transuranic waste/SBW. The EIS also presents the impacts for a grout facility (see Project P2001 in Appendix C.6) that could be used to treat the waste generated after 2005. For purposes of assessing transportation impacts, DOE assumed the grouted waste would be characterized as remote-handled transuranic waste and transported to the Waste Isolation Pilot Plant for disposal (see Appendix C.5).

3.2 Facility Disposition Alternatives

The waste processing alternatives described in Section 3.1 do not include any specific facility disposition ***alternatives*** except for those cases where facility disposition is an integral part of implementation of the option (e.g., disposal of low-level waste Class A or Class C type grout in the Tank Farm and bin sets). However, DOE intends to make decisions regarding disposition of HLW facilities (including existing facilities and facilities that would be constructed under the waste processing alternatives).

The facility disposition analysis considers disposition of currently existing HLW facilities and HLW facilities that would be constructed under the waste processing alternatives. Because most INEEL HLW facilities contain RCRA wastes, the facility disposition alternatives analyzed in this EIS are consistent with RCRA closure requirements. Section 5.3 describes the impacts to the environment of facility disposition alternatives.

Existing HLW facilities would be dispositioned under all waste processing alternatives. The facility disposition alternatives are modular in nature and can be integrated with any waste processing alternative or option. However, each waste processing alternative would result in the construction (and the need for ultimate disposition) of a different number of facilities (as described in the following section). Table 3-***1*** identifies the major facilities that would be constructed for each waste processing alternative.

Facility Disposition

Facility disposition would include activities performed under multiple regulatory programs to address INTEC facilities that no longer **had** a mission and **required placement** in a condition consistent with land use decisions and end-state planning for the INEEL. Some of the activities that would be encompassed by the facility disposition alternatives include:

Closure – Removal, decontamination, or encapsulation of hazardous and radiological contaminants from regulated facilities in accordance with applicable regulatory requirements.

Deactivation – Removal of potentially hazardous (non-waste) materials from the process vessels and transport systems, de-energizing power supplies, disconnecting or reloading utilities, and other actions to place the facility in an interim state that requires minimal surveillance and maintenance.

Decommissioning – Decontamination of facilities that have been deactivated. This may include demolition of the facility and removal of the rubble from the site or entombment by means such as collapsing the aboveground portions of the structure into its below-grade levels and capping the contaminated rubble in place or constructing containment structures around the facility.

The facility disposition activities are intended to reach an end state where the contamination has been removed, contained, or reduced such that the level of risk associated with the residual contamination is no longer considered a threat to human health or the environment. At that time, DOE could either reuse the facilities for new missions or transfer control of the facilities to others.

3.2.1 DESCRIPTION OF FACILITY DISPOSITION ALTERNATIVES

RCRA closure regulations require removal or decontamination of all hazardous waste residues and contaminated containment system components, equipment, structures, and soils during closure. The "remove or decontaminate" standard can be achieved by reducing the amount of residual contamination to levels that are (1) below detection or indistinguishable from background concentrations or (2) at concentrations below levels that may pose an unacceptable risk to human health and the environment. The U.S. Environmental Protection Agency expects that well-designed and well-operated RCRA units (i.e., units that comply with the unit-specific minimum technical requirements) will generally be able to achieve this standard (EPA 1998).

However, based on technological, economic, and worker health risks involved, it may not be practical to remove all of the residual material from the INTEC facilities, decontaminate all equipment, and remove all surrounding contaminated soils to achieve clean closure. The RCRA regulations (40 CFR 264.197) state that if all contaminated system components, structures, and equipment cannot be adequately decontaminated, then the facilities must be closed in accordance with the closure and post-closure requirements that apply to landfills ("closed to landfill standards"). Therefore, DOE is evaluating six potential facility disposition alternatives in this EIS: (1) No Action, (2) Clean Closure, (3) Performance-Based Closure, (4) Closure to Landfill Standards, (5) Performance-Based Closure with Class A Grout Disposal, and (6) Performance-Based Closure with Class C Grout Disposal. Each of these facility disposition alternatives is briefly described below. For all closures, detailed closure plans would be developed and approved to ensure closures are performed in accordance with approved procedures and that risk to workers and the public are minimized and acceptable.

No Action – Under the No Action Alternative, DOE would not plan for disposition of its HLW facilities at INTEC. Nevertheless, over the period of analysis ***through*** 2035, many of the facilities identified in Table 3-***3*** could be deactivated. This means that bulk chemicals would be removed and the facility could be de-energized. Surveillance and maintenance necessary to protect the environment and the safety and health of workers would be performed in the normal course of INTEC operation. Therefore, the No Action Alternative for facility disposition is substantially the same as No Action for waste processing. As a result, Section 5.3 does not present environmental consequences for the facility disposition No Action Alternative ***through*** 2035. Future facility closures and/or dispositions which are not foreseen at this time would be covered in future National Environmental Policy Act reviews, as appropriate.

The one difference between the facility disposition and the waste processing No Action Alternatives is the long-term condition of the bin sets and Tank Farm. The calcine in the bin sets and the mixed transuranic waste/SBW in the Tank Farm would have to remain in those facilities because that is the assumption underlying the No-Action Alternative. Over the period of analysis through 2035, continued storage in these two facilities would result in no activities different from those in the waste processing No Action Alternative. However, over the thousands of years beyond 2035, the materials in these facilities would migrate into the environment. To capture these long-term impacts, DOE analyzed the continued storage of calcine and mixed transuranic waste/SBW. The analysis is presented in Appendix C.9, Facility Closure Modeling. The results of the analysis are reported in the water, human health, and ecology subsections of Section 5.3.

