3.0 Alternatives

For purposes of analysis, DOE used a modular approach in developing alternatives for this EIS. Under this approach, DOE identified a series of discrete projects, which ***can be linked together in different combinations to*** achieve the goals of the proposed action. Thus, some projects are included in more than one waste processing alternative. This modular approach provides DOE flexibility in analyzing waste processing alternatives and treatment options and in selecting the preferred alternative.

The facility disposition alternatives analysis considers all of the facilities that would be required to implement each waste processing alternative.

3.1 Identifying Alternatives

DOE undertook ***and*** documented ***a*** process to identify the range of reasonable alternatives for ***this*** EIS that would satisfy the purpose and need ***and proposed action*** to manage wastes at INTEC.

This EIS analyzes the impacts of implementing each of the alternatives through 2035. Each alternative has a specific time line for associated activities.

The Settlement Agreement/Consent Order requires DOE to have its mixed HLW ready for shipment out of Idaho by a target date of 2035. From 2035 through 2095, DOE would no longer be processing waste, but would be shipping and maintaining mixed HLW road-ready for subsequent shipment and would be decommissioning HLW facilities.

DOE is required to maintain controls on radioactive waste or materials under its jurisdiction until such controls are no longer needed. Nevertheless, for the purposes of analysis in this EIS, it is assumed that institutional controls to protect human health and the environment ***at the INEEL*** would not be in effect after the year 2095. This assumption is consistent with assumptions in the *INEEL Comprehensive Facility and Land Use Plan* and the planning basis for Waste Area Group 3 at INTEC, under CERCLA. This assumed loss of institutional control means that, at some future ***date***, DOE would no longer control the site and, therefore, could no longer ensure that ***unmitigated*** radioactive doses to the public are within established limits or that actions ***would be*** taken to reduce dose levels to as low as reasonably achievable.

> **Institutional controls...**
>
> *are measures DOE takes to limit or prohibit activities that may interfere with operations or result in exposure to hazardous substances at a site. They can take the form of physical measures (such as fences or barriers) or legal and administrative mechanisms (such as land use restrictions or building permits).*

Further, although accident impacts discussed in Section ***6*** of this Summary do not include mitigation, the Federal government is required to respond to any radiological emergency at the INEEL. DOE and other Federal agencies would be available to provide resources to assist in the evaluation of any accident, mitigate potential long-term exposure pathways to humans, and direct subsequent clean-up activities to decontaminate affected areas and reduce radiation levels.

3.2 *EIS Alternatives*

3.2.1 WASTE PROCESSING ALTERNATIVES

The EIS analyzed the following ***six*** waste processing alternatives:

- No Action
- Continued Current Operations
- Separations
  (with three treatment options)
- Non-Separations
  (with ***four*** treatment options)

- Minimum INEEL Processing
- ***Direct Vitrification Alternative (with two treatment options)***

Figures (S-2 through S-13) are provided for each waste processing alternative or treatment option to help clarify the basic processes. DOE developed these alternatives using a modular approach, in which each alternative is comprised of specific projects analyzed in this EIS. This approach permits projects within an alternative to be combined with projects of other alternatives. The resulting creation of hybrid alternatives can increase DOE's flexibility for decision-making. ***For example, the EIS analyzes treatment of post-2005 newly generated liquid waste as mixed transuranic waste/SBW for comparability of impacts between alternatives. Under any alternative, DOE could treat the post-2005 newly generated liquid waste by grouting (see Project P2001 in Appendix C.6), which would result in 1,300 cubic meters of grouted waste and a small reduction in the treated SBW volume. The grout would be managed as transuranic or low-level waste depending on its characteristics.***

Table S-1 provides an overview of the modular waste management elements that make up the EIS alternatives and options, plus other elements that could be considered in constructing hybrid alternatives and options with respect to mixed HLW treatment technologies, mixed transuranic waste/SBW pretreatment requirements, and post-treatment storage and disposal options.

Not all of the waste processing alternatives meet key requirements of the Settlement Agreement/Consent Order. DOE is committed to meeting regulatory requirements, as well as the Settlement Agreement/Consent Order with the State of Idaho. However, the agreement provides for a process whereby DOE may propose changes to specific requirements, provided they are based on an adequate environmental analysis under NEPA. In order to evaluate the range of reasonable waste processing alternatives, some of the alternatives analyzed in this EIS may not meet specific requirements of the Settlement Agreement/Consent Order.

