW Alternative Waste Disposition Map

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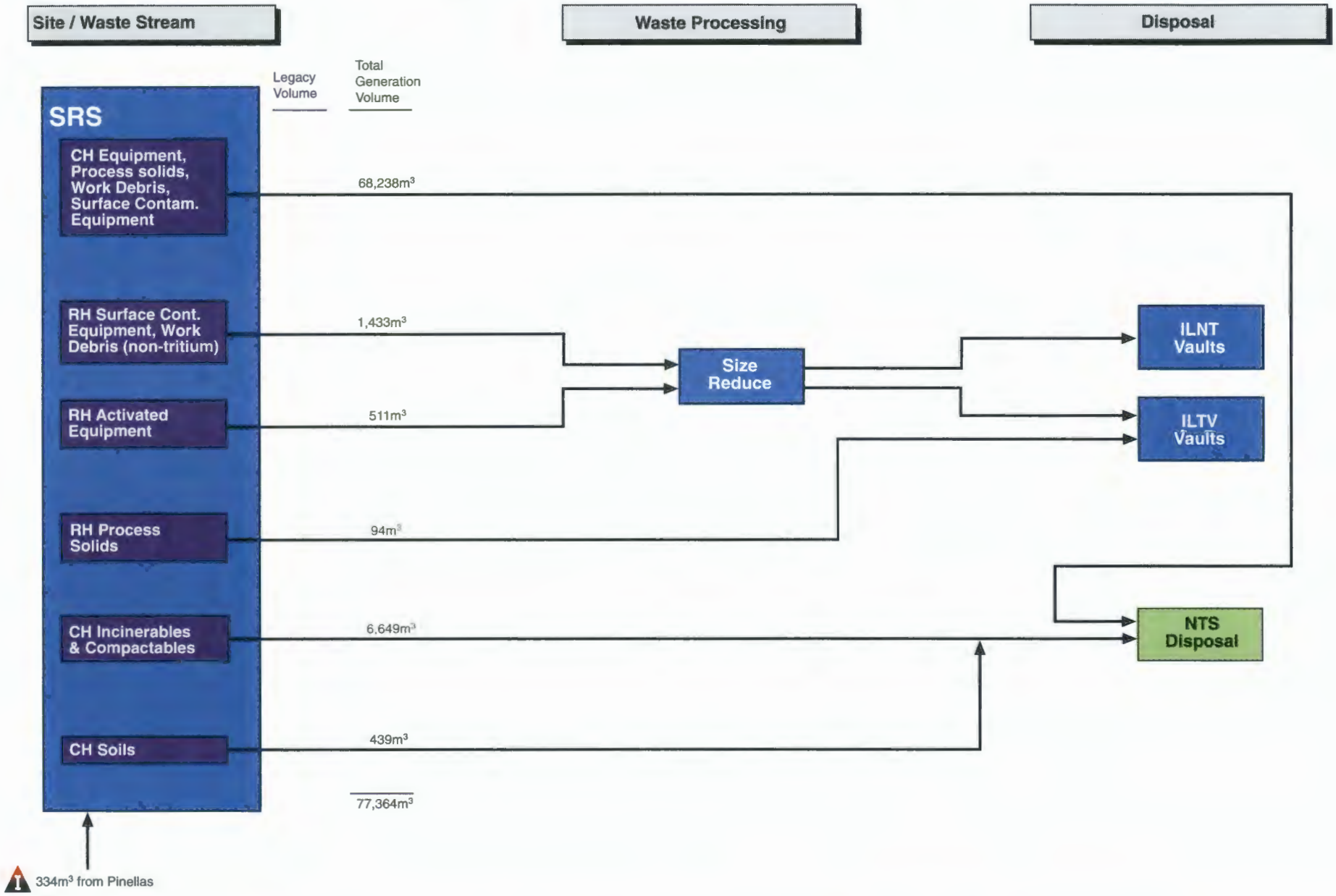

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4/29/97

SCW Alternative Waste Disposition Map

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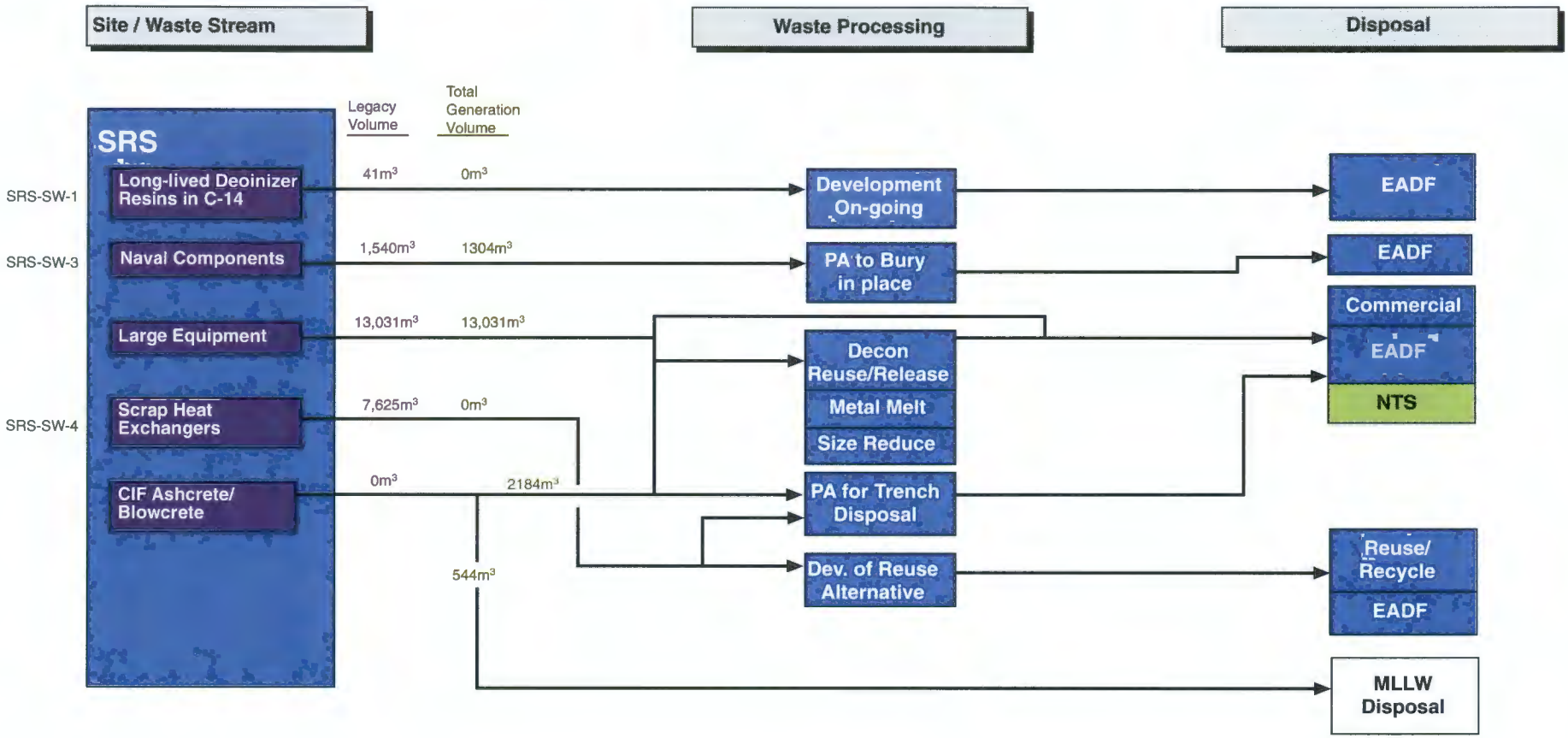

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LLW Alternative Waste Disposition Map

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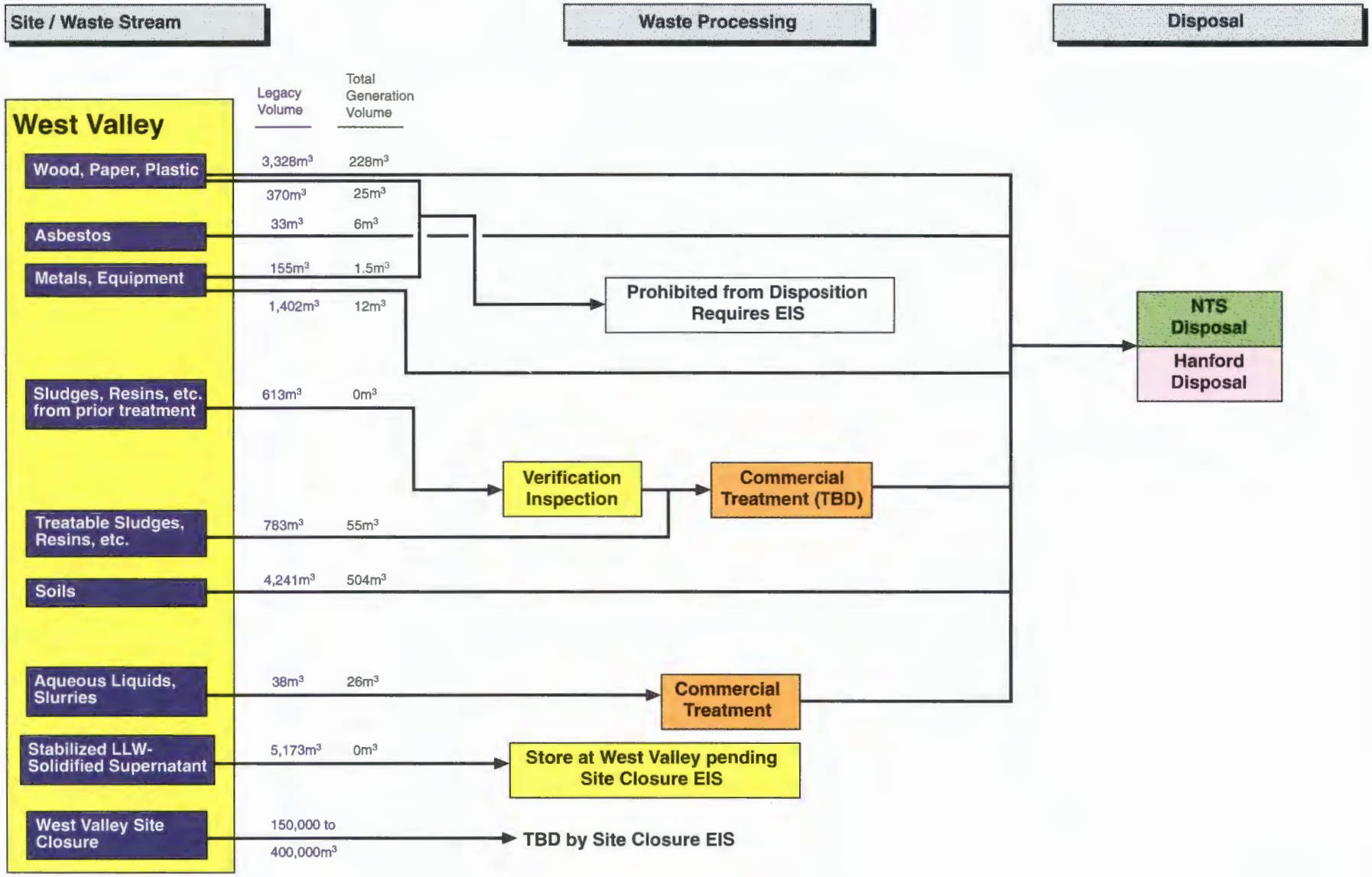

KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/17/97

Attachment 7

ER Enhanced March Baseline Disposition Map

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ER Baseline Waste Disposition Map

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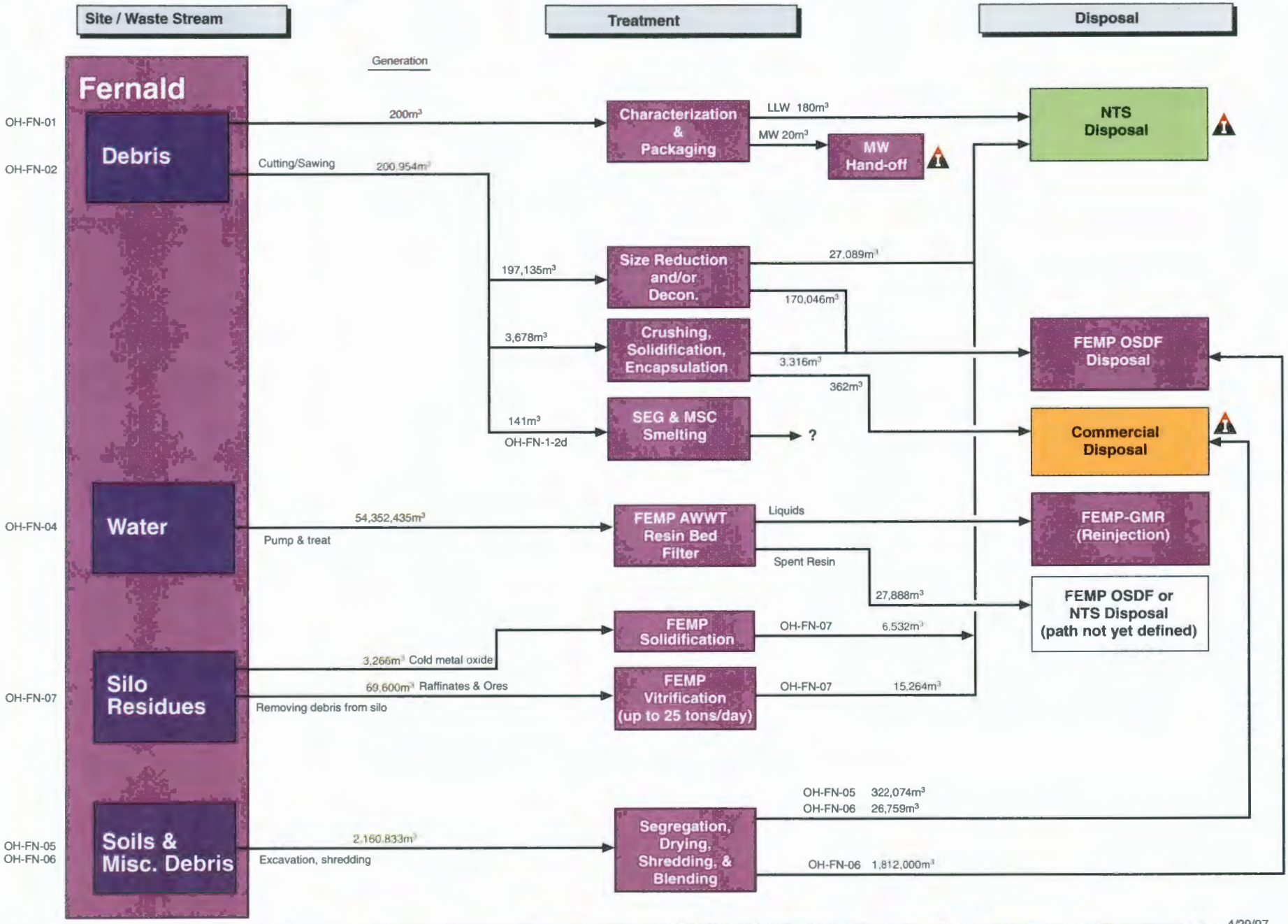