Clean Closure – ***Under the Clean Closure Alternative,*** facilities would have the hazardous wastes and radiological contaminants, including contaminated equipment, removed from the site or treated so the hazardous and radiological contaminants are indistinguishable from background concentrations. Clean Closure may require total dismantlement and removal of facilities. This may include removal of all buildings, vaults, tanks, transfer piping, and contaminated soil. This alternative would require a large quantity of soil for backfilling and would also require topsoil for revegetation. Use of the facilities (or the facility sites) after Clean Closure would present no risk to workers or the public from hazardous or radiological components.

Table 3-3. Facility disposition alternatives *analyzed in this EIS*.

	Performance-Based Closure Methods				
Facility Description	Clean Closure	Performance-Based Closure	Closure to Landfill Standards	Performance-Based Closure with Class A Grout Disposal	Performance-Based Closure with Class C Grout Disposal
Tank Farm and Related Facilities					
Tank Farm[a]	●	●	●	●	●
CPP-619 – Tank Farm Area – CPP (Waste Storage Control House)			●		
CPP-628 - Tank Farm Area – CPP (Waste Storage Control House)			●		
CPP-638 – Waste Station (WM-180) Tank Transfer Building			●		
CPP-712 – Instrument House (VES-WM-180, 181)			●		
CPP-717 – STR/SIR Waste Storage Tank Pads (A, B, C, and D) and Vessels			●		
Bin Sets and Related Facilities					
Bin sets[b]	●	●	●	●	●
CPP-639 – Blower Building/Bin Sets 1, 2, 3			●		
CPP-646 – Instrument Building for 2nd Set Calcined Solids			●		
CPP-647 – Instrument Building for 3rd Set Calcined Solids			●		
CPP-658 – Instrument Building for 4th Set Calcined Solids			●		
CPP-671 – Instrument Building for 5th Set Calcined Solids			●		
CPP-673 – Instrument Building for 6th Set Calcined Solids			●		
Process Equipment Waste Evaporator and Related Facilities					
CPP-604 – Process Equipment Waste Evaporator			●		
CPP-605 – Blower Building			●		
CPP-641 – West Side Waste Holdup	●				
CPP-649 – Atmospheric Protection Building			●		
CPP-708 – Exhaust Stack/Main Stack[c]			●		
CPP-756 – Pre-Filter Vault			●		
CPP-1618 – Liquid Effluent Treatment and Disposal Facility	●				
NA – PEWE Condensate Lines			●		
NA – PEWE Condensate Lines and Cell Floor Drain Lines			●		
Fuel Processing Building and Related Facilities					
CPP-601 – Fuel Processing Building		●	●		
CPP-627 – Remote Analytical Facility Building		●	●		
CPP-640 – Head End Process Plant		●	●		
FAST and Related Facilities					
CPP-666 – Fluorinel Dissolution Process and Fuel Storage Facility		●			
CPP-767 – Fluorinel Dissolution Process and Fuel Storage Facility Stack	●				

Table 3-*3*. Facility disposition alternatives *analyzed in this EIS* (continued).

	Performance-Based Closure Methods				
Facility Description	Clean Closure	Performance-Based Closure	Closure to Landfill Standards	Performance-Based Closure with Class A Grout Disposal	Performance-Based Closure with Class C Grout Disposal
Transport Lines Group					
NA – Process Off-gas Lines		●			
NA – High-Level Liquid Waste (Raffinate) Lines			●		
NA – Process (Dissolver) Transport Lines		●			
NA – Calcine Solids Transport Lines			●		
Other HLW Facilities					
CPP-659 – New Waste Calcining Facility [d]		●	●		
CPP-684 – Remote Analytical Laboratory		●			

a. The INTEC Tank Farm consists of underground storage tanks, concrete tank vaults, waste transfer lines, valve boxes, valves, airlift pits, cooling equipment, and several small buildings containing instrumentation and valves for the waste tanks. Includes waste storage tanks (VES-WM-180 through 190), Tank Vaults for Tanks VES-WM-180 through 186 (CPP-780 through 786), Tank Enclosure for Tanks VES-WM-187 through 190 (CPP-713), and facilities CPP-721 through 723, CPP-737 through 743, and CPP-634 through 636, and CPP-622, 623, and 632.

b. The bin sets consist of ancillary structures, instrument rooms, filter rooms, cyclone vaults, and stacks, including CSSF-1 through 7, CPP-729, CPP-732, CPP-741 through 742, CPP-744, CPP-746 through 747, CPP-760 through 761, CPP-765, CPP-791, CPP-795, and CPP-1615.

c. Includes the instrument building for Main Stack CPP-692 and waste transfer line valve boxes.

d. Includes Organic Solvent Disposal Building CPP-694.

STR = Submarine Thermal Reactor, SIR = Submarine Intermediate Reactor

PEWE = Process Equipment Waste Evaporator.

Performance-Based Closure – ***Under the Performance-Based Closure Alternative, contamination would remain that is below the levels that would impact human health and the environment as established by regulations, and*** closure methods would be dictated on a case-by-case basis. ***These levels, commonly referred to as action levels, are either risk-based (e.g., residual contaminant levels established by requirements) or performance-based (e.g., drinking water standards). Once the performance-based levels are achieved, the unit/facility is deemed closed according to RCRA and/or DOE requirements. Other activities may then occur to the unit/facility such as decontamination and decommissioning or future operations (where non-hazardous waste can enter the unit/facility).*** Most above-grade facilities/units would be ***demolished*** and most below-grade facilities/units (tanks, vaults, and transfer piping) would be stabilized and left in place. ***The*** residual contaminants would no longer pose any unacceptable exposure (or risk) to workers, the public, ***and the environment***.