A key element in the Settlement Agreement/Consent Order that is relevant to this EIS is the commitment to have all calcine treated and ready for shipment out of Idaho by a target date of December 31, 2035. A separate Notice of Noncompliance Consent Order with the State of Idaho requires DOE to cease use of the Tank Farm by December 31, 2012. Based on the analysis in this EIS, DOE expects that all alternatives, except for No Action and Continued Current Operations, would meet the 2035 target date. However, the analysis also indicates that under some alternatives it would be difficult to treat all the waste by 2012 so DOE can cease use of the Tank Farm unless remaining waste is transferred to RCRA-compliant tanks. For any of the waste processing alternatives or options the schedule could be accelerated to meet the treatment of mixed transuranic waste/SBW by 2012. A number of processes would have to be accelerated, and funding would have to be available, so that conceptual design could begin, followed by accelerated permitting, procurement, and construction.

Another key element in the Settlement Agreement/Consent Order is the use of the calciner as the treatment process for liquid mixed transuranic waste/SBW in the tanks. Since there are several treatment technologies evaluated in this EIS that do not require a calcination step, a decision to use a different process would require a modification of the Settlement Agreement/Consent Order and related DOE decisions.

Modular Approach

This EIS shows the projects and facilities associated with the waste processing alternatives and treatment options. Projects and facilities are identified individually and can be combined in a building block fashion to develop other waste processing alternatives. For example, the ion exchange and grouting process used to treat mixed transuranic waste/SBW under the Minimum INEEL Processing Alternative could support other alternatives, where mixed transuranic waste/SBW is treated by the same method.

WASTE MANAGEMENT ELEMENTS

Alternatives and Options	Pre-treatment Storage		Treatment Process								Post-treatment storage on the INEEL	Post-treatment Disposal Destinations			
						Separations			Grout/cement ceramic					Near surface landfill options for LLW	
	Waste in tanks[1]	Calcine in bin sets	Permitted Calciner	Vitrification	*Steam Reforming*	Cs	Sr	TRU	HLW	LLW	TRU		NGR HLW	WIPP TRU	On INEEL	Off INEEL
NO ACTION ALTERNATIVE	●	●														
CONTINUED CURRENT OPERATIONS ALTERNATIVE		●	●													
SEPARATIONS ALTERNATIVE																
· FULL SEPARATIONS	●	●		●		●	●	●		●		●	●		●	●
· PLANNING BASIS		●	●	●		●	●	●		●		●	●			●
· TRANSURANIC SEPARATIONS	●	●						●		●	●	●		●	●	●
NON-SEPARATIONS ALTERNATIVE																
· HOT ISOSTATIC PRESSED WASTE		●	●						●			●	●			
· DIRECT CEMENT WASTE		●	●						●			●	●			
· EARLY VITRIFICATION	●	●		●							●[2,3]	●	●	●		
· *STEAM REFORMING*	●	●			●						●		●	●		
MINIMUM INEEL PROCESSING ALTERNATIVE	●	●		●[4]		●[3]		5	5		●[3]	●	●	●	5	5
DIRECT VITRIFICATION ALTERNATIVE																
· *VITRIFICATION WITHOUT CALCINE SEPARATIONS*	●	●		●								●	●[7]	●[8]		
· *VITRIFICATION WITH CALCINE SEPARATIONS*	●	●		●		●[6]	●[6]	●[6]		●		●	●[7]	●[8]	●	●

LEGEND

Cs	Cesium
LLW	Low-level waste
NGR	National geologic repository
Sr	Strontium
TRU	Transuranic waste
WIPP	Waste Isolation Pilot Plant
WIR	Waste Incidental to Reprocessing