WASTE GENERATION NUMBERS CONTAINED IN THIS DOCUMENT REPRESENT VOLUMES TO BE TRANSFERRED TO TSD FACILITIES

KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/29/97
Enhanced March TYP

ER Baseline Waste Disposition Map

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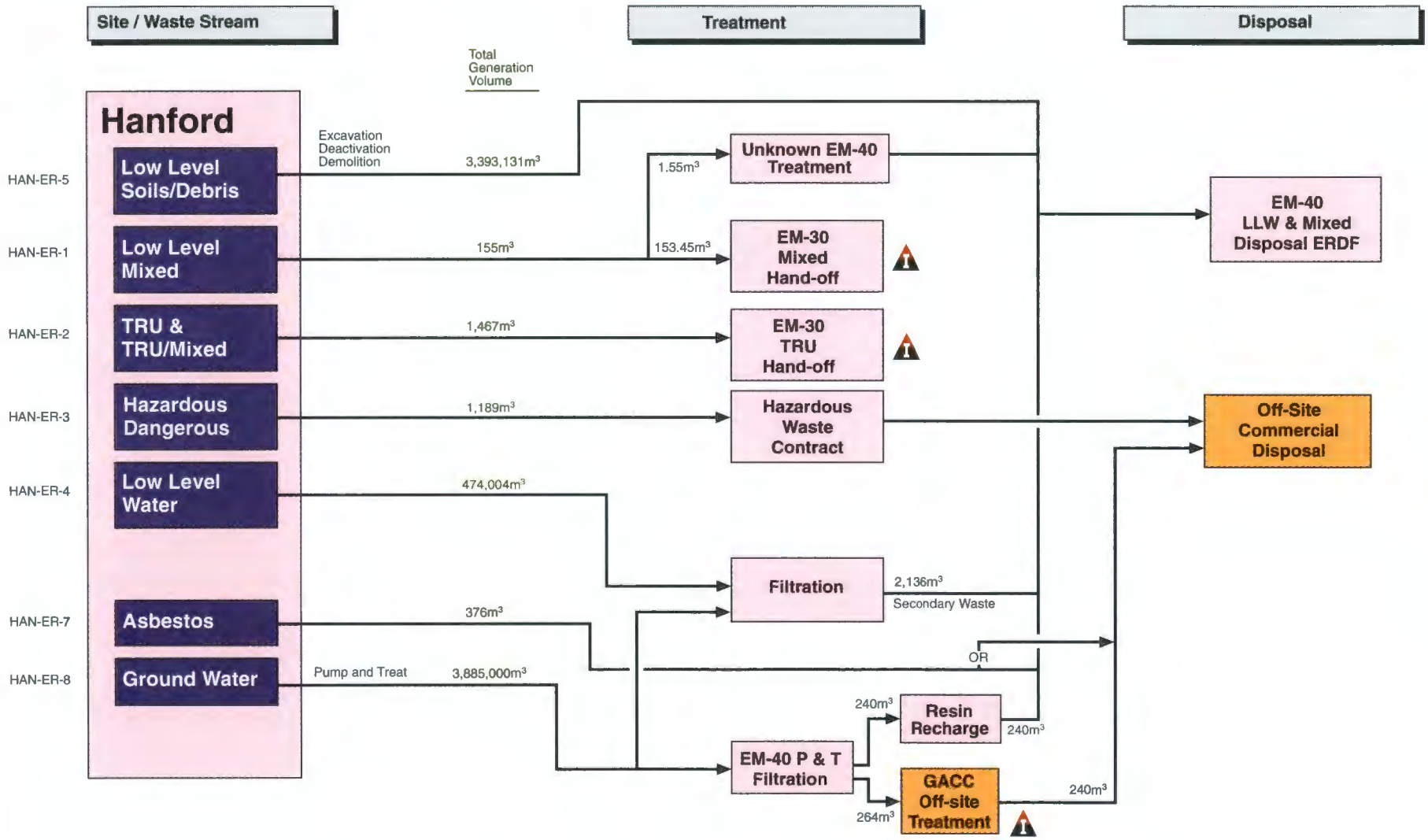

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4/22/97
Enhanced
March TYP

ER Baseline Waste Disposition Map

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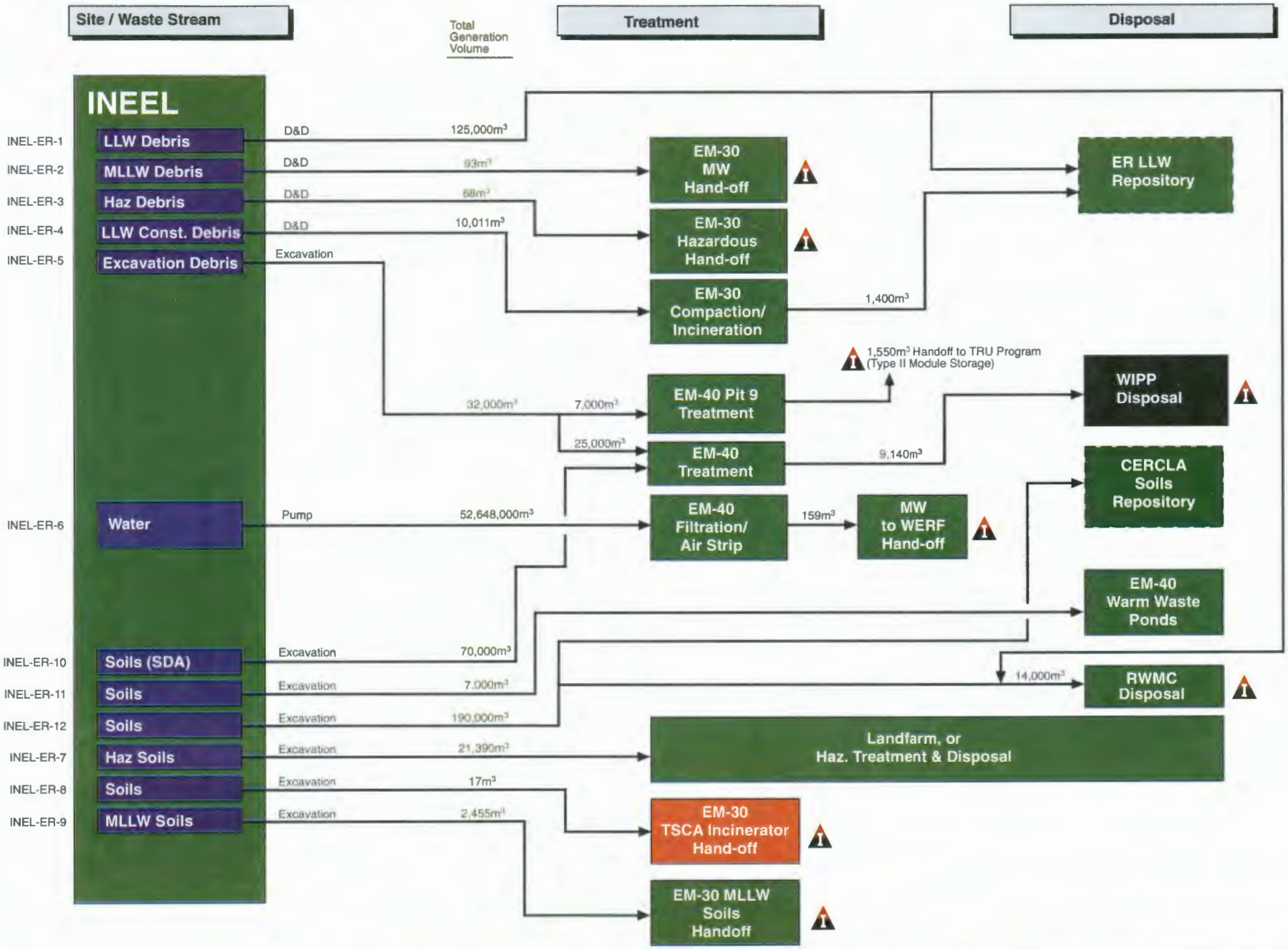

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KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/22/97
Enhanced March TYP

ER Baseline Waste Disposition Map

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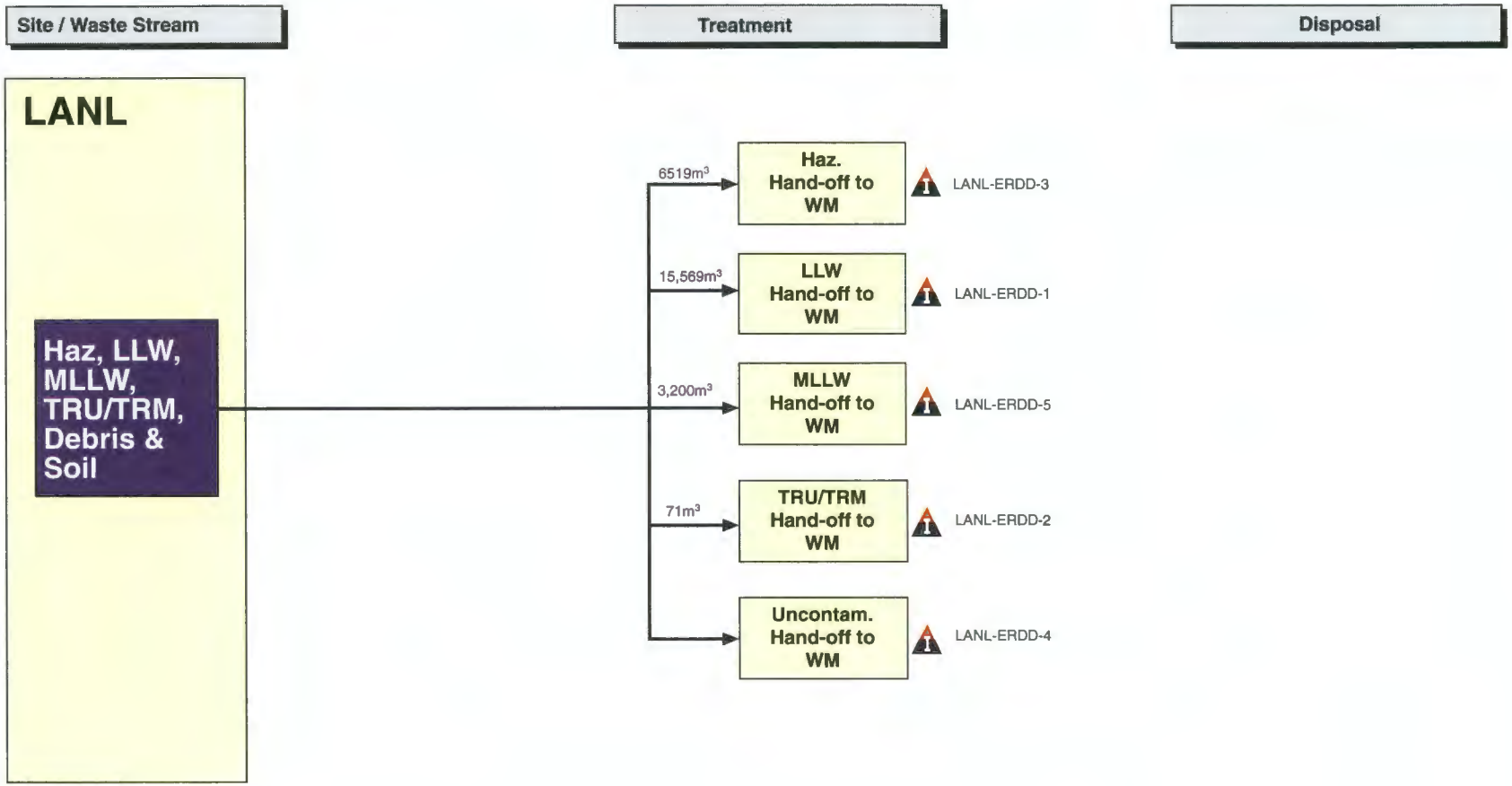

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KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/10/97
Enhanced March TYP

ER Baseline Waste Disposition Map

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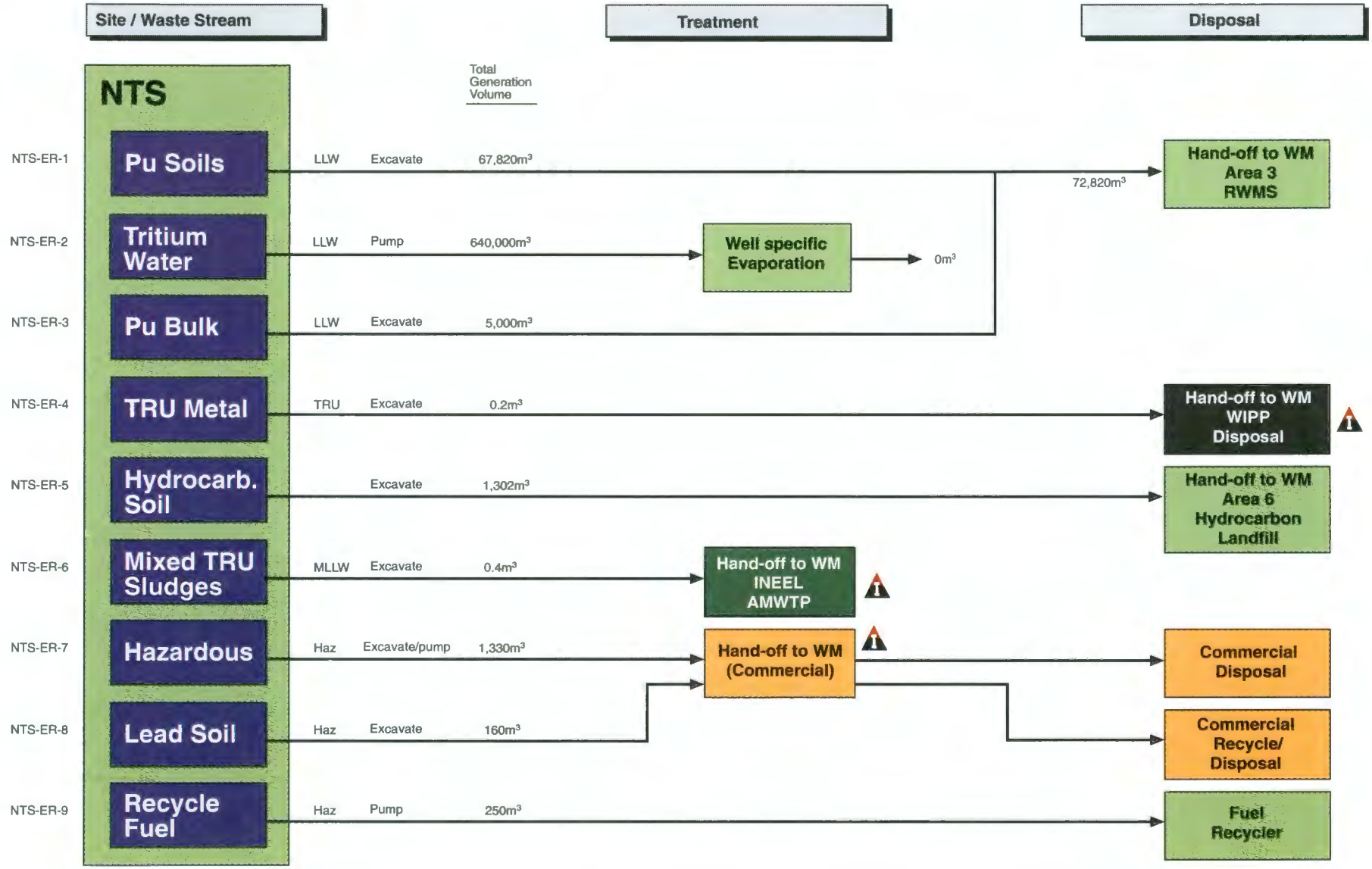

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KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/14/97
Enhanced March TYP