Closure to Landfill Standards – ***Under the Closure to Landfill Standards Alternative,*** the facilities would be closed in accordance with state, Federal ***and/or DOE*** requirements for closure of landfills. ***For landfill closures, wastes are removed to the extent practicable. However, quantities remaining would not meet clean closure or performance-based closure action levels. Therefore, there is a greater potential risk from a landfill closure when compared to a Performance-Based or Clean Closure. Because of this, capping and post-closure monitoring would be required to protect the health and safety of the workers and the public from releases of contaminants from the facility.*** Waste residuals within tanks, vaults, and piping would be stabilized in order to minimize the release of contaminants into the environment. Once waste residues ***were*** stabilized, protection of the environment ***would be ensured*** by installing an engineered cap, establishing a groundwater monitoring system, and providing post-closure monitoring and care of the waste containment system, depending on the type of contaminants, ***to protect the health and safety of the workers and the public from releases of contaminants from the facility/unit in accordance with the closure performance standards. The unit/facility cap requires maintenance and ground water monitoring of the landfill for 30 years (a waiver may be applied for after 5***

years). Also, a landfill closure is required to have a Corrective Action Plan that would be implemented in the event any contamination is detected beyond the boundary of the landfill. Implementing a corrective action resets the time for maintenance and monitoring for another 30 years.

Several of the waste processing options result in production of a low-level waste fraction, which would then be grouted and disposed of either in (1) a near-surface disposal facility on the INEEL, (2) the Tank Farm and bin sets, or (3) an offsite disposal facility. Disposal of this low-level waste in the Tank Farms and bin sets would occur after these facilities have been closed under the Performance-Based Closure alternative.

In order to accommodate the use of the Tank Farm and bin sets for disposal of the low-level waste fraction, this EIS also evaluates two additional facility disposition alternatives for the Tank Farm and bin sets ***as follows.***

Performance-Based Closure with Class A Grout Disposal – The facility would be closed as described above for the Performance-Based Closure alternative. Following completion of those activities, the Tank Farm or bin sets would be used to dispose of low-level waste Class A type grout produced under the Full Separations Option.

Performance-Based Closure with Class C Grout Disposal – The facility would be closed as described above for the Performance-Based Closure alternative. Following completion of those activities, the Tank Farm or bin sets would be used to dispose of low-level waste Class C type grout produced under the Transuranic Separations Option.

DOE has completed a comprehensive evaluation for the cleanup program at INTEC (known as Waste Area Group 3) under the requirements of CERCLA. Under this program (Federal Facility Agreement and Consent Order), DOE, the U.S. Environmental Protection Agency, and the State of Idaho have made decisions regarding the disposition of environmental media, such as contaminated soils and water. While this program is not the subject of this EIS, decisions regarding disposition of HLW facilities are being coordinated with decisions made ***under Waste Area Groups***. ***Waste Area Group 3*** activities also contribute to the cumulative impacts presented in Section 5.4 of this EIS. Chapter 6 provides ***additional regulatory discussion.***

3.2.2 PROCESS FOR IDENTIFYING CURRENT FACILITIES TO BE ANALYZED

DOE used a systematic process to identify which existing INTEC facilities would be analyzed in detail under the facility disposition alternatives in this EIS. The first step was to perform a complete inventory of all INTEC facilities (Wichmann 1998; Harrell 1999). Next, DOE identified which of these facilities are directly related to the HLW Program (i.e., HLW treatment, storage, or generation facilities). This EIS includes detailed analysis for all such facilities. DOE plans to consider this analysis, together with other factors such as mission, policy, technical considerations, and public comments in its final decision(s) about the disposition of these facilities.

DOE assumes that other INTEC facilities will have residual amounts of radioactive and chemical contaminants at closure, and has included the environmental impacts of these facilities in the cumulative impact analysis in this EIS. However, disposition decisions about other INTEC facilities are not within the scope of this EIS. A list of other INTEC facilities analyzed for their contributions to cumulative impacts can be found in Section 5.4.2.

For each significant HLW ***management*** facility, DOE considered which of the facility disposition alternatives would be most appropriate ***for analysis in the EIS***. The determination of the applicable disposition methods was based on the facility and residual waste characteristics. ***The EIS does not analyze all potential facility disposition alternatives for each of the HLW management facilities. However, as explained below, the alternative(s) selected for analysis are representative of the impacts that would be expected for the entire range of facility disposition alternatives. Consequently, for a specific HLW management facility, DOE may select from the full range of facility disposition alternatives (Clean Closure, Performance-Based***

Closure, or Closure to Landfill Standards) based on the analyses in this EIS. A list of the existing HLW management facilities and the corresponding facility disposition alternatives ***analyzed in the EIS*** is provided in Table 3-***3***.

For the Tank Farm and bin sets, which together constitute the great majority of the total inventory of residual radioactivity, DOE analyzed all five facility disposition alternatives. These facilities would be the main contributors to the residual risk at INTEC. The level of residual risk would vary with the different facility disposition alternatives for the Tank Farm and bin sets.