1. DOE must cease use of five pillar and panel vault tanks by *June* 2003 (these are single-shell tanks with an external secondary contaminant structure that is not expected to meet seismic design criteria). Except for the No Action Alternative, DOE would cease use of the monolithic vault tanks by *December 2012* (these are single-shell tanks with a external secondary contaminant structure that is more likely to meet seismic design criteria than the pillar and panel tanks).
2. These waste management elements are currently not included in the alternatives or treatment options but could be considered for development of hybrid alternatives.
3. Mixed transuranic waste/SBW in underground tanks at INTEC would be treated and sent to WIPP. In the Minimum INEEL Processing Alternative, cesium would be separated and sent to Hanford to be treated with INTEC HLW.
4. Vitrification of calcine would be performed at Hanford.
5. Hanford's design decision *process* would determine if these separation technologies would be used and, therefore, what waste fractions will be generated.
6. *Options for calcine treatment.*
7. *If SBW is managed as HLW.*
8. *If SBW is managed as transuranic waste.*

TABLE S-1.
Modular waste management elements included in EIS alternatives and options.

NO ACTION ALTERNATIVE

Council on Environmental Quality regulations require analysis of a No Action Alternative (Figure ***S-2***) as a baseline for comparison to other alternatives. Under this alternative:

- ***The New Waste Calcining Facility calciner would remain in standby (placed in standby in May 2000).*** It would not undergo upgrades and no liquid mixed transuranic waste/SBW would be calcined.

- The ***Process Equipment Waste and*** High-Level Liquid Waste Evaporators would continue to operate to reduce the liquid mixed transuranic waste/SBW volume and enable DOE to cease use of the five pillar and panel tanks by 2003. Newly generated liquid waste would accumulate in the Tank Farm until 2017, at which time DOE assumes that ***the five*** remaining tanks would be full.

- The mixed HLW calcine from bin set 1 would be transferred to bin set 6 or 7 as discussed in the SNF and INEL EIS, but bin set 1 would not be closed. ***DOE is continuing to evaluate the structural integrity of bin set 1.***

Implementation of this alternative would not enable DOE to cease use of the Tank Farm by ***December 31,*** 2012 nor make its mixed HLW ready for shipment to a storage facility or repository outside of Idaho by a target date of 2035.

CONTINUED CURRENT OPERATIONS ALTERNATIVE

This alternative (Figure ***S-3***) involves calcining the liquid mixed transuranic waste/SBW and adding it to the bin sets, where it would be stored with mixed HLW calcine. Under this alternative:

- The New Waste Calcining Facility calciner would ***remain in standby***, pending receipt of a RCRA permit from the State and upgrades to air emission controls required by EPA.

- The ***calciner*** would operate from 2011 through 2014 to calcine the remaining mixed transuranic waste/SBW, which would be stored in the bin sets. After 2014, the calciner would operate as needed until the end of 2016.

- Beginning in 2015, Tank Farm heels (material left in the tanks after initial processing) and newly generated liquid waste would be processed through an ion exchange column. Low-level waste would be grouted for disposal at the INEEL, and transuranic wastes would be disposed of at the Waste Isolation Pilot Plant.

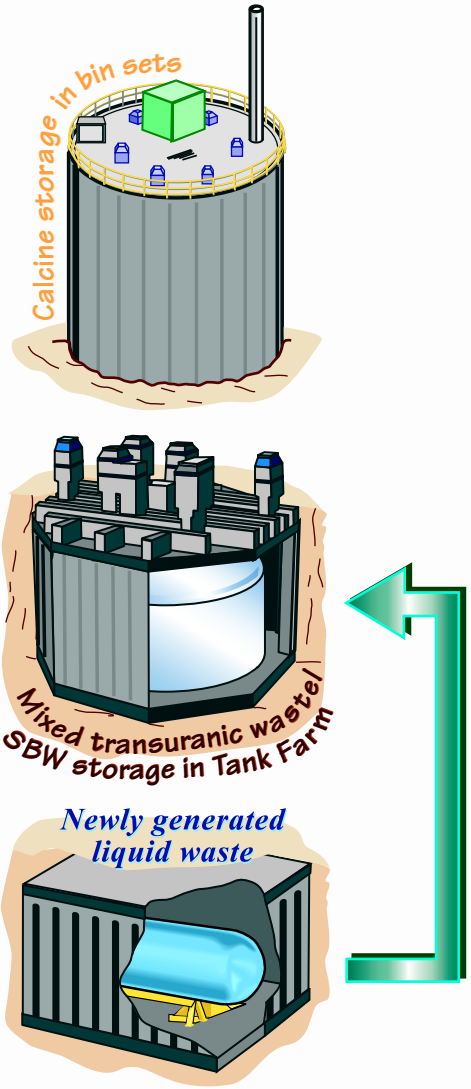
- The mixed HLW calcine in bin set 1 would be transferred to bin set 6 or 7 as discussed in the SNF and INEL EIS, and bin set 1 would be closed in accordance with RCRA regulations. The calcine would be stored in the bin sets indefinitely.