ER Baseline Waste Disposition Map

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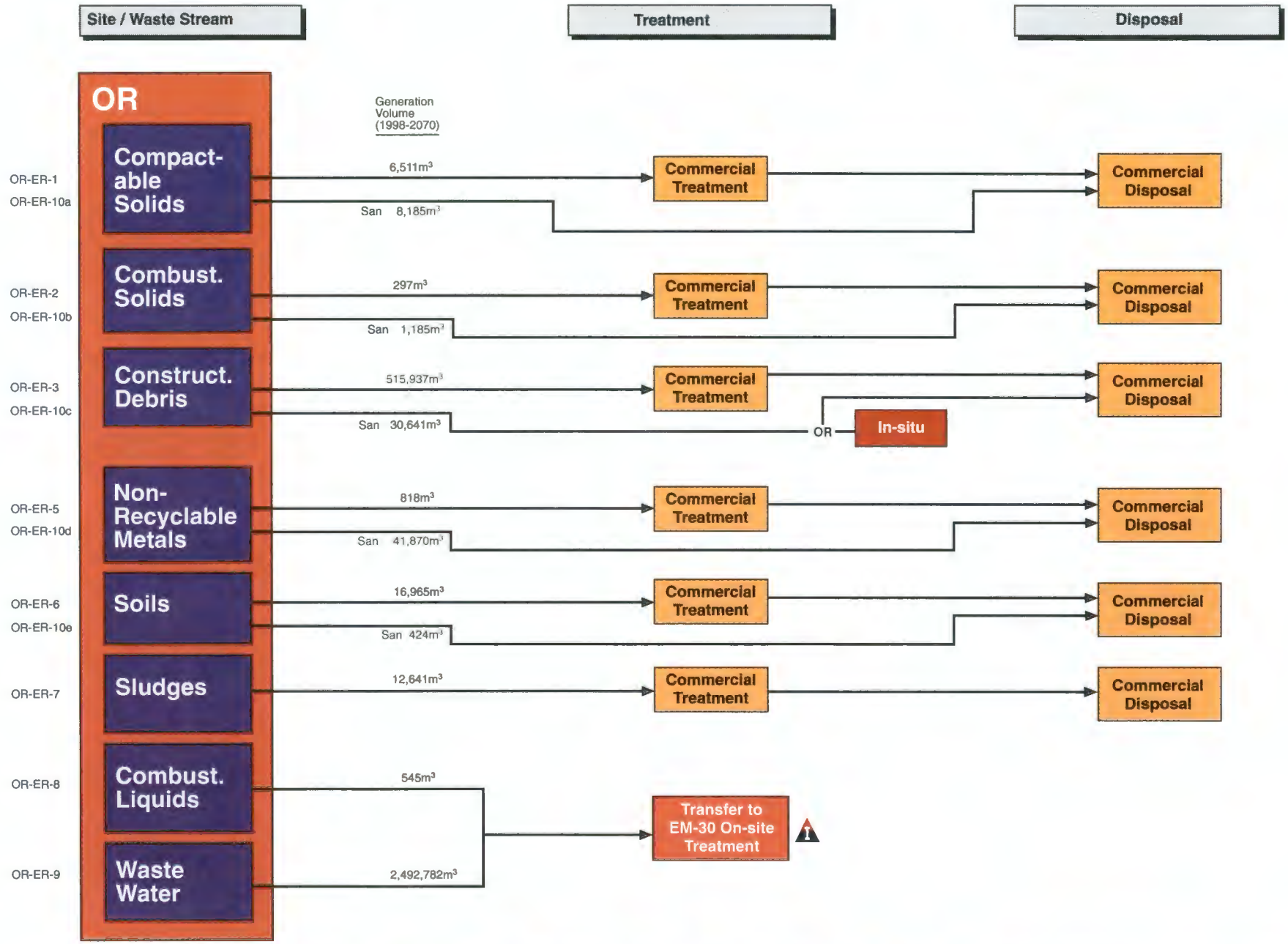

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KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

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Enhanced March TYP

ER Baseline Waste Disposition Map

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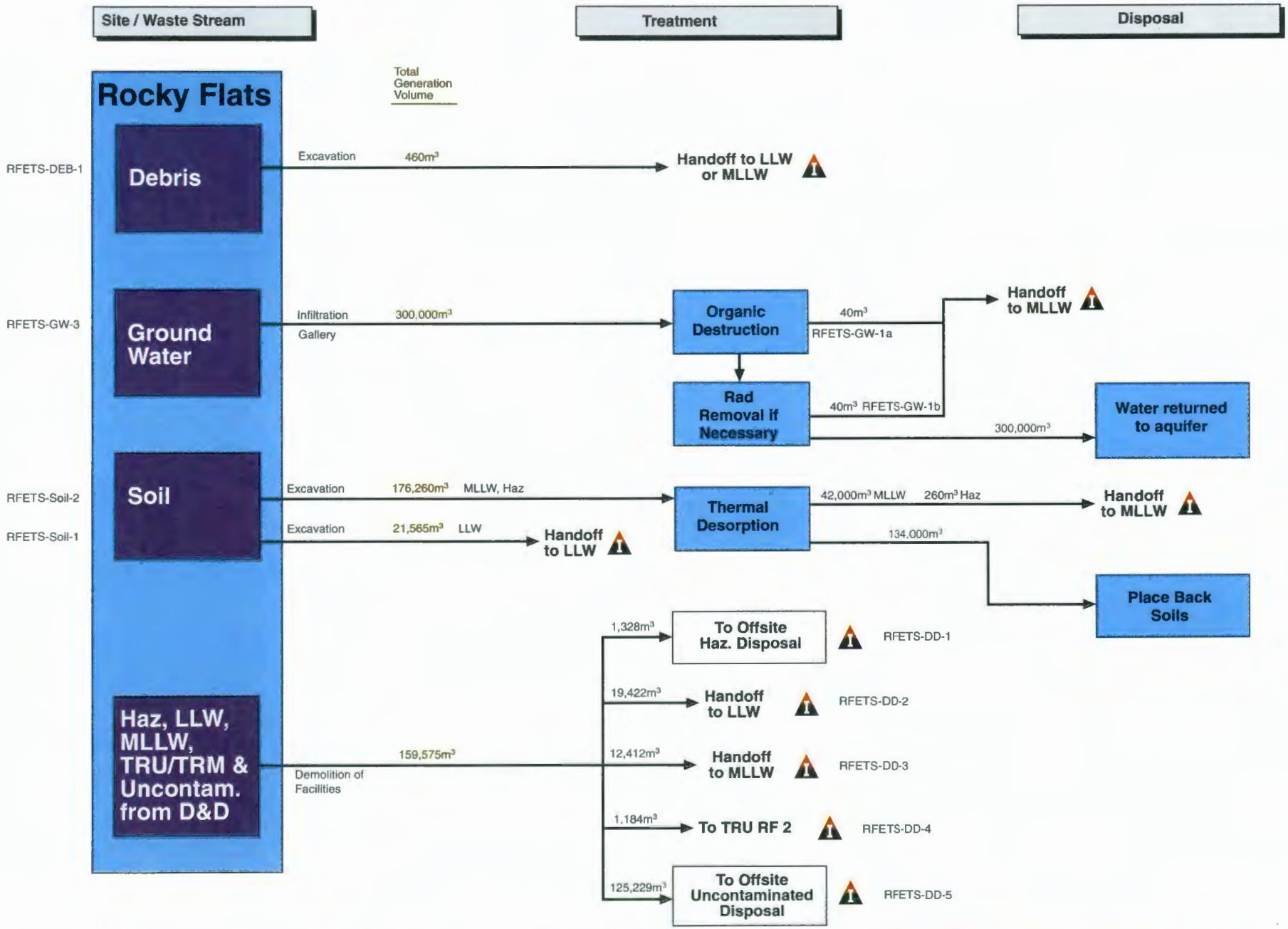

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KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/28/97
Enhanced
March TYP

ER Baseline Waste Disposition Map

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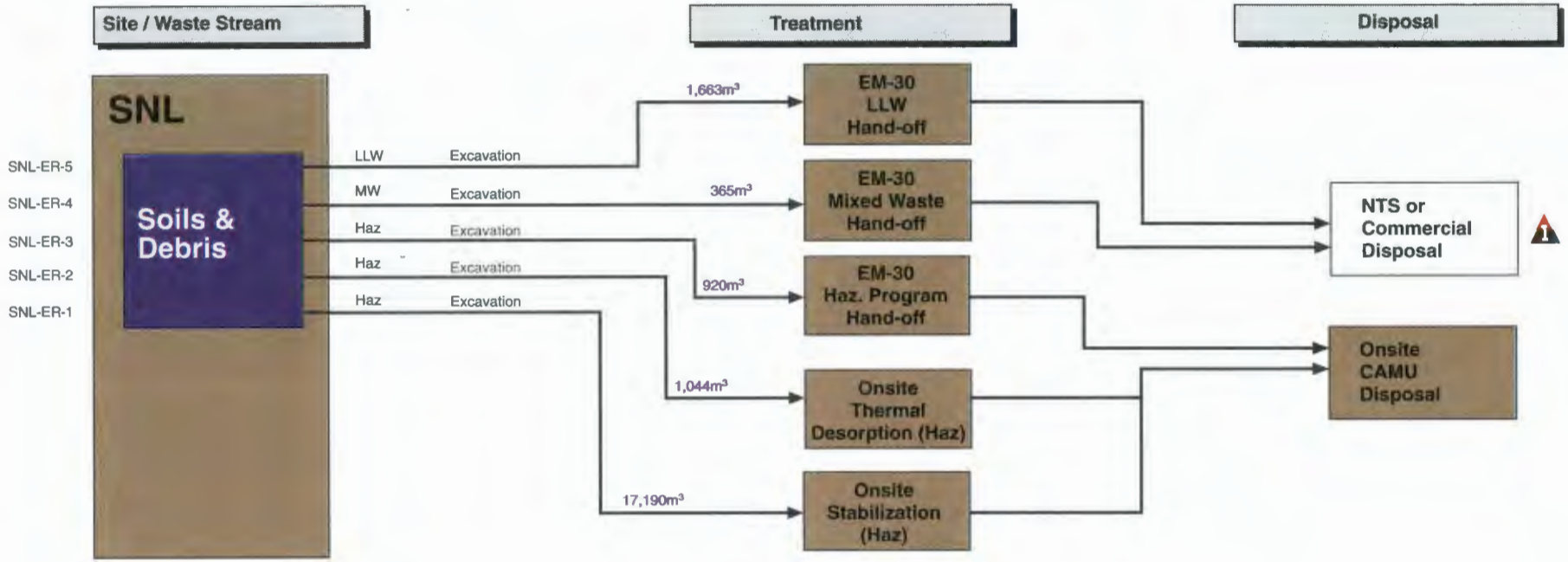

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KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/9/97
Enhanced March TYP

ER Baseline Waste Disposition Map

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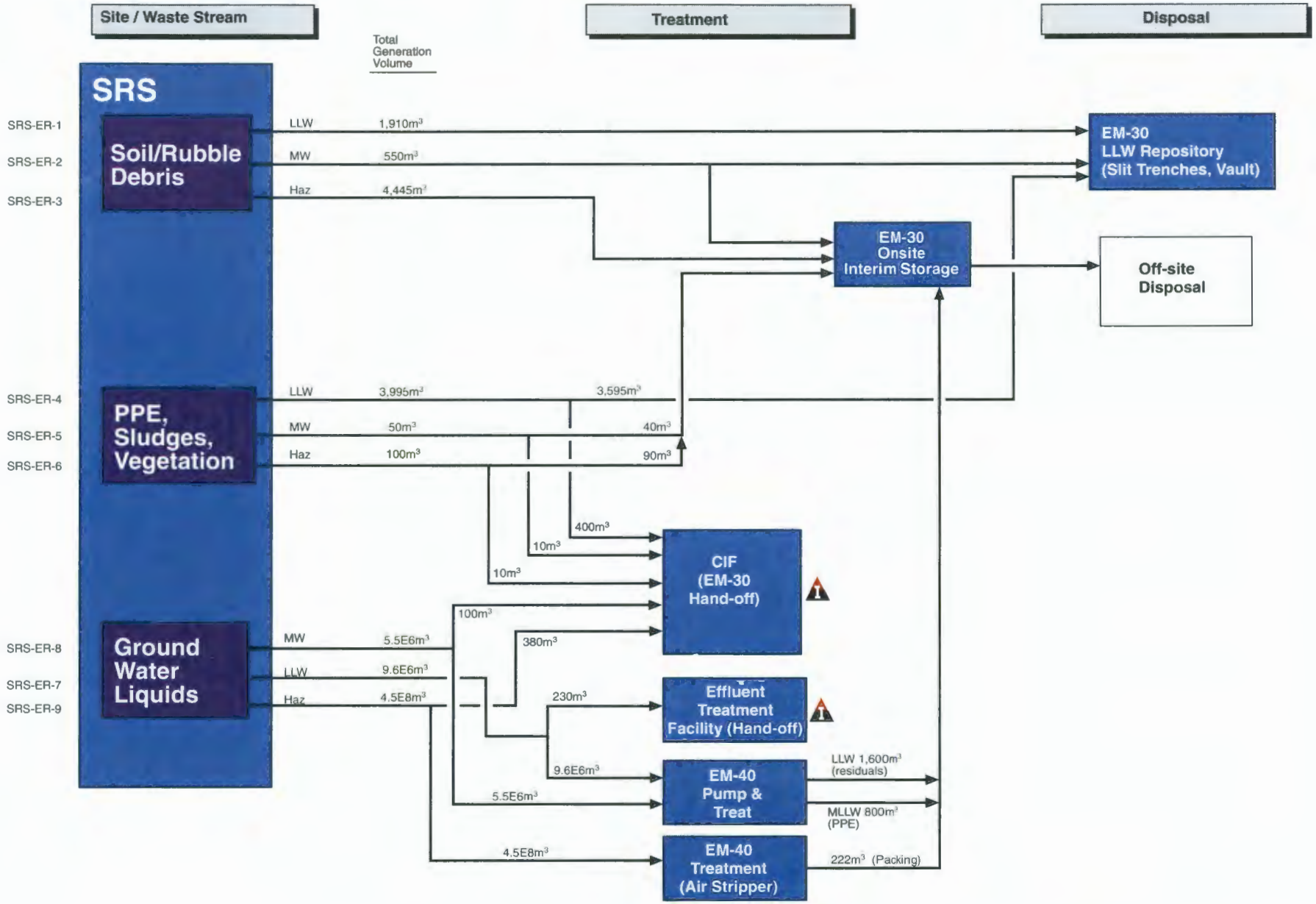

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KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/17/97
Enhanced March TYP

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Attachment 8

ER Disposition Map for Preferred Alternative

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ER Alternative Waste Disposition Map