The residual amount of radioactive and/or chemical contaminants associated with other INTEC facilities is much less than that of the Tank Farm and bin sets. Consequently, the overall residual risk at INTEC would not change significantly due to the contribution from these other facilities. For purposes of analysis, DOE assumed a single facility disposition alternative for the other INTEC HLW ***management*** facilities. ***In general, DOE selected the Closure to Landfill Standards alternative for analysis because it represents the maximum impacts for facility disposition. In some cases, the contaminants associated with a facility posed very small residual risk and DOE selected the Clean Closure Alternative for analysis to maximize the potential short-term impacts associated with facility disposition activities. T***he New Waste Calcining Facility and the Fuel Processing Building and related facilities ***present slightly higher residual risk than the remainder of the other INTEC HLW management facilities. DOE evaluated a second facility disposition alternative, Performance-Based Closure, for these two facilities to determine whether the potential impacts would vary between alternatives.***

For the new HLW ***management*** facilities identified in Table 3-***1***, DOE analyzed the Clean Closure alternative. This facility disposition assumption is ***consistent with the objectives and requirements of DOE Order 430.1A, Life Cycle Management, and DOE Manual 435.1-1, Radioactive Waste Management Manual, that all newly constructed facilities necessary to implement*** the waste processing alternatives would be designed ***and constructed consistent with measures that facilitate clean closure.***

3.3 Alternatives Eliminated from Detailed Analysis

This section identifies those alternatives that have been eliminated from detailed analysis in this EIS and briefly ***discusses*** why they have been eliminated [40 CFR 1502.14(a)]. CEQ regulations direct all ***federal*** agencies to use the NEPA process to identify and assess ***the*** range of ***reasonable*** alternatives to proposed actions that will avoid or minimize adverse effects of these actions upon the quality of the human environment [40 CFR 1500.2(e)]. The CEQ guidance further states that: (1) reasonable alternatives include those that are practical or feasible from a technical, economic, or common sense standpoint; (2) the number of reasonable alternatives considered in detail should represent the full spectrum of alternatives meeting the agency's purpose and need; and (3) the EIS need not discuss every unique alternative when a large number of reasonable alternatives exists.

This section seeks to consolidate the alternatives that serve the same general purpose by eliminating from detailed study those alternatives that present strong cost, schedule, regulatory, and technical maturity or feasibility constraints and offer no significant advantages over alternatives selected for detailed analysis. While cost alone is not normally a criterion for eliminating an alternative from detailed study, it is a powerful discriminator when coupled with the existence of similar but more cost-effective alternatives. Appendix B describes the process DOE used to identify the set of reasonable alternatives for analysis in this EIS. For the reasons discussed below, DOE has decided to eliminate the following alternatives from detailed study:

- Separations Alternative – Transuranic Separations/Class A Type Grout Option
- Non-Separations Alternative – Vitrified Waste Option
- Non-Separations Alternative – Cement-Ceramic Waste Option
- Disposal of Low-Level Waste Class A or Class C Type Grout at the Hanford Site

- Vitrification at the West Valley Demonstration Project or the Savannah River Site
- Shipment of Mixed Transuranic Waste (SBW/Newly Generated Liquid Waste) to the Hanford Site for Treatment
- Treatment of Mixed Transuranic Waste/SBW at the Advanced Mixed Waste Treatment Project
- ***Grout-in-Place***

Subsequent to issuing the Draft EIS, several new waste processing methods were identified and evaluated. Most of these methods were variations on the waste processing alternatives presented in the Draft EIS. In addition, several new technologies and variations of previously studied treatment options were suggested. For the reasons discussed in Appendix B, these alternatives were eliminated from detailed evaluation in this EIS.

3.3.1 TRANSURANIC SEPARATIONS/ CLASS A TYPE GROUT OPTION

This option is similar to the Full Separations Option, except the separation process under this option would result in three waste products:

- Transuranic waste
- Fission products (primarily strontium/ cesium)
- Low-Level Waste Class A type grout

In the Transuranic Separations/Class A Type Grout Option, the mixed transuranic waste/SBW would be sent directly to the Separations Facility for processing into high-level and low-level waste fractions. After the mixed waste transuranic waste/SBW was processed, the calcine would be retrieved from the bin sets, dissolved, and processed in the Separations Facility. Ion exchange columns would be used to remove the cesium from the waste stream. The resulting effluent would undergo the transuranic extraction process to remove the transuranic elements for eventual shipment to the Waste Isolation Pilot Plant. Then, strontium would be removed from the transuranic extraction effluent stream via the strontium extraction process. The cesium and strontium would be combined to produce a HLW fraction that would be vitrified into borosilicate glass. The transuranic fraction would be treated to produce a solid waste, and the low-level fraction would be grouted to form low-level waste Class A type grout.

The Transuranic Separations/Class A Type Grout Option was eliminated after comparison to the Transuranic Separations Option described earlier in Section 3.1.3.3. The Transuranic Separations (Class C Type Grout) Option process would create only two primary waste streams: (1) solidified transuranic fraction for disposal at the Waste Isolation Pilot Plant and (2) a low-level waste fraction to form Class C type grout for onsite disposal. The Transuranic Separations/Class A Type Grout Option would involve more separations steps than the Transuranic Separations (Class C Type Grout) Option and would require a higher capacity Waste Separations Facility. Also, the Transuranic Separations/Class A Type Grout Option would require a separate HLW Treatment (Vitrification) Facility and a HLW Interim Storage Facility that have an estimated total cost substantially greater than the Transuranic Separations (Class C Type Grout) Option.