Implementing this alternative would ***not*** enable DOE to cease use of the Tank Farm by ***December 31, 2012, and*** it would not enable DOE to make its mixed HLW ready for shipment to a storage facility or repository outside of Idaho by a target date of 2035.

SEPARATIONS ALTERNATIVE

The Separations Alternative comprises three options, each of which uses a chemical separations process, such as solvent extraction, to divide the waste into waste fractions suitable for disposal in ***either*** a ***HLW*** repository ***or the Waste Isolation Pilot Plant in New Mexico or*** at ***a low-level waste disposal facility, depending on the characteristics of the fractions***. Separating the radionuclides in the waste into fractions would decrease the amount of waste that would have to be shipped to a repository, saving needed repository space and reducing disposal costs.

Because HLW would be separated into fractions, before undertaking the separation process DOE would ***follow the waste incidental to reprocessing determination process*** to determine whether any of the fractions would be managed as transuranic or low-level waste rather than HLW. The waste streams that meet the requirements of the waste incidental to reprocessing determination process ***established by DOE Order 435.1 and Manual 435.1-1***, either by ***the*** citation or by



LEGEND
NGLW Newly generated liquid waste

FIGURE S-2.
No Action Alternative.

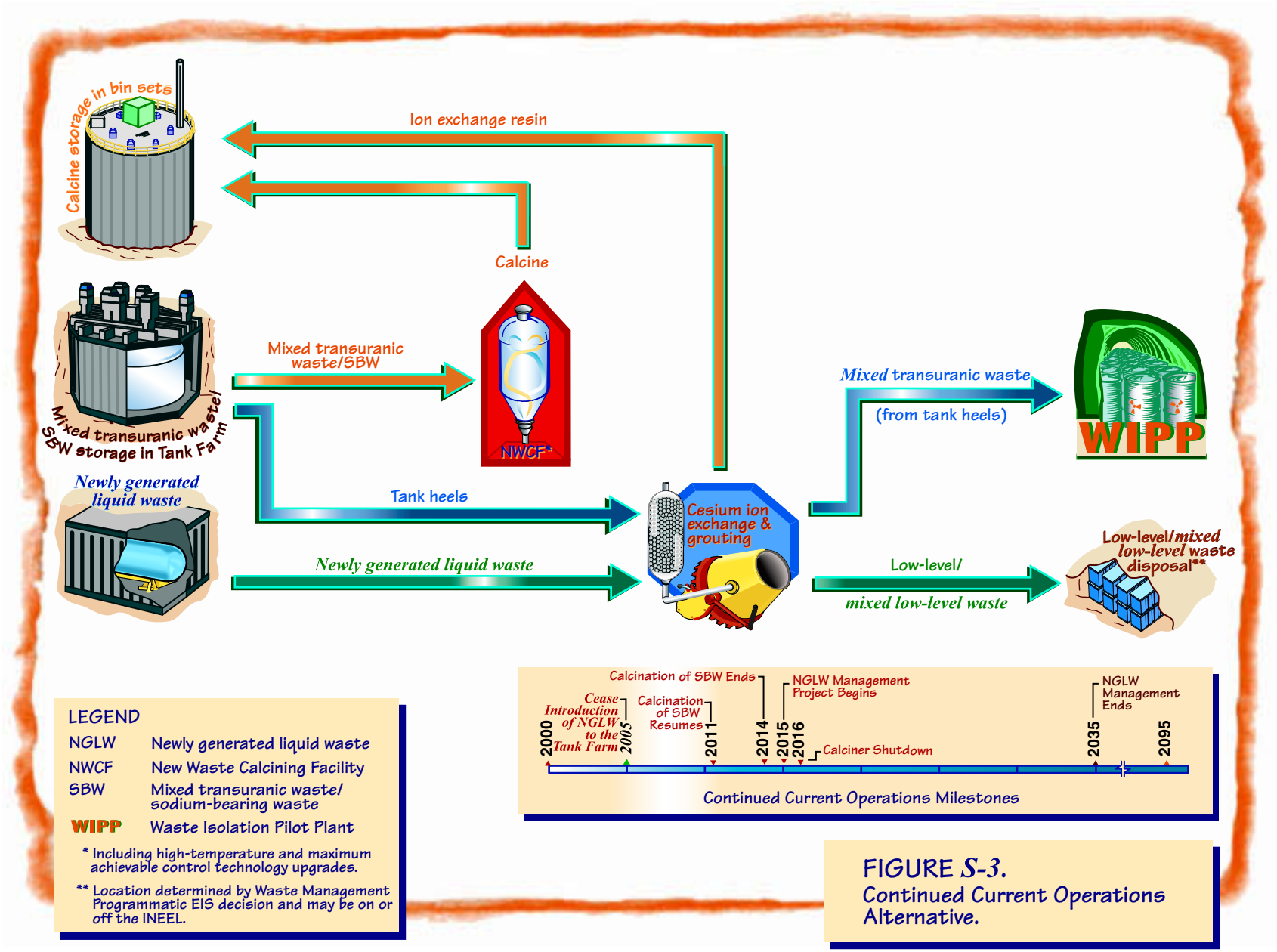


FIGURE S-3.
Continued Current Operations Alternative.

the evaluation ***method***, are excluded from HLW ***management requirements***.

The Separations Alternative could include a small incinerator to destroy organic solvents used in the chemical separations process. These solvents would be radioactively contaminated. The project data sheet for the incinerator (Project P118 in Appendix C.6) indicates that the facility would operate approximately 30 days per year. The three waste treatment options under the Separations Alternative are described below.

Full Separations Option

This option (Figure ***S-4***) would separate the most highly radioactive and long-lived radioisotopes from both mixed HLW calcine and the mixed transuranic waste/SBW, ***resulting in a mixed HLW fraction and a mixed low-level waste fraction***. Under this option:

- DOE would retrieve and dissolve the mixed HLW calcine from the bin sets and treat the dissolved calcine and mixed transuranic waste/SBW (including tank heels) in a new chemical separation facility to remove cesium, strontium, and transuranics from the process stream. These constituents, termed the "high-level waste fraction," account for most of the radioactivity and long-lived radioactive characteristics of HLW and mixed transuranic waste/SBW.

- The mixed HLW fraction would be vitrified in a new facility ***at INTEC, placed in stainless steel canisters,*** and stored onsite until shipped to a storage facility or ***geologic*** repository.

- The process stream remaining after separating out the mixed HLW fraction would be managed as mixed low-level waste. After some pretreatment, the "mixed low-level waste fraction" would be solidified into a grout in a new grouting facility. The concentrations of radioactivity in the grout ***are expected to*** result in its classification as Class A-type low-level waste, which is suitable for disposal in a near-surface landfill.

- DOE would dispose of the Class A-type low-level grout in the empty vessels of the closed Tank Farm and bin sets, in a new INEEL ***mixed*** low-level waste disposal facility, or at an offsite ***DOE or commercial*** low-level waste disposal facility.

Implementing this option would enable DOE to cease use of the Tank Farm by 2016 and make its mixed HLW ready for shipment to a storage facility or repository outside of Idaho by a target date of 2035.

Planning Basis Option

This option (Figure ***S-5***) reflects previously announced DOE decisions and agreements regarding the management of mixed HLW and mixed transuranic waste/SBW with the State of Idaho. It is similar to the Full Separations Option except that, prior to separation, the mixed transuranic waste/SBW would be calcined and stored in the bin sets along with the mixed HLW. Under this option:

- The New Waste Calcining Facility calciner would ***remain in standby***, pending receipt of a RCRA permit from the State and upgrades to air emission controls required by EPA.

- Under an accelerated schedule, DOE could complete calcining by ***December 31,*** 2012 and meet the Settlement Agreement/Consent Order.

- Calcine would be retrieved, dissolved, and separated into high-level and low-level waste fractions using the process described in the Full Separations Option.

- ***The high-level*** fraction would be vitrified to form HLW glass ***and placed in stainless steel canisters***. The vitrified HLW fraction would be ***stored*** in a ***new*** storage facility at the INEEL until shipped to a storage facility or repository outside of Idaho.