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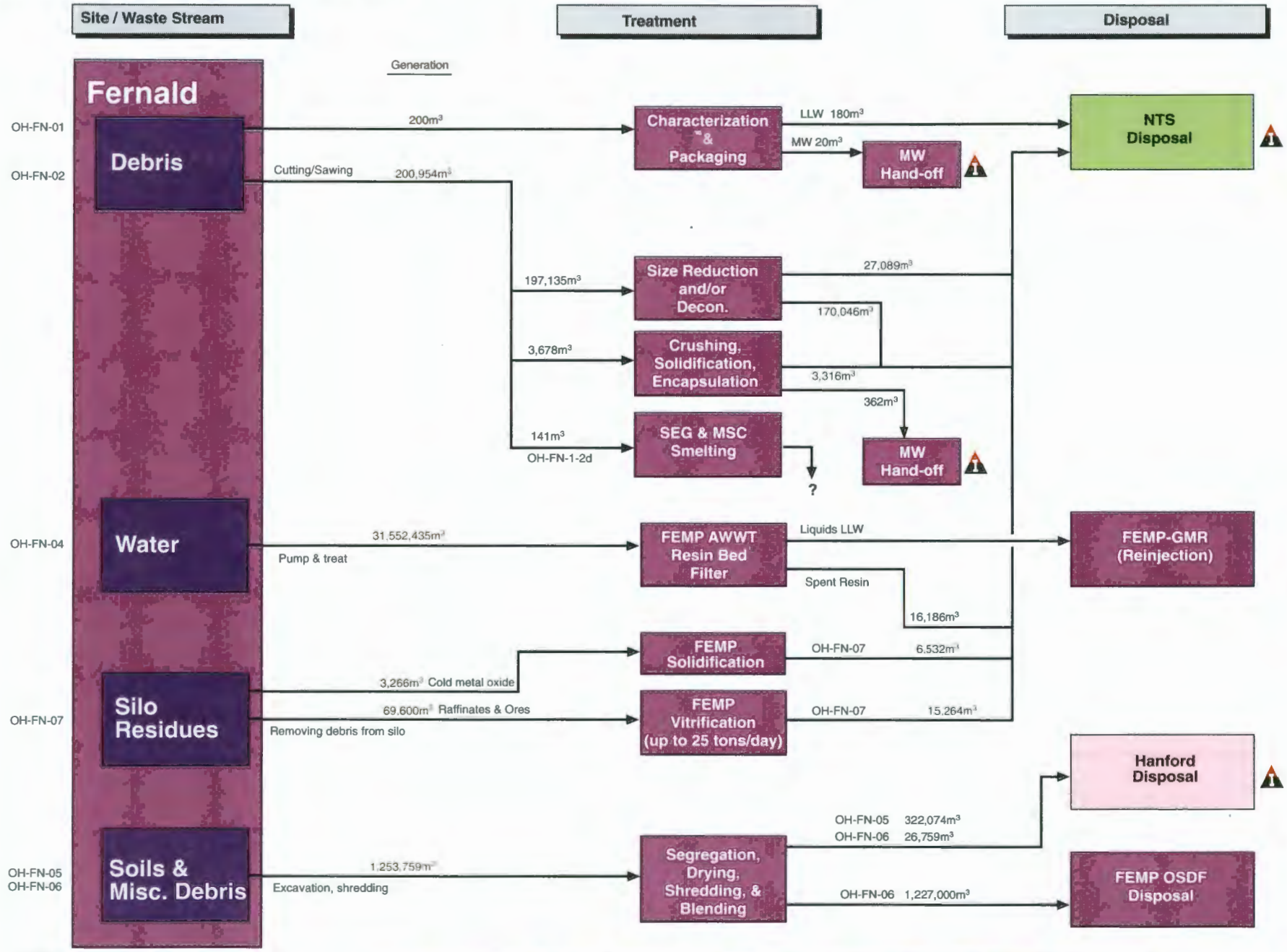

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KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

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ER Alternative Waste Disposition Map

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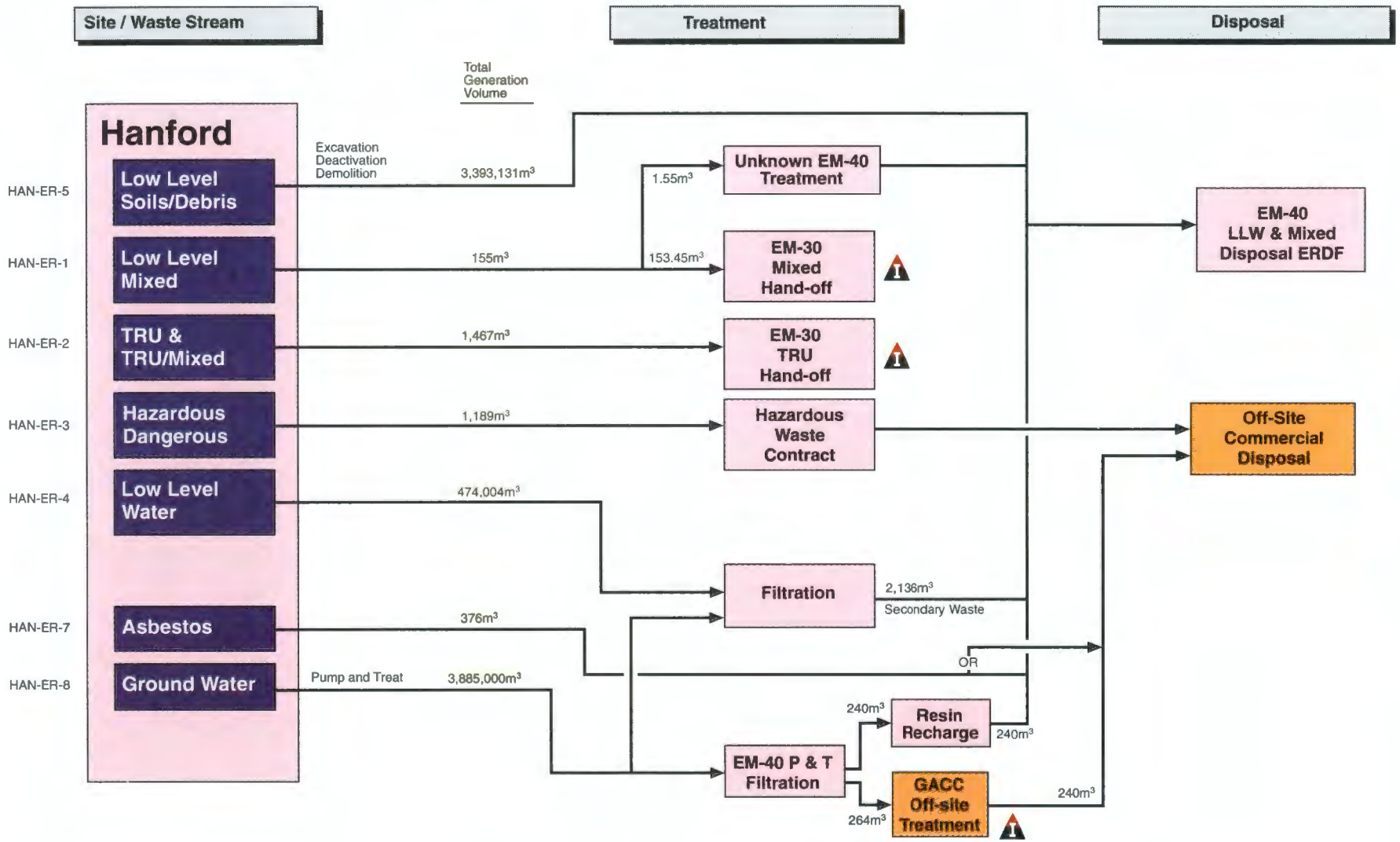

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KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/28/97

ER Alternative Waste Disposition Map

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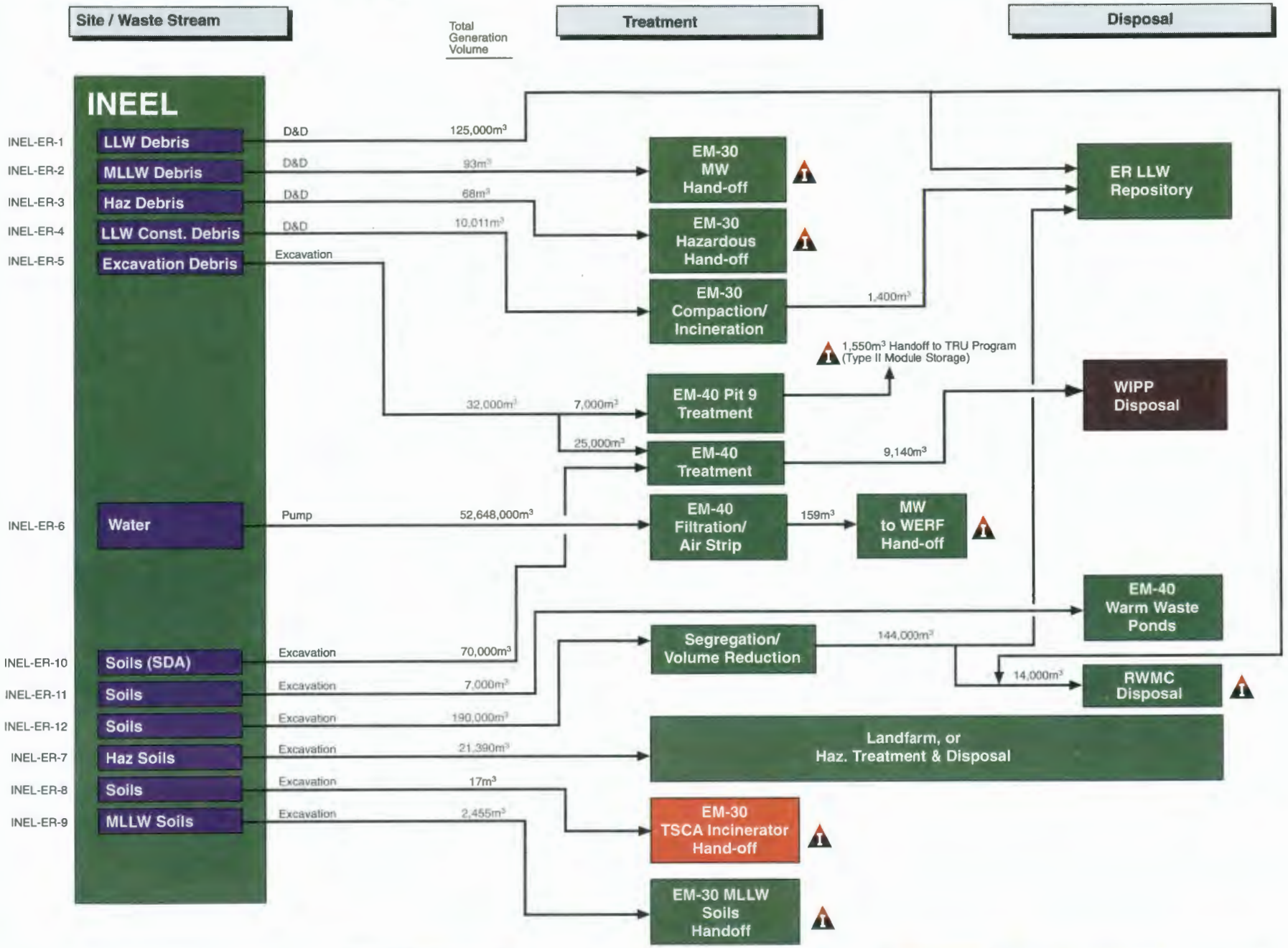

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KEY: INEEL | OR | Fernald | Rocky Flats | SRL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/22/97

ER Alternative Waste Disposition Map

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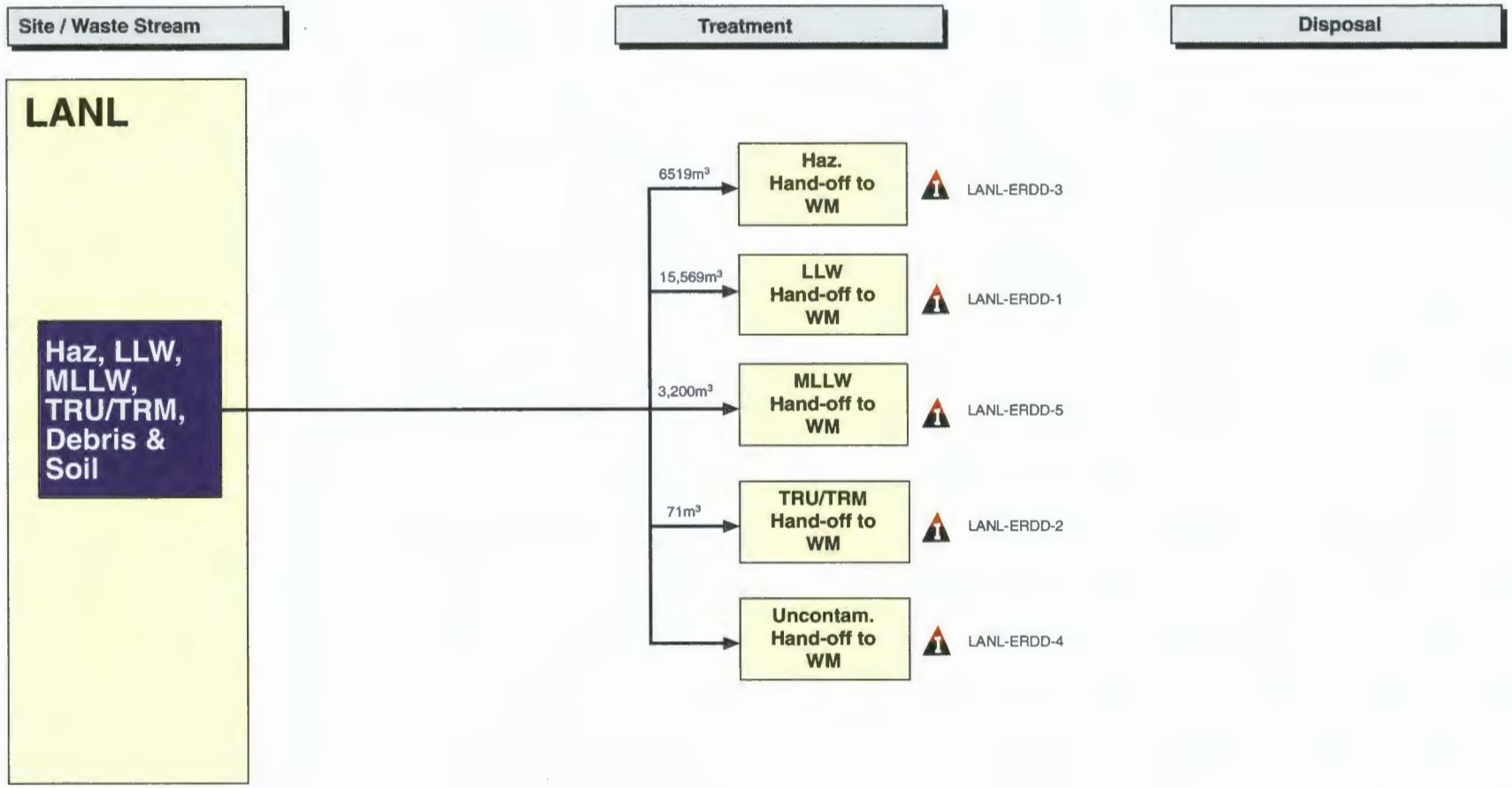

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KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/10/97