Thus, the Transuranic Separations (Class ***A*** Type Grout) Option is similar, has ***more*** complex separations processing, and is ***more*** costly than the Transuranic Separations/Class ***C*** Type Grout Option. Moreover, the environmental impacts of this option are expected to be bounded by the remaining two options under the Separations Alternative. For these reasons, the Transuranic Separations/Class A Type Grout Option was eliminated from ***detailed analysis*** in this EIS.

3.3.2 NON-SEPARATIONS/ VITRIFIED WASTE OPTION

In the Vitrified Waste Option under the Non-Separations Alternative, ***the New Waste Calcining Facility would be upgraded to comply with the Maximum Achievable Control Technology emission requirements, and*** all the mixed transuranic waste/SBW in the Tank Farm would be calcined. The calcine stored in the bin sets would be retrieved and vitrified in a Vitrification Facility to form a HLW borosilicate glass. The molten glass would be poured into canisters similar to those used by the Defense Waste Processing Facility at the Savannah River Site. These glass canisters would be stored at INEEL pending shipment to a geologic repository.

The facilities that would be constructed under the Vitrified Waste Option include a ***New Waste Calcining Facility upgrade to meet Maximum Achievable Control Technology requirements,*** Calcine Retrieval, High-Activity Waste Vitrification Plant (larger scale than for the Full Separations Option), HLW Interim Storage, and a New Analytical Laboratory.

The Early Vitrification Option described in Section 3.1.4.3 would be similar to the Vitrified Waste Option, except the Vitrified Waste Option requires calcination of the liquid mixed transuranic waste/SBW prior to its vitrification. Thus, in the Vitrified Waste Option, the additional calcine produced from mixed transuranic waste/SBW would be combined with the HLW calcine and then vitrified to produce a large number of canisters (14,000 canisters versus 11,700 canisters under the Early Vitrification Option) for disposal at a geologic repository. In the Early Vitrification Option the mixed transuranic waste/SBW would be vitrified directly without calcining to produce a transuranic waste product suitable for disposal at the Waste Isolation Pilot Plant.

In summary, the Vitrified Waste Option would not retain the beneficial segregation of the mixed transuranic waste/SBW that would be achieved by the Early Vitrification Option. This nonsegregation would result in a larger quantity of vitrified HLW being shipped to a geologic repository for disposal. The Vitrified Waste Option would also require greater facility costs for calcining the liquid mixed transuranic waste/SBW with the Maximum Achievable Control Technology upgrades to the New Waste Calcining Facility. Therefore, this option offers no advantages over the Early Vitrification Option that otherwise contains the same treatment concepts. For these reasons, the Vitrified Waste Option was eliminated from ***detailed analysis*** in this EIS.

3.3.3 NON-SEPARATIONS/ CEMENT-CERAMIC WASTE OPTION

The Cement-Ceramic Waste Option under the Non-Separations Alternative is similar to the Direct Cement Option except the liquid mixed transuranic waste/SBW would not be calcined directly but would be mixed with the existing-mixed HLW calcine to form a slurry. In this option, all calcine would be retrieved and combined with the mixed transuranic waste/SBW. The combined slurry would be calcined in the New Waste Calcining Facility with the resulting calcine mixed into a concrete-like material. The concrete waste product would then be poured into drums, autoclaved (cured in a pressurized oven), and placed in an interim storage facility awaiting shipment to a geologic repository ***or a greater confinement disposal facility***. An estimated 16,000 concrete canisters would be produced. This option would require a major modification to the New Waste Calcining Facility to allow slurry calcination and the upgrade for compliance with the Maximum Achievable Control Technology rule, and a Grout Facility with autoclave. The final product (concrete or ceramic) would require an equivalency determination by EPA.

The rationale for initially considering the Cement-Ceramic Waste Option in the EIS was the anticipated potential for significant cost savings in using a greater confinement disposal facility (such as that at the Nevada Test Site) as the final repository for the resulting product. A basis for this assumption was that the cementitious waste form of the Cement-Ceramic Waste Option and the alluvial soil at the greater confinement facility would be chemically compatible, and the cement waste form would be the least likely to migrate in the surrounding soil. However, a greater confinement facility for HLW disposal has not been studied, approved, or constructed. In addition, if INEEL were the only site disposing HLW at a greater confinement disposal facility, the INEEL could potentially bear all costs associated with the development of the repository (e.g., site characterization and performance assessments associated with U.S. Nuclear Regulatory Commission licensing and EPA certification of compliance). Therefore, it is unlikely that significant cost savings at a greater confinement facility (assuming it could be licensed) could be realized over a geologic repository, where INEEL would expect to pay only a prorated share of the development and operational costs based on its share of the waste disposed of.

Even if the Cement-Ceramic Waste Option had a high potential to reduce life cycle costs, the Direct Cement Waste Option has lower technical risk which eliminates the need to include the Cement-Ceramic Waste Option. The Cement-Ceramic Waste Option is based on calcination of liquid mixed transuranic waste/SBW and calcine slurry in the New Waste Calcining Facility, which is currently configured to process a liquid feed. Reconfiguring the New Waste Calcining Facility to process a liquid mixed transuranic waste/SBW and calcine slurry would present a potentially costly technical challenge. No prior research and development work has been conducted to verify the feasibility of such an operation. Thus, a significant technical risk would remain for this process. For these reasons the Cement-Ceramic Waste Option was eliminated from ***detailed analysis*** in this EIS.