- The mixed low-level waste fraction would be grouted to form a waste stream that meets the Nuclear Regulatory Commission's defi-

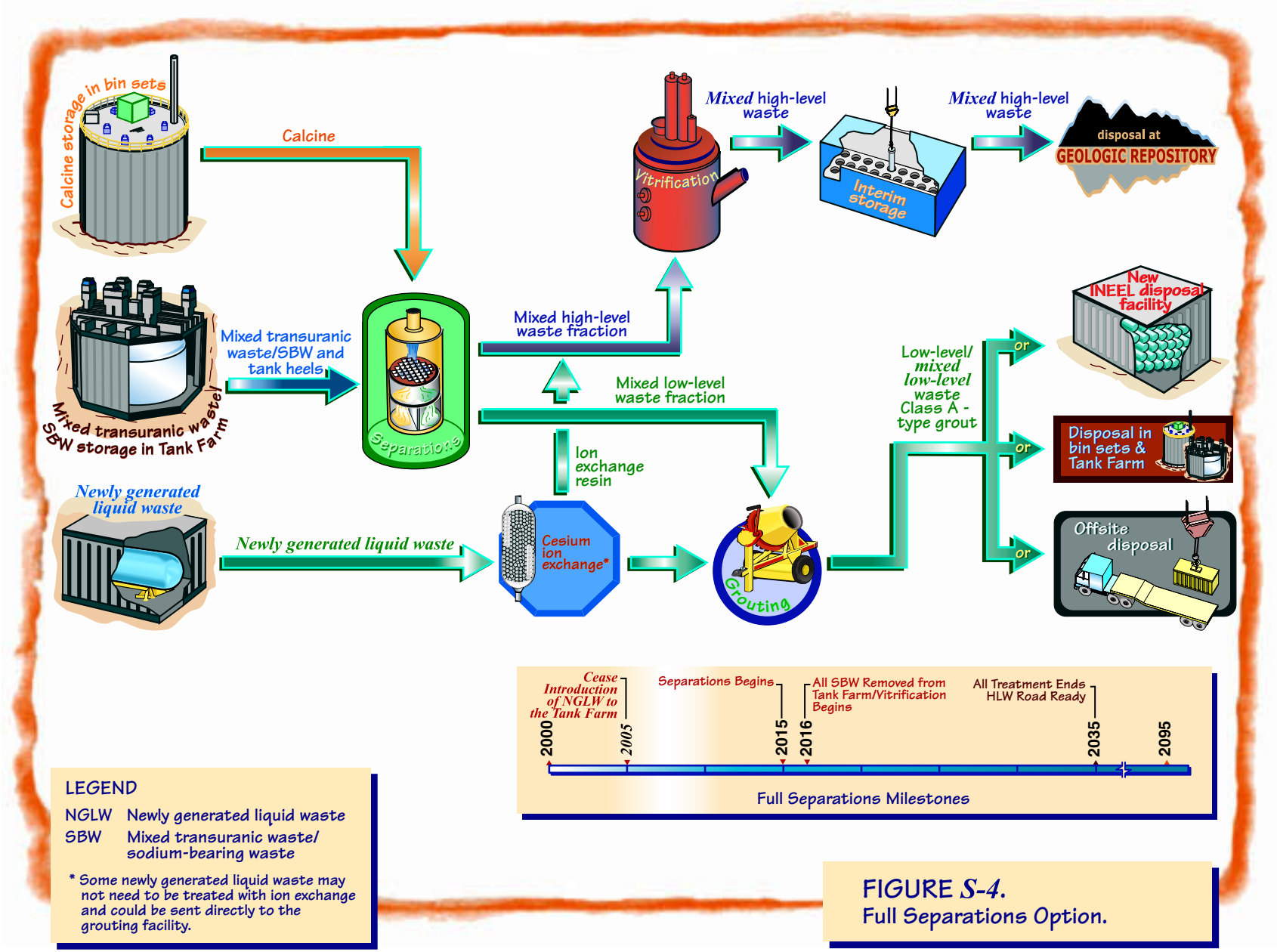
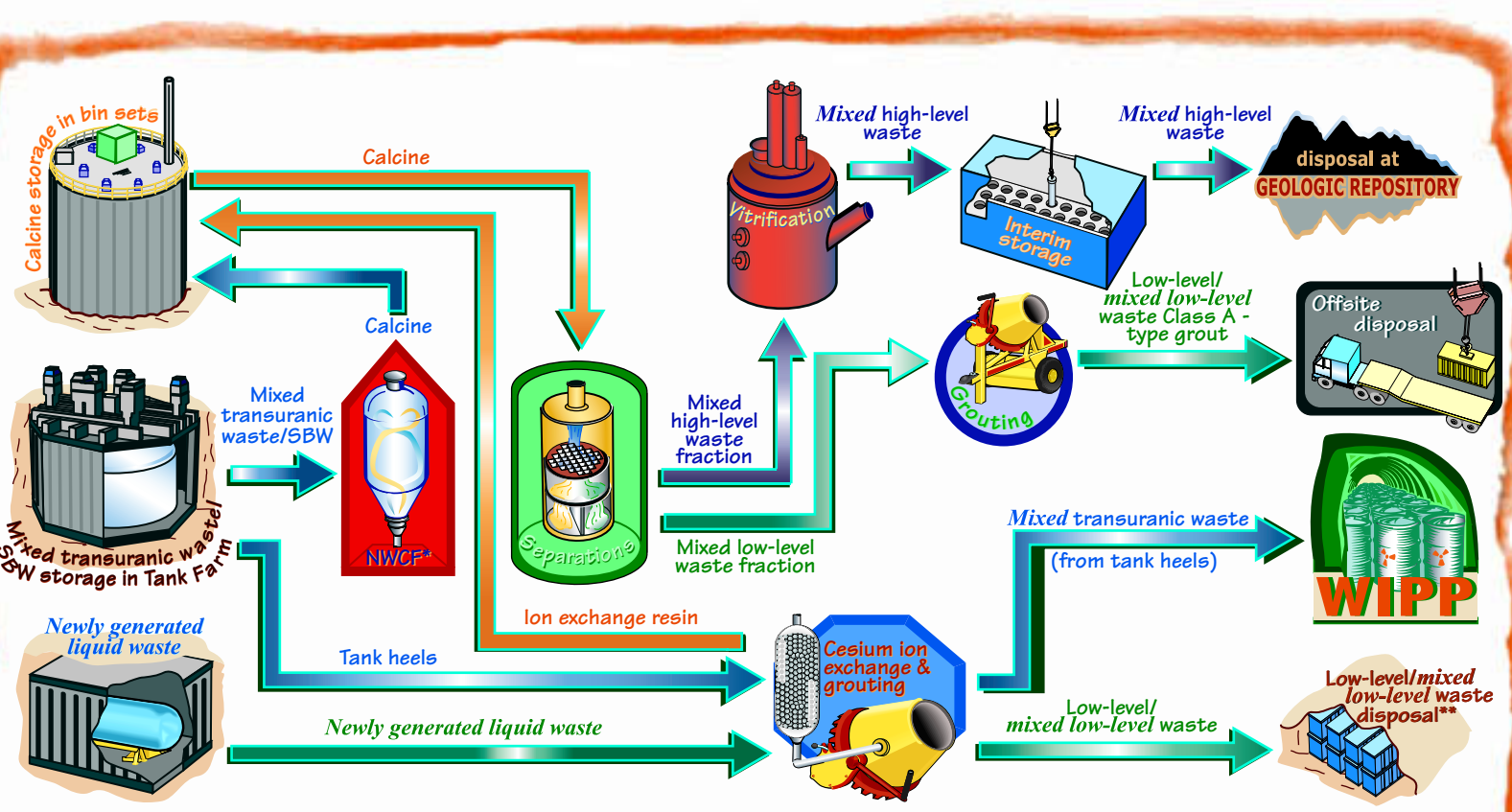


FIGURE S-4.
Full Separations Option.



LEGEND

NGLW	Newly generated liquid waste
NWCF	New Waste Calcining Facility
SBW	Mixed transuranic waste/ sodium-bearing waste
WIPP	Waste Isolation Pilot Plant

* Including high-temperature and maximum achievable control technology upgrades.

** Location determined by Waste Management Programmatic EIS decision and may be on or off the INEEL.

FIGURE S-5.
Planning Basis Option.