ER Alternative Waste Disposition Map

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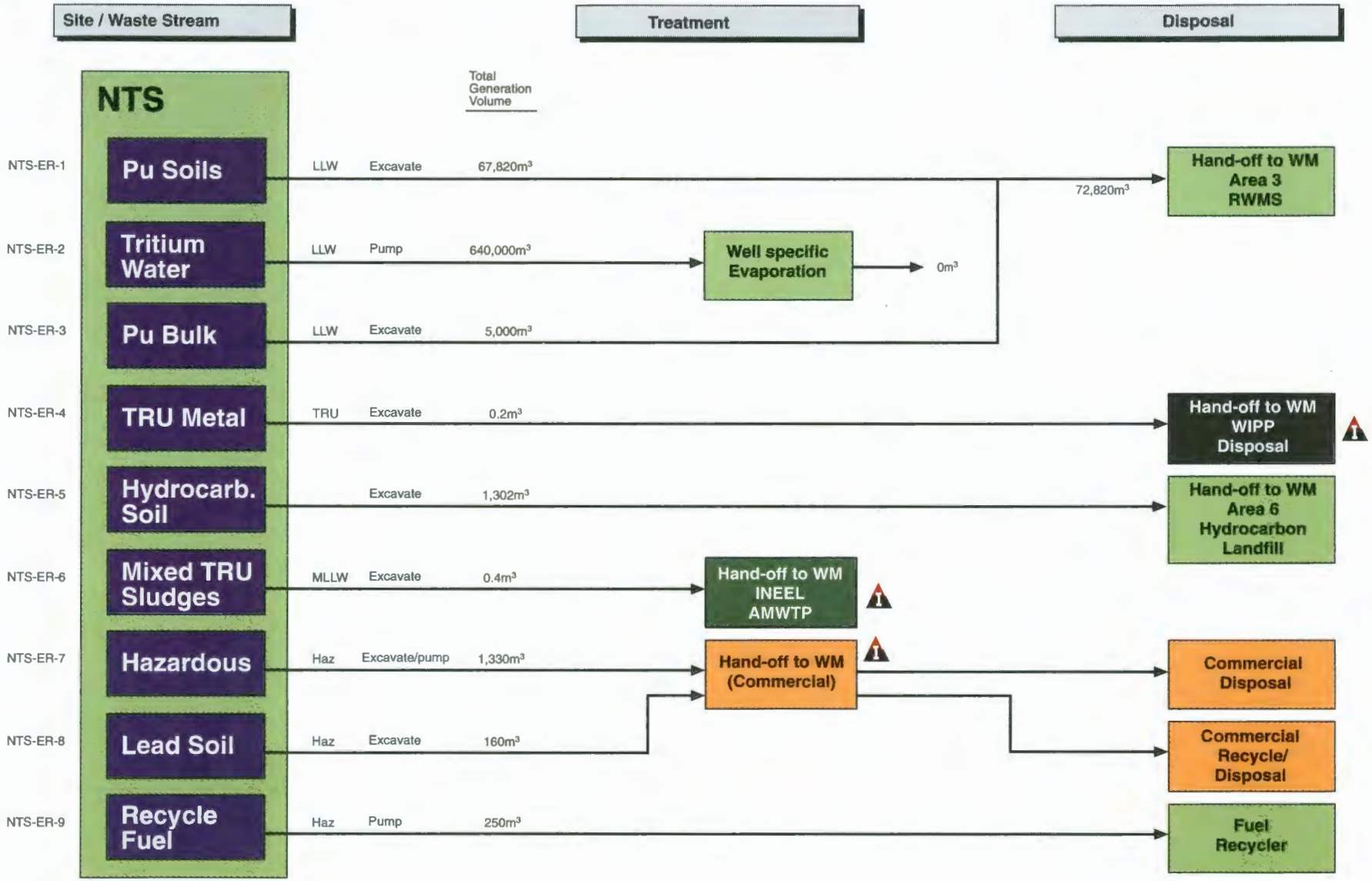

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KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/28/97

ER Alternative Waste Disposition Map

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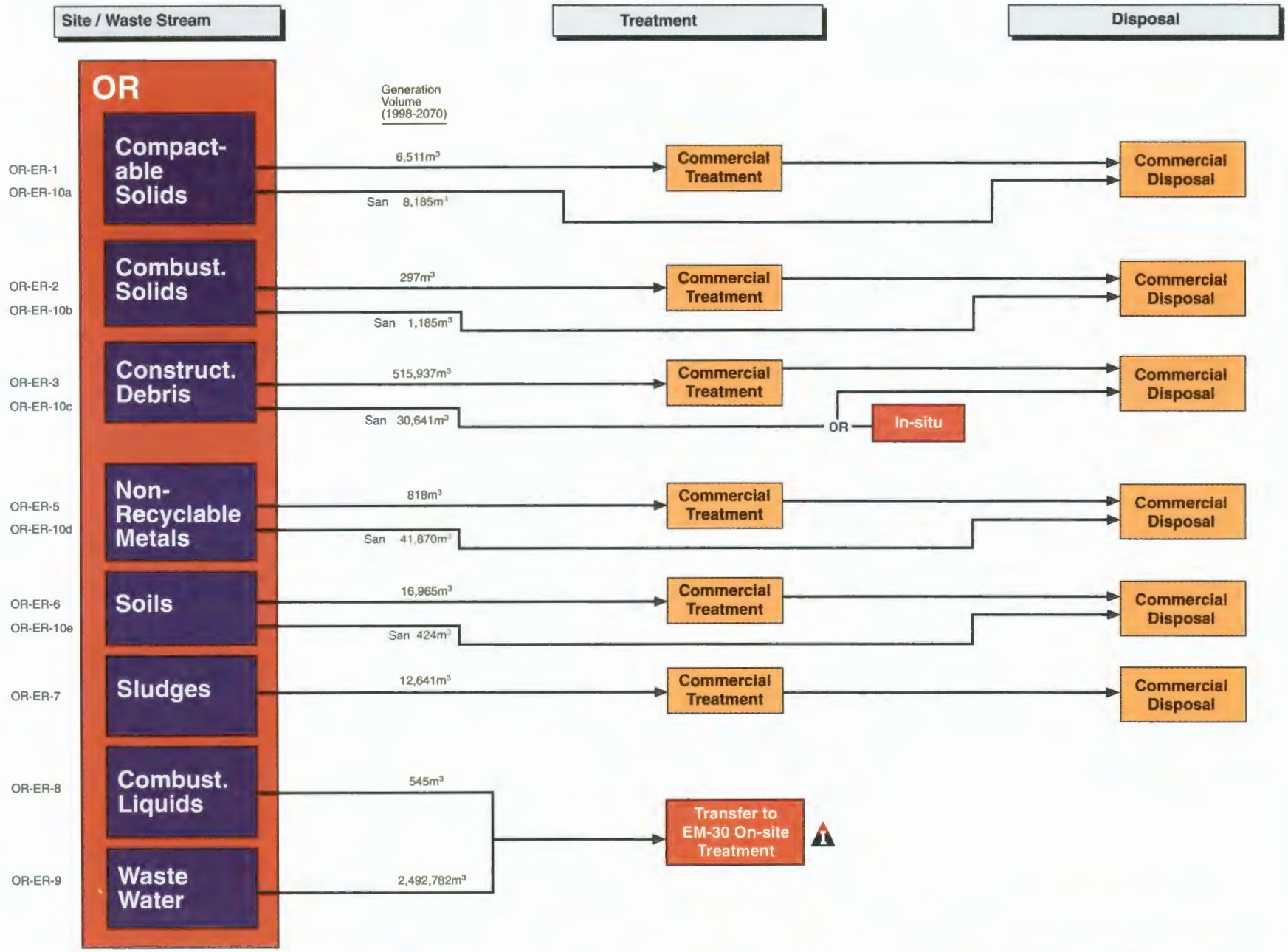

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ER Alternative Waste Disposition Map

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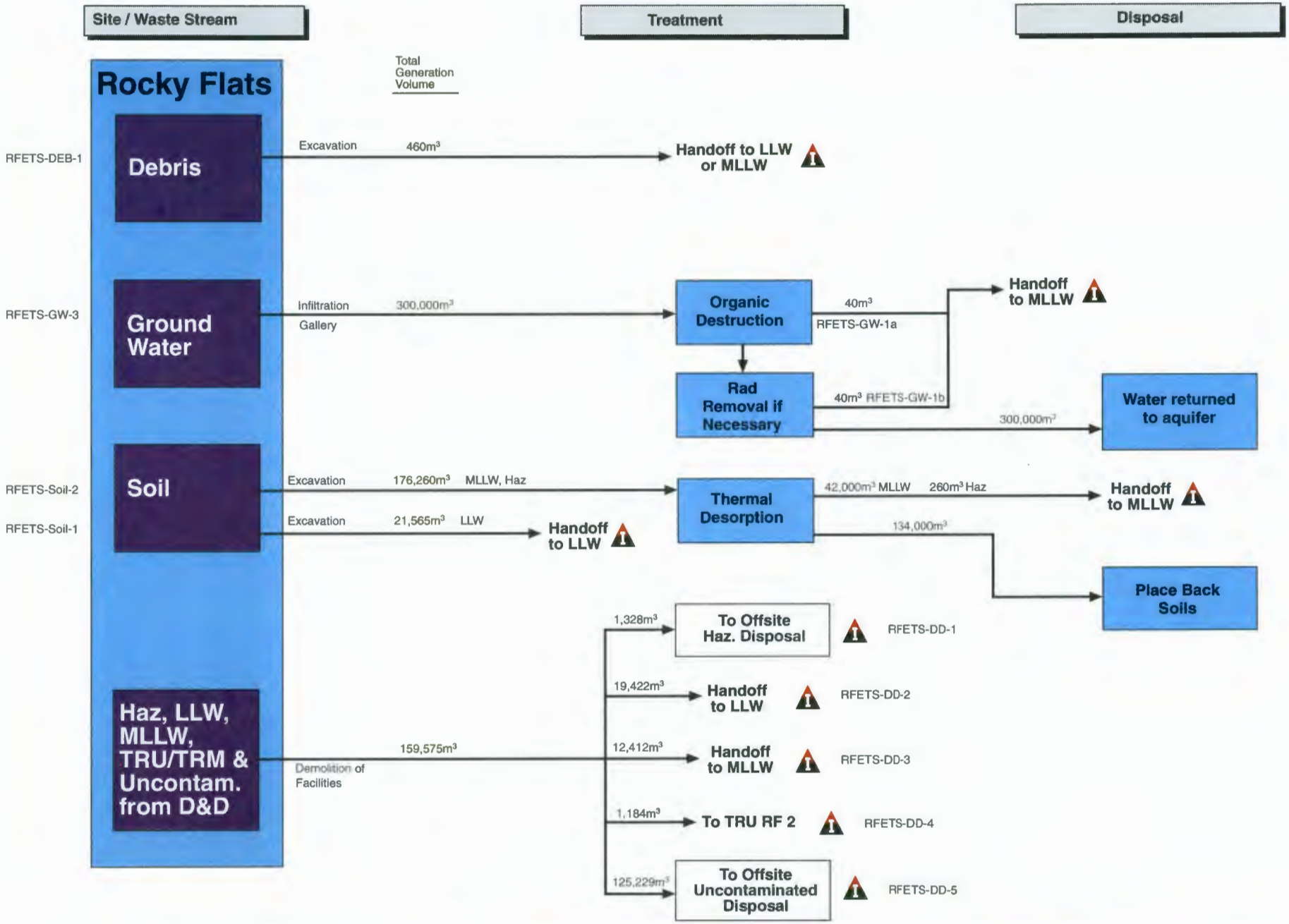

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KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/28/97

ER Alternative Waste Disposition Map

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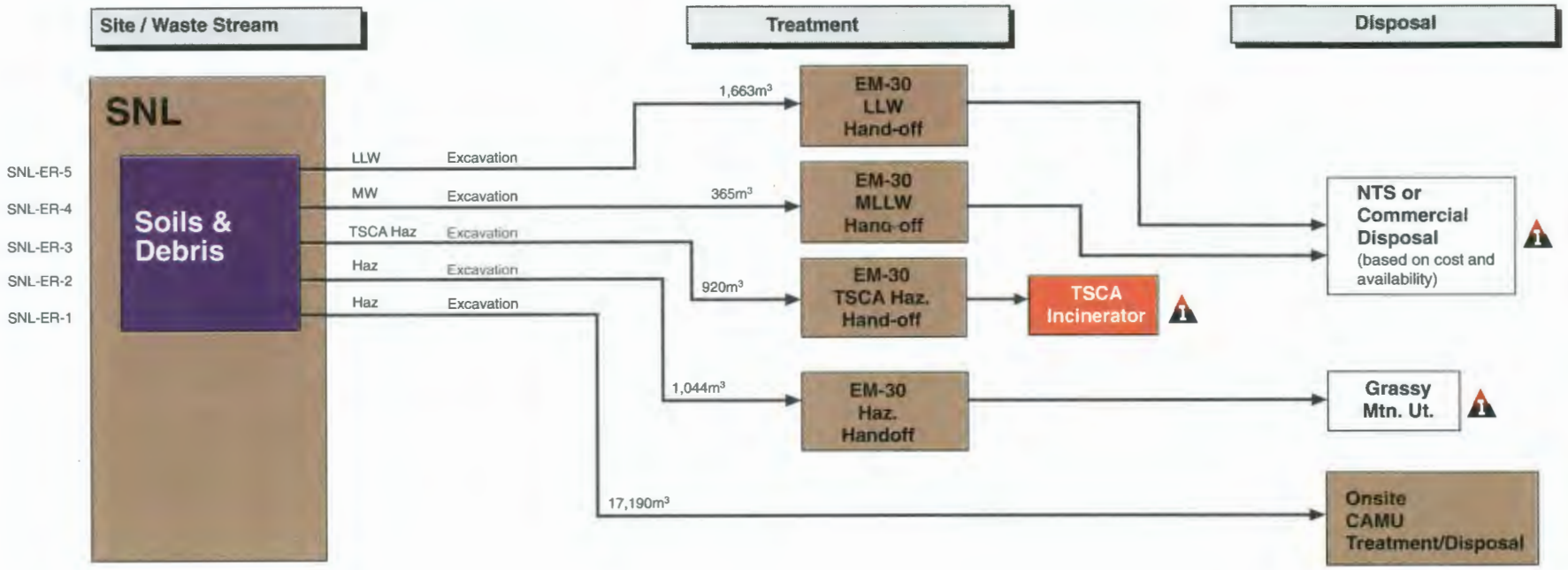

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4/9/97

ER Alternative Waste Disposition Map

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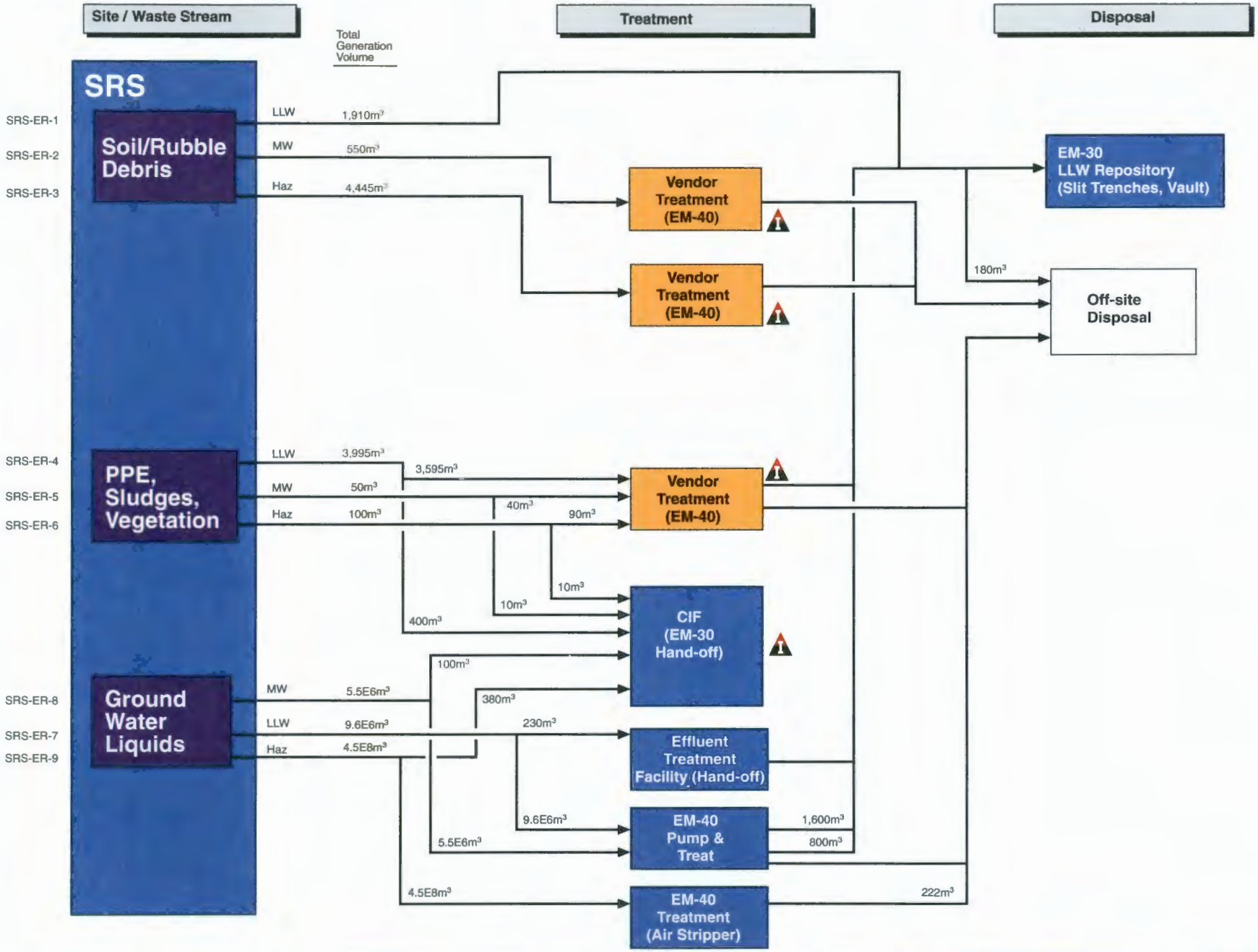