3.3.4 DISPOSAL OF LOW-LEVEL WASTE CLASS A OR CLASS C TYPE GROUT AT THE HANFORD SITE

Each of the options under the Separations Alternative would produce a low-level waste grout. DOE initially considered the Hanford site a representative location for disposal of this grout at a non-INEEL DOE site. However, previous evaluations of low-level waste grout disposal at Hanford indicate the long-term (beyond 1,000 years) impacts of low-level waste grout disposal could exceed regulatory standards for groundwater protection (WHC 1993). Hanford's current HLW management strategy (62 FR 8693; February 26, 1997) calls for vitrifying the low-level waste fraction prior to onsite disposal. It is unlikely Hanford would be able to accept grouted INEEL low-level waste for disposal. Therefore, disposal of low-level waste grout at the Hanford Site was eliminated from ***detailed analysis*** in this EIS.

3.3.5 VITRIFICATION AT THE WEST VALLEY DEMONSTRATION PROJECT OR THE SAVANNAH RIVER SITE

As previously described, DOE is evaluating transportation of HLW (calcine or separated HLW fraction) to DOE's Hanford Site for vitrification, with the borosilicate glass product being shipped back to INEEL for interim storage pending shipment to a geologic repository. DOE also considered shipment of the stabilized HLW to the West Valley Demonstration Project in New York or the Savannah River Site in South Carolina for vitrification. However, the West Valley Demonstration Project Vitrification Facility is not a candidate for treatment of INEEL HLW since the facility will be shut down according to Public Law 96-368 (1980) and DOE plans to cease ***vitrification*** operations at West Valley ***in 2002 (Sullivan 2002)***. Therefore, the West Valley facilities would not be available at the time when the INEEL HLW was ready for processing (Murphy and Krivanek 1998).

Earlier studies concluded that chemical incompatibilities with the Savannah River Site melter would exist because of the presence of fluorides (in calcine) or phosphate (in separated HLW fraction). Significant life cycle costs would be incurred to replace equipment that was beyond design basis life or constructed of materials that were incompatible with INEEL HLW.

Therefore, shipment of HLW to the West Valley Site or the Savannah River Site for vitrification was eliminated from ***detailed analysis*** in the EIS.

3.3.6 SHIPMENT OF MIXED TRANSURANIC WASTE (SBW/NEWLY GENERATED LIQUID WASTE) TO THE HANFORD SITE FOR TREATMENT

In this option, the existing mixed transuranic waste/SBW would be pumped from the INTEC Tank Farm to new permitted tank storage. Mixed transuranic waste (newly generated liquid wastes), after being concentrated, would be stored in the new storage tanks with the existing mixed transuranic waste/SBW. The waste would remain in the new storage tanks until being sent to a new packaging facility where it would be solidified by absorption on a 90 percent silica matrix and placed into shipping containers. There would be a short period of onsite storage until enough containers accumulated to ship to the Hanford Site for treatment. DOE has evaluated several methods for processing the mixed transuranic waste (SBW/newly generated liquid waste) at Hanford: direct vitrification, chemical dissolution followed by separations, and mechanical separation of solid and liquid material. DOE has eliminated all of these methods from ***detailed*** analysis in this EIS for the reasons listed below.

Direct vitrification of the mixed transuranic waste (SBW/newly generated liquid waste) at Hanford poses several technical uncertainties that would need to be overcome before it could be implemented. First, the mixed transuranic waste ***would be*** acidic under the absorbed scenario, while the Hanford facilities are presently being designed and permitted for alkaline materials. Thus, this waste stream would be the only acid waste stream proposed for processing in the Hanford facilities***, which*** would require ***process*** modifications. Second, modifications to the off-gas systems at the Hanford HLW vitrification facility would be required to address higher concentrations of contaminants such as mercury and higher ***levels*** of nitrogen oxides associated with the mixed transuranic waste (SBW/newly generated liquid waste). Finally, direct vitrification of the mixed transuranic waste would result in the generation of approximately 1,500 Hanford HLW canisters, which would have an estimated disposal cost of $650 million [based on DOE (1996b)]. DOE has included for evaluation in this EIS several other methods for treatment of the mixed transuranic waste that do not result in this large disposal cost (e.g., treatment by cesium ion-exchange and grouting under the Minimum INEEL Processing Alternative).

DOE does not consider chemical dissolution of the solidified mixed transuranic waste (SBW/newly generated liquid waste) followed by separations to be a viable option because the only known dissolution agent for the absorbent material is highly concentrated hydrofluoric acid (Jacobs 1998). DOE's past experience with hydrofluoric acid dissolution processes has demonstrated it to be complex and to present health and safety risks (Jacobs 1998).

DOE does not consider mechanical separation of solid and liquid material to be a viable option. While the majority of liquid could be removed through a vacuum-extraction process, DOE's past experience in removing materials from natural or geologic matrices (e.g., soil washing studies, soil partitioning studies) indicates it would be difficult to remove enough of the transuranic material (bound with covalent bonds or trapped in pore spaces) to dispose of the absorbent as low-level waste.

For these reasons, the option of shipment of mixed transuranic waste (SBW/newly generated liquid waste) to the Hanford Site for treatment was eliminated from ***detailed analysis*** in this EIS.