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KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/29/97

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Attachment 9

HLW Enhanced March Baseline Disposition Map

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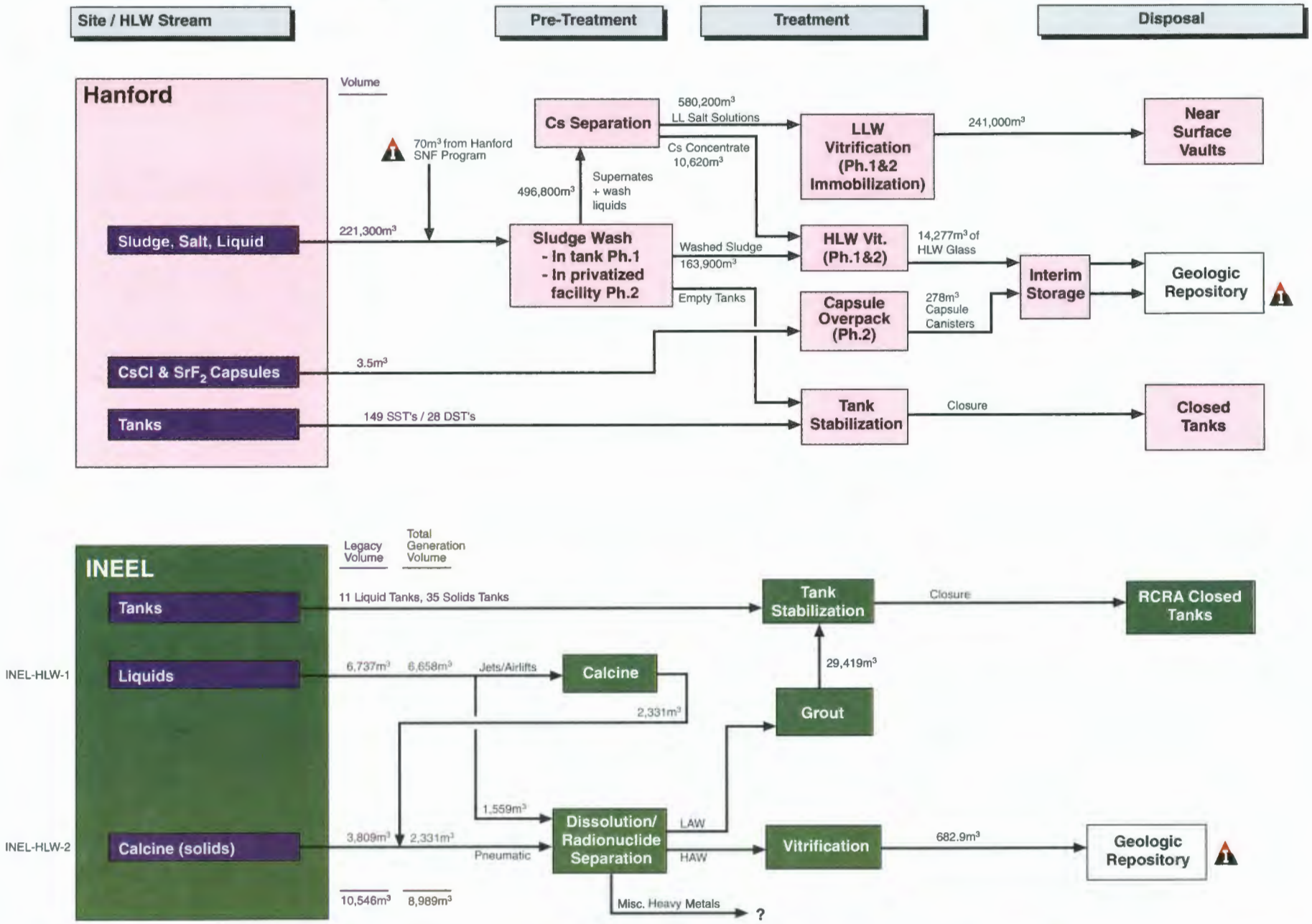
HLW Baseline Disposition Map

PREDECISIONAL DRAFT



KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/28/97
Enhanced March TYP

HLW Baseline Disposition Map

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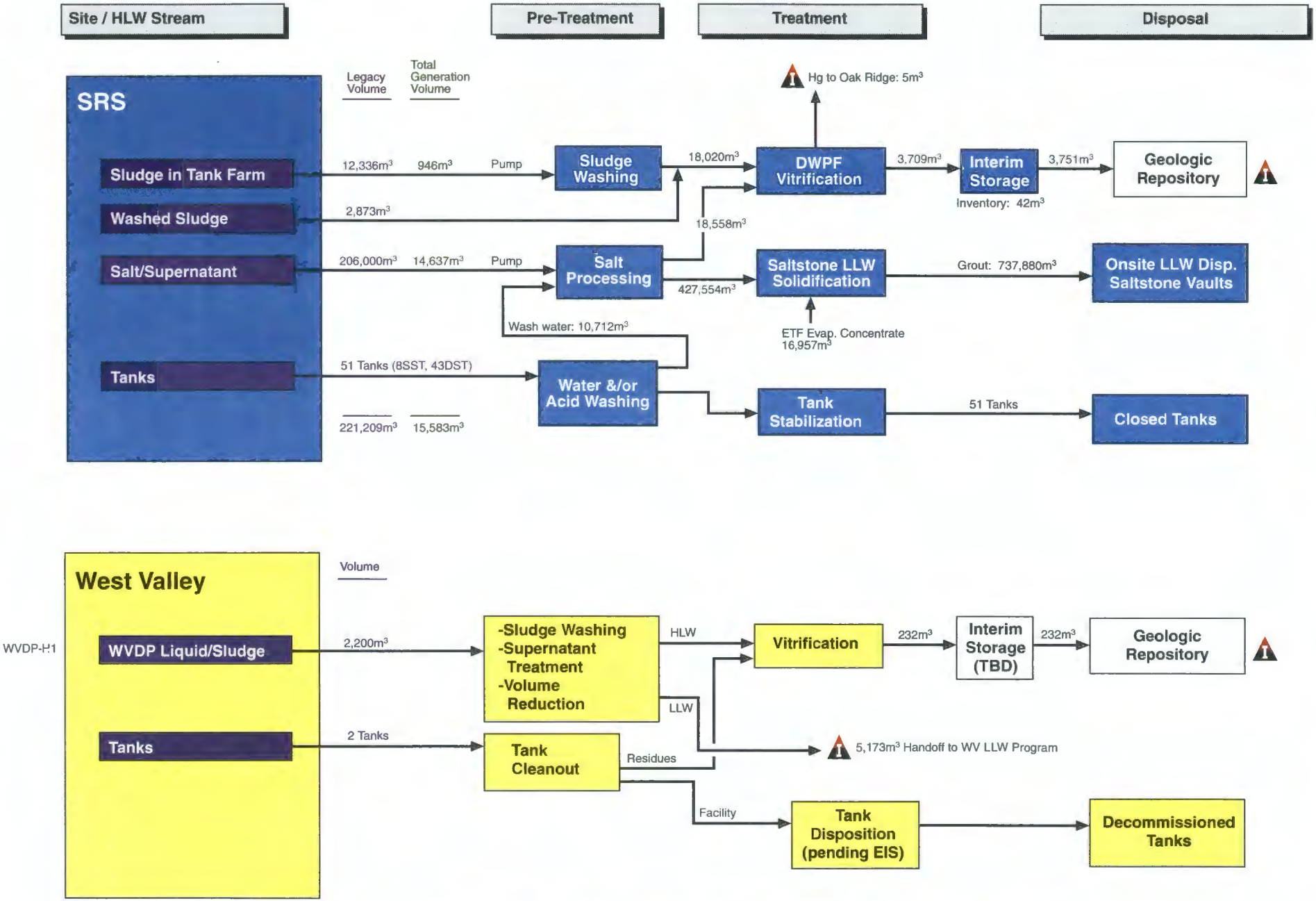

4/16/97
Enhanced March TYP

Attachment 10

HLW Disposition Map for Preferred Alternative

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HLW Alternative Disposition Map

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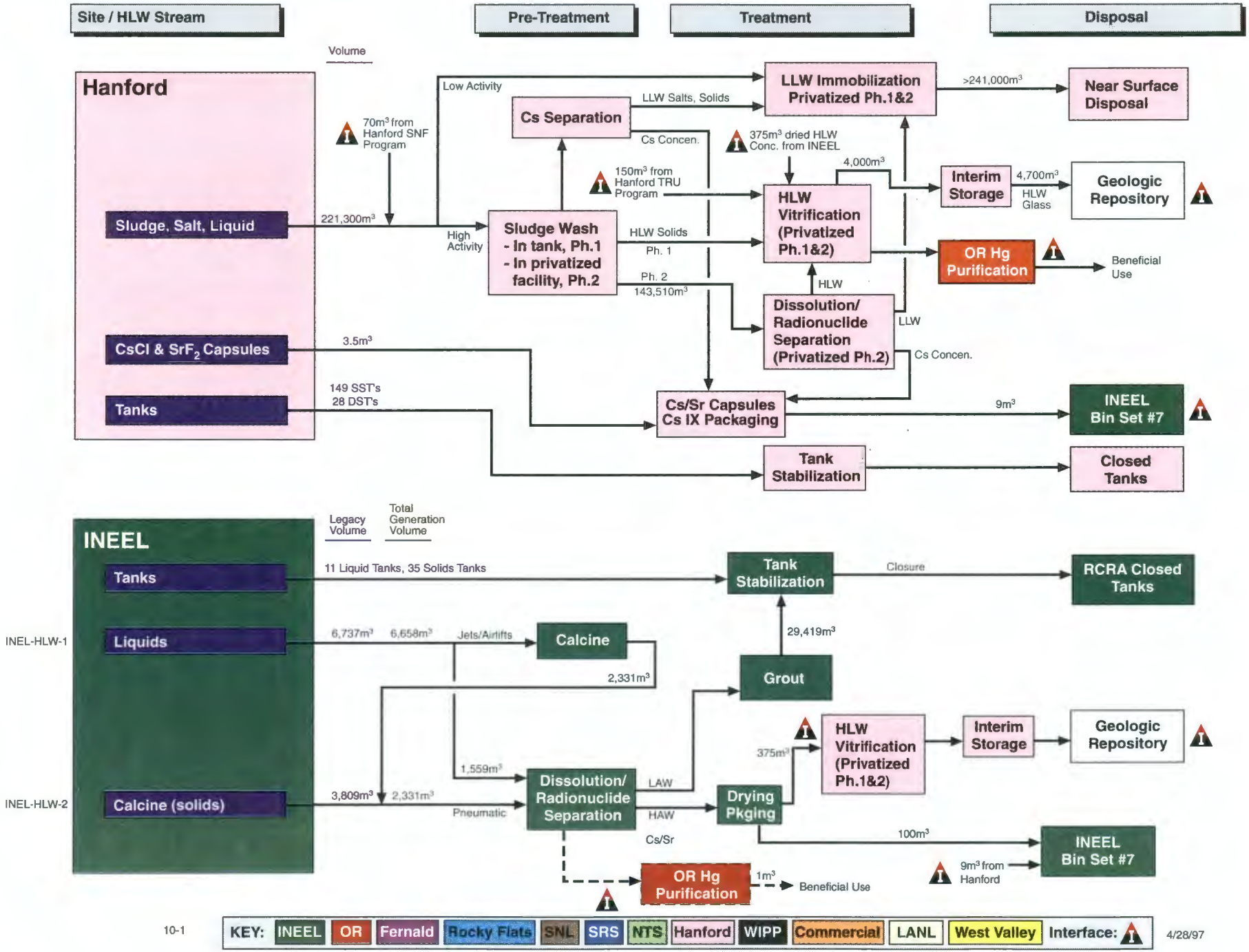

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HLW Alternative Disposition Map

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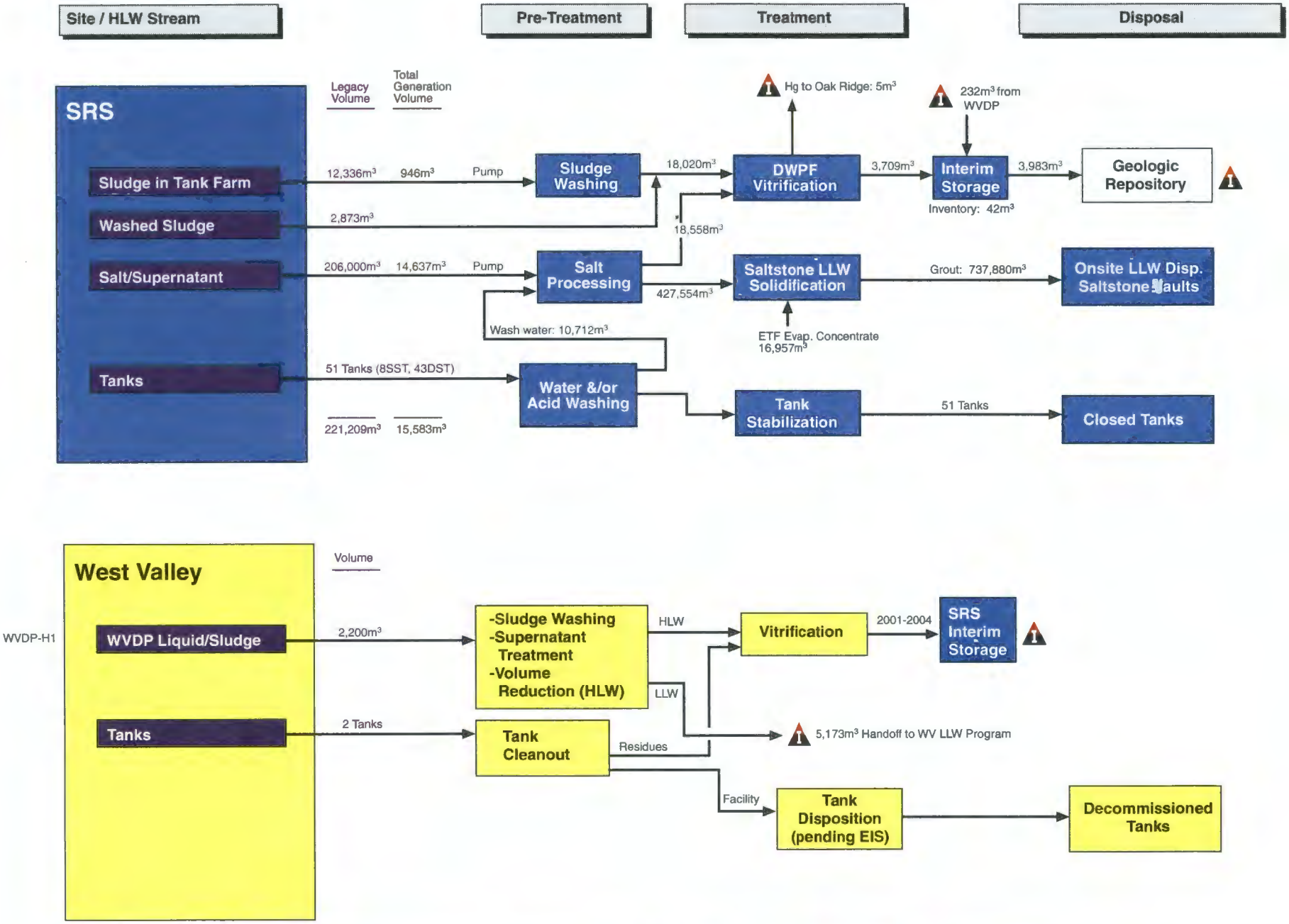