3.3.7 TREATMENT OF MIXED TRANSURANIC WASTE/SBW AT THE ADVANCED MIXED WASTE TREATMENT PROJECT

In this option the mixed transuranic waste/SBW would be shipped to the INEEL ***British Nuclear Fuels Limited*** Advanced Mixed Waste Treatment Project for treatment, with the resulting waste form then being shipped to the Waste Isolation Pilot Plant for disposal. The Advanced Mixed Waste Treatment Project could treat up to 120,000 cubic meters of alpha-contaminated and transuranic wastes from INEEL or other DOE sites. The Advanced Mixed Waste Treatment Project employs multiple treatment technologies (including supercompaction, macroencapsulation, and microencapsulation) to produce final waste forms that ***can*** be certified for disposal at the Waste Isolation Pilot Plant.

The Advanced Mixed Waste Treatment Project treatment units can accommodate contact handled wastes only. As currently designed, all wastes destined for thermal treatment at the Advanced Mixed Waste Treatment Project would be required to be in a dry solid form, as the facility is not configured to process liquid wastes. The mixed transuranic waste/SBW is a liquid. Thus, the mixed transuranic waste/SBW would require pre-treatment (i.e., cesium ion exchange) before shipment to the Advanced Mixed Waste Treatment Project.

Several modifications to the Advanced Mixed Waste Treatment Project to process liquids would be required. These modifications include liquid waste storage and feed systems and additional control systems. Modifications to accept mixed transuranic waste/SBW could disrupt the ongoing Advanced Mixed Waste Treatment Project design and permitting activities, jeopardizing compliance with the Settlement Agreement/Consent Order and increasing costs. In addition, because of the highly acidic nature of the mixed transuranic waste/SBW, modifications to the Advanced Mixed Waste Treatment Project offgas system to remove the additional nitrogen oxides would be necessary.

This EIS contains an alternative (Minimum INEEL Processing) that processes the mixed transuranic waste/SBW into a waste form suitable for disposal at the Waste Isolation Pilot Plant. Using this non-thermal technology would allow the mixed transuranic waste/SBW to be placed into a final form acceptable for disposal using fewer pretreatment or treatment steps and generating less secondary waste than treatment at the Advanced Mixed Waste Treatment Project. Therefore, use of the Advanced Mixed Waste Treatment Project does not fulfill a regulatory or operational need that is not otherwise met by other options evaluated in this EIS.

For these reasons, the option of treatment of mixed transuranic waste/SBW at the Advanced Mixed Waste Treatment Project was eliminated from ***detailed analysis*** in this EIS.

3.3.8 GROUT-IN-PLACE

This alternative would grout the mixed transuranic waste/SBW in the tanks and the calcine in the bin sets. For the mixed transuranic waste/SBW, the grout/waste mixture would be entombed directly in the tanks. The calcine would either be mixed with grout and entombed in the bin sets, or the vaults surrounding the bin sets could be filled with clean grout. This alternative was eliminated from detailed analysis for the following reasons:

- ***Tests on simulated acidic waste (i.e., a non-radioactive equivalent to mixed transuranic waste/SBW) revealed that attempting to transform the waste into a stable in situ solid form in the tanks could result in waste stratification and precipitation. Although it may be possible to stabilize the waste by adding a grout mixture directly to the tanks without exceeding their capacity (assuming a 30 percent waste loading and tanks completely filled), there are technical uncertainties related to the solidification of such a large volume of waste in this manner. Therefore, no credit could be taken for the performance of this method of grouting as a means to meet disposal requirements. As a result, it was determined that it would be necessary to remove the mixed transuranic waste/SBW from the tanks and treat it in a new remote handled grouting facility to neutralize and stabilize the waste to avoid stratification and precipitation. The resultant waste and grout slurry could then be placed into the tanks. For the calcine, there is not enough capacity in the bin sets to grout the calcine in place. If the calcine were encased in clean grout around the bin sets, the potential long-term impacts would be similar to the Continued Current Operations and No Action Alternatives. For long-term impact analysis (Section 5.3.5.2 of this EIS), DOE assumed that any structure was vulnerable to degradation failure after 500 years in accordance with the Nuclear Regulatory Commission position for long-term storage facilities (NRC 1994).***

- ***Although NEPA requirements allow agencies to consider alternatives that may not be consistent with applicable laws, regulations, and enforceable agreements, DOE does not regard disposal of all the mixed transuranic waste/SBW in the tanks or calcine in the bin sets to be reasonable, primarily because it would not meet RCRA regulatory disposal requirements for mixed waste at the INEEL.***

3.3.9 OTHER TECHNOLOGIES EVALUATED

New technologies and variations of previously studied treatment options were suggested by the public, the National Academy of Sciences, and subject matter experts. These options were evaluated and eventually eliminated from further detailed analysis. Section B.8.3 of Appendix B includes a summary of these technologies and variations, and discusses why they were eliminated from detailed analysis. In addition, operating the calciner in its present interim status configuration was evaluated and eliminated from detailed analysis in the Final EIS. Based on programmatic considerations, DOE has determined that operating the calciner in its current configuration is not a reasonable alternative.

3.4 Preferred Alternatives

When the Draft EIS was published, DOE and the State of Idaho, as a cooperating agency, had not selected a preferred alternative. Subsequently, DOE and the State of Idaho have selected their Preferred Alternatives for this EIS. The process used to select the Preferred Alternatives is described in Appendix B.

3.4.1 WASTE PROCESSING

The State of Idaho's preferred waste processing alternative - The State of Idaho's Preferred Alternative for waste processing is the Direct Vitrification Alternative described in Section 3.1.6. This alternative includes vitrification of mixed transuranic waste/SBW and vitrification of the HLW calcine with or without separations.

Under the option to vitrify the mixed transuranic waste/SBW and calcine without separations, the mixed transuranic waste/SBW would be retrieved from the INTEC Tank Farm and vitrified. Calcine would be retrieved from the bin sets and vitrified. In both cases, the vitrified product would be stored at INTEC pending disposal in a geologic repository.

The option to vitrify the mixed transuranic waste/SBW and vitrify the HLW fraction after calcine separations would be selected if separations were shown to be technically and economically practical. Mixed transuranic waste/SBW would be retrieved from the INTEC Tank Farm and vitrified. Calcine would be retrieved from the bin sets and chemically separated into a HLW fraction and transuranic or low-level waste fractions, depending on the characteristics of the waste fractions. The HLW fraction would be vitrified. The vitrified product from both the SBW and HLW fraction would be stored at INTEC pending disposal in a geologic repository. The transuranic or low-level waste fractions would be disposed of at an appropriate disposal facility outside of Idaho.

In addition, under the Direct Vitrification Alternative, newly generated liquid waste could be vitrified in the same facility as the mixed transuranic waste/SBW, or DOE could construct a separate treatment facility for newly generated liquid waste.

DOE's preferred waste processing alternative - DOE's preferred waste processing alternative is to implement the proposed action by selecting from among the action alternatives, options and technologies analyzed in this EIS. Table 3-1 identifies DOE's preferred options, and also identifies options contained within the action alternatives that DOE does not prefer. Options not included in DOE's Preferred Alternative are, storage of calcine in the bin sets for an indefinite period under the Continued Current Operations Alternative, the shipment of calcine to the Hanford Site for treatment under the Minimum INEEL Processing Alternative, and disposal of mixed low-level waste on the INEEL under any alternative. The selection of any one of, or combination of, technologies or options used to implement the proposed action would be based on performance criteria that include risk, cost, time and compliance factors. The selection may also be based on the results of laboratory and demonstration scale evaluations and comparisons using actual wastes in proof of process tests. The elements of the proposed action and how they would be addressed under Preferred Alternative are identified below.

- **Select appropriate technologies and construct facilities necessary to prepare INTEC mixed transuranic waste/SBW for shipment to the Waste Isolation Pilot Plant -** DOE would treat all mixed transuranic waste/SBW stored in the INTEC Tank Farm and ship the product waste to the Waste Isolation Pilot Plant for disposal. A range of potential treatment technologies representative of those that could be used is analyzed in this EIS. The Department's objective is to treat the mixed transuranic waste/SBW such that this waste would be ready for shipment to the Waste Isolation Pilot Plant by December 31, 2012.

- **Prepare the mixed HLW calcine so that it will be suitable for disposal in a repository -** DOE would place all mixed HLW calcine in a form suitable for disposal in a repository. This may include any of the treatment technologies analyzed in this EIS as well as shipment to a repository without treatment as analyzed in this EIS. The Department's objective is to place the mixed HLW calcine in a form such that this waste would be ready for shipment out of Idaho by December 2035.

- **Treat and dispose of associated radioactive wastes -** DOE would treat and dispose of all wastes associated with the treatment and management of HLW and mixed transuranic waste at INTEC. This includes the treatment and disposal of newly generated liquid waste. A range of the potential treatment technologies that could be used is analyzed in this EIS.

- **Provide safe storage of HLW destined for a repository -** DOE would continue to store mixed HLW calcine in the INTEC calcine bin sets until the calcine is retrieved for treatment or placed in containers for shipment to a repository.

3.4.2 FACILITIES DISPOSITION

Both DOE and the State of Idaho have designated performance-based closure methods as the Preferred Alternative for disposition of HLW facilities at INTEC. These methods encompass three of the six facility disposition alternatives analyzed in this EIS: Clean Closure, Performance-Based Closure, and Closure to Landfill Standards. Performance-based closure would be implemented in accordance with applicable regulations and DOE Orders. However, any of the disposition alternatives analyzed in this EIS could be implemented under performance-based closure criteria. Consistent with the objectives and requirements of DOE Order 430.1A, *Life Cycle Management*, and DOE Manual 435.1-1, *Radioactive Waste Management Manual*, all newly constructed facilities necessary to implement the waste processing alternatives would be designed and constructed consistent with measures that facilitate clean closure. Therefore, the Preferred Alternative for disposition of new facilities is Clean Closure.

Waste management activities associated with any of the facility disposition alternatives would be carried out over a long period of time. Disposition actions would be implemented incrementally as the facilities associated with the generation, treatment, and storage of high-level and associated wastes approached the completion of their mission. Disposition actions would be systematically planned, documented, executed, and evaluated to ensure public, worker, and environmental protection in accordance with applicable regulations. Performance-based closure may result in some residual wastes being retained within the dispositioned facilities. Residual wastes would be reduced to the extent technically and economically practical. Examples of wastes which may not be totally removed include residuals in the HLW Tank Farm storage tanks, wastes remaining following decontamination of systems, equipment and facility interiors, and unrecoverable calcine in the bin sets. These remaining wastes would be immobilized and the sites would be monitored in accordance with applicable requirements of RCRA, the Idaho Hazardous Waste Management Act, and/or DOE requirements.

In addition, in accordance with DOE Order 435.1, *Radioactive Waste Management*, a Composite Analysis would be developed to determine the allowable accumulated risk to be protective for all pathways resulting from the residual contamination that would be eventually disposed of in-place from all the INTEC facilities. For example, the CERCLA Record of Decision for Waste Area Group 3, INTEC, which