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Attachment 11

SNF Enhanced March Baseline Disposition Map

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SNF Baseline Disposition Map

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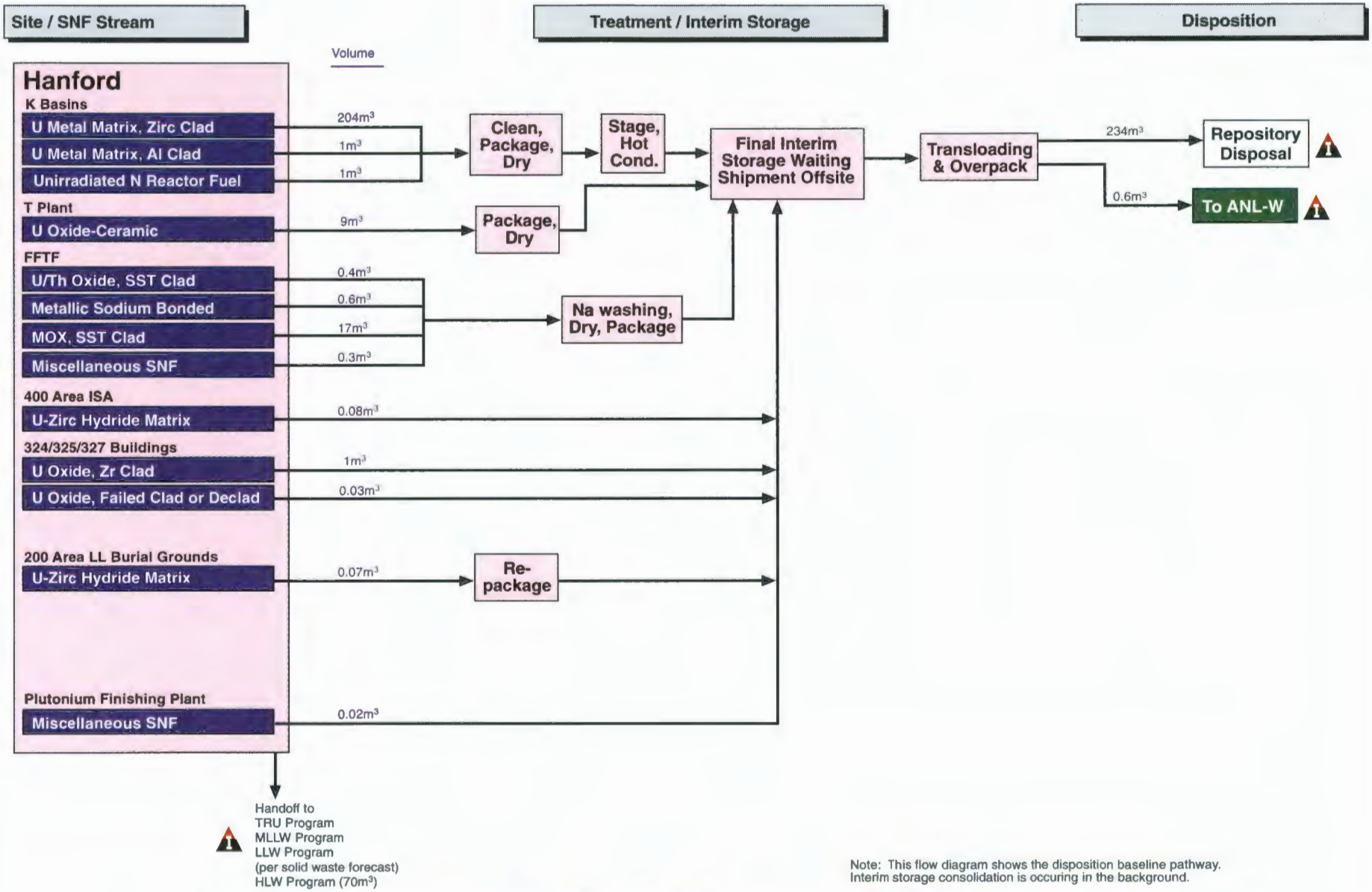

Note: This flow diagram shows the disposition baseline pathway.
Interim storage consolidation is occuring in the background.

KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/28/97
Enhanced
March TYP

SNF Baseline Disposition Map

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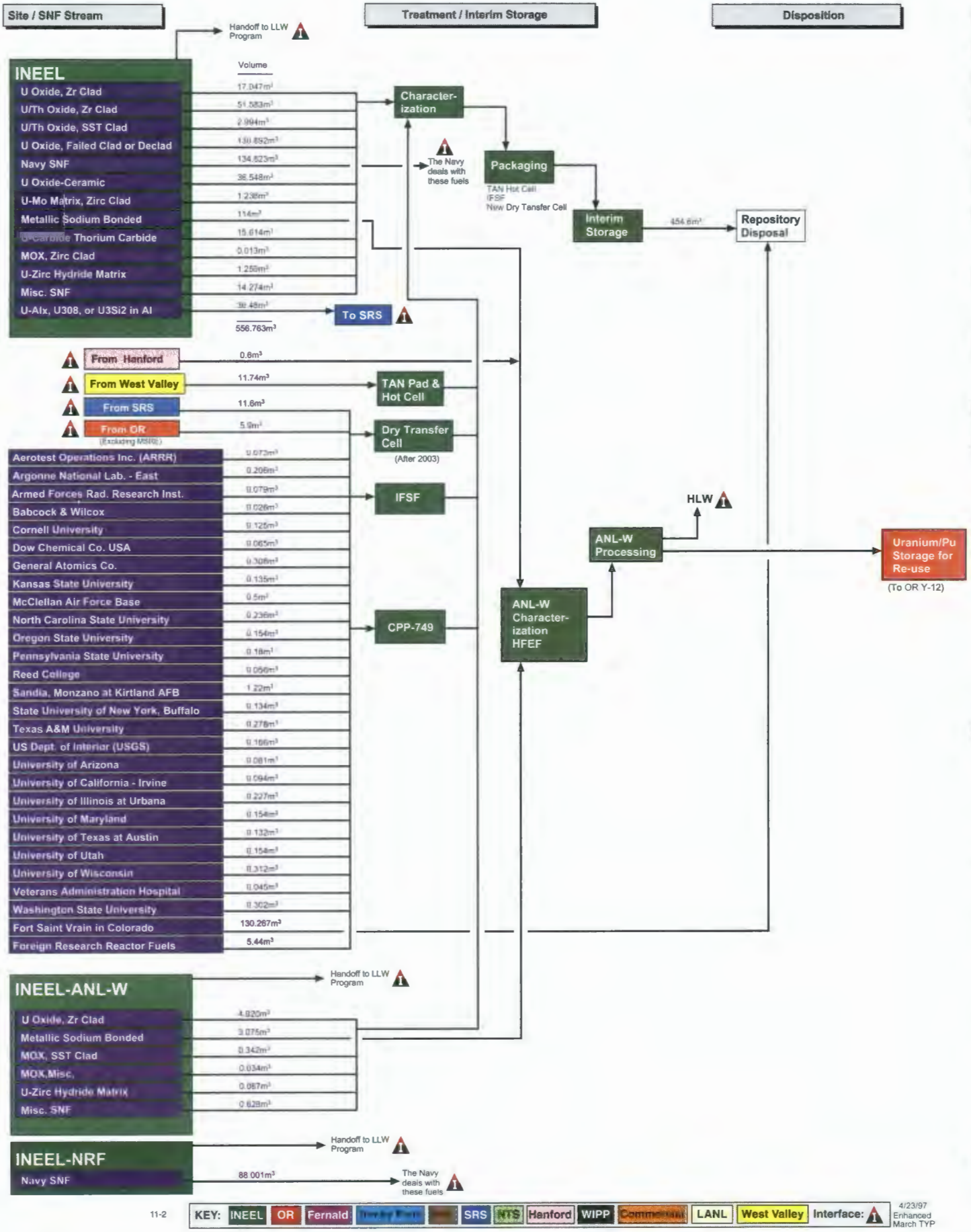

SNF Baseline Disposition Map

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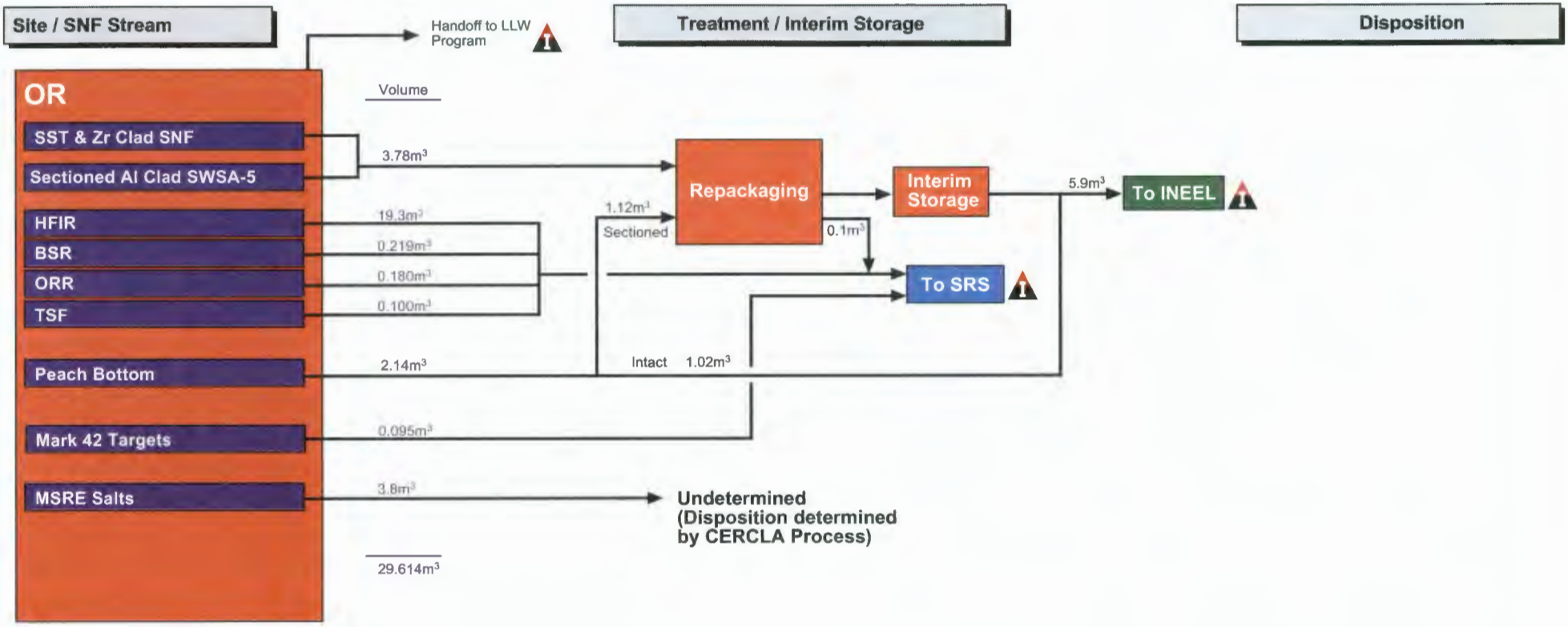
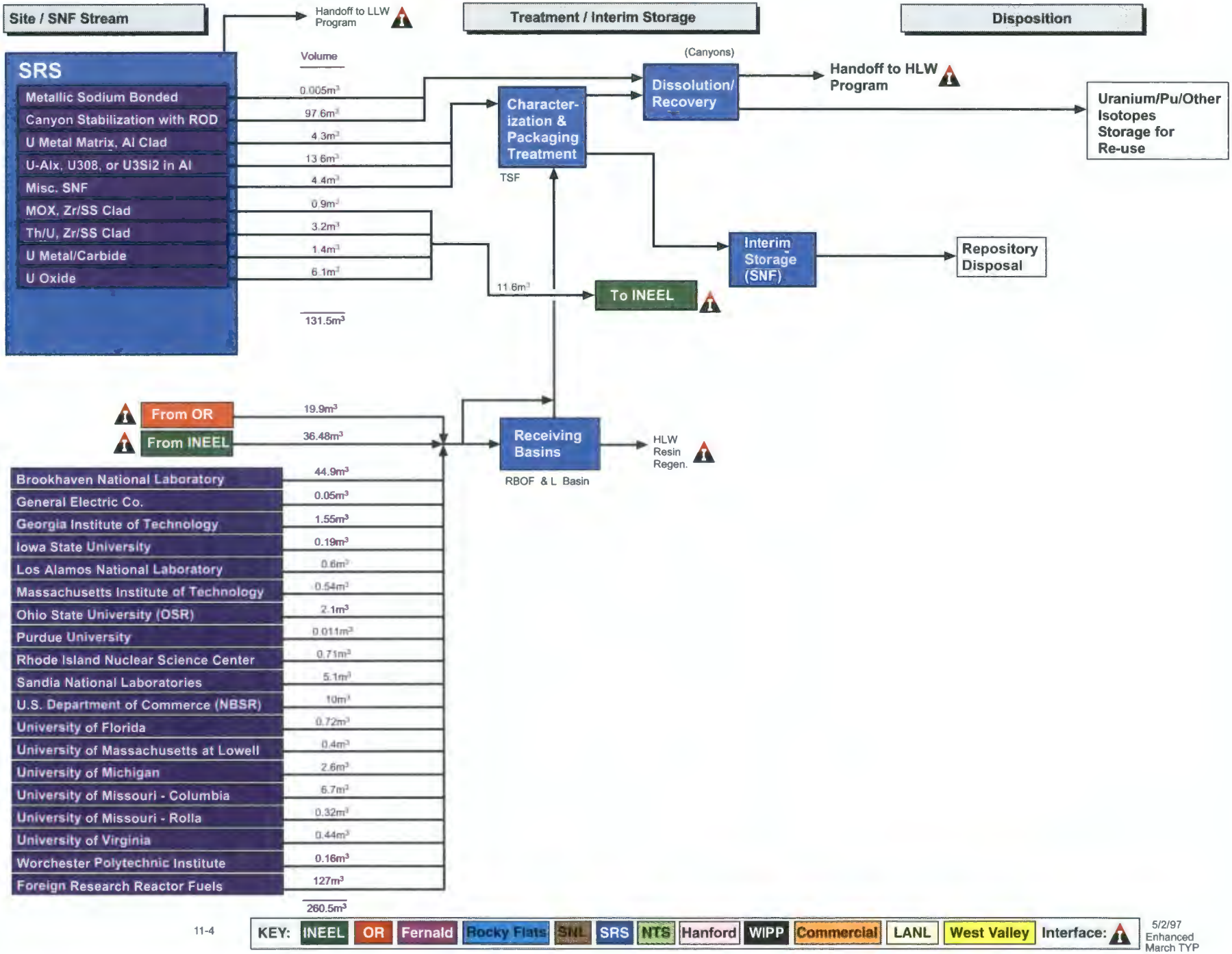


KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/22/97
Enhanced
March TYP

SNF Baseline Disposition Map

PREDECISIONAL DRAFT



Attachment 12

SNF Disposition Map for Preferred Alternative

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SNF Alternative Disposition Map

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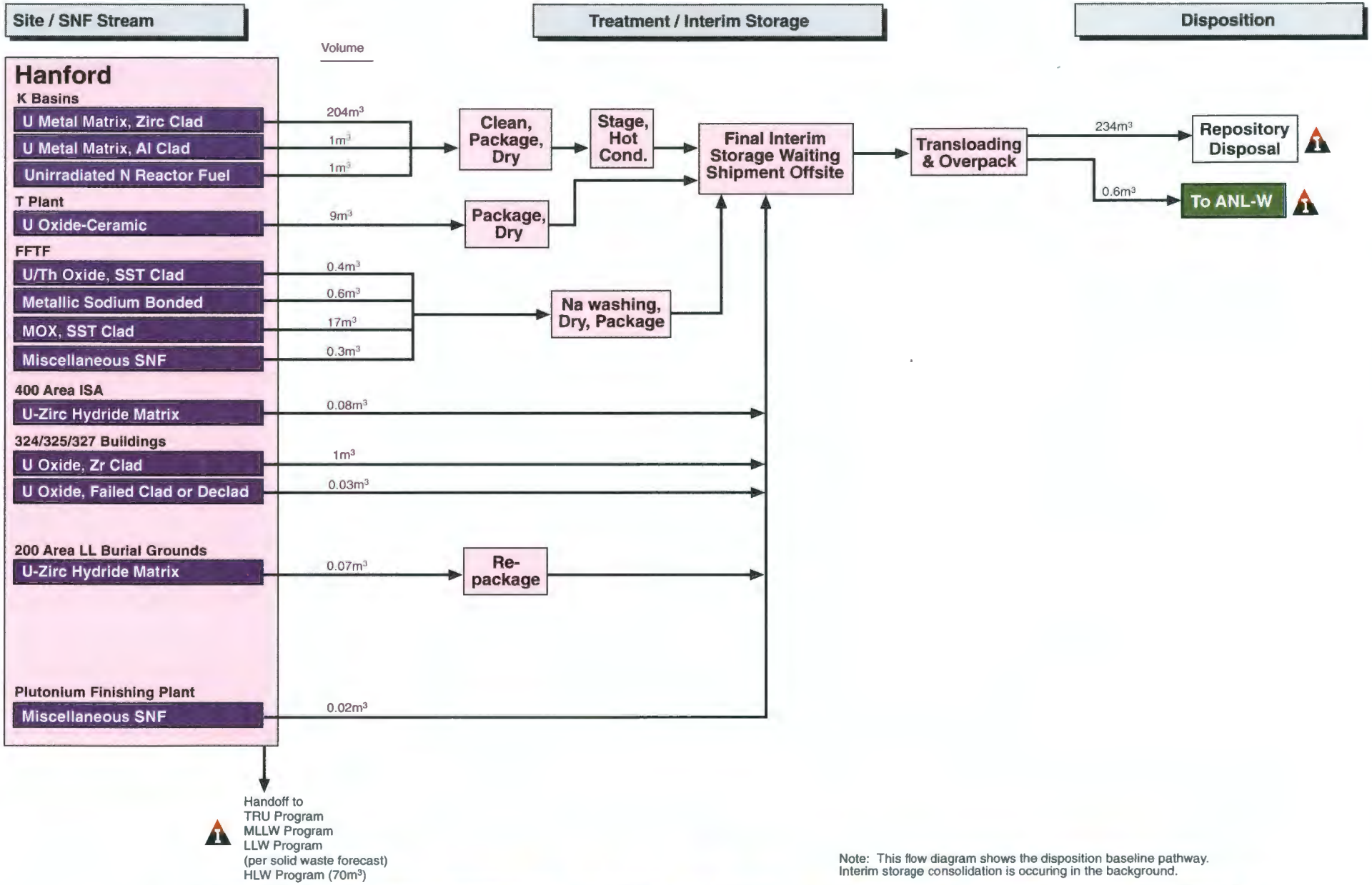

Note: This flow diagram shows the disposition baseline pathway.
Interim storage consolidation is occuring in the background.

KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

4/28/97

SNF Alternative Disposition Map

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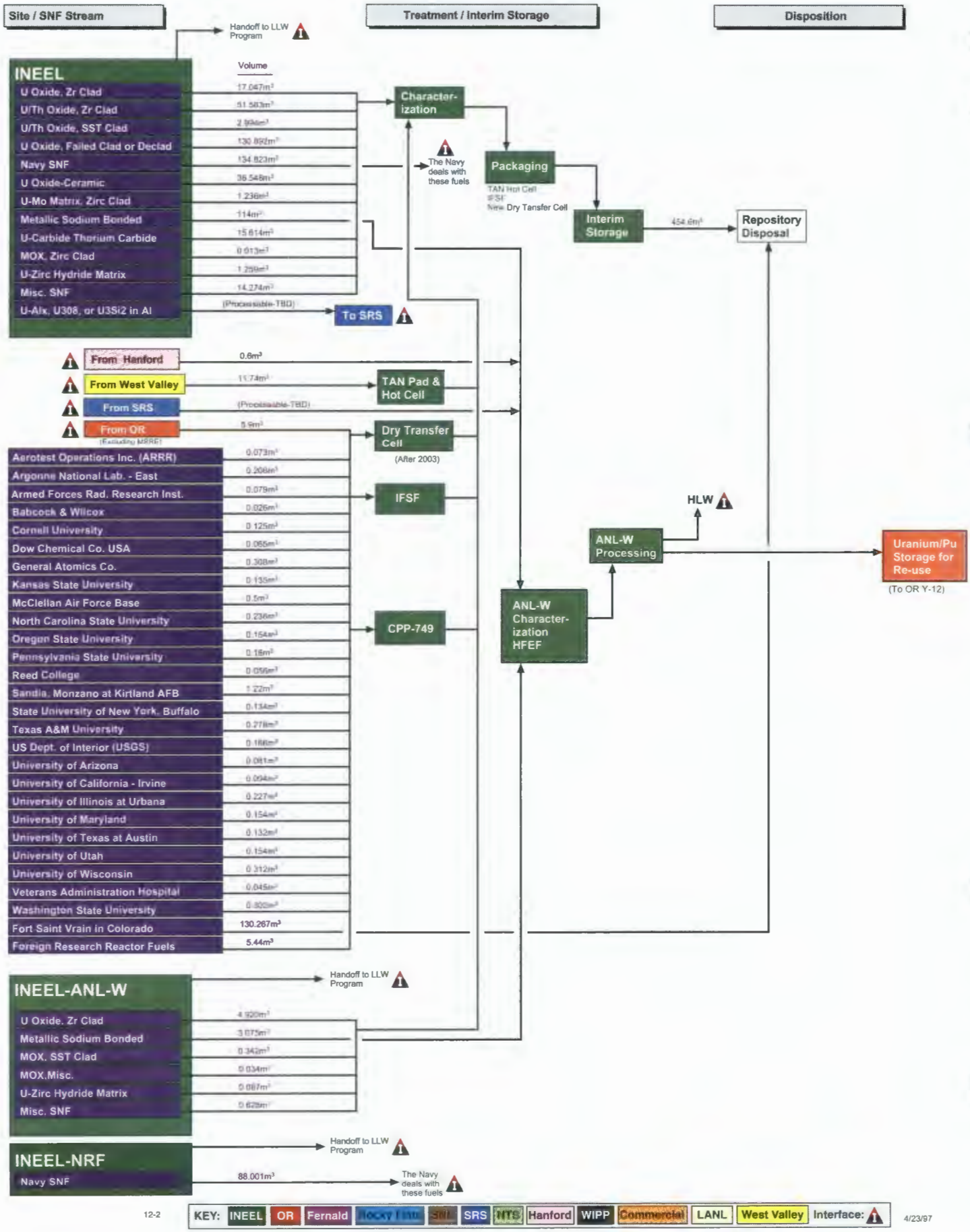

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SNF Alternative Disposition Map

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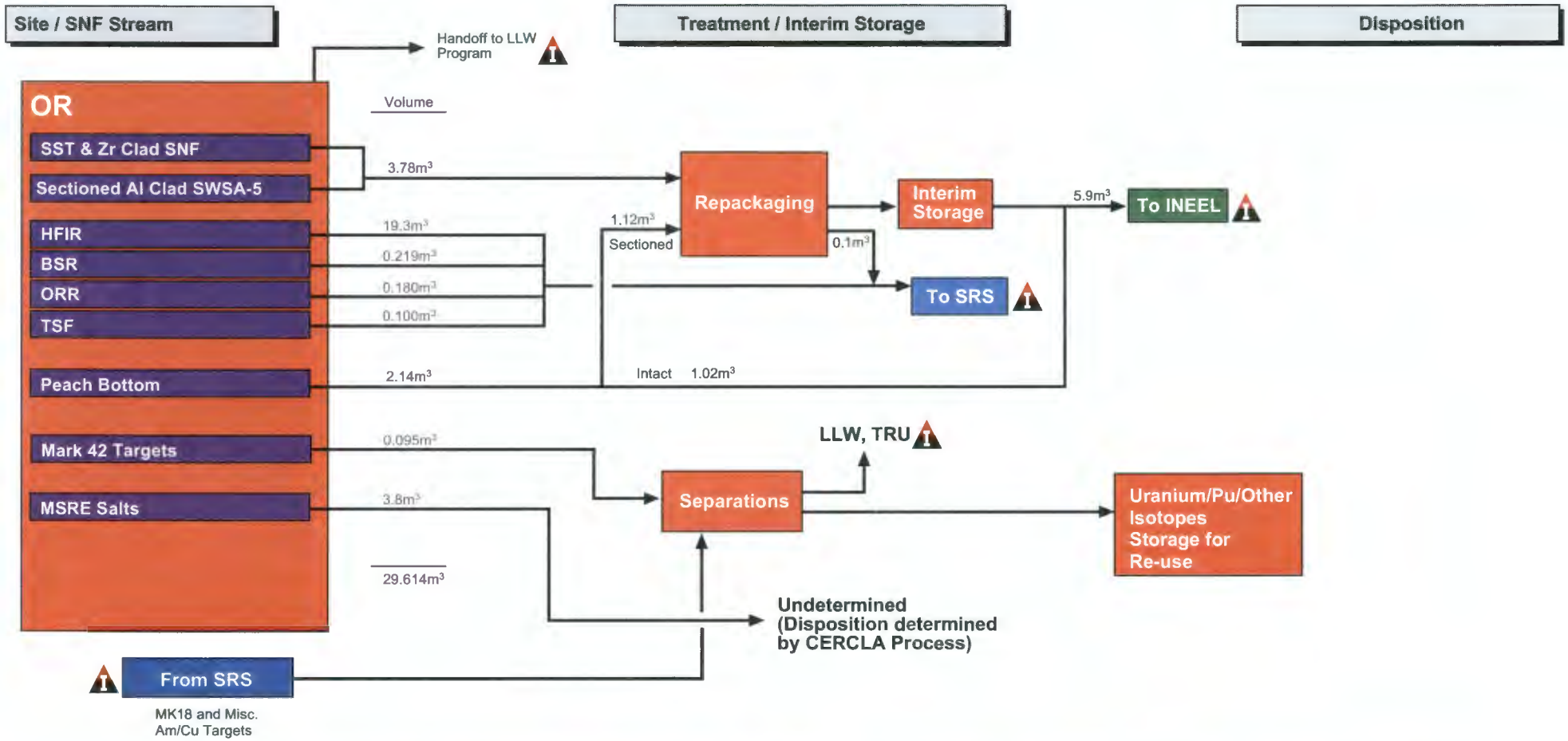

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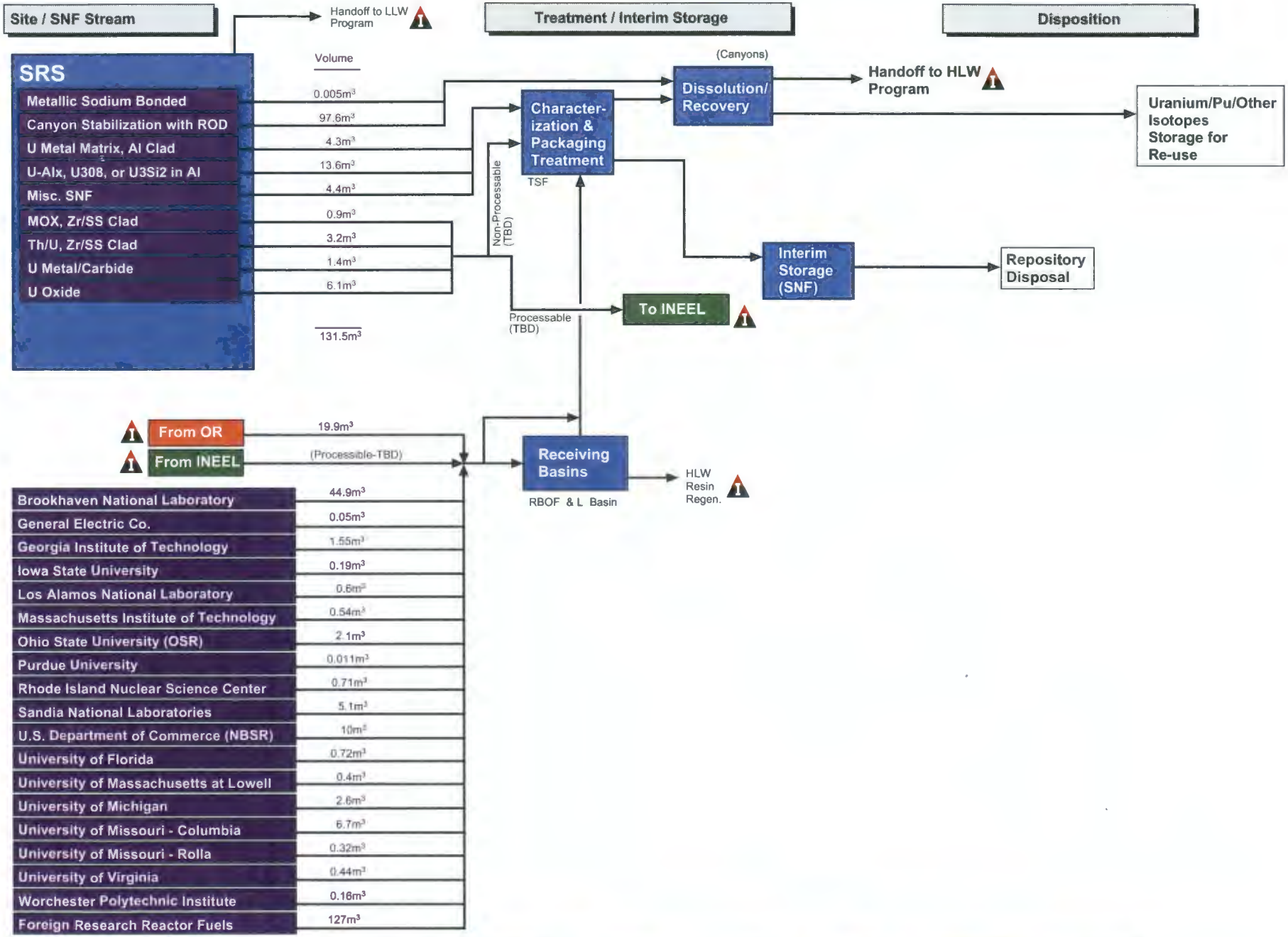
4/22/97

SNF Alternative Disposition Map

PREDECISIONAL DRAFT



KEY: INEEL | OR | Fernald | Rocky Flats | SNL | SRS | NTS | Hanford | WIPP | Commercial | LANL | West Valley | Interface:

5/2/97